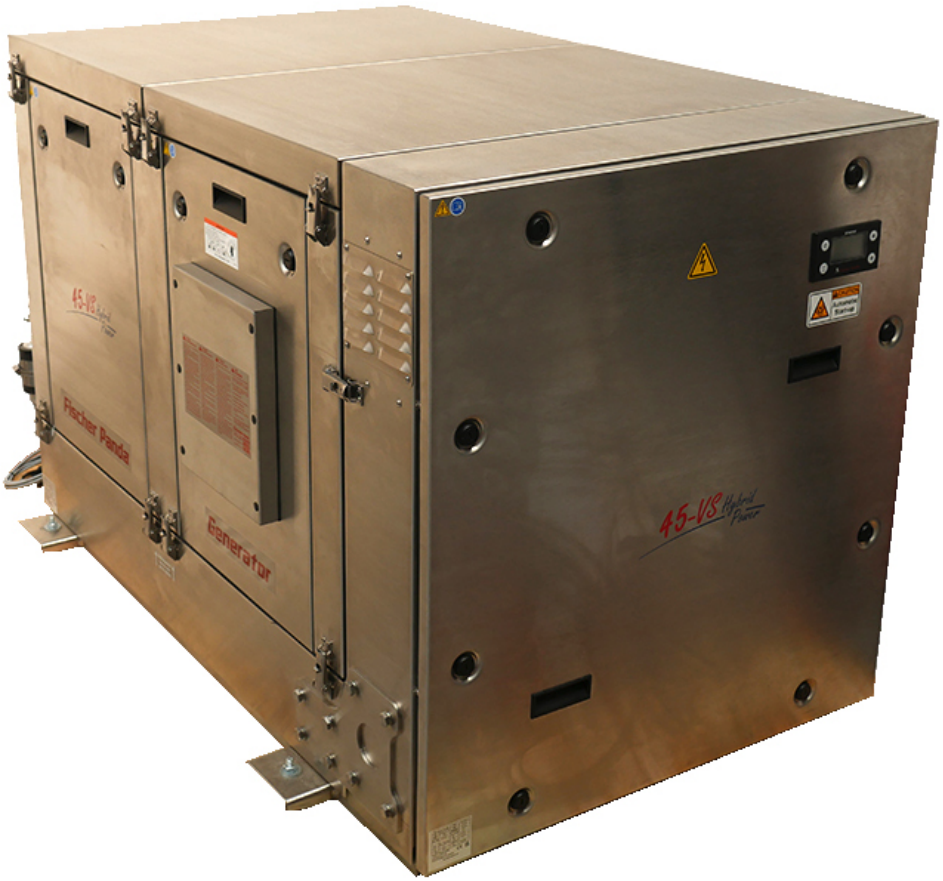

Panda 45-VS PMS manual

Super silent technology

300-500 V_{DC} / 150 A_{DC} / 0-45 kW

Fischer Panda part number: 0032821

Current revision status

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Dear valued customer,

Thank you for deciding to purchase a Fischer Panda generator and for choosing Fischer Panda as your on-board energy partner. Your generator offers you the possibility of generating your own power - wherever you are - making you all the more independent. Not only do you have a Fischer Panda generator on board; you are also supported worldwide by our Fischer Panda team. Please take the time to read this information. We can also assist you with:

Inspecting the generator installation and guarantee

Every generator has a world-wide guarantee. As soon as the installation has been completed, you can register your guarantee with your dealer. If you have obtained an extended guarantee, please ensure that this is properly filed and that your dealer has your current address. Please consult your dealer regarding guarantee options, especially when you have purchased a pre-owned generator. Your dealer will be happy to assist and can inform you regarding authorised Fischer Panda dealers world-wide.

Service and Support

To ensure that your generator runs faultlessly, regular servicing and maintenance tasks described in the handbook must be carried out. Fischer Panda can supply service kits intended for routine maintenance work. We only supply components of the highest quality and ensure that you receive the CORRECT spares for your generator. Service “Plus” Kits are also available and are ideal for longer cruises, which may last for more than one service interval.

Should you require any assistance, please contact your Fischer Panda dealer. Please do not attempt to carry out repairs yourself, as this can affect your generator guarantee. Your dealer can assist you in finding the nearest Fischer Panda service station. You can also find the nearest service station in our global service network, which is available as a download on our homepage.

Product registration

Please take the time to register your Fischer Panda generator on our website under

http://www.fischerpanda.de/mypanda.

By registering, you ensure that you are always informed and up-to-date. You will receive technical upgrades or special information concerning the operation and servicing of your generator. You will also be informed about new Fischer Panda products, which can be particularly helpful should you want to enhance your installation at a later date.

Fischer Panda quality - certified according to DIN ISO 9001

Thank you for purchasing a Fischer Panda generator

Your Fischer Panda Team

1. General instructions and regulations

1.1 The cardinal rule is safety!

Warning symbols are used throughout this manual to warn of the risk of personal injury or lethal danger when certain maintenance tasks or operating procedures are performed. Instructions marked in this way must always be read and followed carefully.

LETHAL DANGER! - Improper operation can cause harm to health and result in death.

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

Warning! Automatic start-up

Improper maintenance can result in severe personal harm and material damage. Therefore:

- Maintenance work must only be performed when the engine is switched off.
- Before commencing work, ensure that there is sufficient freedom of movement for installation work to be carried out..
- Take care the the workplace is neat and clean! Components and tools that are loosely stacked or lying around can result in accidents
- Perform maintenance work only with standard tools or special tools as customarily used in the trade. Incorrect or damaged tools can result in injuries

Warning! Risk of injury

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

- Ensure that there are no open flames while working on the engine.
- Do not smoke.
- Remove oil and fuel residue from the engine and the floor

Warning! Fire hazard

Contact with engine oil, fuel and anti-freeze agents may result in harm to health when inhaled, swallowed or when coming into contact with skin. Therefore:

- Avoid skin contact with engine oil, fuel and anti-freeze.
- Remove splashed oil and anti-freeze from the skin immediately.
- Do not inhale oil and fuel vapours.

Caution! Risk of poisoning

LETHAL DANGER! - Improper operation can cause harm to health and result in death.

Electric voltages of more than 60V 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

Warning! Electrical voltage

electrical connections of the generator.

Generator and coolant may be hot during and after use. Risk of being burnt/scalded!

Warning! Hot surface/material

Excess pressure may develop in the cooling system when operating.

Batteries contain corrosive acids and alkalis.

Warning!

Improper handling can cause the batteries to heat up and burst. Corrosive acid/lye may leak. Under unfavourable conditions, an explosion may result.

Adhere to the instructions of your battery manufacturer.

Personal protective equipment must be worn as applicable. This consists of:

Imperative! Protective equipment required

- Snugly-fitting protective clothing
- Safety shoes
- Protective gloves
- Hearing protection
- Goggles, if required

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

Attention! Switch off all loads.

1.2 Disposal

Engine fluids/batteries are harmful to the environment.

Imperative! Protect the environment.

Collect and dispose of drained engine fluids properly!

Dispose of batteries in the appropriate manner.

1.3 Customer registration and warranty

Use the advantages of registering your product:

- You will receive a guarantee certificate once your installation data has been checked.
- You will receive additional product information that may be safety-relevant.
- You will receive free upgrades, when necessary.

Further advantages:

By providing full details, the Fischer Panda technicians will be able to offer rapid assistance, as 90% of break-downs are caused by peripheral faults.

Problems due to installation errors can be recognised in advance.

1.3.1 Technical support

Technical support via the Internet: info@fischerpanda.de

1.3.2 Caution, important information for start-up!!

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

1.4 Safety Instructions - safety first!

1.4.1 Safe operation

Careful handling of the equipment is the best insurance against an accident. Read the handbook diligently, and make sure you understand it before starting up the equipment. All operators, regardless of their experience level, shall read this handbook 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.

1.4.2 Observe the safety instructions!

Read and understand this handbook 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.

1.4.3 Personal protective clothing

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, medication or drugs.

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

1.4.4 Cleanliness ensures safety

Keep the generator and its environment clean.

Before cleaning, the generator must be switched off and secured against unintended starting. 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.

1.4.5 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 has been 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.

1.4.6 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.

Diesel engine exhaust fumes and other constituents are carcinogenic and may cause malformations and other genetic defects.

1.4.7 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. Handle hot components with care such as exhaust components, radiators, hoses and the engine block both during operation and after the generator has been switched off.

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 block 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 useful life of the battery is significantly reduced, and the risk of explosion increases. Always fill fluid levels to a point between the maximum and minimum levels.

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

Check the charge level with an adequate voltmeter or acid siphon. A metal object lying over the poles will cause a short circuit, battery damage and a high risk of an explosion.

Do not charge frozen batteries. Heat the batteries to +16 °C (61 °F) prior to external charging.

1.4.8 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 moving parts, such as belt pulleys, fans, V-belts and flywheels. Touching can result in serious 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.

1.4.9 Antifreeze and disposal of fluids

Antifreeze 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 is 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.

1.4.10 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 extinguishing unit and a first aid box handy while performing maintenance work.

1.5 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.

1.5.1 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 to be installed without a sound attenuation housing, it must be ensured that all rotating parts (belt pulley, V-belts etc.) are covered and protected so that there is no danger to life and body!

If a sound attenuation upgrade is to be manufactured at the place of installation, then well-placed signs must show that the generator can only be switched on with the sound attenuation housing closed.

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

Electrical voltages above 50 V (in the case of battery chargers, already when greater than 36 volts) are always life-threatening. It is therefore imperative that the rules of the respective regional authority regarding installation and maintenance must be adhered to. For safety reasons, only an electrician may carry out the installation of the electrical connections of the generator.

1.5.1.1 Protective conductor and equipotential bonding

Electrical voltage greater than 50V may, in the event of contact, lead to life-threatening currents in the body. For this reason, systems are earthed with a protective conductor. In conjunction with an RCD (FI switch) or insulation monitoring, the power supply is disconnected in the event of a fault.

Appropriate protective measures, such as the RCD or appropriate fuses must be made available by the customer, to ensure the safe operation of the generator.

1.5.1.2 Switch off all loads when working on the generator

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

1.5.1.3 Potential equalisation in Panda AGT-DC and VS generators

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

1.5.1.4 Safety instructions concerning cables

Cable types

It is recommended to use cables that are in compliance with the UL 1426 (BC-5W2) standard 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. Care must be taken that the cable routing is not run next to hot surfaces such as exhaust manifolds or motor oil drain plugs, but rather as free of any causes of friction or crushing as possible.

1.5.2 General safety instructions when 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 acid splashes on your skin or clothing, wash if off with lots of water and soap.

- If acid enters your eyes, rinse them immediately with clean water, until the burning sensation has stopped. Immediately seek medical assistance.
- Do not smoke near the batteries. Avoid naked flames. 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 blocks: 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 leads must be routed carefully and tested for undue heating under load. Check the battery near vibrating

components regularly for chafing and insulation defects.

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

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

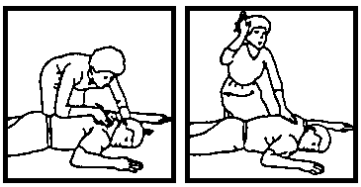
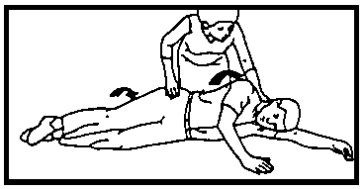
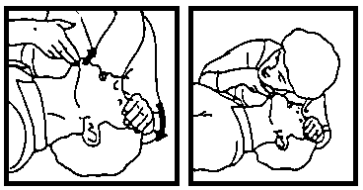
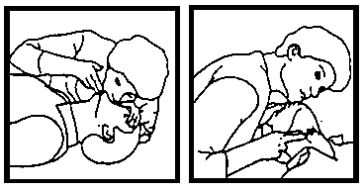
2. In case of Emergency First Aid

	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.	

2.1 WHEN AN ADULT STOPS BREATHING

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

Warning:

1 Does the Person Respond? Tap or gently shake victim. Shout, “Are you OK?“		2 Shout, “Help!“ Call people who can phone for help.
3 Roll Person onto Back. Roll victim towards you by pulling slowly.		
4 Open Airway. Tilt head back, and lift chin. Shout, “Are you OK?“		5 Check for Breathing. Look, listen, and feel for breathing for 3 to 5 seconds.
6 Give 2 Full Breaths. Keep head tilted back. Pinch nose shut. Seal your lips tight around victim's mouth. Give 2 full breaths for 1 to 1½ seconds each.		
7 Check for Pulse at side of Neck. Feel for pulse for 5 to 10 seconds.		8 Phone EMS for Help. Send someone to call an ambulance.
9 Begin Rescue Breathing. Keep head tilted back. Lift chin. Pinch nose shut. Give 1 full breath every 5 seconds. Look, listen, and feel for breathing between breaths.		10 Recheck Pulse Every Minute. Keep head tilted back. Feel for pulse for 5 to 10 seconds. If victim has pulse, not breathing, continue rescue breathing. If no pulse, begin CPR.

3. Special instructions and hazards in the case of VS-DC generators

3.1 General safety instructions for operating a VS-DC generator

VS-DC generators generate high DC voltages and DC current and special safety measures that safeguard the area around the components from fire and overvoltage must therefore be taken.

- High DC current poses a risk of fire due to the incorrect layout of lines and system components.
- High DC current poses a risk of fire due to incorrectly connected or bolted connections.
- High DC current poses a risk of electric arcing in the event of the conductors being interrupted suddenly.
- High DC voltages pose a risk of an electrical shock when live components are touched.

VS-DC generators can be operated individually with the fpControl Panel, or they can be integrated with a higher-level control system (power management system) by means of a CAN Bus interface.

When operated individually, it is essential that the HV battery is fitted with a main switch or an emergency-off switch in an easily accessible location so that the main switch can be disconnected immediately in case of danger. The main switch must, however, be installed directly on the HV battery; this is only possible if the physical proximity of the system components allows it.

If this location is not accessible, a power relay must be used instead of a manually operated main switch, which can then be operated from different locations, as well, if necessary.

The switches for the power relay shall be labelled accordingly as main switch for the HV DC battery with "Switch off in case of danger!".

If the VS-DC generator is integrated with a higher-level power management system then this system must ensure that the generator can be shut down and disconnected from the HV DC BUS in the event of an emergency. In addition, an emergency-off switch should be installed in close proximity to the VS-DC generator.

When performing maintenance, it must be possible to ensure that the generator cannot be switched on and that the HV battery can be disconnected permanently from the VS-DC generator (compliance with the five safety rules).

With all live systems, special safety precautions must be implemented to protect the components from fire.

3.1.1 “Hybrid-Charger” power electronics

VS-DC generators have an active DC/boost converter, which converts the AC generator voltage to the desired DC voltage. This power electronic component is the FP hybrid charger.

The hybrid charger is water-cooled. Proper cooling of the power electronics is therefore possible only as long as the cooling water supply of the generator functions properly.

Circuit breakers and the housing of the power electronics are monitored by temperature switches. After a cooling system failure, the proper functioning of the power electronics must be tested; should faults arise, they should be repaired by or sent to Fischer Panda.

The Hybrid Charger has HV intermediate circuit capacitors, which stores energy even after the device has been shut down. Should the equipment be opened, a check must be made to ensure that there is no voltage in the DC link (by electrician only, comply with the 5 safety rules).

The hybrid charger may only be operated in conjunction with Fischer Panda generators as the system is designed for each generator. It is not permitted to connect it to other generators or a three-phase network and this may lead to malfunction, destruction of the device, fire or a life-threatening shock.

Generally the hybrid charger is installed directly in the capsule of the VS generator. Should this be installed outside, then the shielded 3 phases of the generator may not be extended. The Hybrid Charger must be installed directly adjacent to the generator.

The Hybrid Charger is fused internally for the maximum current of the power electronics. A fuse that is matched to

the appropriate cross-section of the connecting cable must be supplied by the customer There is a fire risk if this is not the case.

3.1.2 Fire protection measures

All components in the vicinity of live parts shall be protected against fire.

All connection interfaces on live parts shall be regularly inspected for heat development (infra-red thermometer).

Temperature variations in particular indicate high contact resistance values or bad connections on the hotter contact.

The generator shall be integrated in the fire safety system (where applicable).

3.1.3 Insulation monitoring measures

An insulation monitor or a specific FI switch must be installed on the DC bus as a safeguard against electrical shock.

4. Basics

4.1 Proper use

The Fischer Panda generator serves to generate electrical current from diesel fuel.

The diesel fuel is converted into mechanical energy in a combustion engine. A generator installed on the engine converts this mechanical energy into electrical energy. The process is controlled and regulated by the (possibly external) remote-control panel and VCS (voltage-control system) components.

Adequate fuel and air for combustion is required for this process. The resulting exhaust gases and heat must be channelled away in accordance with regulations.

When electrical energy is fed into an electrical grid, the guidelines of the grid operator/utility as well as the directives of the specific territory's public authority regarding electrical grids/on-board power supply systems must be complied with. Appropriate safety systems and switches must be installed.

Any use other than that which has been described above will lead to damage to this product and the power grid as well as the consumers, and it is also associated with hazards such as short circuiting, etc. The product as a whole may not be modified or converted and the casing of the plant may not be opened. The safety instructions must be followed without fail.

4.2 Objectives of the manual and declaration of interested parties

This manual serves as the work and operating instructions for the user and operator of Fischer Panda generators.

The handbook serves as a foundation and guide for the installation and servicing of Fischer Panda generators in a manner that complies with legislation and regulation. It does not replace professional judgement and design, nor the modification of the installation to comply with local conditions and national/international regulations. All work must be carried out according to the state of the art.

4.2.1 Specialists

Specialists that are considered to be suitable to work on the mechanical components include qualified motor-vehicle mechanics or persons with equivalent qualifications.

Specialists considered to be suitable to work on the electrical systems include qualified electricians, electrical engineering technicians, or persons with equivalent qualifications.

After the installation, the specialist must instruct the user in the operation and servicing of the generator. He/she must point out the hazards that exist to the user.

4.2.2 Users

The user is considered to be the person who is responsible for operating the generator.

After installation, the user must be instructed regarding the handling and operation of the generator. This includes, in particular, instruction regarding the hazards that arise while operating, the various operating conditions and training regarding the maintenance of the generator,

The user must read the entire handbook and must take note of the safety instructions and regulations contained therein.

4.2.3 Operators

The operators are considered to be the persons who have been appointed by the owner/user to handle and operate the generator.

The owner/user must ensure that the operator has read the manual in full and that the appropriate safety instructions and regulations are complied with. The operator must, in accordance with his/her job description, be trained and made technically competent by the user. This is particularly important in the area of servicing.

4.3 Opening the Fischer Panda Transport Box

4.3.1 Bolted Fischer Panda Transport Box

1. Loosen the bolts for lid / side-walls
2. Remove the cover
3. Remove the loose accessories
4. Remove the bolts for side-walls / floor pallet
5. Remove the side-walls
6. Loosen the equipment lock

4.3.2 Fischer Panda Transport Box with metal tab closure

1. Bend open the metal tab closures on the transport box lid.
2. Remove the cover
3. Remove the loose accessories
4. Bend open the metal tab closures on the transport box bottom.
5. Remove the side-walls
6. Loosen the equipment lock

4.4 Transport and Loading

4.4.1 Transporting the generator

- The generator may only be transported in an upright position.
- The Fischer Panda transport box must be used when transporting the generator. The generator shall be securely attached to the bottom of the box.
- A suitable forklift must be used when loading.
- Depending on the means of transportation (e.g. air freight), the generator fluids (coolant, engine oil, fuel) may need to be drained. The corresponding instructions and warnings must be fitted to the transport packaging.

4.4.2 Loading the generator

Appropriate eye-bolts should be installed in the threaded holes of the support rails for loading. 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

Illustrative example

Fig. 4.4.2-1: Example of lifting yoke

4.5 Fischer Panda Generator scope of delivery

The scope of delivery of the Fischer Panda generators includes the following parts:

4.5.1 Variable speed generators

Fischer Panda VS generator

Illustrative example

Fig. 4.5-1: Fischer Panda Generator

Remote control panel

The remote control panel can also be permanently installed on the exterior of the generator.

Illustrative example

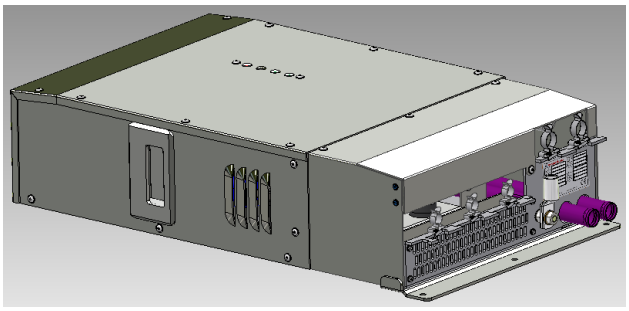
Fig. 4.5-2: Remote control panel

Hybrid charger power electronics

The hybrid charger power electronics can also be permanently installed on the exterior of the generator.

Illustrative example

Fig. 4.5-3: Hybrid charger power electronics



Fischer Panda manual

Fig. 4.5-4: Handbook

The Fischer Panda manual comprises the following components:

- Clear plastic folder with general information, guarantee conditions, installation protocol (installation report) and service list.
- Generator handbook with attached handbook for the remote-control panel.
- Spare part catalogue for "Installation & Service Guide".
- Engine manufacturer's handbook
- Circuit diagram of the generator

Example

Optional accessories

The following are examples of optional accessories:

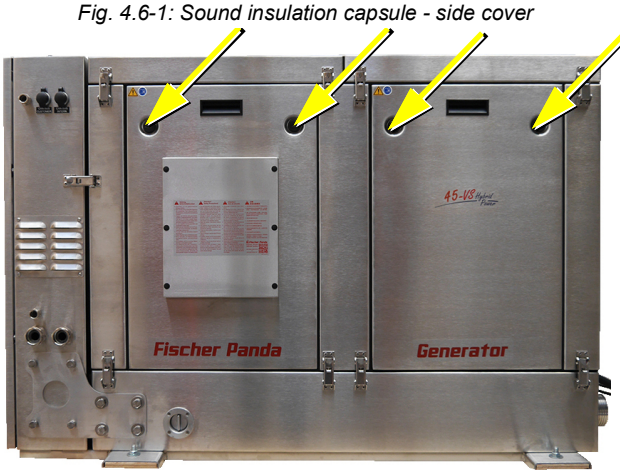
- Fuel pump
- Installation kits

4.6 Opening the MPL sound insulation capsule

Tools needed:	Set of screwdrivers

1. To open the sound insulation capsule, the closures must be rotated anti-clockwise through approximately 180°.
2. Use a flat-bladed screwdriver for this purpose. Pull the side-walls out using the recessed grips.

Fig. 4.6-1: Sound insulation capsule - side cover



3. Closure locked

Fig. 4.6-2: Closure locked

4. Closure open

Fig. 4.6-3: Closure open

5. Open all capsule closures.
6. Remove the capsule lid.
7. Close the capsule in the reverse order.

Fig. 4.6-4: Capsule lid

4.7 Special servicing instructions and measures for extended downtime and decommissioning

The measures mentioned below must be adapted to the actual circumstances.

Note:

The measures mentioned here are "standard" measures for downtime/decommissioning as well as recommissioning.

As the precise circumstances of the downtime and decommissioning are not known to Fischer Panda, these directions can serve as a template and example. The measures must be adapted in accordance with the local circumstances and regulations by a qualified specialist.

Fischer Panda accepts no liability for incorrect, unsuitable storage/downtime/decommissioning and/or recommissioning.

If the components mentioned are not fitted to the generator/engine, the relevant operations can be skipped.

Downtimes are categorised in the following groups:

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

If the generator is not operated regularly, it must be ensured that it is warmed up thoroughly every 2 weeks. If this is not done, water may collect in the oil and exhaust tract, resulting in damage.

WARNING

4.7.1 Instructions regarding the starter battery during extended downtime

Starter batteries

Note:

The self-discharge of batteries is a physical and chemical process which cannot be avoided simply by disconnecting the battery.

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

Depending on the battery type, the acid level must be checked before charging and each cell must be topped up to the marking using distilled water as necessary.

Modern starter batteries are typically maintenance-free.

Deep discharge will damage the battery and may render it unserviceable.

Keep battery clean and dry. Clean battery poles (+ and -) and terminals regularly and coat with an acid-free and acid-resistant grease. During assembly, ensure good contact of the terminal connections. The open-circuit voltage of the battery should not drop below approx. 1.95 V/cell. This corresponds to an open-circuit voltage of around 2.1 V/cell when fully charged.

For a 12 V battery, 11.7 V lower open-circuit voltage (battery discharged) - trickle charging of 13.2 V required.

For a 24 V battery, 23.4 V lower open-circuit voltage (battery discharged) - trickle charging of 13.2 V required.

These values are based on a battery temperature of 20-25 °C. Take note of the details supplied by the battery manufacturer.

Fischer Panda recommends:

- Install a battery disconnect switch and switch it to the “Off” position at the machine. (Cutting the battery circuit.)
- The positive pole of the battery must be secured close to the battery.
- Regularly check contacts for corrosion.

Note:

4.7.2 Measures for short-term downtimes

Short downtime (1 to 3 months)

- Measure battery charge status based on open-circuit voltage.
- During downtime >7 days, disconnect the battery (e.g. main battery switch in the 0-position).
- Drain the water lock and disconnect the water lock/generator connection and seal the connection with the generator.
- Run the engine for at least 10-30 mins until warm every 2--3 months.
- Fill the tank to the 100 % level (Full)

4.7.3 Measures for medium-term downtimes / hibernation

Medium-term downtimes (3 to 6 months)

4.7.3.1 Surface protection measures:

- Check battery charge status and recharge regularly, roughly every 3 months, as necessary. Follow the instructions of the battery manufacturer.
- Check coolant antifreeze level and refill as necessary.

  The antifreeze must not be older than 2 years. The proportion of antifreeze agent should lie between 40 % and 60 %, to ensure corrosion protection in the coolant circuit. Top off coolant if necessary.

  If the coolant has been drained - for example, after mothballing the engine - no water may remain in the engine during the downtime. The control unit must be marked accordingly with a note specifying "NO COOLANT".
- Drain engine oil as specified. Refill engine with preservative oil to the maximum level on the oil dipstick.
- Drain the diesel from the tank and fill up with a mothballing mixture (90 % diesel and 10 % preserving oil (Full level).

Allow the engine to run for 10 minutes to warm up.

- 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 pulleys with preservative.
- Clean air filter housing and spray with preservative.
- Seal the air intake and exhaust gas openings (e.g. with tape or end caps)
- Empty the raw water circuit.
- Close the sea-cock.

- Clean the raw water filter.
- Remove the impeller (if present) and store.

Before recommissioning, remove preservatives and protective measures!

Attention!

4.7.3.2 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 the level of antifreeze protection and the coolant level; top up as required.
- Drain engine oil. Replace oil filter and engine oil as per the specification.
- Remove preservatives from the engine with petroleum spirit.
- Degrease V-belt pulleys 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-power 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 the battery. Close battery main switch.
- Install the impeller (if present)
- Open the sea-cock.
- Check the raw water filter.
- Hold stop lever on generator motor in neutral position and crank starter for approx. 10 seconds. Then, pause for 10 seconds. Repeat this procedure twice.
- Perform visual check of the generator similar to initial commissioning and start up generator.

4.7.4 Measures for long-term downtime / decommissioning

Downtimes (more than 6 months)

4.7.4.1 Surface protection measures:

- Check battery charge status and recharge regularly, roughly every 3 months, as necessary. Follow the instructions of the battery manufacturer.
- Check coolant antifreeze level and refill as necessary.

  The antifreeze must not be older than 2 years. The proportion of antifreeze agent should lie between 40% and 60%, to ensure corrosion protection in the coolant circuit. Top off coolant if necessary.

  If the coolant has been drained - for example, after mothballing the engine - no water may remain in the engine during the downtime. The control unit must be marked accordingly with a note specifying "NO COOLANT".
- Drain engine oil as specified. Refill engine with preservative oil to the maximum level on the oil dipstick.
- Drain the diesel from the tank and fill up with a mothballing mixture (90% diesel and 10% preserving oil (Full level).

Allow the engine to run for 10 minutes to warm up.

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

Cover generator 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 pulleys with preservative.
- Clean air filter housing and spray with preservative.
- 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-power position and crank engine manually several times. Screw the injection nozzles back in with new seals. Observe torque values.
- Spray the radiator cover and tank cover or radiator cover on the expansion tank lightly with preservative oil and refit.
- Seal the air intake and exhaust gas openings (e.g. with tape or end caps)
- Empty the raw water circuit.
- Close the sea-cock.
- Clean the raw water filter.
- Remove and store the impeller

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

4.7.4.2 Measures for removing preservatives after long-term downtime / recommissioning (more than 6 months):

- Check battery charge status and recharge if necessary. Observe instructions of the battery manufacturer.
- Check the level of antifreeze protection and the coolant level; top up as required.
- Drain engine oil. Replace oil filter and oil as per the specification.
- Remove preservatives from the engine with petroleum spirit.
- Degrease V-belt pulleys and mount V-belt according to instructions. Check V-belt tension!
- If applicable, loosen the turbocharger oil pressure line and pour clean engine oil into the gallery.
- Hold engine stop lever in zero-power position and crank engine manually several times.
- Clean air filter housing with petroleum spirit, check air filter and renew if necessary.
- Remove covers from exhaust aperture and intake apertures.
- Connect the battery. Close battery main switch.
- Install the impeller (if present)
- Open the sea-cock.
- Check the raw water filter.
- Does not apply to all types of engines: Hold stop lever on generator motor in neutral position and crank starter for approx. 10 seconds. Then, pause for 10 seconds. Repeat this procedure twice.
- Perform visual check of the generator similar to initial commissioning and start up generator.

Fischer Panda recommends:

After long-term downtime, a complete inspection must be performed in accordance with the engine manufacturer.

Note:

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EC Declaration of conformity

in accordance with Regulation (EU) 2023/1230 on machinery

Manufacturer	Fischer Panda GmbH Otto-Hahn-Straße 40 33104 Paderborn
Product	Fischer Panda Diesel Generator
Product Type	G AGT-VS 000045 PMS 300V-500V M6 HW
Part No.	0038131
Year of manufacture	2025-
Function description	The Fischer Panda diesel generator is intended solely for use as a permanently-installed power generator in (vehicles, trailers and mobile containers) (inland waterway vessels) (seagoing vessels).

We hereby declare that this machine, on the basis of its design and construction and in the version that we have brought to market complies with the fundamental safety and health requirements of the following European and North American directives and regulations:

(EU) 2016/1628	Regulation concerning requirements relating to gaseous and particulate pollutant emission limits and type-approval for internal combustion engines for non-road mobile machinery
(EU) 2024/537	Regulation on fluorinated greenhouse gases, amending Directive (EU) 2019/1937 and repealing Regulation (EU) 517/2014
(EU) 2019/2144	Regulation on the type-approval of motor vehicles and motor vehicle trailers and of systems, components and separate technical units for these vehicles with a view to their general safety and the protection of vehicle occupants and vulnerable road users, amending Regulation (EU) 2018/858 and repealing Regulations (EC) No. 78/2009, (EC) No. 79/2009 and (EC) No. 661/2009 and of Regulations (EC) No. 631/2009, (EU) No. 406/2010, (EU) No. 672/2010, (EU) No. 1003/2010, (EU) No. 1005/2010, (EU) No. 1008/2010, (EU) No. 1009/2010, (EU) No. 19/2011, (EU) No. 109/2011, (EU) No. 458/2011, (EU) No. 65/2012, (EU) No. 130/2012, (EU) No. 347/2012, (EU) No. 351/2012, (EU) No. 1230/2012 and (EU) 2015/166
2014/30/EU	Directive relating to electromagnetic compatibility
2014/35/EU	Low-voltage Directive
(EU) 2023/1230	Regulation on machinery and repealing Directives 2006/42/EC and 73/361/EEC
2005/88/EC	Amendment to Directive 2000/14/EC concerning the approximation of the laws of the Member States relating to the noise emission in the environment by equipment for use outdoors

This machine complies with the following standards and conventions:

DIN EN ISO 8528-13:2017-03	Alternating current generator sets driven by a reciprocating internal combustion engine - Part 13: Safety
DIN EN ISO 12100:2010	Safety of Machines - general design principles - risk assessment and risk reduction
DIN ISO 6826:2022-05	Reciprocating internal combustion engines - Fire protection
DIN EN 60034-1:2015-02	Rotating electrical machines - Part 1 Standard methods for determining losses and efficiency from tests
DIN EN 60204-1:2019-06	Safety of machines - electrical equipment of machines - Part 1: General requirements
ISO 3046-1:2002-05	Reciprocating internal combustion engines - Performance - Part 1: Declarations of power, fuel and lubricating oil consumptions, and test methods - Additional requirements for engines for general use
ISO 3046-3:2006-06	Reciprocating internal combustion engines - Performance - Part 3: Test measurements
ISO 3046-4:2009-12	Reciprocating internal combustion engines - Performance - Part 4: Governor
ISO 3046-5:2001-12	Reciprocating internal combustion engines - Performance - Part 5: Torsional vibrations

ISO 3046-6:2020-02	Reciprocating internal combustion engines - Performance - Part 6: Over-speed protection
ISO 8178-1:2020-06	Reciprocating internal combustion engines - Measurement of exhaust emissions - Part 1: Test bench measurement systems for gaseous and particulate emissions
ISO 8178-4:2020-06	Reciprocating internal combustion engines - Measurement of exhaust emissions - Part 4: Steady-state and transient test cycles for various engine applications
DIN 6280-10:1986-10	Reciprocating internal combustion engines; generating sets with reciprocating internal combustion engines; small power generating sets; requirements and tests
MARPOL 73/78	International Convention for the Prevention of Pollution from Ships, 1973
2011/65/EU	Restriction of the use of certain hazardous substances in electrical and electronic equipment

Emission

DIN EN 55014-1:2022-12; VDE 0875-14-1:2022-12	Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus
DIN EN 55016-1-2:2019-10; VDE 0876-16-1-2:2019-10	Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus
DIN EN 55016-2-1:2019-11; VDE 0877-16-2-1:2019-11	Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus
DIN EN 55016-2-3:2020-11; VDE 0877-16-2-3:2020-11	Requirements for radio interference and immunity measuring apparatus and methods as well as methods of measurement of interference (radio interference) and immunity
DIN EN IEC 61000-6-4:2020-09; VDE 0839-6-4:2020-09	Electromagnetic Compatibility (EMC)

Immunity

DIN EN 61000-4-2:2009-12; VDE 0847-4-2:2009-12	Electromagnetic Compatibility (EMC) - Testing and measurement techniques – Electrostatic discharge immunity test
DIN EN 61000-4-3:2021-11; VDE 0847-4-3:2021-11	Electromagnetic Compatibility (EMC) - Immunity test in respect of high-frequency electromagnetic fields
DIN EN 61000-4-4:2013-04; VDE 04/04/0847:2013-04	Electromagnetic Compatibility (EMC) - Testing and measurement techniques - Immunity test in respect of electrical fast transients
DIN EN 61000-4-6:2014-08; VDE 06/04/0847:2014-08	Electromagnetic Compatibility (EMC) - Testing and measurement techniques - Immunity test in respect of conducted interference induced by high-frequency fields

The person authorized to compile the technical file

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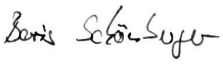
Paderborn, _____15.05.2025_____	
Place, date	Boris Schönberger (General Manager & Technical Director)
Paderborn, _____15.05.2025_____	
Place, date	Roland Ferber (Head of Quality)

6. The Panda Generator

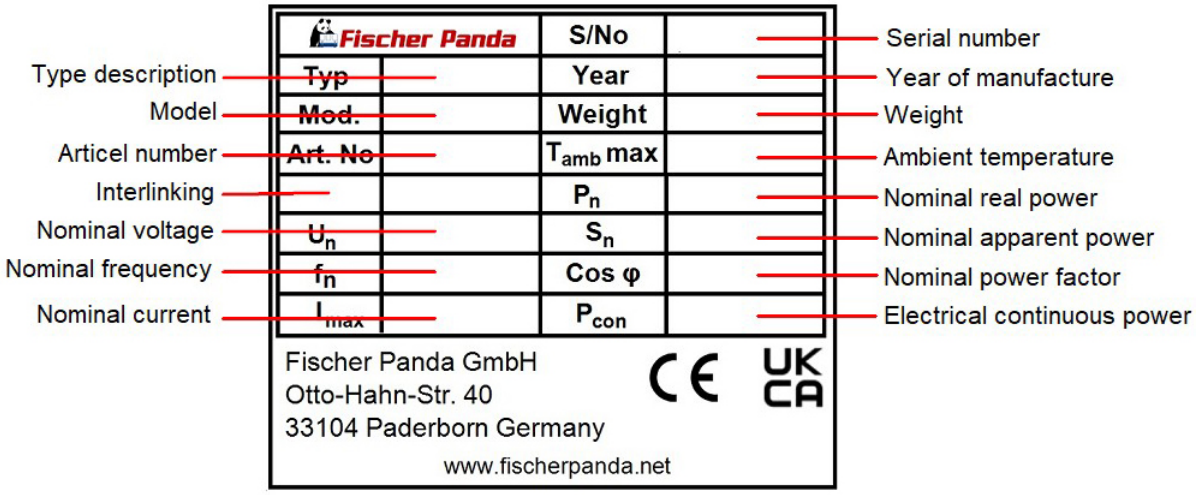
6.1 Position of the identification plate

Fig. 6.1-1: Identification plate on the generator

Fischer Panda		S/No	
Typ		Year	
Mod.		Weight	
Art. No		T_{amb} max	
		P_n	
U_n		S_n	
f_n		Cos φ	
I_{max}		P_{con}	

Fischer Panda GmbH
Otto-Hahn-Str. 40
33104 Paderborn Germany
www.fischerpanda.net

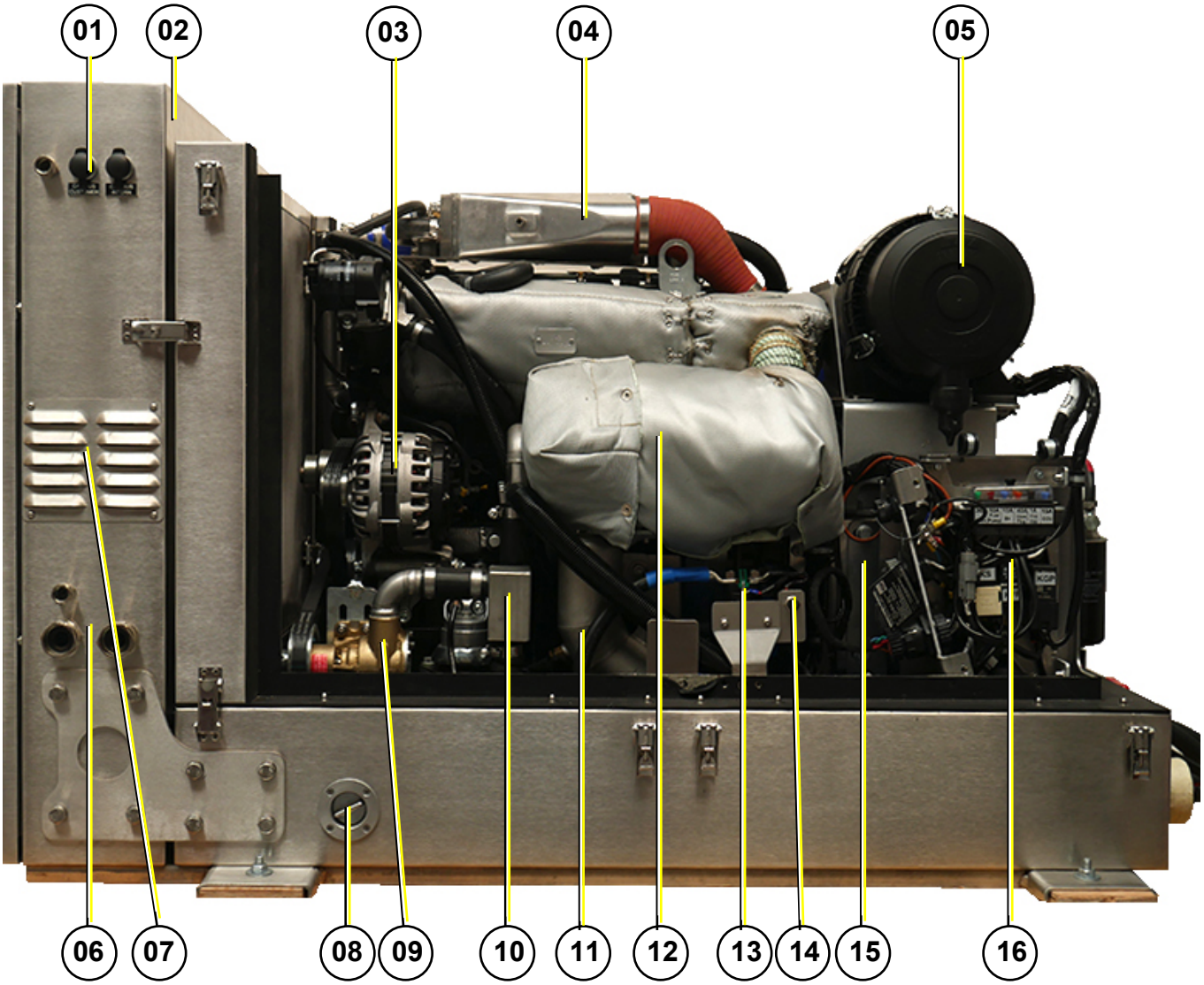
Fig. 6.1-2: Description of the identification plate



6.2 Description of the generator

6.2.1 Right-hand side view

Fig. 6.2.1-1: Right-hand side view



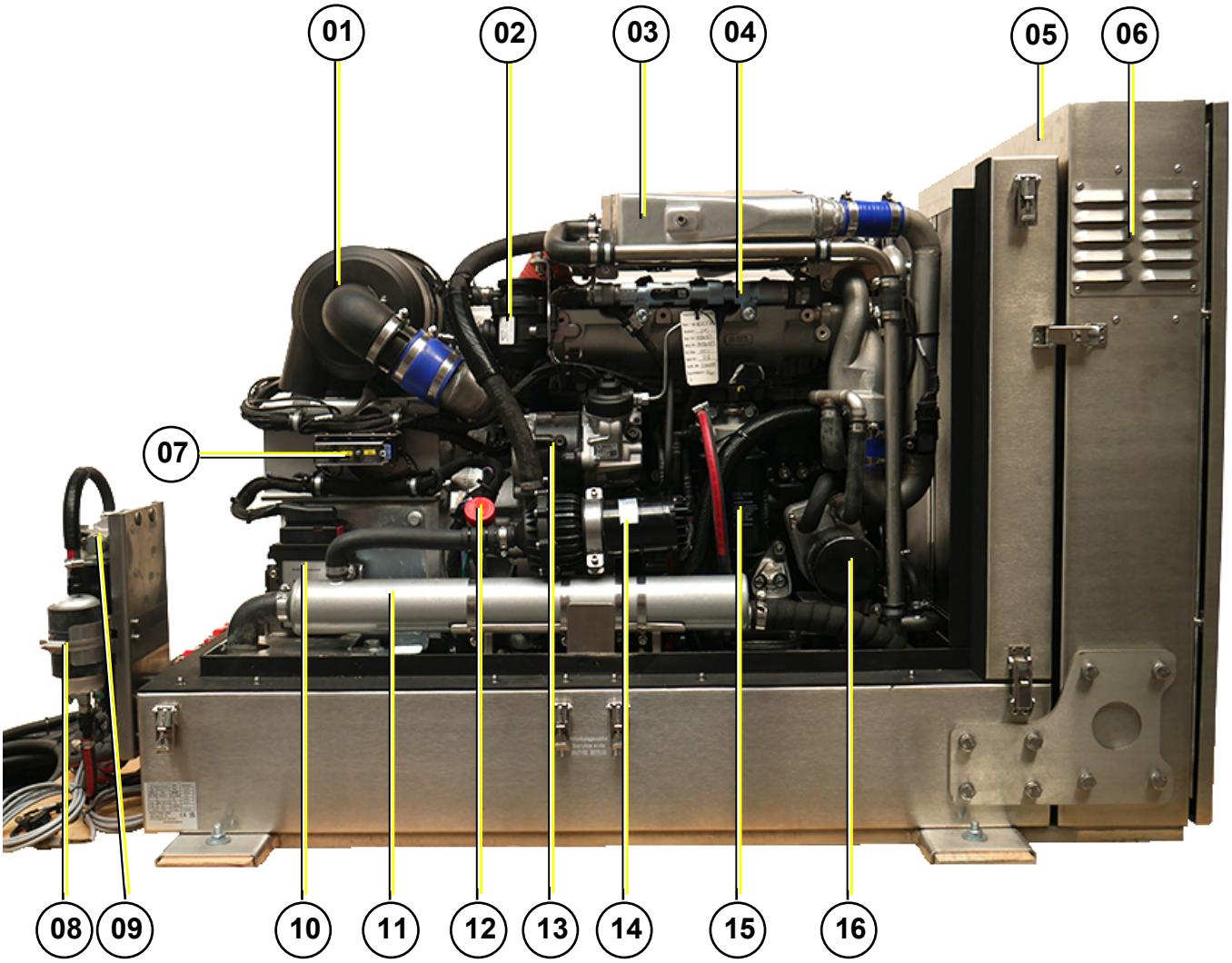
01. Connections, see Fig. 6.2.1-2, “Generator connections on right-hand side,” auf Seite 41
02. Control cabinet
03. DC generator
04. Intercooler
05. Air filter housing
06. Connections, see Fig. 6.2.1-2, “Generator connections on right-hand side,” auf Seite 41
07. Fan grille - do not cover!
08. Capsule feed-through for oil drain hose
09. Raw water pump
10. Impeller filter
11. Exhaust mixer
12. Exhaust mixer under heat insulation
13. Ground isolating relay
14. Switch for ground isolating relay
15. Generator housing
16. DC relays and fuses

Fig. 6.2.1-2: Generator connections on right-hand side

01. Feed-through for customer-supplied communication cable
02. RJ45 CAN Bus plug - customer-supplied
03. RJ45 CAN Bus internal plug
04. Feed-through for earth connection
05. Feed-through for the generator output (-)
06. Feed-through for the generator output (+)

6.2.2 Left-hand side view

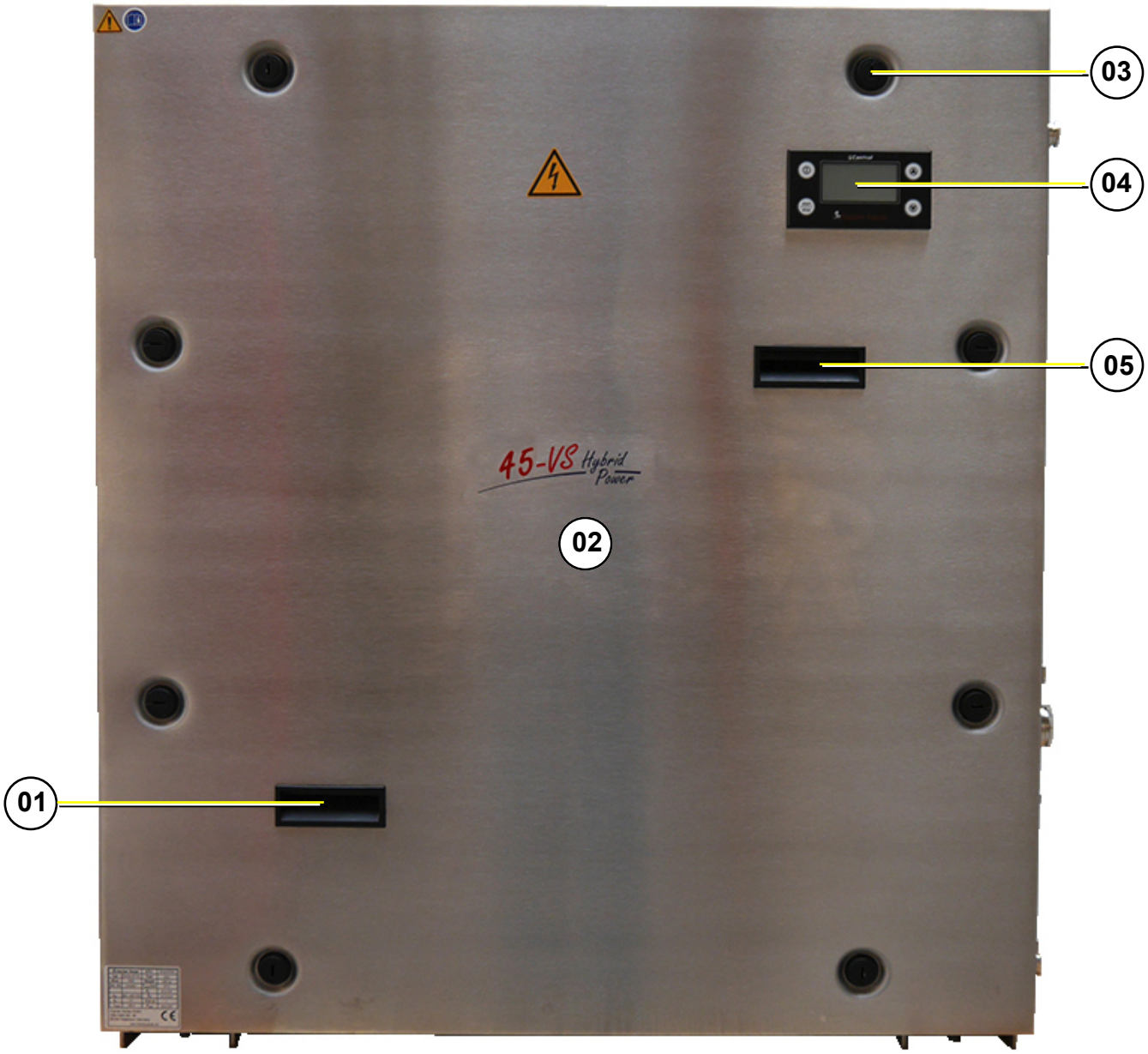
Fig. 6.2.2-1: Left-hand side view



01. Air filter housing
02. Crankcase vent
03. Intercooler
04. Fuel rail
05. Control cabinet
06. Fan grille - do not cover!
07. DC relays and fuse
08. Fuel pump
09. Fuel filter with water separator
10. fpControl circuit board
11. Heat exchanger
12. Oil filler neck
13. Injection pump
14. Coolant pump
15. Fuel filter
16. Oil filter

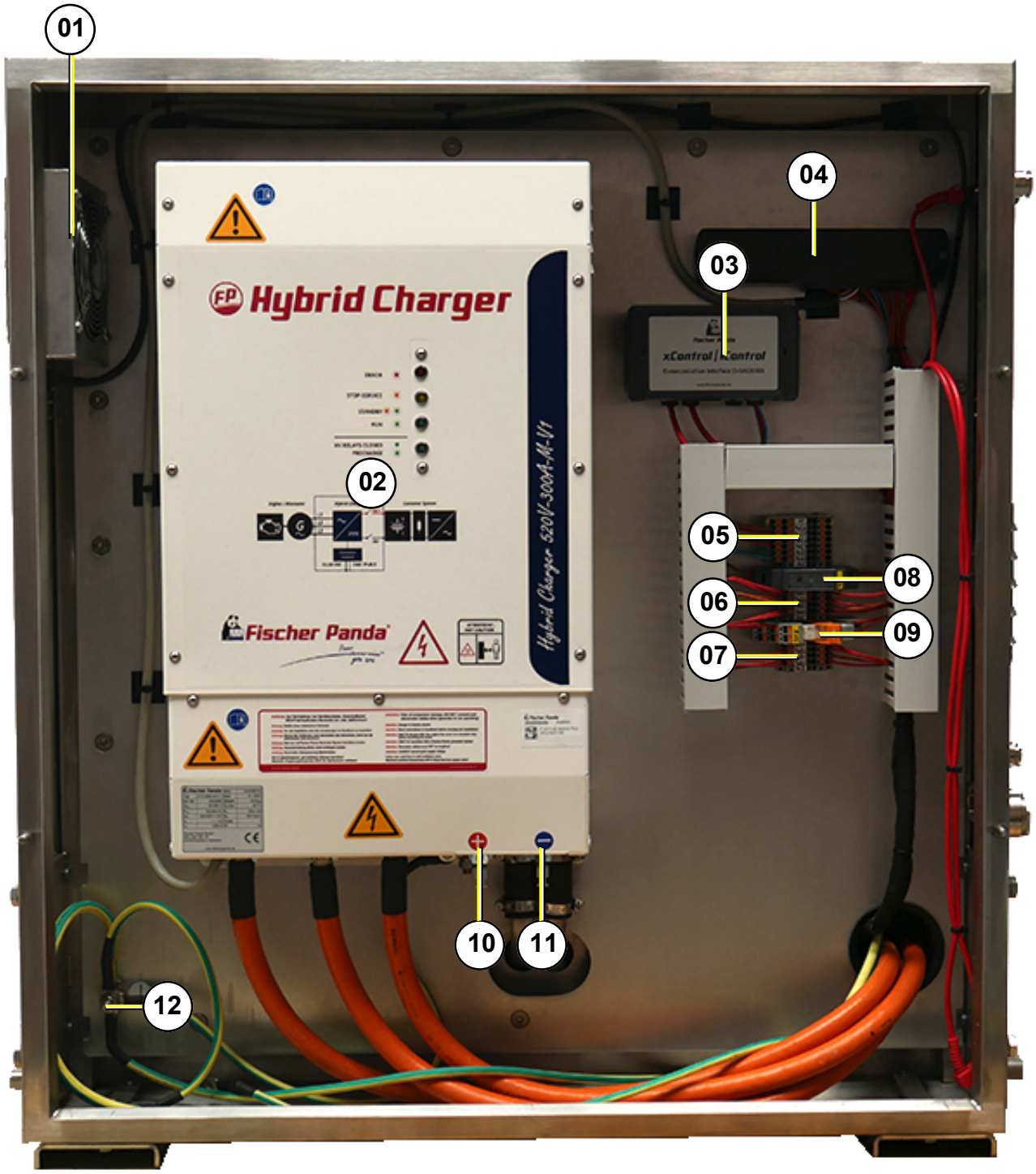
6.2.3 Front view

Fig. 6.2.3-1: Front view



01. Recessed grip
02. Control cabinet door
03. Fastener for control cabinet door (8 pieces)
04. fpControl Panel
05. Recessed grip

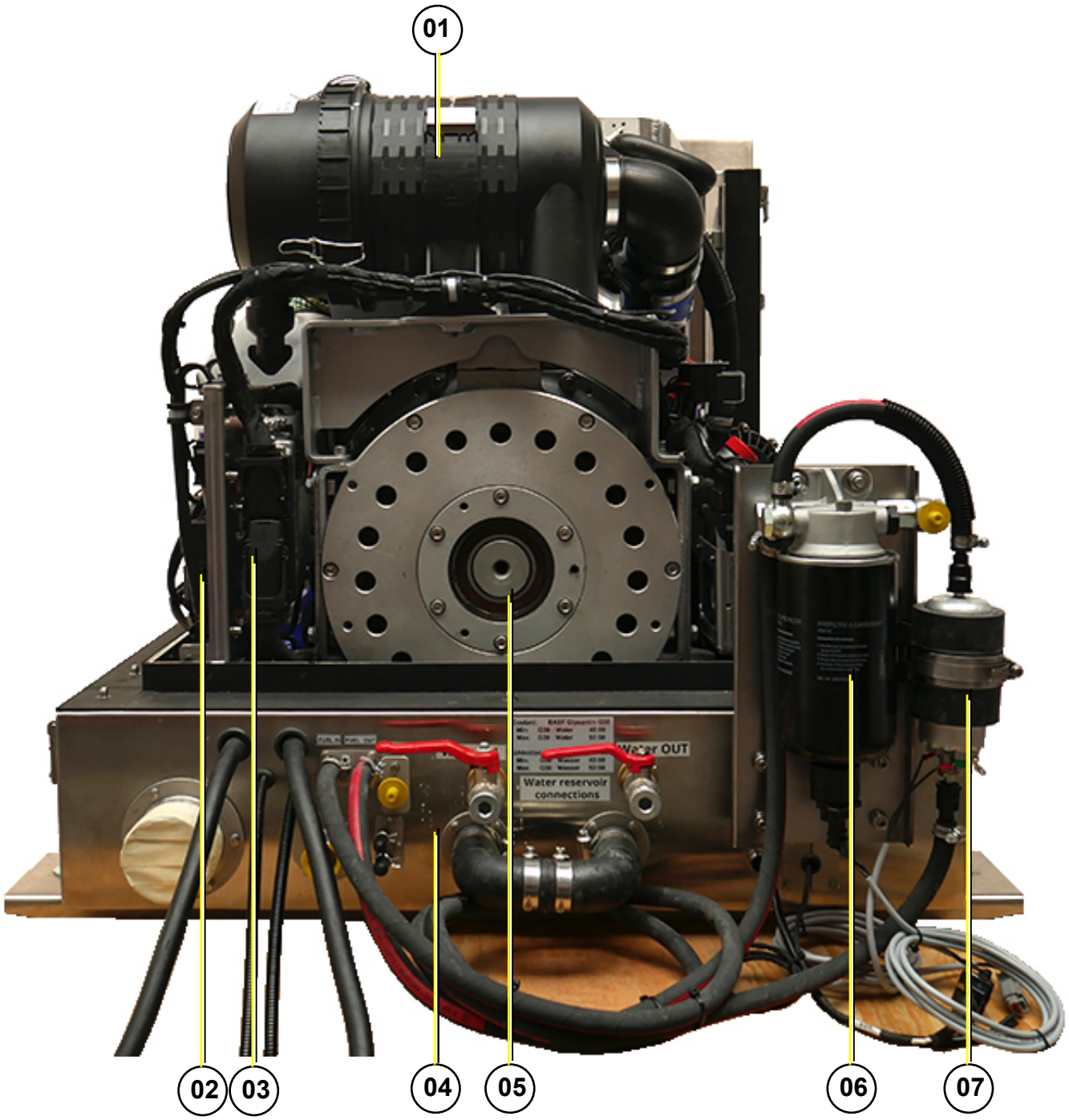
Fig. 6.2.3-2: Open the control cabinet



01. Fan
02. Hybrid charger
03. Communication Interface
04. Terminal strip for fpControl Panel
05. Terminal strip 9X5
06. Terminal strip 9X6
07. Terminal strip 9X8
08. Transformer 9T6
09. Relay 9K8
10. Load output connection (+)
11. Load output connection (-)
12. Earthing point

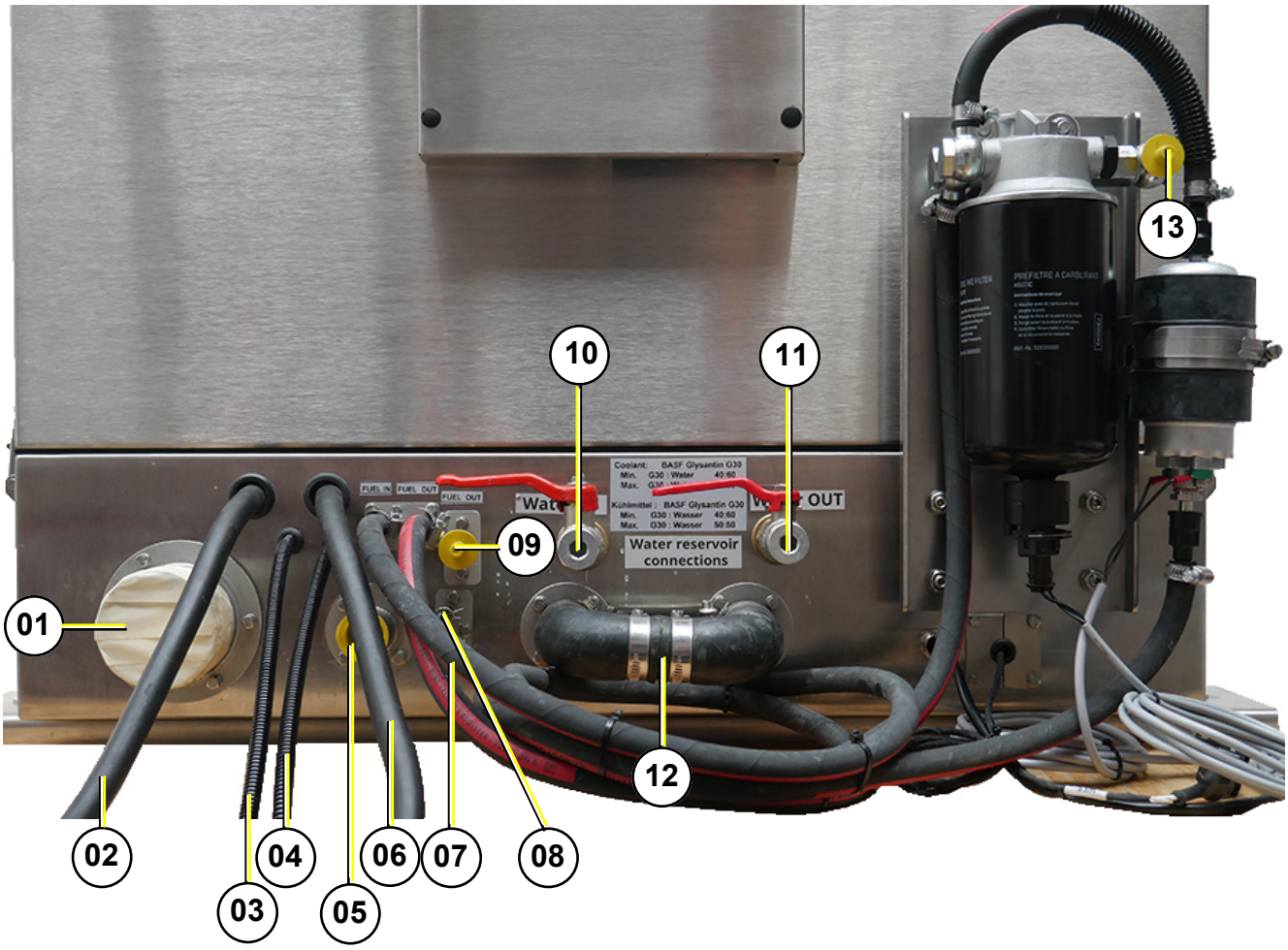
6.2.4 Rear view

Fig. 6.2.4-1: Rear view



01. Air filter housing
02. DC relays and fuses
03. Hatz engine ECU
04. Connections, see Fig. 6.2.4-2, “Generator connections - Rear view,” auf Seite 46
05. Generator housing
06. Fuel filter with water sensor
07. Fuel pump

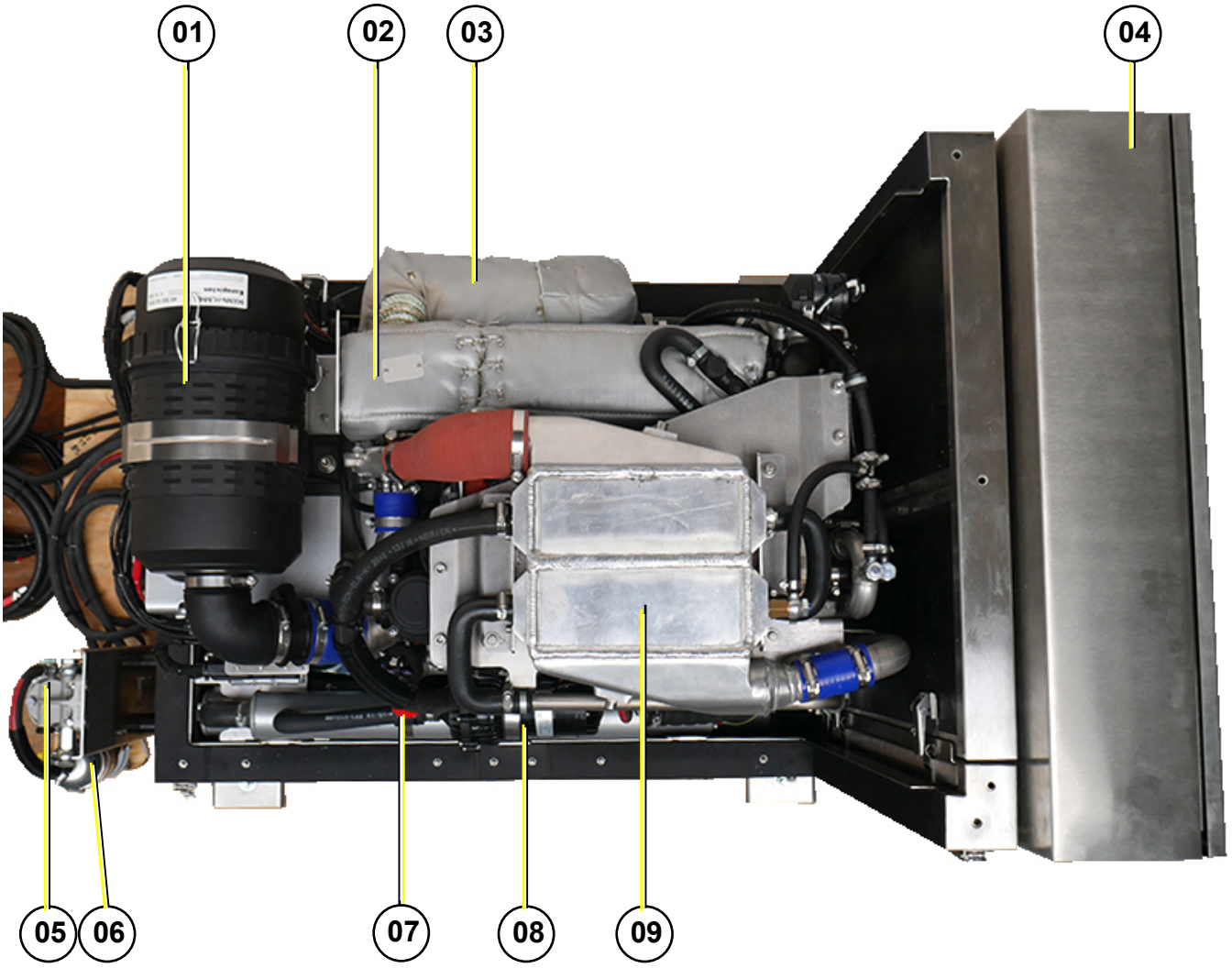
Fig. 6.2.4-2: Generator connections - Rear view



01. Exhaust outlet
02. Starter battery 12 V_{DC} (-)
03. Control system supply line (-)
04. Control system supply line (+)
05. Raw water intake
06. Starter battery 12 V_{DC} (+)
07. Connection for the coolant expansion tank inlet
08. Connection for the coolant expansion tank outlet
09. Fuel return line (to fuel tank)
10. Water in (cold side)
11. Water out (hot side)
12. Connection for the external vent valve
13. Fuel supply line at fuel filter

6.2.5 Top view

Fig. 6.2.5-1: Top view



01. Air filter housing
02. Turbocharger
03. Exhaust mixer under heat insulation
04. Control cabinet
05. Fuel filter with water sensor
06. Fuel pump
07. Coolant pump
08. Oil filler neck
09. Intercooler

6.2.6 Function groups and functional diagrams

6.2.7 fpControl Panel

The remote control panel is equipped with various monitoring functions, which increase the functionality and operational safety of the generator. Various areas of the generator are monitored that trigger an alarm on the remote control panel and that can shut down the generator as soon as a fault is detected.

Fig. 6.2-1: fpControl CP-G front

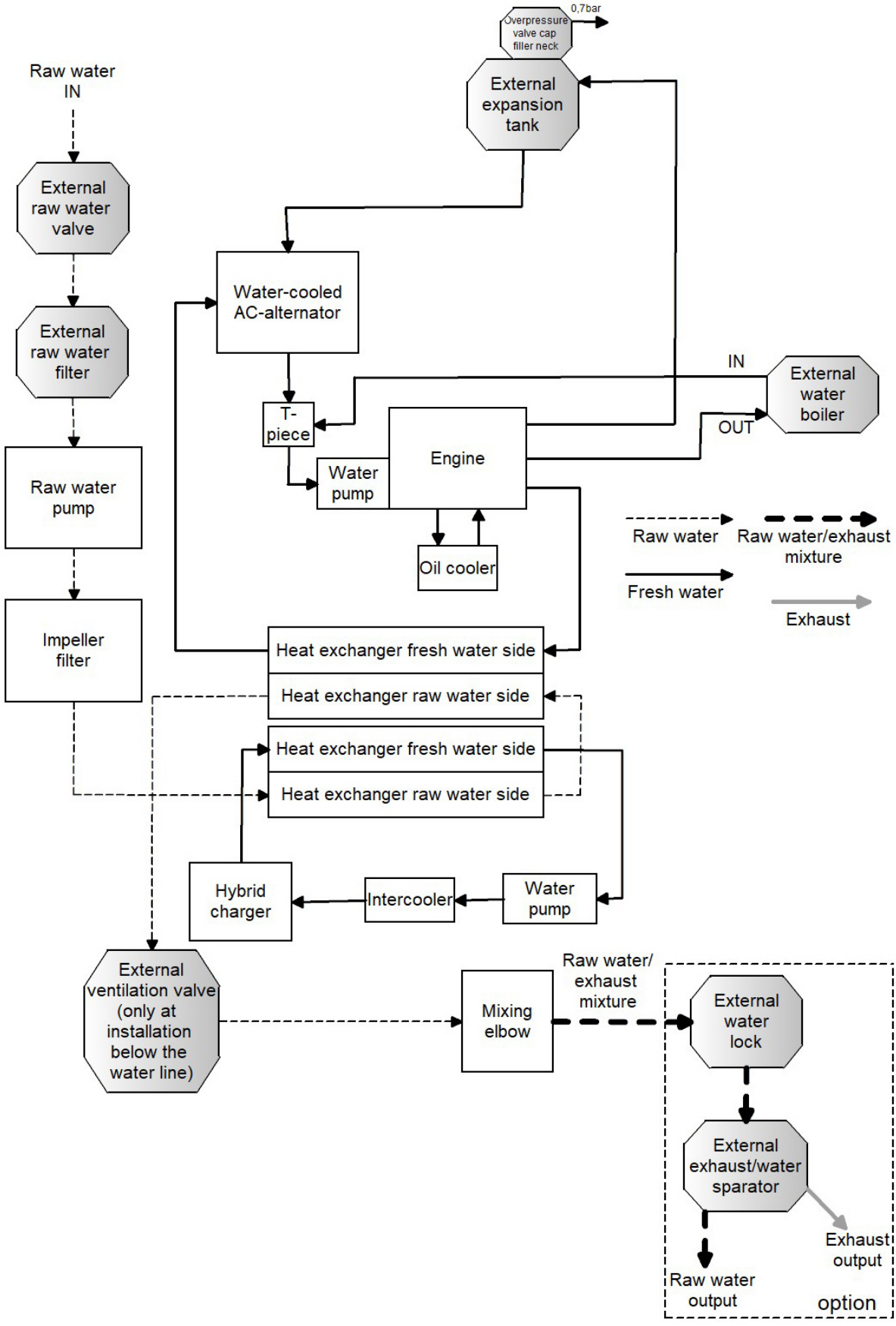
Fig. 6.2.7-2: fpControl CP-G rear

For further information, see the data sheet/manual of the fpControl!

Note!

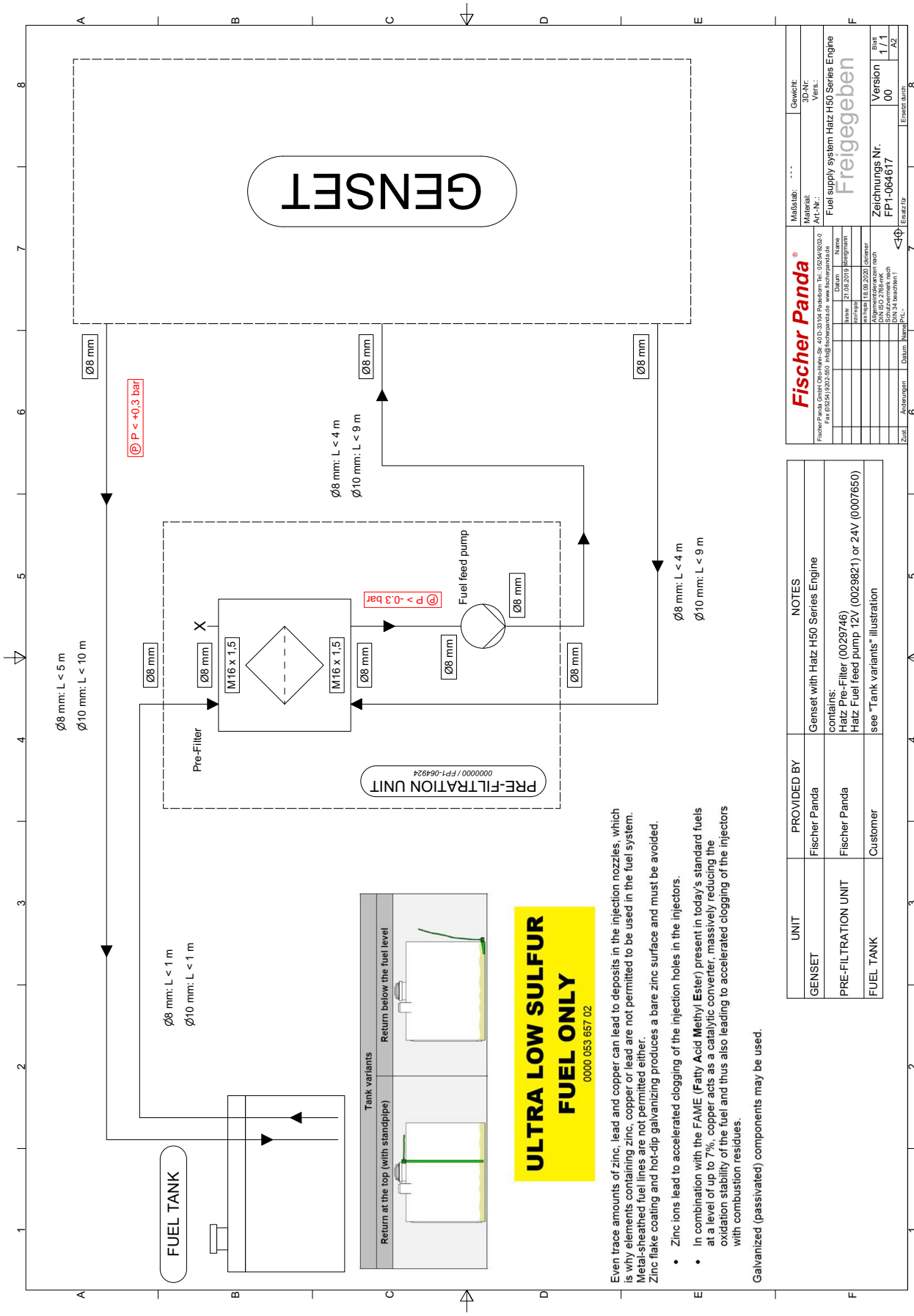
6.2.8 The cooling system

Fig. 6.2.8-1: The cooling system



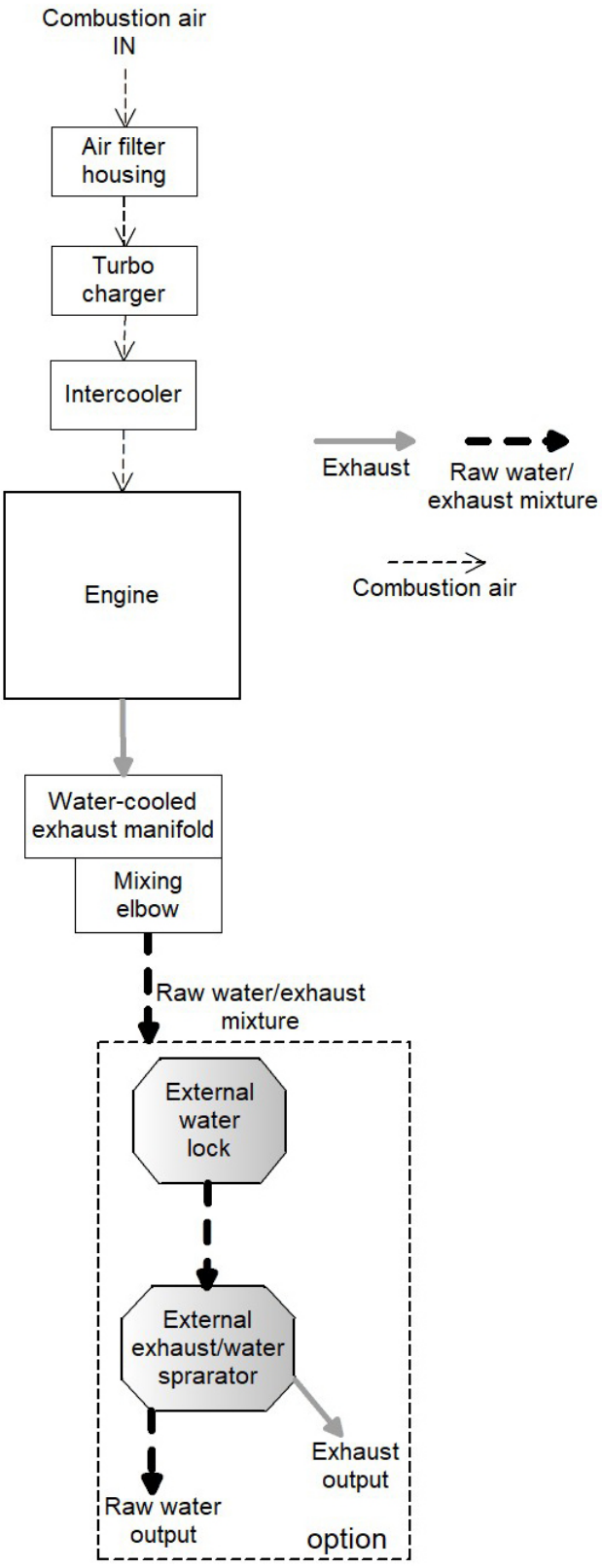
6.2.9 Fuel system

Fig. 6.2.9-1: Fuel system



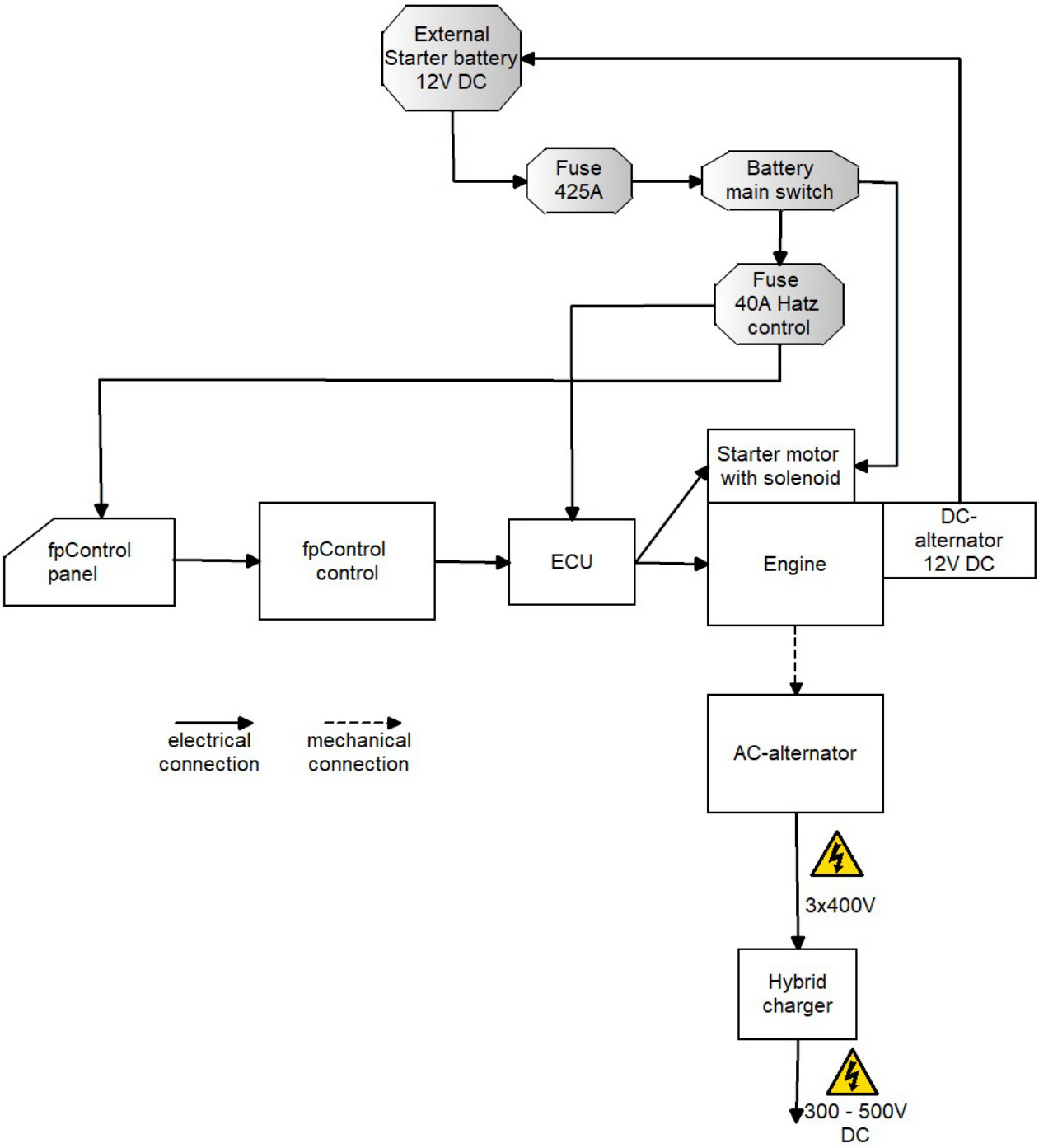
6.2.10 Combustion air system

Fig. 6.2.10-1: Combustion air system



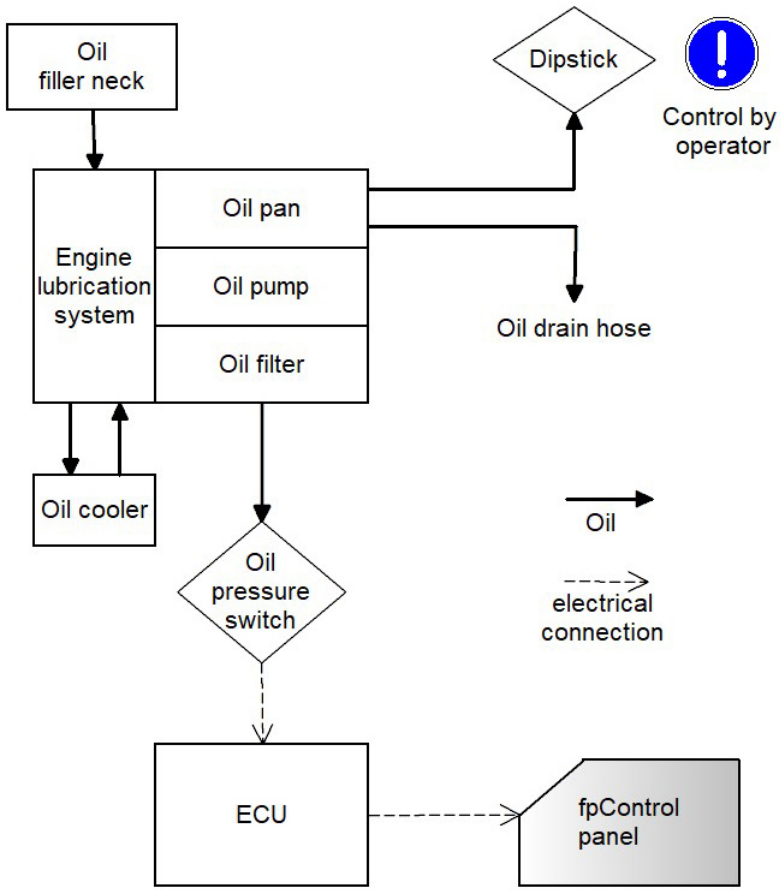
6.2.11 Electrical system

Fig. 6.2.11-1: Electrical system



6.2.12 Lubricant system

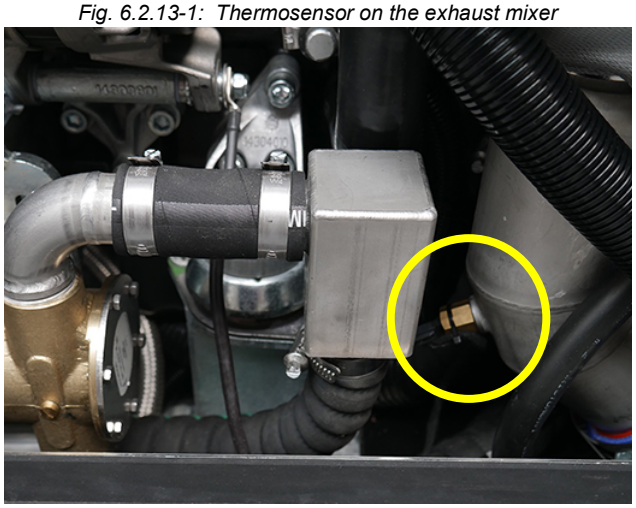
Fig. 6.2.12-1: Lubricant system



6.2.13 Sensors and switches for operational monitoring

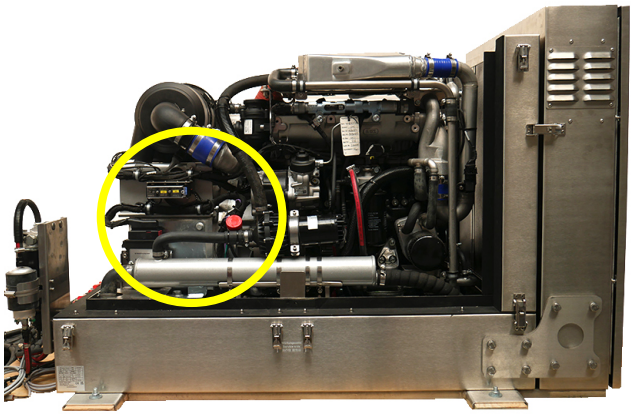
Thermosensor on the exhaust mixer

Fig. 6.2.13-1: Thermosensor on the exhaust mixer



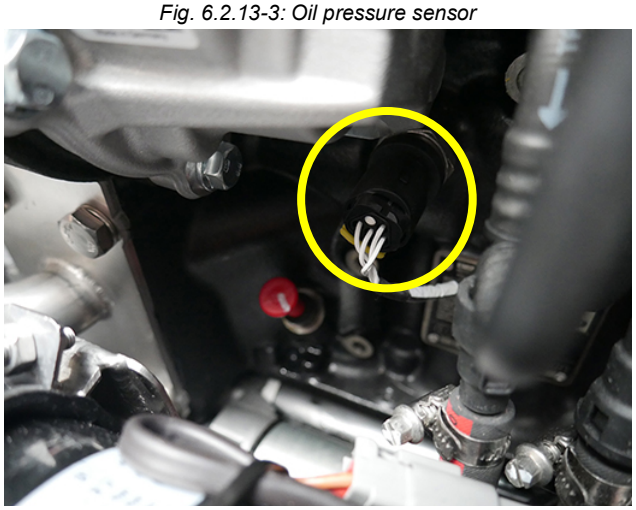
Thermo-switches and sensors on the winding

Fig. 6.2.13-2: Thermo-switches and sensors on the winding



Oil pressure sensor

Fig. 6.2.13-3: Oil pressure sensor



Other temperatures are displayed on the Hatz ECU device.

Note!

7. Installation Instructions

All connecting cables and instructions regarding the installation are designed and suitable for “standard” installation situations.

As the precise installation and operating situation (e.g. special vehicle type, high travelling speeds and special operating conditions, among others) are not known to Fischer Panda, these installation instructions can only serve as a template and example. The installation must be adapted in accordance with the local circumstances and regulations and performed by appropriate specialist.

Damage arising from an incorrect/ improperly adapted installation/mounting is not covered by the guarantee.

Attention! Lay out the system correctly.

7.1 Personnel

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

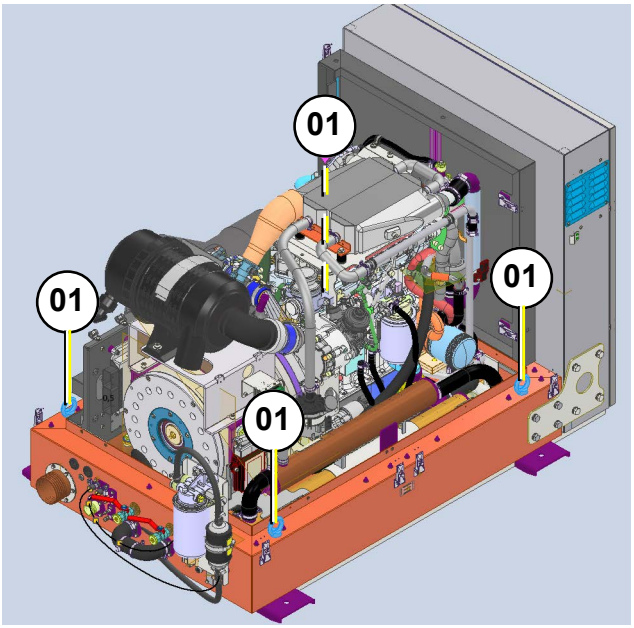
All loads must be disconnected prior to working on the generator to avoid damage to the devices.

Attention! Switch off all loads.

7.2 Hoisting procedure

1. Remove the capsule components.
2. Thread the 4 supplied lifting eyes (01) into the threaded holes provided for this purpose in the lower part of the capsule.

Fig. 7.2-1: Lifting eyes



3. Use appropriate lifting gear with chains (not included in scope of supply).

   Care must be taken not to damage the components of the generator when lifting.

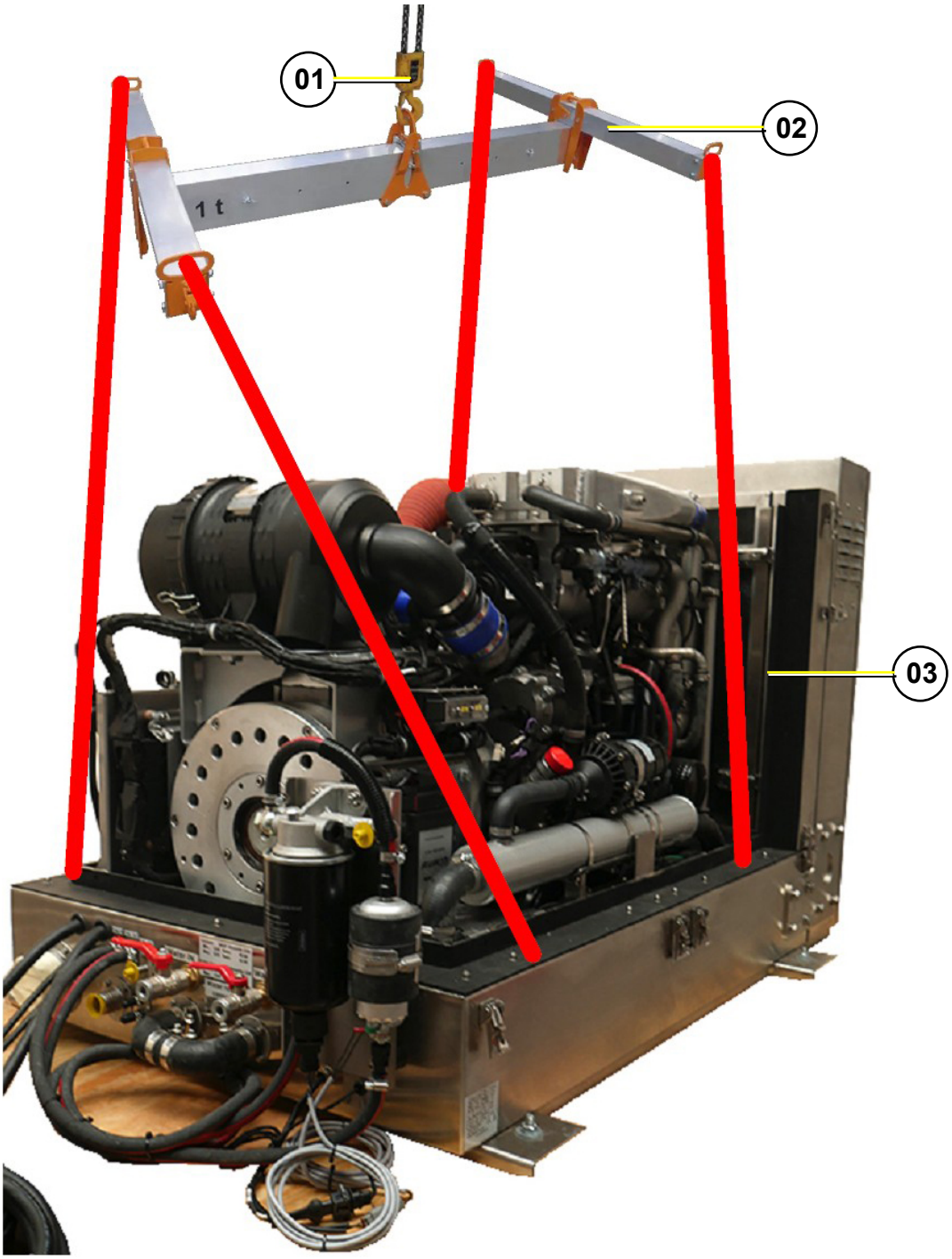
Attention!

Generator weight: approx. 595 kg!

Attention!

4. Lift the generator by means of a crane.
5. After installing, unscrew the 4 lifting eyes and re-install the capsule components.

Fig. 7.2-2: Hoisting procedure



01. Crane
02. Lifting gear (example only, not included in scope of supply)
03. Generator

7.3 Placement

7.3.1 Preliminary remarks

- There must be an adequate supply of fresh air for combustion.
- It must be ensured that there is an adequate cooling air flow from below and the sides.
- The sea cock must be open when operating.
- The generator may only be opened by qualified specialists.
- The generator may only be operated by authorised personnel.

7.3.2 Installation location and base

Since Fischer Panda generators have extremely compact dimensions, they can be installed in cramped locations; they are therefore often installed in places that are difficult to access. Please consider that even almost maintenance-free machinery must still be adequately accessible, at least at the front (drive belt, water pump) and the service-side (actuator, dipstick), as it remains, for example, necessary to check the oil level regularly in spite of the automatic oil-pressure sensor.

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

Avoid mounting the generator on a smooth surface with little mass (e.g. plywood). In the worst case, this acts as an amplifier of airborne sounds. An improvement can be achieved by reinforcing these surfaces with ribs. In addition, openings should also be sawn to interrupt these surfaces. The lining of the surrounding walls with a heavy layer (i.e lead) and foam additionally improve the conditions.

As the motor sucks its combustion air through many openings in the base of the capsule, it must be mounted with sufficient room around the base to ensure an adequate air supply (at least 12 mm [½“]).

The generator draws air from the surrounding engine room. It must therefore be ensured that sufficient ventilation openings are present, so that the generator cannot overheat.

The following data are applicable to the output of the generator:

Ambient temperature: 20 °C

Air pressure: 1 000 mbar (100 m above mean sea level)

Raw water temperature: 20 °C

Rel. humidity: 30 % at ambient temperature

Fuel temperature: up to 20 °C

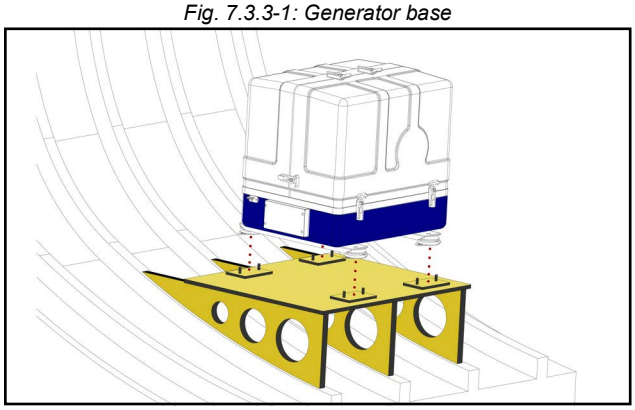
Exhaust back-pressure: 80 mbar (capsule outlet)

Deviations from this data, e.g. an ambient temperature of 40 °C due to installation in an engine room/vehicle with inadequate ventilation, lead to change in the output (derating).

7.3.3 Advice for optimal sound insulation

The appropriate base consists of a sturdy framework, on which the generator is fastened by means of vibration dampers. Since the power unit is "open" from below, the combustion air can be sucked in unhindered. In addition, this prevents vibrations, which would otherwise arise within a closed cover.

Fig. 7.3.3-1: Generator base



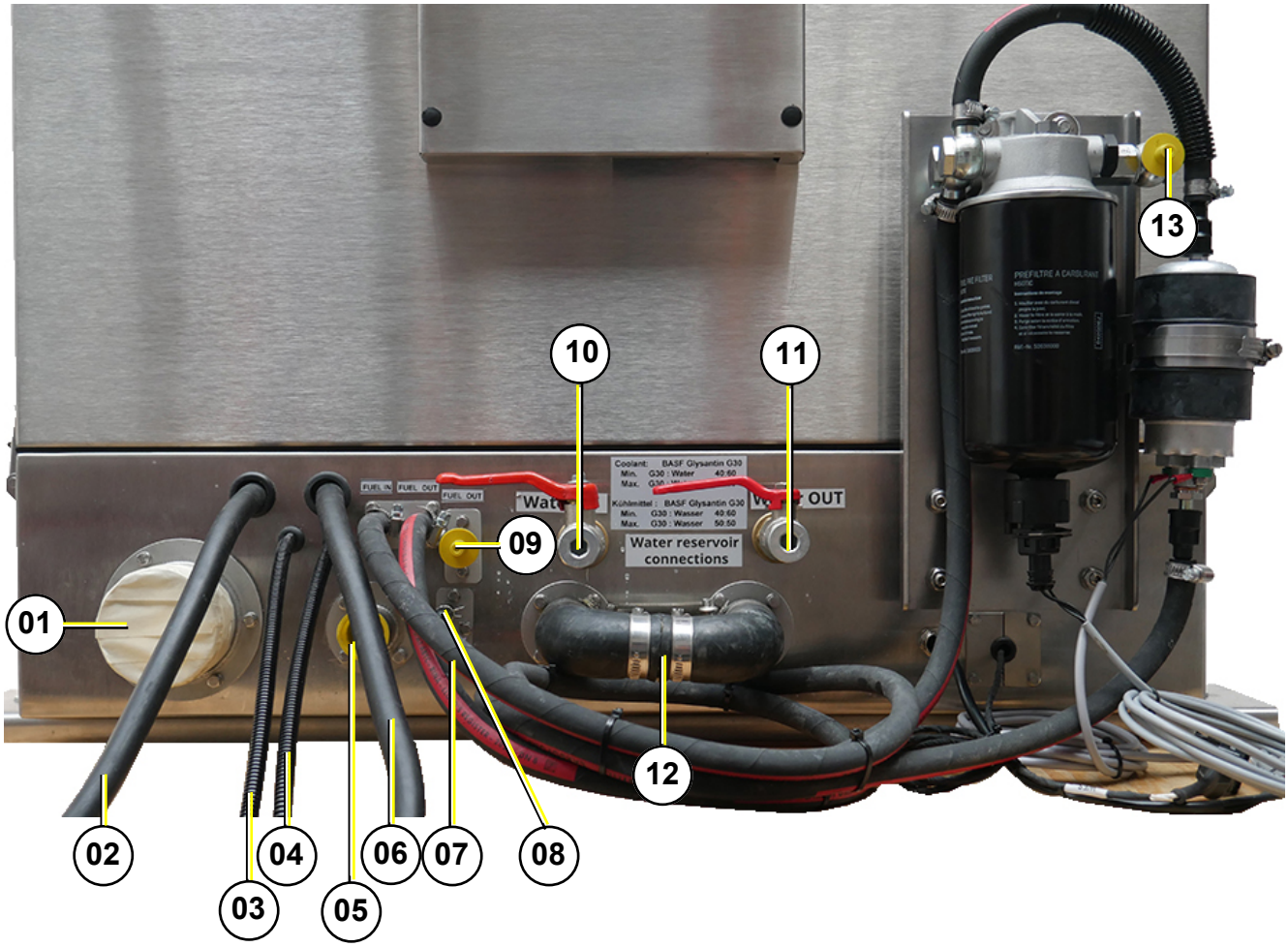
7.4 Generator connections

All electrical supply cables within the capsule must be securely connected to the engine and the generator. This is also applies to fuel lines and cooling water supply lines.

It is imperative that the electrical connections are laid out and implemented according to the applicable regulations. This also applies to the cable materials in use. The cable supplied is meant for "protected" laying (e.g. in a conduit) at a temperature up to a max of. 70 °C (160 °F). The on-board circuit must also be fitted with all the necessary fuses.

Attention! Lethal danger - High voltage

Fig. 7.4-1: Generator connections



01. Exhaust outlet
02. Starter battery 12 V_{DC} (-)
03. Control system supply line (-)
04. Control system supply line (+)
05. Raw water intake
06. Starter battery 12 V_{DC} (+)
07. Connection for the coolant expansion tank inlet
08. Connection for the coolant expansion tank outlet
09. Fuel return line (to fuel tank)
10. Water in (cold side)
11. Water out (hot side)
12. Connection for the external vent valve
13. Fuel supply line at fuel filter

Fig. 7.4-2: Generator connections

01. Feed-through for customer-supplied communication cable
02. RJ45 CAN Bus plug - customer-supplied
03. RJ45 CAN Bus internal plug
04. Feed-through for earth connection
05. Feed-through for the generator output (-)
06. Feed-through for the generator output (+)

7.5 Connecting the cooling system - raw water

7.5.1 General instructions

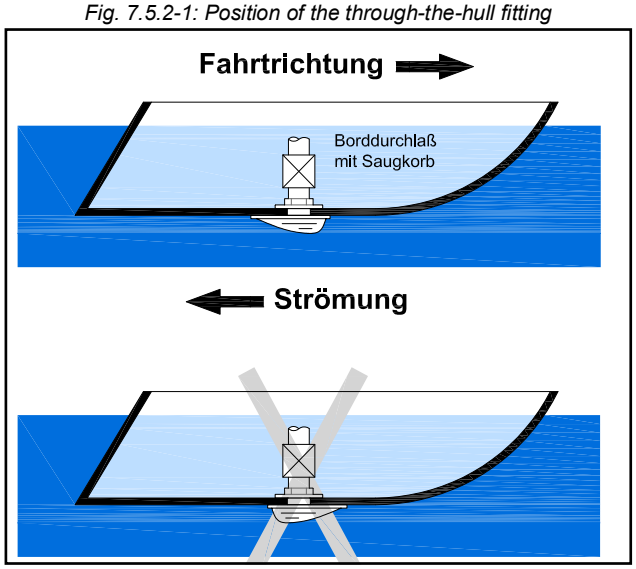
The generator should have its own feed line and should not be connected to the cooling systems of other engines. Ensure that the following installation instructions are complied with:

7.5.2 Arrangement of the through-hull fitting in yachts - schematic

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

For generators, the through-hull inlet should under no circumstances point in the sailing direction as when sailing at higher speeds, a back-pressure may be created that forces water through the impeller, flooding the generator.

Fig. 7.5.2-1: Position of the through-the-hull fitting



7.5.3 Quality of the raw water suction line

In order to keep the suction resistance in the line to the pump as low as possible, the raw water intake hose must have at least the i9nternal diameter of the raw water connection. 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. The through-hull fitting (raw water inlet should therefore be close to the generator.

The cooling water volume must be measured (e.g. by catching at the exhaust) after starting up. See the annex to this manual regarding the flow-rate, as well as the required cross-section of the cooling water pipe.

7.5.4 Installation of the generators above the waterline

When installing the generator, it must be ensured that the impeller pump is easily accessible.

Should this not be possible, an external, electrically-powered pump that is installed in an easily-accessible location can be used instead of a pump that is permanently installed in the capsule. If the generator is installed above the water line, significant impeller wear should be expected, as the pump runs dry for a few seconds after starting. In order for the pump not to suck air briefly, the raw water hose should be looped as close as possible to the raw water input of the generator (see figure). The impeller is lubricated by the raw water, and the service life is increased.

This problem can be reduced to a certain extent by installing a check valve in the raw water inlet line, which is located below the waterline.

If the raw water line is too long or the generator is installed too high above the waterline, an electrical pump can be installed in the suction line. In this case, the impeller should be removed from the impeller pump.

Note!

Contact Fischer Panda for further information.

Under no circumstances should the impeller be changed for many years without also exchanging the old pump.

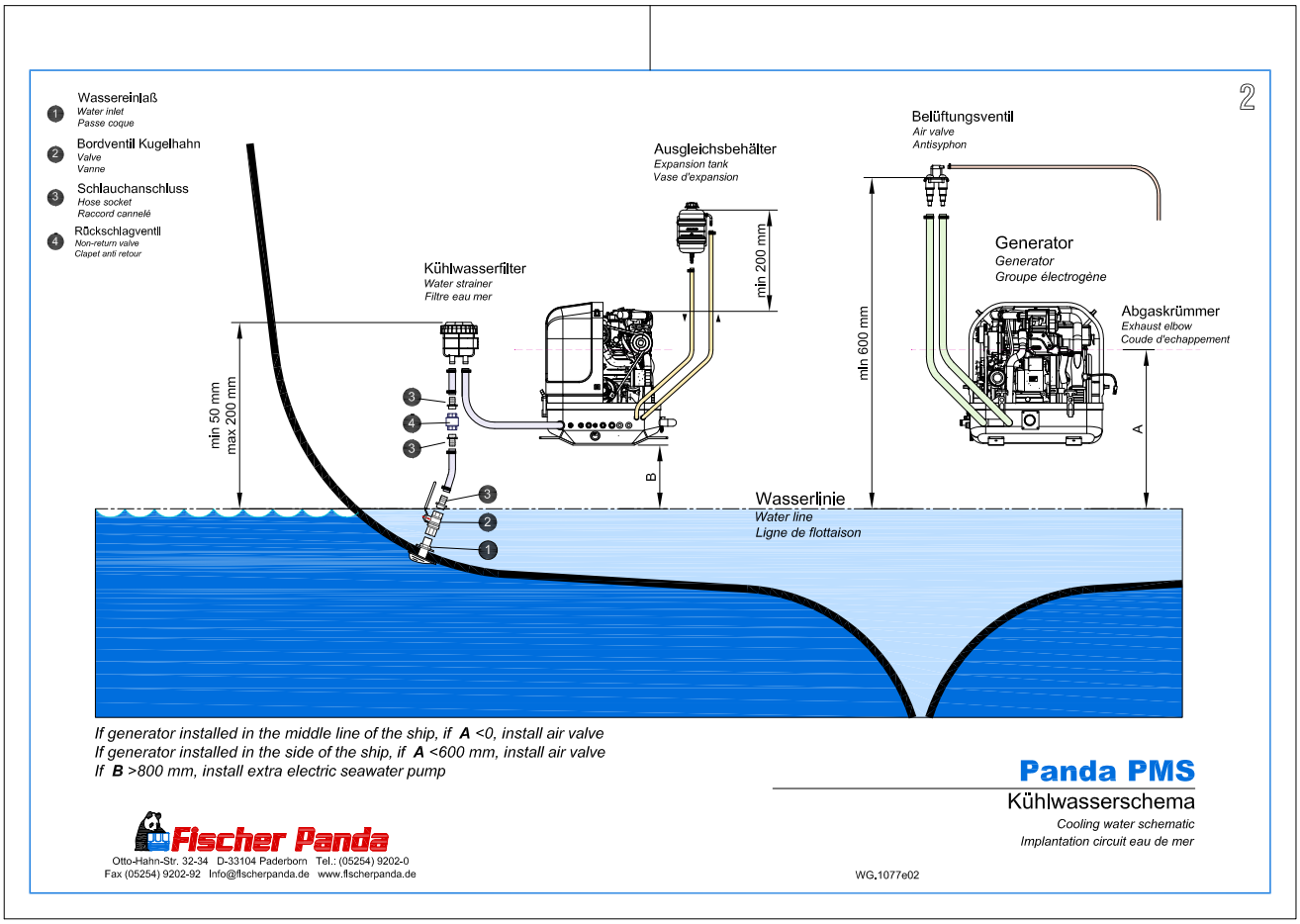
Note!

If the sealing ring within the pump is defective, raw water flows into the capsule of the generator. A repair is then very expensive.

A spare impeller and a spare pump should always be on board. The old pump can be sent back to Fischer Panda for a cost-effective general overhaul.

7.5.4.1 Raw water installation diagram

Fig. 7.5.4.1-1: Raw water installation diagram



7.5.5 Installing the generator below the waterline

If the generator cannot be fitted at least 600 mm above the waterline, it is essential that a vent valve is installed in the raw water line.

Possible heeling must be taken into consideration if installed to the side of the "mid-ship line"! The water hose for the external vent valve at the rear of the capsule is separated at the midpoint and extended by means of an additional hose and a connecting nipple at each end. Both hose ends must be led outside of the capsule to a single point - if possible 600 mm above the waterline on the midship line. The valve is connected to the two hose ends at the highest point. If the valve is stuck, the cooling water line cannot be bled once the generator has been stopped; the water column cannot be interrupted and the water can enter the combustion chamber of the motor. This will quickly lead to the destruction of the motor.

Fig. 7.5.5-1: Air-bleed valve

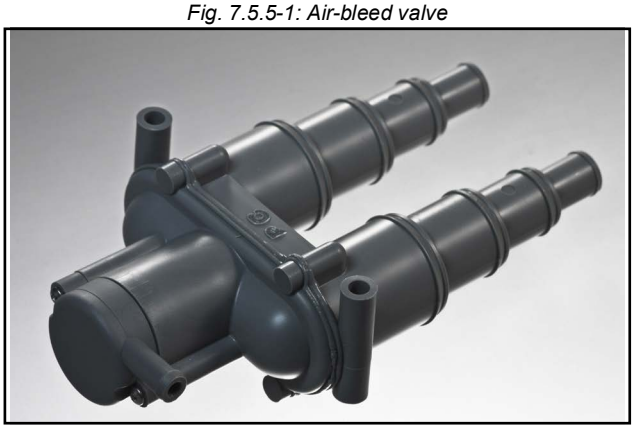
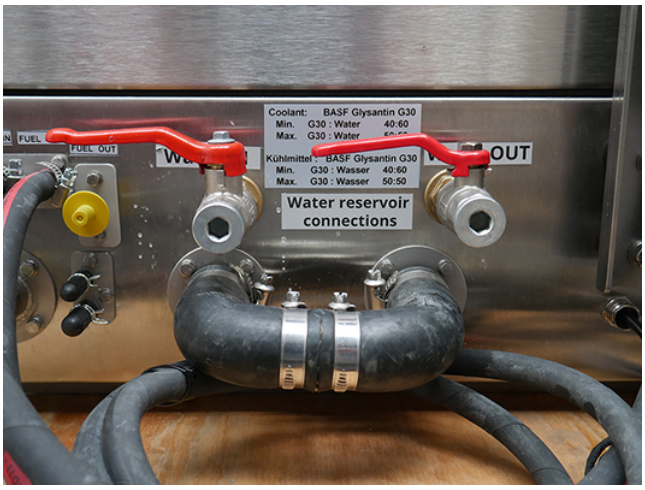


Fig. 7.5.5-2: Rubber hose for the vent valve

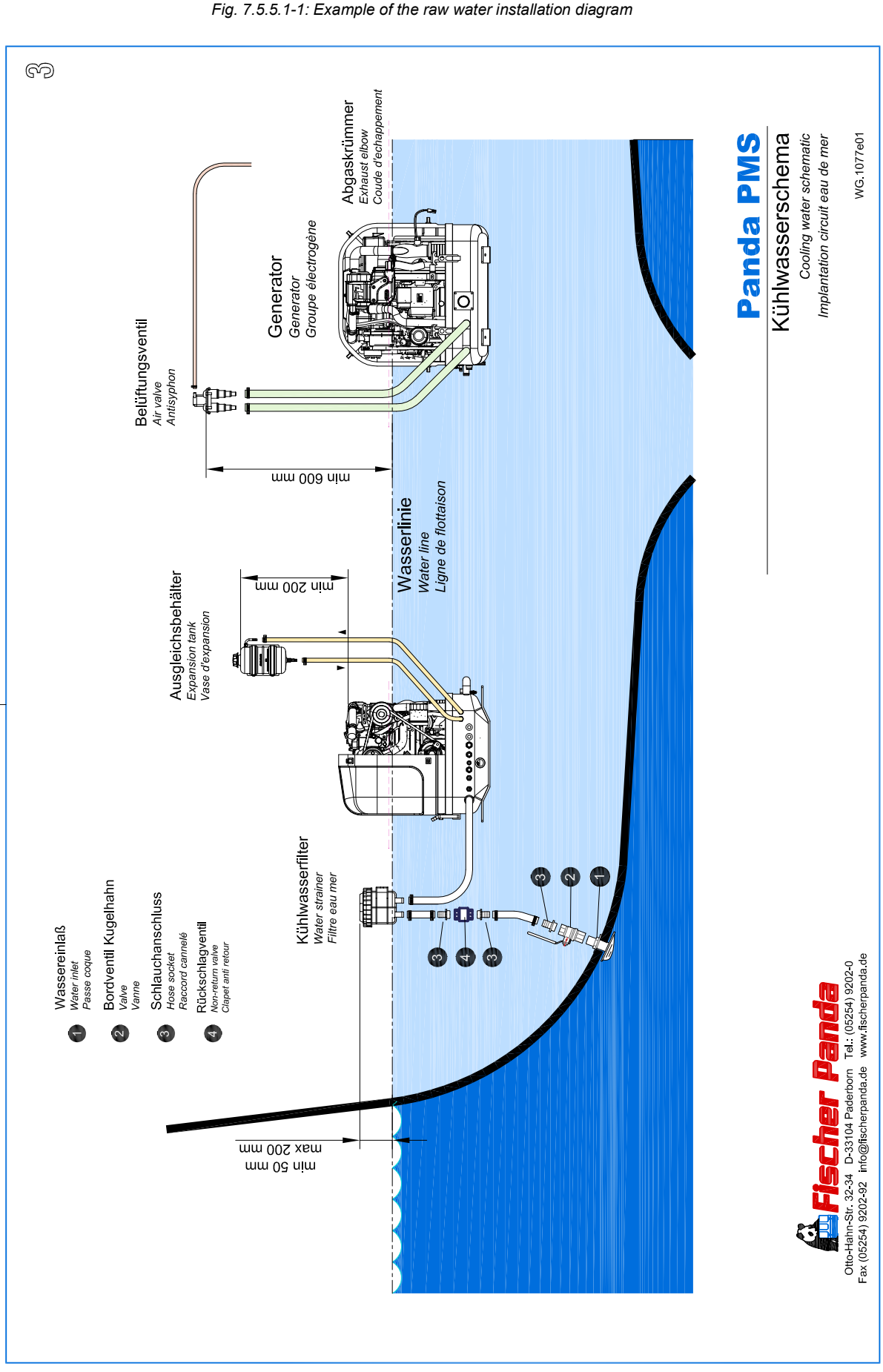


The hose clamps on the rubber hose for the external vent valve are loosened and the hose is bent upwards.

Both ends are now extended by means of a hose and attached to a vent valve at a height of above 600 mm above the waterline.

7.5.5.1 Raw water installation diagram

Fig. 7.5.5.1-1: Example of the raw water installation diagram

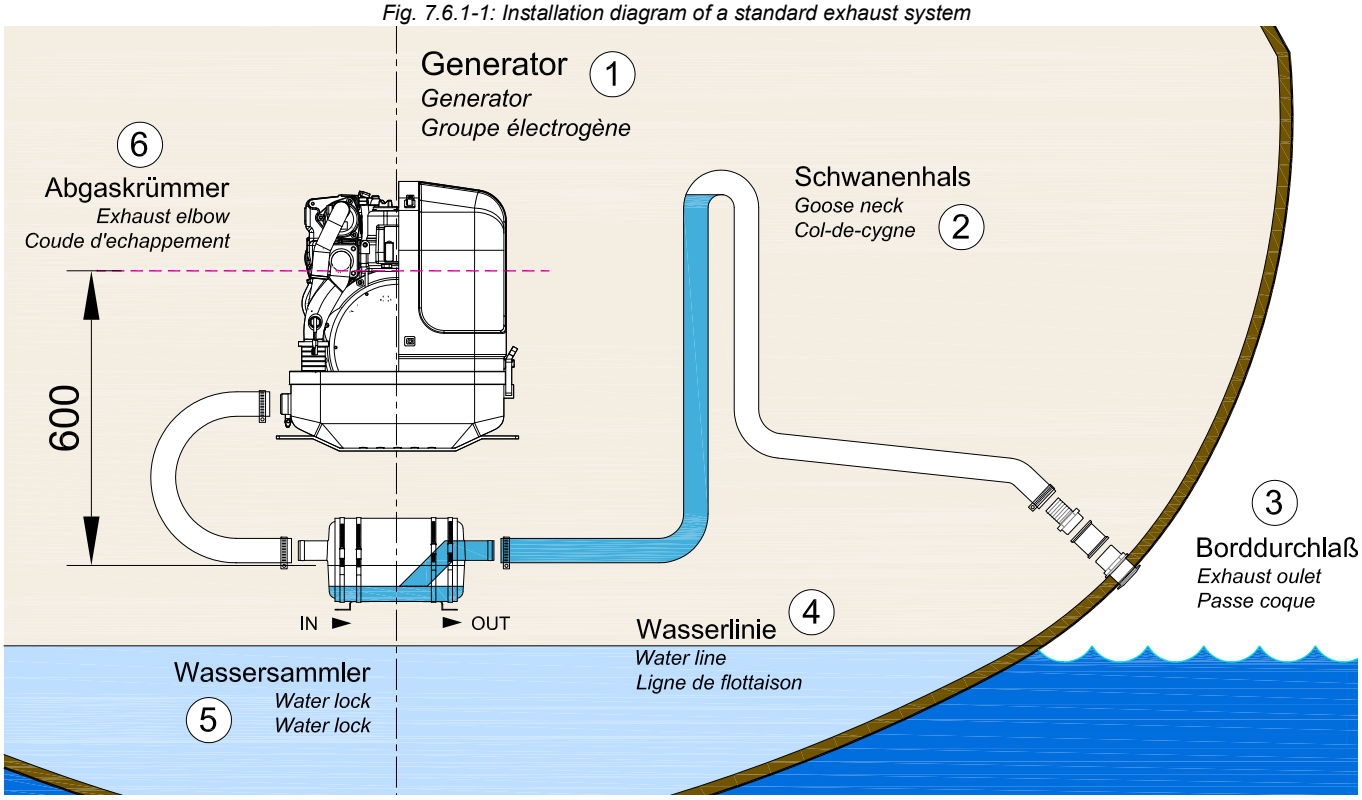


7.6 Installation of the standard exhaust system - diagram

7.6.1 Layout of the exhaust system

The generator exhaust system must be led through the side of the vessel to the outside completely separately from the exhaust system of the main engine or other units. A special water lock is offered in the Fischer Panda accessory list, which also offers highly efficient noise attenuation. The water lock should be installed as close as possible to the generator and at the lowest point of the exhaust system. It must be of such a size that the cooling water inside it is collected from the highest point (normally a "goose neck") to the lowest point, without being able to rise into the machine. The exhaust hose descends from the capsule to the water lock. The hose then rises via the goose neck to the silencer (see drawing). The goose neck must lie on the centreline of the vessel. In order to prevent the exhaust back-pressure from becoming too great, the total length of the exhaust line should not exceed 6 metres.

Fig. 7.6.1-1: Installation diagram of a standard exhaust system



7.7 Installation of the "water lock"

Take note of the correct direction of flow through the water lock.

Note!

An unfavourable installation location may lead to raw water entering the combustion chamber of the diesel engine and causing irreparable damage.

This requires further clarification:

If raw water enters the internals of the engine, it is not the result of an error in the design of the generator or an engine fault. This can only occur via the exhaust line into the combustion chamber and thus into the engine. The position of the generator and the water lock as well as the layout of the cooling water and exhaust lines are the decisive factors.

If the water lock is unfavourably laid out, the cooling water back-flow can rise so high in the exhaust line, that an exhaust lock is achieved. As at least one exhaust valve is always open when the engine is stopped, the raw water

has free access to the combustion chamber. The raw water then flows by capillary attraction past the pistons and into the engine oil.

If it has been ascertained that the engine oil level is unusually high and/or the oil has a grey colour, the engine may no longer be used. This is a sure sign, that cooling water has entered the sump. If the engine is operated under these conditions, the water and the oil will mix to form an emulsion. The oil then quickly becomes as viscous as a paste. In this phase the narrow oil galleries become blocked and a few moments later, the engine seizes due to insufficient lubrication. Before this point is reached, one must immediately perform an oil change. As the water can only enter the engine via the combustion chamber, one must assume that corrosion has occurred in the area of the piston rings. These consequences must be discussed with an engine expert. As a "first-aid" measure, it is sensible to spray generous quantities of penetrating oil through the inlet manifold and then crank the engine slowly using the starter

Cooling water can enter the exhaust area via the exhaust line as well as the cooling water supply.

7.7.1 Potential causes for water in the exhaust line

7.7.1.1 Potential cause: Exhaust line

If the cause lies in the exhaust line itself, the following points of the exhaust line must be checked:

a. The water lock is positioned too high. Water reaches the exhaust duct.

b. The water lock is positioned too far from the mid-point of the generator. The water reaches the exhaust duct when the boat is heeling.

c. The water lock is too small in relation to the exhaust line.

7.7.1.2 Potential cause: Coolant line

If the generator is not in fact installed 600 mm above the waterline, the cooling water supply must be equipped with a vent valve that is positioned at least 600 mm above the waterline. This position must be maintained at any listing/ heeling angle. The vent valve should therefore be positioned amidships, so that it will not go beyond the limits when listing/heeling.

a) The vent valve is positioned too low. The water reaches the exhaust duct when heeling.

b) The position of the air-bleed valve is too far removed from the centre line. The water reaches the exhaust duct when heeling.

c) The vent valve is not functioning, as it has become stuck or clotted with contamination (the functioning of the vent valve must be checked regularly).

As the associated functional risks are not always recognised when installing the exhaust line, the following explanations refer expressly to the exhaust line. Here the orientation, size, and position of the “exhaust water lock” play a very important role.

7.7.2 Installation location of the exhaust water lock

In the case of a water-cooled exhaust system, strict attention must be paid that under no circumstances can any water flow from the exhaust line to the exhaust manifold on the engine. If this occurs, the cooling water can flow into an open valve into the combustion chamber. This will result in irreparable damage to the engine.

Additionally, the angle of heel must always be taken into consideration in the case of sailing yachts, so the position of the water lock is very important. Generally, one can say that:

The deeper the water lock is positioned below the generator, the better the protection against the entry of water in the combustion chamber.

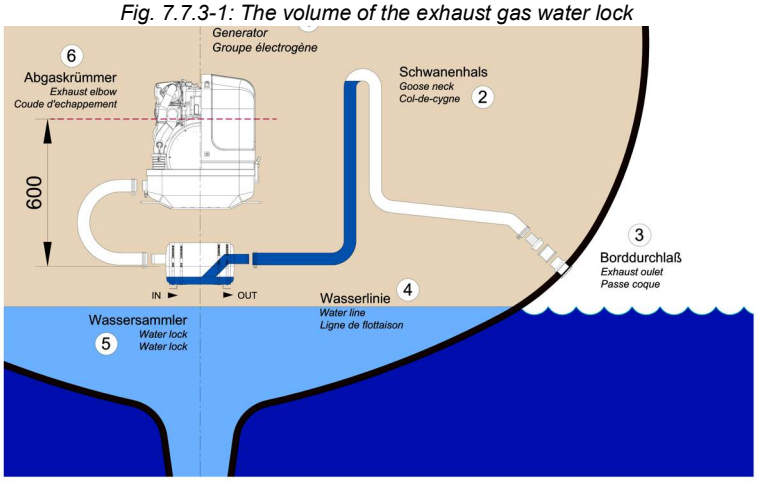
In the sketch below, the distance between the critical point of the exhaust manifold and the highest permissible level of the water in the exhaust line is specified as 600 mm. This distance must be understood as the minimum.

7.7.3 The volume of the exhaust water lock

The exhaust water lock must be of such dimensions that it can contain the total volume of water flowing back from the exhaust line. The volume of water depends on the length (L) and the diameter of the exhaust line. While the diesel engine is running, cooling water is continuously sprayed into the exhaust system and then forced out by the back pressure of the exhaust gases. When the engine is switched off, the revolutions of the diesel engine decrease relatively rapidly. The point is thus reached where the exhaust gas pressure is no longer sufficient to force the cooling water outwards. All cooling water that still remains in the exhaust line, drains back into the water lock. At the same time, the diesel engine will also continue to deliver water through the cooling pump, as long as it continues to turn.

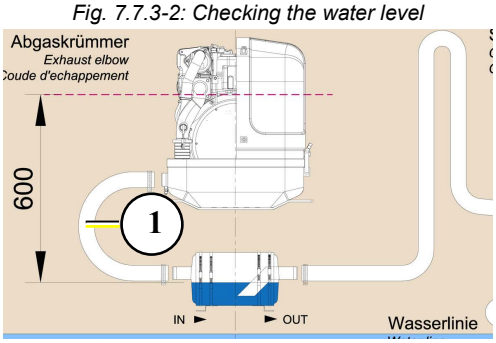
The water lock must certainly be of such dimensions that it can contain the total volume of the cooling water and that the prescribed difference in height between it and the critical point of the exhaust manifold does not exceed 600mm.

Fig. 7.7.3-1: The volume of the exhaust gas water lock



If doubt exists, a test can be conducted with relative ease by temporarily using a transparent hose (1) as an exhaust pipe. This allows the level of the cooling water to be determined very easily.

Fig. 7.7.3-2: Checking the water level



7.7.3.1 Ideal position of the water lock

The ideal position of the water lock is amidships below the generator.

Only this position ensures that the water level cannot change markedly in the case of heeling, when the water lock may depart significantly from the centre line.

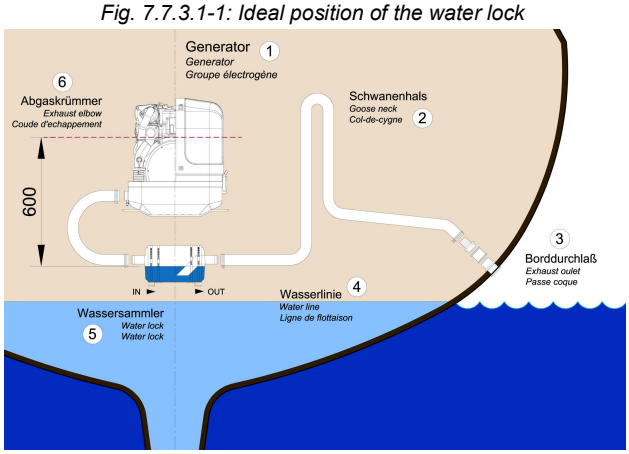
See the sketches that follow:

Important information!

Ideal position of the water lock

As depicted in Fig. 7.7.3.1-1 the water lock is mounted amidships below the generator. When heeling, the position of the water lock relative to the critical point on the exhaust line changes only minimally.

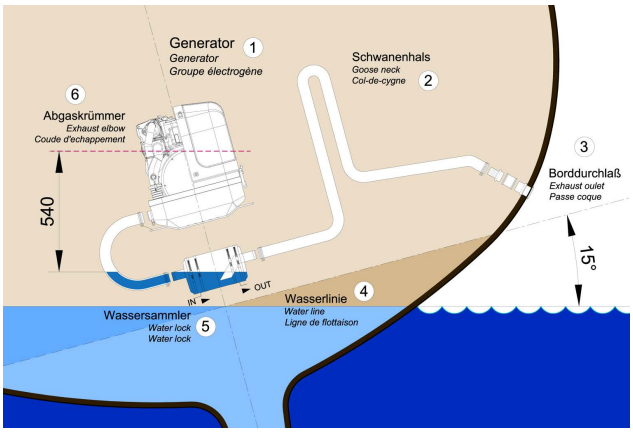
Fig. 7.7.3.1-1: Ideal position of the water lock



15 degree heel - Fig. 7.7.3.1-2

The distance between the exhaust manifold and the water column has been reduced to 540mm.

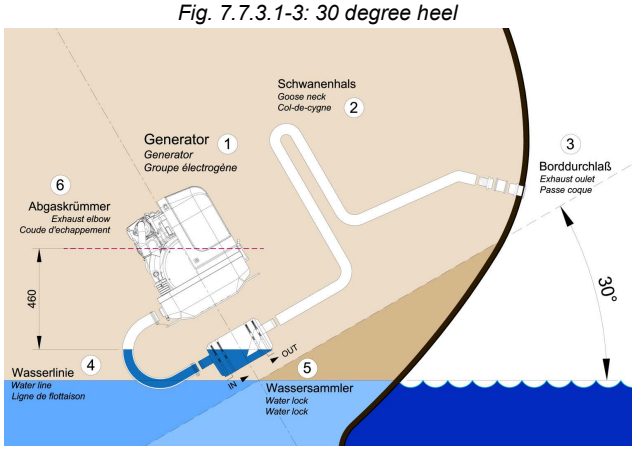
Fig. 7.7.3.1-2: Heel - 15 degrees



30 degree heel - Fig. 7.7.3.1-3

The distance to the water line also changes, so that in the case of the ideal installation position, only a distance of 458 mm remains. The critical distance is already not achieved at this point.

Fig. 7.7.3.1-3: 30 degree heel

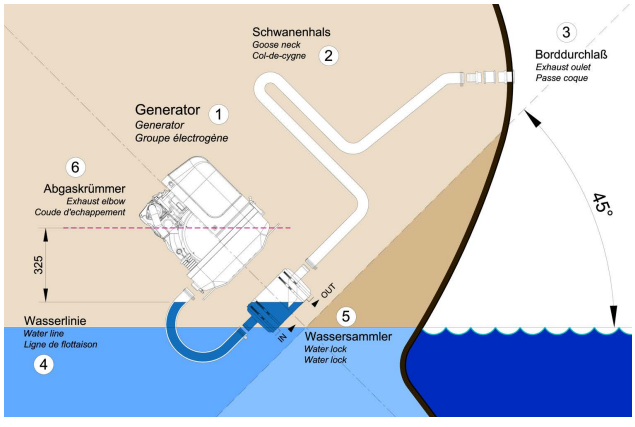


45 degree heel - Fig. 7.7.3.1-4

In this case the water line has risen so high that the distance is now only 325 mm.

In the extreme case of a 45 degree heel, the danger exists that even in the ideal installation position, water can shift ("slosh") into the area immediately around the exhaust stub. It is thus clear that the distance of 600mm represents a minimum, because even in the case of the ideal installation, the danger still can arise that in the event of a sharp heel, water can slosh into the exhaust manifold.

Fig. 7.7.3.1-4: Heel - 45 degrees



Summary:

It is imperative that the specified minimum height of 600 mm is maintained and this applies only if the water lock is installed in the ideal position amidships below the generator. A higher position is strongly recommended, if a heel of 45 degrees must be taken into account.

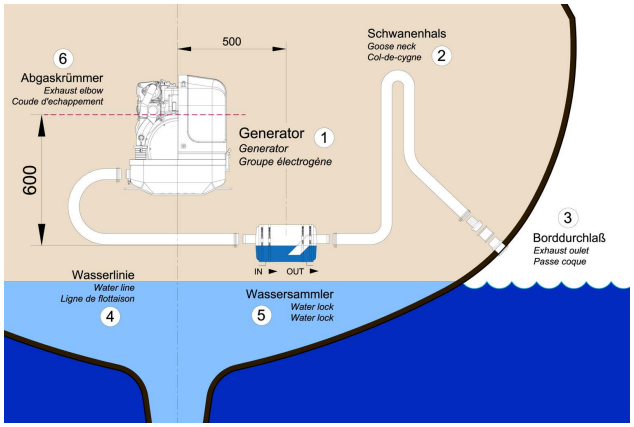
7.7.3.2 Example for the installation of the water lock outside of the mid-line with possible consequences:

The following examples are most relevant to the installation of the generator with a water lock in the case of sailing yachts. In the case of motor yachts, the change in the installation position as a result of heeling need not be taken into consideration. Here one need only take care that the volume of the water lock is sized so that back-flowing water can be completely contained and that a minimum distance of 600 mm is still maintained in this situation.

A) Installation of the water lock 500 mm from the centre line of the generator:

Installation of the water lock 500 mm from the centre line of the generator

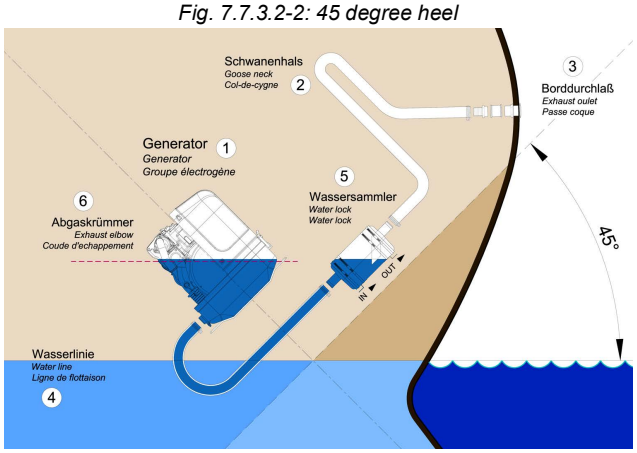
Fig. 7.7.3.2-1: Water lock 500 mm from the centre line of the generator



45 degree heel - Fig. 7.7.3.2-2

The water line is now at the same height as the critical point in the exhaust manifold. With this installation, if the vessel is sailed with a 45 degree angle of heel, then the entry of cooling water into the combustion chamber is unavoidable. Irreparable damage is then inevitable.

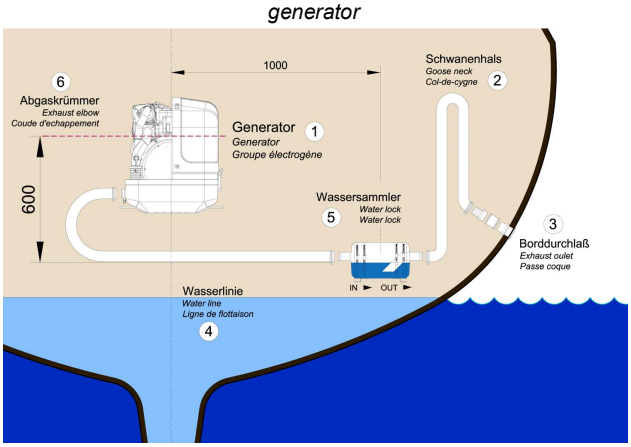
Fig. 7.7.3.2-2: 45 degree heel



B) Installation distance of 1 000 mm between the exhaust water lock and the centre line of the generator:

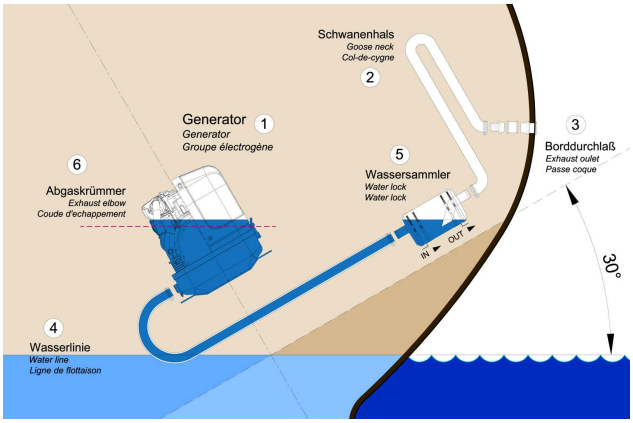
Installation distance of 1 000 mm between the exhaust water lock and the centre line of the generator:

Fig. 7.7.3.2-3: Water lock 1 000mm from the mid-line of the generator



30 degree heel - Fig. 7.7.3.2-4

Fig. 7.7.3.2-4: 30 degree heel



The water line is now at the same height as the critical point in the exhaust manifold. With this installation, if the vessel is sailed with a 30 degree angle of heel, then the entry of cooling water into the combustion chamber is unavoidable. Irreparable damage is then inevitable.

Summary:

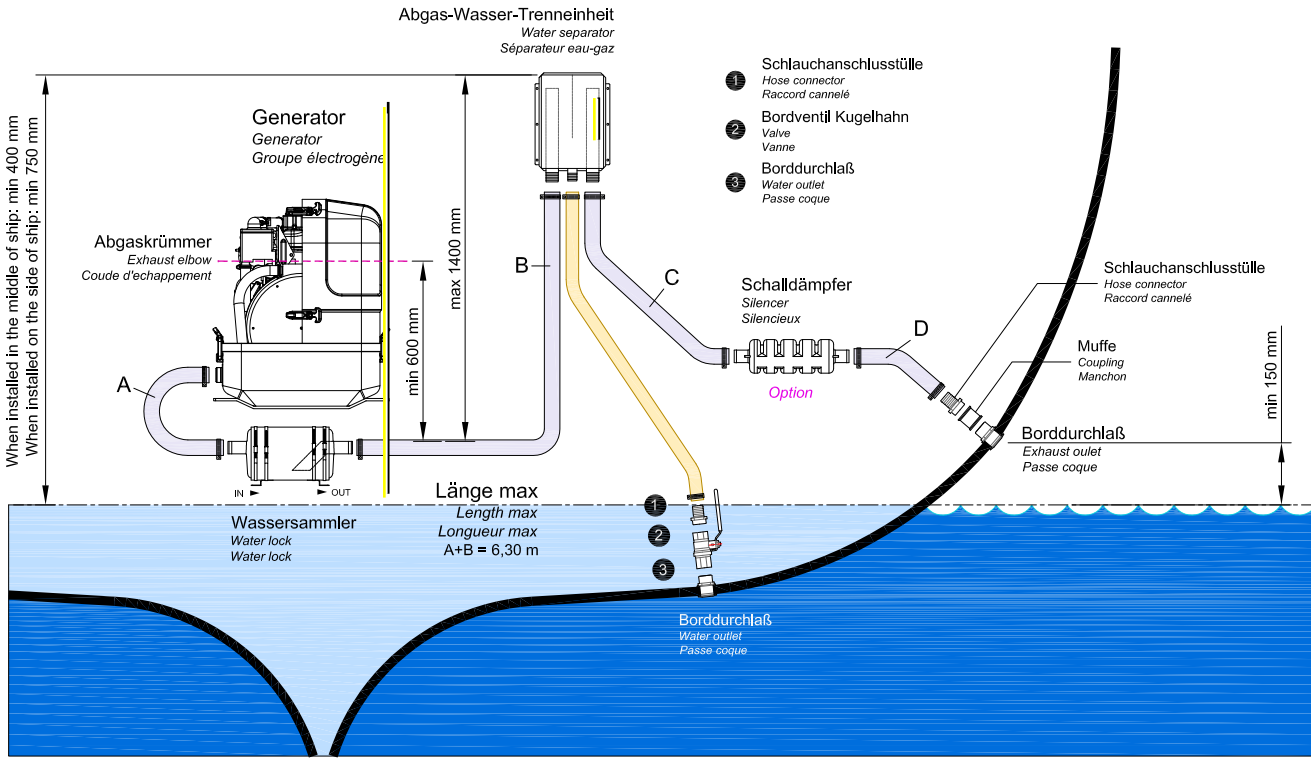
In the case of sailing yachts, it is very important that care is taken to mount the water lock under the mid-line of the generator, at least in relation to the mid-line of the vessel. This prevents significant "leakage" of the water lock in the event of a sharp heel.

The "leakage" of the water lock leads to the water-level rising and approaching the critical point in the exhaust manifold too closely.

7.8 Exhaust/water separator

For optimal reduction of the exhaust noise, the use of an additional silencer close to the through-hull fitting is recommended. Fischer Panda offers a component for this purpose that acts as both an "exhaust goose neck" and a water separator. This "exhaust/water separator" enables the cooling water to be led away via a separate line. This greatly reduces the exhaust noise on the outside of the yacht. "Water splash" in particular is eliminated.

Fig. 7.8-1: Installing the exhaust/water separator

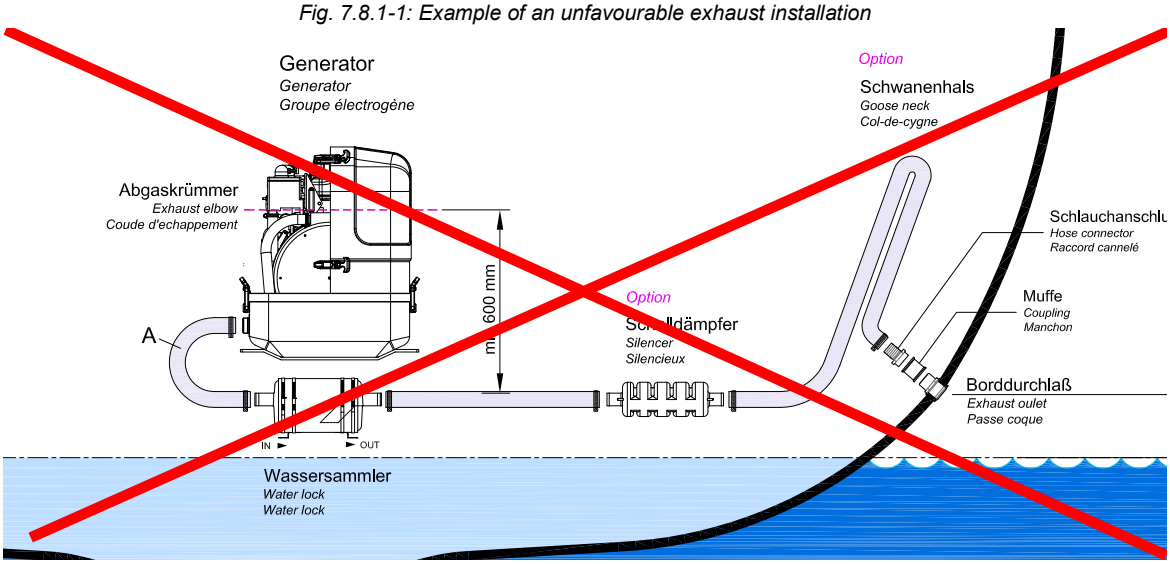


7.8.1 Installing the exhaust/water separator - schematic

If the exhaust/water separator is mounted sufficiently high, then a goose-neck is no longer required. The exhaust/ water separator fulfils the same function. Exhaust noise is practically inaudible if the “Supersilent” exhaust system has been installed correctly and neighbouring boats are not disturbed. The best result is achieved if the hose line through which the cooling water is piped, is located on the shortest downward path directly to the outlet, and this outlet is below 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 to the through-hull outlet. In the case of a longer path, the diameter of the exhaust pipe can be increased (e.g. from NS40 mm to NS50 mm) in order to keep back pressure as low as possible.. If the hose diameter is increased, the exhaust line can be more than 10m in length. An additional outlet exhaust muffler close to the hull outlet will further help to reduce noise emissions.

Fig. 7.8.1-1: Example of an unfavourable exhaust installation



Example of an unfavourable installation:

- Water lock not far enough below the level of the generator
- Distance between the water lock and the goose neck too great

Schematic diagram

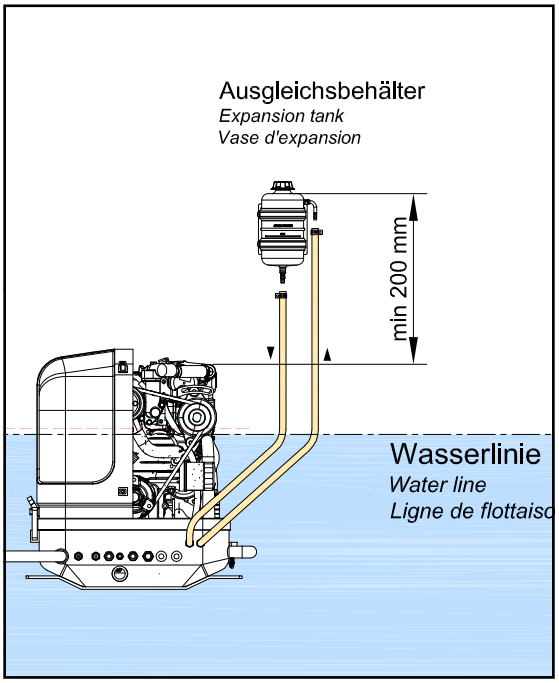
7.9 Connecting the cooling system - raw water

7.9.1 Position of the external cooling water expansion tank

The Fischer Panda generator is usually supplied with a supplementary external cooling water expansion tank. This tank must be installed in such a way that its lower edge is at least 200 mm higher than the upper edge of the noise attenuation capsule.

Should this 200 mm distance not be met, meaning that the cooling water expansion tank is installed at a lower point, significant problems may arise when filling and venting. In this case, the hose lines must be extended and laid to a point outside or even on deck.

Fig. 7.9.1-1: Position of the external cooling water expansion tank



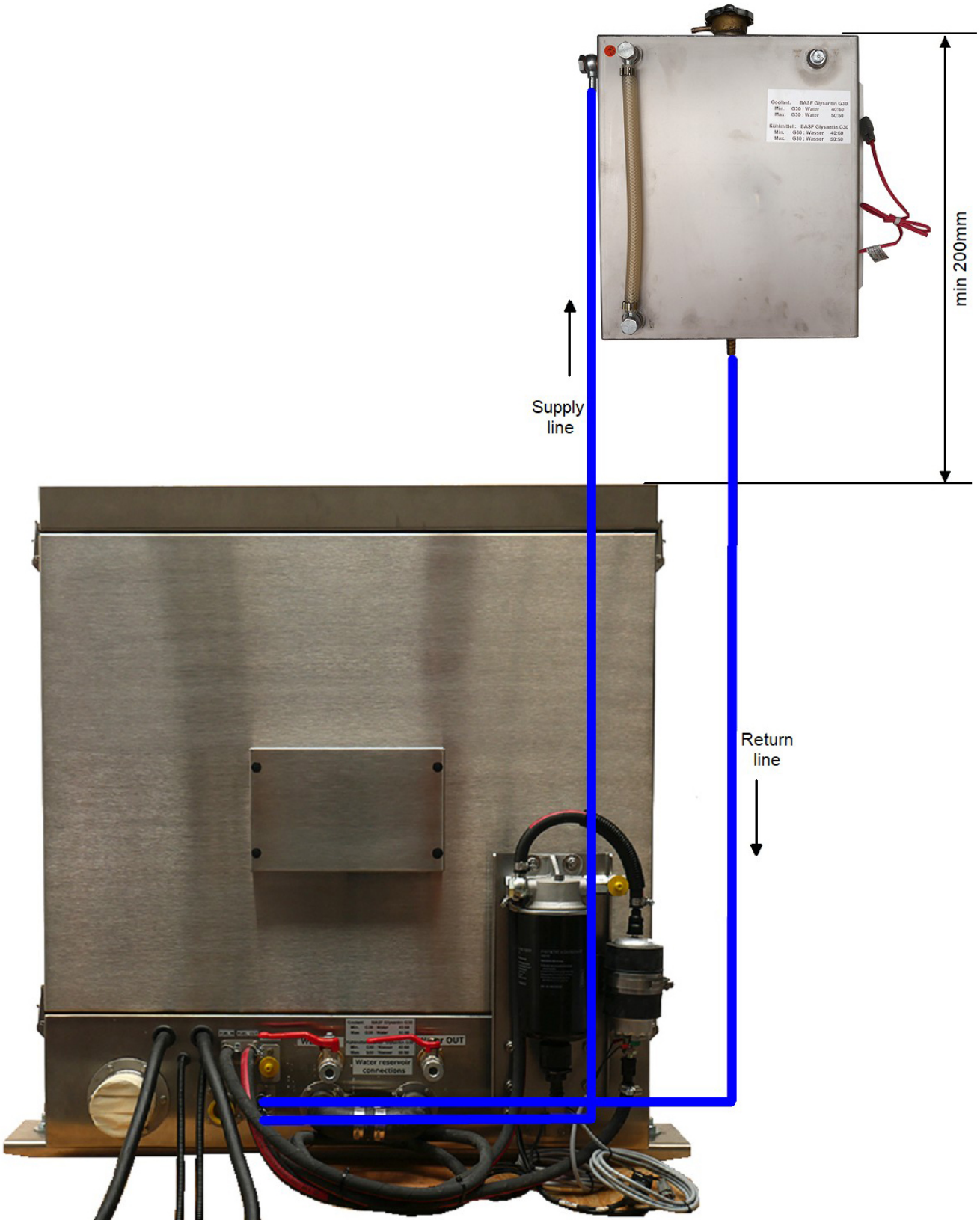
The external cooling water expansion tank may only be filled to the max. mark of the filling level in a cold condition.

Attention!

Generators with an internal expansion tank have no connection points for an external expansion tank (e.g. generators with the EA300 engine). An external expansion tank is not required for these generators.

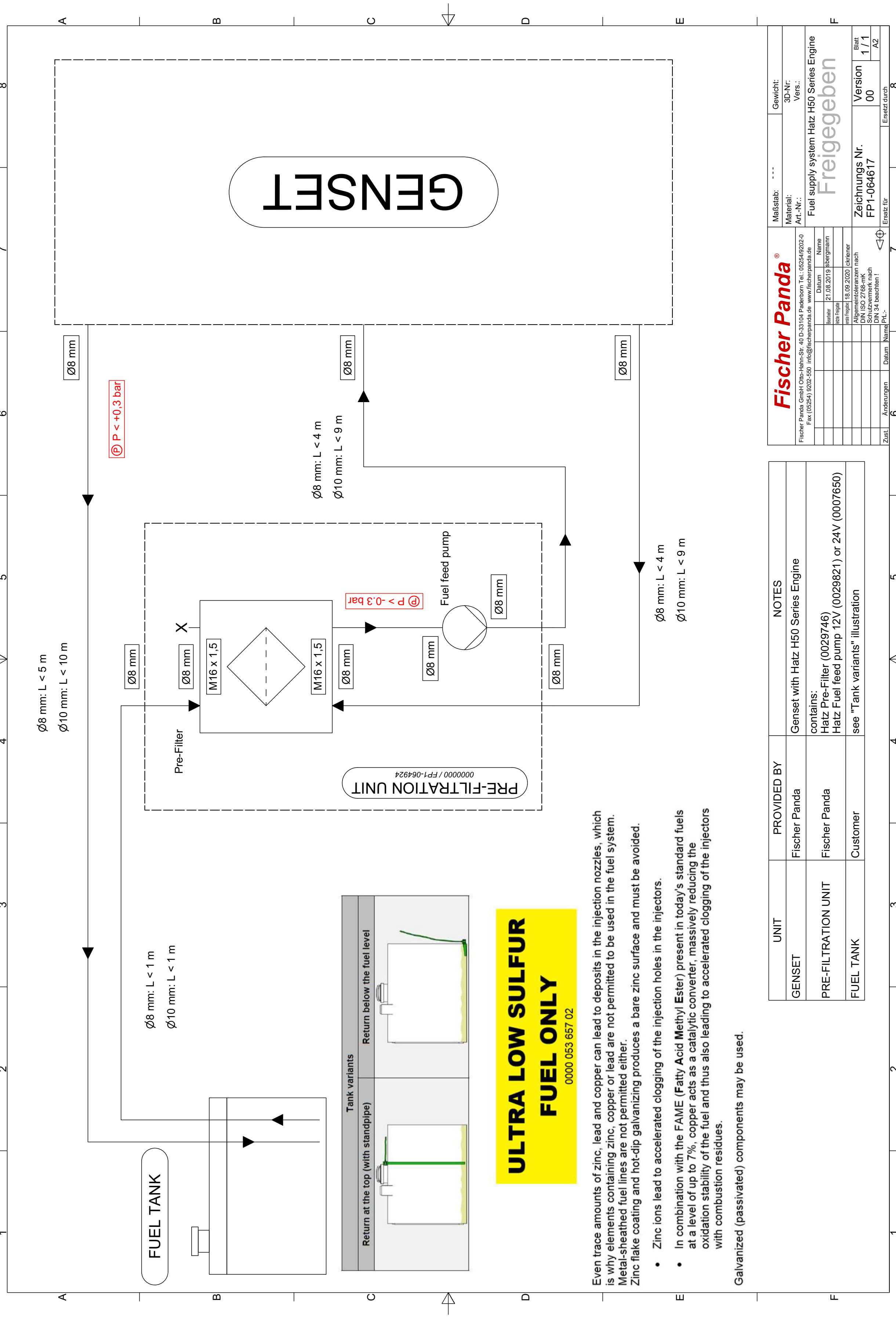
Note!

Fig. 7.9.1-2: External cooling water expansion tank



7.10 Installing the fuel system

Fig. 7.10-1: Fuel system - Schematic diagram



7.10.1 Connecting the fuel line to the tank

Generally, fuel supply and return lines must be connected to the diesel tank by means of a suitable fuel suction fitting.

Note!

Fuel hoses must have a connection diameter of at least 8 mm with a maximum single length of 5 m; fuel pipes with a connection diameter of at least 10 mm have a maximum single length of 10 m. The manifold vacuum may be a maximum of 0.3 bar and must be verified at installation.

Attention!

Lead the return fuel line connection to the day tank down to the floor

If the generator is installed higher than the tank, the return line connected to the tank must be dropped to the same depth in the tank as the suction line, in order to prevent fuel running back into the tank after the generator has been switched off, which can lead to significant difficulties when re-starting after the generator has been switched off for an extended period.

Non-return valve in the suction line

If the return line cannot similarly be immersed in the tank as an immersion tube, a non-return valve should definitely be fitted to the suction line, in order to prevent the fuel from flowing back after the generator has been switched off.

The Panda generator is self-bleeding. The instructions in Kapitel 7.10.2, “Bleeding the fuel lines,” auf Seite 76 should be followed after commissioning or after extended downtime.

Non-return valve for the fuel return line

Attention!

If the fuel tank should be installed above the level of the generator (e.g. day tank), then a non-return valve must be installed on the fuel return line to ensure that no fuel is fed into the injection pump via the return line.

The Fischer Panda generator is equipped with a fuel pre-filter and a fine fuel filter.

Note!

If significant fuel contamination is to be expected, Fischer Panda recommends the installation of an additional Fischer Panda 0026397 pre-filter system.

7.10.2 Bleeding the fuel lines

Bleed the fuel lines at commissioning or after a filter change.

- Activate the pump in the Option menu of the remote control panel.
- Allow the pump to run for approx. 5 mins.
- Deactivate the pump in the Option menu of the remote control panel.

If air is detected in the fuel system, the engine switches to Fault mode at reduced power and speed. After stopping and restarting, the engine runs in Normal mode.

Note!

7.11 Installing the generator DC system

7.11.1 General safety instructions when dealing with batteries

Take note of the instructions and installation guidelines of the battery manufacturer.

Only use batteries that are approved by the battery manufacturer for this application.

Warning!:

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 acid splashes on your skin or clothing, wash if off with lots of water and soap.
- If acid enters your eyes, rinse them immediately with clean water, until the burning sensation has stopped. Immediately seek medical assistance.
- Do not smoke near the batteries. Avoid naked flames. 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 blocks: 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 leads must be routed carefully and tested for undue heating under load. Check the battery near vibrating components regularly for chafing and insulation defects.

7.11.2 Connecting the starter battery

As a rule, Panda generators, from the Panda 6000 upwards, have a built-in alternator/dynamo to charge the starter battery. For generators without an alternator/ dynamo, the starter battery must be charged by an external charger.

Note!

To avoid large voltage losses, the battery must be installed as close as possible to the generator. The positive terminal of the battery is connected to the red cable, the negative terminal is connected to the blue cable.

It must be ensured that the cables are connected first to the generator and then to the battery.

Attention! Check the connection sequence

Use the battery capacity recommended by the engine manufacturer.

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 starting system (e.g. 2x 12 V in series)

Too high a starter battery voltage can destroy parts of the generator!

7.11.3 Installation of the starter battery connection lines

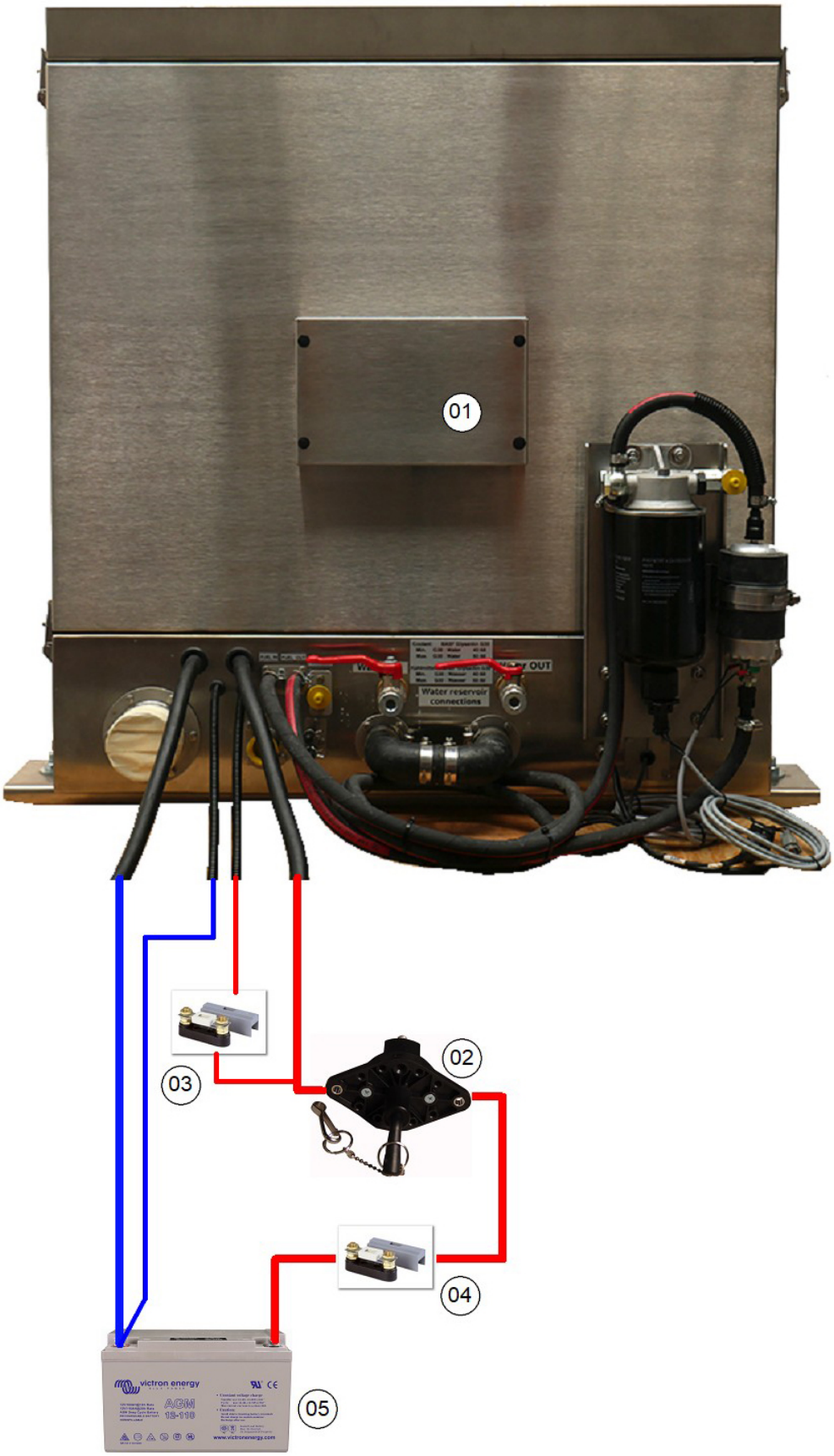
Observe the regulations "ABYC regulation E11 AC and DC electrical systems on boats“ and/or EN ISO 10133:2000 "Small craft -- Electrical systems -- Extra-low-voltage d.c. installations" as applicable!

Attention!

- The battery compartment and the corresponding installation shall be dimensioned adequately.
- The batteries can be separated mechanically or with an adequate power relay.
- Install a fuse of the appropriate rating in the positive lead of the starter battery as close as possible to the battery, but no further than 300 mm (12 inches) from the battery.
- The battery cable must be protected against chafing by a protective pipe/sleeve.
- Use self-extinguishing and fireproof cable suitable for temperatures up to 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 routed so that it does not touch parts that rotate or become hot during operation, such as belt pulleys, exhaust manifolds, exhaust pipes and the engine itself. Do not over-tighten the cable, as this may damage it.

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. 7.11.3-1: 12 V starter battery connection - Schematic diagram



01. Generator
02. Main battery switch
03. 40 A fuse
04. 425 A fuse
05. Starter battery 12 V_{DC}

7.11.4 Connecting the remote control panel

The remote control panel must be connected as described in the data sheet of the remote control panel.

7.11.5 Electrical connections

Before the electrical system is installed, take note of the safety instructions in the respective chapter. When the electrical system is installed, it is essential to comply with the local regulations of the respective electric utility company are complied with. In particular, this includes compliance with regulations regarding the protective earth conductor, personal protection switch, etc.

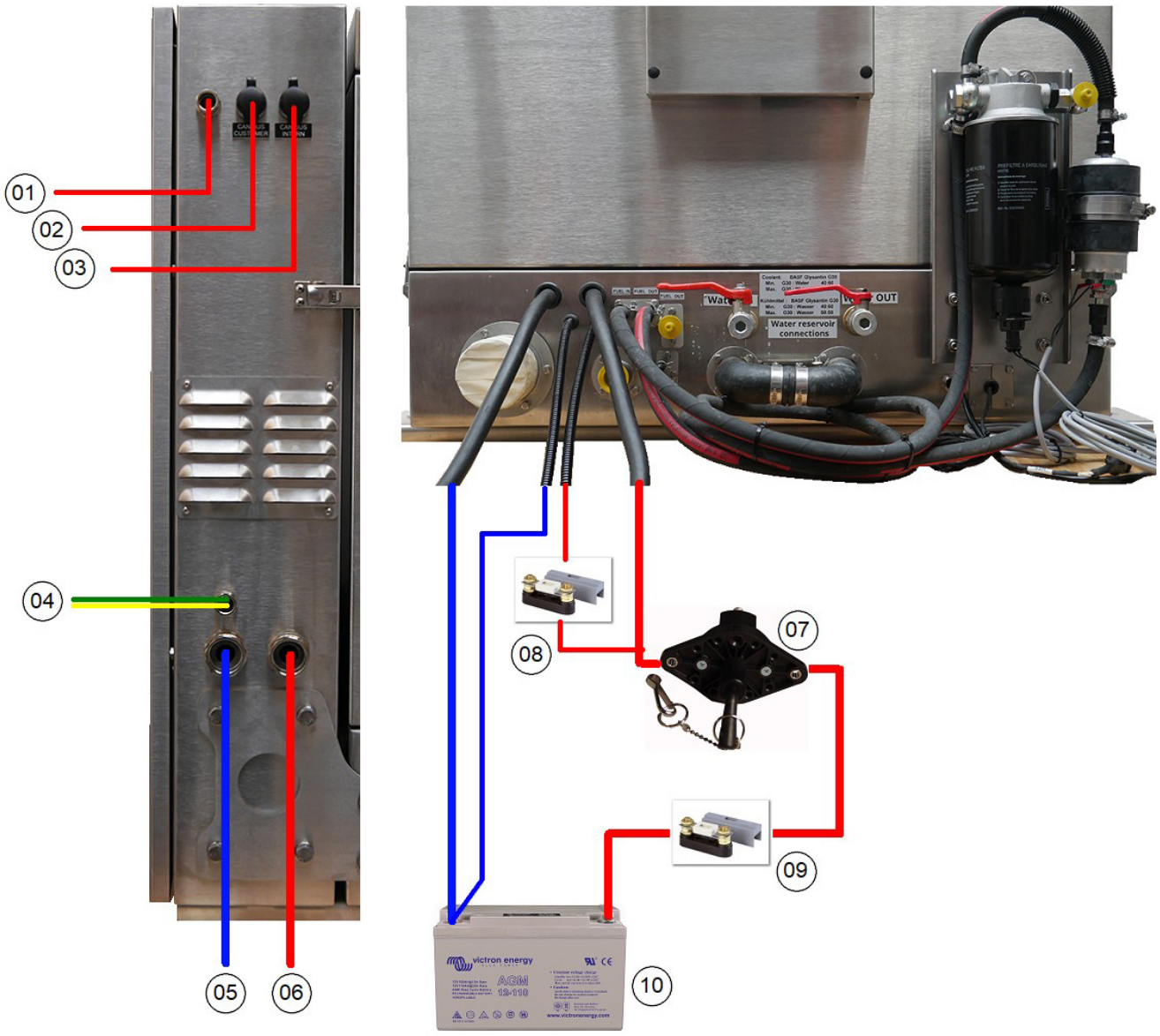
ATTENTION! Lethal danger - High voltage

All safeguards and electrical safety measures must be implemented on board.

Required cable cross-sections:

As a minimum requirement for a proper installation, the cable cross-sections of the connecting lines must comply with the local regulations.

Fig. 7.11.5-1: Electrical connections



01. Communication cable - customer-supplied
02. RJ45 CAN Bus - customer-supplied
03. Internal RJ45 CAN Bus
04. PE conductor
05. Generator output (-)
05. Generator output (+)
07. Main battery switch
08. 40 A fuse
09. 425 A fuse
10. Starter battery 12 V_{DC}

Fig. 7.11.5-2: Customer supplied connection diagram

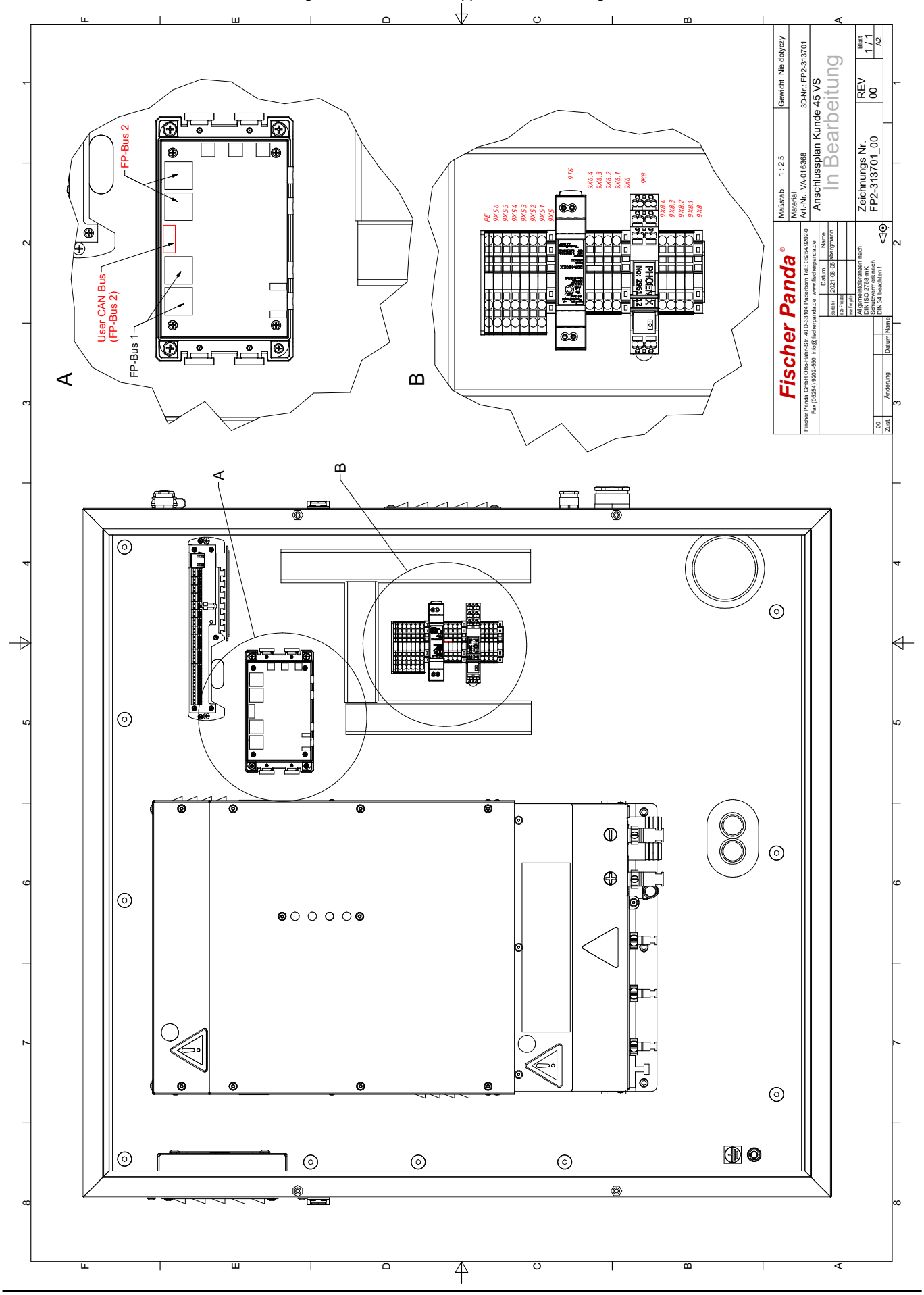
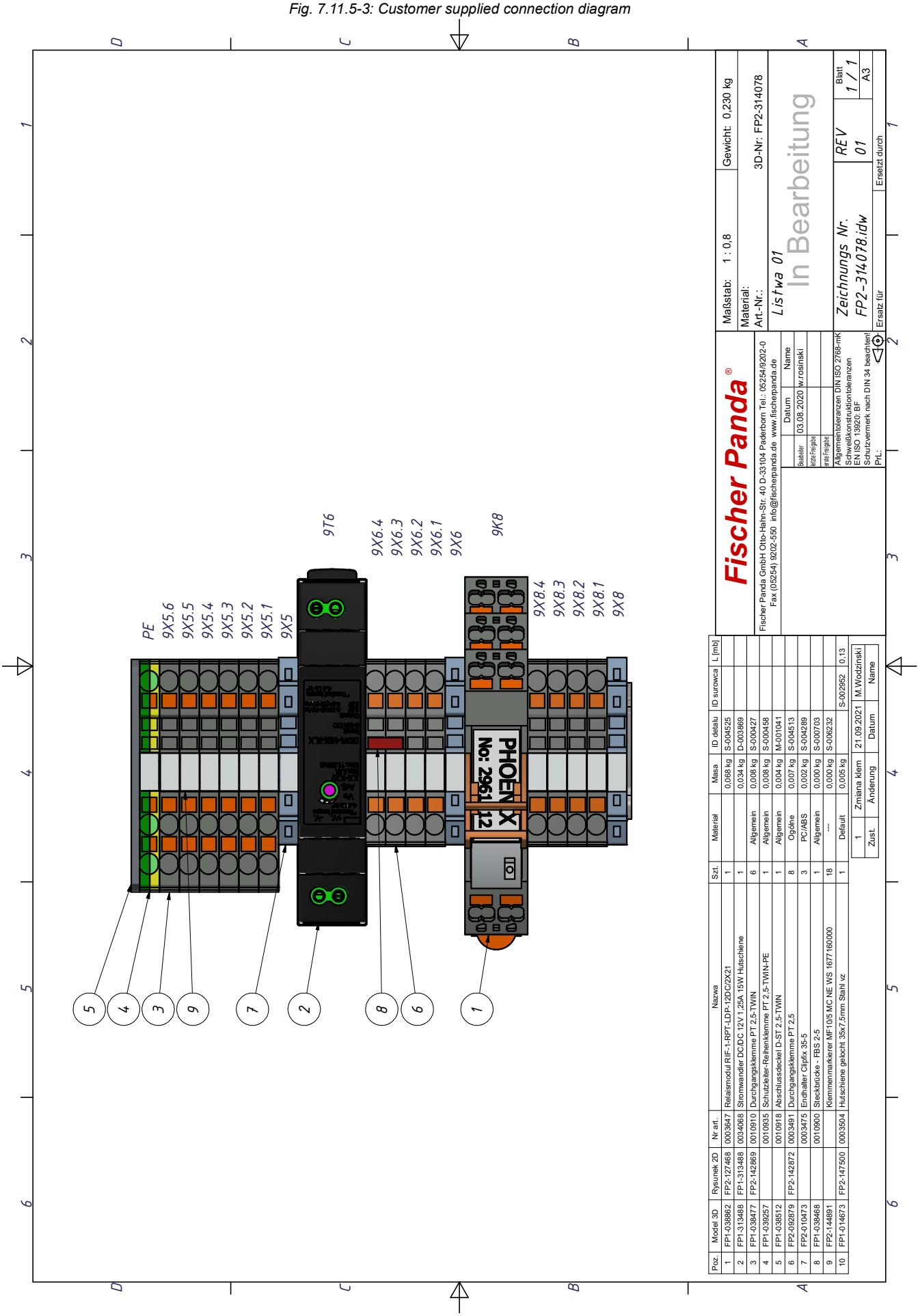


Fig. 7.11.5-3: Customer supplied connection diagram



Poz.	Model 3D	Rysunek 2D	Nr art.	Nazwa	Szt.	Material	Masa	ID detalu	ID surowca	L [mb]
1	FP1-038862	FP2-127468	0003647	Relaismodul RIF-1-RPT-LDP-12DC/2X21	1		0,068 kg	S-004525		
2	FP1-313488	FP1-313488	0034068	Stromwandler DC/DC 12V 1.25A 15W Hutschiene	1		0,034 kg	D-003869		
3	FP1-038477	FP2-142869	0010910	Durchgangsklemme PT 2,5-TWIN	6	Allgemein	0,008 kg	S-000427		
4	FP1-039257		0010935	Schutzleiter-Reihenklemme PT 2,5-TWIN-PE	1	Allgemein	0,008 kg	S-000458		
5	FP1-038512		0010918	Abschlussdeckel D-ST 2,5-TWIN	1	Allgemein	0,004 kg	M-001041		
6	FP2-092879	FP2-142872	0003491	Durchgangsklemme PT 2,5	8	Ogólne	0,007 kg	S-004513		
7	FP2-010473		0003475	Endhalter Clipfix 35-5	3	PC/ABS	0,002 kg	S-004289		
8	FP1-038468		0010900	Steckbrücke - FBS 2-5	1	Allgemein	0,000 kg	S-000703		
9	FP2-144891			Klemmenmarkierer MF10/5 MC NE WS 1677160/000	18	---	0,000 kg	S-006232		
10	FP1-014673	FP2-147500	0003504	Hutschiene gelocht 35x7,5mm Stahl vz	1	Default	0,005 kg		S-002952	0,13

Zust.	Änderung	Datum	Name
1	Zmiana klem	21.09.2021	M.Wodzinski

Fischer Panda®

Fischer Panda GmbH Otto-Hahn-Str. 40 D-33104 Paderborn Tel.: 05254/9202-0
Fax (05254) 9202-550 info@fischerpanda.de www.fischerpanda.de

	Datum	Name
Bearbeiter	03.08.2020	w.rosinski
letzte Freigabe		
erste Freigabe		

Allgemeintoleranzen DIN ISO 2768-mK
Schweißkonstruktionstoleranzen
EN ISO 13920: BF
Schutzvermerk nach DIN 34 beachten!

Maßstab: 1 : 0,8
Gewicht: 0,230 kg
Material:
Art.-Nr.:
3D-Nr: FP2-314078

Listwa 01

In Bearbeitung

Zeichnungs Nr.: FP2-314078.idw
REV 01
Blatt 1 / 1
A3

Ersatz für
Ersetzt durch
PrL:

7.12 Start-up

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

For this purpose, the start-up log is processed and completed by the specialist who installs 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 includes the service procedures and hazards set down in the handbook, as well as other matters relating to the specific installation 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!

8. Generator Operating Instructions

8.1 Personnel

The generator may only be started up by authorised and instructed personnel. The operator shall read the manual in its entirety before starting up the equipment and shall familiarise themselves with the hazards and safety precautions. This applies to both the generator itself and external equipment, attachment parts, and auxiliary units.

8.1.1 Safety instructions regarding operation

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

Note!

LETHAL DANGER! Improper operation can result in severe personal harm and material damage.

The generator can be equipped with an Autostart device. This means that the generator can be started by means of an external signal.

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

Warning! Automatic start-up

Rotating parts! Improper operation can result in severe personal harm and material damage.

The generator must not be operated with the cover removed.

If operation with the cover removed is necessary during a test run, particular caution is required. Never perform these tasks when alone!

Caution! Danger to life and limb

Electric voltage - LETHAL DANGER! Improper operation may cause harm to health and result in death.

Electric voltages of more than 48V 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.

Attention! Lethal danger - High voltage

8.2 General instructions regarding operation

8.2.1 Operating at low temperatures

The engine can be started at temperatures down to minus 20 °C, provided that the other operating conditions are adequate. In particular, operating fluids such as coolant, fuel and engine oil must be suitable for the respective temperature. They should be checked before starting the generator. Appropriate operating fluids and/or additives are available from specialised retailers. Cold-starting aids such as sprays, etc. may not be used -> the warranty is voided!

8.2.1.1 Pre-heating the diesel engine

Pre-combustion chamber diesel engines are equipped with a glow plug. The maximum preheating time may not exceed 20 secs. At 20 °C and higher, preheating should last for 5-6 secs. Below 20 °C, the preheating time must be lengthened accordingly. Die fpControl system preheats automatically.

Preheating enables the generator at temperatures down to -20 °C.

If the operating fluids (fuel, coolant, etc.) are drained and replaced with operating fluids for low temperatures, then the generator must run for at least 10 minutes in order to ensure that the generator has been flushed with fresh operating fluids.

Note!

8.2.1.2 Tips regarding the starter battery

Fischer Panda recommends the use of a commercially available starter batteries. The recommended starter battery capacity (Ah) should be doubled for use in extreme winter conditions. It is recommended that the starter battery be charged regularly (every 2 months). Appropriate battery chargers are to be used for this purpose. A properly charged starter battery is a prerequisite for use of the generator at low temperatures.

8.2.2 Operating at reduced load and idling

If a combustion engine is operated at a reduced load such as 25-30 % of its nominal power, carbon may build up in the generator, creating a cause for concern. This mode of operation results in increased oil consumption and oil escaping from the intake and exhaust manifolds. To a certain extent, this also arises on generators in Standby mode.

8.2.2.1 Reasons for carbon building up in the generator

The cylinders do not achieve their normal operating temperature and optimal fuel combustion thus cannot be assured. In addition, oil carbon builds up on the valves, the pistons and the exhaust system (carbon buildup). Unburned fuel is dissolved in the lubrication oil and contaminates it.

8.2.2.2 In order to avoid generator sooting, take note of the following items:

Operation at low load should be kept as brief as possible.

In order to burn the carbon deposits in the exhaust system, the generator should run at full load for at least 4 hours within a period of 50 hours of operation, If necessary, a dummy load must be connected for this purpose. This should be increased slowly from 30 % to 100 % within a period of 3 hours and then be maintained at 100 % for one hour.

8.2.3 Load placed on the engine in continuous use and overloading

Kindly ensure that the generator is not overloaded. Overloading of the generator occurs when the electrical load is greater than that which can be delivered by the generator. This will damage the engine in the long run. Overloading can lead to the generator running unevenly and roughly, excessive fuel and oil consumption and deterioration of emission values.

In the interests of the engine's long service life, a continuous load should be calculated as 70 % - 80% of the nominal load. Continuous use is understood to be uninterrupted operation of the generator for many hours. It poses no problem for the engine to deliver the full nominal output for 2--3 hours.

The overall design of Fischer Panda Generator ensures that even when operated at full load under extreme conditions, overheating of the engine will not occur. It must, however, be taken into account that when the engine is operated at full load, the exhaust emissions (soot formation) will deteriorate.

8.2.4 Protection conductor

The generator is "earthed " as a standard feature (the centre and earth are connected by means of a jumper in the generator terminal box). 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 earthing (PEN) only functions when all parts of the electrical system are earthed on 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 of 120/230 V or 230/400 V 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 bank must always be disconnected if work on the generator or electrical system of the generator is to be performed, so that the generator cannot be started inadvertently.

8.2.5 Operational monitoring system on the Fischer Panda Generator

Fischer Panda generators are equipped with multiple sensors/temperature switches for operational monitoring. In addition, the combustion engine has an oil pressure switch, which is switched off as soon as the oil pressure drops below a specific value.

8.3 Checks before starting - see the Remote Control Panel data sheet

The notes and instructions in the Remote Control Data sheet must be complied with. **Note!**

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

8.4 Starting the generator - see Remote Control Panel data sheet

The notes and instructions in the Remote Control Data sheet must be complied with. **Note!**

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

8.5 Switching off the generator - see separate Remote Control Panel data sheet

The notes and instructions in the Remote Control data sheet must be complied with.

Note!

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

9. Generator Faults and Errors

9.1 Personnel

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

Further repair work may only be performed by specially trained technical personnel or by authorised workshops (Fischer Panda Service Points). This applies particularly to setting the valves, work on the fuel injection system and engine repairs.

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

Warning: Switch off all loads

9.1.1 Hazard warnings for this chapter

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

Note!

LETHAL DANGER! Improper operation may cause harm to health and result in death.

Warning: Automatic start-up

The generator can be equipped with an Auto-start function. This means that the Auto-start is controlled by an external signal. The battery bank must always be disconnected (negative terminal first, then the positive terminal) if work on the generator or electrical system of the generator is to be performed, so that the generator cannot be started inadvertently.

Improper maintenance can result in severe personal harm and material damage. Therefore:

Warning: Risk of injury

- Maintenance work must only be performed when the engine is switched off.
- Before commencing work, ensure that there is sufficient freedom of movement for installation work to be carried out..
- Take care the the workplace is neat and clean! Components and tools that are loosely stacked or lying around can result in accidents
- Perform maintenance work only with standard tools or special tools as customarily used in the trade. Incorrect or damaged tools can result in injuries

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

Warning: Fire hazard

- Ensure that there are no open flames while working on the engine.
- Do not smoke.
- Remove oil and fuel residue from the engine and the floor

Contact with engine oil, fuel and anti-freeze agents may result in harm to health when inhaled, swallowed or when coming into contact with skin. Therefore:

- Avoid skin contact with engine oil, fuel and anti-freeze.
- Remove splashed oil and anti-freeze from the skin immediately.
- Do not inhale oil and fuel vapours.

Caution: Risk of poisoning

LETHAL DANGER! Improper operation may cause harm to health and result in death.

Electric voltages of more than 48V 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: Electrical voltage

Generator and coolant may be hot during and after use. Risk of being burnt/scalded!

Excess pressure may develop in the cooling system when operating.

Warning: Hot surface/material

Batteries contain corrosive acids and alkalis.

Improper handling can cause the batteries to heat up and burst. Corrosive acid/lye may leak. Under unfavourable conditions, an explosion may result.

Adhere to the instructions of your battery manufacturer.

Warning:

Personal protective equipment must be worn as applicable. This consists of:

- Snugly-fitting protective clothing
- Safety shoes
- Protective gloves
- Hearing protection
- Goggles, if required

Imperative: Protective equipment required

9.2 Tools and measuring instruments

In order for you to be able to deal with faults while travelling, the following tools and measuring instruments should belong to the equipment kept on board:

- Multimeter for voltage (AC/DC), frequency and resistance
- Measuring instrument for inductance
- Measuring instrument for capacity
- Current absorbing clamps
- Thermometer (an infra-red thermometer is ideal)
- Pliers for squeezing

9.3 Overloading the generator

Kindly ensure that the engine is not overloaded. This must be taken into account, especially with regards to multi-power units. In this case, the extra load including the electrical output may be considerably greater than the drive performance of the engine, which can eventually lead to a damaged engine. In addition, the exhaust gases are contaminated with soot (environment)

The full nominal performance of the generator is primarily for short term use. It is, however, required to start electric motors or to enable special starting procedures to be implemented.

In the interests of a long service life, a continuous load should be calculated as 70 % - 80 % of the nominal load.

(Continuous use is understood to be uninterrupted operation of the generator for many hours). It poses no problem for the engine to be run occasionally for 2-3 hours at full nominal load. The overall design of the Panda Generator ensures that even when operated continuously under extreme conditions, overheating of the engine will not occur. In principle, it must be taken into account that when the engine is operated at full load, the exhaust emissions (soot formation) will deteriorate.

Effects of short-circuiting and overloading on the generator

It is practically impossible for the generator to be damaged by a short-circuit and overload. Both a short-circuit and overload cause the generator to stop generating electricity. The generator stops generating electricity and the voltage fails. This condition is immediately reversed if the short-circuit is eliminated or the overload is switched off.

9.3.1 Generator output voltage is too low

Before working on the system, see “Safety Instructions - safety first!” on page 15.

ATTENTION!

If the generated AC voltage is too low, then the consumers should be disconnected, one after the other, in order to reduce the load on the generator. Generally the problem is solved at this point. If the output voltage continues to be too low, even when all loads are switched off - and the generator thus runs without a load - it can be assumed that one or more capacitors are defective.

9.4 Starting problems

9.4.1 Clogged fuel filter

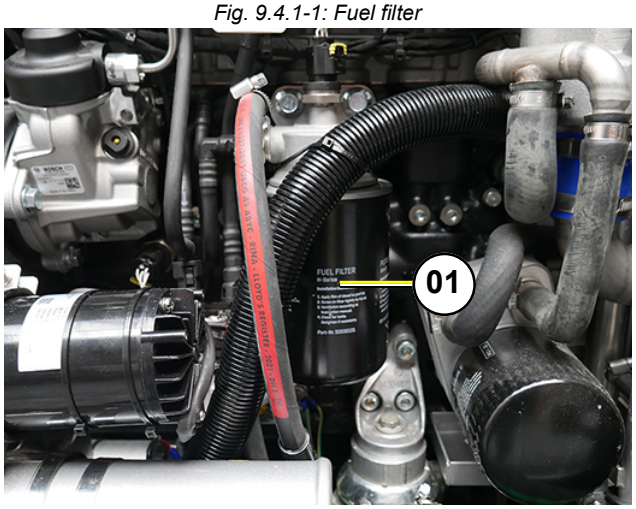
If the fuel filter is clogged, the filter element must be exchanged.

To exchange the filter element, kindly refer to the Hatz operating manual.

Fuel filter

01. Filter element

Fig. 9.4.1-1: Fuel filter



9.4.2 Troubleshooting table

See Kapitel 12.1, “Fehlertabelle,” auf Seite 113 regarding troubleshooting.

9.5 Faults on the Hatz engine

If the ECU of the Hatz engine detects a fault, it is displayed on the fpControl Panel.

If an engine fault arises, the generator is stopped by the fpControl. A fault message with the fault code is shown on the display.

Fig. 9.5-1: Event-code

9.5.1 Hatz ECU fault code table

Fig. 9.5.1-1: Hatz ECU fault code table

SPN	FMI	FaultCheckDescription	Possible Causes
107	14	Error path for Clog Detection in Air filter	
702	5	No load error	
702	12	Over temperature error	
702	3	Short circuit to battery error	
702	4	Short circuit to ground error	
3597	3	Short circuit to battery error at actuator relay	
3598	3	Short circuit to battery error at actuator relay	
3597	4	Short circuit to ground error at actuator relay	
3598	4	Short circuit to ground error at actuator relay	
168	0	High Battery Voltage indication	alternator defective or Battery with voltage >12V is used for jump start
168	1	Low Battery voltage indication	Battery voltage low --> discharged or defective, alternator defective
168	3	The sensor raw signal BattU_uRaw (voltage) is above BattU_uSRCMax_C (4521mV).	Battery voltage upper limit
168	4	The sensor raw signal BattU_uRaw (voltage) is below BattU_uSRCMin_C (950mV).	Battery voltage below limit
22000	14	error passive CAN A	CAN transmitter
22001	15	error passive CAN B	CAN transmitter
22000	15	BusOff error CAN A	CAN transmitter
22000	15	BusOff error CAN B	CAN transmitter
110	17	defect fault check for Absolute plausibility test	wiring harness or component
110	18	defect fault check for dynamic plausibility test	wiring harness or component
110	15	Engine coolant temperature too high plausibility error	less cooling water, water pump defective, water cooler blocked
110	0	Physical Range Check high for CEngDsT	wiring harness or component
110	1	Physical Range Check low for CEngDsT	wiring harness or component

SPN	FMI	FaultCheckDescription	Possible Causes
110	3	The sensor raw signal CEngDsT_uRaw (voltage) is above CEngDsT_SRC.uMax_C (4957mV).	wiring harness or component
110	4	The sensed raw voltage value CEngDsT_uRaw is less than CEngDsT_SRC.uMin_C (359mV).	wiring harness or component
22040	19	Timeout Error of CAN-Receive-Frame TSC1TE	CAN transmitter
22058	19	Reported SPI and COM-Errors of a Cy146	
20201	19	SPI/COM-Errors of the Cy320	ECU internal fault
23618	3	Powerstage diagnosis could be disabled due to high Battery voltage	Jump Start with voltage higher than system voltage Alternator damaged
23618	4	Powerstage diagnosis could be disabled due to low Battery voltage	High power consumption Battery damaged Alternator damaged
2802	11	EEP Read Error based on the error for more blocks	ECU internal fault
2802	14	EEP Read Error based on the error for more blocks	ECU internal fault
2802	12	EEP Write Error based on the error for one block	disconnection of battery while writing of EEPROM (afterrun).ECU internal fault
2791	6	Current limited	actuator dirty
27	17	DFC for valve drift at closed position	EGR valve dirty and/or defective
2791	15	DFC for valve drift at open position	EGR valve dirty and/or defective
2791	2	DFC for Range drift	EGR valve defective
2791	12	Cold Start	EGR valve defective
2791	18	Permanent governor deviation for valve	EGR valve dirty or defective
2791	16	Permanent governor deviation for valve	EGR valve dirty or defective
20282	5	Open load error for powerstage	wiring harness or component
20282	12	Over temperature error for H-bridge	wiring harness component or ECU internal fault
20282	3	Short circuit to battery on Out1 error for H-bridge	wiring harness or component
20282	3	Short circuit to battery on Out2 error for H-bridge	wiring harness or component
20282	4	Short circuit to ground on Out1 error for H-bridge	wiring harness or component
20282	4	Short circuit to ground on Out2 error for H-bridge	wiring harness or component
2791	1	Jammed valve of valve	EGR valve defective or blocked
2791	0	Jammed valve of valve	EGR valve defective or blocked
2791	8	DFC for long time valve drift at closed position	EGR valve defective
2791	9	DFC for long time valve drift at open position	EGR valve defective
2791	5	No load error for powerstage	wiring harness or component
2791	12	Over temperature error	Power stage overtemperature due to internal ECU fault
2791	20	DFC for valve position sensor physical SRC high	EGRVlv missadjusted or dirty
2791	21	DFC for valve position sensor physical SRC low	EGRVlv missadjusted or dirty
2791	3	Short circuit to battery error for powerstage	wiring harness or component
2791	4	Short circuit to ground error for powerstage	wiring harness or component
2791	22	DFC for short time valve drift at closed position	EGRVlv missadjusted or dirty
2791	23	DFC for short time valve drift at open position	EGRVlv missadjusted or dirty
2791	7	DFC for spring break detection	EGRVlv return spring broken or valve misadjusted or dirty
2791	13	DFC for valve position sensor voltage SRC high	wiring harness or component
2791	14	DFC for valve position sensor voltage SRC low	wiring harness or component
2791	11	Fault code for temporary errors	wiring harness or component
1109	11	Injection cut off demand (ICO) for shut off coordinator	ECU internal defect
1769	11	Overspeed detection in component engine protection	overspeed caused by driver
171	0	Physical Range Check high for Environment Temperature	wiring harness or component
171	1	Physical Range Check low for Environment Temperature	wiring harness or component

SPN	FMI	FaultCheckDescription	Possible Causes
171	3	SRC High for Environment Temperature	wiring harness or component
171	4	SRC low for Environment Temperature	wiring harness or component
190	8	In between of several camshaft revolutions there are too many or too less camshaft edges present or the distance or the series of the camshaft edges is unplausible. The defect debounce counter EpmCaS_ctErrSigDef is incremented at each inplausible camshaft revolution, reaches the counter the threshold EpmCaS_numErrSigDef_C the error is set. If the monitoring range is left, the debounce counter is reseted.	tone wheel defective
190	12	In between of several crankshaft revolutions there is not any camshaft edge present. The defect debounce counter EpmCaS_ctNoSig reaches the threshold EpmCaS_numNoSigDef_C. If the monitoring range is left, the debounce counter is reseted.	wiring harness or component
190	2	DFC for camshaft offset angle exceeded	wiring harness or camshaft sensor defect or wrong mounting position or tone wheel misadjusted
190	8	DFC for crankshaft signal diagnose - disturbed signal	– Loose connection or poor contact on socket – Change of air gap between sensor and trigger wheel (eccentric trigger wheel, air gap too big, loose sensor mounting, sensor movement) – Disturbance on sensor lines – Oscillating trigger wheel as starter engages – Bent or broken teeth on crankshaft trigger wheel
190	12	There is no crankshaft signal available (EpmHCrS_stSigMode = WAITSIG). The camshaft signal has been checked (EpmCaS_stNEng .7 = 1) and it is plausible (EpmCaS_stNEng .0-2 = 0). The Camshaft rotation counter EpmCrS_ctCaSRev_mp for defect debouncing reaches threshold EpmCrS_numNoSigDef_C (4 events).	wiring harness or crankshaft sensor defect
97	15	Water in fuel detected	
95	17	Low fuel pressure error monitoring	fuel tank empty, fuel filter blocked, wiring harness or pre supply pump itself defective
95	3	SRC High for Environment Pressure	wiring harness or component
95	4	SRC low for Environment Pressure	wiring harness or component
174	0	Physical Range Check high for fuel temperature	high engine load with low fuel level and high ambient temperture
174	1	Physical Range Check low for fuel temperature	very cold ambient temperture
174	3	SRC high for fuel temperature sensor	wiring harness or component
174	4	SRC low for fuel temperature sensor	wiring harness or component
20288	21	DFC for coding error when selected coding is not working	
20288	22	DFC for faulty diagnostic data transmission or protocol error	
20288	2	DFC for coding error when different coding words were received in a coding cycle	
20288	2	No load error for Low Voltage System	
20288	5	Over temperature error on ECU powerstage for Glow plug Low Voltage System	
20288	3	Short circuit to battery error for Low Voltage System	
20288	4	Short circuit to ground error for Low Voltage System	

SPN	FMI	FaultCheckDescription	Possible Causes
5324	11	Array of DFCs for failure in i+1th Glow Plug	
5325	11	Array of DFCs for failure in i+1th Glow Plug	
5326	11	Array of DFCs for failure in i+1th Glow Plug	
5327	11	Array of DFCs for failure in i+1th Glow Plug	
5324	4	Array of DFCs for short circuit in i+1th Glow Plug	
5325	4	Array of DFCs for short circuit in i+1th Glow Plug	
5326	4	Array of DFCs for short circuit in i+1th Glow Plug	
5327	4	Array of DFCs for short circuit in i+1th Glow Plug	
20288	14	DFC for T30 missing error in GCU-T	
20288	23	DFC for glow module error in GCU-T	
23895	13	check of missing injector adjustment value programming	IMA not programmed
23896	13	check of missing injector adjustment value programming	IMA not programmed
23897	13	check of missing injector adjustment value programming	IMA not programmed
23898	13	check of missing injector adjustment value programming	IMA not programmed
23350	4	Short circuit	wiring harness or injector short circuit.
23352	4	Short circuit	wiring harness or injector short circuit.
23354	12	CY33X is defect	ECU internal fault
651	5	open load	wiring harness or injector load drop cylinder
653	5	open load	wiring harness or injector load drop cylinder
654	5	open load	wiring harness or injector load drop cylinder
652	5	open load	wiring harness or injector load drop cylinder
651	3	general short circuit	wiring harness or injector cylinder.
653	3	general short circuit	wiring harness or injector cylinder.
654	3	general short circuit	wiring harness or injector cylinder.
652	3	general short circuit	wiring harness or injector cylinder.
976	3	Diagnostic fault check for max error of COM message	wiring harness or component
1076	5	open load of metering unit output	10A fuse for ECU Pin K01 wiring harness or component
1076	12	over temperature of device driver of metering unit	output stage of ECU defect or wiring harness
1076	15	short circuit to battery in the high side of the MeUn	
1076	17	short circuit to ground in the high side of the MeUn	
1076	16	short circuit to battery of metering unit output	wiring harness or component
1076	18	short circuit to ground of metering unit output	wiring harness or component

SPN	FMI	FaultCheckDescription	Possible Causes
976	4	Diagnostic fault check for min error of COM message	wiring harness or component
20220	2	Diagnostic fault check to report the NTP error in ADC monitoring	ECU internal fault
20220	11	Diagnostic fault check to report the ADC test error	ECU internal fault
20220	14	Diagnostic fault check to report the error in Voltage ratio in ADC monitoring	ECU internal fault
20221	11	Diagnostic fault check to report errors in query-/response-communication	ECU internal fault
20222	11	Diagnostic fault check to report errors in SPI-communication	ECU internal fault
20223	11	Diagnostic fault check to report multiple error while checking the complete ROM-memory	ECU internal fault
20290	11	Loss of synchronization sending bytes to the MM from CPU.	ECU internal fault
20290	20	DFC to set a torque limitation once an error is detected before MoCSOP's error reaction is set	1) Engine Plug of ECU disconnected. 2) If also an InjSys-DFC is stored this DFC is only for information. If DFC is stored without another InjSys-DFC then ECU is defective.
20290	21	Wrong set response time	ECU internal fault
20290	22	Too many SPI errors during MoCSOP execution.	ECU internal fault
20290	23	Diagnostic fault check to report the error in undervoltage monitoring	ECU internal fault
20290	23	Diagnostic fault check to report that WDA is not working correct	ECU internal fault
20290	25	OS timeout in the shut off path test. Failure setting the alarm task period.	ECU internal fault
20290	25	Diagnostic fault check to report that the positive test failed	ECU internal fault
20290	25	Diagnostic fault check to report the timeout in the shut off path test	ECU internal fault
20290	3	Diagnostic fault check to report the error in overvoltage monitoring	ECU internal fault
20224	11	Diagnostic fault check to report the accelerator pedal position error	ECU internal fault
20225	11	Diagnostic fault check to report the engine speed error	ECU internal fault
20226	11	Diagnostic fault check to report the plausibility error between level 1 energizing time and level 2 information	ECU internal fault
20227	11	Diagnostic fault check to report the error due to plausibility between the injection begin v/s injection type	ECU internal fault
20228	11	Diagnostic fault check to report the error due to non plausibility in ZFC	ECU internal fault
20229	11	Diagnosis fault check to report the demand for normal mode due to an error in the PoI2 quantity	ECU internal fault
20229	14	Diagnosis fault check to report the error to demand for an ICO due to an error in the PoI2 shut-off	ECU internal fault
20230	11	Diagnosis fault check to report the error to demand for an ICO due to an error in the PoI3 efficiency factor	ECU internal fault
1108	16	Diagnostic fault check to report the error due to Over Run	ECU internal fault
1108	15	Diagnostic fault check to report the error due to cooling injection in Over Run	ECU internal fault
20231	11	Diagnostic fault check to report the error due to injection quantity correction	ECU internal fault
20232	11	Diagnostic fault check to report the plausibility error in rail pressure monitoring	ECU internal fault
20276	11	Diagnostic fault check to report the remote accelerator pedal position error	ECU internal fault
0	0	function monitoring: fault in the monitoring of the start control	

SPN	FMI	FaultCheckDescription	Possible Causes
20233	11	Diagnostic fault check to report the error due to torque comparison	ECU internal fault
20234	11	Diagnosis of curr path limitation forced by ECU monitoring level 2	ECU internal fault
20234	20	Diagnosis of lead path limitation forced by ECU monitoring level 2	ECU internal fault
20234	21	Diagnosis of set path limitation forced by ECU monitoring level 2	ECU internal fault
20235	3	Reported OverVoltage of VDD5	ECU internal fault
20235	4	Reported UnderVoltage of VDD5	ECU internal fault
2634	11	Early opening defect of main relay	relay defect or wiring harness
2634	12	DFC for stuck main relay error	relay defect or wiring harness
97	17	Fuel Level unplausible	
976	2	Diagnostic fault check non plausibility of COM message	wiring harness or component
20238	11	Diagnostic fault check to report "WDA active" due to errors in query-/response communication	ECU internal fault but healed. No action!
20238	4	Diagnostic fault check to report "ABE active" due to undervoltage detection	ECU internal fault but healed. No action!
20238	3	Diagnostic fault check to report "ABE active" due to overvoltage detection	ECU internal fault but healed. No action!
20238	14	Diagnostic fault check to report "WDA/ABE active" due to unknown reason	ECU internal fault but healed. No action!
100	0	Maximum oil pressure error in plausibility check	wiring harness or component
100	1	Minimum oil pressure error in plausibility check	wiring harness or component
100	3	Oil_uRawPSwmp > Oil_SRCPSwmp.uMax_C (4772mV)	wiring harness or component
100	4	Oil_uRawPSwmp < Oil_SRCPSwmp.uMin_C (234mV)	wiring harness or component
175	15	Oil temperature too high plausibility error	oil extremely hot, maybe missuse of engine (tuning) wiring harness or component
175	0	Physical Range Check high for Oil Temperature	1) Too high load on engine 2) Sensor misadjusted or wiring harness
175	1	Physical Range Check low for Oil Temperature	Sensor misadjusted or wiring harness
175	19	Signal error on CAN for Oil Temperature	1.) CAN transmitter from sender defect 2.) CAN defect 3.) Sensor defect
175	3	SRC High for Oil Temperature	wiring harness or component
175	4	SRC low for Oil Temperature	wiring harness or component
107	2	Signal non-plausible for AirFltDs pressure sensor	
107	0	Physical Range high error for Inlet air pressure (P1) sensor	
107	1	Physical Range low error for Inlet air pressure (P1) sensor	
107	3	SRC High for Controller Mode Switch	
107	4	SRC low for Controller Mode Switch	
107	3	SRC high for AirFltDs pressure sensor	
107	4	SRC low for AirFltDs pressure sensor	
1244	5	open load of pressure control valve output	
1244	12	over temperature of device driver of pressure control valve	

SPN	FMI	FaultCheckDescription	Possible Causes
1244	15	short circuit to battery in the high side of the pressure control valve	
1244	17	short circuit to ground in the high side of the pressure control valve	
1244	16	short circuit to battery of pressure control valve output	
1244	18	short circuit to ground of the pressure control valve output	
1244	4	signal range check high error of pressure control valve AD-channel	
1244	3	signal range check low error of pressure control valve AD-channel	
108	0	Ambient air pressure sensor range chack max-error	
108	1	Ambient air pressure sensor range check min-error	
108	3	fault check max signal range violated for ambient air pressure sensor	
108	4	fault check min signal range violated for ambient air pressure sensor	
102	0	Physical Range Check high for air pressure at the upstream of intake valve sensor	Over boost condition, maybe wastgate blocked
102	1	Physical Range Check low for air pressure at the upstream of intake valve sensor	Under boost, maybe turbocharger defective
102	0	Plausibility Check for air pressure at the upstream of intake valve sensor	PIntkVUss pressure sensor or EnvP sensor misadjusted or defect
102	1	Plausibility Check for air pressure at the upstream of intake valve sensor	PIntkVUss pressure sensor or EnvP sensor misadjusted or defect
102	3	Diagnostic fault check for SRC high in air pressure upstream of intake valve sensor	wiring harness or component
102	4	Diagnostic fault check for SRC low in air pressure upstream of intake valve sensor	wiring harness or component
23906	5	open load of pre-supply pump output	
23906	12	Over temperature error on ECU powerstage for Pre supply pump	
23906	3	short circuit to battery of pre-supply pump output	
23906	4	short circuit to ground of pre-supply pump output	
23613	0	maximum positive deviation of rail pressure exceeded	1.) Leakage in the high pressure section 2.) injection nozzle stuck in open position 3.) worn high pressure pump 4.) worn injector (to high injector backflow quantity) 5.) fuel filter clogged up 6.) PSP (electric pre-supply pump) output too low
23613	24	leakage is detected based on fuel quantity balance	Maladjusted rail pressure sensor, defective high pressure pump, leakage, Possible error in the low pressure stage, Backflow too low
23613	1	If the rail pressure governor deviation Rail_pDvt falls below the limiting value Rail_pMeUnDvtMin_CUR and if the CP3 delivery quantity MeUn_dvolSet falls to the threshold Rail_MeUnMon.dvolSetMin_C (-350 mm^3/s) an error will be detected.	1.) Metering unit is stuck in open position 2.) zero delivery throttle clogged up 3.) metering unit without power due to electrical error. 4.) pressure after zero-delivery throttle too high.

SPN	FMI	FaultCheckDescription	Possible Causes
23613	2	If the rail pressure RailP_pFlt exceeds the limiting value Rail_MeUnMon.pFltMax_C (1.750.000 hPa) an error will be detected.	1.) Metering unit is stuck in open position 2.) zero delivery throttle clogged up 3.) metering unit without power due to electrical error. 4.) pressure after zero-delivery throttle too high. 5.) very last action: change ECU
23614	20	maximum positive deviation of rail pressure exceeded	
23614	22	maximum negative rail pressure deviation with closed pressure control valve exceeded	
23614	0	maximum rail pressure exceeded	
23614	1	maximum rail pressure exceeded (second stage)	
157	25	Rail pressure raw value is intermittent	wiring harness or components (loose contact)
157	3	Sensor voltage above upper limit	wiring harness or component
157	4	Sensor voltage below lower limit	wiring harness or component
91	3	Signal Range Check High for APP1	wiring harness or component
29	3	Signal Range Check High for APP2	wiring harness or component
20277	3	Signal Range Check High for RmtAPP1	wiring harness or component
20278	3	Signal Range Check High for RmtAPP2	wiring harness or component
91	4	Signal Range Check Low for APP1	wiring harness or component
29	4	Signal Range Check Low for APP2	wiring harness or component
20277	4	Signal Range Check Low for RmtAPP1	wiring harness or component
20278	4	Signal Range Check Low for RmtAPP2	wiring harness or component
3509	2	Error Sensor supplies 1	1.) wiring harness 2.) component defect: APP2 (Accelerator Pedal 2 sensor) A/C compressor pressure sensor DPF pressure sensor Clutch sensor BPA sensor (Boost pressure aktuator position sensor) EGR valve position sensor Throttle plate position sensor Neutral gear detection sensor Break boost vacuum pressure sensor 3.) ECU internal defect
3510	2	Error Sensor supplies 2	1.) wiring harness 2.) component defect: APP1 (Accelerator Pedal 1 sensor) CaS (Camshaft sensor) BPS (Boost pressure sensor) RDS (Rail pressure sensor) Analogue oil pressure sensor Engine cylinder pressure sensors 3.) ECU internal defect
3511	2	Error Sensor supplies 3	1.) wiring harness 2.) component defect: Crankshaft position sensor Rail pressure sensor 3.) ECU internal defect
677	5	No load error	
677	6	Over temperature error on ECU powerstage for Starter	
677	3	Short circuit to battery error	
677	4	Short circuit to ground error	
987	5	No load error	wiring harness or component

SPN	FMI	FaultCheckDescription	Possible Causes
987	12	No load error	wiring harness or component
987	3	Short circuit to battery error	wiring harness or component
987	4	Short circuit to ground error	wiring harness or component
20251	11	Visibility of SoftwareResets in DSM	ECU internal fault
20251	20	Visibility of SoftwareResets in DSM	ECU internal fault
20251	21	Visibility of SoftwareResets in DSM	ECU internal fault
91	11	In case of dual analog accelerator pedal, it is the plausibility check between APP1 and APP2 and in case of potentiometer switch accelerator pedal, it is the plausibility check between APP1 and idle switch	wiring harness or component
20280	2	In case of dual analog accelerator pedal, it is the plausibility check between RmtAPP1 and RmtAPP2 and in case of potentiometer switch accelerator pedal, it is the plausibility check between APP1 and idle switch	wiring harness or component
23550	12	Defective T50 switch	switch defective or is active for a long time
105	0	Physical Range Check high for Charged Air cooler down stream temperature	
105	1	Physical Range Check low for Charged Air cooler down stream temperature	
105	3	The sensor raw signal Air_uRawTCACDs (voltage) is above Air_SRCTCACDs.uMax_C (4803mV).	wiring harness or component
105	4	The sensor raw signal Air_uRawTCACDs (voltage) is above Air_SRCTCACDs.uMax_C (318mV).	wiring harness or component
1136	3	SRC high for ECU temperature sensor	ECU internal fault
1136	4	SRC low for ECU temperature sensor	ECU internal fault

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10. Maintenance Instructions

10.1 Personnel

The maintenance work described here can be performed by the operator unless otherwise labelled.

Further maintenance work may only be performed by specially trained technical personnel or by authorised workshops (Fischer Panda Service Points). This applies in particular to valve adjustments, work on the diesel injection system, and to engine repairs.

The tasks described here can be seen as a guide. As the precise installation and storage conditions are not known to Fischer Panda, the work instructions and materials must be adapted by a qualified specialist on site. Damage due to improper maintenance/repair is not covered by the guarantee.

Attention!

10.1.1 Hazard warnings for maintenance

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

Note!

LETHAL DANGER! - Improper operation can cause harm to health and result in death.

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

Warning! Automatic start-up

Improper maintenance can result in severe personal harm and material damage. Therefore:

- Maintenance work must only be performed when the engine is switched off.
- Before commencing work, ensure that there is sufficient freedom of movement for installation work.
- Take care the the workplace is neat and clean! Components and tools that are loosely stacked or lying around can result in accidents.
- Perform maintenance work only with standard tools or special tools as customarily used in the trade. The use of incorrect or damaged tools may result in injuries.

Attention! Risk of injury

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

- Ensure that there are no open flames while working on the engine.
- No smoking.
- Remove oil and fuel residue from the engine and the floor.

Warning! Fire hazard

Contact with engine oil, fuel, and anti-freeze agents can cause impaired health. Therefore:

- Avoid skin contact with engine oil, fuel and anti-freeze.
- Remove splashed oil and anti-freeze from the skin immediately.
- Do not inhale oil and fuel vapours.

Caution! Risk of poisoning

Electric voltage - LETHAL DANGER! - Improper operation can cause harm to health and result in death.

Electric voltages of more than 48V 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! Electrical voltage

Generator and coolant may be hot during and after use.

Excess pressure may develop in the cooling system when operating.

Attention! Risk of injury!

Personal protective equipment must be worn when performing maintenance work. This consists of:

- Snugly-fitting protective clothing
- Safety shoes
- Protective gloves
- Goggles, if required

Attention! Protective equipment required

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

Attention! Switch off all loads

Batteries contain corrosive acids and alkalis.

Improper handling can cause the batteries to heat up and burst. Corrosive acid/lye may leak. Under unfavourable conditions, an explosion may result.

Adhere to the instructions of your battery manufacturer.

Warning!

10.1.2 Disposal of engine fluids

Engine fluids are harmful to the environment.

Collect and properly dispose of engine fluids that have been drained off!

Protect the environment.

10.2 Important information!

Two jumpers must be set in order to test the generator without the customer's external system!

These jumpers must be set on the emergency-off relay in order to operate in Service mode. The jumpers must be removed again after the service work and the test must be recorded in the log!

Attention!

10.3 Checking hose elements and rubber parts in the noise attenuation capsule

Check that all hoses and hose connectors are in good condition. The rubber hoses are very sensitive to environmental influences. They can deteriorate quickly in environments with dry air, light oil or fuel fumes, and increased temperatures. The hoses must be checked regularly for elasticity. There are operating situations that will require hoses to be exchanged once a year.

10.3.1 Exhaust gas lines and hoses

As the water/exhaust gas mixture is highly corrosive,the exhaust line/hose must be checked regularly (once a month) and replaced if necessary.

10.4 Securing the generator to prevent it from being switched on unintentionally

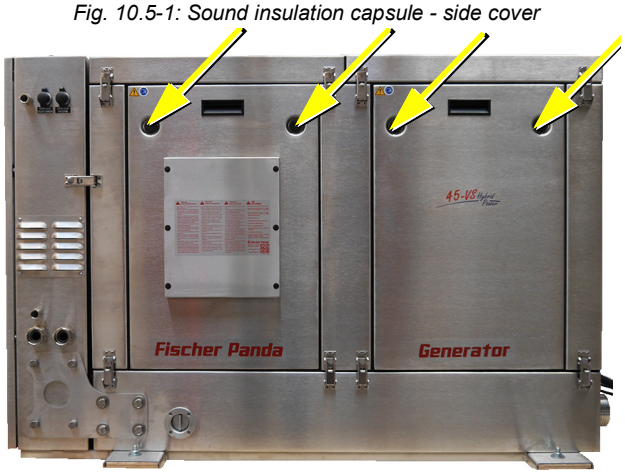
In order to safeguard the generator from being switched on unintentionally, the starter battery must be disconnected and/or the main battery switch, if installed, must be switched off.

10.5 Opening the capsule

Tools needed:	Set of screwdrivers

1. To open the sound insulation capsule, the closures must be rotated anti-clockwise through approximately 180°.
2. Use a flat-bladed screwdriver for this purpose. Pull the side-walls out using the recessed grips.

Fig. 10.5-1: Sound insulation capsule - side cover



3. Closure locked

Fig. 10.5-2: Closure locked

4. Closure open

Fig. 10.5-3: Closure open

5. Open all capsule closures.
6. Remove the capsule lid.
7. Close the capsule in the reverse order.

Fig. 10.5-4: Capsule lid

10.6 Maintenance instructions

All maintenance work must be performed in accordance with the Hatz engine manual.

Note!

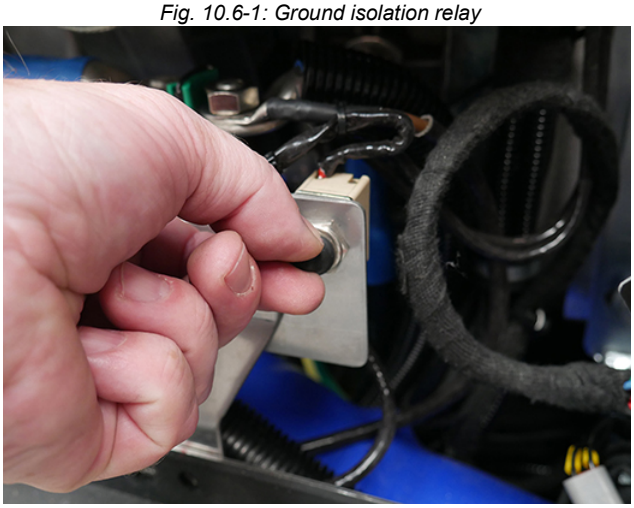
	Maintenance work	Chapter	Category		
			Every 8-15 hours of operation or after the daily start-up	Every 150 hours of operation or once a year	Every 500 hours of operation or every 2 years
01	Check the oil level	Section 10.7.1, on page 109	X		
02	Check the intake area of the combustion air	Section 10.7.2, on page 111	X		
03	Check the cooling system	Section 10.7.3, on page 113	X		
04	Change the engine oil and oil filter [1)]	Section 10.7.4, on page 114			X
05	Exchange the fuel pre-filter [1)]	Section 10.7.5, on page 117			X
06	Exchange the main fuel filter [1)]	Section 10.7.6, on page 118			X
07	Check the poly V-belt [1)]	Section 10.7.7, on page 119			X
08	Exchange the oil separator of the crankcase vent [1)]	Section 10.7.8, on page 120			X
09	Check the threaded connections [1)]	Section 10.7.9, on page 121			X
10	Check the fuses	Section 10.7.10, on page 122			X
11	Check the relays	Section 10.7.11, on page 125			X
12	Exchange the air filter cartridge	Section 10.7.12, on page 128			X (every 500 hours of operation or when notified, after 2 years at the latest)
13	Drain the water separator [1)]	Section 10.7.13, on page 131			X (when notified, after 2 years at the latest)
14	Exchange the poly V-belt	Section 10.7.14, on page 133	When necessary, every 3 000 hours of operation at the latest		
15	Clean raw water filter / if necessary exchange	Section 10.7.17.1, on page 136		X	
16	Exchange raw water pump impeller	Section 10.7.17.3, on page 137		X	

[1)] Maintenance according to maintenance interval or after 2 years, depending on which criterion is fulfilled first

1. Open the capsule (see section 10.5, “Opening the capsule,” on page 106).
2. The ground isolation relay must be switched on in order to be able to start the Hatz engine using the Hatz diagnostic tool.

   Normal operation switch/ground isolating relay off
   Maintenance mode switch/ground isolating relay on

Fig. 10.6-1: Ground isolation relay



10.7 Maintenance work

Maintenance work may only be performed by qualified specialists!

Attention!

10.7.1 Checking the oil level

Average duration of the measure	approx. 10 min
Personnel required	1
Tool required / spare part / material	Oil can / absorbent cloth / engine oil

Place the generator on a level surface.

Run the generator for approx. 10 minutes and ensure that the engine warms up. Wait 3 minutes until the oil has flowed back into the oil sump.

Generator and engine may be hot during and after use.

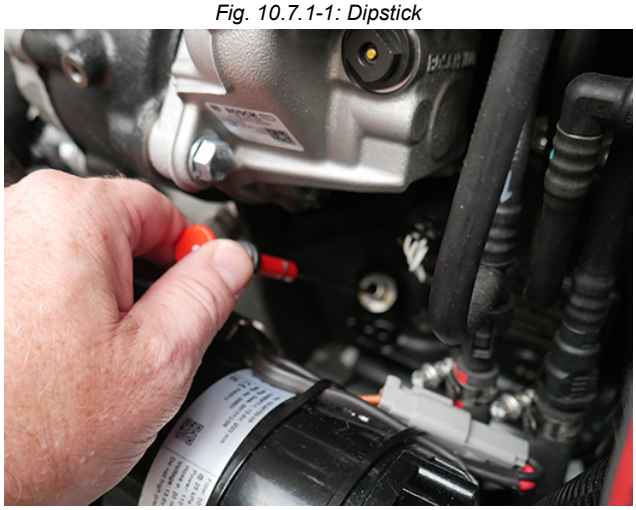
Warning: Risk of being burned!

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

Attention!

1. Secure the generator to prevent it from being started unintentionally (see section 10.4, “Securing the generator to prevent it from being switched on unintentionally,” on page 105).
2. Open the capsule (see section 10.5, “Opening the capsule,” on page 106).
3. Pull out the dipstick
4. Clean the dipstick.
5. Re-insert the dipstick and wait 10 seconds.
6. Pull dipstick out again and measure oil level.

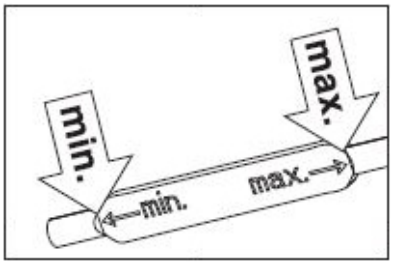
Fig. 10.7.1-1: Dipstick



7. If the oil level is close to the minimum mark, top the engine oil up to the **max.** mark.

   Specification and viscosity, see section 11.2, “Engine oil specification,” on page 141.
8. Re-insert the dipstick

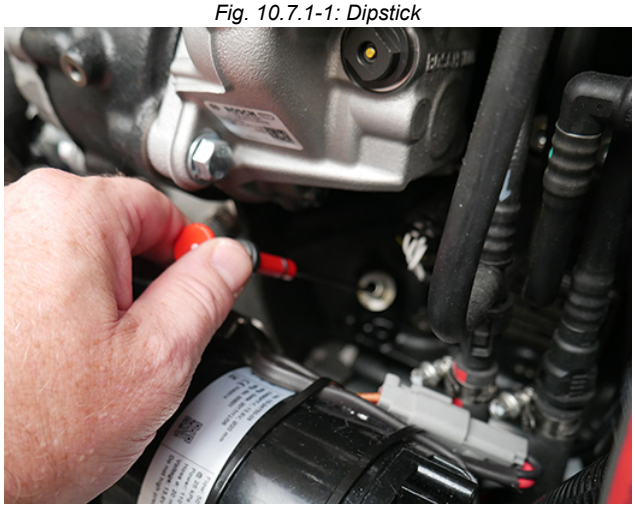
Fig. 10.7.1-2: Dipstick



10.7.1.1 Topping up the oil

1. Check the oil level as described in section 10.7.1, “Checking the oil level,” on page 109.
2. Pull the dipstick out and clean it.

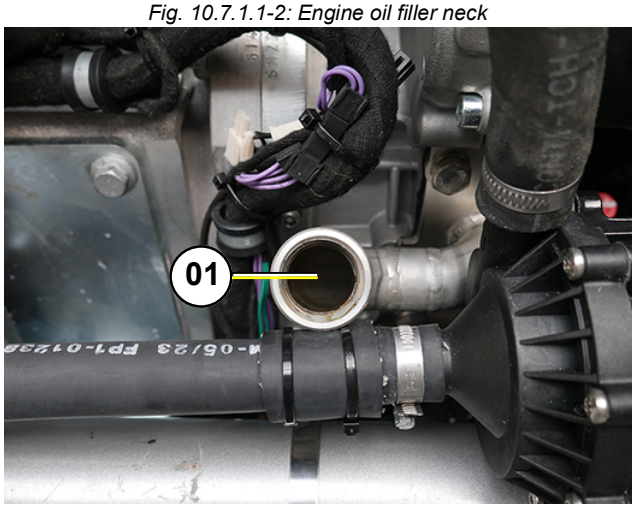
Fig. 10.7.1-1: Dipstick



3. Open the oil filler neck (01).
4. Pour in oil.

   Specification and viscosity, see section 11.2, “Engine oil specification,” on page 141.
   See section 11.1, “Technical data,” on page 141 regarding the volume of oil.
5. Re-insert the dipstick.
6. Pull dipstick out and measure the oil level.
7. If necessary, top oil up to the **max.** mark
8. Re-insert the dipstick.
9. Close the oil filler cap.

Fig. 10.7.1.1-2: Engine oil filler neck



10.7.1.2 After checking the oil and topping up

1. Remove any oil drops and splashes from the generator and surrounding area.
2. Close the generator capsule.
3. Remove the securing device that prevents an unintended start-up of the generator.

10.7.2 Checking the intake area of the combustion air

Average duration of the measure	approx. 20 min
Personnel required	1
Tool required / spare part / material	Absorbent cloth

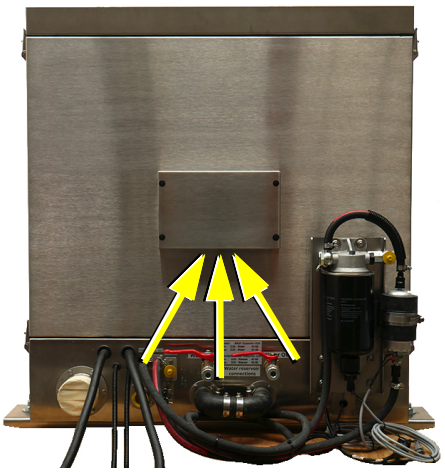
Generator and engine may be hot during and after use. **Warning: Risk of being burned!**

Wear personal protective equipment (gloves, protective goggles, safety clothing and safety shoes). **Attention!**

1. Secure the generator to prevent it from being started unintentionally (see section 10.4, “Securing the generator to prevent it from being switched on unintentionally,” on page 105).

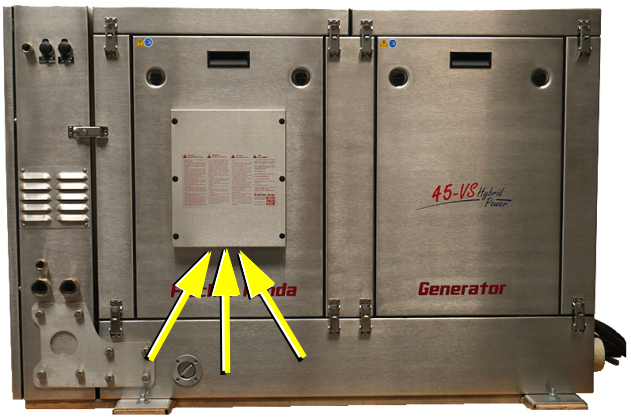
2. Check the air inlet at the rear of the generator and clean if necessary.

Fig. 10.7.2-1: Checking the air inlet



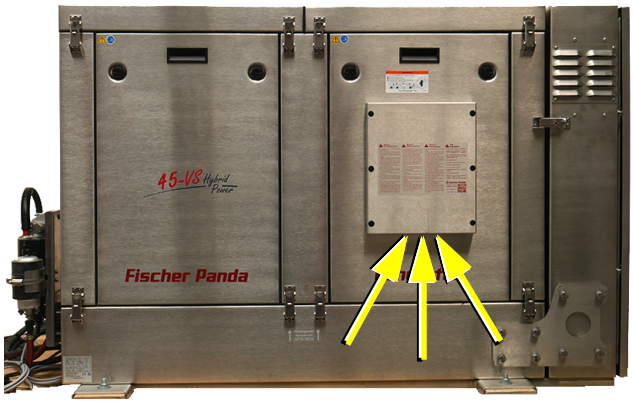
3. Check the air intake on the right-hand side of the generator and clean if necessary.

Fig. 10.7.2-2: Checking the air inlet



4. Check the air intake on the left-hand side of the generator and clean if necessary.

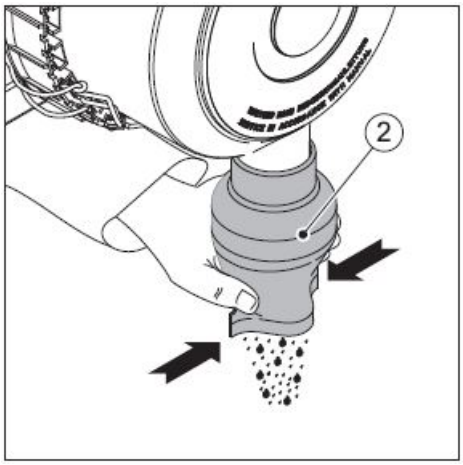
Fig. 10.7.2-3: Checking the air inlet



5. Open the capsule (see section 10.5, “Opening the capsule,” on page 106).

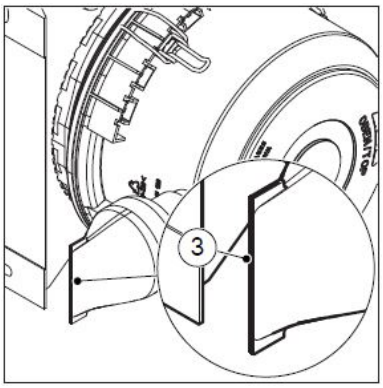
6. Check the dust discharge valve (2) for free airflow. Remove the dust caps by squeezing.

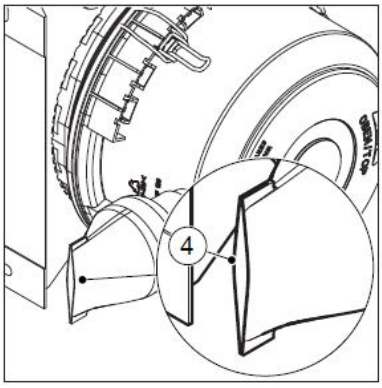
Fig. 10.7.2-4: Dust discharge valve



7. Take care that the rubber lips (3) run parallel to each other. The gap between the rubber lips may be a maximum of 2 mm. Deformed rubber lips (4) affect the function of the pre-separator and thus reduce the maintenance interval of the air filter. If necessary, renew the dust discharge valve.
8. Close the generator capsule.
9. Remove the securing device that prevents an unintended start-up of the generator.

Fig. 10.7.2-5: Dust discharge valve





10.7.3 Checking the cooling system

Average duration of the measure	approx. 20 min
Personnel required	1
Tool required / spare part / material	Screwdriver set / absorbent cloth

Cooling system may be pressurised. **Attention!**

Generator and engine may be hot during and after use. **Warning: Risk of being burned!**

Wear personal protective equipment (gloves, protective goggles, safety clothing and safety shoes). **Attention!**

1. Place the generator on a level surface.
2. Secure the generator to prevent it from being started unintentionally (see section 10.4, “Securing the generator to prevent it from being switched on unintentionally,” on page 105).
3. Open the capsule (see section 10.5, “Opening the capsule,” on page 106).
4. Check all coolant hoses visually while squeezing them by hand.
5. In the case of small leaks, tighten the hose clamps.
6. If a hose is brittle or defective, it must be replaced.
7. Depending on the operation and requirements, replace the hose clamps every 2 - 5 years.
8. Close the generator capsule.
9. Remove the securing device that prevents an unintended start-up of the generator.

10.7.4 Changing the engine oil and oil filter

Average duration of the measure	approx. 20 min
Personnel required	1
Tool required / spare part / material	Set of spanners / filter strap wrench / suitable container to collect the engine oil / oil-proof pad / absorbent cloth / new oil filter / engine oil

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

Attention!

Place the generator on a level surface.

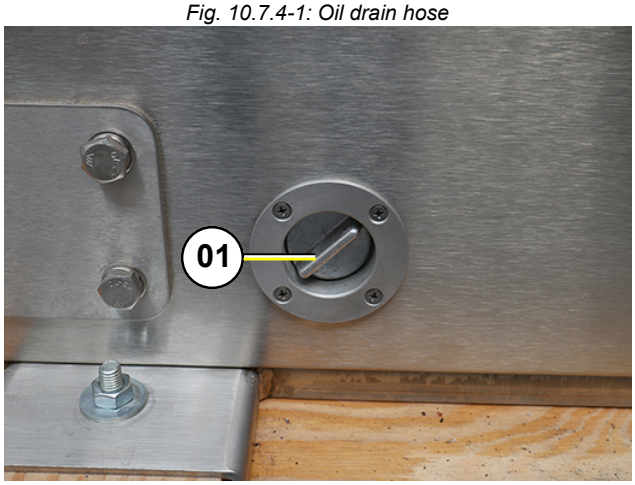
Run the generator for approx. 10 minutes and ensure that the engine warms up. Wait 3 minutes until the oil has flowed back into the oil sump.

Generator and engine may be hot during and after use.

Warning: Risk of being burned!

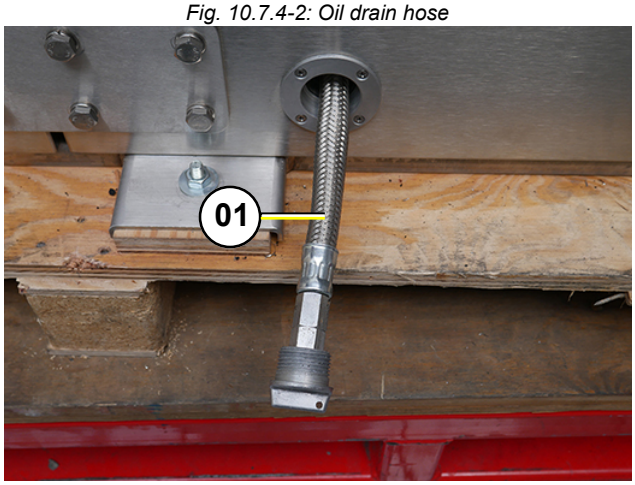
1. Secure the generator to prevent it from being started unintentionally (see section 10.4, “Securing the generator to prevent it from being switched on unintentionally,” on page 105).
2. Open the capsule (see section 10.5, “Opening the capsule,” on page 106).
3. An oil drain hose is installed on the sump to change the oil.
4. Open the capsule feed-through (01).

Fig. 10.7.4-1: Oil drain hose



5. Pull out the oil drain hose (01) and place the end in a suitable container.
6. Place an oil-proof pad beneath the area around the drain hose.

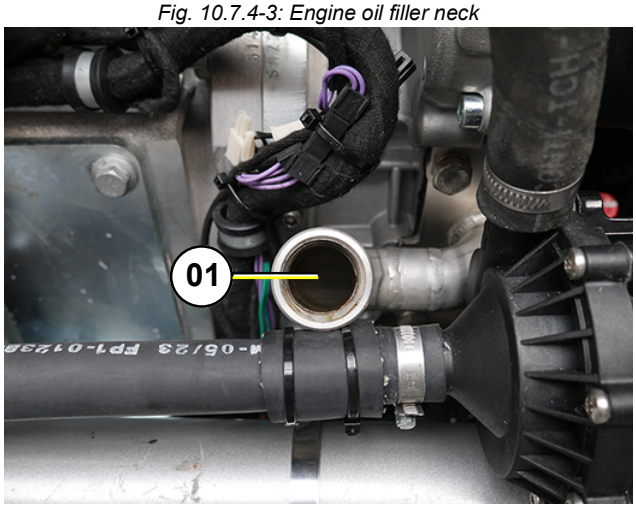
Fig. 10.7.4-2: Oil drain hose



7. Open the oil filler neck (01).

   Unscrew the oil filler cap. This is necessary,
   as otherwise a vacuum develops, thus preventing the oil from
   draining completely.

Fig. 10.7.4-3: Engine oil filler neck



8. The oil can be discharged by opening the oil drain screw. To lock the nut, use a second wrench.

   19 mm spanner.

Fig. 10.7.4-4: Oil drain hose

9. Drain the old oil.

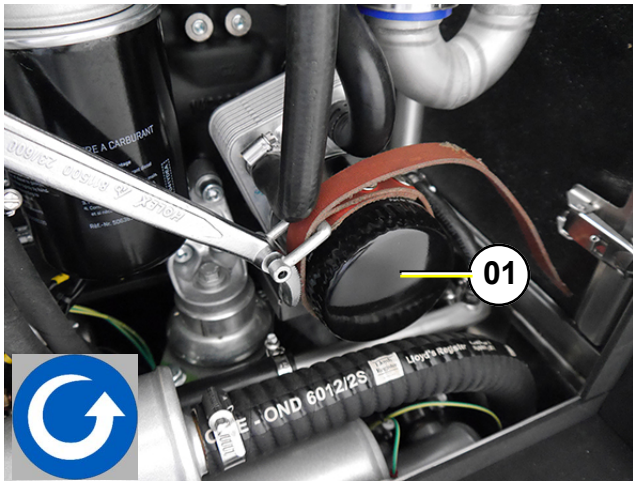
   Allow all the oil to drain out of the engine. This can take some minutes.

10. Close the oil drain plug again.

11. Remove the old oil filter (01) and dispose of it in accordance with local environmental protection regulations.

    Loosen the filter by turning the filter wrench anti-clockwise. The filter may be full of oil. Take care not to spill and avoid contact with the skin.

Fig. 10.7.4-5: Oil filter



12. Clean the sealing surface thoroughly.
13. Lightly oil the sealing lip of the new oil filter.
14. Screw in the oil filter and **tighten by hand**.
15. Topping up the oil, see section 10.7.1.1, “Topping up the oil,” on page 110).
16. Checking the oil level, see section 10.7.1, “Checking the oil level,” on page 109.

10.7.4.1 After the oil change

1. Replace the dipstick in the guide.
2. Close the oil filler cap.
3. Close the oil filler cap.
4. Remove any oil drops and splashes from the generator and surrounding area.
5. Close the generator capsule.
6. Remove the securing device that prevents an unintended start-up of the generator.
7. Dispose of the used oil and filter properly.

Old oil is very toxic and may not be disposed of together with household refuse. It is forbidden to dispose of old oil in the sewage system. Ensure that used oil is disposed of correctly (e.g. The place where the oil was purchased, or a local recycling centre).

Attention!

10.7.5 Exchanging the fuel pre-filter

Average duration of the measure	approx. 20 min
Personnel required	1
Tool required / spare part / material	Filter belt / absorbent cloth / hose clamps / fuel filter element / container that is suitable to collect fuel

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

Attention!

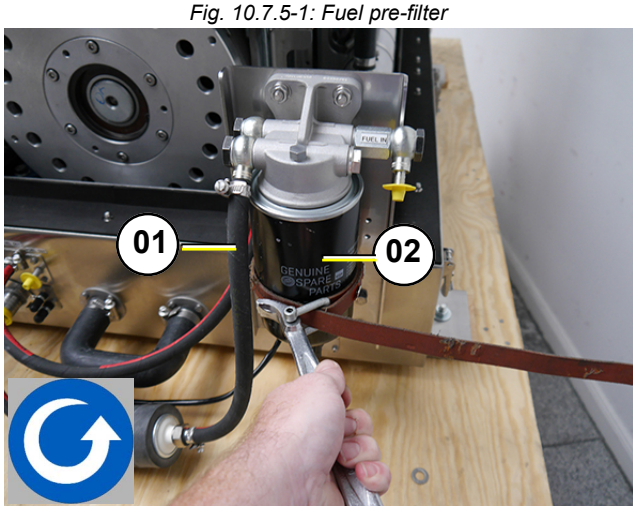
The replacement interval depends on the contamination of the fuel, but the filter must be inspected regularly.

Attention!

1. Secure the generator to prevent it from being started unintentionally (see section 10.4, “Securing the generator to prevent it from being switched on unintentionally,” on page 105).

Figure similar!

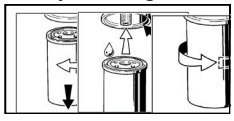
Fig. 10.7.5-1: Fuel pre-filter



2. Interrupt the fuel lines (01) by means of a hose clamp or disconnect the lines.

3. Place a suitable container beneath the filter to collect escaping fuel.
4. Disconnect the cable of the water level sensor on the drain plug.
5. Loosen the drain plug and drain the fuel.
6. Unscrew the fuel pre-filter (02) anti-clockwise by means of a filter belt wrench.

7. Unscrew the drain plug with integrated water level sensor completely.
8. Dispose of the used fuel pre-filter in accordance with the local environmental protection regulations.
9. Clean the drain plug with integrated water level sensor and lightly oil the sealing surface. Thread the drain plug into the new fuel pre-filter.
10. Lightly oil the new fuel pre-filter, install the filter dry and tighten **by hand**.



11. Release the fuel feed line once again and plug the cable of the water level sensor back on.
12. Remove the securing device that prevents an unintended start-up of the generator.
13. Start the engine and conduct a test run.
14. Bleeding the fuel system, see section 10.7.16, “De-aerating (bleeding) the fuel system.,” on page 135.
15. After the test run, check the fuel pre-filter and drain plug for leaks and tighten by hand if necessary.

10.7.6 Exchanging the main fuel filter

Average duration of the measure	approx. 20 min
Personnel required	1
Tool required / spare part / material	Filter belt / absorbent cloth / hose clamps / fuel filter element / container that is suitable to collect fuel

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

Attention!

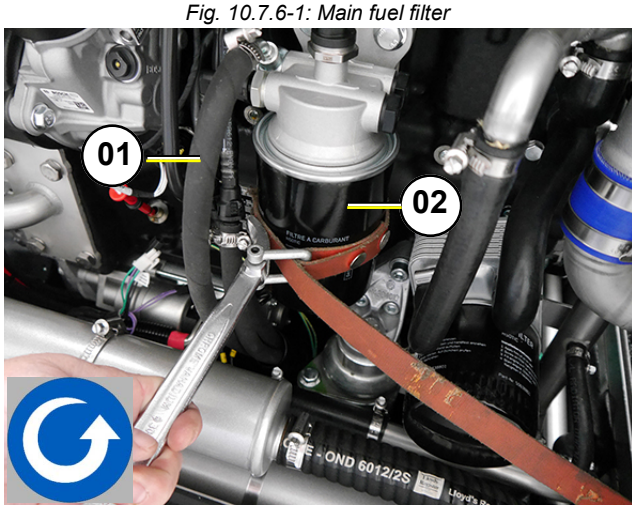
The replacement interval depends on the contamination of the fuel, but the filter must be inspected regularly.

Attention!

1. Secure the generator to prevent it from being started unintentionally (see section 10.4, “Securing the generator to prevent it from being switched on unintentionally,” on page 105).
2. Open the capsule (see section 10.5, “Opening the capsule,” on page 106).

Figure similar!

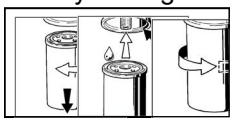
Fig. 10.7.6-1: Main fuel filter



3. Interrupt the fuel lines (01) by means of a hose clamp or disconnect the lines.

4. Place a suitable container beneath the filter to collect escaping fuel.
5. Unscrew the fuel pre-filter (02) anti-clockwise by means of a filter belt wrench.

6. Dispose of the used main fuel filter in accordance with the local environmental protection regulations.
7. Lightly oil the new main fuel filter, install the filter dry and tighten **by hand**.



8. Release the fuel feed line once again.
9. Remove the securing device that prevents an unintended start-up of the generator.
10. Start the engine and conduct a test run.
11. Bleeding the fuel system, see section 10.7.16, “De-aerating (bleeding) the fuel system.,” on page 135.
12. After the test run, check the fuel pre-filter and drain plug for leaks and tighten by hand if necessary.
13. Close the generator capsule.

10.7.7 Checking the poly V-belt

Average duration of the measure	approx. 20 min
Personnel required	1
Tool required / spare part / material	-

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

Attention!

Generator and engine may be hot during and after use.

Warning: Risk of being burned!

1. Place the generator on a level surface.
2. Secure the generator to prevent it from being started unintentionally (see section 10.4, “Securing the generator to prevent it from being switched on unintentionally,” on page 105).
3. Open the capsule (see section 10.5, “Opening the capsule,” on page 106).

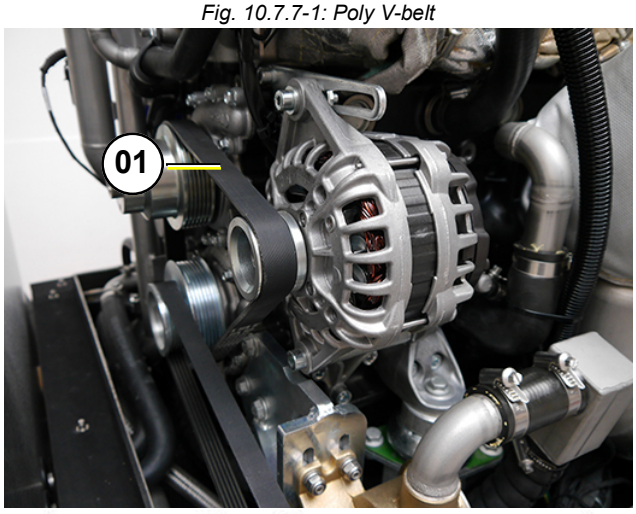
Due to the relatively high ambient temperature (approx. 85 °C) inside the closed sound insulation capsule, a reduction in the useful life of the V-belt is to be expected. It is possible that the plasticisers in the rubber compounds may partially lose their effectiveness even after a brief period of operation because the air in the sound insulated capsule can be relatively warm and dry.

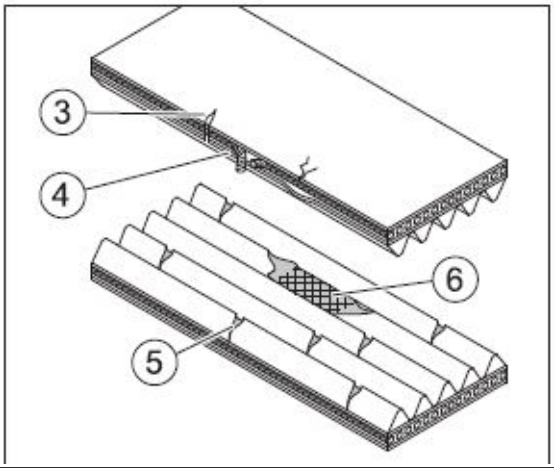
The V-belt must therefore be checked at very short time intervals.

4. Check the poly V-belt (01) for the following damage:
   - Transverse cracks (3) on the back of the belt.
   - Lateral fraying (4)
   - Accumulation of dirt between the ribs.
   - Oily contamination.
   - Transverse cracks in multiple ribs (6).
   - Cracked ribs (6).

   If one or many types of damage are present, renew the poly V-belts immediately, see section 10.7.14, “Exchanging the poly V-belt,” on page 133.
5. Close the generator capsule.
6. Remove the securing device that prevents an unintended start-up of the generator.

Fig. 10.7.7-1: Poly V-belt





10.7.8 Exchanging the oil separator of the crankcase vent

Average duration of the measure	approx. 20 min
Personnel required	1
Tool required / spare part / material	Set of Allen keys / oil separator / absorbent cloth

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

Attention!

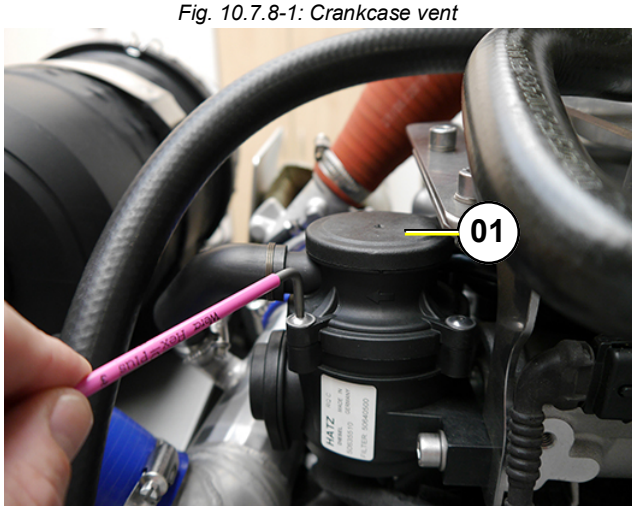
Generator and engine may be hot during and after use.

Warning: Risk of being burned!

1. Place the generator on a level surface.
2. Secure the generator to prevent it from being started unintentionally (see section 10.4, “Securing the generator to prevent it from being switched on unintentionally,” on page 105).
3. Open the capsule (see section 10.5, “Opening the capsule,” on page 106).
4. Loosen the four fastening screws of the vent cover (01).

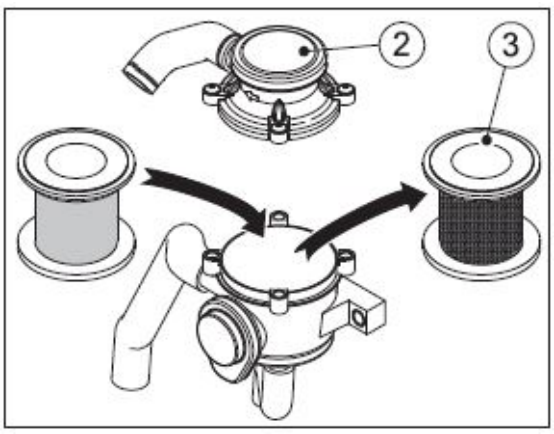
5. Lift the vent cover carefully.

Fig. 10.7.8-1: Crankcase vent



6. Remove the used oil separator cartridge (3) and dispose of it in accordance with local environmental protection regulations.
7. Wipe the interior of the breather housing with a clean cloth. Take care that no contamination enters the breather housing when doing so.
8. Insert a new oil separator cartridge.
9. Fit the vent cover (2) and tighten the four fastening screws (max. 4 Nm). If necessary, reconnect the venting hose.
10. Close the generator capsule.
11. Remove the securing device that prevents an unintended start-up of the generator.

Fig. 10.7.8-2: Crankcase vent



10.7.9 Checking the threaded connections

Average duration of the measure	approx. 20 min
Personnel required	1
Tool required / spare part / material	Set of spanners

Re-tighten only those threaded connections that are loose. Threaded connection can be secured with thread lock adhesive or be tightened to a defined torque value. Further tightening of tight threaded connections may lead to damage.

Note!

Thread lock varnish has been applied to the adjusting screws of the injection system and they may not be tightened or adjusted.

Do not tighten the cylinder head bolts!

1. Place the generator on a level surface.
2. Secure the generator to prevent it from being started unintentionally (see section 10.4, “Securing the generator to prevent it from being switched on unintentionally,” on page 105).
3. Open the capsule (see section 10.5, “Opening the capsule,” on page 106).
4. Check the condition of all threaded connections and whether they are seated securely (exceptions, see note).
5. Re-tighten loose threaded conditions.
6. Close the generator capsule.
7. Remove the securing device that prevents an unintended start-up of the generator.

10.7.10 Checking/exchanging the fuses

Average duration of the measure	approx. 10 min, each
Personnel required	1
Tool required / spare part / material	Screwdriver set / blade-type fuses, see Circuit Diagram

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

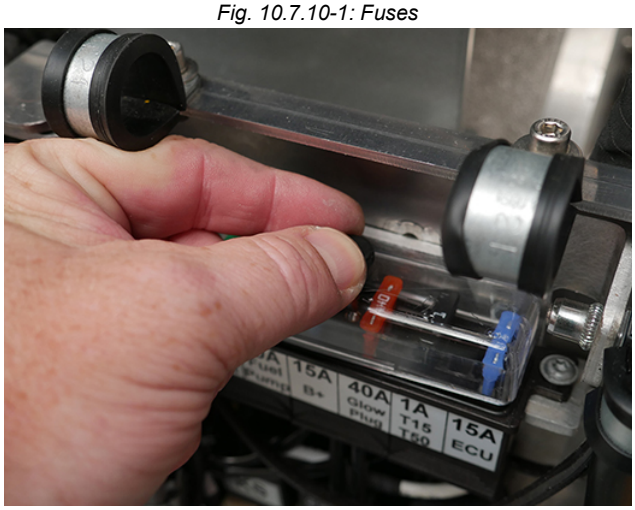
Attention!

Generator and engine may be hot during and after use.

Warning: Risk of being burned!

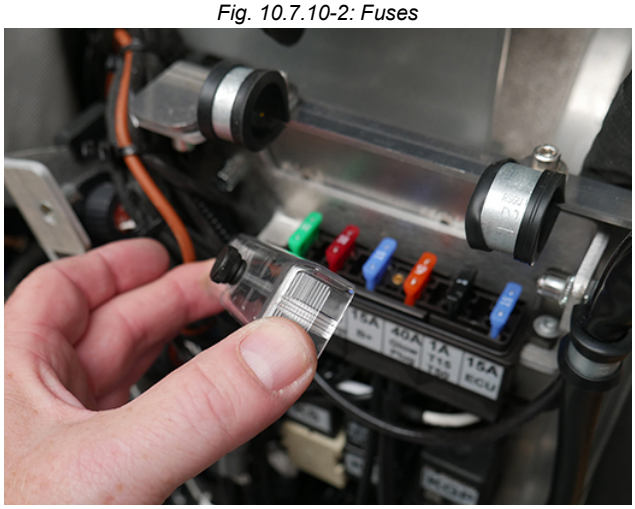
1. Place the generator on a level surface.
2. Secure the generator to prevent it from being started unintentionally (see section 10.4, “Securing the generator to prevent it from being switched on unintentionally,” on page 105).
3. Open the capsule (see section 10.5, “Opening the capsule,” on page 106).
4. Loosen the retaining screw of the plastic cover by hand.

Fig. 10.7.10-1: Fuses



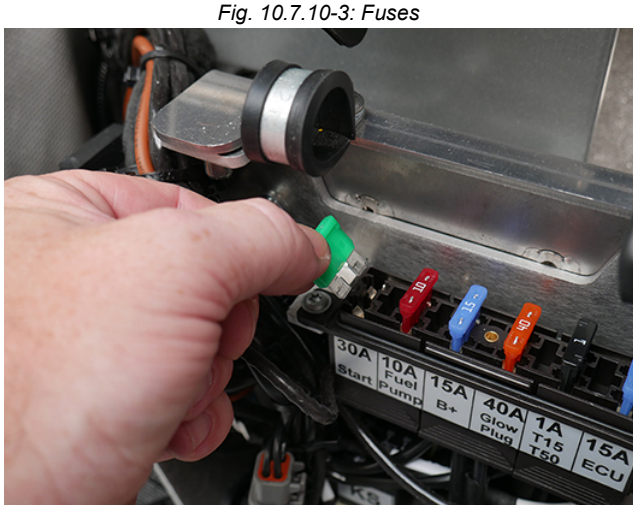
5. Remove the plastic cover.

Fig. 10.7.10-2: Fuses



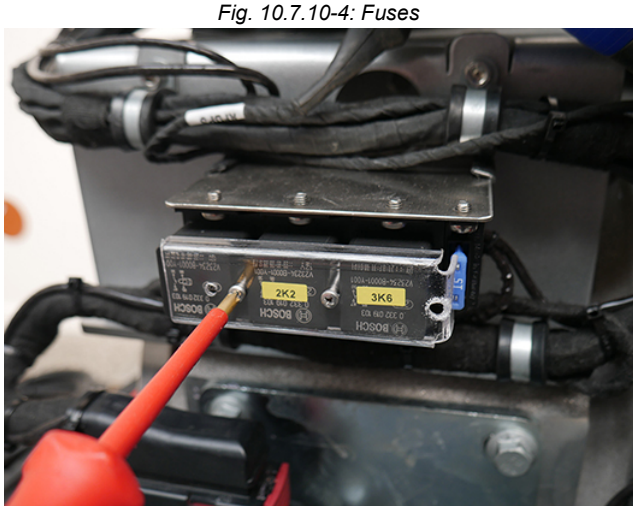
6. Pull the fuse out of the socket and check. If defective, renew the fuse.

Fig. 10.7.10-3: Fuses



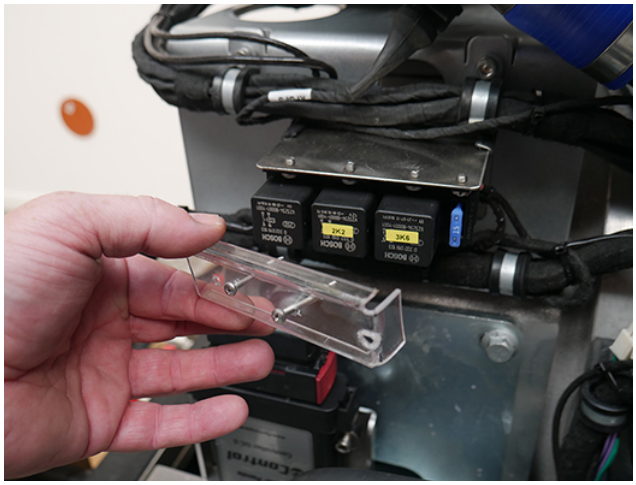
7. Loosen the retaining screw of the plastic cover by means of a Phillips screwdriver.

Fig. 10.7.10-4: Fuses



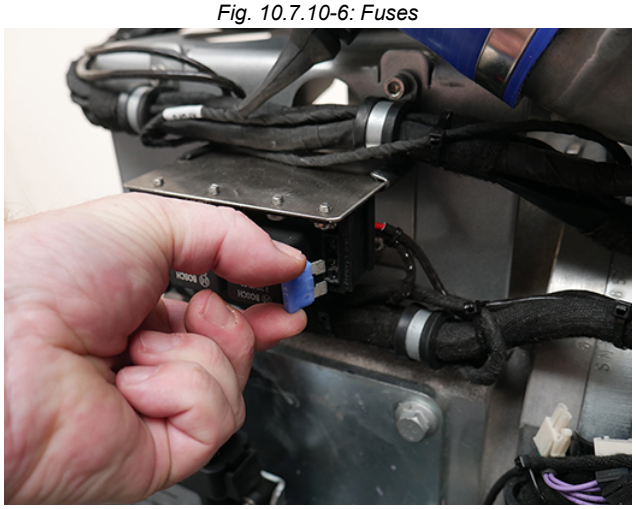
8. Remove the plastic cover.

Fig. 10.7.10-5: Fuses



9. Sicherung aus dem Sockel herausziehen und überprüfen.
10. Reassemble in reverse order.
11. Close the generator capsule.
12. Remove the securing device that prevents an unintended start-up of the generator.

Fig. 10.7.10-6: Fuses



10.7.11 Checking/exchanging the relays

Average duration of the measure	approx. 10 min, each
Personnel required	1
Tool required / spare part / material	Screwdriver set / relay, see Circuit Diagram

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

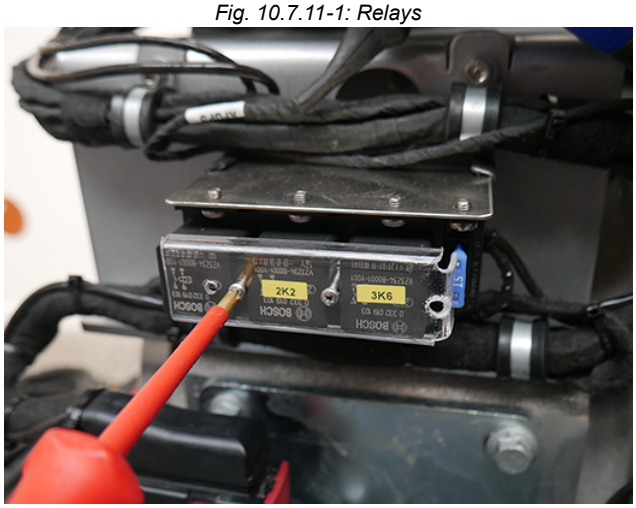
Attention!

Generator and engine may be hot during and after use.

Warning: Risk of being burned!

1. Place the generator on a level surface.
2. Secure the generator to prevent it from being started up unintentionally (see section 10.4, “Securing the generator to prevent it from being switched on unintentionally,” on page 105).
3. Open the capsule (see section 10.5, “Opening the capsule,” on page 106).
4. Loosen the retaining screw of the plastic cover by means of a Phillips screwdriver.

Fig. 10.7.11-1: Relays



5. Remove the plastic cover.

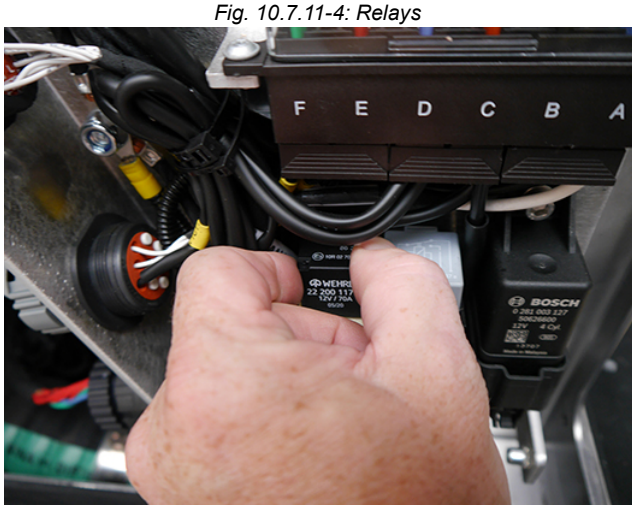
Fig. 10.7.11-2: Relays

6. Pull the ignition and starter realy out of the socket and check. If defective, replace the relay.
7. Reassemble in reverse order.

Fig. 10.7.11-3: Relays

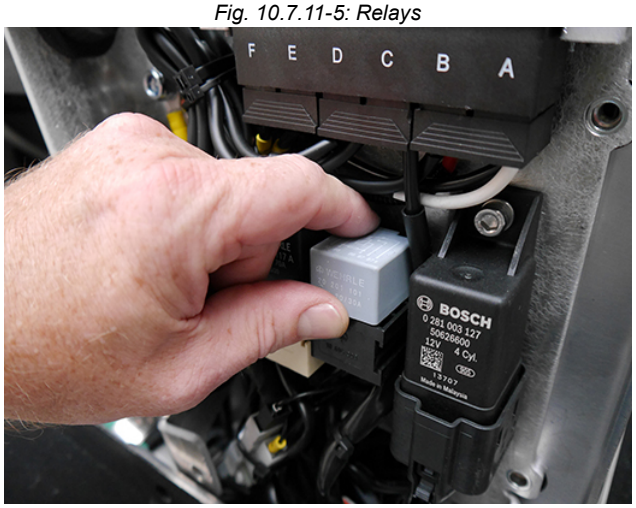
8. Pull the starter relay out of the socket and check. If defective, replace the relay.

Fig. 10.7.11-4: Relays



9. Pull the fuel pump relay out of the socket and check. If defective, replace the relay.

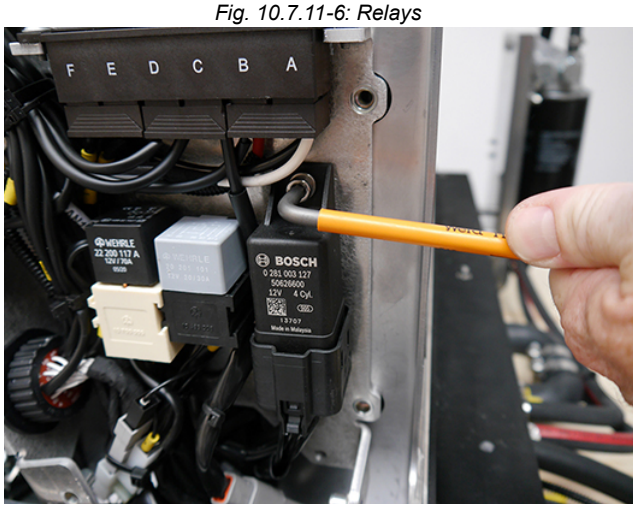
Fig. 10.7.11-5: Relays



10. Loosen the retaining screw by means of a 5 mm Allen key.

11. Pull the glowplug relay out of the socket and check. If defective, replace the relay.
12. Close the generator capsule.
13. Remove the securing device that prevents an unintended start-up of the generator.

Fig. 10.7.11-6: Relays



10.7.12 Exchanging the air filter cartridge

Average duration of the measure	approx. 20 min
Personnel required	1
Tool required / spare part / material	Absorbent cloth / air filter element / compressed air / lamp

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

Attention!

Generator and engine may be hot during and after use.

Warning: Risk of being burned!

1. Place the generator on a level surface.
2. Secure the generator to prevent it from being started up unintentionally (see section 10.4, “Securing the generator to prevent it from being switched on unintentionally,” on page 105).
3. Open the capsule (see section 10.5, “Opening the capsule,” on page 106).

In the case of oily or damp contamination, exchange the filter elements as cleaning is not possible.

Note!

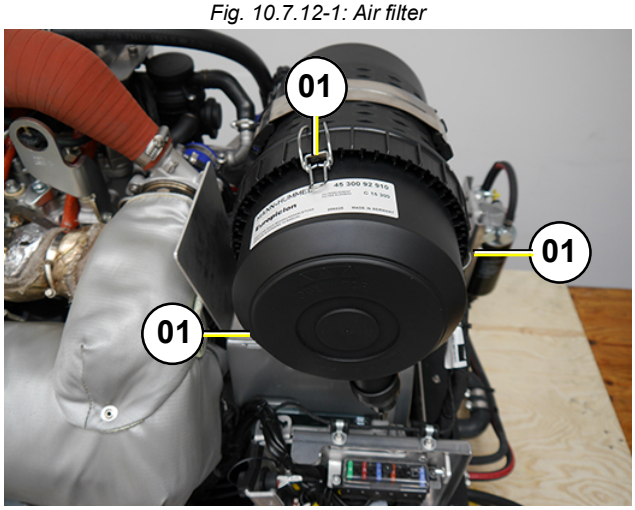
The slightest damage in the areas of the sealing surfaces, filter paper and filter cartridge precludes re-use.

The filter cartridge may not be flushed or tapped.

The filter cartridge may only be blown clean in exceptional cases. The pressure may not exceed 5 bar.

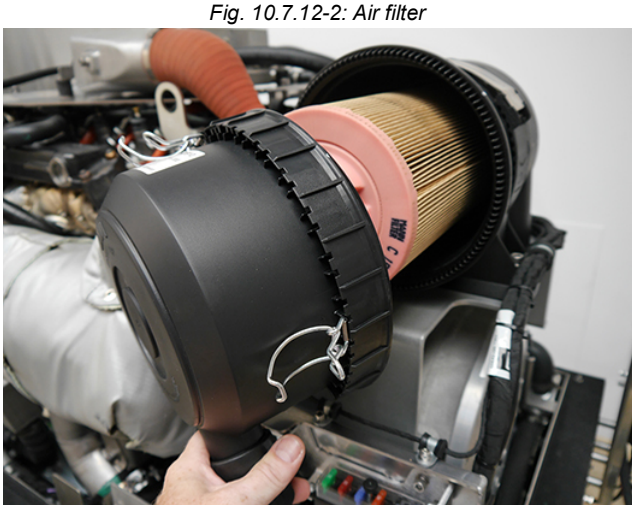
4. Open the retaining clips (01).

Fig. 10.7.12-1: Air filter



5. Remove the air filter cover.

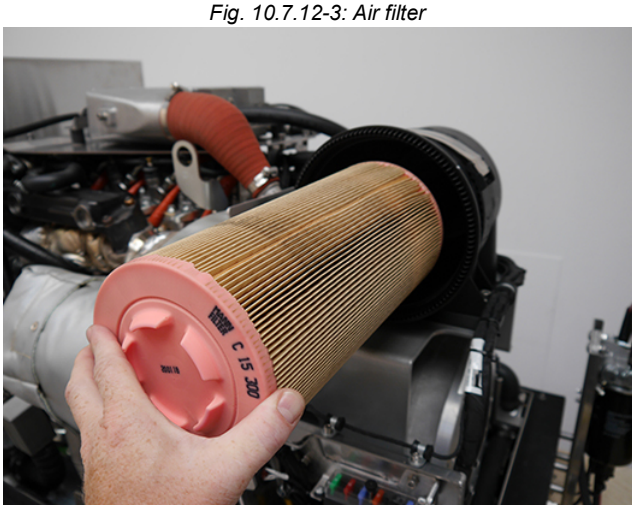
Fig. 10.7.12-2: Air filter



6. Pull out the primary filter and either exchange (recommended) or clean (see below).

   Exchange or clean the primary filter in accordance with the maintenance indicator. The primary filter must however be exchanged every two years at the latest, after this length of time cleaning is no longer possible.
7. Remove contamination adhering to the interior of the air filter housing (1), air filter cover (3) and the dust discharge valve (4).
8. Insert the new filter element carefully.

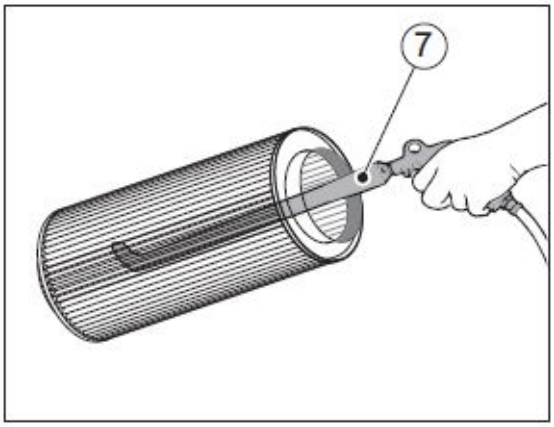
Fig. 10.7.12-3: Air filter



Cleaning the primary filter

9. Blow the interior of the primary filter clean from the inside outwards by means of dry compressed air until no further dust escapes. Use a compressed air pistol with an extension tube (7) with its end bent through approx. 90°. The end of the extension tube is not permitted to touch the filter paper

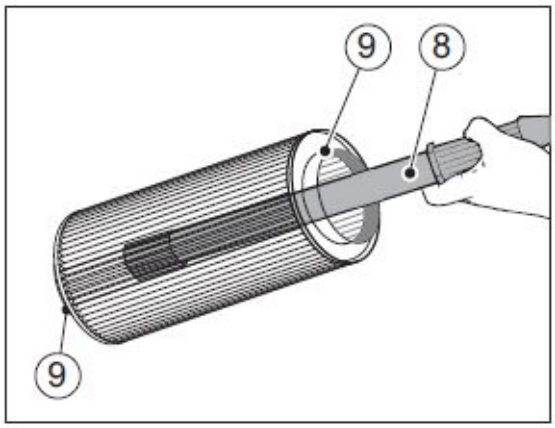
Fig. 10.7.12-4: Air filter



10. Check the sealing surfaces (9) of the filter cartridge for damage.
11. Inspect the primary filter for cracks or other damage to the filter paper by tilting it against the light or illuminating it with a lamp (8). In the event of doubt, always exchange the primary filter.

Note: The primary filter may only be cleaned once and must then be exchanged.

Fig. 10.7.12-5: Air filter



12. Fit the air filter cover to the air filter housing and lock all retaining clips. Take care that the dust discharge valve points vertically downwards when doing so.
13. Close the generator capsule.
14. Remove the securing device that prevents an unintended start-up of the generator.

10.7.13 Draining the water separator

Average duration of the measure	approx. 20 min
Personnel required	1
Tool required / spare part / material	Set of spanners / hose clamps / absorbent cloth / suitable container to collect fuel

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

Attention!

Generator and engine may be hot during and after use.

Warning: Risk of being burned!

The fuel pre-filter is fitted with an integrated water separator. An electronic water level sensor reports when the maximum permissible water level in the water separator has been reached.

When water is drained from the water separator, a small volume of fuel is also drained.

Attention!

Collect the water/fuel mixture that escapes and dispose of it in accordance with the local environmental protection regulations.

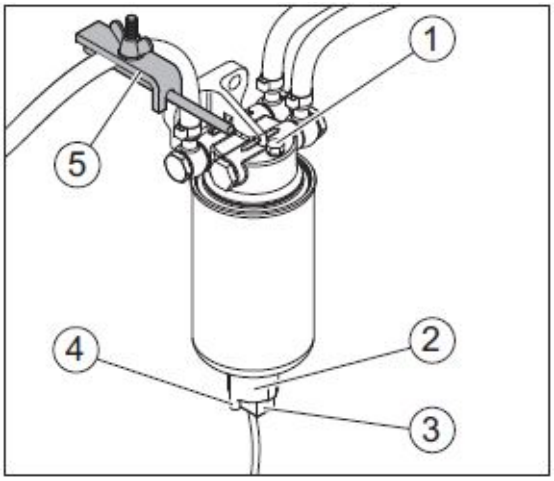
1. Place the generator on a level surface.
2. Secure the generator to prevent it from being started up unintentionally (see section 10.4, “Securing the generator to prevent it from being switched on unintentionally,” on page 105).
3. Interrupt the fuel lines by means of a hose clamp or disconnect the lines.

4. Place a suitable container beneath the drainage nozzle (4) of the drain plug (2).

Note: If access is unfavourable, an extension hose can be fitted to the drainage nozzle on the drain plug.

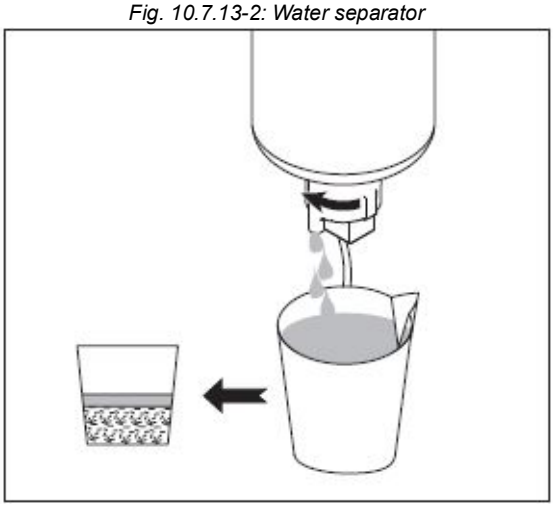
5. Open the drain plug (2) and drain the water into the container.

Fig. 10.7.13-1: Water separator



6. If insufficient liquid drains, loosen the de-aerating screw (1) in addition.

Fig. 10.7.13-2: Water separator



Note: If the fuel tank is lower than the fuel pre-filter, the fuel feed line must be clamped by means of a hose clamp (5). Otherwise, fuel flows back into the tank after the drain plug has been opened.

7. As soon as fuel escapes, close the drain plug (2) and the de-aerating screw (1).

Note: First water and then fuel escapes. This can be recognised as a clear dividing line.

8. If necessary, release the fuel feed line. Dispose of the water/fuel mixture in accordance with the local environmental protection regulations.
9. Remove the securing device that prevents an unintended start-up of the generator.

10.7.14 Exchanging the poly V-belt

Average duration of the measure	approx. 20 min
Personnel required	1
Tool required / spare part / material	Set of Allen keys / Poly V-belt / "Facom DM.16" belt tension meter

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

Attention!

Generator and engine may be hot during and after use.

Warning: Risk of being burned!

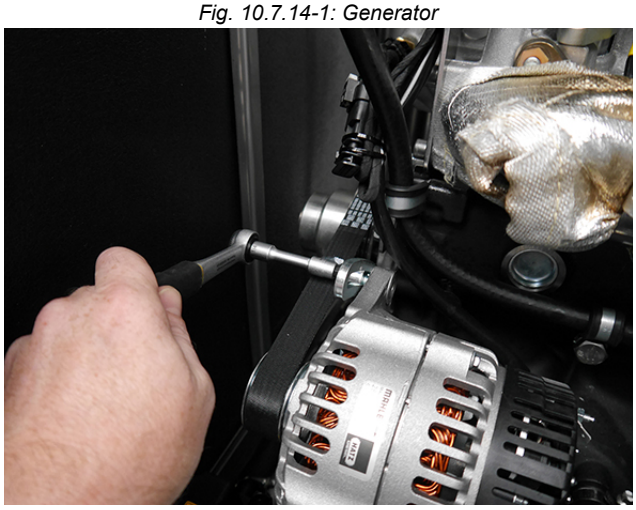
1. Place the generator on a level surface.
2. Secure the generator to prevent it from being started up unintentionally (see section 10.4, “Securing the generator to prevent it from being switched on unintentionally,” on page 105).
3. Open the capsule (see section 10.5, “Opening the capsule,” on page 106).

Similar to illustration!

4. Loosen the fastening screw at the top of the generator.

   6 mm Allen key

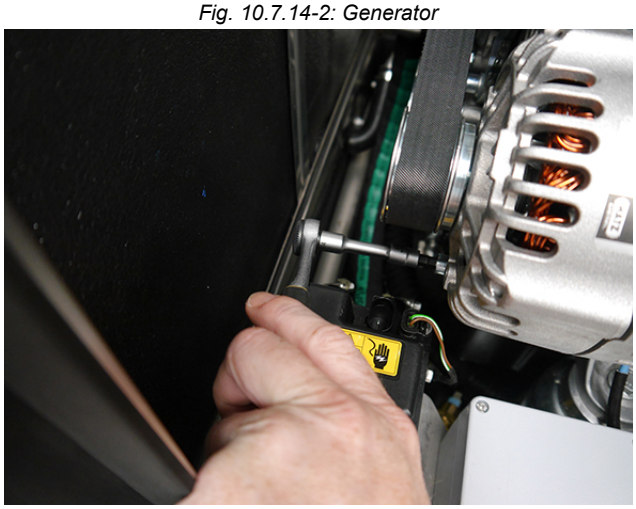
Fig. 10.7.14-1: Generator



5. Loosen the fastening screw at the bottom of the generator.

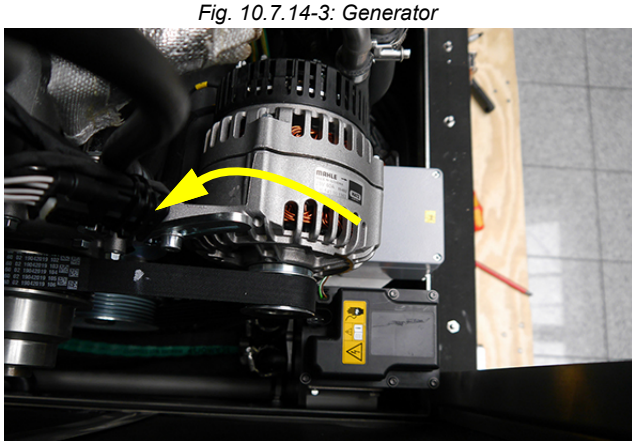
   6 mm Allen key

Fig. 10.7.14-2: Generator



6. Push the generator towards the thermostat housing.
7. Exchanging the Poly V-belt.
8. Check that the belt pulleys are in a flawless condition. If the grooves are flared or damaged, always renew the pulley.
9. Fit the poly V-belts over the pulleys and tension, see section 10.7.14.1, “Checking the belt tension,” on page 134.
10. Close the generator capsule.
11. Remove the securing device that prevents an unintended start-up of the generator.

Fig. 10.7.14-3: Generator

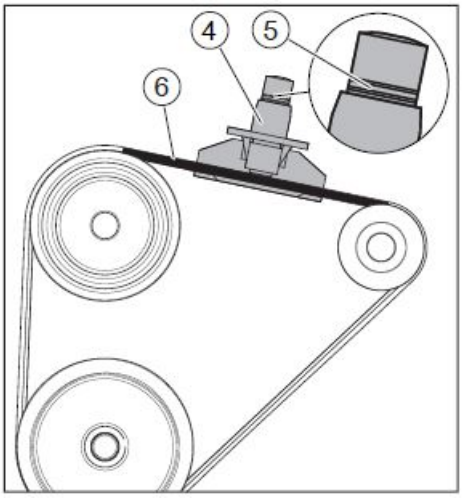


10.7.14.1 Checking the belt tension

Checking the belt tension

1. Check the belt tension at the measuring point (6), in accordance with the manufacturer of the measuring device ("Facom DM.16" belt tension meter) and compare with the *Belt tension settings*. If necessary, adjust the belt tension.

Fig. 10.7.14.1-1: Belt tension

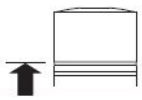
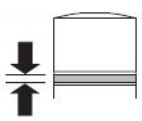
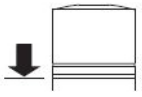


Setting the belt tension

1. Loosen the fastening screws, see Items 4 and 5 section 10.7.14, “Exchanging the poly V-belt,” on page 133.
2. Push the generator towards the thermostat housing, hold it and simultaneously re-tighten the fastening screws.
3. Check belt tension again.
4. If necessary, correct the belt tension.

Belt tension settings

The decisive factor when adjusting the belt tension is the preload or the vibration frequency of the belt. We recommend that a DM16 belt tension meter by Facom or a frequency meter be used for this purpose. If neither of these measuring devices is available, kindly contact your nearest **HATZ-Service station**.

	Belt tension	
	Display (5) on the "Facom” belt tension meter	Vibration frequency (frequency meter)
New belt		210 Hz (+ 10 Hz)
Belt after maintenance interval		150 Hz (+ 10 Hz)
Minimum tension		125 Hz

10.7.15 Checking the condition of the starter battery

The specifications of the battery manufacturer must be complied with!

10.7.16 De-aerating (bleeding) the fuel system.

Average duration of the measure	approx. 10 min
Personnel required	1
Tool required / spare part / material	-

Normally, the fuel system is designed to bleed 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 automatically after a certain amount of time. It is nevertheless essential to bleed the system as follows prior to the first operation (as all hoses are empty):

In the case of generators with iControl2/xControl/ fpControl control systems, the fuel pump can be switched on by means of a function of the control system. See also the iControl2/xControl/fpControl manual.

Attention!

Bleeding the fuel system at commissioning or after a filter change.

- Activate the fuel pump in the Option menu of the panel.
- Let the pump run for approx. 5 minutes.
- De-activate the fuel pump in the Option menu of the panel.

If air is detected in the fuel system, the engine runs in Fault mode at reduced power and speed After stopping and restarting, the engine runs in Normal mode.

Note!

10.7.17 Maintaining the raw water circuit

10.7.17.1 Cleaning the raw water filter

Average duration of the measure	approx. 20 min
Personnel required	1
Tool required / spare part / material	Absorbent cloth

Residue should be removed from the raw water filter regularly. It is imperative that the sea cock beforehand. It often suffices to merely hit the filter punnet.

If water should seep through the cover of the raw water filter, this may never be sealed with adhesive or sealant. The cause of the leakage must be determined. In the simplest case, only the sealing ring between the cap and filter holder must be exchanged.

Illustrative example

Fig. 10.7.17.1-1: Raw water filter

10.7.17.2 Raw water pump and impeller

1. Improper operating conditions

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

2. Long cooling water intake path

If the cooling water suction path is relatively long or is blocked, this has a negative effect on the useful life of the impeller, so that an under-pressure occurs in the cooling water suction area. Firstly, this can reduce the output of the cooling water pump and lead to significant strain being placed on the blades of the impeller. This can greatly reduce the life expectancy.

3. Operating in contaminated water

Furthermore, operation in water with a high concentration of suspended matter places a great strain on the impeller pump. The use of the impeller in coral waters is also critical. Cases have been recorded of the impeller pump being so worn after 100 hours of use that the lip seal was ground away by the shaft. In these cases, sharp parts of coral crystal settle in the rubber seal and act as a grinding material on the stainless steel shaft of the impeller pump.

4. Generator is installed above the waterline

Furthermore, it is especially disadvantageous for the impeller pump if the generator is mounted above the water level. This means that it is unavoidable for a few seconds to pass after the first start before the impeller can suck in cooling water. This short dry running period damages the impeller. The increased wear can also lead to a breakdown after a short time.

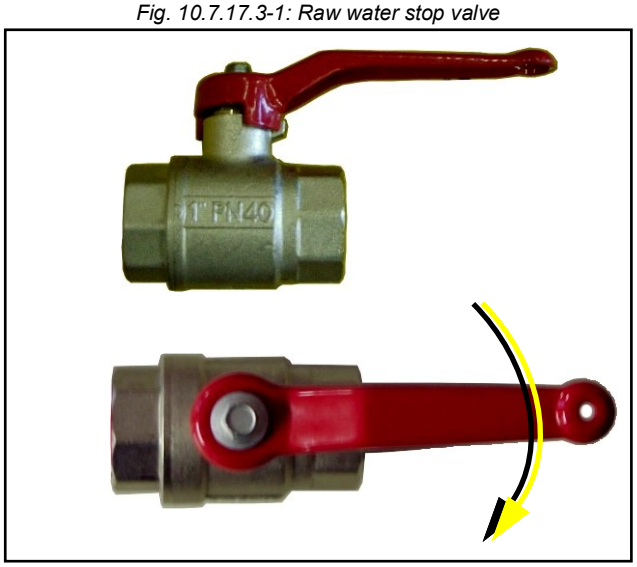
10.7.17.3 Exchanging the impeller

Average duration of the measure	approx. 20 min
Personnel required	1
Tool required / spare part / material	Absorbent cloth

1. Close the raw water stop valve.

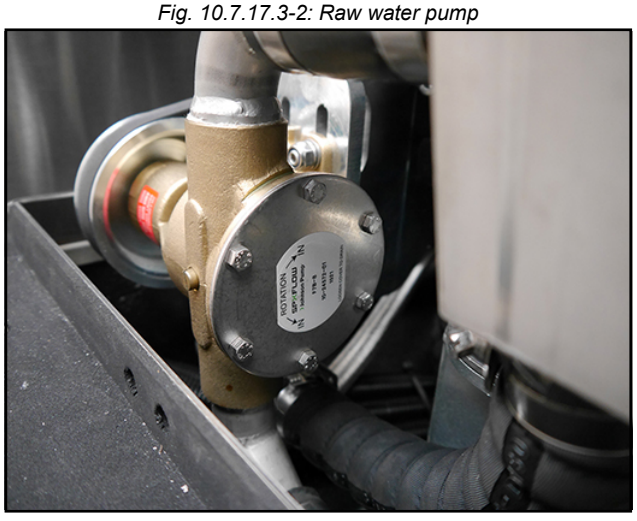
Illustrative example

Fig. 10.7.17.3-1: Raw water stop valve



2. Raw water pump

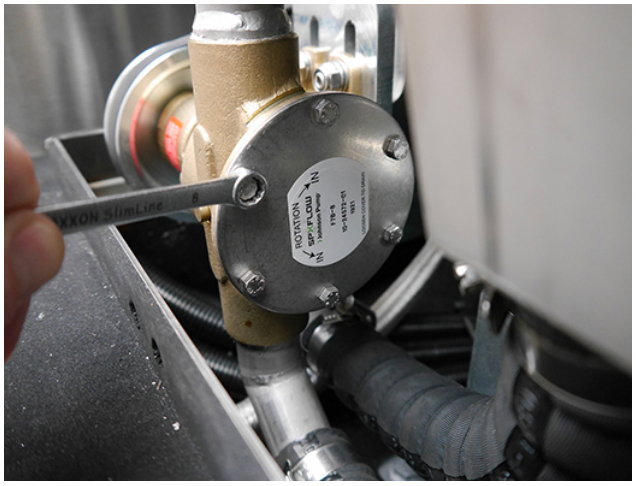
Fig. 10.7.17.3-2: Raw water pump



3. Remove the cover of the raw water pump by loosening the screws on the housing.

   8 mm spanner.

Fig. 10.7.17.3-3: Raw water pump housing

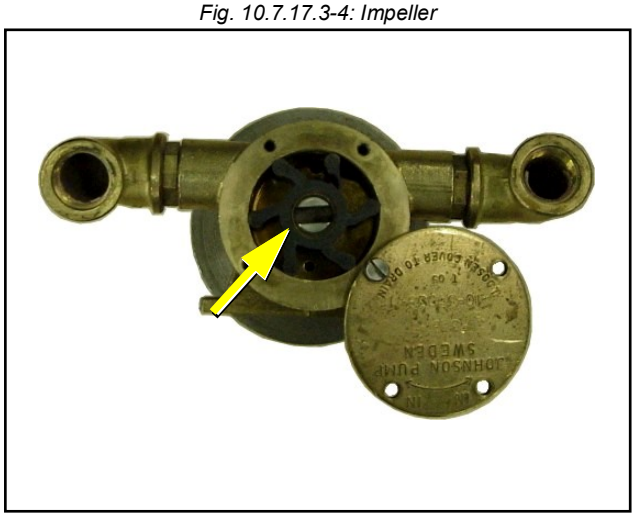


4. Pull the impeller from the shaft by means of water pump pliers..

   Mark the impeller to ensure that it is inserted in the correct position when possibly re-installed.

Illustrative example

Fig. 10.7.17.3-4: Impeller



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

   The impeller should be lubricated with glycerine or a non-mineral oil-based lubricant e.g. glycerine, before being re-inserted in the housing.

Illustrative example

Fig. 10.7.17.3-5: Impeller

6. The impeller is fitted to the pump shaft (if the impeller continues to be used, take note of the previously applied mark).

   Fasten the cover and use a new seal.

Illustrative example

Fig. 10.7.17.3-6: Pump shaft cover

10.7.18 Filling the fresh water system

Average duration of the measure	approx. 20 min
Personnel required	1
Tool required / spare part / material	Spanner set / absorbent cloth / coolant

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

Attention!

Generator and engine may be hot during and after use.

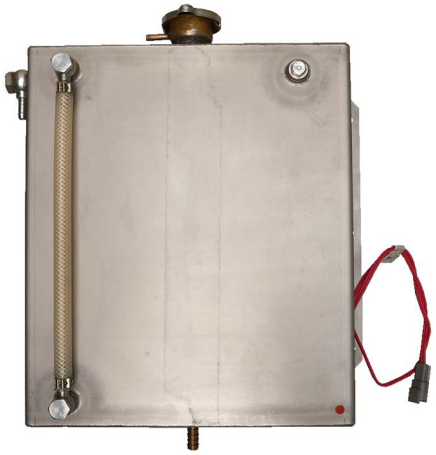
Warning: Risk of being burned!

This procedure must be repeated multiple times to ensure that any air bubbles that may remain in the system are finally removed.

Note!

1. Place the generator on a level surface.
2. Open the capsule (see section 10.5, “Opening the capsule,” on page 106).
3. Fill the expansion tank with coolant.

Fig. 10.7.18-1: External expansion tank



4. Open the de-aerating screw on the engine.

   10 mm spanner.

5. If bubble-free coolant can be seen escaping from the de-aerating screw, close the de-aerating screw again.

   In order to prevent escaping coolant from running into the capsule, an absorbent cloth should be placed beneath the connection to soak it up.

Fig. 10.7.18-2: De-aerating (air bleed) screw

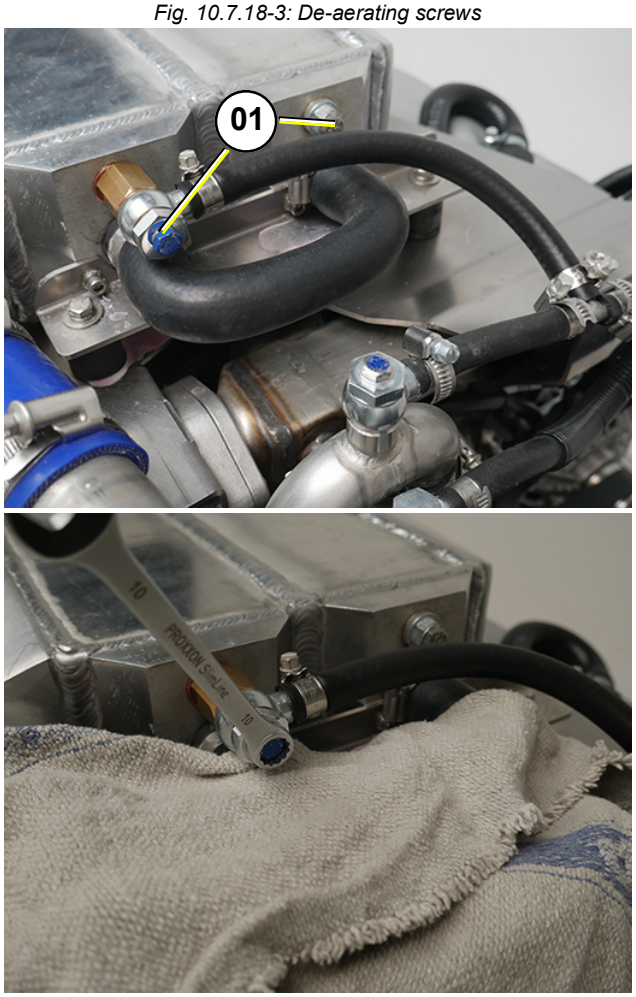
6. Open the two de-aerating screws (01) on the intercooler.

   10 mm spanner.

7. If bubble-free coolant can be seen escaping from the de-aerating screw, close the de-aerating screw again.

   In order to prevent escaping coolant from running into the capsule, an absorbent cloth should be placed beneath the connection to soak it up.
8. If necessary, top up coolant in the expansion tank.
9. Close the generator capsule.
10. Allow the generator to run for about half an hour and top up the coolant in the expansion tank if necessary.

Fig. 10.7.18-3: De-aerating screws



11. Annex

11.1 Technical data

11.1.1 Technical Data for Engine

See the Hatz engine operating manual.

Required cooling water volume (raw water) 100 l/min.

11.1.2 Technical Data for Generator

See Generator identification plate.

11.2 Engine oil specification

Castrol Vectron Long Drain 10W-40 E6/E9.

Fischer Panda Part No.: 0028989

11.3 Coolant specification

See the Hatz diesel engine operating manual.

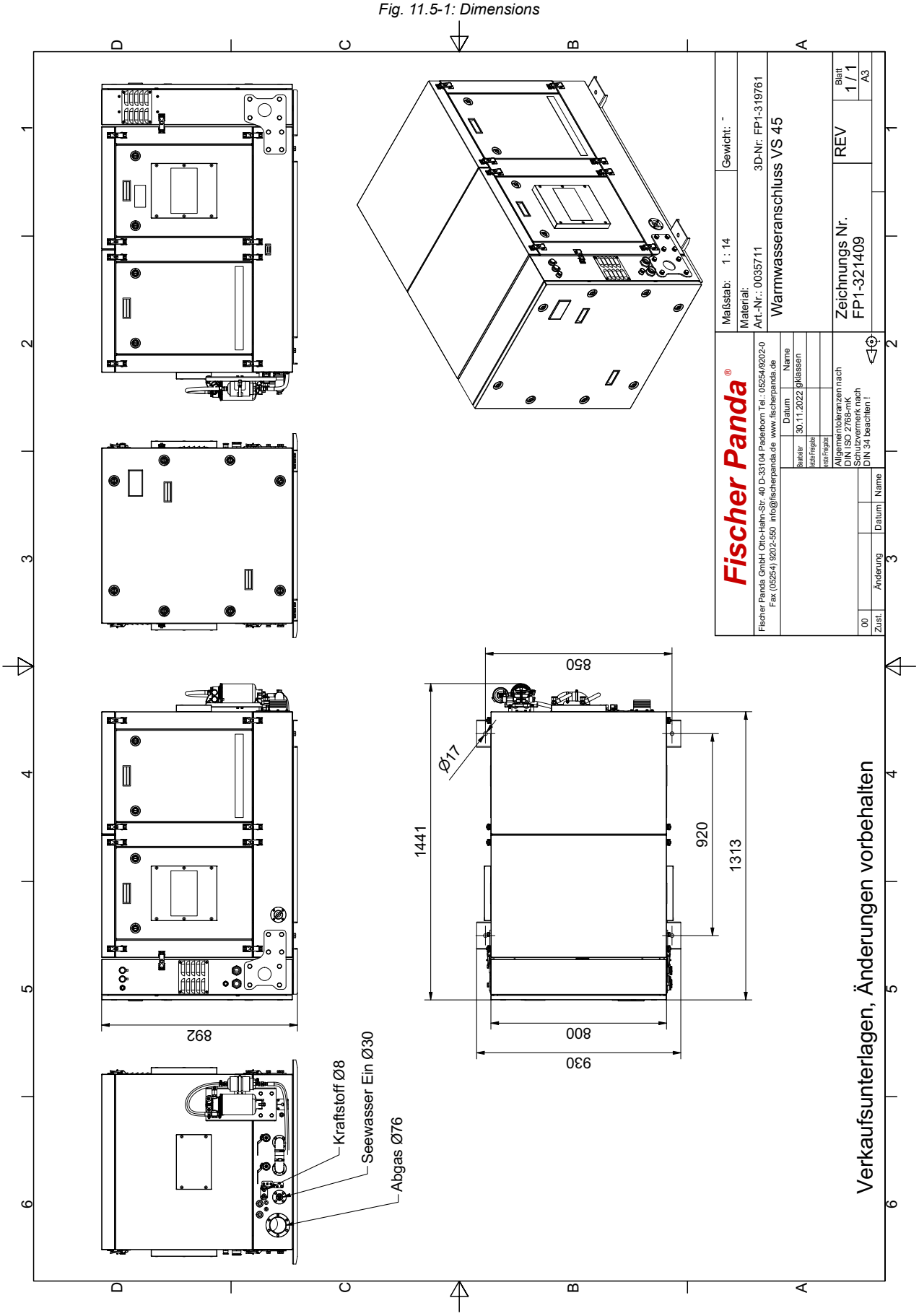
11.4 Fuel specification

Diesel DIN EN-590.

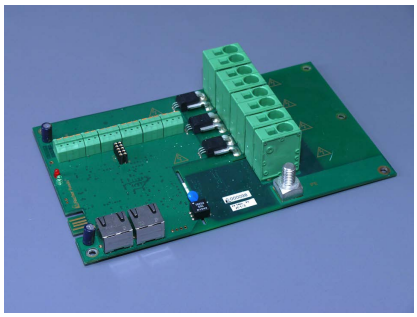
See the Hatz diesel engine operating manual.

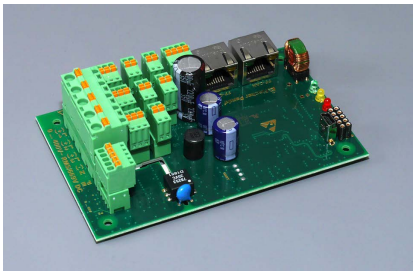
11.5 Dimensions

Fig. 11.5-1: Dimensions



FischerPanda





Panda fpControl Manual

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13. Panda fpControl Safety Instructions

13.1 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.

13.2 Safety instructions

Adhere to the safety instructions in the Fischer Panda generator manual.

If these instructions are not to 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 to be 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!

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

Electric voltage - Deadly Danger!

Warning! Electrical voltage

Electric voltages of more than 48 V 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

Attention!

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 performed, so that the generator cannot be started inadvertently.

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.

Note!

13.3 Function description

The fpControl system is intended for the operation, monitoring and control of piston-powered generators.

13.4 Proper use

Intended exclusively for use with Fischer Panda generators, the proper use of which arises from the declaration of conformity of the complete machine.

14. Panda fpControl

14.1 Components of the fpControl

14.1.1 fpControl - CP-G

(**C**ontrol **P**anel – **G**enerator)

Display and Control Element of the fpControl

The fpControl CP-G is the display and control element

Power is supplied via the bus cable. Multiple control elements can be installed in a single system.

Fig. 14.1.1-1: Control Panel - Generator

14.1.1.1 Environmental specifications, physical data of the fpControl CP-G

Storage temperature	-10 °C – +60 °C
Operating temperature	-20 °C – +50 °C
Supply voltage	12 V or 24 V, automotive (12–13,5 V or 24–28 V)
Rated current consumption	< 21 mA @ 12 V (without display heating) < 18 mA @ 24 V (without display heating)
Max. current consumption	120 mA (with display heating)
Current consumption in Standby mode / Off	0 A
Housing	ABS plastic
Protection class	IP30 (RJ45 plug plugged in)
Overall dimensions	120 x 65 x 35 mm (L x B x H), Cutout: 109,2 x 54,5 mm
Weight	0.11 kg
FP part number	0029338
Circuit board	FP1403

14.1.2 fpControl - GC-S

(**G**enerator **C**ontrol - **S**ervo)

Main module of the fpControl.

Fig. 14.1.2-1: Generator Control - Servo

The module contains the control electronics.

The fpControl GC-S is usually installed in the generator capsule.

The fpControl GC-S takes over the monitoring and control of the diesel engine of the Fischer Panda generator, as well as the control of the output voltage and frequency of the generator.

The fpControl GC-S is suitable for 12 V and 24 V starting systems. The connected actuators are supplied with power via switching outputs with input voltage.

Current measurement is single-phase and can be done directly. A voltage sensor is not necessary. Current measurement takes place via an external current sensor. An additional three-phase module can be used for 3-phase generators.

14.1.2.1 Environmental specifications, physical data of the fpControl GC-S

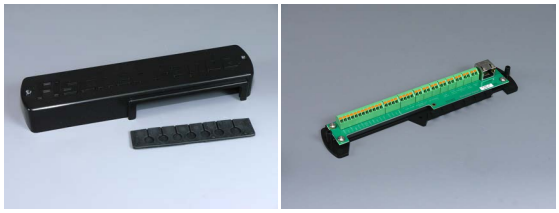
Ambient temperature	-40 °C – +125 °C (max.)
Operating temperature	90 °C
Supply voltage	12 V or 24 V, automotive (12–13,5 V or 24–28 V)
Rated current consumption	< 66 mA @ 12 V < 77 mA @ 24 V
Housing	Automotive, PBT GF30
Protection class	IP65
Overall dimensions	117 mm x 136 mm (incl. plug)
Weight	0.25 kg
FP part number	0029554
Circuit board	FP1704

14.1.3 fpControl - CB-G

(**C**onnection **B**ox - **G**enerator)

The fpControl CB-G is usually installed in the generator capsule (externally).

Fig. 14.1.3-1: Connection Box - Generator



The fpControl CB-G is the external terminal block for the fpControl generator.

The control element and the fuel pump are connected here. Emergency stop devices, auto-start devices, load relays and boosters can be connected as options.

Only qualified electricians may perform work on the fpControl CB-G.

Note:

14.1.3.1 fpControl CB-G connections

1 x RJ45	Control Panel/fpCAN
1 x 2-pole Phoenix contact socket	Boost relay/Inverter power supply
1 x 2-pole Phoenix contact socket	Multifunction output 1 A)
1 x 2-pole Phoenix contact socket	Multifunction output 5 A)
1 x 2-pole Phoenix contact socket	Powerline relay
1 x 2-pole Phoenix contact socket	Automatic start-up contact
1 x 2-pole Phoenix contact socket	Emergency-stop
1 x 2-pole Phoenix contact socket	Fuel pump (5 A)
1 x 2-pole Phoenix contact socket	Water pump/Fan (5 A)
1 x 4-pole Phoenix contact socket	Alternative for the fpCAN
1 x 4-pole Phoenix contact socket	Boost relay Universal output 1 Universal output 2
1 x 12-pole Phoenix contact socket	Digital output - Water pump/Fan Digital output - Fuel pump Emergency-stop Automatic start-up contact Wake-up line CAN-High CAN-Low Bus voltage GND

14.1.3.2 Environmental specifications, physical data of the fpControl CB-G

Storage temperature	-40 °C – +125 °C
Operating temperature	-20 °C – +100 °C
Supply voltage	without own power supply
Rated current consumption	--
Housing	Plastic
Protection class	IP12
Overall dimensions	216,9 x 50,1 x 29,6 mm (L x B x H)
Weight	0.13 kg
FP part number	0000306
Circuit board	FP1801

14.1.4 fpControl CAN Interface - SAE J1939 (fpControl CI-SAE J1939)

The »fpControl CAN Interface - SAE J1939« manages the communication between the »fpCAN« and an external SAE J1939-CAN-BUS. The interface protects the internal »fpCAN« by filtering the data of the external CAN-Bus. The internal and external CAN-Bus are galvanically isolated. The fpControl CI-SAE J1939 is supplied with power via the fpCAN.

Figure: »fpControl CAN Interface - SAE J1939« (fpControl CI-SAE J1939), Illustration shows an older hardware status

Fig. 14.1.4-1: fpControl CAN Interface - SAE J1939

14.1.4.1 fpControl CI-SAE J1939 connections

2 x RJ45	Power supply and internal fpCAN (FP CAN BUS 1)
2 x RJ45	external fpCAN (FP CAN BUS 2)
1 x 4-pole Phoenix contact socket	Alternative for the external fpCAN (USER CAN BUS)

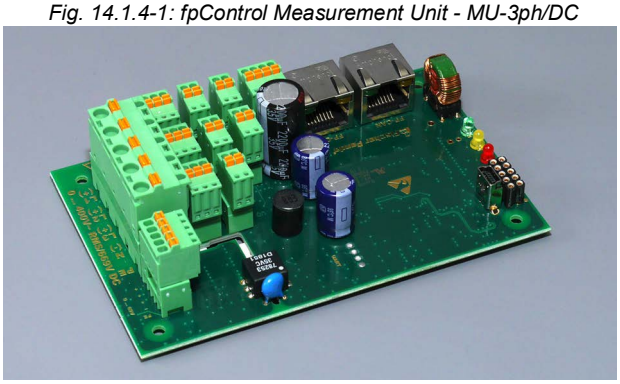
14.1.4.2 Environmental specifications, physical data of the fpControl CI-SAE J1939

Storage temperature	-30 °C – +60 °C
Operating temperature	-20 °C – +50 °C
Supply voltage	12 V or 24 V, automotive (12–13,5 V or 24–28 V)
Rated current consumption	< 32 mA @ 12 V < 17 mA @ 24 V
Housing	ABS plastic
Protection class	IP30
Overall dimensions	151 x 80 x 60 mm (L x B x H)
Weight	0.25 kg
FP part number	0006107
Circuit board	FP1409

14.1.4.3 fpControl Measurement Unit - MU-3ph/DC (fpControl MU-3ph/DC)

The fpControl Measurement Unit - MU-3ph/DC« is used for AC and DC generators. On AC generators, the module measures the 3-phase AC voltage up to 400 V and three times the AC current by means of an external sensor. When used on DC generators, the module measures the 2-phase DC voltage in a range from 12 V to 600 V and twice the DC current by means of an external sensor.

Fig. 14.1.4-1: fpControl Measurement Unit - MU-3ph/DC



14.1.4.4 fpControl MU-3ph/DC connections

2 x RJ45	Power supply and fpCAN
1 x 4-pole Phoenix contact socket	Alternative for the external FP Bus (USER CAN BUS)
1 x 5-pole Phoenix contact socket	**AC:** Voltage measurement L1, L2, L3 and N (0 … 400 V~ RMS) and PE **or** **DC:** 3 x (+), 1 x (-), 1 x PE (669 V DC)
1 x 3-pole Phoenix contact socket	external transformer L1
1 x 3-pole Phoenix contact socket	external transformer L2
1 x 3-pole Phoenix contact socket	external transformer L3
1 x 5-pole Phoenix contact socket	Voltage measurement (0 … 69 V DC) 3 x (+), 1 x (-), 1 x PE
3 x 2-pole Phoenix contact socket	Temperature sensor
1 x 2-pole Phoenix contact socket	Boost
1 x 2-pole Phoenix contact socket	AUX

14.1.4.5 Environmental specifications, physical data of the fpControl MU-3ph/DC

Storage temperature	-30 °C – +60 °C
Operating temperature	-20 °C – +50 °C
Supply voltage	12 V or 24 V, automotive (12–13.5 V or 24–28 V)
Rated current consumption	< 139 mA @ 12 V < 91 mA @ 24 V
Housing	--
Protection class	IP30
Overall dimensions	114 mm x 72.5 mm (L x B) (circuit board)
Weight	0.094 kg (circuit board)
FP part number	0029859
Circuit board	FP1901

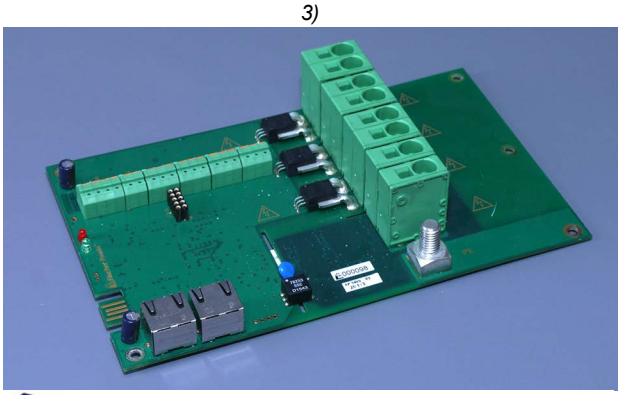
14.1.5 fpControl Measurement Unit - MM-3 (fpControl MM-3)

The »fpControl Measurement Unit - MU-MM-3/DC« is used for AC generators. The module measures the 3-phase AC voltage and three times the AC current. Current measurement is performed by the module directly by means of three internal current sensors. The measuring range is 65 A per phase. Higher currents can be measured by means of optional external current sensors.

Figure: »fpControl Measurement Unit - MM-3« (fpControl MM-3) - Circuit board

Figure: »fpControl Measurement Unit - MM-3« (fpControl MM-3) in housing

Fig. 14.1.5-1: fpControl Measurement Unit - MM-3 (fpControl MM-3)



fpControl MM-3 connections

2 x RJ45	Power supply and fpCAN
1 x 4-pole Phoenix contact socket	Alternative for the external FP Bus (USER CAN BUS)
1 x 3-pole Phoenix contact socket	external transformer N
1 x 3-pole Phoenix contact socket	external transformer L1
1 x 3-pole Phoenix contact socket	external transformer L2
1 x 3-pole Phoenix contact socket	external transformer L3
1 x 2-pole Phoenix contact socket	Voltage measurement / internal transformer L1, max. 65 A
1 x 2-pole Phoenix contact socket	Voltage measurement / internal transformer L2, max. 65 A
1 x 2-pole Phoenix contact socket	Voltage measurement / internal transformer L3, max. 65 A
2 x 1-pole Phoenix contact socket	N
1 x 1-pole Phoenix contact socket	PE

14.1.5.1 Environmental specifications, physical data of the fpControl MM-3

Storage temperature	-30 °C – +60 °C
Operating temperature	-20 °C – +50 °C
Supply voltage	12 V or 24 V, automotive (12–13.5 V or 24–28 V)
Rated current consumption	< 71 mA @ 12 V < 36 mA @ 24 V
Housing	ABS plastic
Protection class	IP30
Overall dimensions	151 x 80 x 60 mm (L x B x H)
Weight	0.212 kg (circuit board, fitted)
FP part number	0023600 (Circuit board FP1405 V7)
Circuit board	FP1405

14.2 Installation

14.2.1 Installation of the Electronic Control Unit (ECU) fpControl - GC-S

The ECU fpControl - GC-S is pre-installed. The ECU can be exchanged easily. All connections are mechanically coded and prevent the risk of confusion.

14.2.2 Installation of the Connection Box fpControl - CB-G

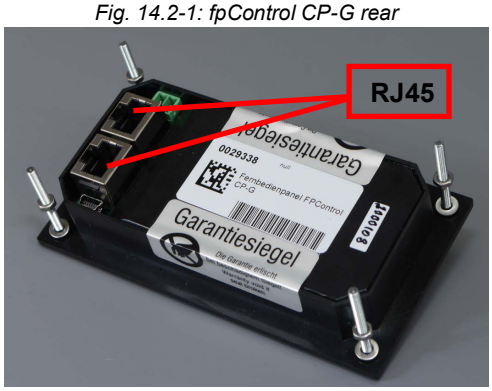
The connection box is pre-installed. External components are connected in accordance with the installation manual and the circuit diagram of the fpControl generator.

14.2.3 Installation of the fpControl - CP-G

The fpContol - CP-G is a CAN Bus module. All Fischer Panda CAN bus modules have two RJ45 ports. One for connection to the module on the CAN bus, the second to relay the CAN bus. The last module on the CAN bus must have a terminating resistor in the RJ45 port.

Connection by means of the Fischer Panda bus cable is mandatory.

Fig. 14.2-1: fpControl CP-G rear



14.3 Operation

The fpControl is operated by means of the fpControl CP-G panel.

Fig. 14.3-1: fpControl CP-G front with buttons

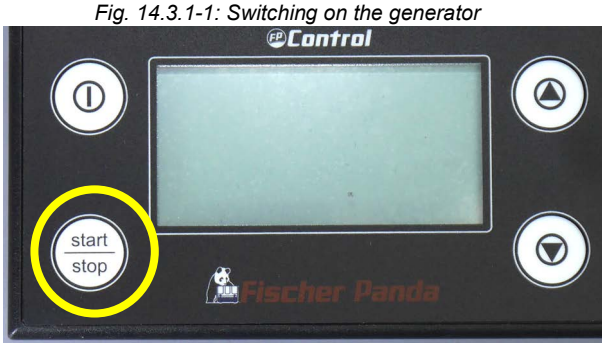
14.3.1 Switching on the generator

Press the "ON/OFF" button to switch on the control system of the generator.

The fpControl Generator thereby switches to "Standby Mode".

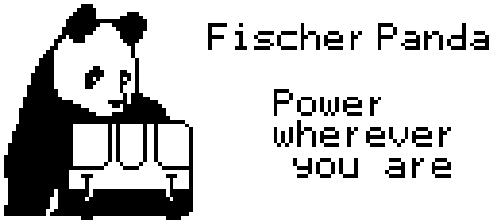
If automatic starting is activated at the menu, the generator can henceforth be started by means of an external signal.

Fig. 14.3.1-1: Switching on the generator



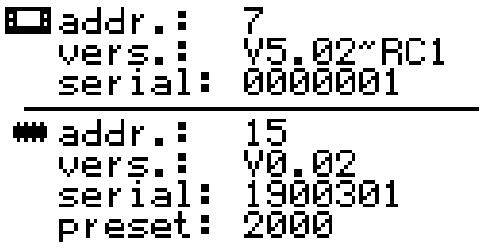
The CP-G Panel displays the home page for two seconds.

Fig. 14.3.1-2: Home Page



The CP-G then displays the address page for one second.

Fig. 14.3.1-3: Address Page

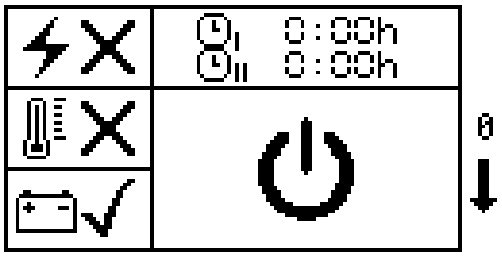


At the end of the power-on routine, the CP-G displays the first overview page.

The language as well as the display mode can be set in the menu.

Overview Page 1 is the same in all display modes/languages.

Fig. 14.3.1-4: Overview Page 1



14.3.1.1 Overview page with Autostart activated

Deadly danger! - The generator can be equipped with an Autostart function. This means that the generator is started by an external signal. In order to prevent an inadvertent start-up, the starter battery must be disconnected before work on the generator may commence.

Warning! Autostart

The “Autostart” also remains active, if the fpControl CP-G is switched off and on again.

If a fault should arise when the generator is started or is already operating, it is stopped and the Autostart is set to "off".

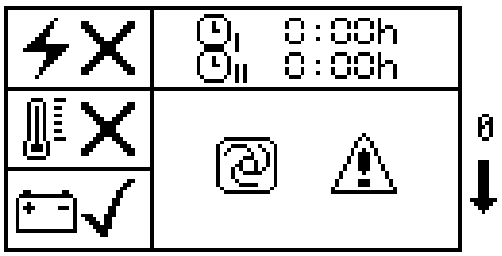
If the generator is operated by Autostart and is stopped manually, the Autostart is set to "off".

Once the system has been switched off and then on again, the Autostart is active once more.

The first overview page shows if the Autostart is active.

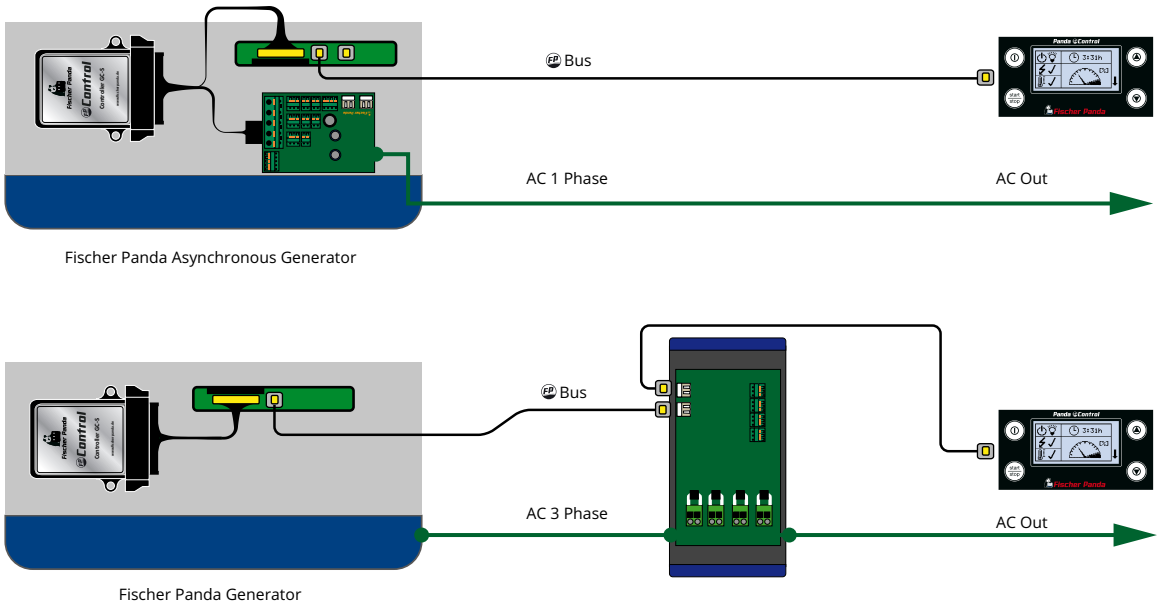
Overview Page 1 with Autostart function activated.

Fig. 14.3.1-1: Overview Page 1 with Autostart



14.3.2 The fpControl VCS overview pages

The display mode/language of the display can be set in the menu.

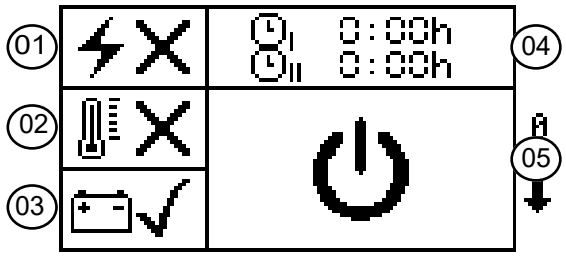


Overview Page 1:

01. Generator Status (on/off)
02. AC OK
03. Temperature of the generator (OK/Error)
04. Operating hours of the generator
05. Info screen

Overview Page 1 is the same in all languages.

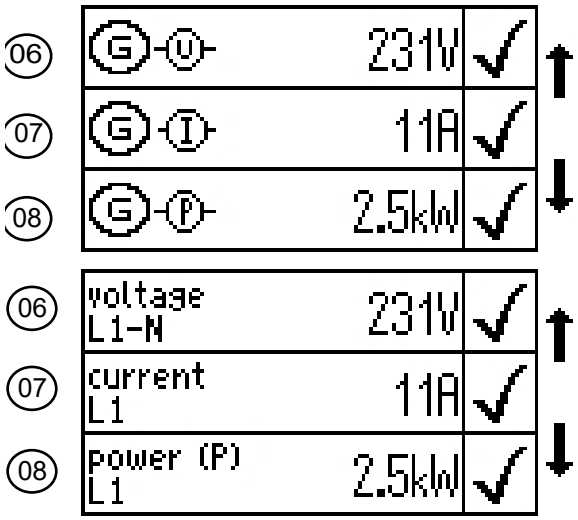
Fig. 14.3.2-1: Symbols used - Overview Page 1



Overview Page 2 (Generator):

06. Output voltage [V]
07. Generator current [A]
08. Generator active power [kW]

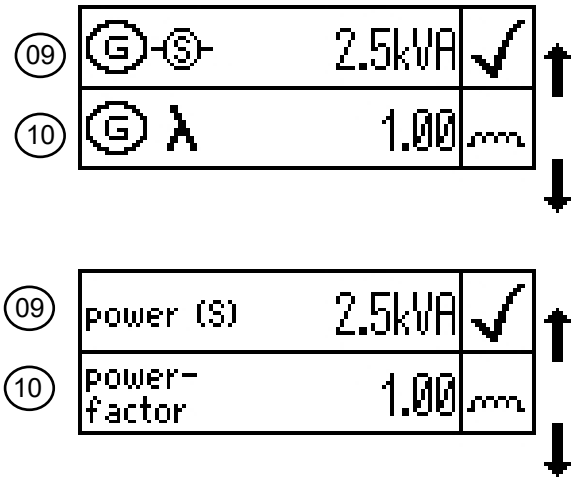
Fig. 14.3.2-2: Overview Page 2 Symbols/English



Overview Page 3 (Generator):

09. Generator apparent power [kVA]
10. Power Factor

Fig. 14.3.2-3: Overview Page 2 Symbols/English

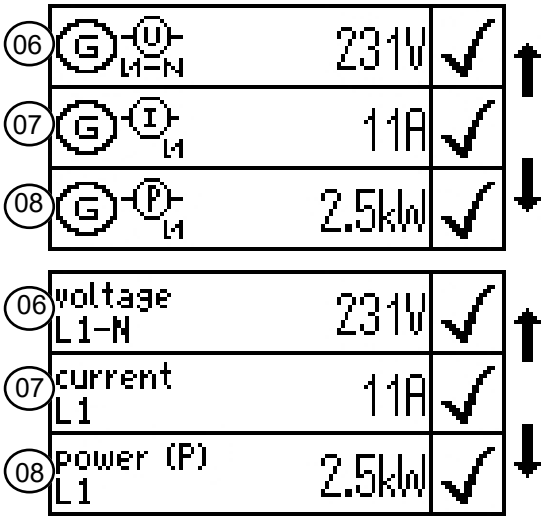


In the case of 3-phase generators, the voltage, the current and the electrical power are shown on separate pages. Each page shows the value of one of the three phases one below the other.

Note:

Example of the voltage display of a 3-phase generator.

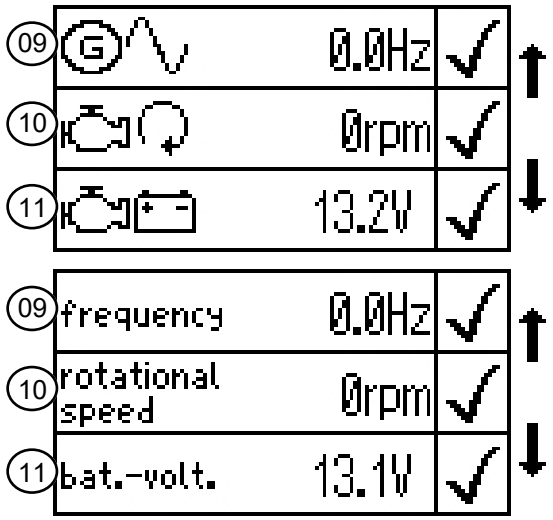
Fig. 14.3.2-4: Voltage display 3-P Symbols/English/



Overview Page 4:

09. Frequency of the generator [Hz]
10. Generator speed (r.p.m.)
11. Voltage of the starter battery [V]

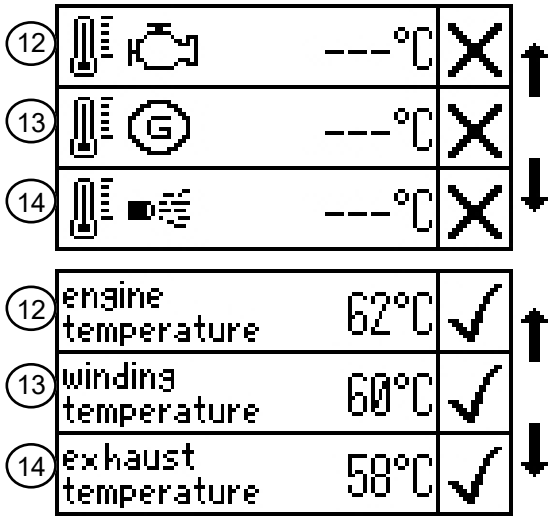
Fig. 14.3.2-5: Overview Page 3 Symbols/English



Overview Page 4:

12. Temperature of the cylinder head
13. Temperature of the generator winding
14. Temperature at exhaust manifold

Fig. 14.3.2-6: Overview Page 4 Symbols/English



If the information pages of optional components (e.g. fuel gauge, oil pressure) are available, then these pages are inserted after Overview Page 4.

Whether these pages are displayed automatically, always or not at all can be set in the Panel menu.

Note:

Final Overview Page:

Fig. 14.3.2-7: Final overview page

Proceed to this menu by pressing the Start/Stop - Enter key

Overview Page 5 is the same in all display modes/languages.

14.3.3 The fpControl AGT overview pages

The display mode/language of the display can be set in the menu.

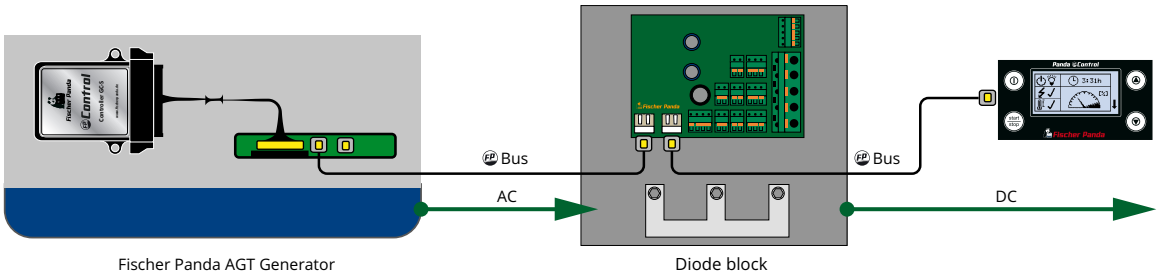
The battery-specific charging parameters are set by the Fischer Panda Service Point.

When exchanging a battery this must be checked and adjusted accordingly.

Warning:

Incorrect setting of the charging parameters may result in the battery being damaged or destroyed. The specifications of the battery manufacturer must be adhered to.

.

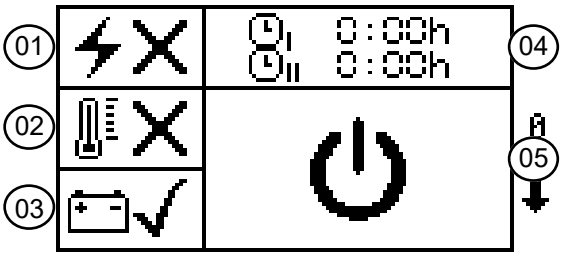


Overview Page 1:

01. Generator Status (on/off)
02. AC OK
03. Temperature of the generator (OK/Error)
04. Operating hours of the generator
05. Info screen

Overview Page 1 is the same in all languages.

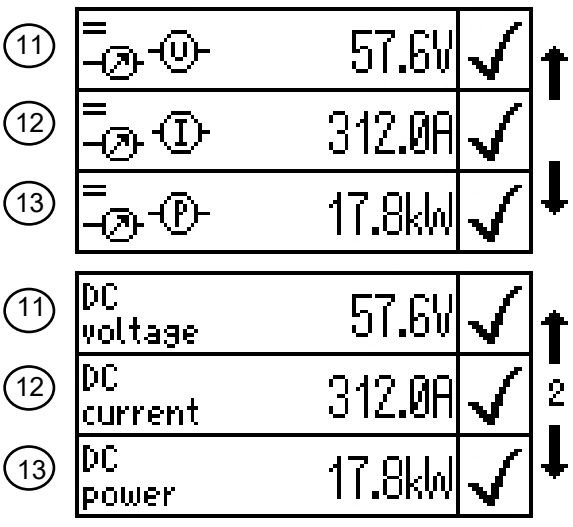
Fig. 14.3-1: Symbols used - Overview Page 1



Overview Page 2:

11. DC voltage [V]
12. DC current [A]
13. DC output [kW]

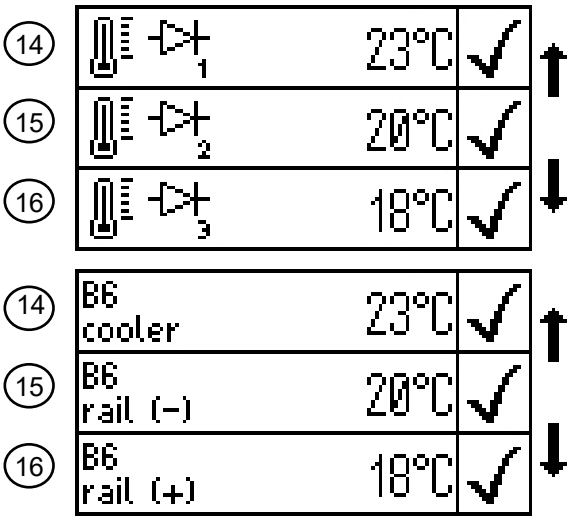
Fig. 14.3.3-2: Overview Page 2 Symbols/English



Overview Page 3:

14. Temperature of the diode plate fan
15. Temperature of the diode plate busbar (-)
16. Temperature of the diode plate busbar (+)

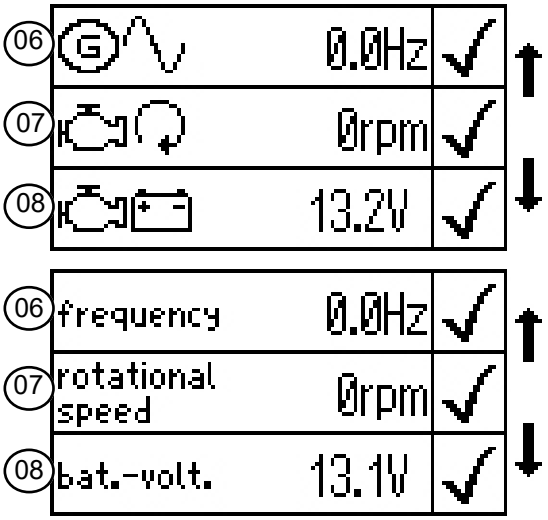
Fig. 14.3.3-3: Overview Page 3 Symbols/English



Overview Page 4:

06. Frequency of the generator [Hz]
07. Generator speed (r.p.m.)
08. Voltage of the starter battery [V]

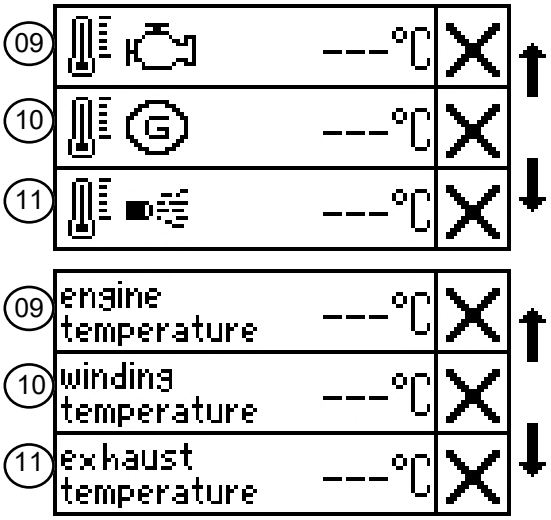
Fig. 14.3.3-4: Overview Page 4 Symbols/English



Overview Page 5:

09. Temperature of the cylinder head
10. Temperature of the generator winding
11. Temperature at exhaust manifold

Fig. 14.3.3-5: Overview Page 5 Symbols/English



If the information pages of optional components (e.g. fuel gauge, oil pressure) are available, then these pages are inserted after Overview Page 4.

Whether these pages are displayed automatically, always or

Note:

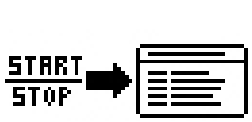
not at all can be set in the Panel menu.

Final Overview Page:

Fig. 14.3.3-6: Final overview page

Proceed to this menu by pressing the Start/Stop - Enter key

Overview Page 5 is the same in all display modes/languages.



14.3.3.1 Battery guard

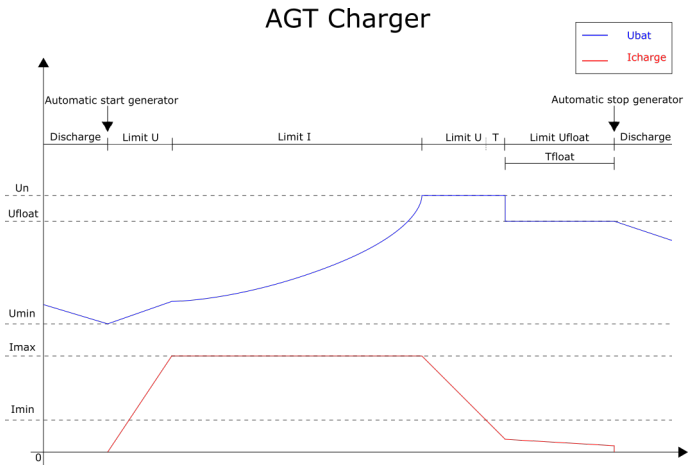
Generator must be in Standby mode (remote control panel switched on; generator off)

When the battery monitor is activated in the Service menu, the generator starts automatically as soon as the connected battery bank has reached the set minimum voltage. After the charging process (UIU) has ended, the generator switches off (back to Standby).

Activation of the battery monitor as well as the storage of individual parameters for UIU charging/the connected battery bank are performed by your Fischer Panda Service Point.

14.3.3.2 Functional description of the UIU charging process

Fig. 14.3.3.2-1: UIU charging curve of AGT-DC generator with FP Control



The UIU charging process: **linearly increasing voltage – constant current – constant voltage**

When the battery voltage has reached its minimal value $\mathbf{U_{min}}$ when discharging, the battery charger starts automatically, if the battery guard is activated. The UIU charging process begins:

Phase »Limit U«:	In the first phase, charging takes place with linearly increasing voltage This phase continues until the charging current has reached its maximum value $\mathbf{I_{max}}$.
Phase »Limit I«:	In the second phase, charging takes place at **constant current**. In this phase, the maximum charging current $\mathbf{I_{max}}$ flows to the battery.
Phase »Limit U«	In the third phase, charging takes place at **constant voltage** $\mathbf{U_n}$ (absorption voltage). During this phase, the charging current drops to its minimum value $\mathbf{I_{min}}$.
Phase »T«	Once the charging current has reached its minimum value $\mathbf{I_{min}}$, the battery voltage is maintained at the $\mathbf{U_n}$ (absorption voltage) value throughout a hysteresis time **T**. The charging current continues to decrease during hysteresis.
Phase »Limit Ufloat«	After hysteresis the battery charger switches from loading at constant voltage $\mathbf{U_n}$ to float voltage $\mathbf{U_{float}}$, thus ensuring that the fully charged condition of the battery is maintained throughout $\mathbf{T_{float}}$.

Once the float time $\mathbf{T_{float}}$ has elapsed, the generator stops automatically.

Parameters of the charging curve

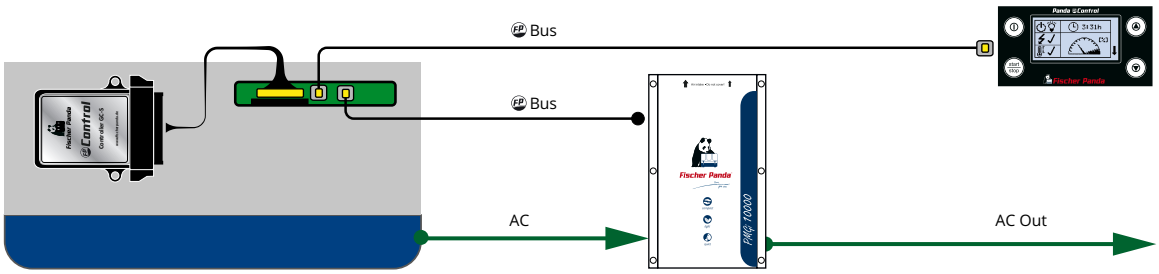
Parameter	Meaning	Corresponding menu item in "battery charger"
U_{min}	Battery voltage at which the battery charging generator is started automatically.	**min. voltage [V]**
U_n	Constant charging voltage (absorption voltage), until the charging current has dropped to the minimum value **I_{min}**.	**absorption-voltage [V]**
U_{float}	Once the battery has been charged, the float voltage ensures that the fully charged condition of the battery is maintained throughout the float time **T_{float}**.	**float-voltage [V]**
I_{min}	If the minimum charging current is not achieved, the battery is fully charged. At this point in time, hysteresis **T** begins and continues until switching to the float voltage **U_{float}**.	**min. current [A]**
I_{max}	Maximum charging current flowing to the battery.	**max. current [A]**
T	Once this time has elapsed, the system switches over to the float voltage **U_{float}**.	**hysteresis [ms]**
	"On" – Battery guard is activated, automatic generator start/stop is active. The generator is started automatically if the battery voltage drops below the minimum **U_{min}**. "Off" – Battery guard is deactivated, automatic generator start/stop is deactivated.	**battery guard [On/Off]**
T_{float}	Once the float time has elapsed, the generator is stopped automatically if the battery guard is activated.	**float-timeout [min]**

The graphic display of the UIU charging curve displays the basic principle and symbolises the functionality.

NOTE:

14.3.4 The fpControl Inverter overview pages

The display mode/language of the display can be set in the menu.



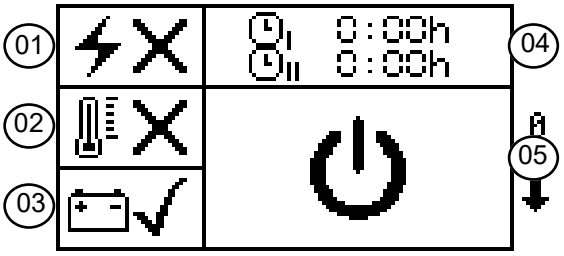
Fischer Panda Inverter Generator

Overview Page 1:

01. Generator Status (on/off)
02. AC OK
03. Temperature of the generator (OK/Error)
04. Operating hours of the generator (I. Operating hours total, II. Operating hours since last service)
05. Info screen

Overview Page 1 is the same in all languages.

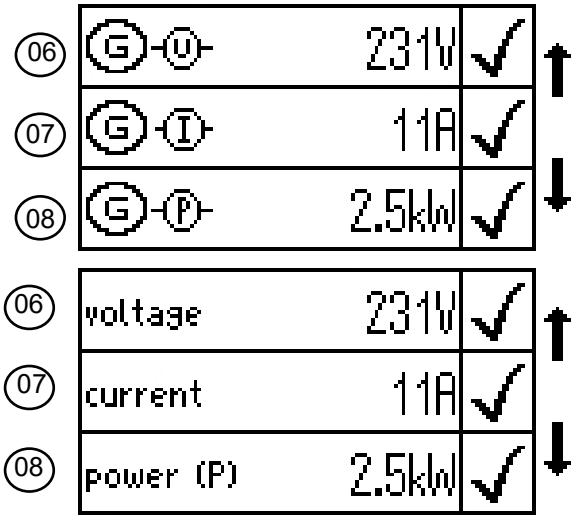
Fig. 14.3.4-1: Symbols used in Overview Page 1



Overview Page 2 (Generator):

06. Output voltage [V]
07. Generator current [A]
08. Generator active power [kW]

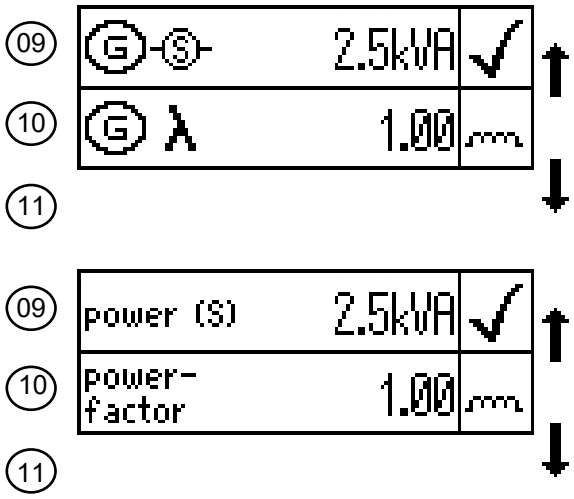
Fig. 14.3.4-2: Overview Page 2 Symbols/English



Overview Page 3:

09. Generator apparent power [kVA]
10. Power Factor

Fig. 14.3.4-3: Overview Page 3 Symbols/English

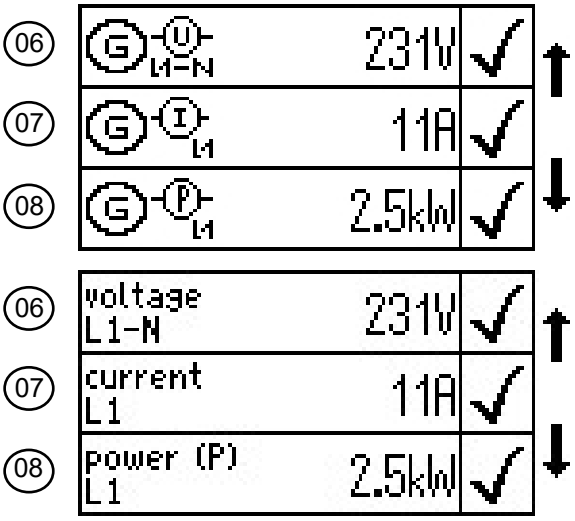


In the case of 3-phase generators, the voltage, the current and the electrical power are shown on separate pages. Each page shows the value of one of the three phases one below the other.

Note:

Example of the voltage display of a 3-phase generator.

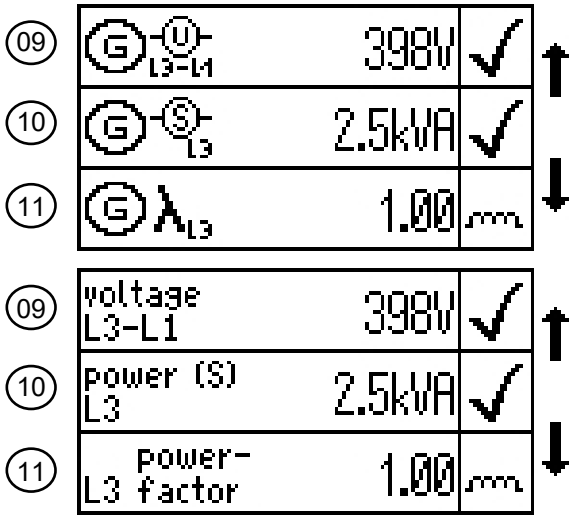
Fig. 14.3.4-4: Voltage display 3-P Symbols/English/



Overview Page 3:

09. Phase/Phase voltage
10. Generator apparent power [kVA]
11. Power Factor

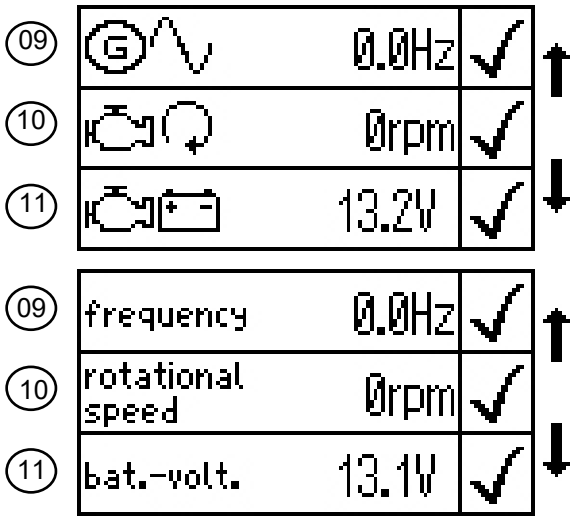
Fig. 14.3.4-5: Overview Page 3 Symbols/English



Overview Page 4:

09. Frequency of the generator [Hz]
10. Generator speed (r.p.m.)
11. Voltage of the starter battery [V]

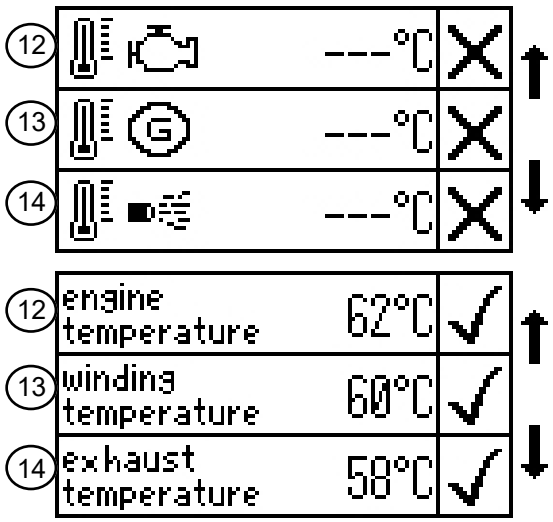
Fig. 14.3.4-6: Overview Page 4 Symbols/English



Overview Page 5:

12. Temperature of the cylinder head
13. Temperature of the generator winding
14. Temperature at exhaust manifold

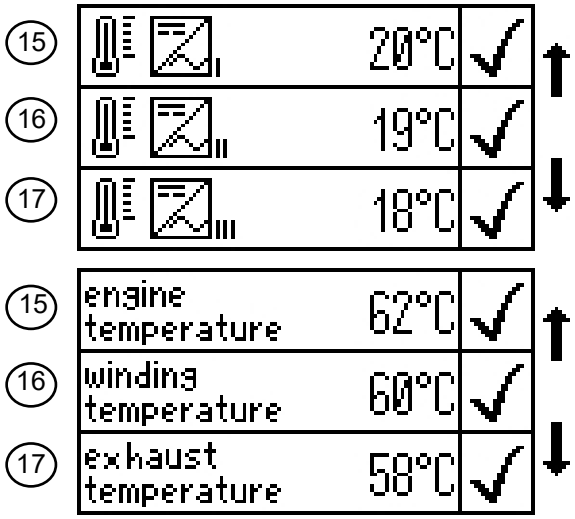
Fig. 14.3.4-7: Overview Page 5 Symbols/English



Overview Page 6:

15. Inverter Temperature L1
16. Inverter Temperature L2
17. Inverter Temperature L3

Fig. 14.3.4-8: Overview Page 6 Symbols/English



If the information pages of optional components (e.g. fuel gauge, oil pressure) are available, then these pages are inserted after Overview Page 4.

Whether these pages are displayed automatically, always or

Note:

not at all can be set in the Panel menu.

Final Overview Page:

Fig. 14.3.4-9: Final overview page

Proceed to this menu by pressing the Start/Stop - Enter key
Overview Page 5 is the same in all display modes/languages.

14.4 Starting up the generator

14.4.1 Preparations for starting up / Checks (daily) for marine version

1. Oil level check (ideal level: 2/3 Max).

   The level should be about 2/3 of the maximum level when the engine is cold.

   Furthermore, if installed, the oil level of the oil-cooled bearing must be checked before each start - see sight glass on generator front cover!.

2. Check cooling water level.

   The external expansion tank should be filled to 1/3 in a cold state. It is very important that there is sufficient volume for expansion of the coolant.

3. Check if the raw water intake valve is open.

   For safety reasons, the raw water intake valve must be shut 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. If the raw water intake is restricted by detached residue, this increases wear on the impeller.

5. Visual inspection

   Control fixing bolts, check hose connectors for leaks, check electrical connections. Check electrical lines for damage/chafing.

6. Switch off loads.

   The generator should only be started without a load.

7. Open fuel valve, if installed.
8. Close main battery switch (switch on).

14.4.2 Preparations for starting up / Checks (daily) for vehicle version

1. Oil level check (ideal level: 2/3 Max).

   The level should be about 2/3 of the maximum level when the engine is cold.

   Furthermore, if installed, the oil level of the oil-cooled bearing must be checked before each start - see sight glass on generator front cover!.

2. Check cooling water level.

   The external expansion tank should be at 1/3 in a cold state. It is very important that there is sufficient volume available for expansion of the coolant.

3. Visual inspection

   Control fixing bolts, check hose connectors for leaks, check electrical connections. Check electrical lines for damage/chafing.

4. Switch off loads.

   The generator should only be started without a load.

5. Open fuel valve, if installed.
6. Close main battery switch (switch on).
7. Open the raw water intake valve (only in the case of Fischer Panda Marine generators)

14.4.3 Starting up the generator

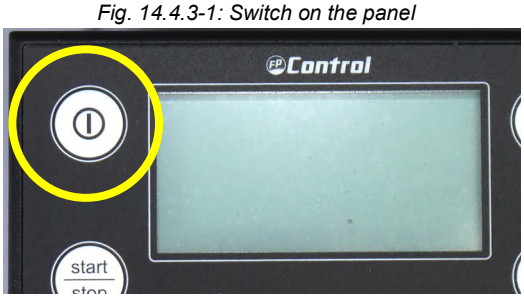
Deadly danger! - The generator can be equipped with an Autostart function. This means that the generator is started by an external signal. In order to prevent an inadvertent start-up, the starter battery must be disconnected before work on the generator may commence.

Warning! Automatic start-up

1. Switch on the fpControl CP-G

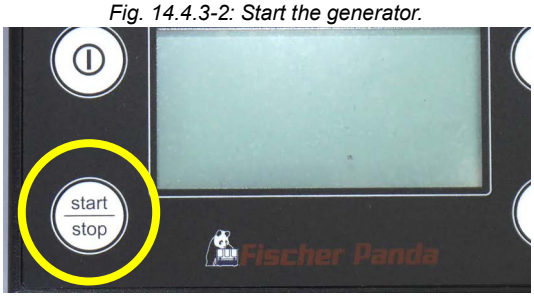
   The remote control panel is started by pressing the On/Off button. The On/Off button must be pressed until the Home page is displayed.

Fig. 14.4.3-1: Switch on the panel



2. Press the Start/Stop - Enter key

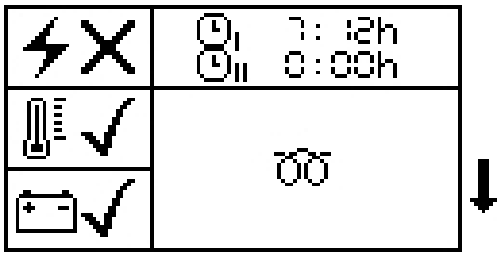
Fig. 14.4.3-2: Start the generator.



3. The fpControl preheats the diesel engine.

After preheating, the generator is started by the fpControl system.

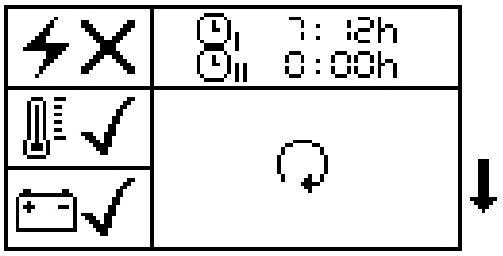
Fig. 14.4.3-3: Preheating



4. Starter on.

In order to minimise current consumption, preheating is interrupted briefly when the starter is operated.

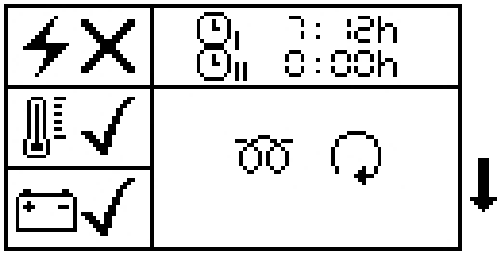
Fig. 14.4.3-4: Electric starter



5. Starter and preheater

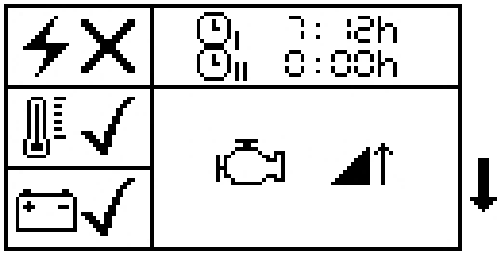
As soon as the high inrush current of the starter has dropped, preheating is switched on again.

Fig. 14.4.3-5: Preheating



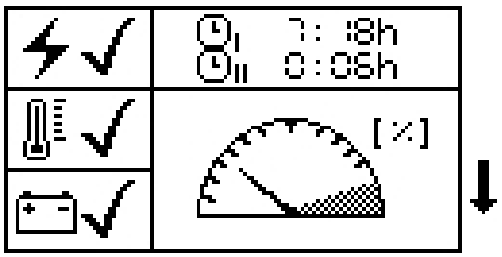
The engine idles for the first few seconds. Thereafter, the fpControl increases the speed to the operating speed and indicates this in the display.

Fig. 14.4.3-6: Increase revolutions



As soon as the AC voltage is within limits (e.g. 207 V-253 V at 230 V) (normal operating mode), the consumer can be connected.

Fig. 14.4.3-7: AC OK



Close the raw water intake valve in the event start-up problems (Panda Marine generators only).

Attention:

If multiple attempts to start up are required (e.g. to bleed the fuel lines), then the raw water intake valve must definitely be shut while the attempts are being made. The cooling water impeller turns during the starting process and feeds cooling water. As long as the engine has not started up, the exhaust gas pressure is insufficient to discharge the coolant water that has been introduced. This protracted start-up process would flood the exhaust system with water. This can damage/destroy the generator/engine.

Re-open the raw water intake valve as soon as the generator has started.

14.4.4 Stopping the generator

1. Switch off loads.
2. Recommendation: With turbo engines and under a load that exceeds 70 % of the rated output, allow the generator temperature to stabilise for at least 5 minutes with load switched off.

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

3. Press "Start/Stop" button (to switch off).

Fig. 14.4.4-1: Stopping

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

Attention:

4. Close the raw water intake valve (only in the case of Fischer Panda Marine generators)

14.5 The Menu

The menu can be accessed from the final overview page.
Switch on the CP-G and scroll down to "Enter Menu" page.
Press the Start/Stop - Enter key to enter the menu.

Fig. 14.5-1: Menu entry symbols

14.5.1 Main Menu

You can choose from the following sub-menus in the main menu:

Fig. 14.5.1-1: Main Menu

1. "Panel" sub-menu - The display of the of the panel can be adapted in the "Panel" sub-menu (e.g. brightness, language, etc.).

2. "Generator" sub-menu - All settings related to the generator can be made in the "Generator" sub-menu, e.g. bleeding the fuel pump etc.

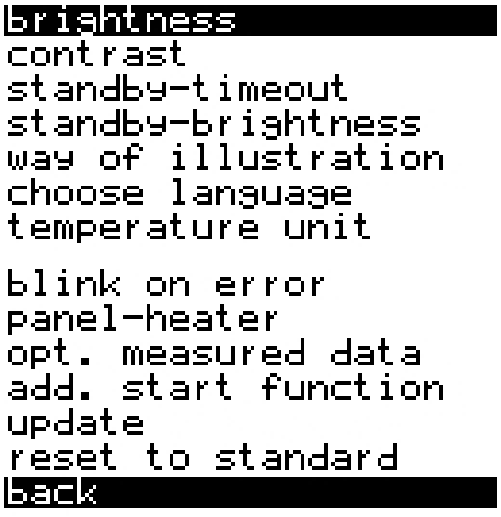
3. The "Service" sub-menu is blocked and can only be accessed by trained personnel and Fischer Panda employees.

4. Back - back to the overview pages

14.5.2 Sub-menu: "Panel"

The following items can be selected in the Panel sub-menu:

Fig. 14.5.2-1: Sub-menu: Panel



1. Lighting
   - changes the brightness of the display in Normal mode.
2. Contrast
   - *changes the contrast of the display.*
3. Standby Time
   - *to set the time until the panel switches to Standby mode.*
4. Standby Lighting
   - *changes the brightness of the display in Standby mode.*
5. Display Mode
   - *changes the display mode of the overview pages.*
6. Language selection
   - *changes the language of the panel*
7. Temperature Unit

- to set the temperature unit to °C or °F

8. Audible alarm

   - to activate the audible alarm in the event of faults

9. Flashing when faulty

   - to activate panel flashing in the event of faults

10. Panel heating

    - to activate panel heating at temperatures <+10°C

11. Optional measurement data

    - to manage the additional information pages, e.g. tank display

12. Additional start-up functions (only in the case of inverter generators)

    - Start without inverter/Inverter Softstart

13. Update

    - Software update for the panel

14. Reset to standard

    - to reset the "Panel" sub-menu to the factory settings

15. back

    - Switching from the "Panel" sub-menu to the Main Menu

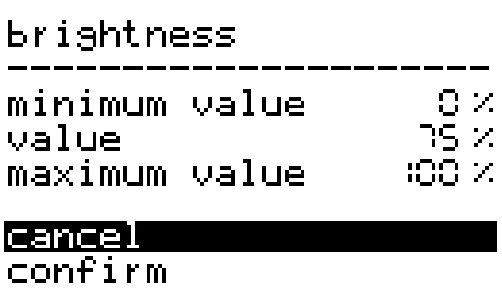
14.5.2.1 Setting the illumination of the CP-G

The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

The value is changed by using the "Step-up"/"Step-down" keys and the setting is confirmed with the "Start/Stop Enter“ key.

"Cancel" or "Confirm" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/ Stop-Enter“ key.

Fig. 14.5.2.1-1: Sub-menu: Illumination



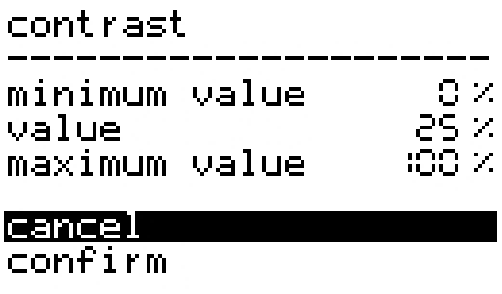
14.5.2.2 Setting the contrast of the CP-G

The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

The value is changed by using the "Step-up"/"Step-down" keys and the setting is confirmed with the "Start/Stop-Enter“ key.

"Cancel" or "Confirm" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/ Stop-Enter“ key.

Fig. 14.5.2.2-1: Sub-menu: Contrast



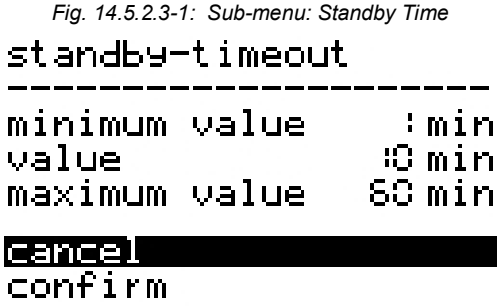
14.5.2.3 Setting the standby time of the CP-G

The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

The value is changed by using the "Step-up"/"Step-down" keys and the setting is confirmed with the "Start/Stop-Enter“ key.

"Cancel" or "Confirm" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/Stop-Enter“ key.

Fig. 14.5.2.3-1: Sub-menu: Standby Time



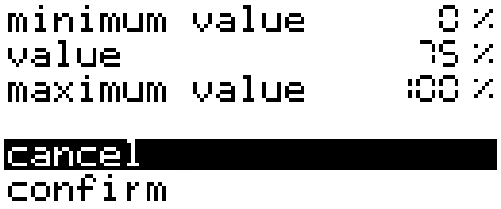
14.5.2.4 Setting the standby illumination of the CP-G

The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

The value is changed by using the "Step-up"/"Step-down" keys and the setting is confirmed with the "Start/Stop - Enter“ key.

"Cancel" or "Confirm" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/Stop - Enter“ key.

Fig. 14.5.2.4-1: Sub-menu: Standby Illumination



14.5.2.5 Setting the display mode of the CP-G overview page

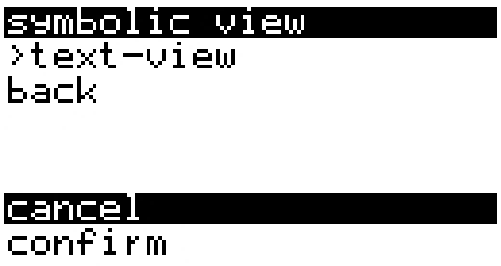
The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

"Symbolic View" or "Text View" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/Stop-Enter“ key.

The "back" item returns you to the "Panel" sub-menu.

"Cancel" or "Confirm" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/Stop-Enter“ key.

Fig. 14.5.2.5-1: Sub-menu: Display Mode



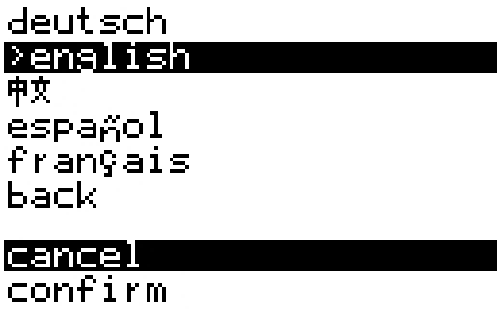
14.5.2.6 Setting the language of the text pages of the CP-G

The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

Select the corresponding language by using the "Step-up"/ "Step-down" keys and then confirm with the "Start/Stop-Enter“ key.

"Cancel" or "Confirm" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/ Stop-Enter“ key.

Fig. 14.5.2.6-1: Sub-menu: Language Selection



14.5.2.7 Setting the Temperature Unit

The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

"°C“ for "degrees Celsius" or "°F" for "degrees Fahrenheit“ can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/Stop - Enter“ key.

The "Back" item returns you to the Panel sub-menu.

"Cancel" or "Confirm" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/ Stop - Enter“ key.

Fig. 14.5.2.7-1: Sub-menu: Temperature Unit

14.5.2.8 Setting the Aural Alarm

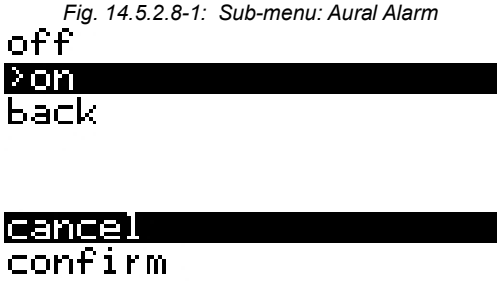
The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

"Off" or "On" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/Stop-Enter“ key.

The "Back" item returns you to the Panel sub-menu.

"Cancel" or "Confirm" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/ Stop-Enter“ key.

Fig. 14.5.2.8-1: Sub-menu: Aural Alarm



14.5.2.9 Setting the display to flash in the event of a fault

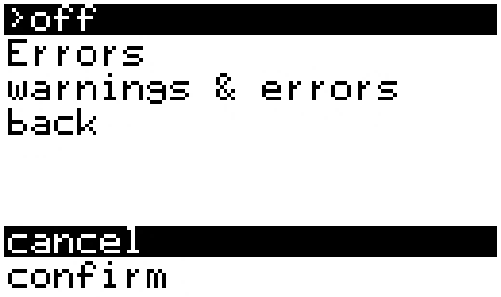
The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

"Off" or "Error" or "Warning and Error" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/Stop-Enter“ key.

The "Back" item returns you to the Panel sub-menu.

"Cancel" or "Confirm" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/ Stop-Enter“ key.

Fig. 14.5.2.9-1: Sub-menu: Flashing when Faulty



14.5.2.10 Setting the Panel Heating

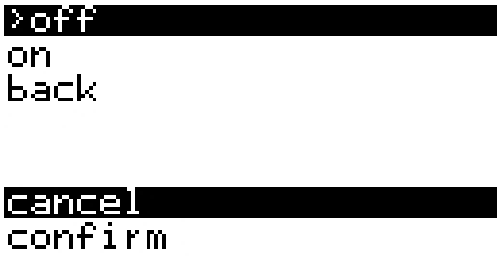
The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

"Off" or "On" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/Stop-Enter“ key.

The "Back" item returns you to the Panel sub-menu.

"Cancel" or "Confirm" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/ Stop - Enter“ key.

Fig. 14.5.2.10-1: Sub-menu: Panel Heating



14.5.2.11 Setting the display of the optional measurement data

The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

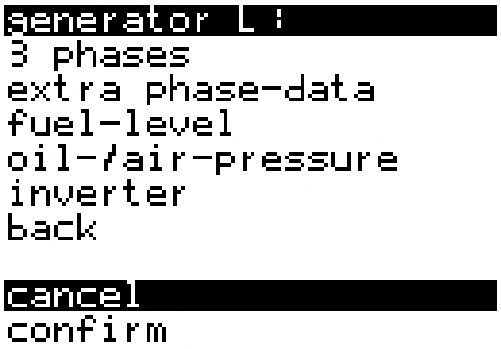
The desired optional measurement data is changed by using the "Step-up"/"Step-down" keys and the setting is confirmed with the "Start/Stop-Enter“ key.

The desired option is selected by using the "Step-up"/"Step-down" keys and the setting is confirmed with the "Start/Stop-Enter“ key.

The "Back" item returns you to the Panel sub-menu.

"Cancel" or "Confirm" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/ Stop-Enter“ key.

Fig. 14.5.2.11-1: Sub-menu: Optional Measurement Data



14.5.2.12 Supplementary Start-up functions

This menu item is only available in the case of inverter generators

Note:

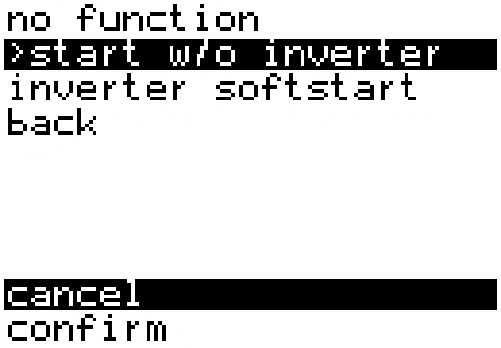
The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

The desired option is selected by using the "Step-up"/"Step-down" keys and the setting is confirmed with the "Start/Stop-Enter“ key.

The "Back" item returns you to the Panel sub-menu.

"Cancel" or "Confirm" can be selected by using the "Step-up"/ "Step-down" keys and then confirmed with the "Start/Stop-Enter“ key.

Fig. 14.5.2.12-1: Sub-menu: Supplementary Start-up functions



14.5.2.13 Resetting all values of the Panel sub-menu to default values

The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

"Cancel" or "Confirm" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/ Stop-Enter“ key.

Fig. 14.5.2.13-1: Resetting all values

14.5.2.14 Return to Main Menu

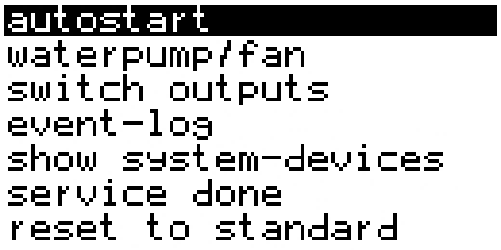
The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

14.5.3 Sub-menu: "Generator"

The following items can be selected in the Generator sub-menu:

1. Autostart
   - configuring the Autostart function
2. Water pump/Fan
   - setting the optional DC outputs
3. Switch Outputs
   - manual switching of the individual digital outputs
4. Event Memory
   - displaying the event memory
5. Display System Devices
   - displaying the detected system devices
6. Service performed
   - resets the service interval
7. Reset to standard
   - all parameters of the "Generator" sub-menu are reset to the factory settings
8. back
   - Switching from the "Generator" sub-menu to the Main Menu

Fig. 14.5.3-1: Generator Sub-Menu



14.5.3.1 Setting the Autostart of the CP-G

The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

A choice can be made between "Switch on/off" and "Number of start-up attempts" in in the "Autostart" sub-menu.

Fig. 14.5.3.1-1: Autostart

Switching On / Off

"Off" for deactivated or "On" for activated can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/Stop-Enter“ key.

"Cancel" or "Confirm" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/ Stop-Enter“ key.

Fig. 14.5.3.1-2: Autostart

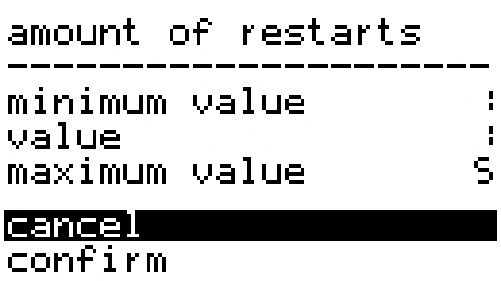
Number of start-up attempts

The value is changed by using the "Step-up"/"Step-down" keys and the setting is confirmed with the "Start/Stop-Enter“ key.

"Cancel" or "Confirm" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/ Stop-Enter“ key.

For safety reasons, the number of start-up attempts is limited to one in the case of marine (PMS) generators.

Fig. 14.5.3.1-3: Autostart



Deadly danger! - The generator can be equipped with an Autostart function. This means that the generator is started by an external signal. In order to prevent an inadvertent start-up, the starter battery must be disconnected before work on the generator may commence.

Warning! Automatic start-up.

The "Autostart" also remains active if the fpControl CP-G is switched off and then on again.

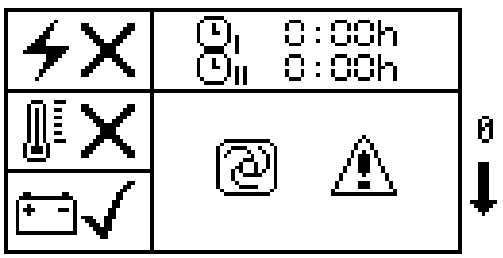
If a fault should arise when the generator is started or is already operating, it is stopped and the Autostart is set to "off".

If the generator is operated by Autostart and is stopped manually, the Autostart is set to "off".

Once the system has been switched off and then on again, the Autostart is active once more.

The first overview page shows if the Autostart is active.

Fig. 14.5.3-4: Overview Page 1 with Autostart



14.5.3.2 Setting the optional water pump/fan DC output of the CP-G

The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

"Operating Mode" or "Follow-up Time" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/Stop-Enter“ key.

The "Back" item returns you to the "Generator" sub-menu.

Select “cancel” or “confirm” by using the "Step-up"/"Step-down" keys and then confirm with the "Start/Stop-Enter“ key.

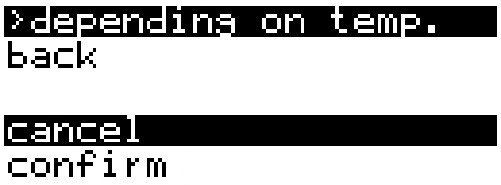
Fig. 14.5.3.2-1: Sub-menu: Optional DC Output

Setting the “Operating mode” for the optional DC output (DP) of the CP-G

An option can be selected by using the "Step-up"/"Step-down" keys and the setting is confirmed with the "Start/Stop-Enter“ key.

"Cancel" or "Confirm" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/Stop-Enter“ key.

Fig. 14.5.3.2-2: Sub-menu: Operating Mode

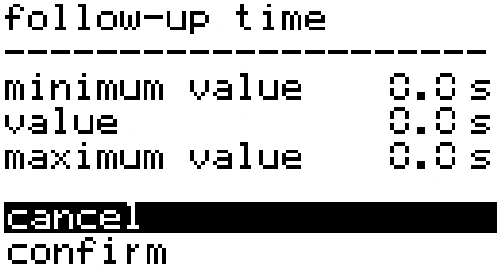


Setting the follow-up time of the optional DP Output of the CP-G

The value is changed by using the "Step-up"/"Step-down" keys and the setting is confirmed with the "Start/Stop-Enter“ key.

"Cancel" or "Confirm" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/Stop-Enter“ key.

Fig. 14.5.3.2-3: Sub-menu: Follow-up Time



14.5.3.3 Switching the switching outputs of the CP-G

The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

Select "Fuel Pump" or "Opt. DC Outputs" by using the "Step-up"/"Step-down" keys and then confirm with the "Start/Stop-Enter“ key.

The "Back" item returns you to the "Generator" sub-menu.

The value of the output can be set to "0" for deactivated or "1" for activated by using the "Step-up"/"Step-down" keys. Confirm with the "Start/Stop-Enter“ key.

Fig. 14.5.3.3-1: Sub-menu: Switching Outputs

14.5.3.4 Reading out the Event Memory of the CP-G

The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

Siehe “Table of Faults” auf Seite 181. Siehe “Description of the symbols” auf Seite 183.

Fig. 14.5.3.4-1: Event Memory

One can scroll through the event memory by using the "Step-up"/"Step-down" keys and then return to the Generator menu with the "Start/Stop-Enter“ key.

By using the QR Code, the relevant fault page of the knowledgebase.fischerpanda.de can be called up via the Internet.

To do so, simply scan the QR Code with a smartphone (Internet connection required).

Note:

14.5.3.5 Resetting all values of the Generator sub-menu to the default values

The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

"Cancel" or "Confirm" can be selected by using the "Step-up"/"Step-down" keys and then confirmed with the "Start/Stop-Enter“ key.

Fig. 14.5.3.5-1: Resetting all values

14.5.3.6 Returning the Main Menu

The menu item is selected by using the "Step-up"/"Step-down" keys and confirmed with the "Start/Stop-Enter“ key. The respective menu item opens.

14.5.4 Resetting the panel language to the default (English)

1. Press and hold the "Step down" key with the panel switched off.
2. Switch on the panel and hold down the "Step down" key until the first overview screen is displayed.
3. The panel language has now been reset. All other settings are retained.

14.5.4.1 How to set the panel language after a reset.

1. Switch on the fpControl Panel CP-G
2. Wait until the first overview screen appears.
3. Scroll to the last overview screen.
4. Press the "Start/Stop-Enter" key to access the menu.
5. Scroll down to the "Panel" menu item.
6. Press the "Start/Stop-Enter" key to access the "Panel" sub-menu.
7. Scroll down to the "Choose language" menu item.
8. Press the Start/Stop-Enter key to access the "Language Selection" sub-menu.
9. Scroll to the desired language and confirm with the "Start/Stop-Enter" key.
10. Scroll down to the "confirm" menu item and press the "Start/Stop-Enter" key.

The menu text is now set to the selected language.

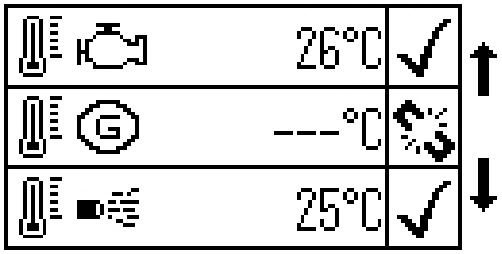
14.6 Faults

14.6.1 Symbols and messages on the display

14.6.1.1 Example of message - "Sensor defective"

A soon as a defective sensor is detected, the fpControl reports this on the display.

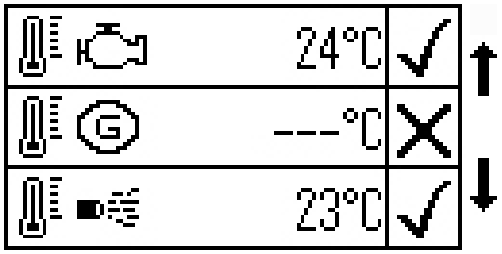
Fig. 14.6.1.1-1: Sensor defective



14.6.1.2 Example of message - "Sensor/Cable break"

If the sensor has failed or the cable is broken, the following report is displayed:

Fig. 14.6.1.2-1: Sensor/Cable break



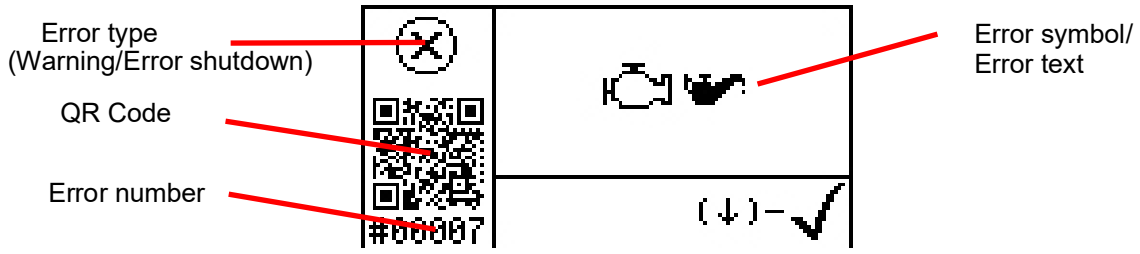
14.6.2 Error code

An error code is displayed if a parameter lies beyond its operating limits.

Siehe “Table of Faults” auf Seite 181. Siehe “Description of the symbols” auf Seite 183.

Example: Error No. 7 - Oil pressure too low -Fault led to emergency shutdown

Fig. 14.6.2.0-1: Sub-menu: "Event Memory"



By using the QR Code, the relevant fault page of the knowledgebase.fischerpanda.de can be called up via the Internet.

To do so, simply scan the QR Code with a smartphone (Internet connection required).

Note:

14.6.2.1 Table of Faults

See also the "Faults" chapter in the manual of the generator.

The relevant fault page of the knowledgebase.fischerpanda.de can be called up via the Internet.

(Internet connection required).

Note:

Fig. 14.6-1: Table of faults

No.	Description	Basic
1	AC Voltage L1	AC Voltage L1 is below its lower limit
2	AC Frequency L1	AC Frequency L1 is below its lower limit
5	Emergency-Off	Emergency-off switch is active/has been pressed
7	Oil pressure	Engine oil pressure is below its lower limit
8	Cylinder head temperature	Cylinder head temperature sensor not available/Contact open/Cable break
9	Winding temperature	Winding temperature sensor not available/Contact open/Cable break
10	Exhaust temperature	Exhaust temperature sensor not available/Contact open/Cable break
11	Electronics temperature	Temperature sensor for the electronic system (sensor on the fpControl circuit board) not available/defective
13	Starter motor current	Starter motor not connected/Starter motor defective
14	Glow plug circuit	One or more glow plugs not connected or defective
16	Fuel supply	Fuel valve/fuel pump not connected or defective
17	ETR Stop Solenoid hold	Current at output of the ETR hold coil is below the lower limit
18	ETR Stop Solenoid pull	Current at output of the ETR pull coil is below the lower limit
19	Water pump/Fan	Fan/water pump not connected or defective
20	Current sensor	Current sensor not available/Contact open/Cable break
21	Boost relay current	Boost relay not connected or defective
25	Starter battery voltage	Starter battery voltage too low
26	Engine speed error	Engine speed (r.p.m.) too low
30	AC Voltage L2	AC Voltage L2 is below its lower limit
31	AC Frequency L2	AC Frequency L2 is below its lower limit
34	AC Voltage L3	AC Voltage L3 is below its lower limit
35	AC Frequency L3	AC Frequency L3 is below its lower limit
38	Inverter DC supply	Current at output of the DC supply voltage of the inverter is below the lower limit
39	Universal output 1 (1A)	Electrical load on Universal output 1 is defective/no consumer connected
40	Universal output 2 (5A)	Electrical load on Universal output 2 is defective/no consumer connected
41	AGT DC voltage 1	Battery voltage too low
42	AGT DC current 1	Battery current too low
43	AGT DC voltage 2	Total voltage compared to battery voltage too low
44	AGT DC current 2	Sum of battery and load current too low
45	AGT B6 radiator	Temperature sensor not available/Contact open/Cable break
46	AGT B6 busbar (-)	Temperature sensor not available/Contact open/Cable break
47	AGT B6 busbar (+)	Temperature sensor not available/Contact open/Cable break
62	Fuel temperature	Temperature sensor not available/Contact open/Cable break
63	Fuel level	The fuel level has reached its lower limit
65	AC Voltage L1	AC Voltage L1 is above upper limit
66	AC Frequency L1	AC Frequency L1 is above upper limit
67	AC Current L1	AC Current L1 is above upper limit
68	AC Output L1	AC Output L1 is above upper limit
70	Servomotor current	Servomotor current is above upper limit

No.	Description	Basic
71	Oil pressure	Oil pressure is above upper limit
72	Cylinder head temperature	Temperature of the diesel engine / Cylinder head is above upper limit
73	Winding temperature	Winding temperature is above upper limit
74	Exhaust temperature	Exhaust temperature is above upper limit
75	Electronics temperature	Temperature of electronic system above upper limit
77	Starter motor output	Current at output of starter motor is above upper limit
78	Glow plug circuit	Current at output of the glow plugs is above upper limit
79	Flame-start system	Current at output of flame-start system is above upper limit
80	Fuel supply	Current at output of the fuel valve / fuel pump / DC generator exciter is above upper limit
81	Stop Solenoid hold	Current at output of the hold coil of the stop solenoid is above upper limit
82	Stop Solenoid pull	Current at output of the pull coil of the stop solenoid is above upper limit
83	Water pump/Fan	Current at output of the water pump/fan is above upper limit
84	Current sensor supply	Current at output of the current sensor is above upper limit
85	Boost relay	Boost relay fault
86	Bus current	Current at the CAN bus is above upper limit
89	Starter battery voltage	Starter battery voltage is above upper limit
93	Power output relay	Current at output of load-breaking relay is above upper limit
94	AC Voltage L2	AC Voltage L2 is above upper limit
95	AC Frequency L2	AC Frequency L2 is above upper limit
96	AC Current L2	AC Current L2 is above upper limit
97	AC Output L2	AC Output L2 is above upper limit
98	AC Voltage L3	AC Voltage L3 is above upper limit
99	AC Frequency L3	AC Frequency L3 is above upper limit
100	AC Current L3	AC Current L3 is above upper limit
101	AC Output L3	AC Output L3 is above upper limit
102	Inverter DC supply	Current at output of the DC supply of the inverter is above the upper limit
103	Universal Output 1 (1A)	Current at Universal Output 1 is above upper limit
104	Universal Output 2 (5A)	Current at Universal Output 2 is above upper limit
105	AGT DC Voltage 1	Battery voltage too high
106	AGT DC Current 1	Battery current too high
107	AGT DC Voltage 2	Total voltage compared to battery voltage too high
108	AGT DC Current 2	Sum of battery and load current too high
109	AGT B6 Radiator	Temperature at heat sink of the B6 bridge too high/Sensor error: Short circuit on temperature sensor
110	AGT B6 Busbar (-)	Temperature at busbar (-) of the B6 bridge too high/Sensor error: Short circuit on temperature sensor
111	AGT B6 Busbar (+)	Temperature at busbar (+) of the B6 bridge too high/Sensor error: Short circuit on temperature sensor
126	Fuel temperature	Fuel temperature too high/Sensor error Short circuit on temperature sensor
130	CAN communication interrupted	The panel has lost contact with the control system
131	CAN communication interrupted	The control system has lost contact with the panel
132	Service interval	Service due
133	BUS Module lost (3ph measurement)	Communication with the 3-ph Module interrupted
134	BUS Module lost (DC measurement)	Communication with the AGT Module interrupted
135	Synchronisation error	Problem with synchronisation of the output voltages of generators switched in parallel.
136	External motor controller communication	Communication with the external motor controller (ECU) has been interrupted
137	Air filter	Air filter has generated an error message
138	Diagnostic message (ECU)	Control device of the diesel engine has transmitted a diagnostic warning
139	Synchronisation module communication	Communication with the synchronisation module has been interrupted

No.	Description	Basic
140	Load distribution	Load balancing error
141	Synchronisation deactivated	Synchronisation module deactivated
142	Error message from engine control unit	The diesel engine control unit has generated a Red Stop Lamp Error
148	Rotary field error	The phases are connected in the incorrect sequence
149	Fuel level sensor error	Communication with the fuel level sensor has been interrupted
151	"Watchdog", control system restart	Control system is restarted after a malfunction
152	Temperature Inverter L1	Temperature of L1 of the inverter above upper limit
153	Temperature Inverter L2	Temperature of L2 of the inverter above upper limit
154	Temperature Inverter L3	Temperature of L3 of the inverter above upper limit
155	Temperature Inverter DC intermediate circuit	Temperature of the DC intermediate circuit of the inverter is above upper limit
157	Inverter communication	Communication with the inverter has been interrupted
163	Inverter DC intermediate circuit load	DC intermediate circuit current is above upper limit
164	Inverter DC intermediate circuit voltage	Inverter DC intermediate circuit voltage too high
167	No rev analysis/Monitoring	Simulation of the engine speed for start-up without inverter
245	Factory setting changed	User input in Factory menu
251	Parameter changed in Admin Level	User input in Admin menu

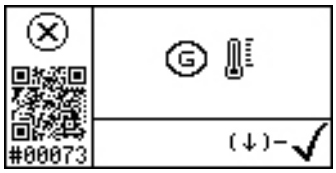
14.6.2.2 Description of the symbols

Fig. 14.6-1: Description of the symbols

Symbol	Description			Symbol	Description	
	WARNING				Current	Generator output
	Error shutdown				Frequency	Generator output
	Faults	No contact			Voltage	Generator output
	Broken	Short circuit			(%)/Load	
	OK				Generator runs	
	AC Voltage				Generator off	
	Run-up phase/Over-ride	Generator start-up			Temperature	
	Standby				Engine	
	Automatic start-up.				Exhaust system	
	Starter battery				Winding	
	Operating hours				Preheating	

Symbol	Description			Symbol	Description	
	Oil pressure				Speed/RPM	
	Self test				Tank gauge %	
	Apparent power				Starter turns	

Example:



Error73: Error shutdown due to winding temperature

14.7 Accessories:

FP Bus Cable (15 m): 34.02.02.131H

Fig. 14.7-1: FP Bus Cable (15 m): 34.02.02.131H

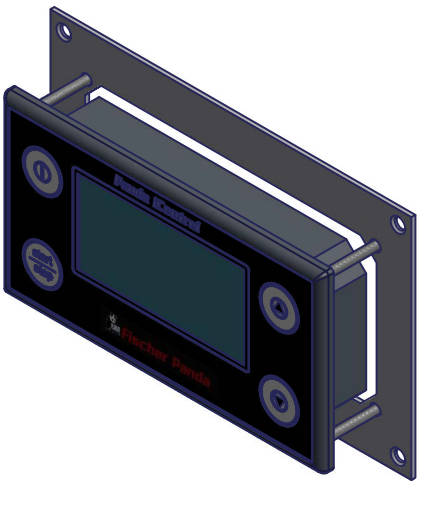
Terminating resistor:34.02.02.133H

Fig. 14.7-2: Terminating resistor:34.02.02.133H

Adapter Frame: 31.03.20.263H

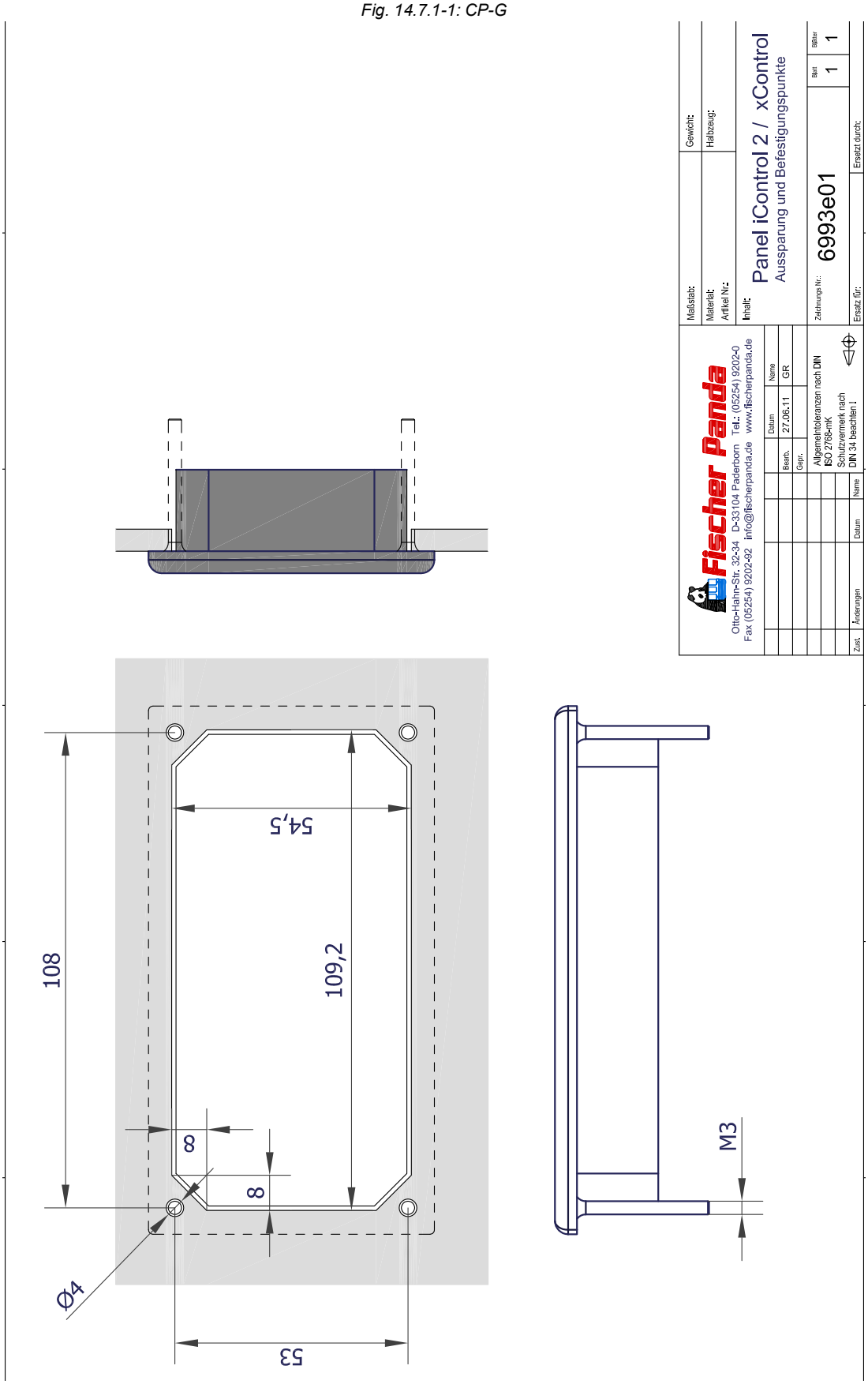
Fig. 14.7-3: Adapter Frame: 31.03.20.263H

xContol CP-G in a Generator Control (P6+) section



14.7.1 Dimensional drawing

Fig. 14.7.1-1: CP-G



Panda VS Hybrid Charger Manual

DC Out: 300 - 520 V_{DC} / Max. 300 A_{DC} / Max. 100 kW

Fischer Panda part number: 0034095

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16. Special instructions and hazards in the case of VS DC generators

16.1 General safety instructions for operating a VS DC generator

Introduction:

The hybrid charger has been developed specifically for use in conjunction with Fischer-Panda VS DC generators and may only be used in conjunction with them. The following safety instructions must be followed when operating VS DC generators:

- High DC current poses a risk of fire due to the incorrect layout of cables and system components.
- High DC current poses a risk of fire due to incorrectly connected or bolted connections.
- High DC current poses a risk of electric arcing in the event of the conductors being interrupted suddenly.
- High DC voltages pose a risk of an electrical shock when live components are touched.

VS DC generators can be operated individually with the fpControl Panel, or they can be integrated with a higher-level control system (power management system) by means of a CAN bus interface.

When operated individually, it is essential that the HV battery is fitted with a main switch or an emergency-off switch in an easily accessible location so that the main switch can be disconnected immediately in case of danger. The main switch must, however, be installed directly on the HV battery; this is only possible if the physical proximity of the system components allows it.

If this location is not accessible, a power relay must be used instead of a manually operated main switch, which can then be operated from different locations, as well, if necessary.

The switches for the power relay shall be labelled accordingly as main switch for the HV DC battery with "Switch off in case of danger!".

If the VS DC generator is integrated with a higher-level power management system then this system must ensure that the generator can be shut down and disconnected from the HV DC BUS in the event of an emergency. In addition, an emergency-off switch should be installed in close proximity to the VS DC generator.

When performing maintenance, it must be possible to ensure that the generator cannot be switched on and that the HV battery can be disconnected permanently from the VS DC generator (compliance with the five safety rules).

With all live systems, special safety precautions must be implemented to protect the components from fire.

16.1.1 “Hybrid Charger” power electronics

VS DC generators have an active DC/boost converter, which converts the AC generator voltage to the desired DC voltage. This power electronic component is the FP hybrid charger.

The hybrid charger is liquid cooled (coolant used for the generator is G30, take note of the manual). Proper cooling of the power electronics is therefore possible only as long as the coolant supply of the generator functions properly.

Circuit breakers and the housing of the power electronics are monitored by temperature sensors. The proper functioning of the power electronics must be tested after a cooling system failure. Should faults arise, the equipment should be repaired by Fischer Panda or sent to Fischer Panda for repair.

The Hybrid Charger has HV intermediate circuit (DC link) capacitors, which store energy even after the device has been shut down. Should the equipment be opened, a check must be made to ensure that there is no voltage in the DC link (by electrician only, wait at least 7 minutes, check that no voltages are present and only then open, comply with the 5 safety rules).

The hybrid charger may only be operated in conjunction with Fischer Panda VS DC generators as the system is designed for each generator. It is not permitted to connect it to other generators or a three-phase network and this may lead to malfunction, destruction of the device, fire or a life-threatening shock.

Generally the hybrid charger is installed directly in the capsule of the VS DC generator. Should this be installed

outside, then the shielded 3 phases of the generator may not be extended. The Hybrid Charger must be installed directly adjacent to the generator.

16.1.2 Short circuit measures

The Hybrid Charger is fused internally for the maximum current of the power electronics. A fuse that is matched to the appropriate cross-section of the connecting cable must be supplied by the customer There is a fire risk if this is not the case.

16.1.3 Fire protection measures

All components in the vicinity of live parts shall be protected against fire.

All connection interfaces on live parts shall be regularly inspected for heat development (infra-red thermometer).

Temperature variations in particular indicate high contact resistance values or bad connections on the hotter contact.

The generator shall be integrated in the fire safety system (where applicable).

16.1.4 Isolation monitoring measures

An isolation monitor or a specific FI switch must be installed on the DC bus as a safeguard against electrical shock.

17. Basics

17.1 Proper use

The Fischer Panda Hybrid Charger is used to convert 3-phase alternating current that is supplied by an appropriate Fischer-Panda VS DC generator.

The HV DC output is designed for connection to a HV DC system with voltage levels that match the product.

The HV DC system can be a HV battery or take the form of integration in HV DC grids. The HV DC system must comply with the safety measures, insulation monitoring, fire prevention and short circuit protection required in this manual.

Any use other than that described above may result in damage to or destruction of this product and/or connected loads such as HV batteries or components in the HV DC on-board electrical system; in addition, this is linked to hazards such as a short circuit, etc. The product as a whole may not be modified or converted and the casing of the plant may not be opened. The safety instructions must be followed without fail.

17.2 Objectives of the manual and declaration of interested parties

This manual serves as the work and operating instructions for the user and operator of Fischer Panda hybrid charger power electronics. The manual should be regarded to be complementary to the manual of the VS DC generators.

The manual serves as a basis and guide for the proper installation and operation of the Fischer Panda hybrid charger. It does not replace professional judgement and design, nor the modification of the installation to comply with local conditions and national/international regulations. All work must be carried out according to the state of the art.

17.2.1 Specialists

Specialists that are considered to be suitable to work on the mechanical components include qualified motor-vehicle mechanics or persons with equivalent qualifications.

Specialists considered to be suitable to work on the electrical systems include qualified electricians, electrical engineering technicians, or persons with equivalent qualifications. An additional qualification as an electrician for high voltage systems in motor vehicles is recommended.

After installation, the specialist must instruct the user regarding the operation and maintenance of the hybrid charger. He/she must point out the hazards that exist to the user.

17.2.2 Users

The user is considered to be the person who is responsible for operating the hybrid charger.

After installation, the user must be instructed regarding the handling and operation of the hybrid charger. This includes, in particular, instruction regarding the hazards that arise while operating, the various operating conditions and training regarding the maintenance of the hybrid charger.

The user must read the entire handbook and must take note of the safety instructions and regulations contained therein.

17.2.3 Operators

The operators are considered to be the persons who have been appointed by the owner/user to handle and operate the hybrid charger.

The owner/user must ensure that the operator has read the manual in full and that the appropriate safety instructions and regulations are complied with. The operator must, in accordance with his/her job description, be trained and made technically competent by the user. This is particularly important in the area of servicing.

EC Declaration of conformity

in accordance with EC Machine Directive 2006/42/EC, Annex II A

Manufacturer	Fischer Panda GmbH Otto-Hahn-Straße 40 33104 Paderborn
Product	Hybrid Charger
Product Type	0034095 Hybrid Charger VS
Year of manufacture	2022-
Function description	The Fischer Panda Hybrid Charger is intended exclusively for direction connection to Fischer Panda VS-DC-Generators as a permanently installed inverter in (motor vehicles, trailers and mobile containers) (inland waterway vessels) (ocean-going vessels).

We hereby declare that the products stated above, on the basis of their design and construction and in the versions that we have brought to market, comply with the fundamental requirements of the following European directives:

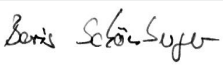
2014/30/EC	Electromagnetic Compatibility Directive
2014/35/EC	Low-voltage Directive
2015/863/EC	Delegated directive regarding the list of substances that are subject to limitations
2011/65/EG	Directive regarding the restriction of the use of certain hazardous substances in electrical and electronic equipment

The product described above complies the basic requirements of the standards listed as follows:

EN 61000-6-1:2007	Electromagnetic Compatibility (EMC) - Part 6-1: Generic standards - Immunity to interference
EN 61000-6-2:2005	Electromagnetic Compatibility (EMC) - Part 6-2: Generic standards - Immunity to interference
EN 61000-6-3:2007	Electromagnetic Compatibility (EMC) - Part 6-3: Generic standards - Emitted interference
EN 55014-1:2017	Electromagnetic Compatibility - Emitted interference
EN 55014-2:2015	Electromagnetic Compatibility - Immunity to interference
EN 62109-1:2011-04	Safety of power converters for use in photovoltaic power systems - Part 1: General requirements

The person authorized to compile the technical file

Sören Hupe
Fischer Panda GmbH
Otto-Hahn-Straße 40
33104 Paderborn

Paderborn, _____25.08.2022_____	
Place, date	Boris Schönberger (General Manager & Technical Director)
Paderborn, _____25.08.2022_____	
Place, date	Roland Ferber (Head of Quality)

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19. The VS Hybrid Charger

19.1 Safety instructions

Electric voltage - LETHAL DANGER! - Improper operation can cause harm to health and result in death.

Electric voltages of more than 60 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: Electrical voltage!

The hybrid charger must not be started up with the cover removed.

All service, maintenance, or repair work may only be carried out on the unit/hybrid charger when the engine is not running.

19.2 Identification plate

1. Type plate on hybrid charger

Fig. 19.2-1: Identification plate

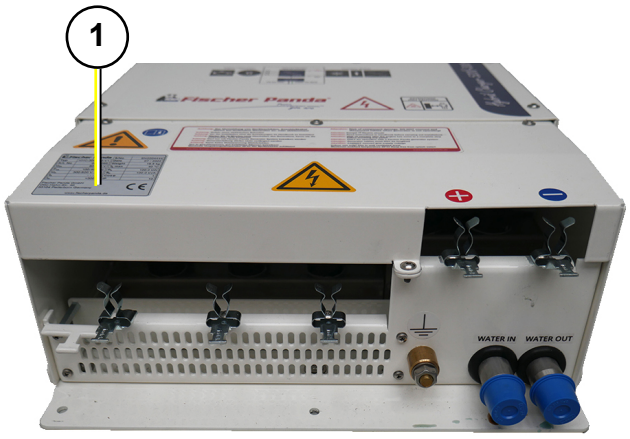
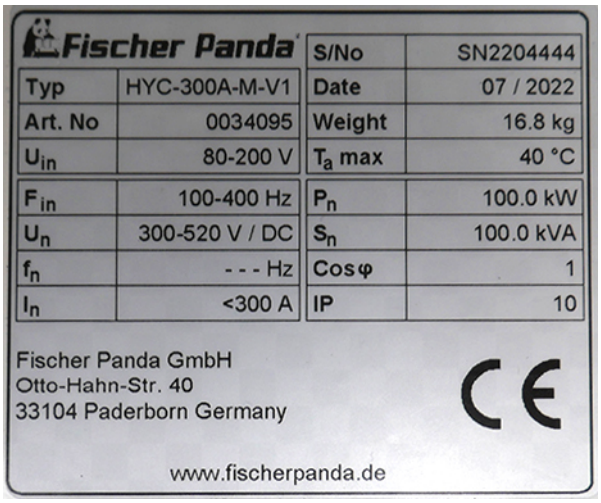


Fig. 19.2-2: Identification plate



19.3 Description of the hybrid charger

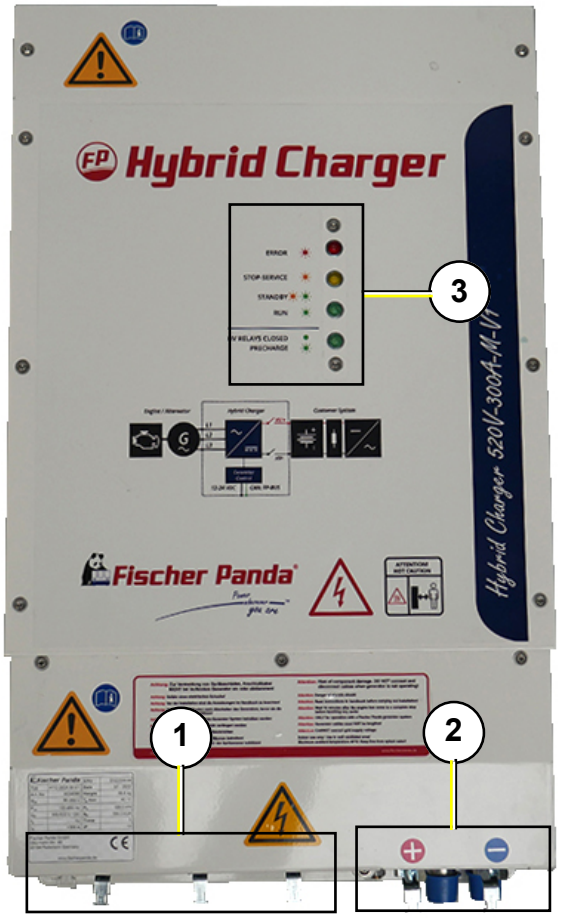
19.3.1 Front

1. Inputs

2. Outputs and coolant connections

3. Status indicators

Fig. 19.3-1: Front of the hybrid charger



19.3.2 Terminal assignment on the hybrid charger

The generator may cause potentially lethal voltages of up to 600 V_{DC} on the hybrid charger. The housing of the hybrid charger may only be opened by trained specialists! LETHAL DANGER!

Attention!

Ensure that there is a permanent electrical connection between the hybrid charger and the generator.

If the DC cable is disconnected while operating, an electrical arc may result!

Attention!

19.3.2.1 Hybrid charger input

The “Power Out” cable and the supply cable of the generator are connected here.

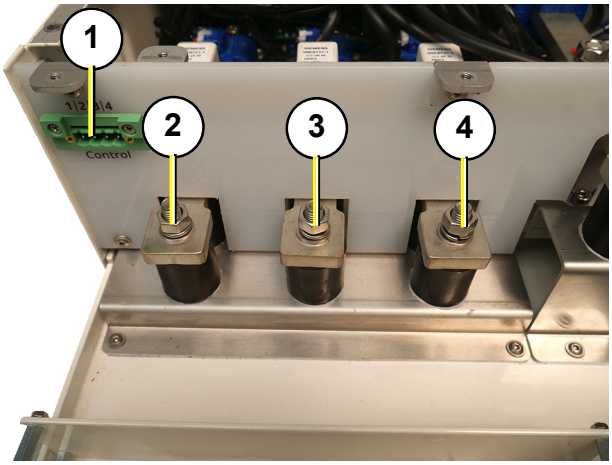
1. Communication line and power supply: 12-24 V_{DC}

2. Line L1

3. Line L2

4. Line L3

Fig. 19.3.2.1-1: Hybrid charger input



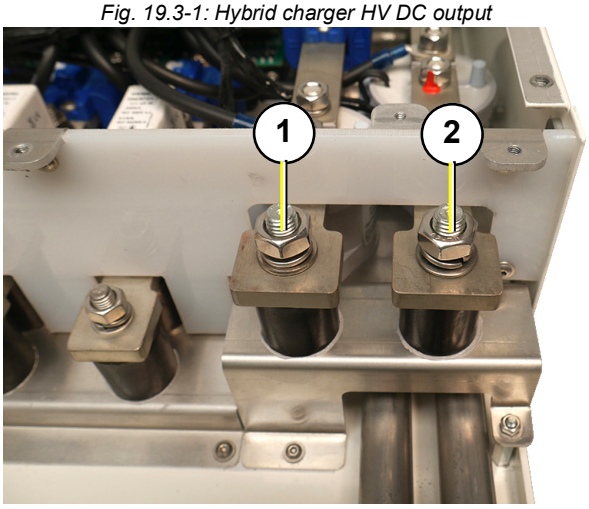
19.3.2.2 Hybrid charger HV DC output and coolant connections

Connection point for HV DC output, customer-end.

1. HV (+) cable

2. HV (-) cable

Fig. 19.3-1: Hybrid charger HV DC output



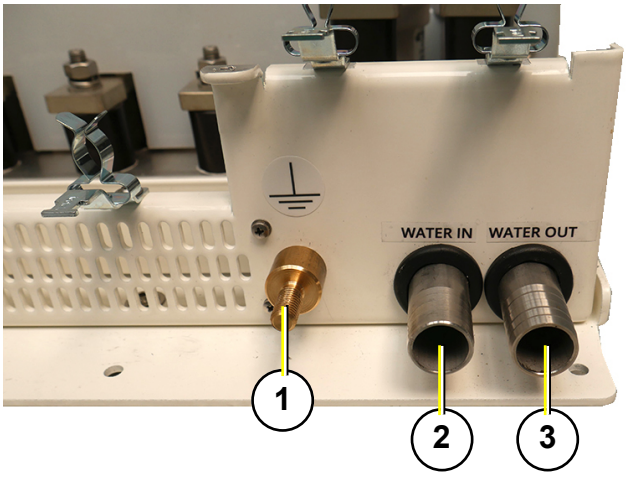
Connection points for the coolant circuit and ground connection.

1. Ground connection

2. Coolant flow from generator

3. Coolant return to generator

Fig. 19.3-2: Hybrid charger coolant connections



19.3.2.3 Status indicator of the hybrid charger

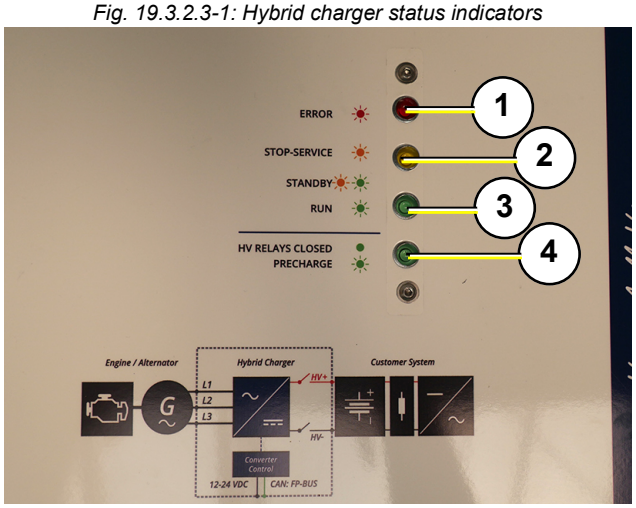
1. Status LED - red

2. Status LED - orange

3. Status LED - green

4. HV DC Relay Status LED - green

Fig. 19.3.2.3-1: Hybrid charger status indicators



20. Installation Instructions

20.1 Personnel

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

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

Attention! Switch off all loads.

20.2 Safety notes regarding this chapter

All connecting cables and instructions regarding the installation are designed and suitable for “standard” installation situations.

Attention! Lay out the system correctly.

As the precise installation and operating situation (e.g. special vehicle shapes, high travelling speeds and special operating conditions, among others) are not known to Fischer Panda, these installation instructions can only serve as a template and example. The installation must be adapted and executed by an appropriate specialist in accordance with the local circumstances and regulations.

Damage arising from an incorrect/ improperly adapted installation/mounting is not covered by the guarantee.

LETHAL DANGER! Improper operation can result in severe personal harm and material damage.

Warning! Automatic start-up

The generator can be equipped with an “Autostart” device. This means that the generator can be started by means of an external signal.

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

Electric voltage - LETHAL DANGER! Improper operation may cause harm to health and result in death.

Attention! Lethal danger - High voltage

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 install the electrical connections of the generator.

To avoid damage to the device, do NOT disconnect the connecting cable when the generator is running!

Attention!

Risk of an electric shock!

Attention!

Wait 10 minutes after switching off the generator before touching the electrical parts!

Attention!

May only be operated with a Fischer Panda generator-system!

Attention!

Generator cables may not be lengthened!

Attention!

The system cannot rectify mains voltage!

Attention!

Operate the system only in well-ventilated rooms.

Maximum ambient temperature 40 °C!

Provide protection against spraying water!

Attention!

20.3 Installation of the Hybrid Charger

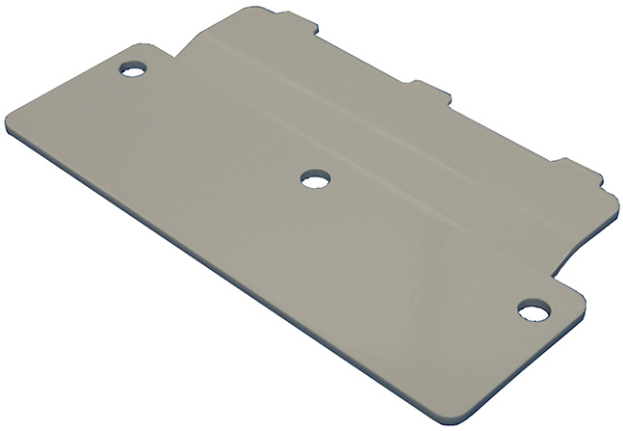
Material required	Mounting plate, hybrid charger, screws

The hybrid charger must be installed vertically so that the electrical connections face downwards and the writing on the housing is legible.

The surface of the wall should be flat and support the conduction of heat. The ventilation slots and holes must remain unobstructed and assure an adequate supply of fresh air and the dissipation of hot air.

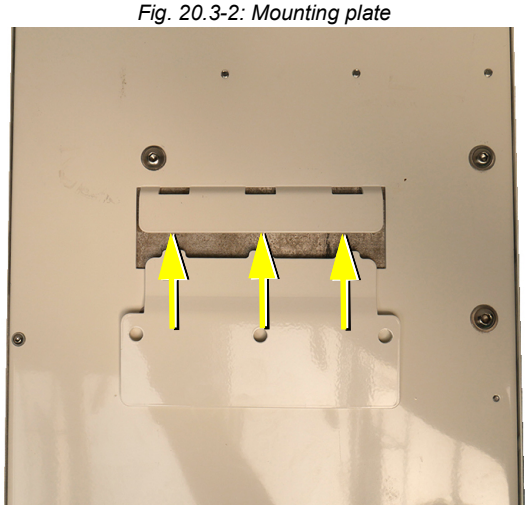
1. The mounting plate must be used for the purposes of installation. This is secured to the wall by means of three screws.

Fig. 20.3-1: Mounting plate



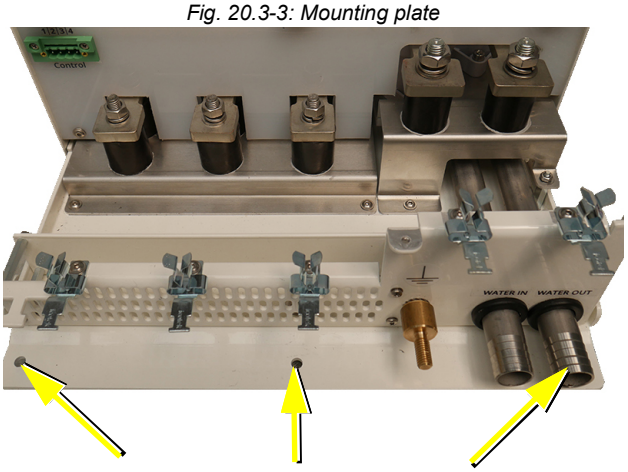
2. The hybrid charger is pushed onto the mounting plate.

Fig. 20.3-2: Mounting plate



3. The hybrid charger is secured to the wall by three further screws.

Fig. 20.3-3: Mounting plate

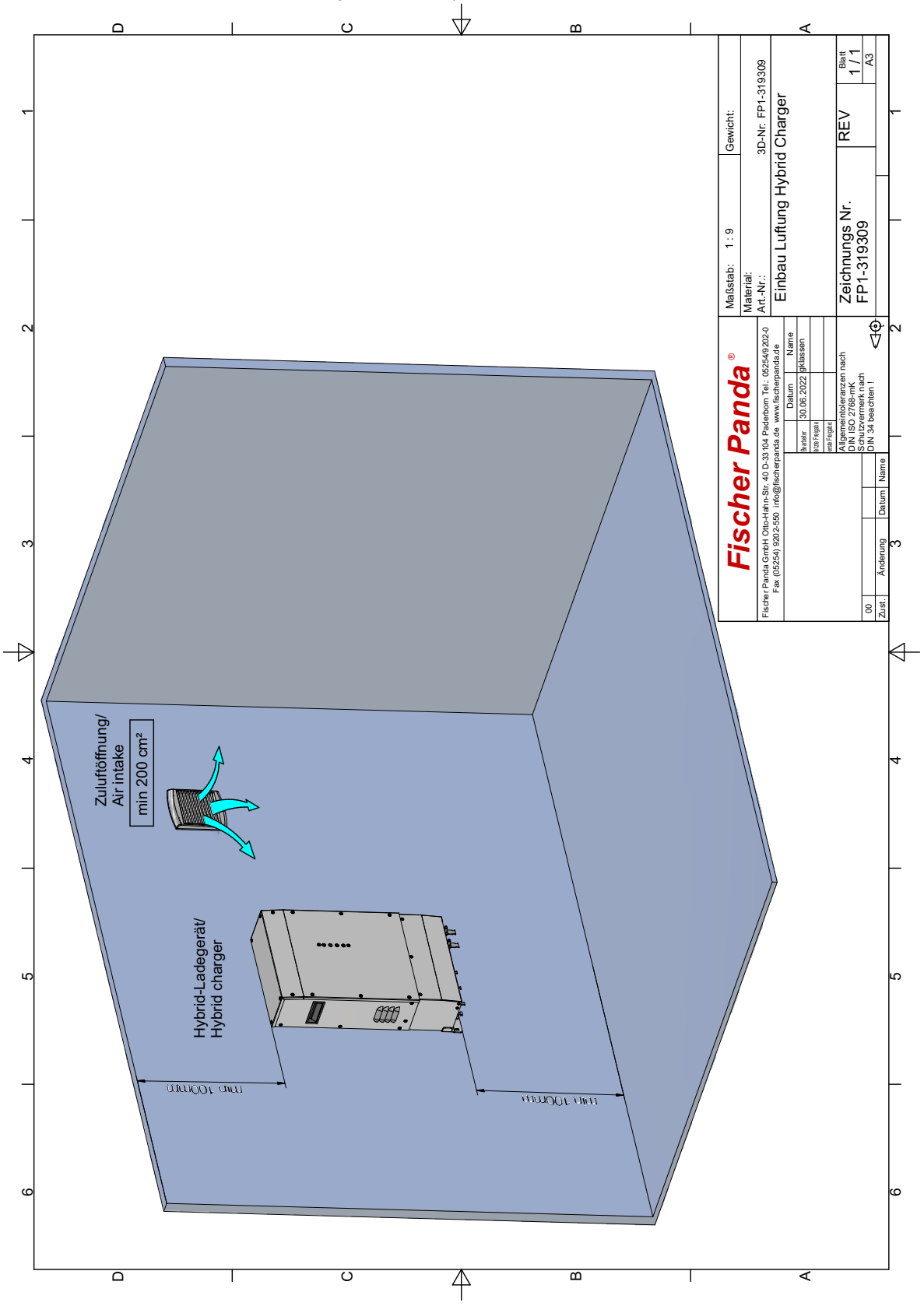


When installing, comply with the safety instructions in the manuals of the generator and hybrid charger.

Important!

Comply with local and national installation regulations. Electrical installations may only be performed by trained specialists.

Fig. 20.3-4: Example of an installation



20.4 Opening the connection cover

Tools needed:	Set of Allen keys

The housing should only be opened by specially trained technical personnel or by authorised workshops (Fischer Panda Service Points).

1. Loosen the four Allen screws by means of a 2.5 mm Allen key and remove the cover.

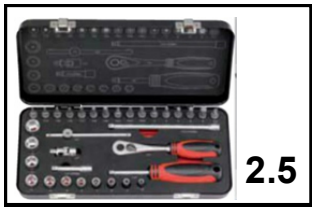


Fig. 20.4-1: Connection cover

20.5 Installing the cooling system

20.5.1 Integrating the hybrid charger with the cooling system

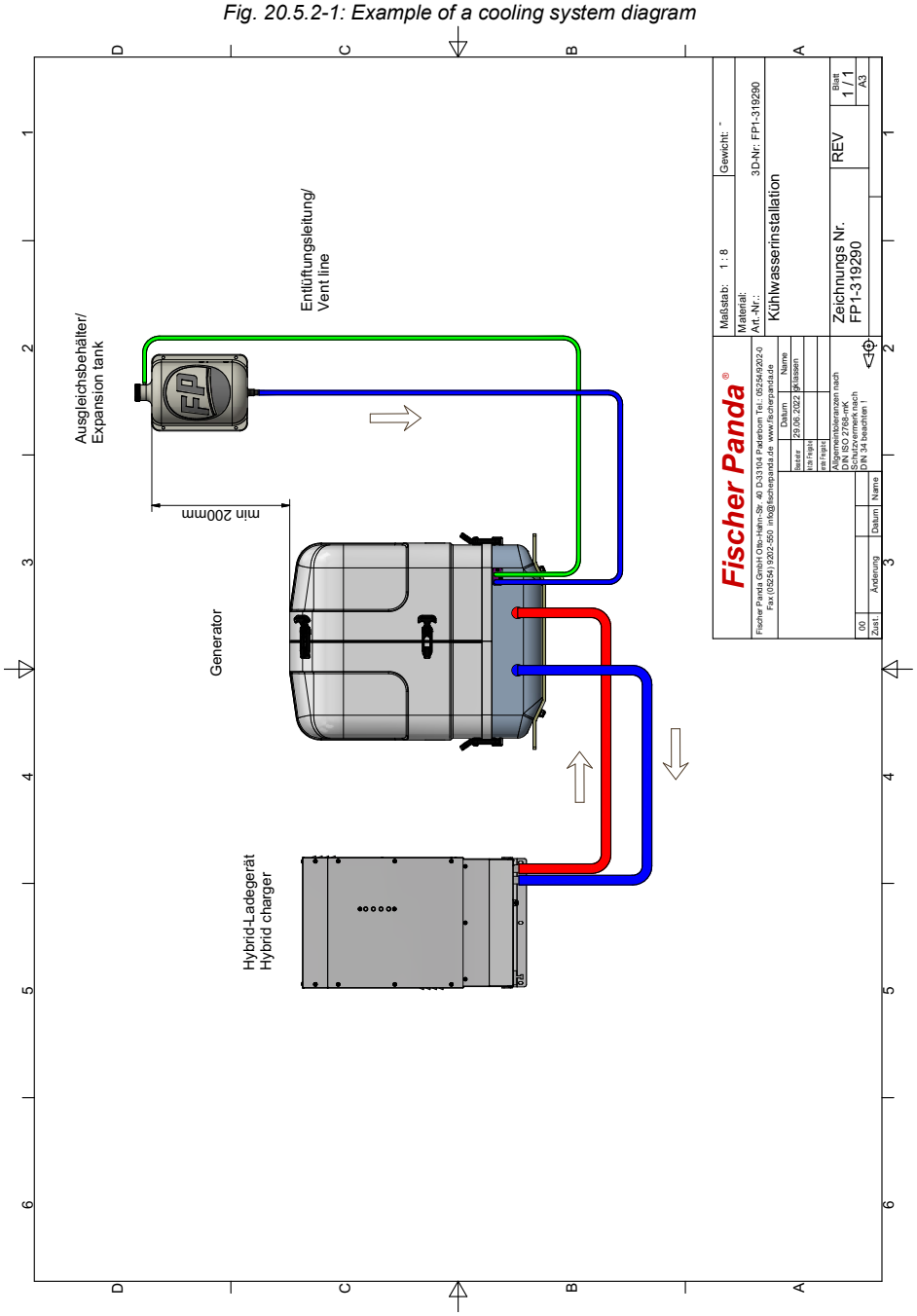
The liquid cooled hybrid charger requires its own coolant circuit. The cooling circuit of the hybrid charger requires its own electrical coolant pump, which is installed in the generator.

20.5.2 Hosing

Tools needed:	Set of screwdrivers
Material required	Coolant flow and return lines, hose clamps

The hose diameter is 20 mm. The length of the hose is 4 - 5 m.

Fig. 20.5.2-1: Example of a cooling system diagram

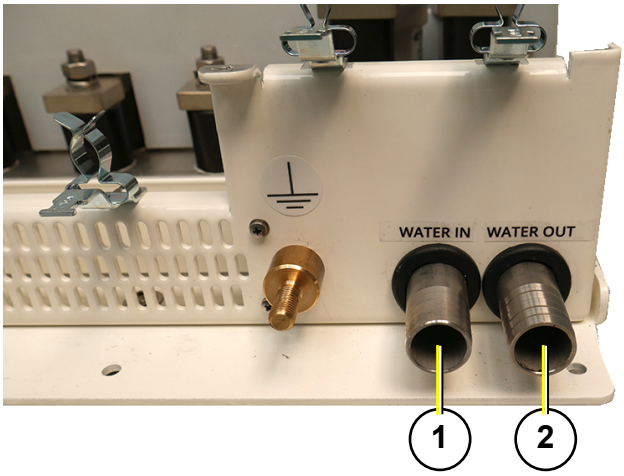


Connect the flow and return lines to the hybrid charger and secure the lines with hose clamps.

1. Coolant flow from generator

2. Coolant return to generator.

Fig. 20.5.2-2: Hybrid charger coolant connections



20.6 Electrical installation

The electrical connections may only be set up by an electrician. National regulations and the safety instructions in the manuals of the generator and hybrid charger must be complied with.

Important!

Always shorten excess connecting cable to the correct length; do not coil.

Rolls of cables act as coils.

Attention

20.6.1 Cable lengths and cross-sections

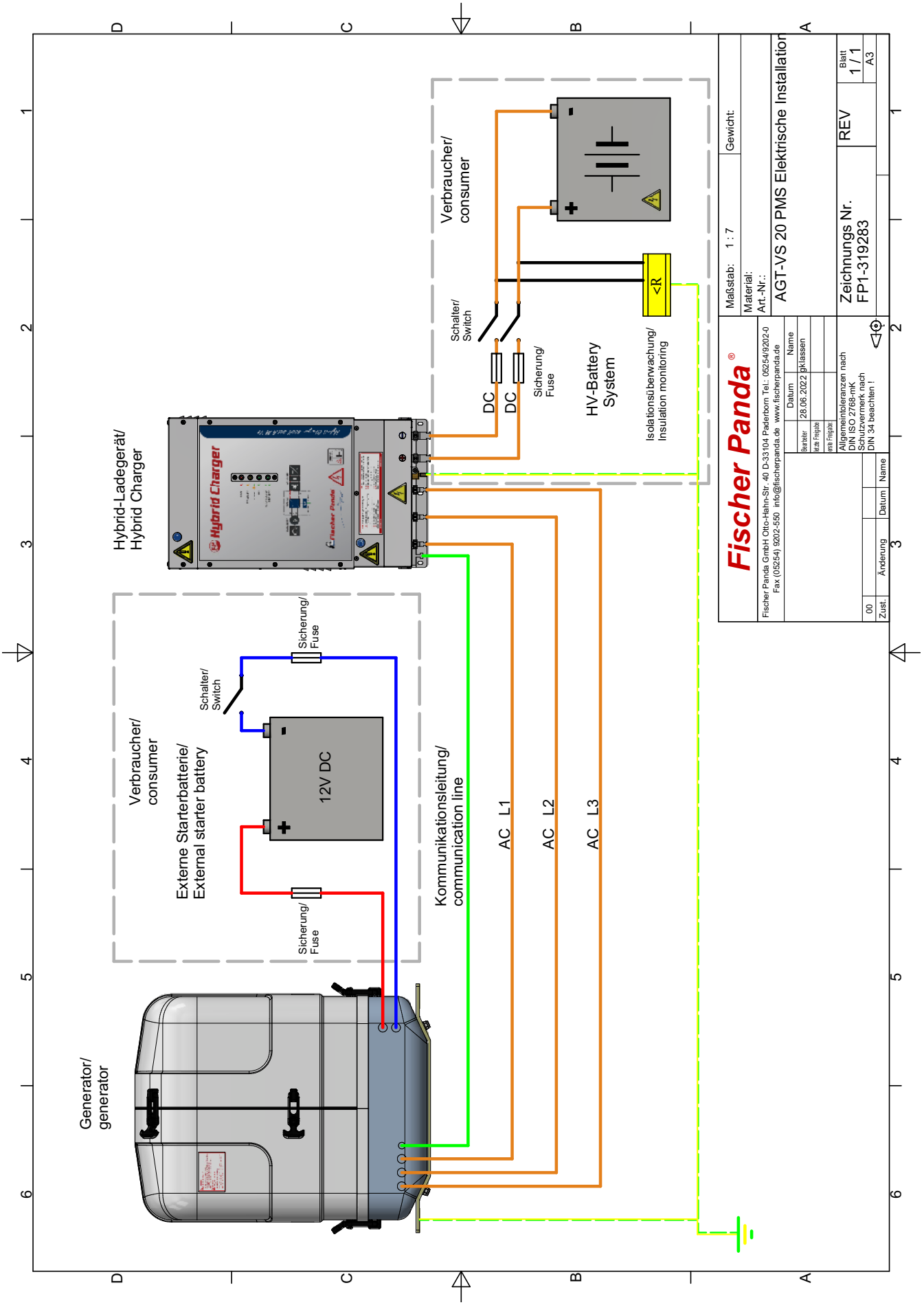
The cross-section of the cable at the L1/L2/L3 input-end depends on the type of generator. The length of cable is 3.5 - 4 m as supplied. If this must be shortened, the screen must be applied properly. Lengthening of the cable is not permitted.

The cable length and cross-section on the HV DC output-side of the hybrid charger as well as protection, battery isolation and isolation monitoring must be determined by the customer/installer.

The cable length and cross-section on the starter battery as well as protection and battery isolation must be determined by the customer/installer.

National regulations must be complied with. The cable length and cross-section depend on the voltage drop. The voltage drop in the cable may not exceed 2.5 % of the nominal voltage.

Fig. 20.6-1: Example of an electrical installation



20.6.2 Installing the inputs

Tools needed:	Set of spanners
Material required	Cables L1, L2 and L3, Communication line, cable ties

1. Loosen the nut with a 13 mm spanner.

2. Connect Line (cable) L1 from the generator and re-tighten the nut. The screen must be placed in the appropriate clamp and strain relief must be assured by means of cable ties.

Attention! Torque 24.93 Nm

Same procedure for Line (cable) L2 and L3.

The communication cable coming from the generator is connected here (1). The strain relief must be attached by means of cable ties in the loops provided.

Fig. 20.6.2-1: Inputs

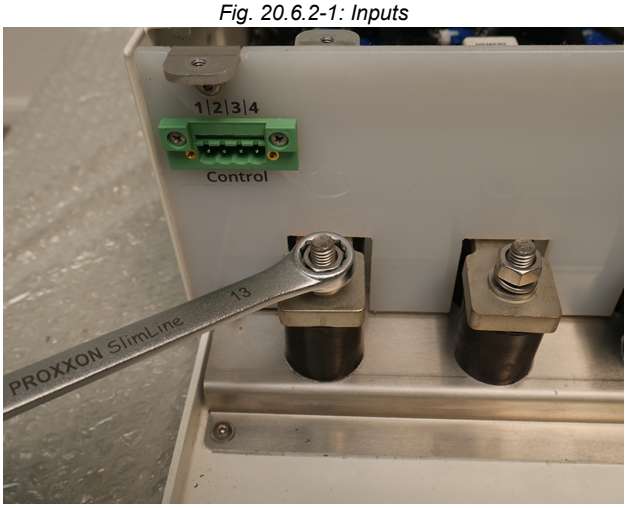
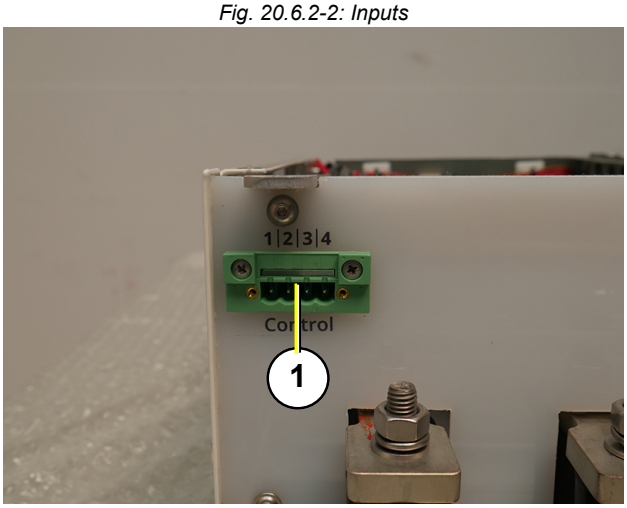


Fig. 20.6.2-2: Inputs



20.6.3 Installing the outputs

Tools needed:	Set of spanners
Material required	(+) and (-) cables, communication line

1. Loosen the nut with a 17 mm spanner.

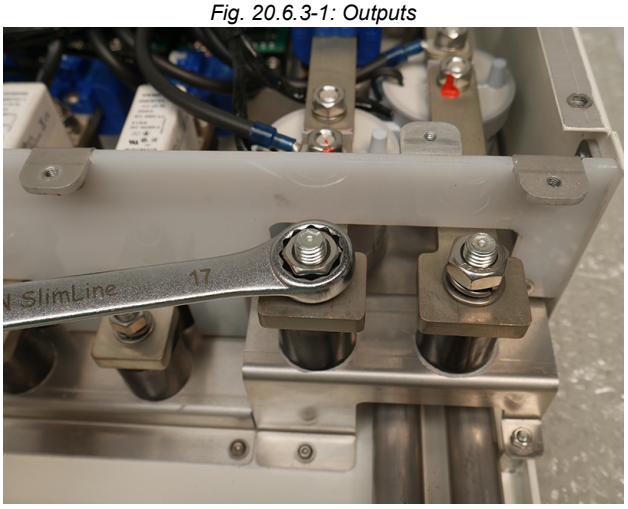
2. Connect the HV(+) cable and re-tighten the nut. A screen must be placed in the appropriate clamp and strain relief must be assured by means of cable ties.

Attention! Torque 49 Nm

Follow the same procedure with the HV(-) cable.

Kindly take note! The cable length and cross-section on the output-side of the hybrid charger as well as protection, battery isolation and isolation monitoring must be determined by the customer/installer.

Fig. 20.6.3-1: Outputs



20.6.4 Installation of grounding

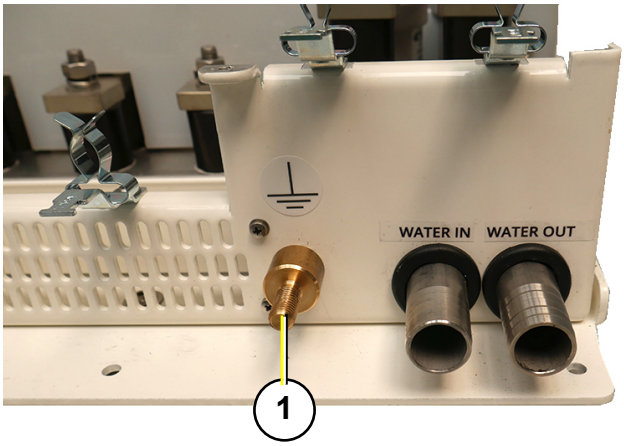
Tools needed:	Set of spanners
Material required	Ground cable

Connect the grounding cable here (1).

Attention! Torque 24.93 Nm

Kindly take note! The cable length and cross-section of the grounding cable must be determined by the customer/installer.

Fig. 20.6.4-1: Grounding connection



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21. Operating instructions

21.1 Personnel

The generator may only be started up by authorised and instructed personnel. The operator shall read the manual in its entirety before starting up the equipment and shall familiarise themselves with the hazards and safety precautions. This applies to both the generator itself and external equipment, attachment parts, and auxiliary units.

21.2 Safety notes regarding this chapter

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

Note!

LETHAL DANGER! Improper operation can result in severe personal harm and material damage.

The generator can be equipped with an “Autostart” device. This means that the generator can be started by means of an external signal.

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

Warning! Automatic start-up

Rotating parts! Improper operation can result in severe personal harm and material damage.

The generator must not be operated with the cover removed.

If operation with the cover removed is necessary during a test run, particular caution is required. Never perform these tasks when alone!

Caution! Danger to life and limb

Electric voltage - LETHAL DANGER! Improper operation may cause harm to health and result in 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.

Attention! Lethal danger - High voltage

To avoid damage to the device, do NOT disconnect the connecting cable when the generator is running!

Attention!

Risk of an electric shock!

Attention!

Wait 10 minutes after switching off the generator before touching the electrical parts!

Attention!

May only be operated with a Fischer Panda generator-system!

Attention!

Generator cables may not be lengthened!

Attention!

The system cannot rectify mains voltage!

Attention!

Operate only in closed, well-ventilated rooms.

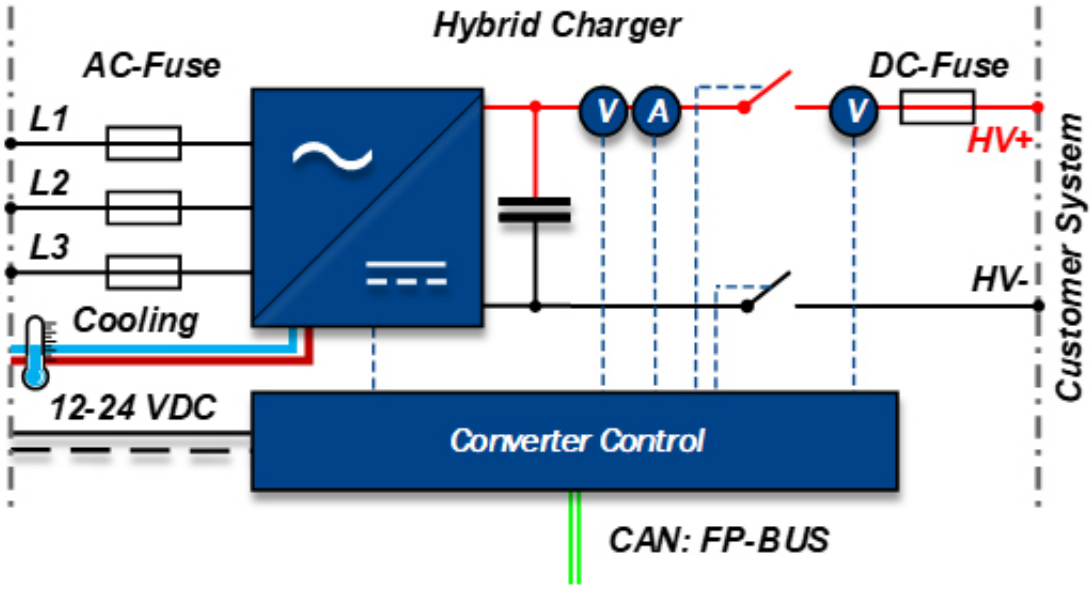
Maximum ambient temperature 40 °C!

Provide protection against spraying water!

Attention!

21.3 Operating modes

Fig. 21.3-1: Hybrid charger power electronics



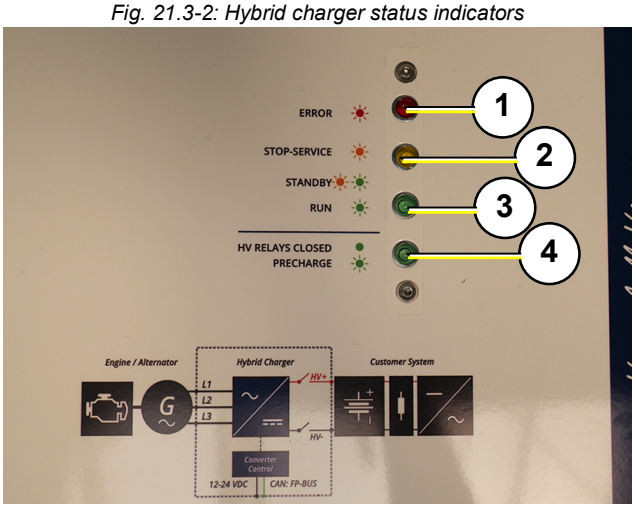
In normal use, the converter is switched on and off by the generator control system.

Based on the generator states, the states are run through on the CAN bus automatically.

The generator control system switches the power supply to the converter off automatically in the event of a fault.

Should this not be the case, the red LED flashes continuously. The converter can only be reset by a fresh start.

Fig. 21.3-2: Hybrid charger status indicators



The converter has three LEDs that indicate the operating state and one LED that indicates the status of the HV DC relay.

Status LEDs (red (1), yellow (2) and green (3))

LED	Status	Meaning	Description
red	flashing	ERROR	- The converter control system is active. - Control of the PWM and IGBT is not active. - The converter controller is switched off. - The HV DC relays are not switched on (2 pole disconnection). - No values such as speed, voltage, power, etc. are transmitted from the converter on the CAN bus. - The converter may be configured in this mode; the values may be applied when transitioning to Standby mode.

LED	Status	Meaning	Description
yellow	flashing	STOP/SERVICE	- The converter control system is active. - Control of the PWM and IGBT is not active. - The converter controller is switched off. - The HV DC relays are not switched on (2 pole disconnection). - **No** values such as speed, voltage, power, etc. are transmitted from the converter on the CAN bus. - The converter may be configured in this mode; the values may be applied when transitioning to Standby mode.
yellow/green	simultaneous flashing	STANDBY	- The converter control system is active. - Control of the PWM and IGBT is not active. - Regulator of the converter is already running at “idle”. - The HV DC relays are not switched on (2 pole disconnection). - Values such as speed, voltage, power, etc. are transmitted from the converter on the CAN bus. - The converter may be configured in this mode; the values are applied only when next transitioning from Stop/Service to Standby mode.
green	flashing	RUN	- The converter control system is active. - Control of the PWM and IGBT is active. - The converter controller functions normally. - The HV(-) relay is switched on immediately; as soon as all connection conditions are fulfilled the HV(+) relay is connected in accordance with the set operating mode. - Values such as speed, voltage, power, etc. are transmitted from the converter on the CAN bus. - The converter may be configured in this mode; the values are applied only when next transitioning from Stop/Service to Standby mode.

HV DC Relay Status LED -(green (4))

Status	Meaning	Description
on	HV DC relay closed	- HV(+) relay and HV(-) relay are closed/switched on. The converter is connected to the battery/DC bus.
flashing	STOP/SERVICE	- HV(+) relay is open/not activated, HV(-) relay is closed/switched on. - Depending on the operating mode, the converter attempts to pre-charge the internal intermediate circuit to the battery/DC bus voltage in order to then connect itself.
off	HV DC relay open	- HV(+) relay and HV(-) relay should be open / not triggered. The converter should not be connected to the battery/DC bus.  **Attention! The LED only indicates the currently Set status and does replaces the 5 Safety Rules. A defective relay indicator LED or failure of the control chain may result in relays remaining connected.** **Comply with the 5 Safety Rules!**  **Attention! Internal energy accumulators may remain charged for up to 10 minutes even when the battery/DC bus is disconnected.** **Comply with the 5 Safety Rules!**

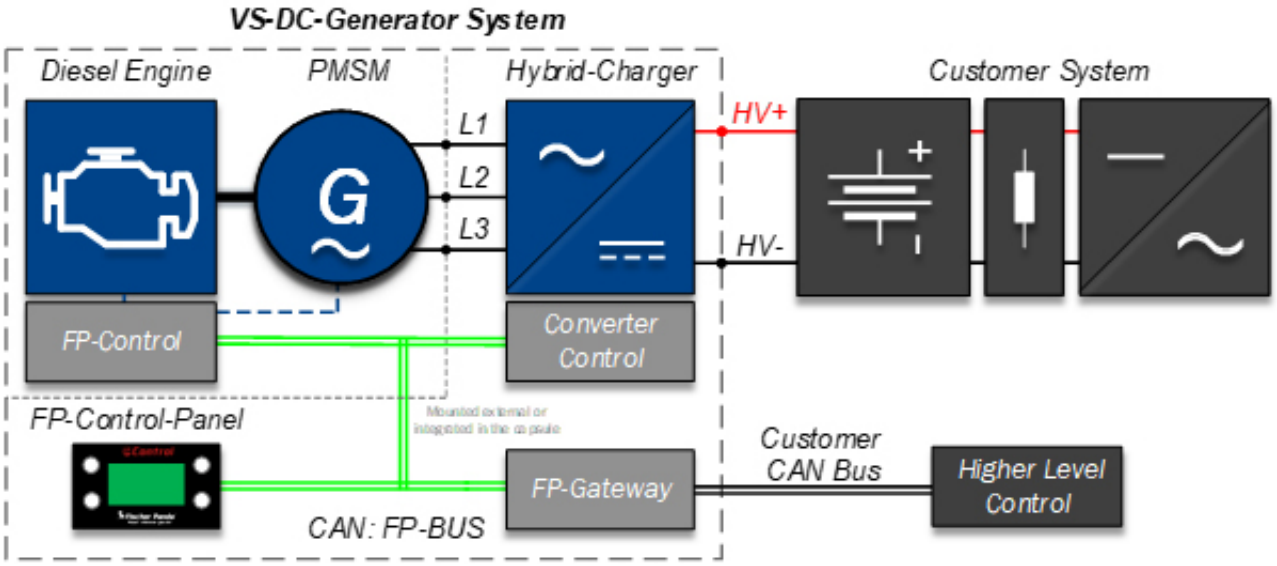
22. Short circuit protection

22.1 VS DC generator

The “Variable-Speed Hybrid DC Generators” of the Fischer Panda VS Series have been developed specifically for the charging of marine batteries and on-board hybrid propulsion. The VS DC Generator System generates DC voltages that are delivered at the HV (High Voltage) outputs of the VS DC Generator System.

Generally, the VS Generator System consists of various components. Firstly, the diesel engine, which converts diesel fuel into mechanical energy. The crankshaft of the diesel engine is mechanically connected to a permanent magnet synchronous electric machine (PMSM). The PMSM (generator) generates three-phase alternating current, the frequency and amplitude of which depend on the engine speed.

Fig. 22.1-1: VS DC generator system



The variable alternating current is converted to a constant direct current that is delivered at the HV DC outputs of the VS DC generator. The HV DC voltages are decoupled from the mechanical, engine speed-dependent frequency and amplitude of the PMSM by the hybrid charger power electronics. The hybrid charger is a device with active boost converter topology. This type of power electronics enables high voltage to be delivered even at low engine speed.

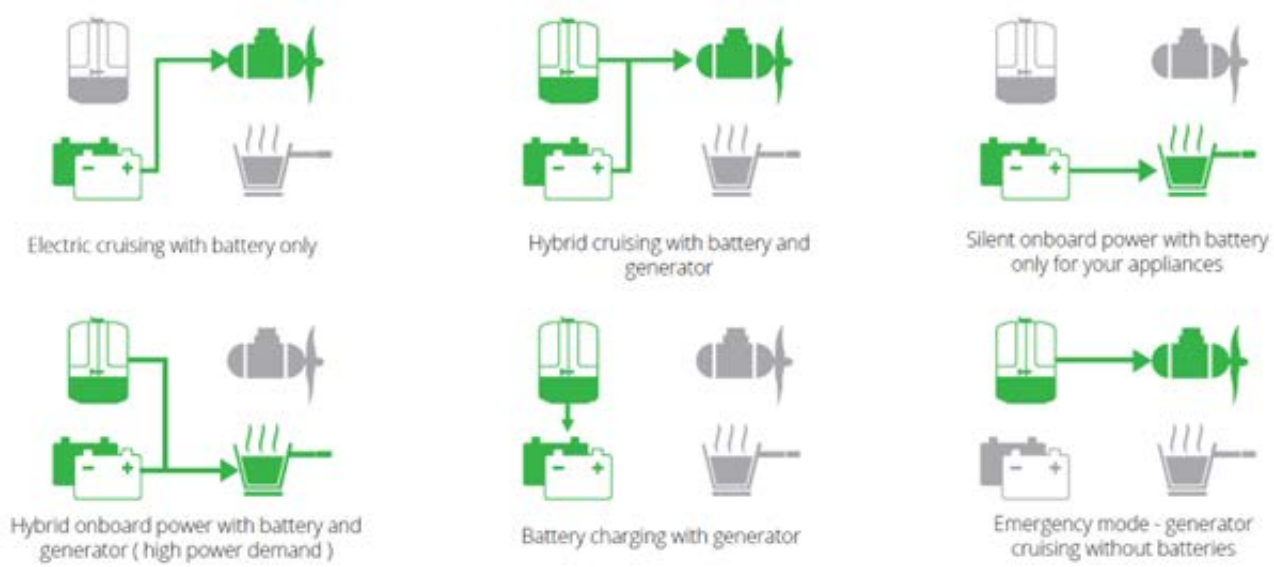
The HV DC outputs of the hybrid charger are also the outputs of the VS DC generator. These HV DC outputs can also be connected directly to a high voltage battery or integrated with the HV DC bus supplied by the customer.

The components of the VS DEC generator are interconnected by means of the CAN-SAE-J1939-based FP bus. The FP bus connects the FP control system that controls the diesel engine, the converter control system that controls the hybrid charger, the FP Control Panel (HMI) and the FP Gateway for integration with higher-level control systems.

The FP control system is the main control component of the VS DC generator. When the system enters sleep mode, the FP Control shuts down all components as the system then requires only minimal µA standby current from the starter battery. A wake-up signal enables the system to be started up by the FP Control Panel or a higher-level control system.

Fischer Panda VS DC generators are designed for use in hybrid electric drive systems or DC on-board electrical systems that are supplied primarily by a battery bank. If additional power is required for battery charging or the electric drive, the VS generator system is switched to the available battery or DC system. Potential situations for integration of the VS DC generator are shown in Fig. 22.1-2, “VS DC generator operation,” on page 218

Fig. 22.1-2: VS DC generator operation



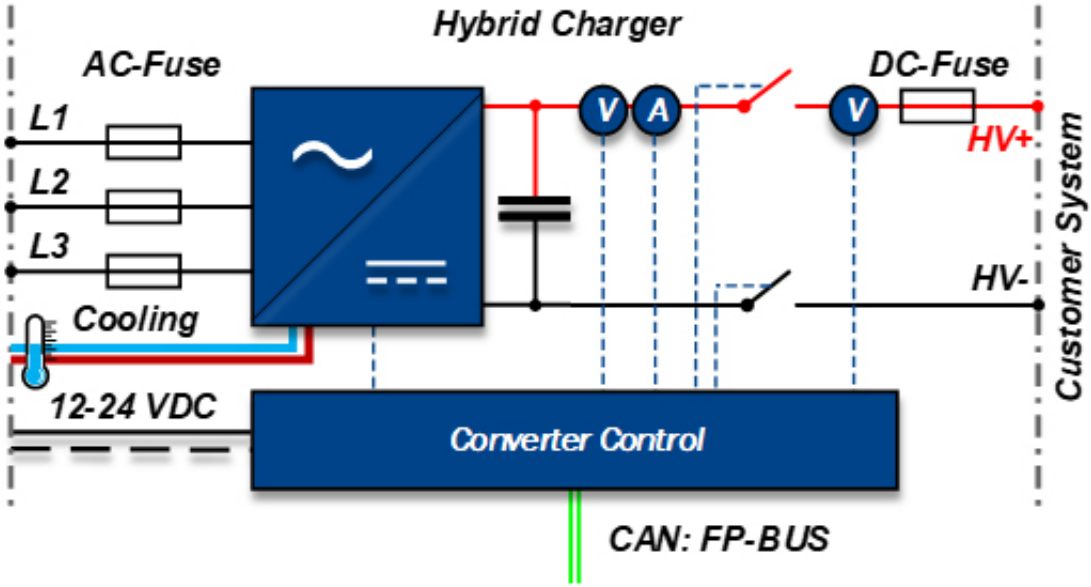
The last shown situation is a special case, when neither a battery nor DC system is present. This mode is only intended for emergency situations, as this mode cannot comply with all regulatory provisions. If this mode of operation is foreseen, then the entire system must be designed for this case. It is possible that additional components will need to be installed in the system supplied by the customer, such as supplementary electrical power storage, brake choppers, pre-charge resistors and insulation monitors. The dynamics of the VS DC generator must be adapted to the dynamics of the DC system and the drive system. A configuration to pre-charge drained intermediate circuit capacitors or to switch to passive loads may be required.

The VS DC generator has a standard configuration for default settings as customer-specific parameters such as DC operating voltage, battery capacity, drive system, passive loads or cable diameter are not known during the manufacturing process. The VS DC generator can be configured manually by means of the FP Control Panel or a higher-level control system via CAN bus.

22.2 Hybrid charger power electronics

The hybrid charger power electronic unit is a fully assembled system component, which may either be installed within the capsule of the VS DC generator system or mounted externally by the customer. The hybrid charger provides a power interface with the customer-supplied system and is described in greater detail in the section below.

Fig. 22.2-1: Hybrid charger power electronics



22.2.1 Hybrid charger interface

Function	Name	Description
AC power In	L1, L2, L3	Three-phase alternating current from the generator
DC power Out	HV+, HV-	DC battery of the DC bus (HV = High Voltage)
Communication	FP bus	CAN-SAE J1939 - FP bus
Supply	12-24 V DC	Starter battery
Cooling	Cooling In, Cooling Out	Fresh water cooling / FP intercooler

22.2.2 Hybrid charger AC fuse

Fuses are installed on the AC input rails of the hybrid charger semiconductor. These fuses are very fast acting and protect the power semiconductor from the effects of a short circuit. Temperature-dependent current derating of the fuse and derating due to skin effect have been taken into account in the design.

22.2.3 Hybrid charger DC fuse

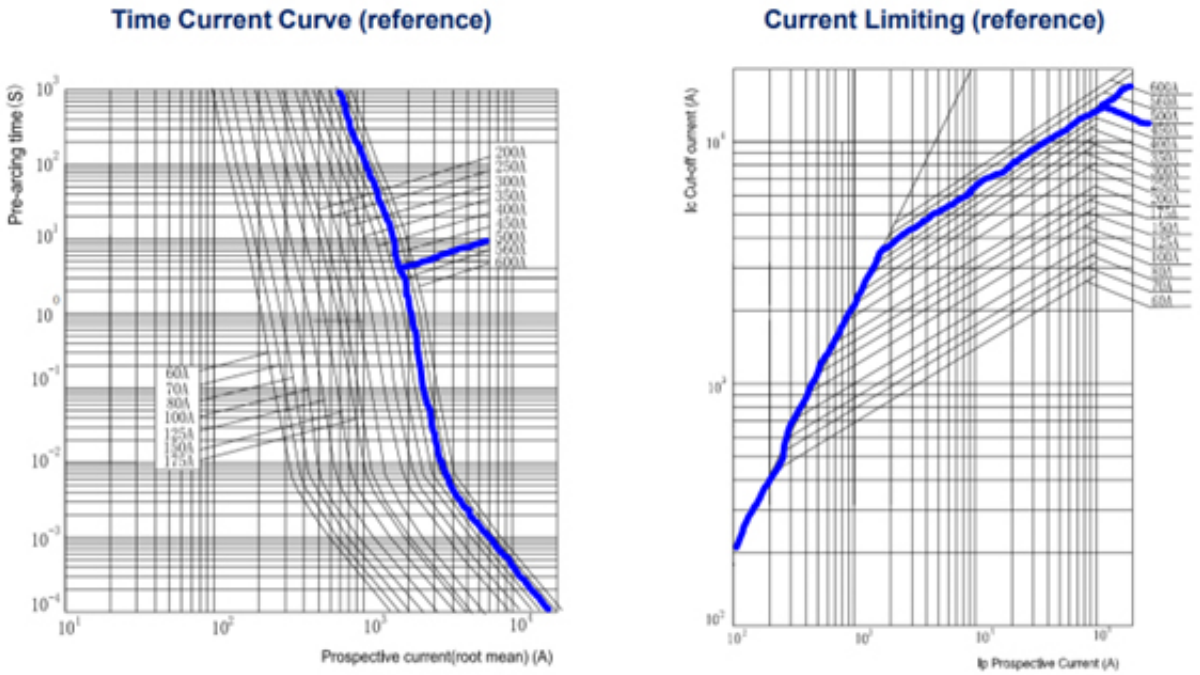
A DC high speed fuse in the hybrid charger is installed in a power rail of the HV DC outputs. This fuse serves primarily to protect the power electronics and the VS DC generator. In the event of defects or short circuits (e.g. defective mains switch) the fuse disconnects the VS DC generator of the customer-supplied battery in order to prevent further damage or fire.

The fuse is designed for the maximum current and voltage of the hybrid charger power electronics. As the hybrid charger is designed for many types of generators in the Fischer Panda VS Series, the rated current may be greater than the rated current of the system.

Example: VS-50 with-520V-300A-M-V1-1 hybrid charger:

The input of the fuse has been designed with a breaking capacity of 800 V DC / 500 A / 50 kA at 700 V DC. Under normal operating conditions, a temperature-dependent current derating of the fuse must be calculated. In the case of the hybrid charger power electronics, this current derating is 8–9 %.

Fig. 22.2.3-1: DC fuse characteristics



22.3 VS DC generator short circuit protection

There are multiple mechanisms that protect the VS DC generator and the customer-supplied system from damage or fire in the event of a short circuit.

22.3.1 Software shutdown

If an internal or external fault is detected on the converter control or FP Control firmware, the system is shut down immediately or remedial measures are taken, insofar as this is possible. The reaction time of the converter control system amounts to some hundred microseconds. If the DC current measured at the HV DC outputs is greater than the maximum system current, the system is shut down and the HV DC relays open after approx. 20 ms.

However, higher short circuit currents may arise due to the internal energy storage of the VS DC generator. The VS DC generator mainly contains two internal energy accumulators that are relevant when considering faults and instances of a short circuit. Firstly, the mechanical energy of the VS generator system. If the VS generator system is shut down immediately, rotational energy is stored in the rotating mass of the engine and PMSM. Secondly, the hybrid charger power electronics contain intermediate circuit (DC link) capacitors that store electrical energy.

22.3.2 Intrinsic safety

The available power output of the VS DC generator system is limited by the physical limits of the diesel energy and the PMSM. In the event of a dead short at the three-phase AC inputs or the HV DC outputs, the diesel engine remains stationary or does not start at all.

22.3.3 Fuse

If the VS DC generator system is supplied with external power and remedial measures implemented by the control system have no effect, then the hardware fuse interrupts the circuit. Another case in which fuses are required is an interruption or short circuit without a low impedance connection.

22.4 Short circuit at the generator AC inputs

If an overcurrent is detected at the three-phase AC inputs by the converter control firmware, normal operation is stopped and all circuit breakers are switched off. Normal operation resumes after a brief delay. If an overcurrent is detected numerous times, the converter control system switches off with an overcurrent fault. An overcurrent at the AC inputs need not always be caused by a short circuit. It is possible that the short circuit may be caused by the PMSM stalling.

If a dead short arises between two or three phases, the diesel engine shuts down or simply does not start. The maximum sustained short circuit is limited by the resistance and inductance of the PMSM. The limit for the sustained short circuit is three times greater than the rated current.

If a partial short circuit arises on the three AC phases, which is not detected by the converter control system, or if the engine does not shut down or remains stopped in the event of a short circuit, then the AC fuse breaks the circuit before further damage or fire can occur.

Current	Time	Condition	Reaction
I AC-Actual > I AC-Max	500 µs	Converter Control active	Software Reset
I AC Actual > 3x I AC Rated	Max. 2 s	Time of max. RPM	Engine standstill or fuse breaks the circuit.

22.5 Short circuit at the HV DC outputs

If a dead short occurs at the HV DC outputs while the VS DC generator is operating, the transient maximum leakage current may reach 20 kA. This current is caused by the voltage of the DC link capacitors. Once the DC link capacitors have been discharged for the first time, further use of boost mode is no longer possible. Thereafter, the voltage is not higher than the commutated short circuit voltage of the PMSM.

The discharge current of the capacitor is limited by the internal resistance and inductance of the power rails, as determined by the design of the power electronics. The engine stops after a brief time, in accordance with the inductive resistance of the PMSM.

Current	Time	Condition	Reaction
I DC Actual > I DC Max	Max. 500 µs	Converter Control active	Software system shutdown
I-DC-Actual > I-DC-Max	Max. 20 ms	Converter Control active or standstill	HV+/HV- relays open
<=20 kA	0-100 µs	The capacitor energy depends on the operating voltage (@max. voltage 520 V)	Current is limited by the fuse, see Fig. 22.2.3-1, “DC fuse characteristics,” on page 220.
>10 kA	>100 µs	20 °C	DC fuse blows in approx. 100 µs
>1 kA	100 µs		DC fuse blowing
> 600 A	Max. 2 s	Time of max. RPM	Engine standstill or DC fuse blowing

22.6 Necessary customer-supplied safety devices

Despite the internal short circuit protection mechanisms of the VS DC generator, safety devices must be provided by the customer to assure safe operation.

22.6.1 Customer-supplied external DC fuse

The internal DC fuse serves to protect the power electronics and the VS DC generator. If the system current deviates from the maximum current of the power electronics, an external fuse is required. The installation of fuses on both HV+ and HV- is recommended. The fuse must match the cross-section of the customer-supplied cable.

22.6.2 Customer-supplied battery isolation

In the event of maintenance or troubleshooting situations, the safe and permanent disconnection of the battery contacts is required. This may take the form of a manual switch or a relay that disconnects the HV+ and HV- from the battery or DC bus permanently.

22.6.3 Customer-supplied generator shutdown facility

In the event of maintenance or troubleshooting situations, it must be ensured that the VS DC generator cannot start up. This may be ensured by means of active emergency shutdown or disconnection of the starter battery.

22.6.4 Customer-supplied isolation monitoring

An isolation monitor is required for operation of the VS DC generator. This isolation monitor is usually integrated with the battery or intermediate circuit systems. If the VS DC generator is operated autonomously, an isolation monitor is required that stops the VS DC generator if an earth leakage is detected.

23. Annex

23.1 Technical data

Type designation	HYC-300A-M-V1
Part number	0034095
Input voltage U_{in} [V]	80 - 200
Input frequency F_{in} [Hz]	100 - 400
Rated voltage U_n [V_{DC}]	300 - 520
Rated frequency [Hz]	-
Rated current [A]	<300
Rated output [kW]	100
Rated apparent power [kVA]	100
Cos Phi	1
IP Protection class	10
Serial number	---------
Year of manufacture	06/2022
Weight [kg]	16.8
Max. ambient temperature	40

23.2 Dimensions

Fig. 23.2-1: Dimensions