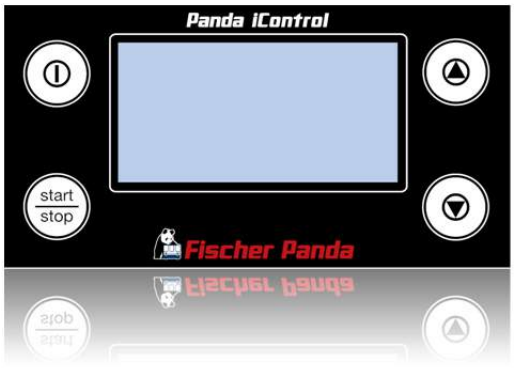
Fischer Panda®

Power wherever you are™



Manual Vehicle Generator

Panda 8000i PVMV-N 230 V - 50 Hz - 8 kVA - 120 V - 60 Hz - 8 kVA

Panda 10000i PVMV-N 230 V - 50 Hz - 10 kVA

Super silent technology

Panda_8000i-10000i_System_PVMV-N_eng.R07.1 16.1.15

Current revision status

	Document
Actual:	Panda_8000i-10000i_System_PVMV-N_eng.R07.1_16.1.15
Replace:	Panda_8000i_System_PVMV-N_eng.R07

Revision	Page
iControl2: „Kontrolltätigkeiten vor dem Start eingefügt“	
Bilderverknüpfungen eingepflegt.	
Jahresupdate R07	
Neues Design R07.1	

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Dear Customer,

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

Installation Approval and Warranty

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

Service and Support

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

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

Product Registration

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

http://www.fischerpanda.de/mypanda

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

Fischer Panda Quality - Tried and Tested

DIN-certified according DIN ISO 9001

Thank you for purchasing a Fischer Panda Generator.

Your Fischer Panda Team

1. General Instructions and Regulations

1.1 Safety first!

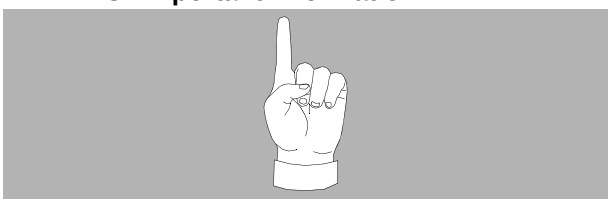
These symbols are used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury of lethal danger during certain maintenance work or operations. Read these instructions carefully.

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

WARNING: Hazardous materials

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

WARNING: Important information!



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

WARNING: Fire hazard

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

PROHIBITED: No smoking

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

PROHIBITED: No fire or naked light

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

PROHIBITED: Do not activate/start up

Touching of the corresponding parts and systems is prohibited.

PROHIBITED: Do not touch

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

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

DANGER: Automatic start-up

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

WARNING: Hazardous electric voltage

General warning of a hazard area

WARNING: General warning

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

WARNING: Danger due to inhalation and/or ingestion

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

WARNING: Risk of electric shock upon contact

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

WARNING: Danger due to rotating parts

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

WARNING: Explosion hazard

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

WARNING: Hot surface

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

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

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

WARNING: System may be pressurised!

Warning of hearing damages.

WARNING: Hearing damage

Warning of magnetic field.

WARNING: Magnetic field

Warning of overpressure.

WARNING: Overpressure

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

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

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

MANDATORY INSTRUCTION: Wear hearing protection (PPE).

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

MANDATORY INSTRUCTION: Wear safety goggles (PPE).

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

MANDATORY INSTRUCTION: Wear protective gloves (PPE).

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

MANDATORY INSTRUCTION: Observe the instructions in the manual.

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

MANDATORY INSTRUCTION: Comply with environmental protection requirements.

1.2 Tools

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

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

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

1.3 Manufacturer declaration in accordance with the Machinery Directive 2006/42/EC

Manufacturer declaration in accordance with the Machinery Directive 2006/42/EC

The generator was designed in such a way that all assemblies correspond with the CE guidelines. If Machinery Directive 2006/42/EC is applied, then it is forbidden to start the generator until it has been ascertained that the system into which the generator is to be integrated also complies with the Machinery Directive 2006/42/EC. This includes the exhaust system, cooling system and electrical installations.

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

1.4 Customer registration and guarantee

Use the advantages of registering your product:

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

Additional advantages:

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

Problems due to installation errors can be recognized in advance.

1.4.1 Technical support

Technical Support via the Internet: info@fischerpanda.de

1.4.2 Caution, important information for start-up!

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

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

1.5 Safety Instructions - Safety First!

1.5.1 Safe operation

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

1.5.2 Observe safety instructions!

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

1.5.3 Personal protective clothing (PPE)

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

Wear appropriate safety and protective clothing during work.

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

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

1.5.4 Cleanliness ensures safety

Keep the generator and its environment clean.

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

1.5.5 Safe handling of fuels and lubricants

Keep fuels and lubricants away from naked fire.

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

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

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

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

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

1.5.6 Exhaust fumes and fire protection

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

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

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

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

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

CALIFORNIA

Proposition 65 Warning

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

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

1.5.7 Safety precautions against burns and battery explosions

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

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

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

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

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

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

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

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

1.5.8 Protect your hands and body from rotating parts!

Always keep the capsule closed while operating the generator.

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

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

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

1.5.9 Anti-freeze and disposal of fluids

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

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

1.5.10 Implementation of safety inspections and maintenance

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

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

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

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

1.6 Warning and instruction signs

Keep warning and instruction signs clean and legible.

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

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

1.6.1 Special instructions and hazards of generators

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

The generator must not be operated with the cover removed.

If the generator is being installed without a sound insulation capsule, it must be ensured that all rotating parts (belt-pulley, belts etc.) are covered and protected so that there is no danger to life and body!

If a sound insulation covering will be produced at the place of installation, then easily visible signs must show that the generator must only be switched on while the capsule is closed.

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

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

1.6.1.1 Protective conductor and potential equalisation:

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

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

1.6.1.2 Protective conductor for Panda AC generators:

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

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

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

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

1.6.1.3 Switch off all loads while working on the generator

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

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

A) The working capacitors

B) The booster capacitors

Both groups are located in a separate AC control box.

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

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

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

1.6.1.4 Potential equalisation for Panda AGT DC generators

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

1.6.1.5 Safety instructions concerning cables

Cable types

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

Cable cross-section

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

Cable installation

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

1.6.2 Recommended starter battery sizes

Use only batteries approved by the manufacturer as starter batteries.

Use the battery capacity recommended by the engine manufacturer.

ATTENTION!

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

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

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

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

ATTENTION!!! Start-up:

Installation of battery connection lines.

Observe the instructions installation guidelines of the battery manufacturer.

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

The battery compartment and the corresponding installation shall be dimensioned adequately.

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

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

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

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

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

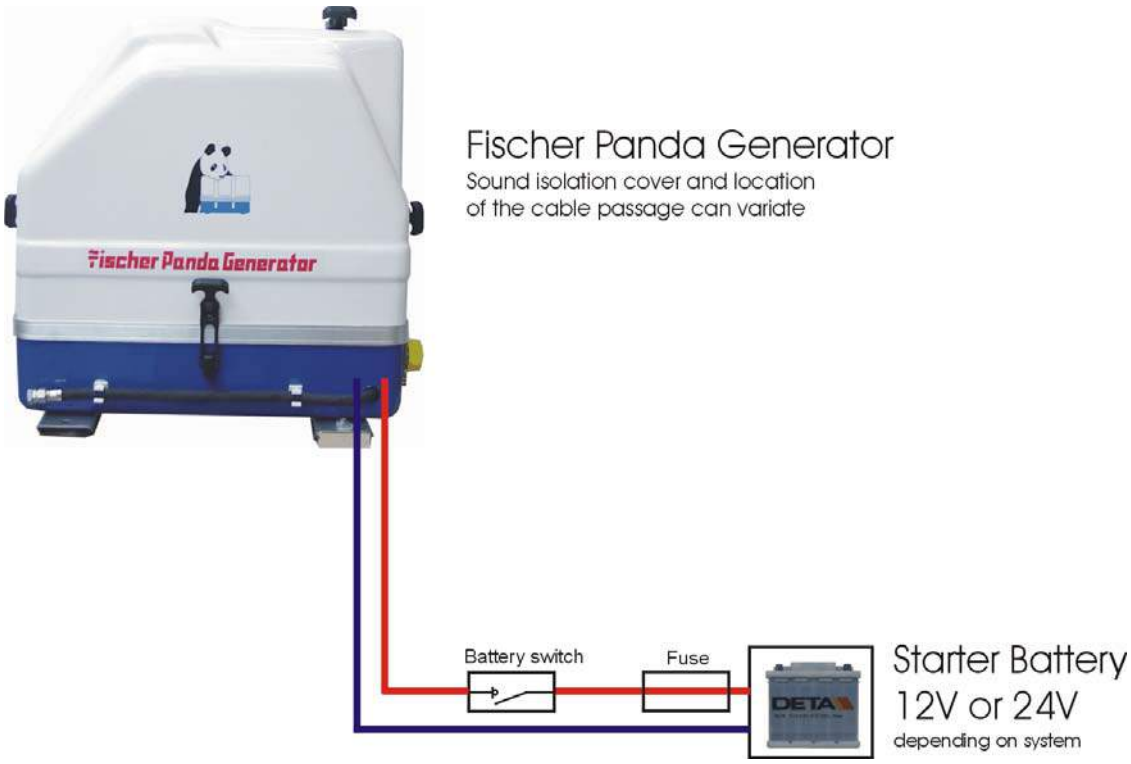
Install the battery cables in such a way that the insulation cannot be removed by chafing or other mechanical stresses.

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

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

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

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



1.6.4 General safety instructions for handling batteries

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

- While you are working on the batteries, a second person should be within earshot to help you if necessary.
- Keep water and soap ready in case battery acid is burning your skin.
- Wear eye protection and protective clothing. Do not touch your eyes while handling batteries.

- If you have acid splashes on the skin or clothing, wash them out with lots of water and soap.
- If acid sprays into your eyes, immediately flush them with clean water until no more burning is felt. Immediately seek medical assistance.
- Do not smoke near the batteries. Avoid naked fire. The area around batteries is a potentially explosive atmosphere.
- Ensure that no tools are dropped on the battery terminals; cover them as necessary.
- Do not wear jewellery or watches on your arms during installation that might short-circuit the battery. Otherwise, there is a risk of skin burns.
- Protect all battery contacts against accidental contact.

- For battery banks: Use only deep cycle batteries. Starter batteries are not suitable. Lead-acid gel batteries are recommended. They are maintenance-free, cycle stable, and do not release gases.
- Never charge a frozen battery.
- Avoid battery short-circuits.

- Ensure proper ventilation of the battery to vent gases that may be released.
- Battery connection terminals must be checked for proper seating before operation.
- Battery connection cables shall be installed with utmost care and shall be checked for excessive heating under load. Check the battery near vibrating components regularly for chafing and insulation defects.

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

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

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

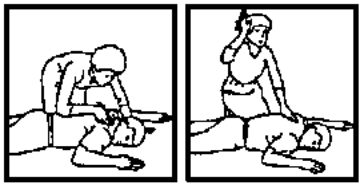
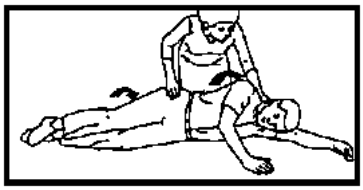
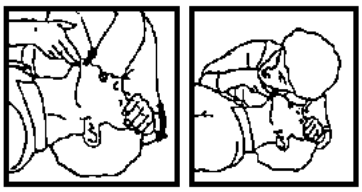


	First Aid in case of accidents by electrical shocks 5 Safety steps to follow if someone is the victim of electrical shock	
1	Do not touch the injured person while the generator is running.	
2	Switch off the generator immediately.	
3	If you cannot switch off the generator, pull, push, or lift the person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

2.1 WHEN AN ADULT STOPS BREATHING

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

Warning:

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

3. Basics

3.1 Intended use of the machine

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

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

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

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

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

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

This manual contains the working instructions and operating guidelines for the owner and user of Fischer Panda generators.

The manual is the base and the guideline for the correct installation and maintenance of Fischer Panda generators. It does not substitute the technical evaluation and should be used as an example guide only. The installation must be undertaken and proved by a suitable qualified/trained person and should be in accordance with the law as required by the country and special situation. All work has to be undertaken according to the state of the technology.

3.2.1 Trained persons

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

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

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

3.2.2 Operator

The operator is responsible for the operation of the generator.

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

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

3.2.3 User

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

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

3.3 Components of the i system

1. Panda i PMS Generator

Permanent-Magnet-Generator

representative picture

Fig. 3.3-1: Panda i generator

2. Panel Panda iControl with electronic board at the generator

representative picture

Fig. 3.3-2: iControl panel

3. Panda PMGi Inverter AC/AC

representative picture

Fig. 3.3-3: PMGi inverter

4. Fischer Panda manual

The Fischer Panda manual comprises the following components:

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

b.- Generator manual

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

d.- Engine manual from the engine manufacturer

e.- Generator circuit diagram

representative picture

Fig. 3.3-4: Manual

3.4 Range of operation

Reliable power supply on sailing boats.

3.5 Panda transport box

3.5.1 Bolted Fischer Panda transport box

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

3.5.2 Fischer Panda transport box with metal tab closure

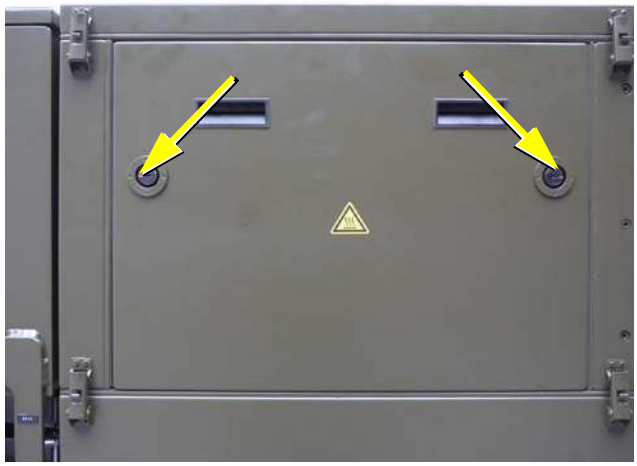
1. Bend up the metal tab closures on the transport box lid

2. Remove the cover
3. Remove the loose
4. Bend open the metal tab closures at the bottom of the transport box
5. Remove the sidewalls
6. Open the generator attachment

3.6 Opening the MPL sound insulation capsule

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

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



Closure locked

Fig. 3.6-2: Closure locked

Closure open

Fig. 3.6-3: Closure open

3.6.1 Opening the GFK sound insulation capsule

GFK sound insulation capsule with lash closures

Fig. 3.6-1: Lash closures

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

Fig. 3.6-2: Lash closures

3.7 Transport and Loading/Unloading

3.7.1 Transporting the generator

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

3.7.2 Loading/unloading of the generator

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

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

Fig. 3.7.2-1: Lifting yoke (example)

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

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

Note:

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

Downtimes are categorised in the following groups:

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

3.8.1 Instructions for the starter battery for extended downtimes

Starter batteries

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

Note: Information starter battery

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

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

Modern starter batteries are typically maintenance-free.

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

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

General limits for lead-acid batteries:

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

1.95 V / cell corresponds with empty battery - recharge.

For a 12 V battery, the following applies:

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

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

For a 24 V battery, the following applies:

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

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

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

Fischer Panda recommends:

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

Note: Starter battery recommendation

3.8.2 Measures for short downtimes

Short downtime (1 to 3 months)

- Measure battery charge status based on open-circuit voltage.
- During downtimes >7 days, disconnect battery (e.g. battery main switch to position 0).
- Check the battery within 2 months and allow the engine to warm up for min. 10 min.
- Fill fuel tank to 100% (level to full).

3.8.3 Measures for medium term downtimes / hibernation

Medium term downtimes (3 to 6 months)

3.8.3.1 Courses for preservation:

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

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

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

Crank engine without start.

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

Cover alternator apertures. **Attention!**

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

- Clean engine as per manufacturer's instructions.
- Spray engine parts and V-belt disks with preservative.
- Clean air filter housing and spray with preservative (metal housing only).
- Close off intake and exhaust apertures (e.g. with tape or end caps).

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

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

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

3.8.4 Measures for extended downtimes / decommissioning

Downtimes (more than 6 months)

3.8.4.1 Courses for preservation:

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

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

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

Crank engine without start.

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

Cover alternator apertures. **Attention!**

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

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

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

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

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

- Check battery charge status and recharge if necessary. Observe instructions of the battery manufacturer.

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

Fischer Panda recommends:

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

Note:

4. The Panda Generator

4.1 Type plate at the Generator

Fig. 4.1-1: Type plate

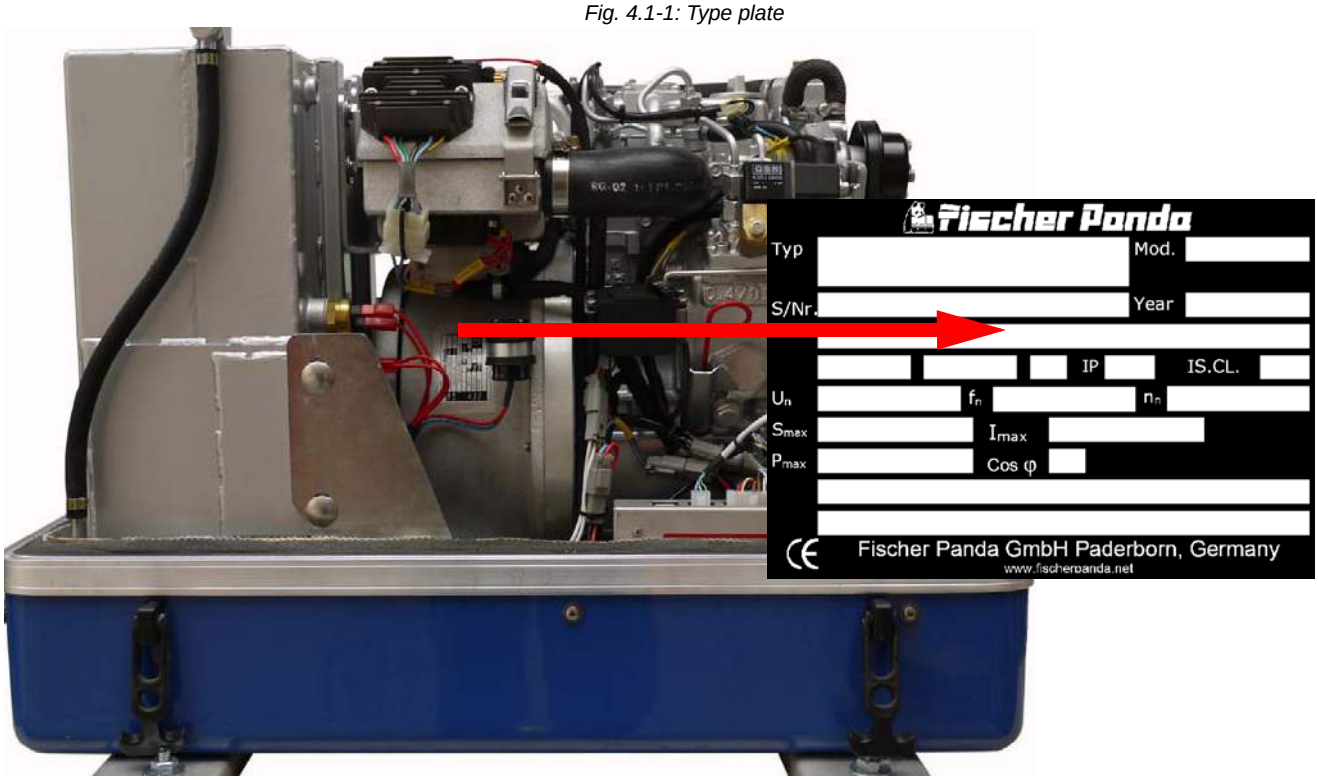
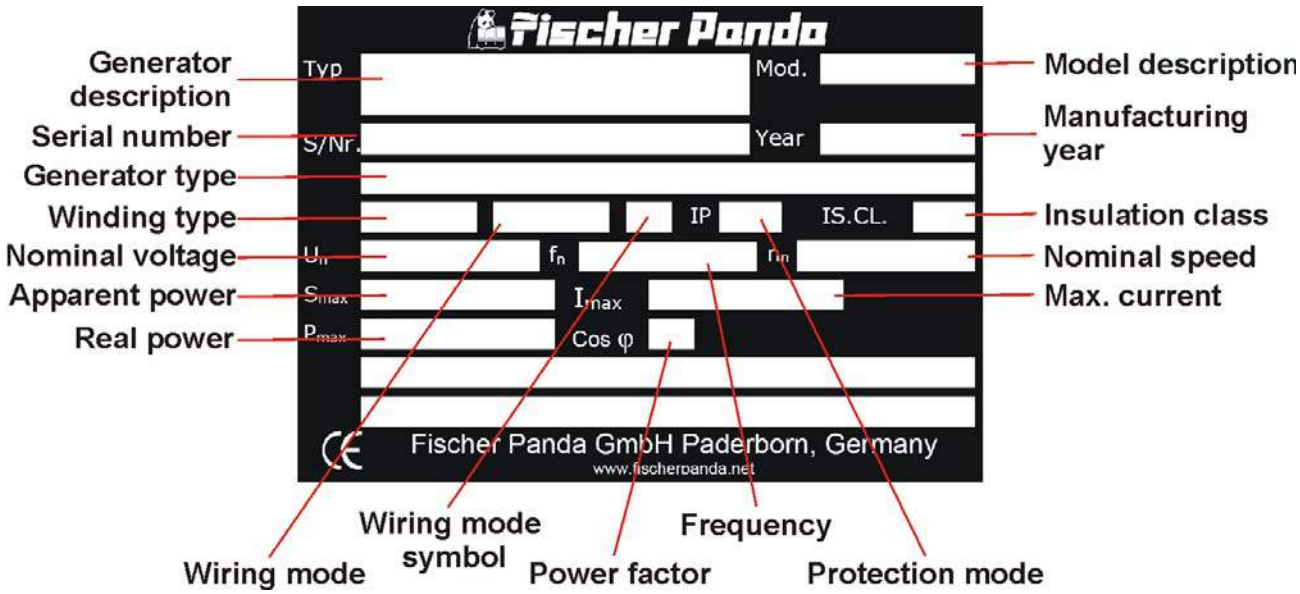


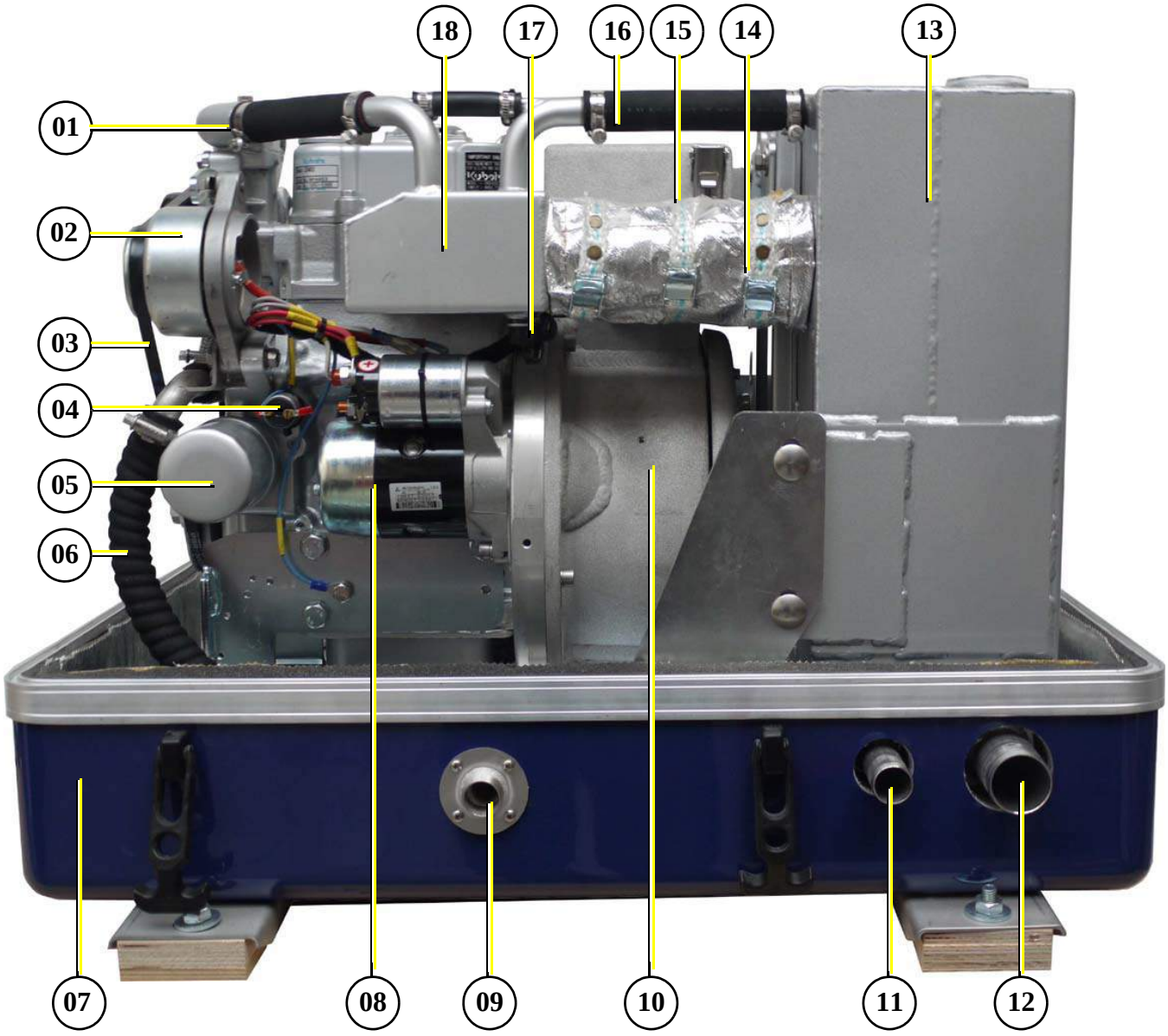
Fig. 4.1-2: Discription type plate



4.1.1 Description of the generator

4.1.2 Right side view

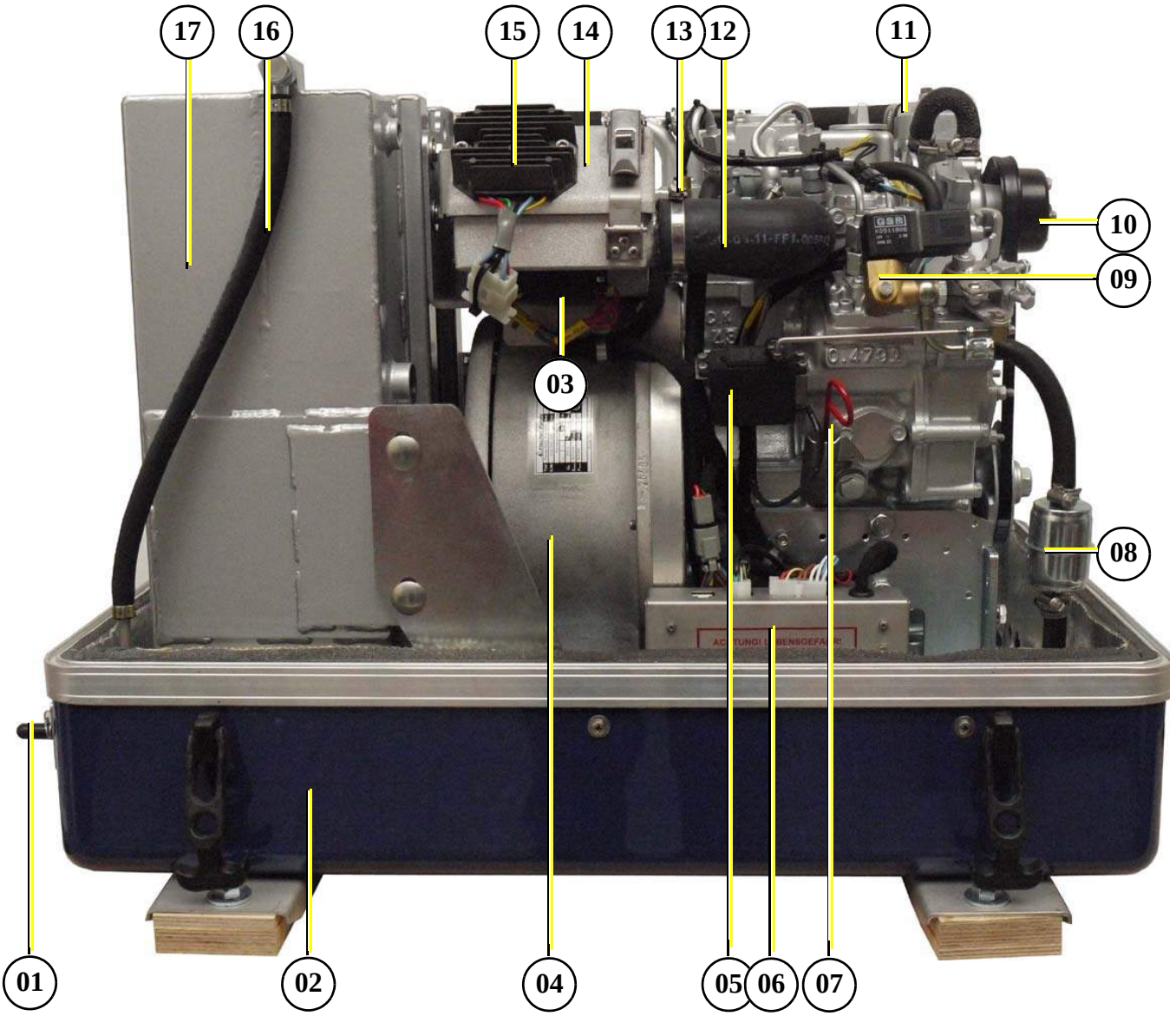
Fig. 4.1.2-1: Right side view



01) Thermostat housing
02) DC-alternator
03. V-Belt
04) Oil pressure switch
05) Oil filter
06) Cooling water pipe to water pump
07) Sound cover base part
08) Starter motor
09) Cooling water input
10) Generator housing with coil
11) Cooling water output
12) Exhaust output
13) Watercooled silencer
14) Compensator under heat isolation
15) Air suction housing
16) Cooling water pipe
17) Thermosensor exhaust elbow
18) Watercooled exhaust elbow

4.1.3 Left side view

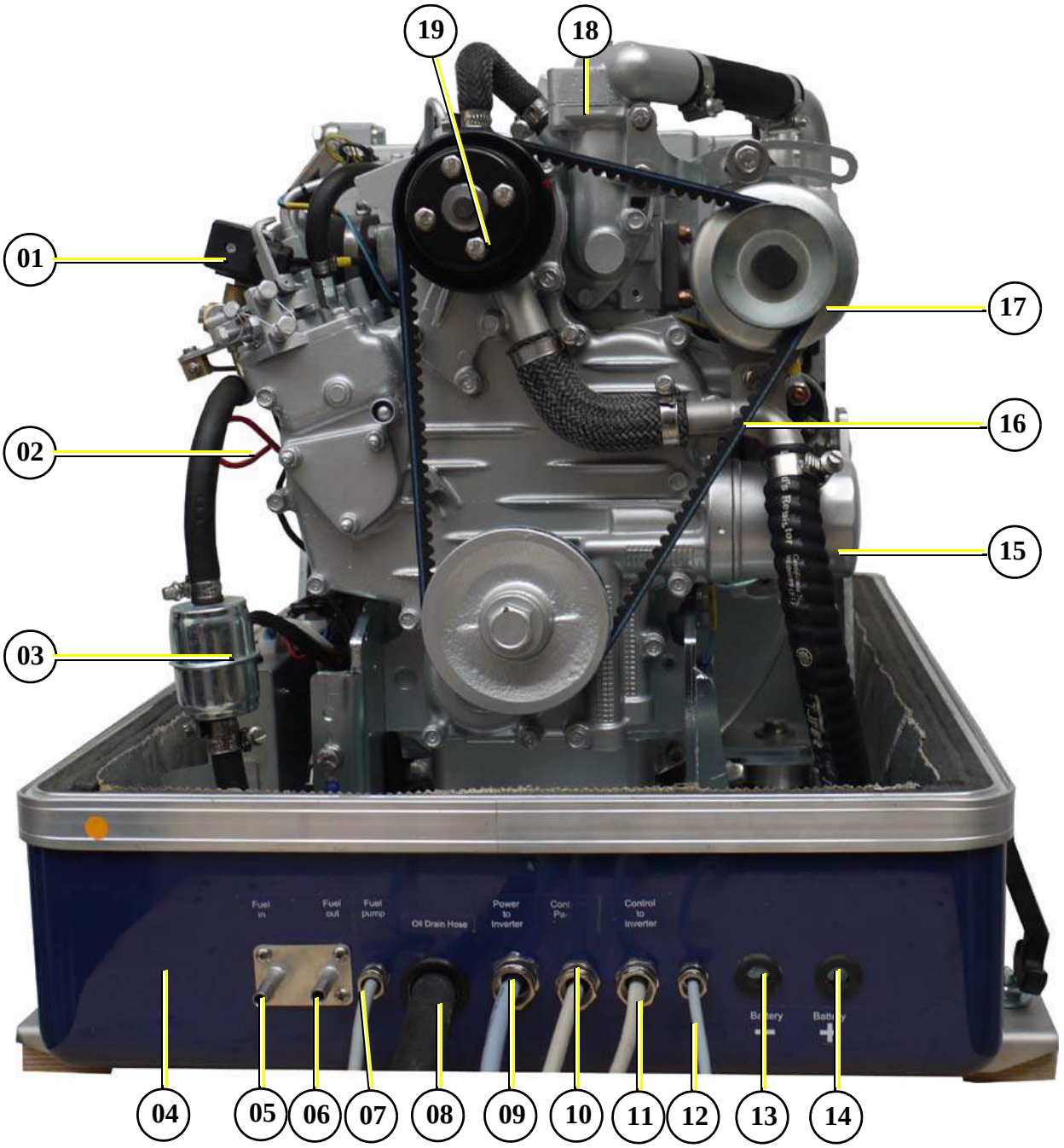
Fig. 4.1.3-1: Left side view



01) Connection external expansion tank
02) Sound cover base part
03) Electrical fuse
04) Generator housing with coil
05) Capacitor for fan control
06) Actuator
07) Housing with iControl electronic board (DO NOT OPEN)
08) Oil dipstick
09) Fuel filter
10) Fuel solenoid switch
11) Pulley for internal cooling water pump
12) Thermostat housing
13) Suction hose, air suction housing - induction elbow
14) Thermoswitch cylinder head
15) Air suction housing
16) Charge controller for DC-alternator
17) Ventilation hose to external expansion tank
18) Water cooled silencer

4.1.4 Front view

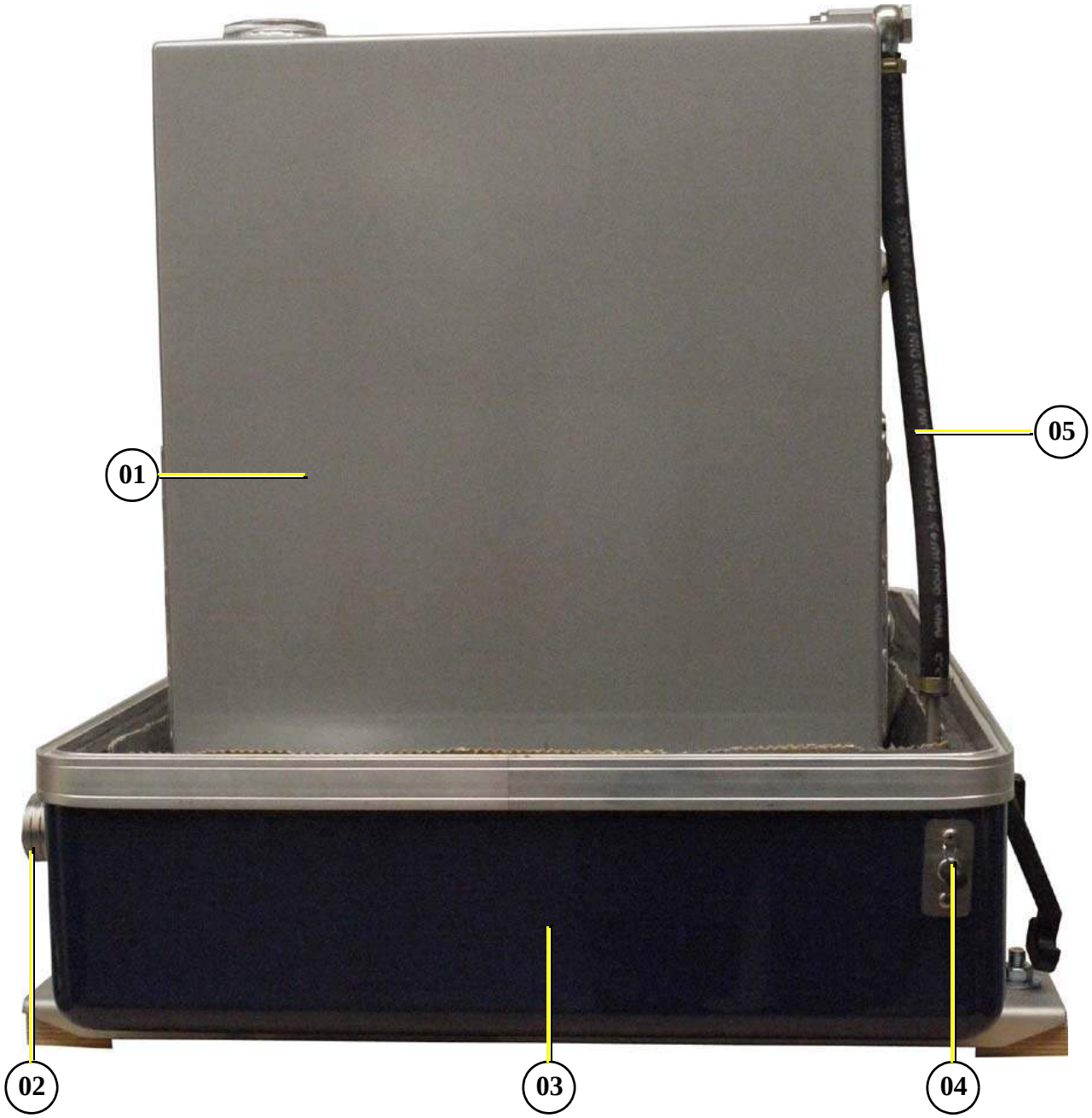
Fig. 4.1.4-1: Front view



01) Fuel stop solenoid
02) Oil dipstick
03) Fuel filter
04) Sound cover base part
05) Fuel IN
06) Fuel OUT
07) Cable for fuel pump
08) Oil drain hose
09) Cable for PMGi 8000i inverter
10) Cable for iControl panel
11) Cable for FP bus to PMGi
12) DP+ put
12) Passage for starter battery cable (-)
13) Passage for starter battery cable (+)
15) Oil filter
16) V-belt
17) DC-alternator
18) Thermostat housing
19) Pulley for internal cooling water pump

4.1.5 Back view

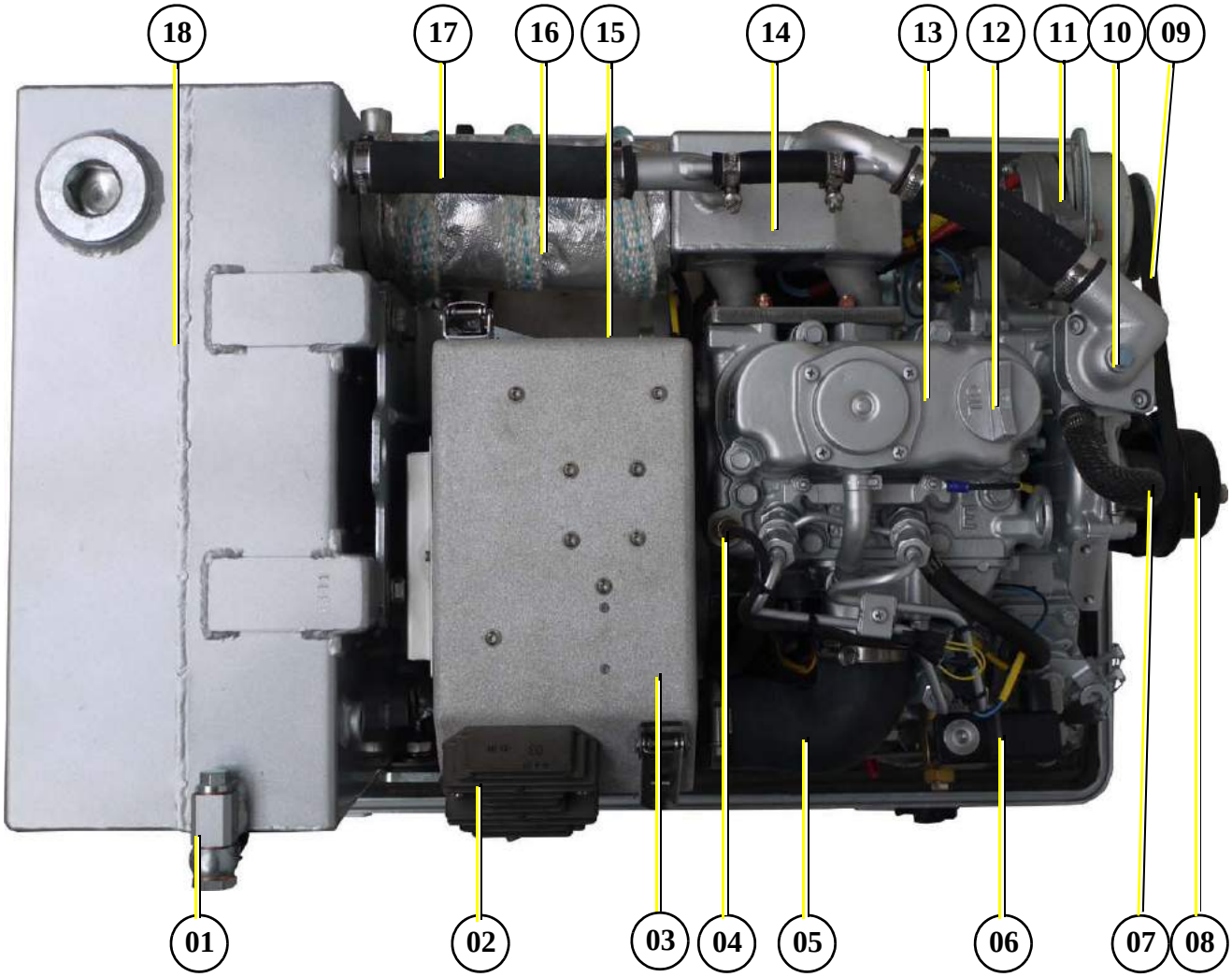
Fig. 4.1.5-1: Back view



01) Water cooled silencer
02) Exhaust outlet
03) Sound cover base part
04) Connection to external expansion tank
05) Ventilation hose to external expansion tank

4.1.6 View from above

Fig. 4.1.6-1: View from above



01) Ventilation hose to external expansion tank
02) Charge controller for DC-alternator
03) Air suction housing
04) Thermoswitch cylinder head
05) Suction hose, air suction housing - induction elbow
06) Fuel solenoid valve
07 Ventilation screw internal cooling water pump
08) Pulley for internal cooling water pump
09) V-belt
10) Ventilation screw thermostat housing
11) DC-alternator
12) Oil filler neck with cap
13) Valve cover
14) Watercooled exhaust elbow
15) Actuator power modul
16) Compensator under heat isolation
17) Cooling water pipe
18) Pre-silencer

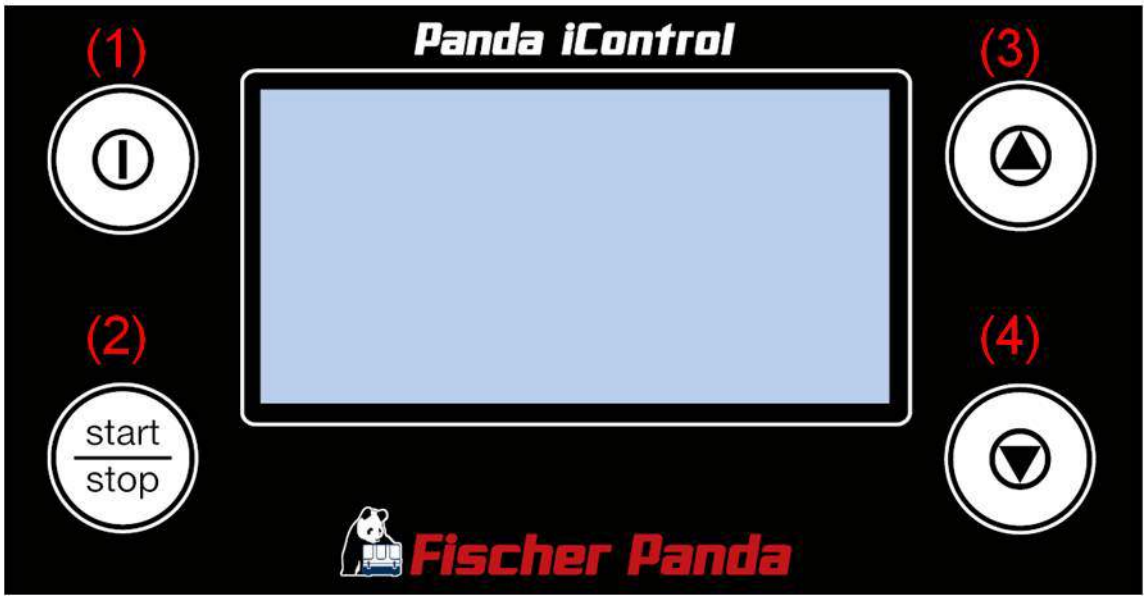
4.2 Details of function units

4.3 The Panda iControl2 panel

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

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

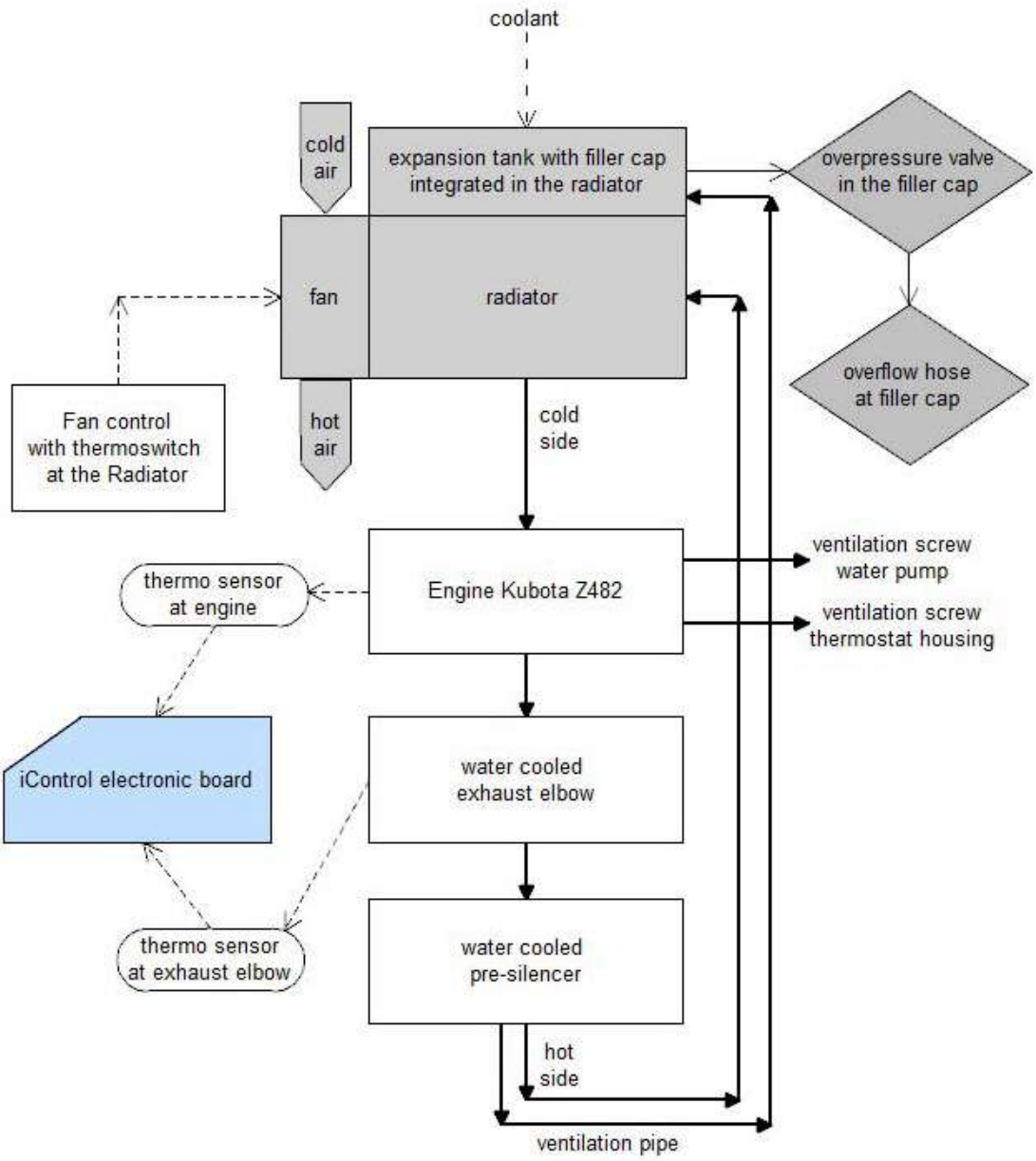
Fig. 4.3-1: Panda iControl 2 panel



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

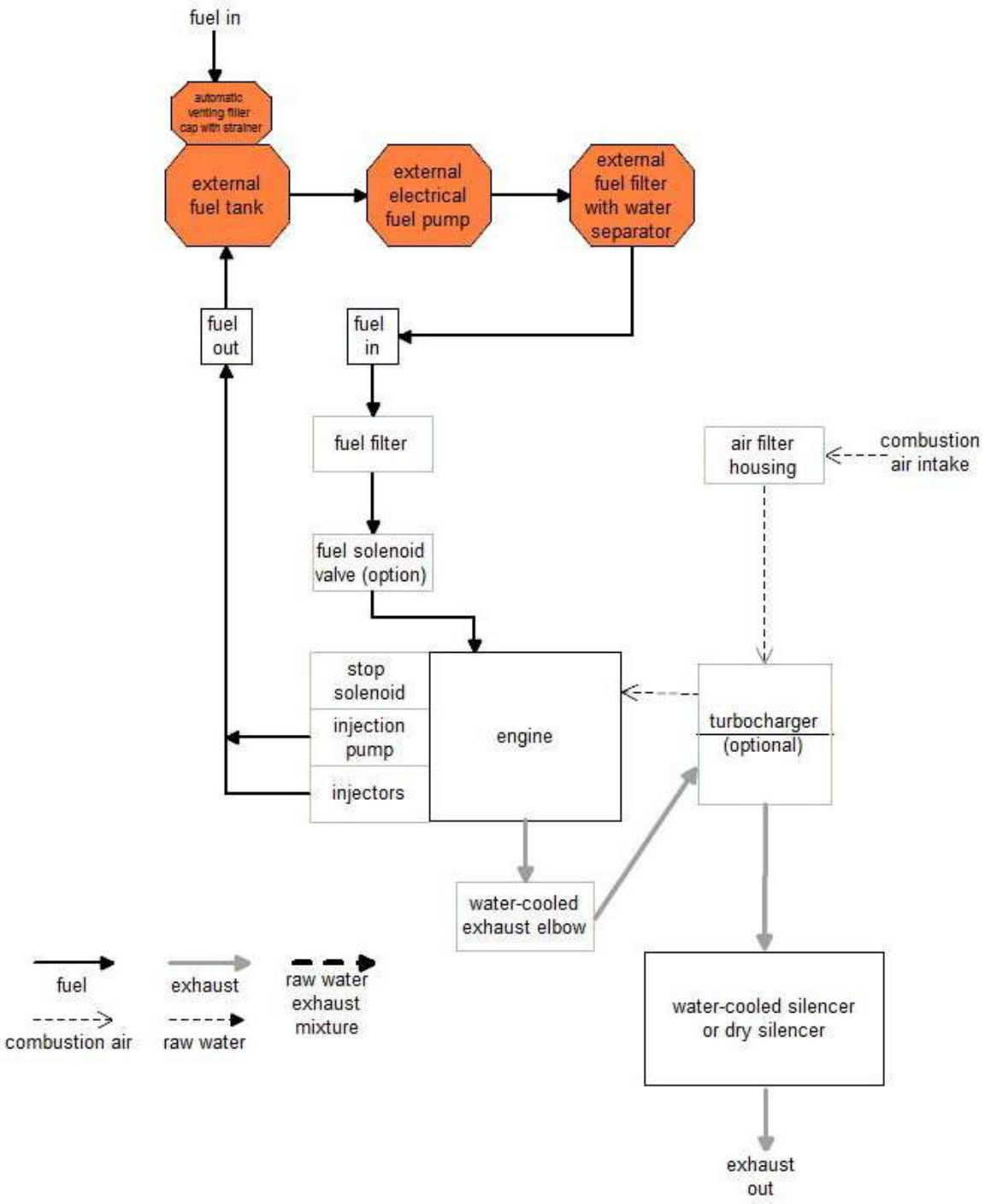
4.3.1 The cooling system

Fig. 4.3.1-1: Cooling system



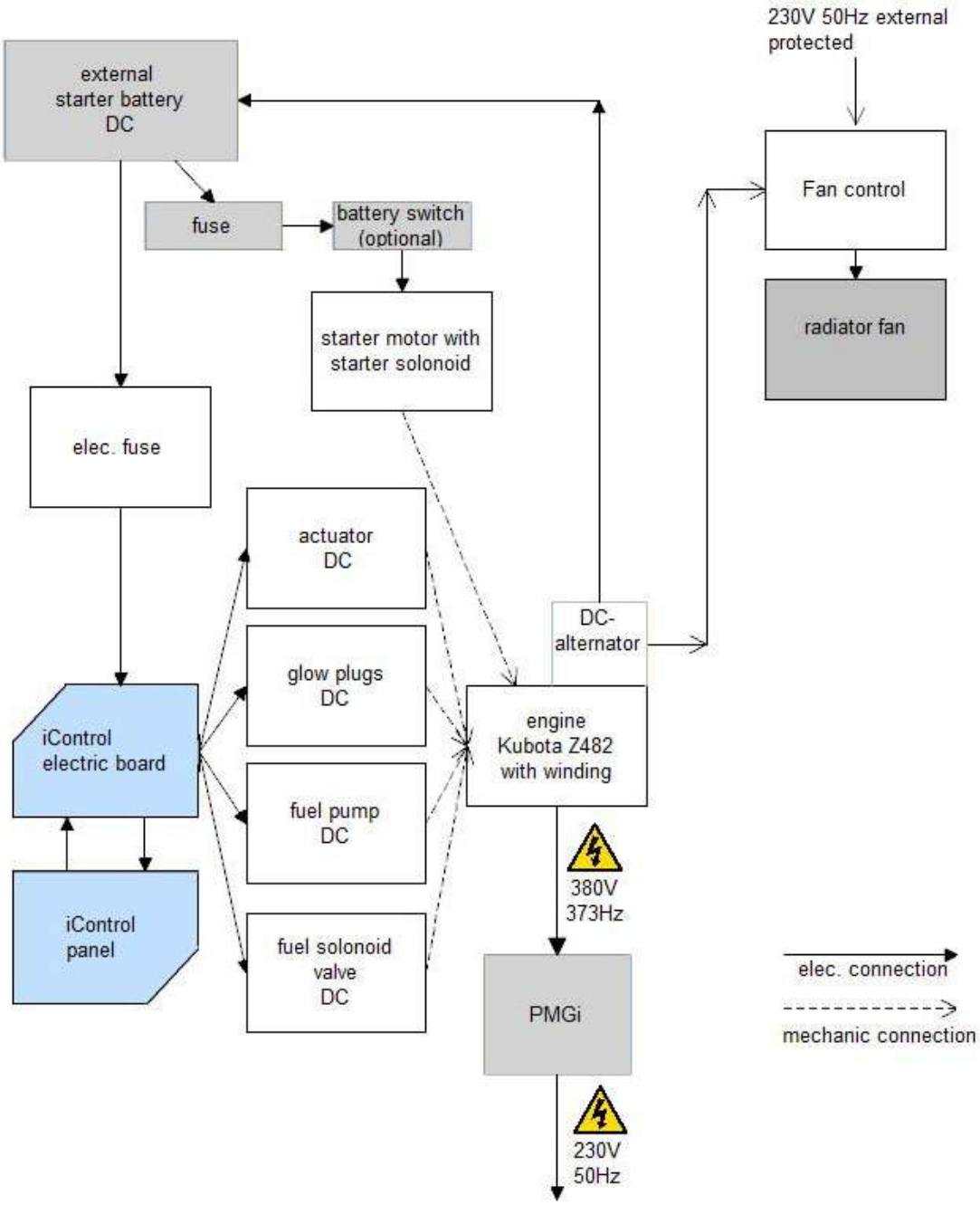
4.3.2 Components of the fuel, air intake and exhaust system

Fig. 4.3.2-1: Fuel, air intake and exhaust system



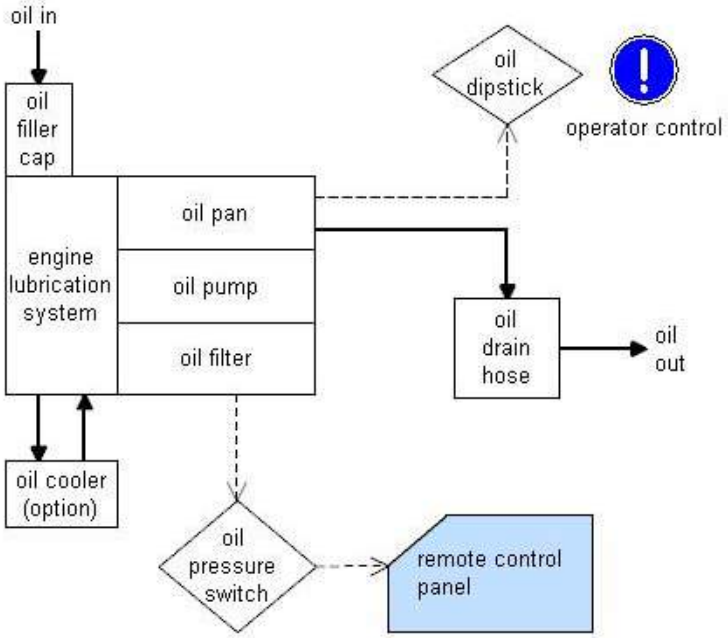
4.3.3 Components of the electrical system

Fig. 4.3.3-1: Electrical system



4.3.4 Components of the lubrication system

Fig. 4.3.4-1: Lubrication system

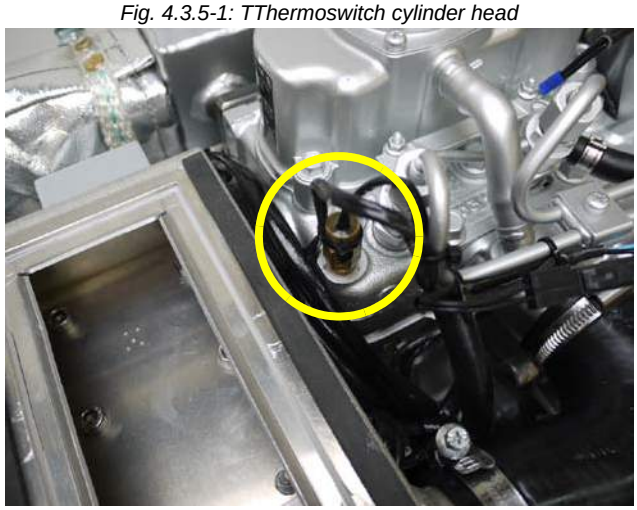


4.3.5 Sensors and switches for operating surveillance

hermoswitch cylinder head

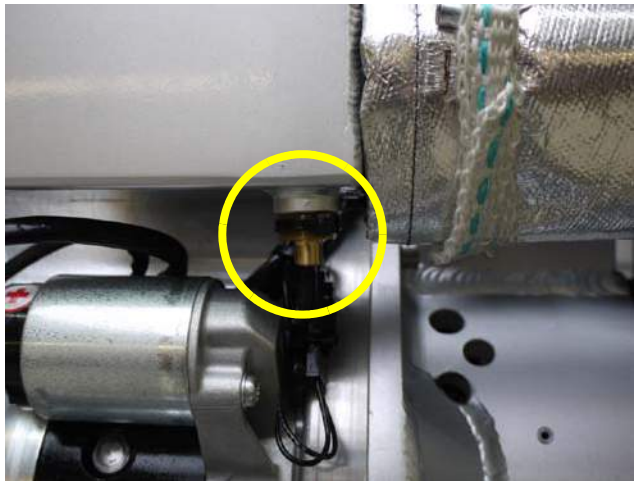
The thermo-switch at the engine is used for monitoring the engine temperature.

Fig. 4.3.5-1: TThermoswitch cylinder head



Thermossensor exhaust elbow

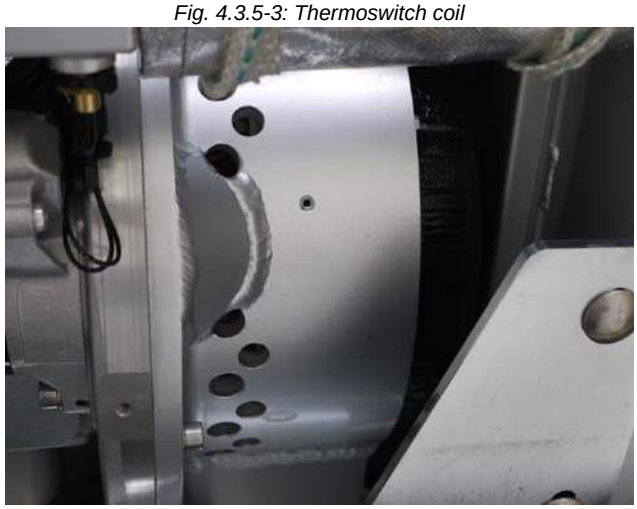
Fig. 4.3.5-2: Thermosensor exhaust elbow



Thermoswitch coil

Another thermoswitch is located in the stator coil.

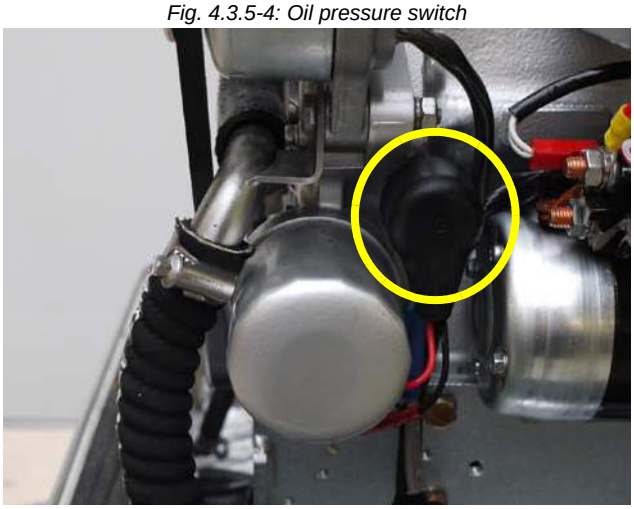
Fig. 4.3.5-3: Thermoswitch coil



Oil pressure switch at the engine

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

Fig. 4.3.5-4: Oil pressure switch



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5. Installation Instructions

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

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

Attention!

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

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

5.1 Personal requirements

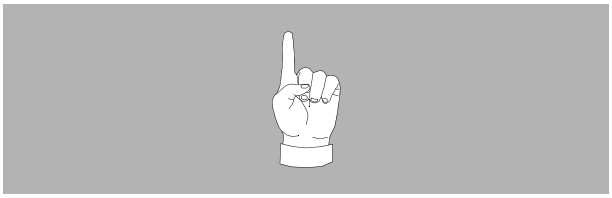
The described installation must be done by a technical trained person or a Fischer Panda service point.

Hazard notes for the installation

see “Safety first!” on Page 12.

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

Notice!:



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

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

DANGER: Automatic start-up

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

- Always undertake installation work when the generator is switched off.
- Ensure there is sufficient installation clearance before start working.
- Ensure tidiness and cleanliness at the workplace. Loose components and tools lying around or on top of each other are sources of accidents.
- Only perform installation work using commercially available tools and special tools. incorrect or damaged tools can result injuries.

Warning!: Risk of injury

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

- No open flames during work on the generator.
- Do not smoke.
- Remove oil and fuel residues from the generator and floor.

-Warning!: Danger of fire

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

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

Danger!: Danger of poisoning

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

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

ATTENTION!: Danger to Life - High voltage

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

Warning!: Hot surface/material

Batteries contain diluted sulphuric acids and bases

Incorrect use can warm up and burst the batteries. Diluted sulphuric acid / base can escape. Under unfavourable conditions there is a risk of explosion

Observe the instructions from your battery manufacturer.

Warning:

During Installation/maintenance personal protective equipment is required to minimize the health hazards.

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

Instruction!: Personal protective equipment necessary.

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

Attention!: disconnect all load

5.2 Environmental protection

Engine liquids/batteries are harmful for the environment.

Collect discharged engine liquids and dispose it properly.

Batteries should be disposed properly.

Environmental protection.

5.3 Placement

5.3.1 General instructions

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

5.3.2 Preparing the base - Placement

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

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

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

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

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

5.3.3 Advice for optimal sound insulation

The convenient base consists of a stable framework, on which the generator is fastened by means of shockmounts. The combustion air can be sucked in unhindered.

Fischer Panda recommend captive shock mount!

Shock mount

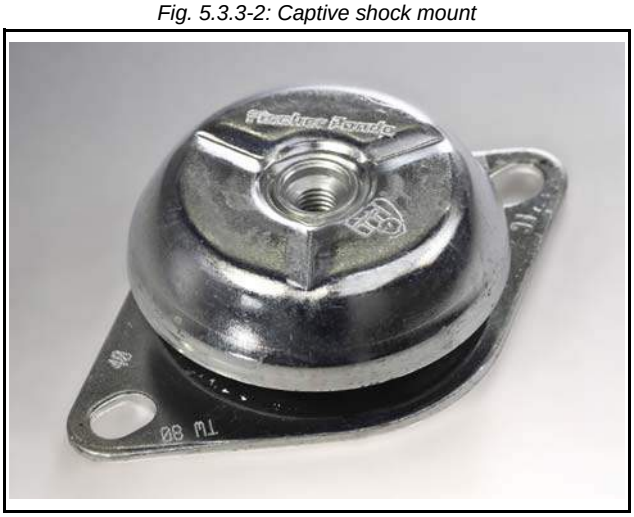
representative picture

Fig. 5.3.3-1: Shock mount

Captive shock mount

representative picture

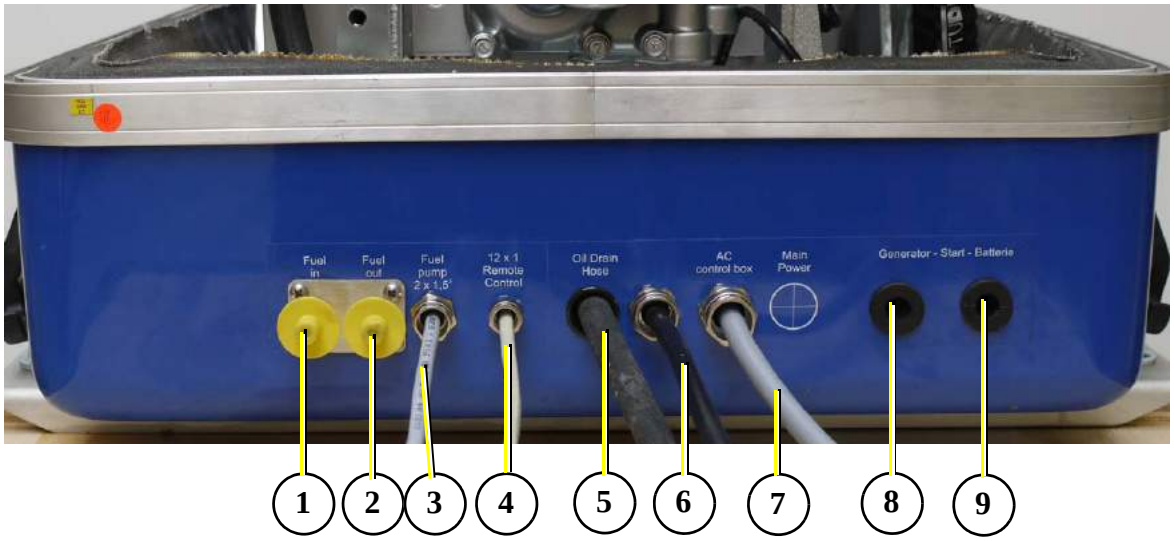
Fig. 5.3.3-2: Captive shock mount



5.4 Connections

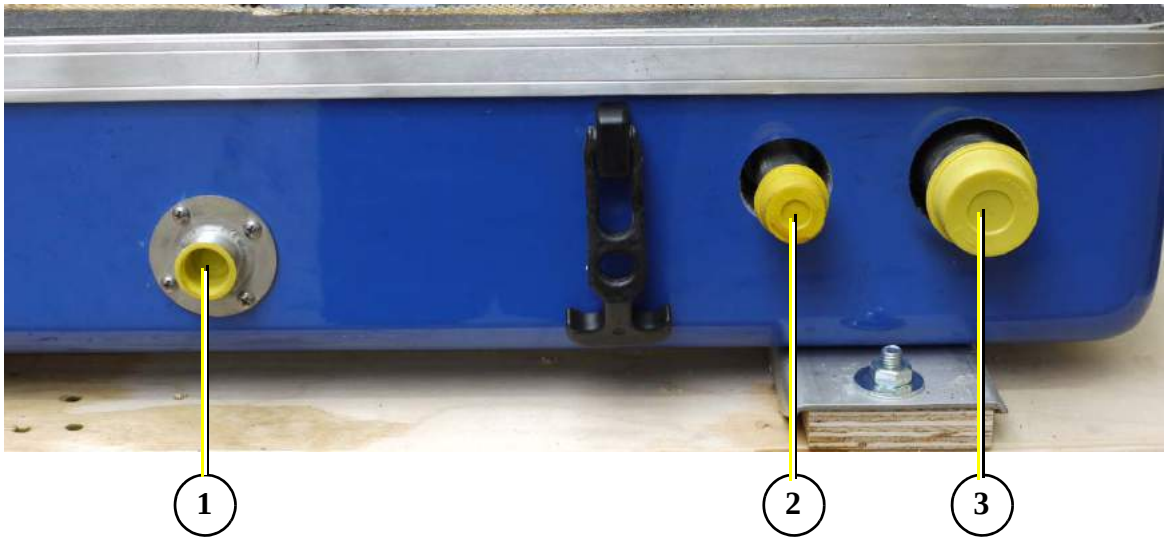
Sample for the connection at the Fischer Panda generator. See the description of the generator for the original location.

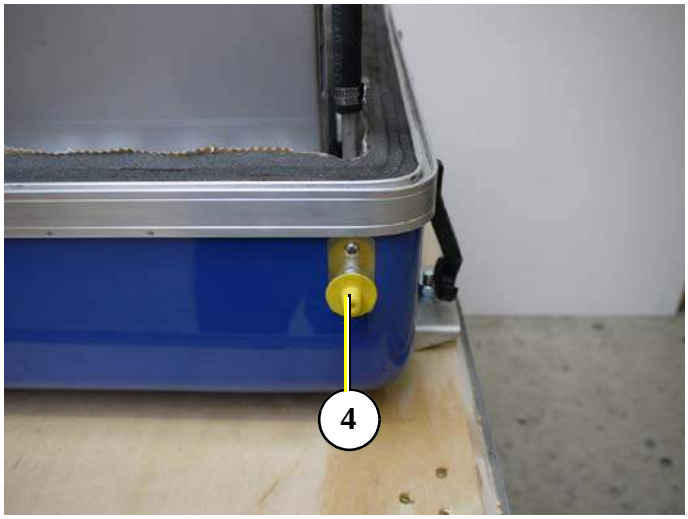
Fig. 5.4.0-1: Connections - sample



1. Connection fuel IN
2. Connection fuel OUT
3. Cable for fuel pump
4. Cable for iControl panel
5. Oil drain hose
6. Cable for fan
7. Cable for PMGi 6000 inverter
8. Passage for starter battery minus (-)
9. Passage for starter battery plus (+)

Fig. 5.4.0-2: Connections - sample





1. Connection cooling water IN
2. Connection cooling water OUT
3. Connection exhaust OUT
4. Connection to external expansion tank

5.5 Fuel system installation

5.5.1 Fischer Panda installation kit - Fuel system

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

Note:

Fuel hose

representative picture

Fig. 5.5.1-1: Fuel hose

No return valve

representative picture

Fig. 5.5.1-2: No return valve

Pre filter with water separator

representative picture

Fig. 5.5.1-3: Pre filter with water separator

Pre filter with water separator

Alternative Article

representative picture

Fig. 5.5.1-4: Pre filter with water separator

Quick connector for fuel lines

representative picture

Fig. 5.5.1-5: Quick connector for fuel lines

Hose clamps

representative picture

Fig. 5.5.1-6: Hose clamps

5.5.1.1 The following items need to be installed:

- Fuel supply pump (DC)
- Pre-filter with water separator (not part of the delivery)
- Fine particle fuel filter
- Return fuel line to fuel tank (unpressurized)

The external Fuel pump should be installed near the tank

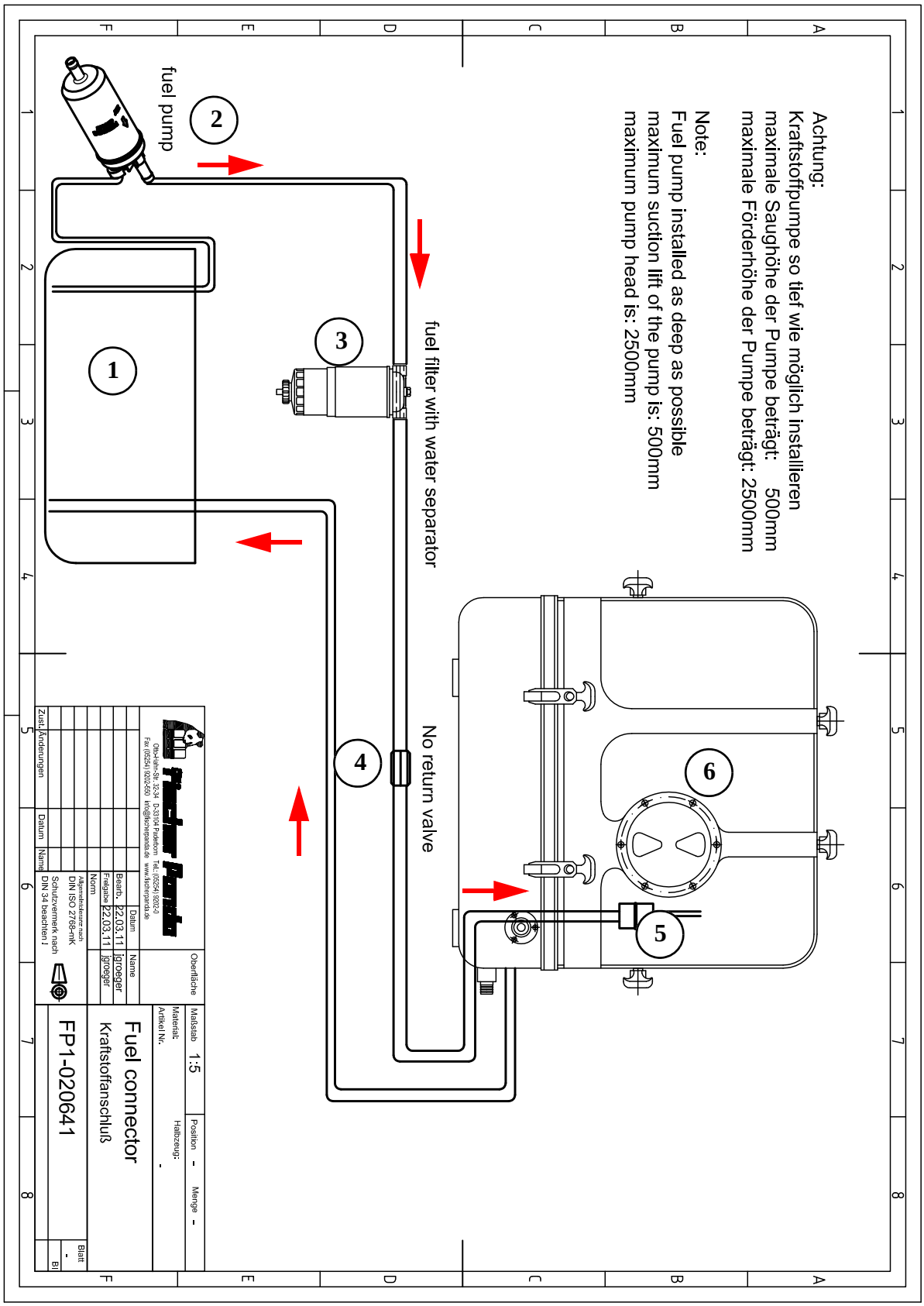
Electrical fuel pump

With the Fischer Panda generator is usually supplied an external, electrical fuel pump (DC). The fuel pump must be installed close at the fuel tank. The electrical connections is prepared at the generator.

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

Fig. 5.5.1-1: electrical fuel pump

Fig. 5.5.1-2: Fuel system - schema



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

External fine filter

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

representative picture

Fig. 5.5.1-3: externer Feinfilter

5.5.2 Connection of the fuel lines at the tank

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

Note:

Connection of the return pipe to the tank

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

Non-return valve in the suction pipe

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

Non-return valve for the fuel return pipe

ATTENTION!

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

5.5.3 Position of the pre-filter with water separator

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

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

representative picture

Fig. 5.5.3-1: Pre-filter with water separator

5.6 Generator DC system installation

The Panda generators from 6000 upwards have their own dynamo to charge a DC starter battery.

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

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

The generator is then Earth/Ground free.

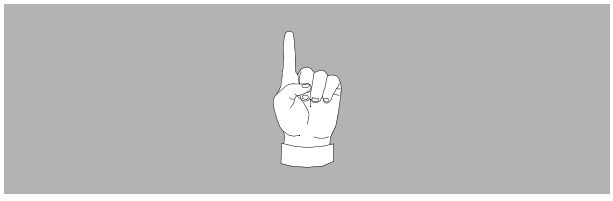
5.6.1 Connection of the starter battery block

IAn own separate starter battery must be installed for the generator.

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

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

NOTE:



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

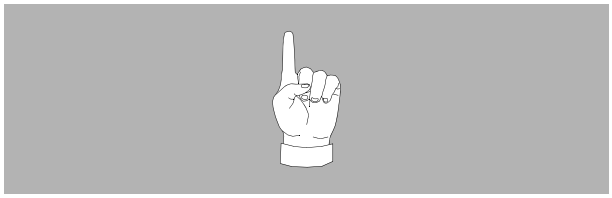
f.e. 12 V starter battery for a 12 V start system

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

ATTENTION!

To avoid large voltage drops the battery should be installed as near as possible to the generator. The positive terminal of the battery is attached at the red cable, the negative pole at the blue cable.

NOTE:



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

ATTENTION!: Consider correct connection sequence

Battery connection

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

ATTENTION!: Right connection of the battery.

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

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

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

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

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

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

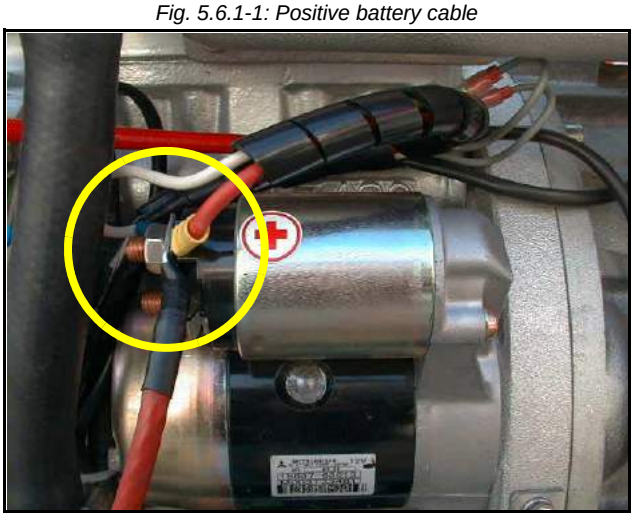
Make a test run after the installation and check the laying of the batteries during the test run and afterwards. If necessary, correct the laying.

Examine regularly the cable laying and the electrical connections.

Positive battery cable

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

Fig. 5.6.1-1: Positive battery cable

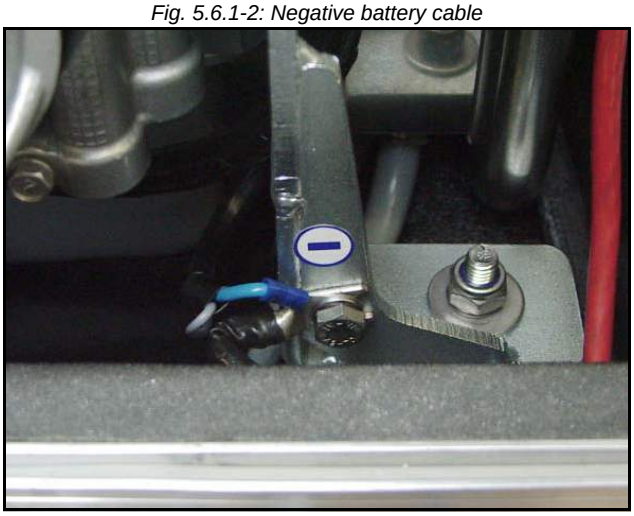


Negative battery cable

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

Note! The battery negative pole may not be connected with the boat ground or with the protective grounding of the 12 V installation!

Fig. 5.6.1-2: Negative battery cable



DC starter motor

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

1. Solenoid switch for starter motor

2. Starter motor

Fig. 5.6.1-3: DC starter motor

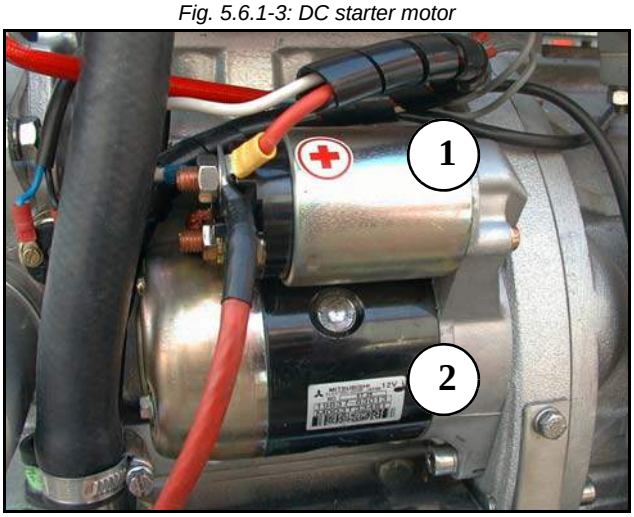
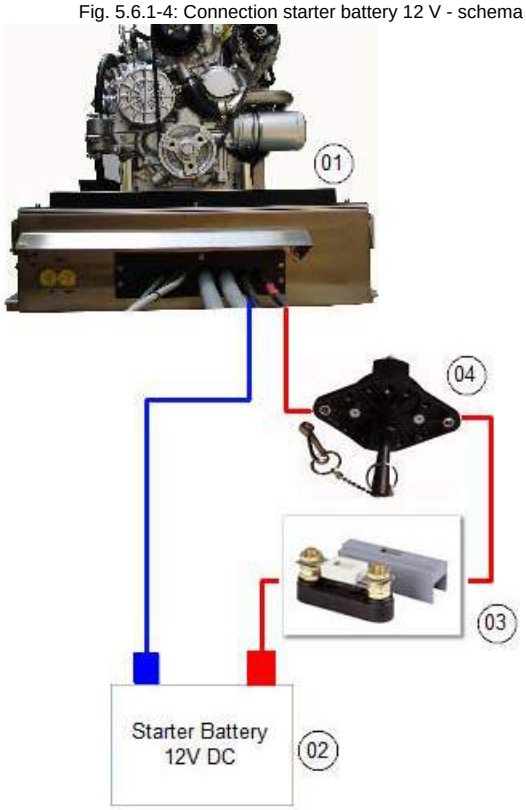
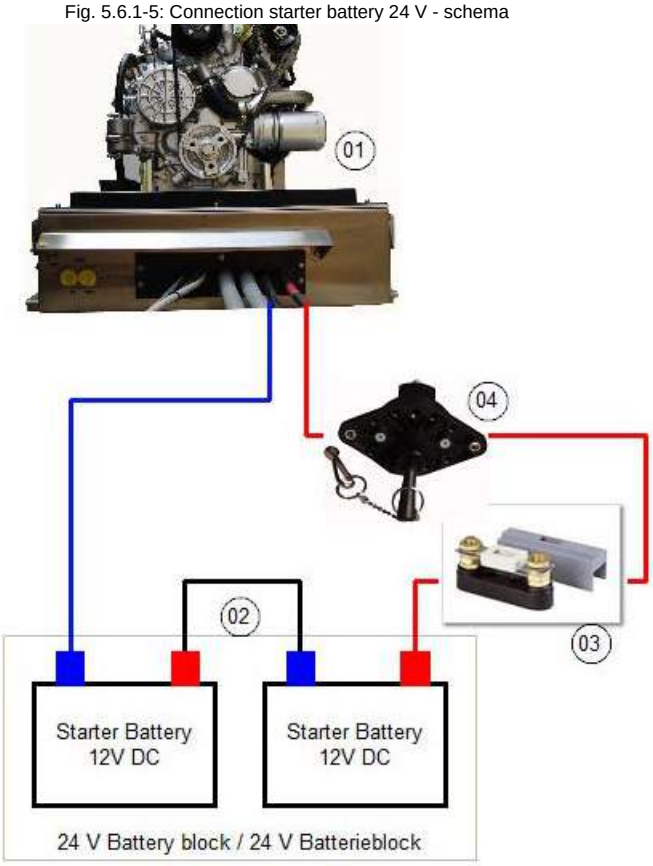


Fig. 5.6.1-4: Connection starter battery 12 V - schema



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

Fig. 5.6.1-5: Connection starter battery 24 V - schema



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

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

The starter batteries have to be connected in this order:

1. (+) cable of first battery

Fig. 5.6.2-1: Installation starter battery

2. (-) cable of second battery

Fig. 5.6.2-2: Installation starter battery

3. (+) cable of second battery

Fig. 5.6.2-3: Installation starter battery

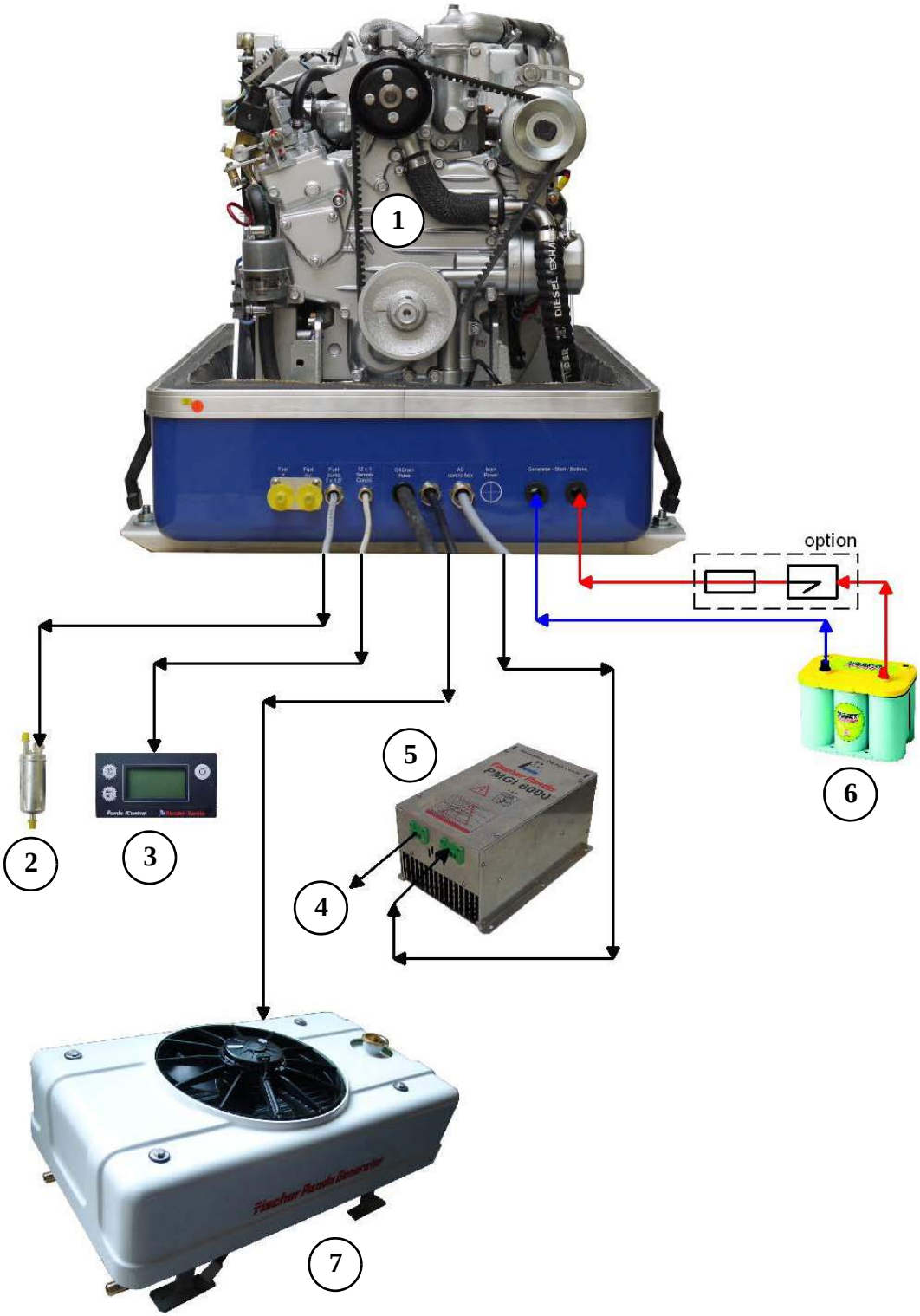
4. (-) cable of first battery
5. Disconnect the batteries in reverse procedure.

Fig. 5.6.2-4: Installation starter battery

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

5.7 Connection of electrical components

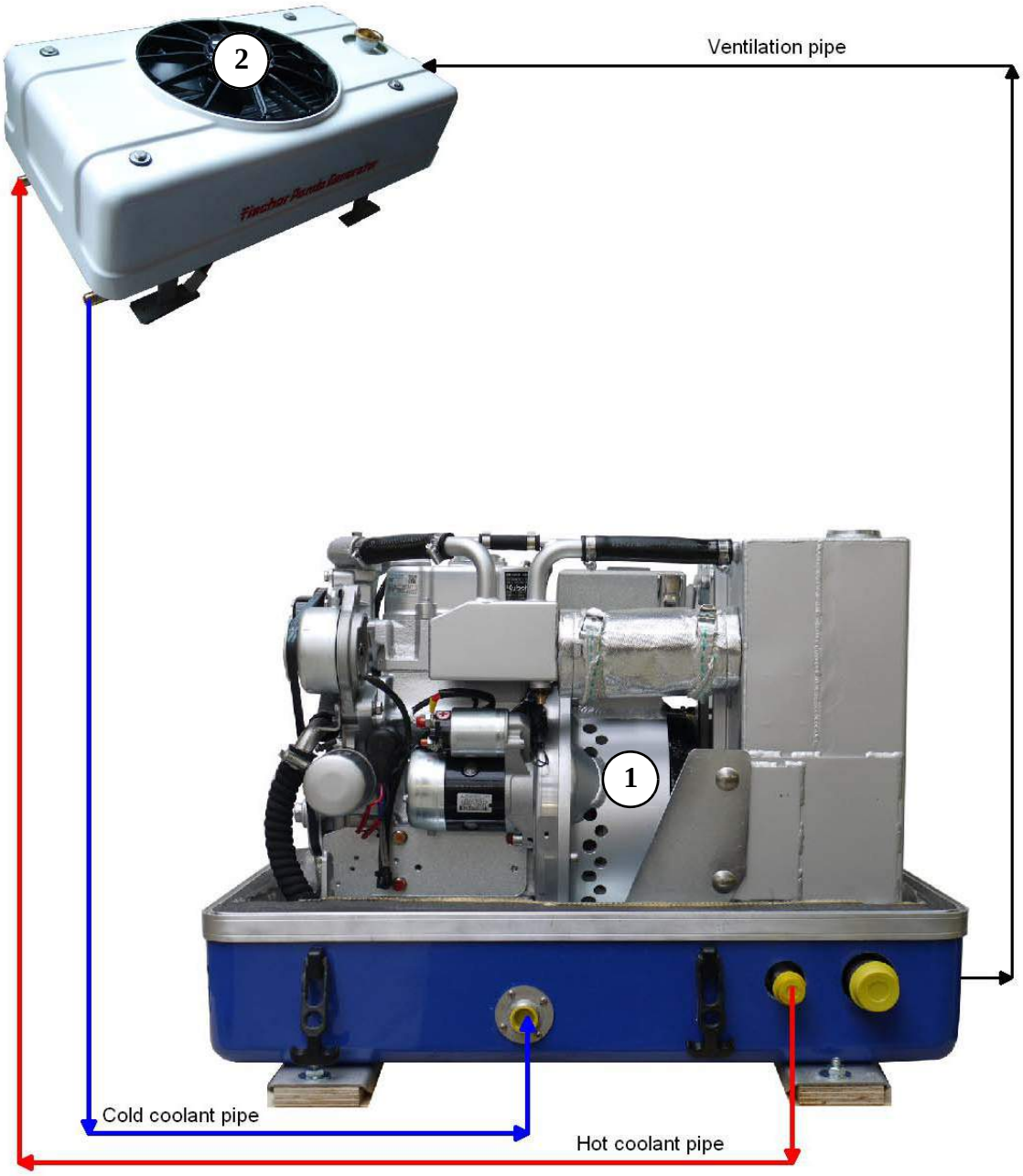
Fig. 5.7.0-1: Connection of electrical components - Scheme



1. Generator
2. Fuel pump
3. iControl panel
4. Generator output
5. PMGi inverter
6. Starter battery
7. Radiator

5.7.1 Connection of the external radiator

Fig. 5.7.1-1: Connection of the external radiator



1. Generator
2. External radiator

5.7.2 Installation PMGi inverter - See separate PMGi 8000 inverter manual

5.8 Installation of the cooling system

5.8.1 The cooling system / general instructions

The Fischer Panda vehicle generator is delivered without a radiator, with the exception of generators with permanently installed radiators such as the PVK-UK or the PSC series.

Depending on the purpose and installation situation, a wide variety of Fischer Panda radiators are available for the optimum customization of the system. Operation with a commercially available vehicle radiator is possible. The corresponding dimensioning must be implemented by the installer.

For generators with a permanently installed radiator (e.g. PVK-UK series), the radiator dimensioning and the installation are not necessary.

Note:

5.8.2 Optionally available components for the installation of the cooling system

For the installation of the cooling system, additional components will be required, these can be procured individually or as an installation kit from Fischer Panda.

Coolant hoses

For use in outdoor areas, check the technical data (e.g. UV resistance).

Example

Fig. 5.8.2-1: Coolant hoses

Pipe elbows

With hose connector or thread

Example

Fig. 5.8.2-2: Pipe elbows

T-fittings

e.g. for connecting the external expansion tank.

Example

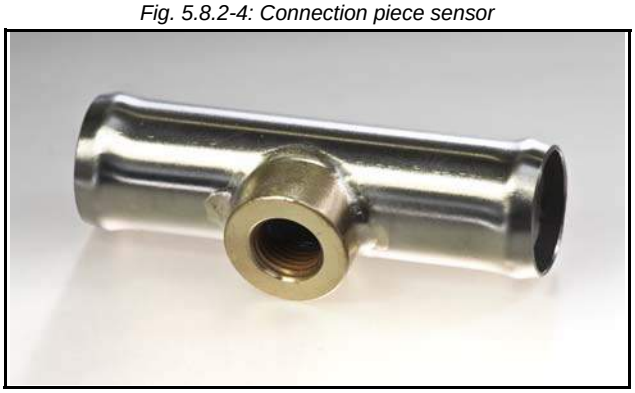
Fig. 5.8.2-3: T-fittings

Connection piece sensor

for temperature sensors/ switches for fan open-loop/closed-loop control

Example

Fig. 5.8.2-4: Connection piece sensor



Roof feed-throughs

in single or double design

Example

Fig. 5.8.2-5: Roof feed-throughs

External expansion tanks

Example

Fig. 5.8.2-6: External expansion tanks

Hose clips

Example

Fig. 5.8.2-7: Hose clips

Radiator

Various radiator models are available for roof mounting, side mounting, or underfloor installation.

The output levels are adapted to the generators and the application (e.g. radiators with increased output for use in hot regions).

Example

Fig. 5.8.2-8: Radiator

5.9 Radiator baseplate

The radiator baseplate shall be dimensioned in accordance with the purpose. The corresponding checks and entries in the vehicle papers shall be implemented by the operator.

5.9.1 Determining the size of the radiator

The size of the radiator must be dimensioned in accordance with the total thermal load, the operating conditions, and the installation situation.

In principle, the thermal load of the generator equals 1.8 times the electrical rated power (1.8 times with a water-cooled silencer, 1.2 times with a dry silencer) in kW. This means that e.g. a Panda 12000 PVMV-N generator with a rated power of 10 kW has a thermal load of 18 kW.

Note:

The radiator must always be dimensioned taking into account a safety margin adjusted for the operating conditions. Undersized radiators will result in an emergency shut-down. This may damage other equipment that is connected to them.

Warning: Include safety margin in the calculation.

5.9.2 Radiator design

The radiator consists in 3 main components:

1. Radiator. Depending on the version, includes an integrated expansion tank or an external expansion tank.
2. Fan. Depending on the generator, as a DC fan (e.g. 12 V-24 V) or as an AC fan (e.g. 230 V 50 Hz) with respective input voltage.
3. Cover (optional).

5.9.3 Radiator types

In principle, the following radiator types are differentiated.

1. Flange-mounted radiator for installation on top of, on the side of, or under the vehicle - Siehe “Installation location for radiators for roof, side, or underfloor mounting on the vehicle” auf Seite 77.
2. Built-in radiator for installation in the vehicle wall or cabin wall - Siehe “Installation location for radiator in the vehicle wall or cabin wall” auf Seite 81.
3. Permanently installed radiators for the PVK-UK series
4. Permanently installed radiators for the PSC series for operation inside containers or for tunnel installation - Siehe “Installation location for radiator in a tunnel” auf Seite 82.

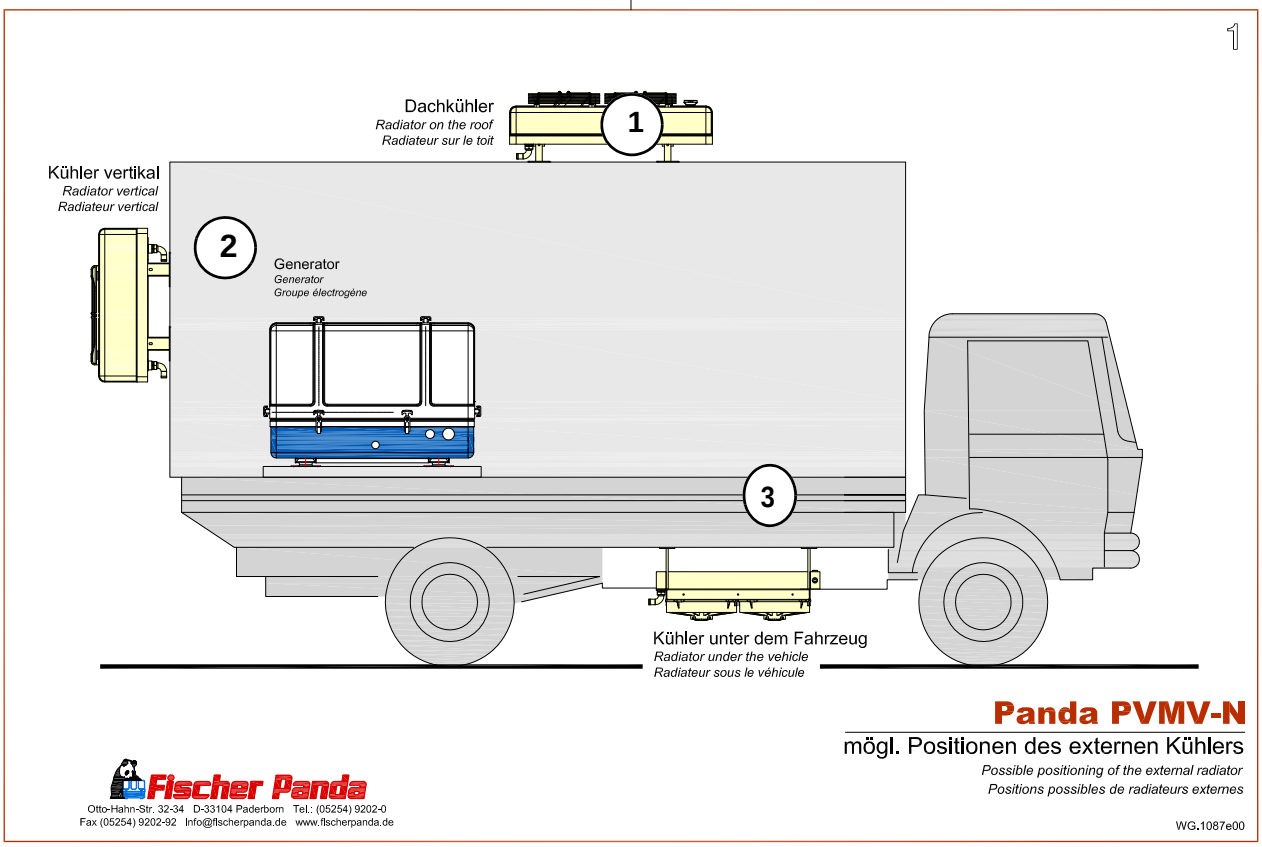
The radiator must be installed away from the generator in a well ventilated area. In doing so, it must be ensured that the air outflow of the radiator is completely uninhibited. Turbulence and thermal short-circuiting must be avoided.

The radiator can be installed in a vertical or a horizontal position. It must be taken into account that the air intake is located above the fan motor.

The best results will be achieved if the radiator can be mounted horizontally on the vehicle roof.

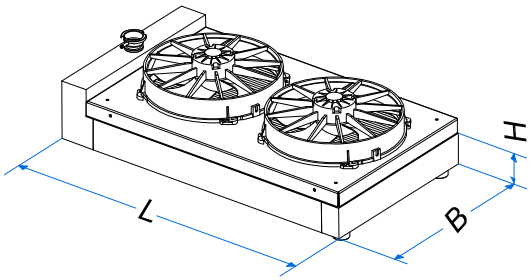
5.9.3.1 Installation location for radiators for roof, side, or underfloor mounting on the vehicle

Fig. 5.9.3-1: Radiator installation - example



1. Radiator mounted on the roof
2. Radiator mounted in vertical position
3. Radiator mounted under the vehicle

Fig. 5.9.3.1-2: Radiator dimensions



5.9.3.2 Roof installation

Please note:

- Minimum distance to vehicle roof: 100 mm.
- Minimum distance to next vertical wall: 1/2 radiator width.
- Min. distance to gas exhaust (heat and dirt source): 500 mm.
- The max. permissible vehicle height must not be exceeded.
- Install warnings stating new vehicle height inside driver's cab.
- During operation, the exhaust flow must be uninhibited for at least 3 meters.

Fig. 5.9.3.2-1: Schematic: radiator, roof installation

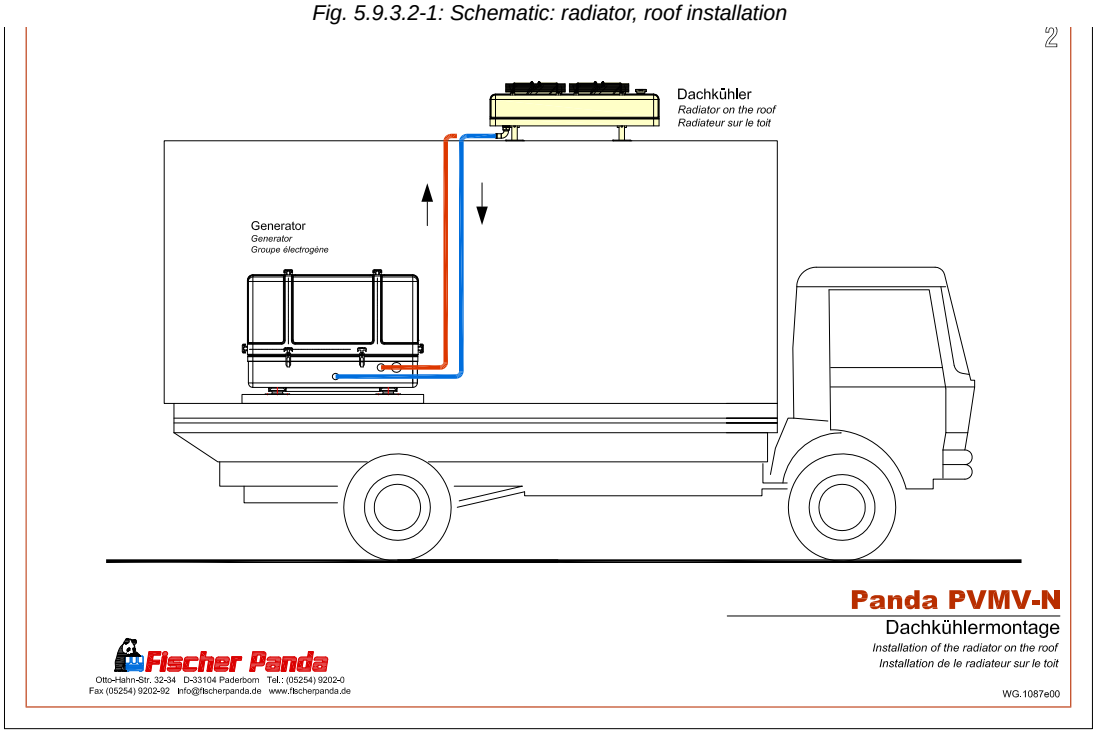
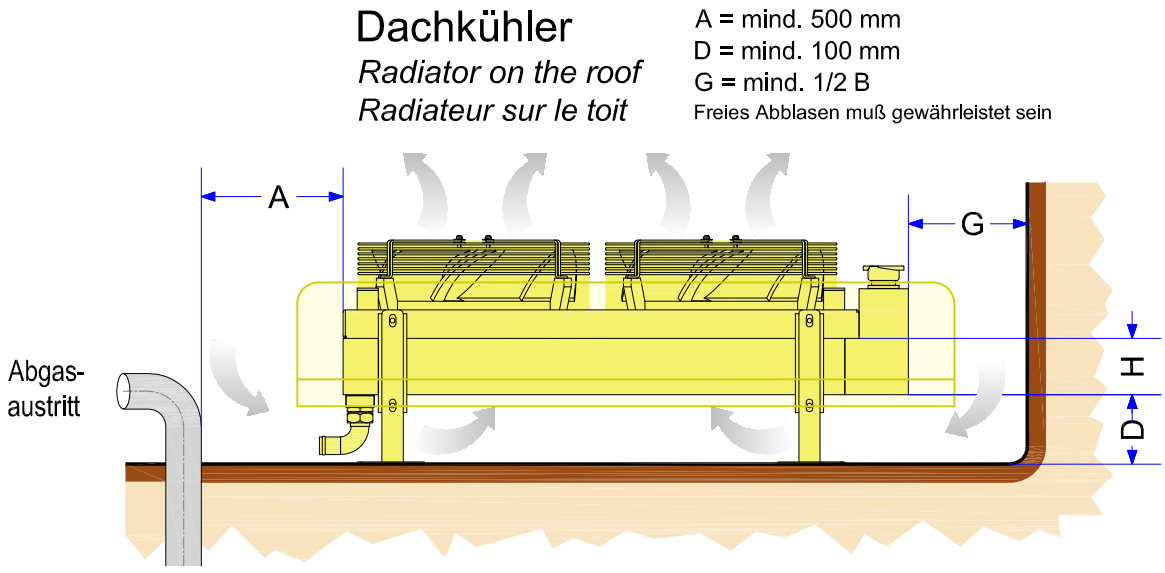


Fig. 5.9.3.2-2: Schematic: radiator, roof installation



5.9.3.3 Installation on the vehicle wall

Please note:

- Minimum distance to vehicle wall: 100 mm.
- Min. distance to gas exhaust (heat and dirt source): 500 mm.
- The max. permissible vehicle length or width must not be exceeded.
- During operation, the exhaust flow must be uninhibited for at least 3 meters.

Fig. 5.9.3.3-1: Schematic: radiator, vehicle wall installation

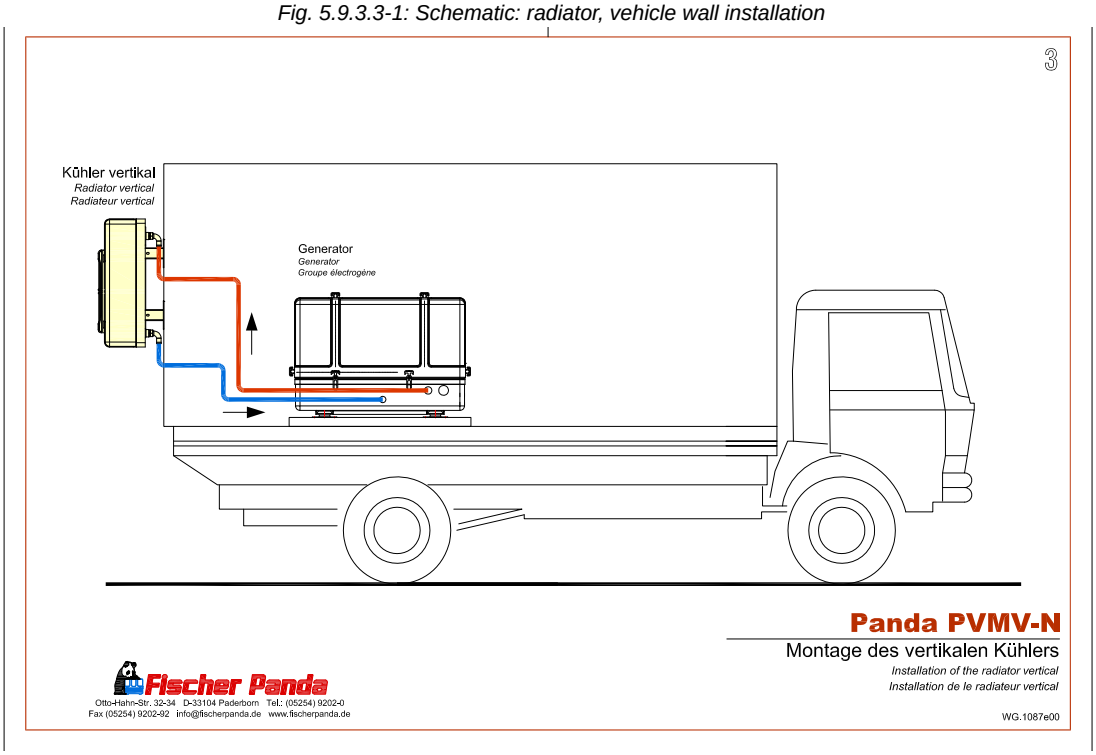
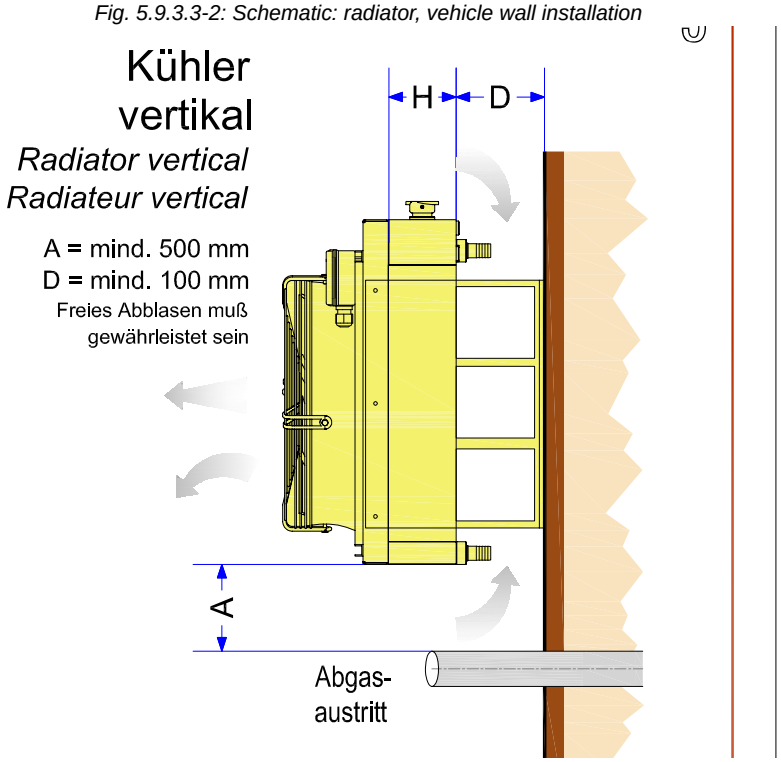


Fig. 5.9.3.3-2: Schematic: radiator, vehicle wall installation



5.9.3.4 Underfloor installation of radiator

Please note:

- Minimum distance to vehicle floor: 100 mm.
- Minimum distance to ground: 1/2 radiator width
- Min. distance to gas exhaust (heat and dirt source): 500 mm.
- The max. permissible vehicle height must not be exceeded.

Fischer Panda does not recommend underfloor installation. The radiator can quickly become dirty. Rock impacts can result in damage to the radiator. The efficiency of the radiator will drop due to thermal short-circuiting. The radiator may have to be dimensioned larger to compensate.

Note:

The installation position of the radiator (upside down or not) depends on the airflow direction of the fan. The airflow must be always from the vehicle side through the radiator to the ground.

Attention:

Fig. 5.9.3.4-1: ***Underfloor installation of radiator***

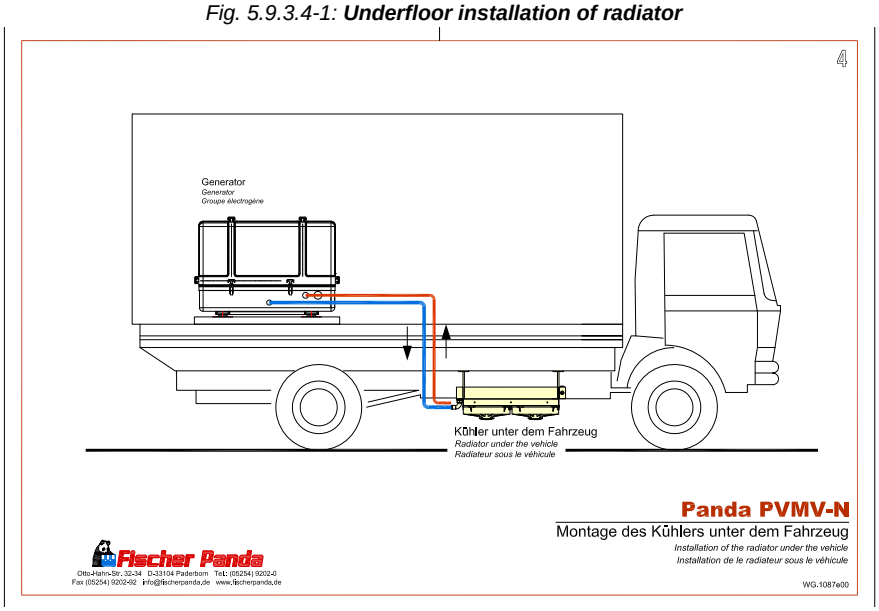
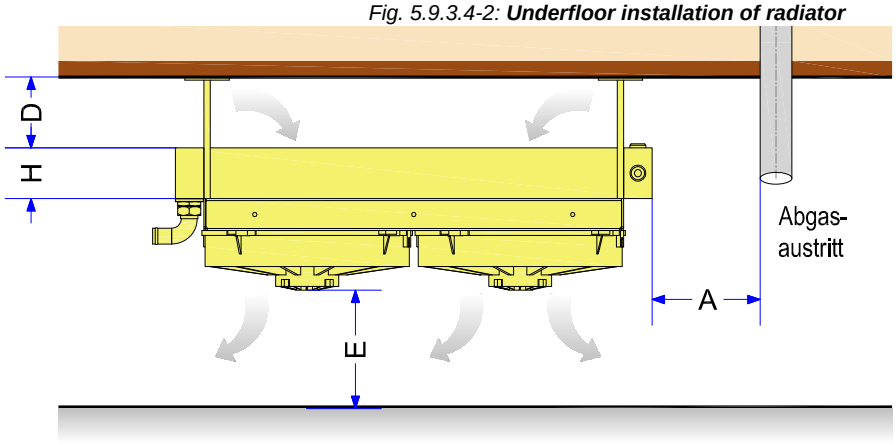


Fig. 5.9.3.4-2: ***Underfloor installation of radiator***



Kühler unter dem Fahrzeug
Radiator under the vehicle
Radiateur sous le véhicule

Von FP nicht empfohlen wegen Verschmutzung, Steinschlag und Effektivität (thermischer Kurzschluss) Kühler muß evtl. größer ausgelegt werden.

A = mind. 500 mm
D = mind. 100 mm (abhängig von L x B)
E = mind. 1/2 B
Freies Abblasen muß gewährleistet sein

5.9.3.5 Installation location for radiator in the vehicle wall or cabin wall

A cabin installation is achieved if the set-up location is freely accessible during operation and serves as a working space, if applicable.

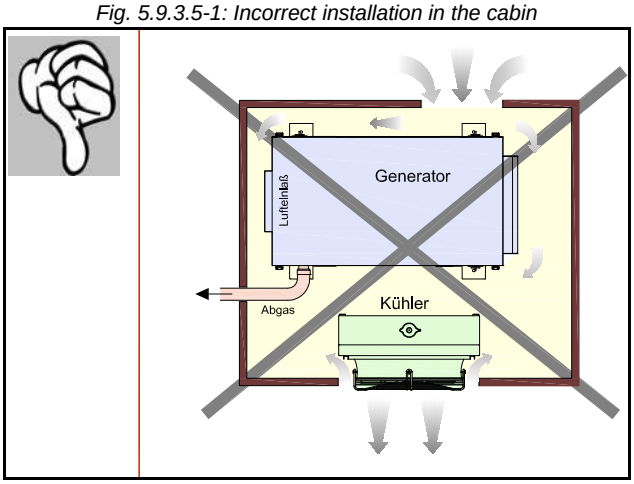
Please note:

- If persons are present in the set-up space during operation, a safety circuit must ensure that the air intake is opened.

Incorrect installation in the cabin

- Air intake too narrow
- Generator air intake too close to the wall
- Hot air can be taken in next to the radiator
- Exhaust gas line not insulated, heats up combustion air

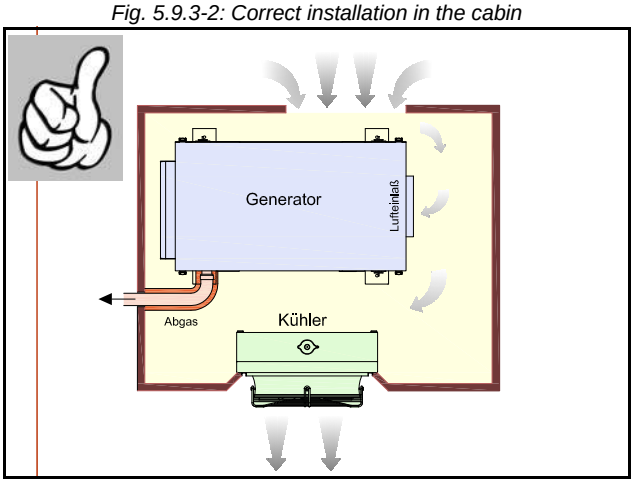
Fig. 5.9.3.5-1: Incorrect installation in the cabin



Correct installation in the cabin

- Air intake is min. radiator size (safety grating and decorative grille must be taken into account)
- Uninhibited air intake for generator
- Exhaust flow direction of radiator is shielded and air exhaust enlarged (safety grating and decorative grille were taken into account)
- Exhaust line insulated

Fig. 5.9.3-2: Correct installation in the cabin



5.9.3.6 Installation location for radiator in a tunnel

A tunnel installation is implemented if the set-up location is separated from the vehicle cab by constructive measures.

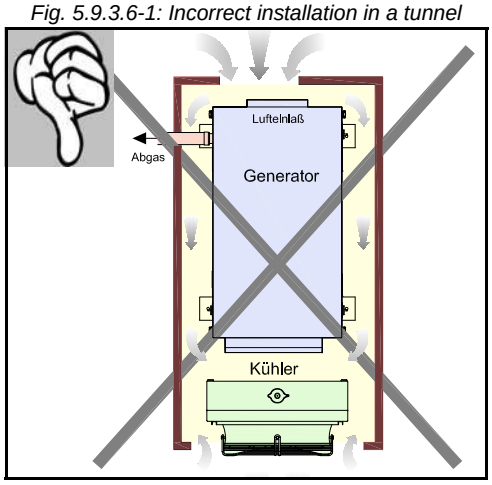
Please note:

- The total of the air intakes must be at least equal to the radiator width (
- The total of the cross-sections of the air ducts incl. lateral air intake must be at least equal to the radiator width
- The distance between generator and radiator must equal at least 1/2 the radiator width
- Lateral air supply between generator and radiator can be designed on the side, above, or below

Incorrect installation in a tunnel

- Air intake too narrow
- Generator air intake too close to the wall
- Hot air can be taken in next to the radiator
- Exhaust gas line not insulated, heats up combustion air

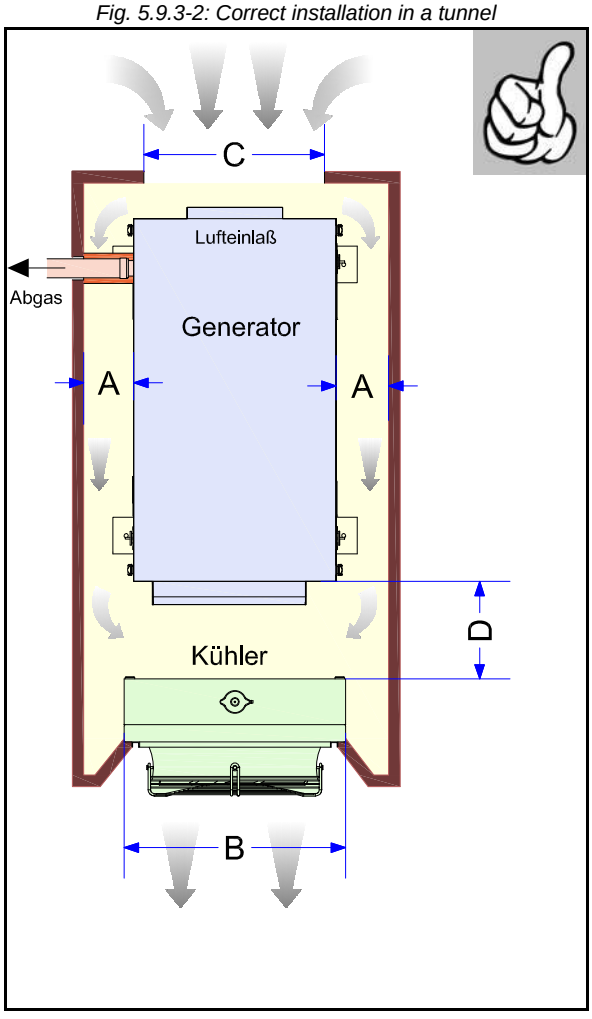
Fig. 5.9.3.6-1: Incorrect installation in a tunnel



Correct installation in a tunnel

- Air intake (C) is min. radiator size (B) (safety grating and decorative grille must be taken into account)
- Total of air intakes (A) equals min. the radiator size (B)
- Uninhibited air intake for generator
- Exhaust flow direction of radiator is shielded and air exhaust enlarged (safety grating and decorative grille were taken into account)
- Exhaust line insulated

Fig. 5.9.3-2: Correct installation in a tunnel



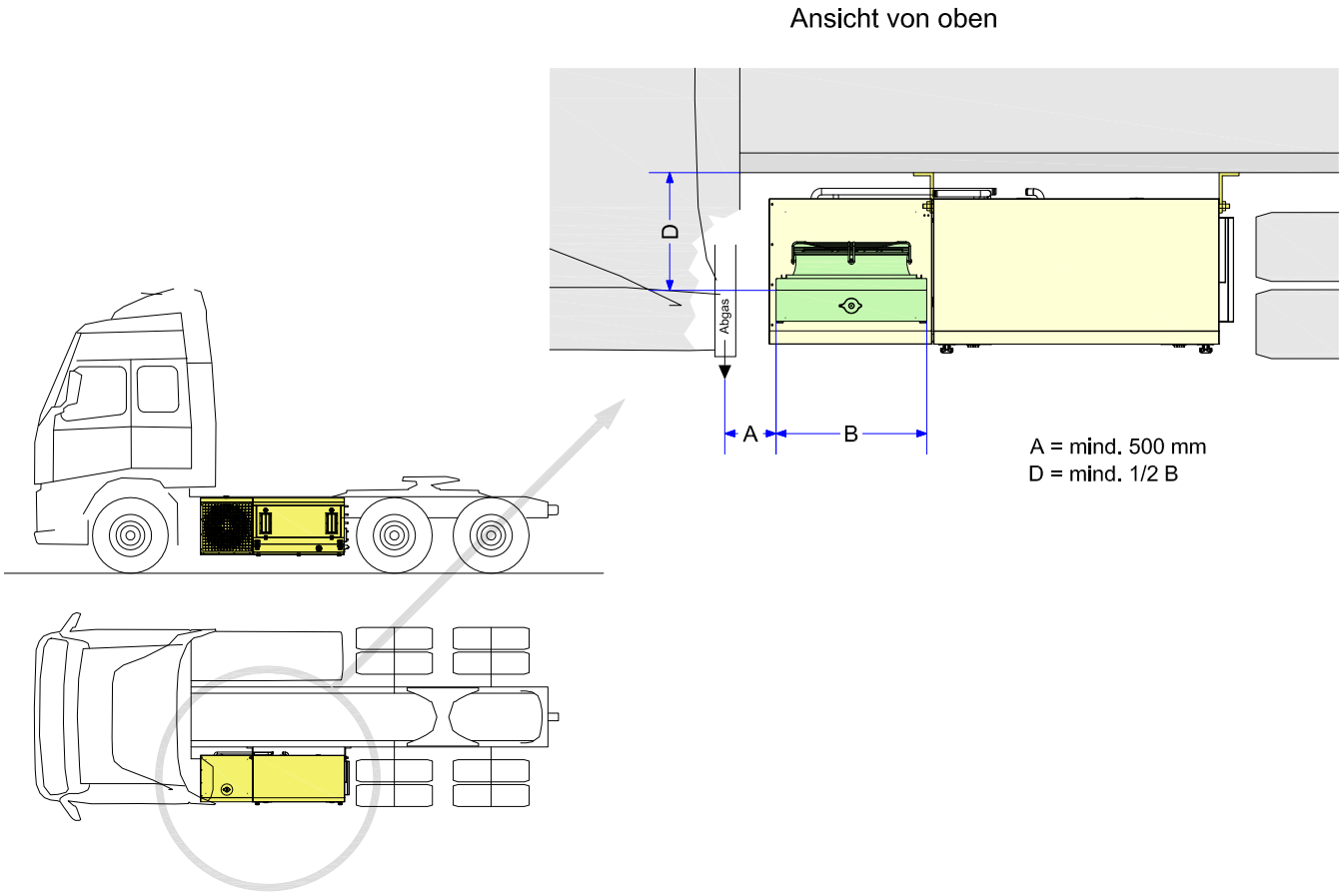
5.9.3.7 Installation location for generators of the PVK-UK series

Generators of the PVK-UK series are designed for lateral installation on the vehicle chassis

Please note:

- Min. distance between radiator and vehicle chassis must be 1/2 B.
- Min. distance to gas exhaust (heat and dirt source): 500 mm.
- The exhaust flow area must be unobstructed. No impairment to the vehicle chassis or installations.

Fig. 5.9.3.7-1: PVK-UK installation location



5.9.4 Coolant hoses

- The diameter of the coolant hoses must be equal to or greater than the diameter of the generator connections.
- A vacuum-tight and temperature resistant hose (min. 120 °C) must be used.
- The hoses must be pressure resistant under vacuum conditions.
- Depending on the application location, the hoses must be UV resistant.
- The hoses must be weather resistant and chemical resistant (resistant to oil, etc.).
- The bending radii of the hose type shall be taken into account.
- The hoses must have a general operating permit (ABE) / approval certificate.

5.9.5 Connection of the external radiator

see Kapitel 5.11, “Installation schematics,” auf Seite 87

5.9.6 Coolant expansion tank

Coolant expansion tank for systems with a radiator below the generator.

For operation, a coolant expansion tank must be installed at least 100 mm above the level of the exhaust manifold and the radiator.

The ventilation line of the radiator and the generator shall be installed on the top connection. The bottom connection is used to refill the coolant circuit and is integrated in the coolant circuit at a low-lying location using a T-fitting.

The coolant expansion tank can be procured from the Fischer Panda accessories.

Coolant expansion tank for systems with a radiator installed above the generator.

If the radiator is installed min. 100 mm above the exhaust manifold, a radiator with integrated coolant expansion tank can be used. In this case, the ventilation line of the generator is connected to the return line to the radiator (hot side) using a T-fitting. If is refilled via the feed line (cold side) to the generator.

5.9.7 Installation of a coolant temperature indicator

Where sensitive systems are installed (e.g. in television transmission vehicles, rescue vehicles, or other vehicles with sensitive metrological installations) a remote indicator for coolant temperatures should be installed. It is, however, highly recommended to install two indicator instruments:

1. coolant feed line (cold side)
2. coolant return line (hot side)

The exact location of the measuring unit is not important, here.

A corresponding indicator kit can be procured from Fischer Panda.

Note:

For subsequent installation, Fischer Panda T-fittings are available for hose elements in which the temperature sensors are then installed.

5.9.8 Permissible coolant temperatures

- The radiator must be dimensioned such that the feed line to the generator (cold side) does not get hotter than 70°C during normal operation. The coolant feed line must be connected to the coolant pump.
- The coolant volume flow must be dimensioned such that the temperature difference between engine inflow (coolant pump) and engine outflow (exhaust manifold) is no greater than 12 K under full load.

To ensure this, the coolant hoses shall be routed without kinks or sharp bends. Resistance, e.g. due to narrowed points in transition pieces or shut-off valves, shall be avoided.

Note:

5.9.9 Coolant pump

- The generator is equipped with a normally suctioning (not self-priming) coolant pump.

- The coolant pump is designed so that a max. distance of 5 m between pump and radiator is possible.

If the necessary coolant volume flow is not achieved (e.g. due to a special installation situation), an external coolant pump with the corresponding output must be installed in the coolant circuit to increase the coolant volume flow.

Note:

The pressure in the coolant circuit must not exceed 0.7°bar!

Warning:

Required coolant volume flow:

Fig. 5.9.9-1: Coolant volume flow

Generator type	Coolant volume flow
Panda 4500	min. approx. 10 L/min
Panda 8000 - 10000	approx. 16 to 22 L/min
Panda 12000 - 15000	approx. 24 to 28 L/min
Panda 18 - 24	approx. 32 to 38 L/min
Panda 30 - 32	approx. 40 to 45 L/min
Panda 42 - 65	approx. 50 to 60 L/min

5.9.10 Radiator fan

Radiator fans are wearing parts. To ensure a long service life, there must be no objects impairing or blocking the free movement of the fan during operation. Such objects include:

- Snow
- Ice
- Leaves
- Branches
- Increased air resistance due to dirty radiator

5.9.11 Anti-freeze and corrosion protection

At the factory, the coolant is adjusted to a 50% concentration of G48 anti-freeze solution (approx. -40°C). If lower temperatures are possible during transport or storage, the coolant filling must be drained or adjusted for the lower temperatures.

After draining the coolant, the system must be blown dry with compressed air at 0.5 bar. This will ensure that the system is complete drained.

The anti-freeze agent also serves to protect the system against corrosion. The anti-freeze concentration in the coolant must not drop below 30%.

5.9.12 Logging the temperature values during initial start-up

It is mandatory to measure the temperature values of the circulating coolant in the circuit after installing the generator for the initial start up. Two remote thermometers must be used for this purpose. One connection must be mounted to the coolant feed line to the engine, the second one on the coolant outfeed. The generator must then be loaded with min. 75% of the rated power after a brief warm-up phase. The circulation of the coolant must be checked. The values must fall within the following limits:

1. Coolant feed line max. 70 °C in permanent operation mode at maximum load
2. Coolant return line max. 85 °C in permanent operation mode.
3. Differential of the two values: This item is of particular importance and provides information on the circulation of the coolant. The difference should be max. 17 K for a coolant water system with an integrated water-cooled muffler. It should, however, typically be between 10 and 12 °K.

If the difference is greater than 15°K, the coolant circulation is not sufficient. The water circulation must then be increased. This can be solved by e.g. improving the line routing, or by reducing the belt pulley diameter. It is absolutely necessary to measure the output of the cooling system after installing the generator. The values given above shall be considered maximum permissible values. They apply to operation in increased temperatures, as well. In permanent operation mode at external temperatures around 20 °C, the values must fall near the lower limit of the tolerance.

Each manual includes installation certificates, which must be filled in after installation and returned to the manufacturer (copy).

Returning the installation certificates and commissioning logs is an important component of the warranty conditions.

Note:

5.10 Custom installations

The effects on the warranty must be agreed on a case-by-case basis with Fischer Panda.

5.10.1 External heat exchangers

External heat exchangers shall be installed as per the specifications of the respective manufacturers.

5.10.2 External engine pre-heater

The external engine pre-heater shall be installed as per the manufacturer's instructions.

This applies to:

- electrical pre-heater systems (e.g. Defa),
- diesel-operated pre-heater systems,
- petrol-operated pre-heater systems.

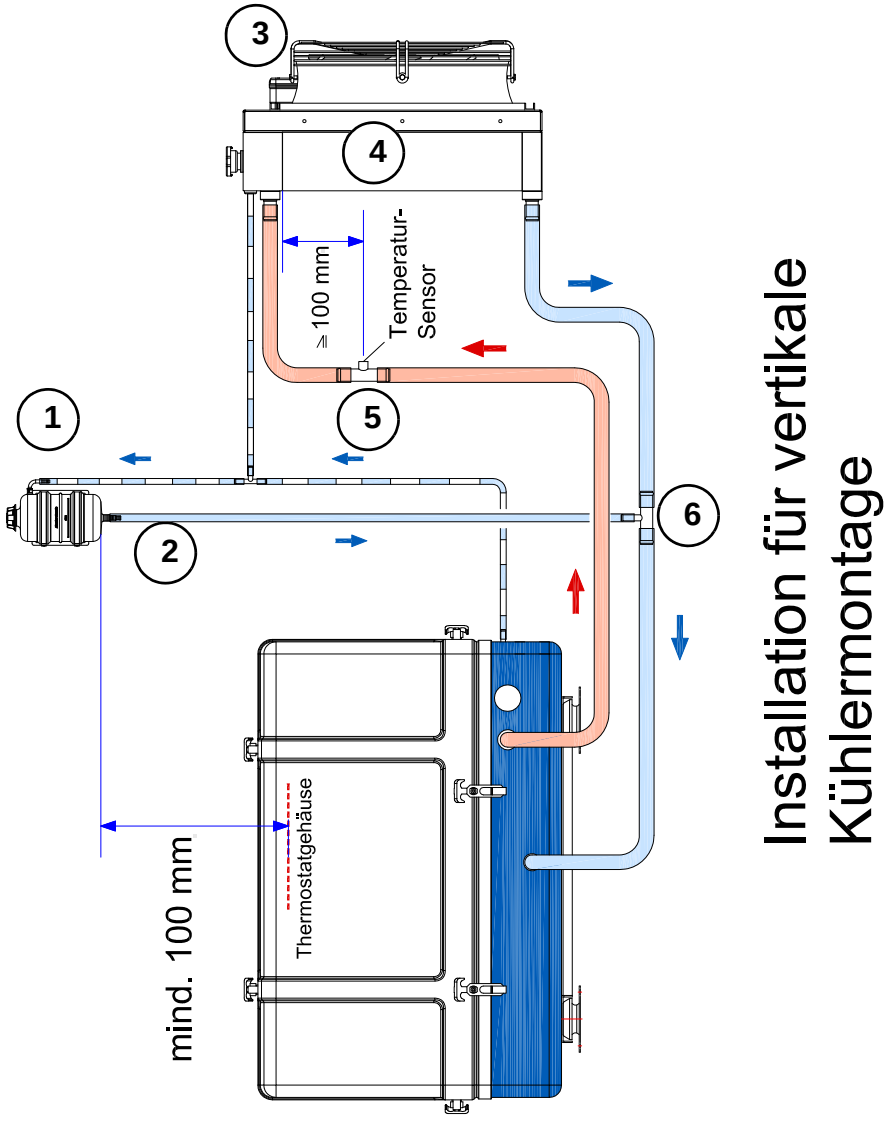
5.10.3 Keel cooling

The keel cooling system shall be dimensioned and installed as per the manufacturer's instructions.

5.11 Installation schematics

5.11.1 Installation for vertical radiator installation

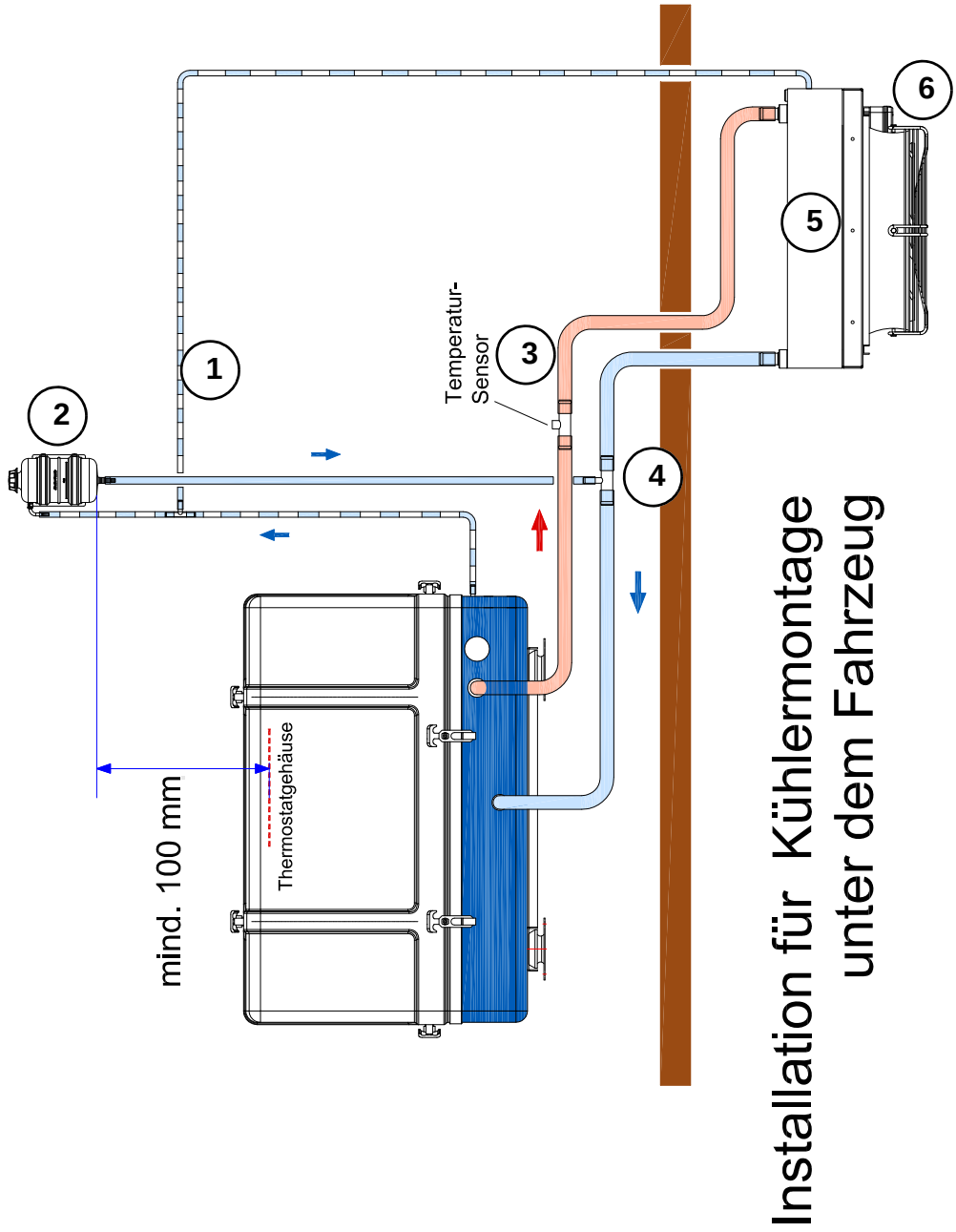
Fig. 5.11.1-1: Vertical radiator - schematic



01. Coolant expansion tank
02. Engine bleed line
03. Fan for radiator
04. Radiator
05. Thermal switch (on the hot side)
06. T-fitting

5.11.2 Installation for mounting the radiator under the vehicle

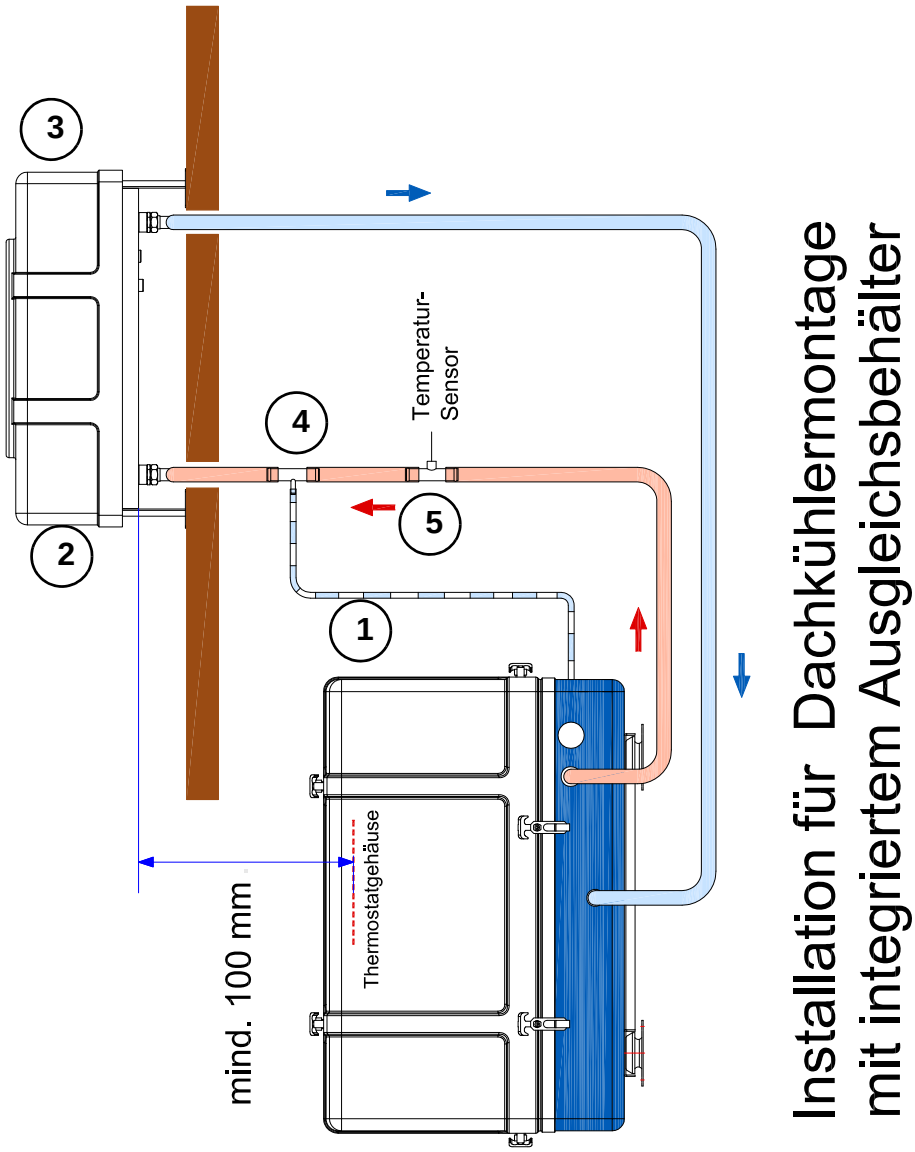
Fig. 5.11.2-1: Underfloor radiator - schematic



01. Ventilation line
02. Coolant expansion tank
03. T-fitting with connection for thermal switch
04. T-fitting
05. Radiator
06. Fan for radiator

5.11.3 Installation schematic for roof mounted radiator with expansion tank

Fig. 5.11.3-1: Roof-mounted radiator - schematic



1. Engine bleed line
2. Radiator (horizontal)
3. Coolant expansion tank (integrated)
4. T-fitting for bleed line
5. T-fitting with connection for thermal switch

5.12 Radiator fan control / electronic fan control

To control the radiator fan, various controls/electronic controls can be chosen from the Fischer Panda delivery program.

In the following the basic functions of the fan controls are described. The original manual/ data sheet with further informations of the fan control must be respected.

Note!:

5.13 Standard fan control for 1-phase and 3-phase generators.

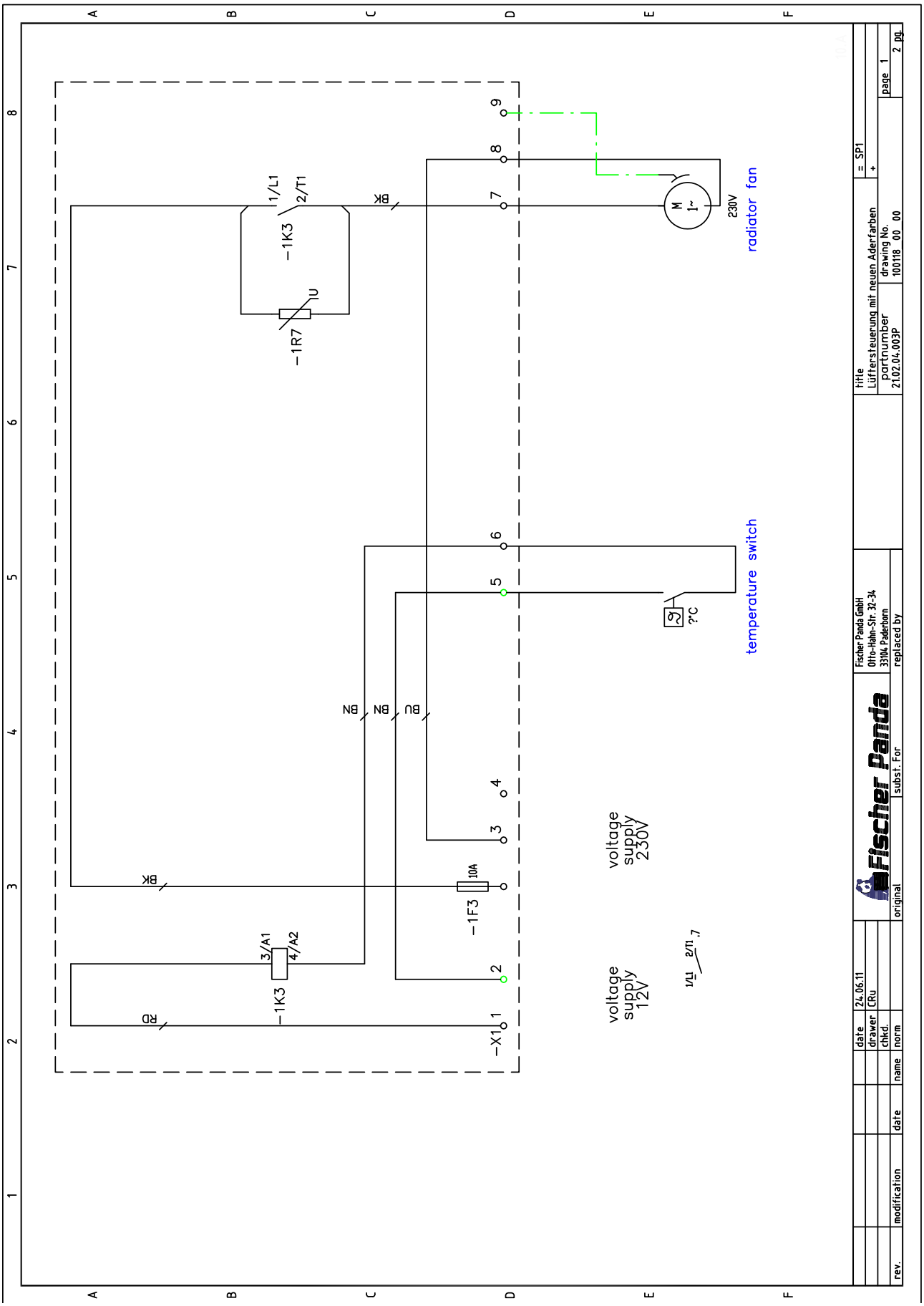
In the standard kit, the generators will be equipped with a one step fan control.

Fan control 230 V

representative picture

Fig. 5.13.0-1: Fan control 230V

Fig. 5.13.0-2: Fan control 230V



5.14 Electronic fan control for DC fans RE 0201

For DC Fans the fan control RE 0201 can be used.

Fig. 5.14-1:

5.15 Brief description

Temperature-dependent continuous speed controlling device for one or two DC-fans.

5.15.1 Function

The speed regulation of the fan is made by pulse tracing modulation (PWM) of the operating voltage. Pulse/no pulse ratio becomes over an external temperature sensor (NTC resistance to attach at clamp 7 and 8) dependent on the coolant temperature. Between the lower limit temperature (starting temperature) and the upper limit temperature the fan is controlled with 30 to 100% of the available operating voltage (PWM = 30% to 100%).

Potentiometer for adjustment concerning temperature and PWM behaviour

Poti Start:	Adjusting the starting temperature (fan start-up). The start temperature is with left stop 60°C and with right stop 80°C. Ex factory a starting temperature of 70°C is adjusted (potentiometer position: In the middle).
Poti Window:	Adjusting the temperature window: With the potentiometer „Window“ the size of the window between starting temperature and temperature for full number of revolutions (upper limit temperature) can be adjusted. The temperature window can be adjusted from 5°C to 20°C. Is the starting temperature adjusted to 70°C and the temperature window to 10°C thus the fan start-up with 70°C and reaches the maximum speed with 80°C (upper limit temperature). Ex factory a temperature window of 12,5°C is adjusted (potentiometer position: In the middle).
Poti Freq:	Adjusting of the PWM frequency. Desired to many customers a potentiometer was added for changing the PWM frequency. A selection of the frequency between approx. 1,7 and 3,5kHz is possible, which can serve for the avoidance of unwanted oscillation/resonances. Ex factory a PWM frequency of 2 kHz is adjusted.

Function of the temperature sensors (NTC-resistance, extern und intern):	
extern:	Over this temperature sensor the coolant temperature is collected. The starting temperature (fan start-up) and the upper limit temperature can be adjusted by means of potentiometer present at the plate. The PWM ratio starts with the exceeding of the starting temperature with approx. 40% (for 2 seconds), so that the fan starts reliably. According to expiration of the 2 seconds the PWM ratio is determined by coolant temperature and potentiometer adjust. Since the coolant temperature will not continue to rise in the 2 seconds, the PWM ratio will jump back to the minimum value of 30%. At, from here, far rising coolant temperature, the PWM ratio will then rise linear with the temperature. If the upper limit temperature is nearly reached, the PWM ratio rose to 85%. By 85% to 100% PWM ratio with reaching the upper limit temperature switching over is made by one step, in order to avoid very short turn-off times. Likewise switch-back is made with falling coolant temperature of 100% to 85% PWM ratio. If the coolant temperature falls under the starting temperature, the minimum PWM ratio is not fallen below of 30%, but remains constant. If the coolant temperature sinks approx. 3°C under the starting temperature, then the fan is switched off completely. All data exclusively apply on use of the temperature sensor type S891-100k of the manufacturer Epcos.
intern:	Over this temperature sensor the temperature of the output stage is collected. If the temperature of the output stage rises over 85°C, the PWM ratio, independently of the coolant temperature, is set to 100%, in order to avoid the switching losses and cool the output stage down again. If the temperature of the output stage continues to rise nevertheless and beyond 90°C, the fan controller switches itself off. **NOTE: The cooling of the generator is not ensured anymore.** If the output stage temperature sinks again under 85°C, the fan controller restarts itself. Such output stage temperatures cannot occur however with intended use of the equipment.

Light emitting diodes: The 3 light emitting diodes (LED's) indicate the operating condition of the fan controller and have the following meaning:	
LED (green):	Shines with normal operation. After the self check and successful recognizing of the sensors the fan controller jumps into the normal operating condition, in which the fan regulates, if the temperature lies in the appropriate range.
LED (yellow):	Shines if the fan controller is in slave-mode.
LED (red):	Shines with the occurrence of the following errors: Incorrect external temperature sensor. If the temperature sensor for the cooling water is defective or the feeder line to it interrupted (cable break), then the fan is accessed with 100% PWM. Incorrect internal temperature sensor. If the temperature sensor for the output stage is defective or the feeder line to it interrupted (cable break), then this is indicated over the LED. The fan controller continues working normally. Overheating of the output stage. If the output stage of the fan controller becomes too hot, then this switches itself off. Please read in addition the description of the function of the internal temperature sensor.

5.15.2 Master - Slave - Operation

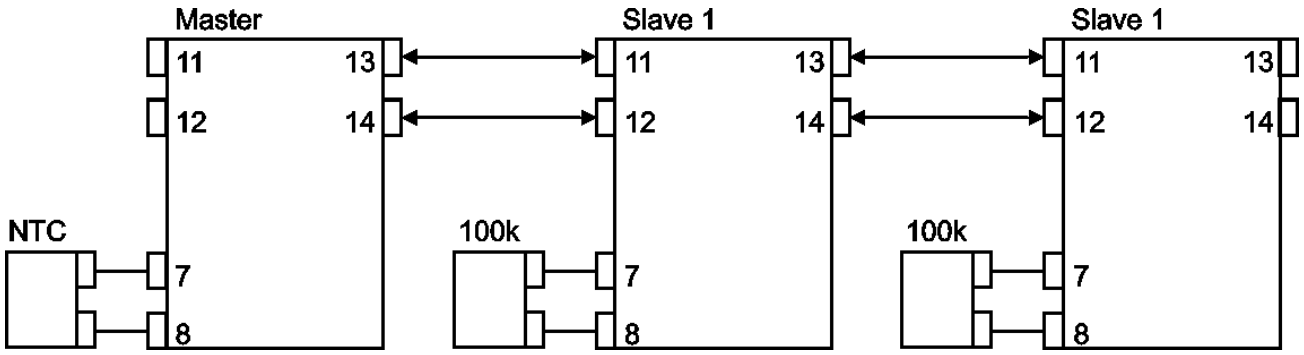
Two or three fan controllers can be connected with each other that over one temperature sensor for the cooling water, all fan controllers cam be operated synchronous.

On the connection between master and slave the PWM signal of the masters will transfer. The slave takes over of it the PWM ratio and the frequency. The slave spends its PWM impulse only then if that of the masters is terminated. Thus even load of the current supply is reached. The second slave (if available) regards the first slave as its master (see also drawing).

The slave operation is activated automatically, by the presence of a PWM signal at the slave control inlet. As soon as such a signal is present, the slave follows the control signal and ignores its own adjusts and its own temperature measuring input. If the master does not spend a PWM signal, because the coolant temperature is under its starting temperature, the slave drops back into the master operation and uses its own adjusts and analyses its own temperature measuring input. So that the slave behaves correctly now, a 100k fixed resistor must be attached at its temperature measuring input, which corresponds to a coolant temperature below the starting temperature.

The plug-able plug-in for the master-slave-connection and the 100k fixed resistor belong not to the normal scope of supply and must be ordered separately.

Fig. 5.15.2-1:



5.15.3 Function of the clamps for the Master-Slave-Operation

Clamp 11+12:	Control input for slave operation. Clamp 11 is the positive input. Clamp 12 is the negative input. The input is floating, so that via this input connected fan controllers of the same source can be supplied, without a ground loop develops.
Clamp 13+14:	Output for the master-slave-operation. At clamp 13 is the signal and at clamp 14 is ground.

5.15.4 Remote controlled switching on and off of the fan controller

he fan controller can be switched on and/or off over the connection „ON“ (clamp 9). If at connection „ON“ lies the same voltage as at the connection „BAT +“, the fan controller is switched on. If at connection „ON“ lies no voltage, the fan controller is switched off. If this option is not needed, then the connection „ON“ can connected directly on the printed circuit board, over the solder joint J101, with the connection „BAT +“.

- J101 closed: Fan control always on
- J101 open: Fan control only on if operation voltage at connection „ON“

The solder joint J101 is seen from the direct line clamp directly behind the main safety device (main fuse) on the printed circuit board.

5.15.5 12V / 24V - Operation

For 12V and/or 24V-operation the pre-resistor for the operating voltage of control electronics must be adapted. This pre-resistor consists of two resistances, which are connected in series. For 12V-operation one of these resistances is short circuit with the solder joint J102. For 24V-Betrieb the solder joint J102 must be opened. Additionally different safety devices (fuses) must be installed depending upon operating voltage.

Main fuse (flat fuse on the printed circuit board):

12V-operation: 50A flat fuse

24V-operation: 30A flat fuse

Output fuse (plug fuse on the terminal block, each two pieces):

12V-operation: 25A plug fuse

24V-operation: 20A plug fuse

5.16 Technical Data

Characteristics	
closed current (electronics off)	0,5mA
closed current (electronics on)	10 - 15mA
Benchmark figure of the temperature control:	
fan start-up	60°C - 80°C
max. number of revolution	65°C - 100°C
tolerance of the temperatures	± 5%
Maximum ratings	
maximum ambient temperature (for operation)	50°C
Maximum ratings: Battery operation 12V	
nominal load operating voltage (continuity)	11 VDC - 14.4 VDC
load operating voltage (15min)	- 16.0 VDC
maximum idle speed operating voltage (3 sec)	17 VDC
nominal load current (continuity)	40 A
maximum load current (3 sec)	44 A
nominal voltage fan	12 VDC
Maximum ratings: Battery operation 24V	
nominal load operating voltage (continuity)	18 VDC - 28.0 VDC
load operating voltage (15min)	- 28.8 VDC
maximum load operating voltage (3 sec)	30 VDC
idle speed voltage (continuity)	34 VDC
maximum idle speed operating voltage (3 sec)	36 A
nominal load current (continuity)	20 A
maximum load current (3 sec)	22 A
nominal voltage fan	24 VDC
Maximum ratings: Transformer operation 12V	
sieving in the power supply	≥ 10000µF 63V (depending on the load current)
data for secondary winding after rectification/sieving	
nominal load operating voltage (continuity)	11 VDC - 14.4 VDC
load operating voltage (15min)	- 16.0 VDC
maximum load operating voltage (3 sec)	17 VDC
idle speed operating voltage (continuity)	28 VDC
maximum idle speed operating voltage (3 sec)	30 VDC
nominal load current (continuity)	40 A
maximum load current (3 sec)	44 A
nominal voltage fan	12 VDC
Maximum ratings: Transformer operation 24V	
sieving in the power supply	≥ 10000µF 63V (depending on the load current)
data for secondary winding after rectification/sieving	
full load operating voltage (15min)	18 VDC - 28.0 VDC
load operating voltage (15min)	- 28.8 VDC
maximum full load operating voltage (3 sec)	30.0 VDC
maximum partial load operating voltage	36.0 VDC
idle speed operating voltage (continuity)	39.0 VDC
maximum idle speed operating voltage (3 sec)	40.0 VDC
maximum input peak voltage	44.0 VDC *1)
maximum output peak voltage	44.0 VDC *1)
nominal load current (continuity)	24 A

maximum load current (3 sec)	28 A
nominal voltage fan	24 VDC

1) *The maximum input and/or output peak voltage is measured over the appropriate clamps of the fan controller. It may be exceeded at no time. This applies independently of whether a voltage increased height was possibly caused by the fan controller or an external component. To this belong the switch off-transient of the fan (pulse width modulation = fan will be 2000 times per second switched on and off), and by outside switching operation caused glitches.*

- solder joint J101 closed
- solder joint J102 open
- main fuse 30A installed
- output fuse 20A installed

Attention!: Configuration at delivery for 24V-operation.

For 12V-operation the installed fuses must be replaced against the provided fuses, as described above. The pre-resistors for the operating voltage of control electronics must be configured like above described.

Assembly: Vertical on standard rail, pay attention to good ventilation.

At breach of specification can destroy one or more components of the system or shorten the life span substantially.

Subject to change without prior notice.

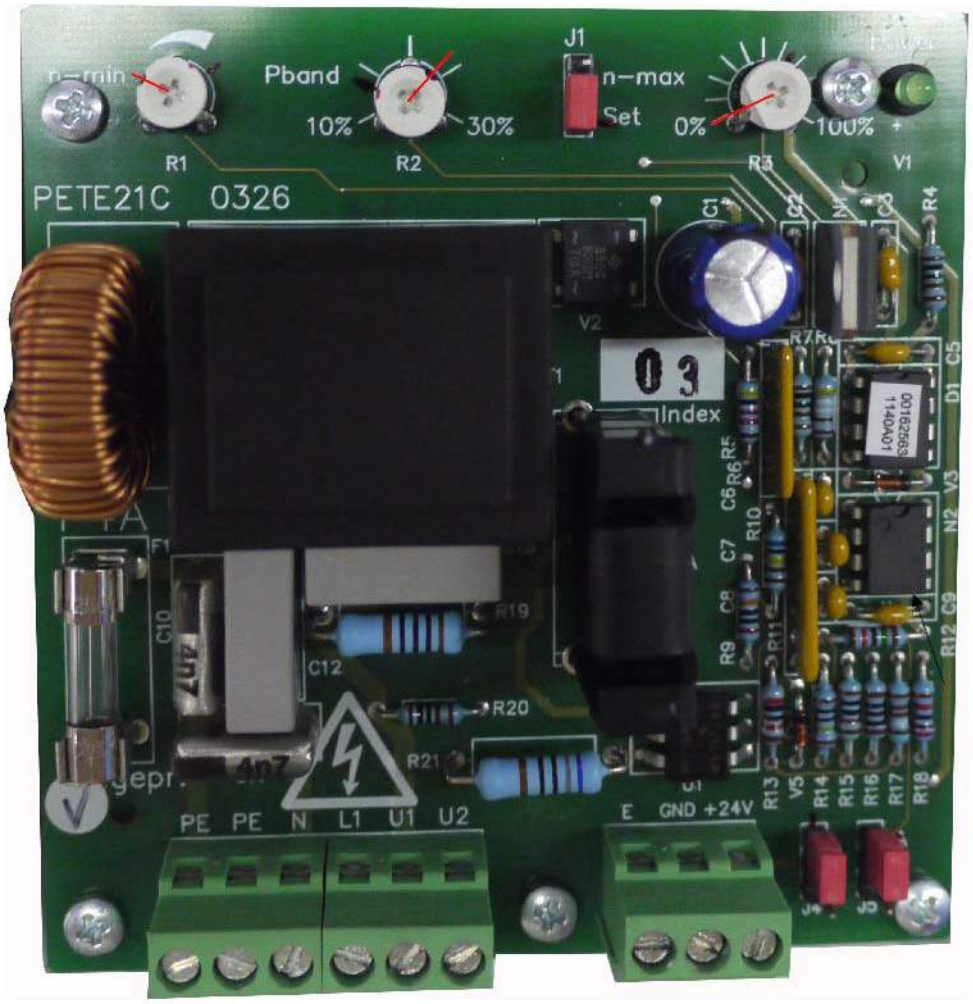
5.17 Electronic fan control for single phase fans PKE-2.5V_Ziehl Abegg

The electronic fan control variety the fan rpm stepless.

5.17.1 Preset for the use with Fischer Panda generators

The Ziehl Abegg fan control is preset for the use with Fischer Panda generators. For the preset following data and jumper settings are used.

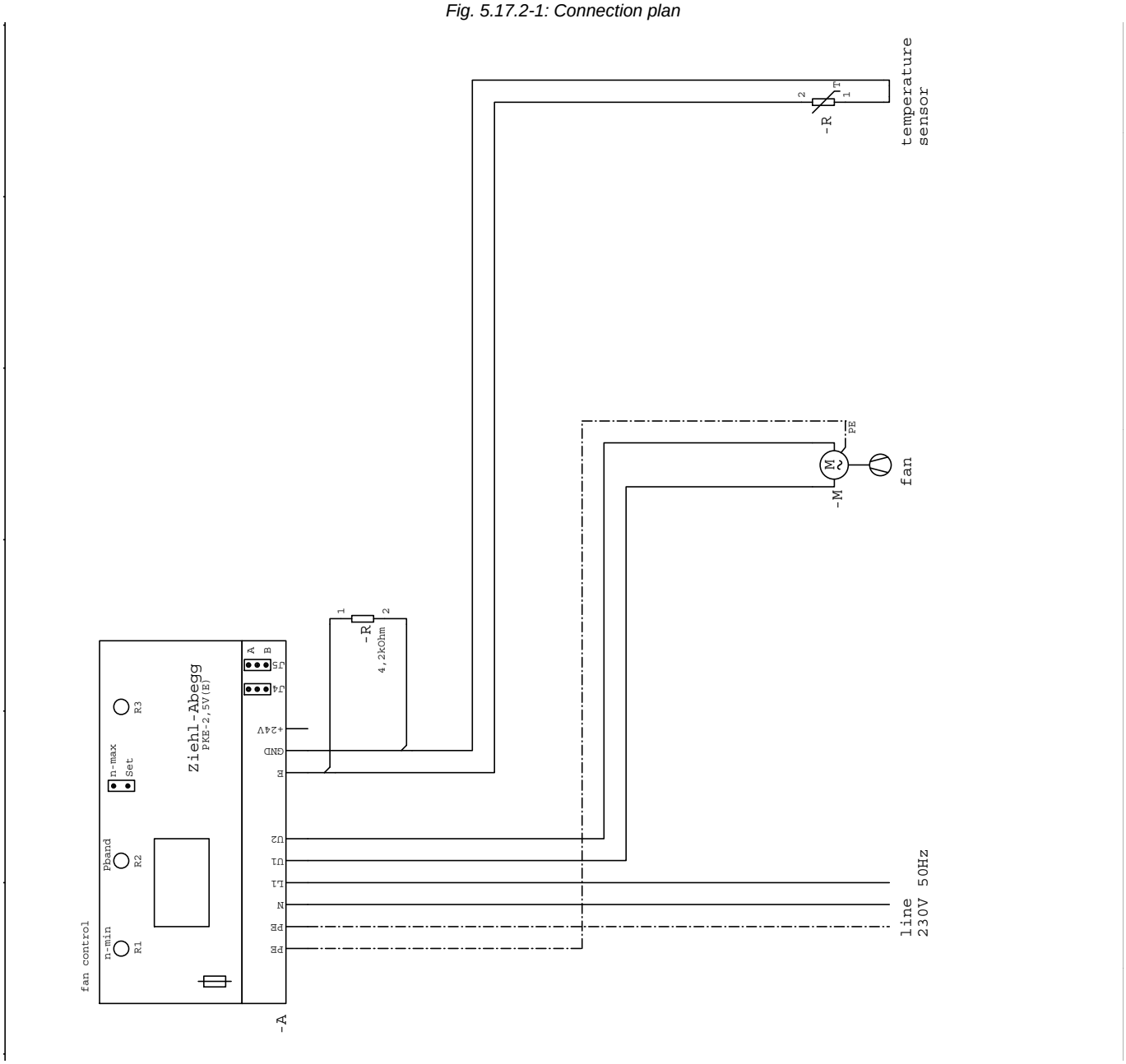
Fig. 5.17-1: Preset



5.17.2 Connection of the sensor (Ziehl Abegg KTY)

The sensor is connected to E/GND. A resistor 4,2kOhm must be connected parallel to the sensor.

Fig. 5.17.2-1: Connection plan



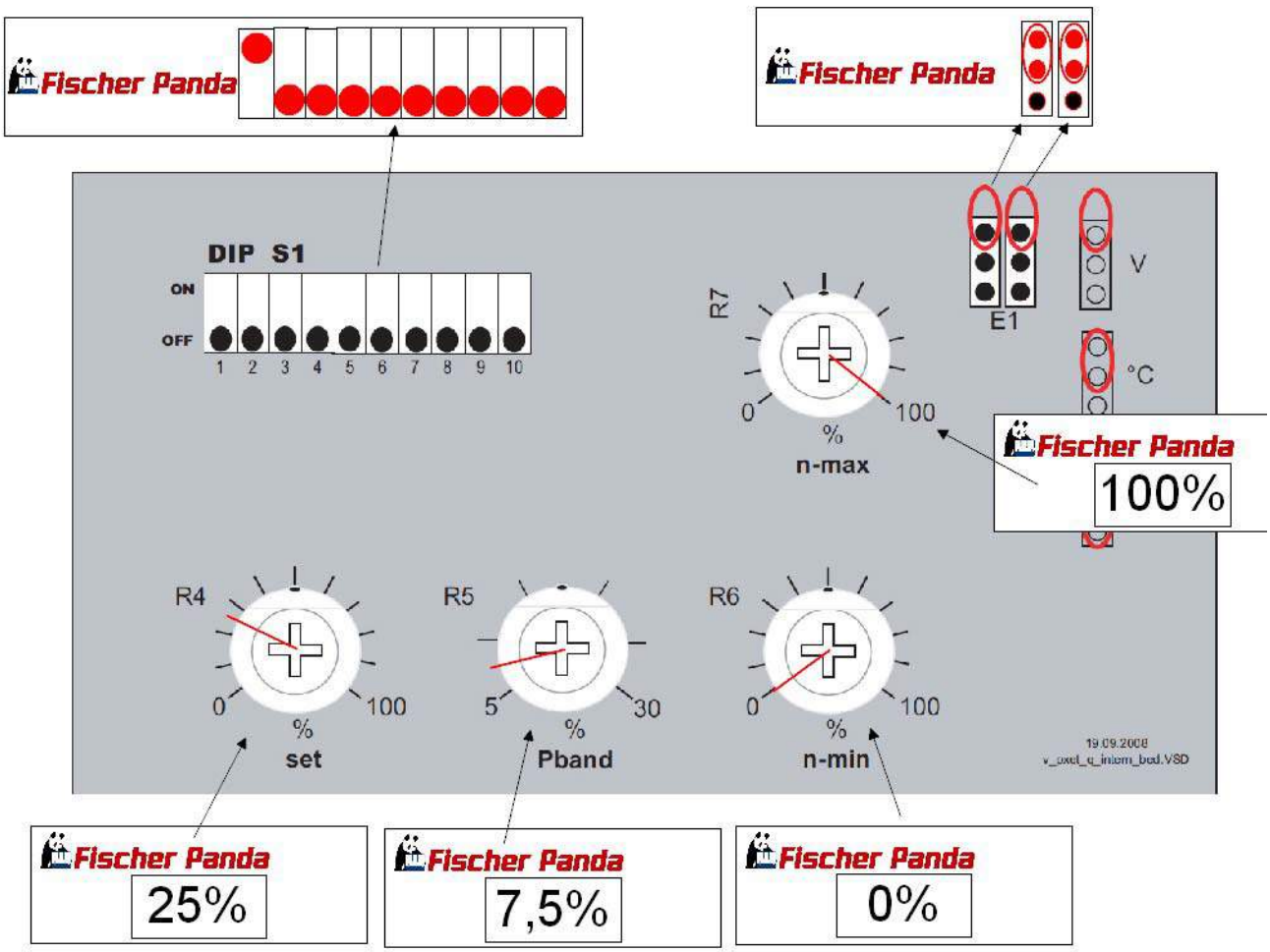
5.18 Electronic fan control for single phase fans PXET6Q_Ziehl Abegg

The electronic fan control variety the fan rpm stepless.

5.18.1 Preset for the use with Fischer Panda generators

The Ziehl Abegg fan control is preset for the use with Fischer Panda generators. For the preset following data and jumper settings are used.

Fig. 5.18-1: Preset

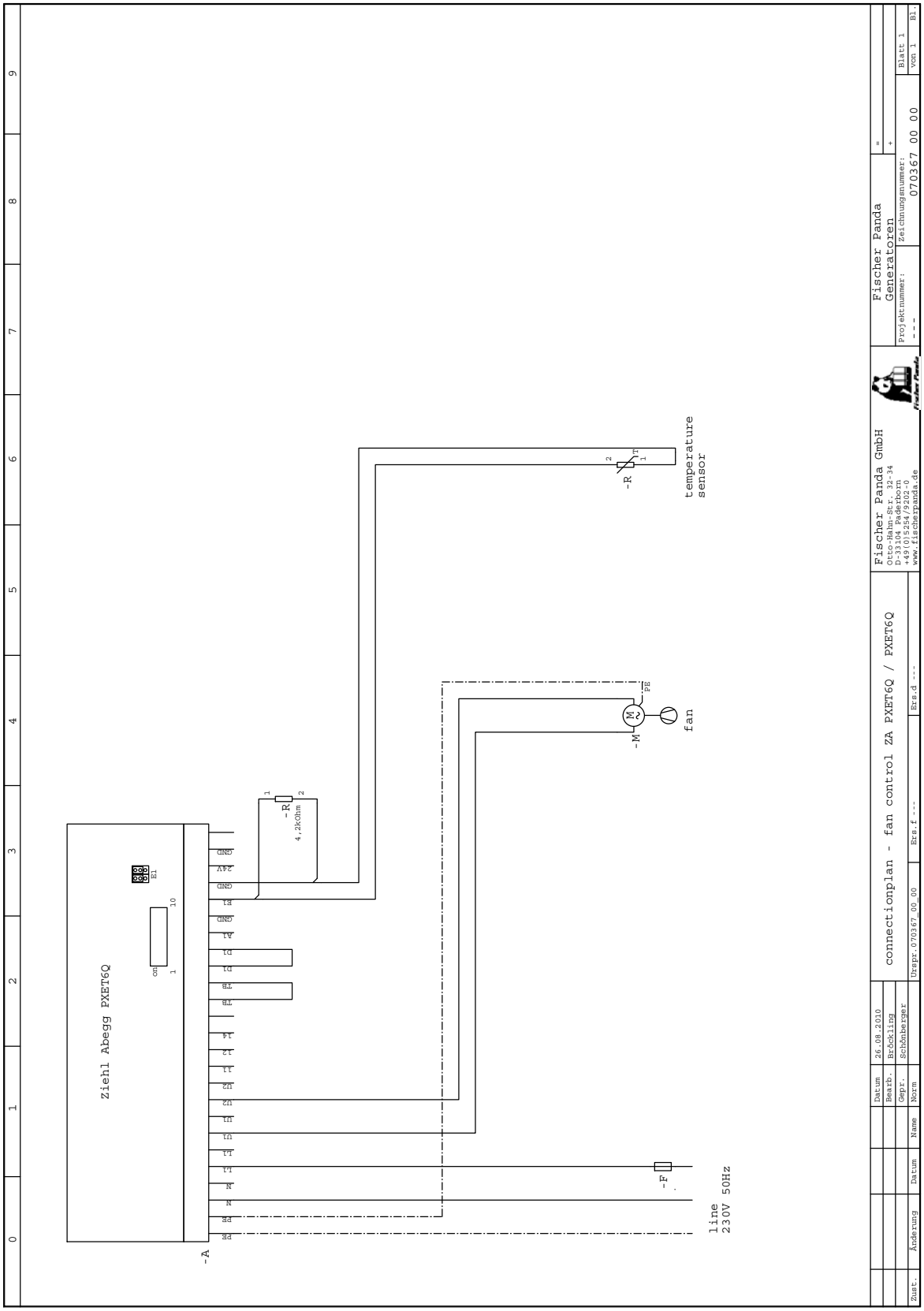


5.18.2 Connection of the sensor (Ziehl Abegg KTY)

The input TB and D1 are bridget.

The sensor is connected to E1/GND. A resistor 4,2kOhm must be connected parallel to the sensor.

Fig. 5.18.2-1: Connection plan



5.19 Electronic fan control for 3 phase fans PKD T5 Ziehl Abegg

The electronic fan control variety the fan rpm stepless.

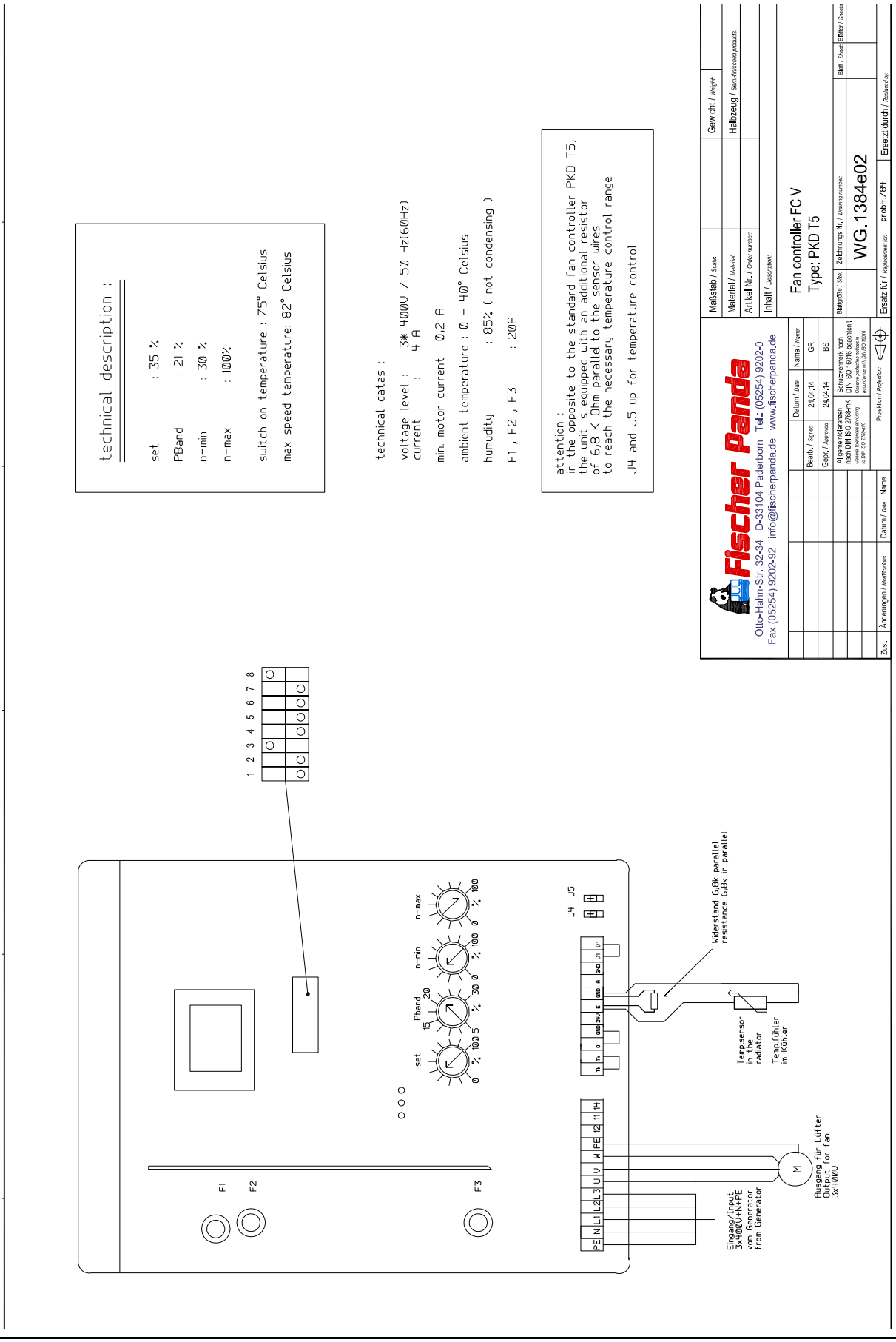
Fan control PKD T5

representative picture

Fig. 5.19.0-1: Fan control PKD T5

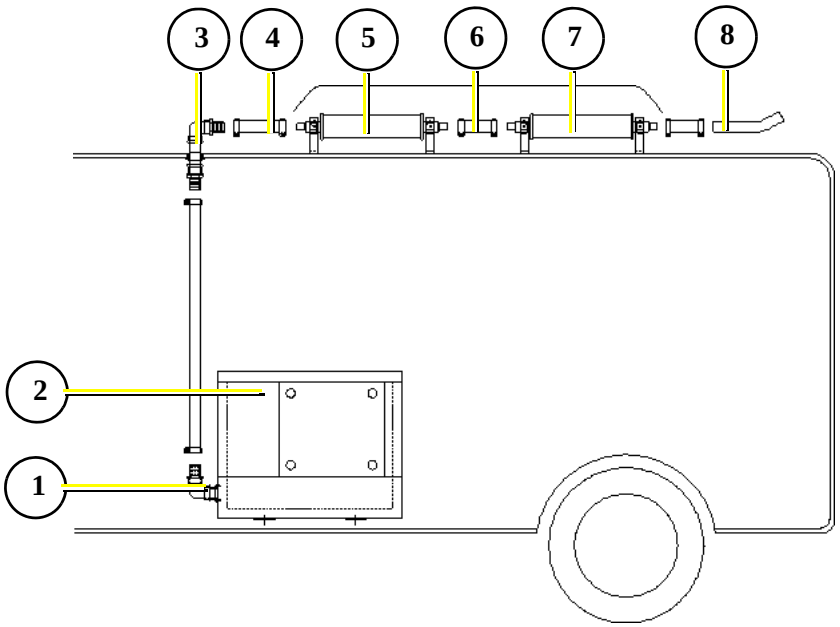
5.19.1 Configuration of the electronic fan control PKD T5 for Fischer Panda Generators

Fig. 5.19.1-1: Configuration of the fan control PKD T5 for Fischer Panda Generators



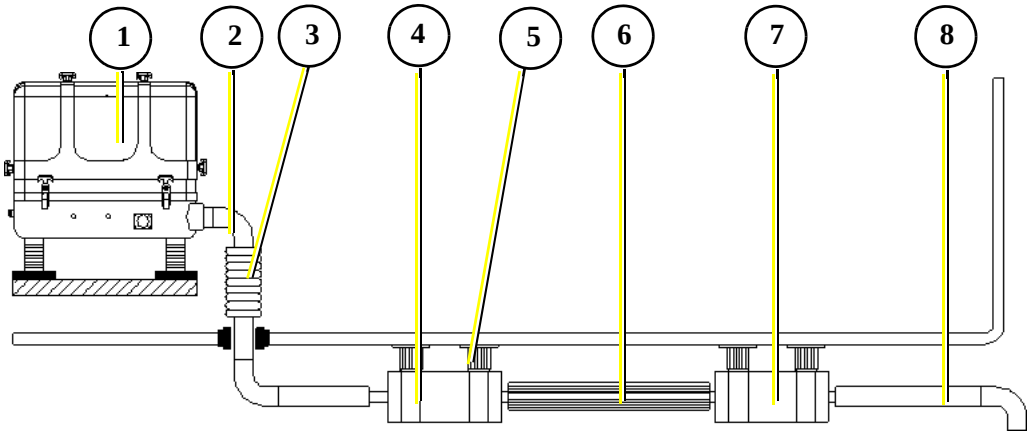
5.20 Exhaust installation

Fig. 5.20-1: Exhaust connection for roof outlet



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

Fig. 5.20-2: Exhaust connection for mounting below the vehicle



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

5.21 Isolation test

After installation, but before the generator is set into normal operation and handed to the customer, an isolation test must be performed as followed:

ATTENTION!

1. Disconnect all load.
2. Start the generator.

3. Measure with a voltmeter (AC) the voltage between:
   a. Generator housing and PMGi housing.
   b. Generator housing and ground of the vehicle.
   c. The measured voltage must be lower than 50 mV.
4. Test the installed protective devices (like RCD). If a RCD is installed, a functional test must be done. Check all terminals for right connections. Measure all phases against each other and against the neutral wire.
5. If the generator is Protected by PME, make sure that all components has the same ground at the housing.

The protective devices must match the national regulation.

5.22 Set into operation

After the installation the generator must be brought in service. For this the „Service record and warranty registration must be worked through and filled out by the installing technical trained person.

This document must be handed out to the owner. The owner must be instructed for the operation, maintenance and hazards of the generator. These include the in the manual mentioned hazards and further ones, which are the result of the specific installation and the connected components.

Send the original Service and warranty record to Fischer Panda to get full warranty. Make a copy for your hands.

Note!:

5.23

6. Generator operation instruction

6.1 Personal requirements

Only instructed persons are allowed to run the generator. Instructed Persons has read the manual of the generator and all ancillary components and external equipment. He must be acquaint with the specific risks and safety instructions.

Only persons who are expected to perform their tasks reliably are permitted as personnel. Persons whose reaction capability is impaired, e.g. through drugs, alcohol or medication are not permitted.

When selecting the personnel, the stipulations regarding age and occupation applying at the location must be observed.

6.2 Hazard notes for the operation

Please note the safety first instructions in front of this manual.

Notice!:

Danger for life! - The generator can be equipped with a automatic start device. This means the generator can be started by an external signal.

Warning!: Automatic start

To avoid an unexpected starting of the generator, the starter battery must be disconnected before start working at the generator.

Rotating parts inside of the generator

Attention!: Danger to life

Do not run the generator with removed sound cover. If it is necessary to test the generator without sound cover, pay special attention. Never do this work alone. Do all service, maintenance and repair with engine stopped.

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

Attention!: Danger to Life - High voltage

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

6.3 General operating instruction

6.3.1 Operation at low temperatures

The Generator can be started at temperatures down to - 20 °C, therefor the operation fluids like fuel, cooling water, lubricant oil ect. must be suitable for this temperatures. These should be checked before start. Cold start spray ect. are not allowed to use, or the warranty will be lost.

6.3.1.1 Pre-heating the diesel motor

Pre.champer diesel engines are equipped with a quick glow plug. The maximum pre glow time should not exceed 20 sec. At 20 °C or more the pre glow time should be about 5-6 sec. Below 20 °C the pre glow time should be increased,

If the operation fluids have been drained and then filled with cold weather fluids, always run the generator for 10 minutes to ensure the new fuel is present throughout the system.

Note:

6.3.1.2 Tips regarding starter battery

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

6.3.2 Light load operation and engine idle

If an engine is operated on a load less than 25-30 % of its rated output, the soot of the generator will be observed which may give cause for concern. The usual results of this operation are heavier than normal lubricating oil consumption, and oil leaks from the air and exhaust manifolds. This condition is particularly evident on standby generator set applications.

6.3.2.1 The soot of the generator is due to the fact that:

The cylinder temperatures are too low to ensure complete burning of all the fuel delivered.

A further result is that of abnormal carbon build-up on the valves, piston crowns and exhaust ports. Fuel dilution of the lubricating oil will also occur.

6.3.2.2 To prevent the soot of the generator following steps should be observed:

Running on light load should be avoided or reduced to the minimum period.

In a period of 50 operation hours the engine or generator set should be run on full load for four hours, to burn off accumulations of carbon in the engine and exhaust system. This may require the use of a 'dummy load'. The load should be built up gradually from 30 % to 100 % within 3 hours and hold at 100 % for one hour.

6.3.3 Generator load for a longer period and overload

Ensure the generator is not overloaded. Overloading occurs when the electrical load is higher than the generator can provide. If this occur for a longer period, the engine may be damaged. Overloading may cause rough running, high oil and fuel consumption, increased emissions.

For a long engine life, the long therm load should not exceed 80 % of the nominal load. Long therm load is the load over several hours. It is harmless for the generator to deliver full nominal power for 2-3 hours.

The hole conception of the Fischer Panda generator make sure, that the full power operation at extreme condition will not increase the engine temperatures over. Please note that the emissions of the generator also increase at full power operation.

6.3.4 Protection conductor:

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

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

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

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

6.3.5 Operating control system on the Fischer Panda generator

Fischer Panda generators are equipped with various sensors/temperatures switches. The combustion engine is further equipped with a oil pressure control switch, which switches the motor off, if the oil pressure sinks to a particular level.

6.4 Instructions for capacitors - not present at all models

Danger to Life - High voltage **CAUTION!**

Do not touch the capacitor contact terminals!

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

A) The booster capacitors

B) The operating capacitors

Both types are mounted in the electrical cabinet. (At some models direct on the generator)

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

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

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

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

6.5 Checks before start - see remote control panel data sheet

The instructions and regulations of the remote control panel data sheet must be respected. **Note:**

Respect the safety instruction in front of this manual.

6.6 Starting the generator - see remote control panel data sheet

The instructions and regulations of the remote control panel data sheet must be respected.

Note:

Respect the safety instruction in front of this manual.

6.7 Stopping the generator - see remote control panel data sheet

The instructions and regulations of the remote control panel data sheet must be respected.

Note:

Respect the safety instruction in front of this manual.

7. Maintenance Instructions

7.1 Personal requirements

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

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

7.2 Hazard notes for the maintenance

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

Notice!:

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

Warning!: Automatic start

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

Make sure that the generator is stopped and the starter battery is disconnected to guarantee that the generator cannot be inadvertently started.

Do not run the generator with removed sound isolation cover

Warning!: Risk of injury

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

- Always undertake installation/maintenance work when the generator is switched off.
- Ensure there is sufficient installation clearance before start working.
- Ensure tidiness and cleanliness at the workplace. Loose components and tools lying around or on top of each other are sources of accidents.
- Only perform installation work using commercially available tools and special tools. incorrect or damaged tools can result injuries.

Warning!: Risk of injury

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

- No open flames during work on the generator.
- Do not smoke.
- Remove oil and fuel residues from the generator and floor.

Warning!: Danger of fire

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

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

Danger!: Danger of poisoning

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

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

ATTENTION!: Danger to Life - High voltage

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

Warning!: Hot surface/material

During Installation/maintenance personal protective equipment is required to minimize the health hazards.

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

Instruction!: Personal protective equipment necessary.

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

Attention!: disconnect all load

Batteries contains acid or alkalis.

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

See the operation and safety instruction from your battery manufacturer.

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

Observe the instructions from your battery manufacturer.

Warning!:

7.3 Environmental protection

Danger to the environment due to mishandling!

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

- Always observe the instructions mentioned below.
- Take immediate action if environmentally hazardous materials reach the environment. Inform the responsible local authorities about the damage in the case of doubt.

The disposal must be performed by a specialist disposal company.

Environmental protection.

7.4 Maintenance Requirements

Control before starting

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

Once a week

- Lubrication of actuator-trapezoid thread spindle

7.5 Maintenance interval

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

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

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

Note:

7.6 Checking oil-level

You require:

paper towels / cloth for the oil dipstick

The generator must be placed at level.

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

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

Generator and coolant can be hot during and after operating.

Caution: Burn hazard!

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

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

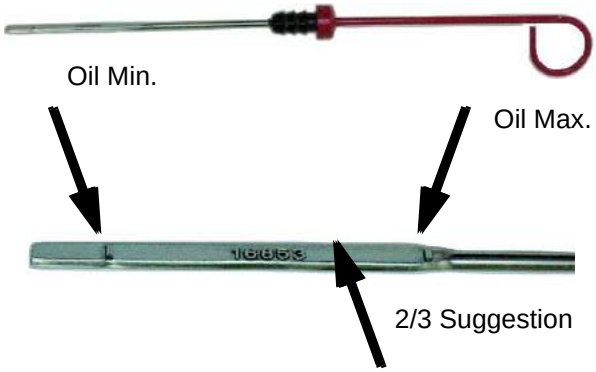
Oil dipstick

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

We recommend an oil-level of 2/3.

Sample picture

Fig. 7.6-1: Oil dipstick - Sample



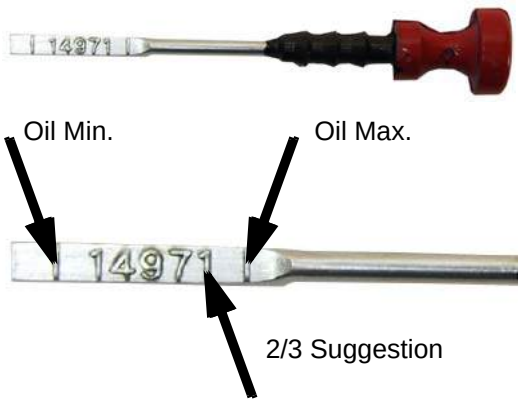
Oil dipstick EA 300 Engine

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

We recommend an oil-level of 2/3.

Sample picture

Fig. 7.6-2: Oil dipstick



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

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

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

- with 150 operating hours or more the oil should be changed (See your generators' service table)
- if the oil-level is under the minimum mark by less than 50h, there might be a technical problem! In that case, we recommend going to a shop or a Fischer Panda service point.
- if the oil is cloudy or even „creamy“, coolant might have mixed with the oil. See a garage or a Fischer Panda service point immediately.

7.6.1 Refilling Oil

You require:

Engine oil

1. Check oil-level as described under section 7.6, “Checking oil-level,” on page 111.
2. Oil dipstick is pulled out of the check rail.
3. Open the oil filler cap.
4. Fill in oil (approx. 1/2 litre) and wait for about 2 min. so this it can flow into the oil pan.
5. Wipe off the oil dipstick and put it into the check rail.
6. Pull the oil dipstick out of the check rail and check the oil-level. See section 7.6, “Checking oil-level,” on page 111.

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

7.6.2 After the oil level check and refilling the oil

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

7.7 Replacement of engine oil and engine oil filter

You require:

- Engine oil. See attachment.

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

- Sealing for oil drain screw

- Personal protective gear

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

- Open-ended wrench for oil drain screw

- Paper towels and cloth

- Oil filter wrench

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

The generator must be placed at level.

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

Run the generator for about 10 minutes to ensure that the engine is warm.

Wait for 3 minutes, so the oil can flow back into the oil pan.

Generator and coolant can be hot during and after operating.

Caution: Burn hazard!

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

1. Prepare generator.

   - Assure generator against accidental start.

   - Open the generator casing.

   - with generators that have an external oil drain hose: Release the oil drain hose from the mounting.

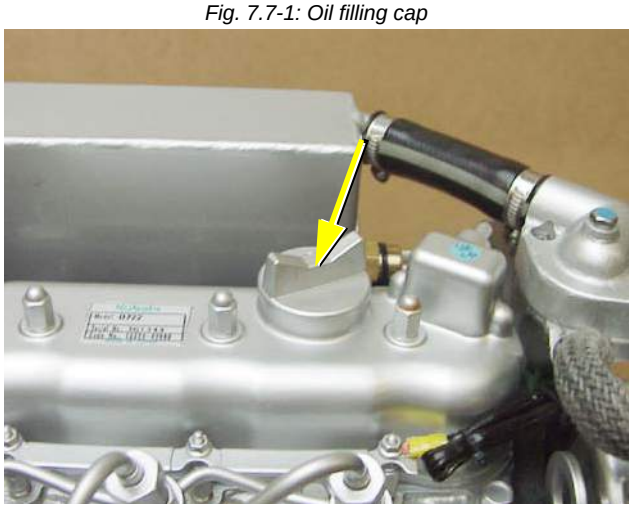
   - with generators that have an internal oil drain hose: Open the lead-through for the oil drain hose (left turn of the sealing). Pull out the sealing with the oil drain hose.

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

2. Loosen oil filling cap

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

Fig. 7.7-1: Oil filling cap



3. Open oil drain screw.

   Unscrew the oil drain screw by means of the open-ended wrench from the oil drain hose (rotating direction left). Use a second open-ended wrench to lock. Make sure to do this over the container.
   Use spanner size 17 mm.

Fig. 7.7-2: Oil drain hose

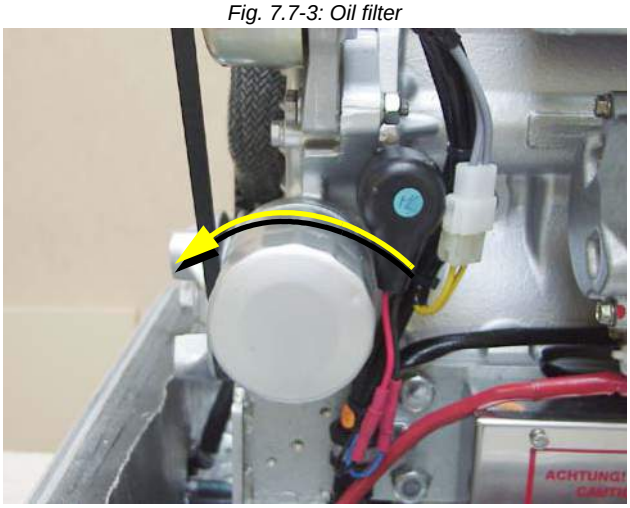
4. Discharge used oil.

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

5. Remove used oil filter / clean oil screen

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

Fig. 7.7-3: Oil filter



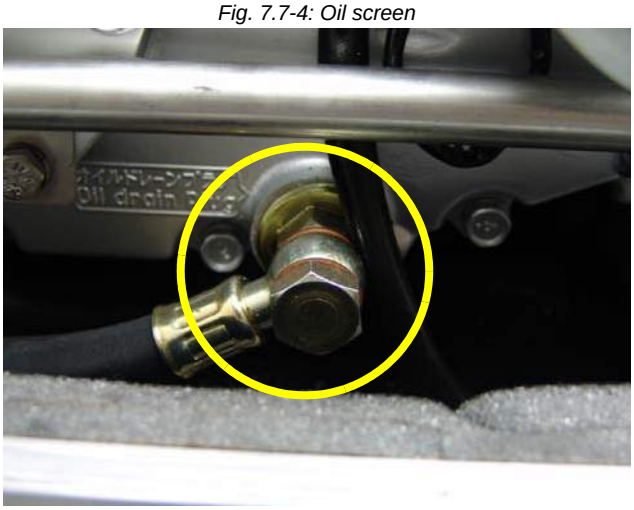
Oil screen with generators with EA300 engines

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

Use spanner size 17 mm.

Sample picture

Fig. 7.7-4: Oil screen



6. Preparing a new filter

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

Fig. 7.7-5: Oil screen sealing ring

7. Mounting the new filter

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

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

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

9. Check proper filling level. See section 7.6, “Checking oil-level,” on page 111.

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

10. Clean up

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

7.7.1 After the oil change

- Put the oil dipstick back into the check rail.
- Close the oil filling cap.
- Remove potential oil stains and splashes from the generator and surroundings.
- Close the generator casing.
- Remove lock against accidental generator start.
- Duly dispose of used oil and filter.

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

7.8 Verifying the starter battery and (if necessary) the battery bank

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

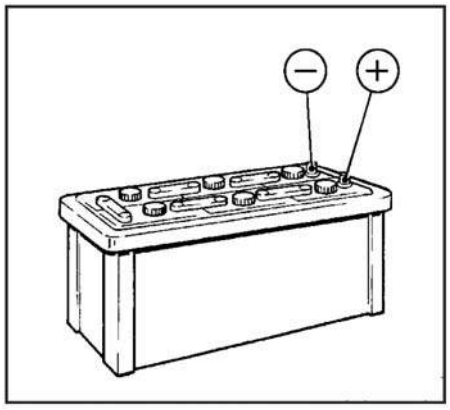
If from the battery manufacturer not otherwise mentioned.

7.8.1 Battery

7.8.1.1 Check battery and cable connections

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

Fig. 7.8.1.1-1: Battery

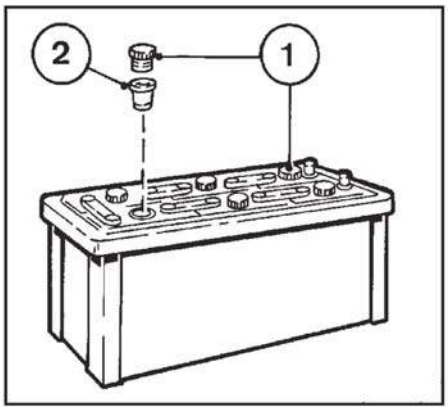


7.8.1.2 Check electrolyte level

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

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

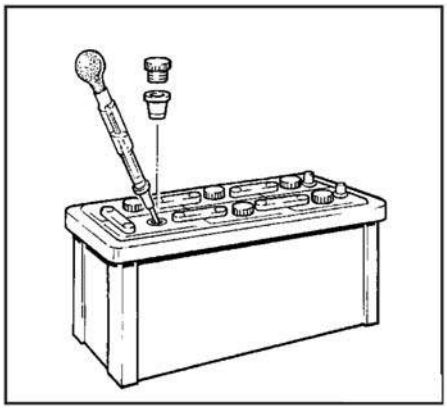
Fig. 7.8.1.2-1: Battery



7.8.1.3 Check electrolyte density

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

Fig. 7.8.1.3-1: Battery



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

Attention

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

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

Wear protective goggles!

Do not rest tools on the battery!

7.9 Ventilating the fuel system

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

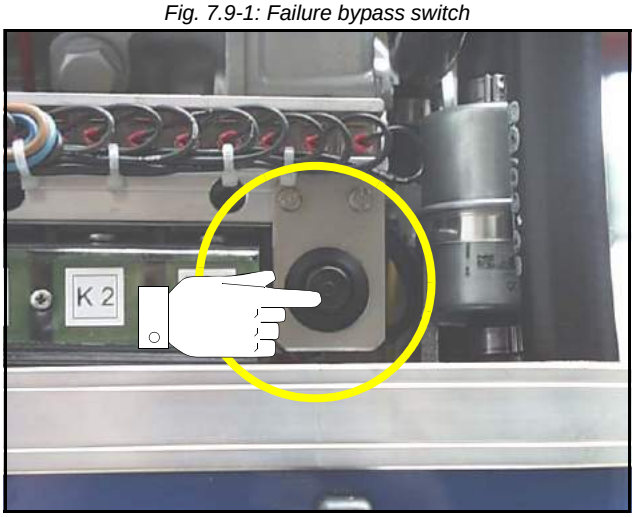
Generators with iControl system do not need a Failure bypass switch. At these generators the fuel pump can be activated by an option of the control panel. See Control panel manual.

Attention:

1. Main power switch „OFF“

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

Fig. 7.9-1: Failure bypass switch



Note!

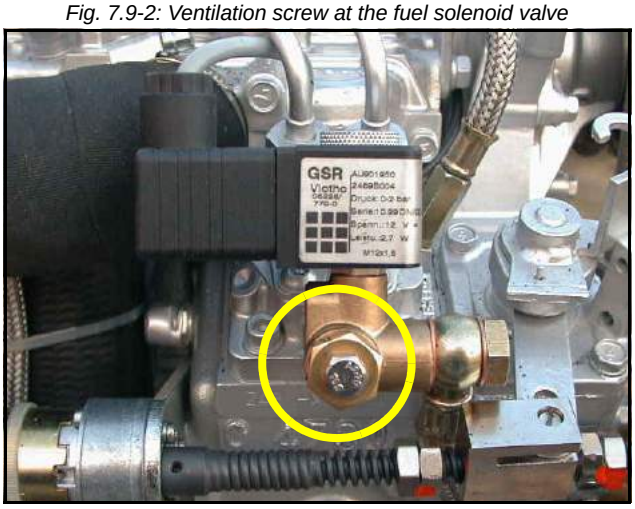
Generators with iControl system has no failure bypass switch. The Fuel pump can be activated at the iControl panel.

Please see iControl manual for details.

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

   Use spanner size 10 mm.

Fig. 7.9-2: Ventilation screw at the fuel solenoid valve



Not all generator models has a fuel solenoid valve. At generators without fuel solenoid valve, a single ventilation screw is installed.

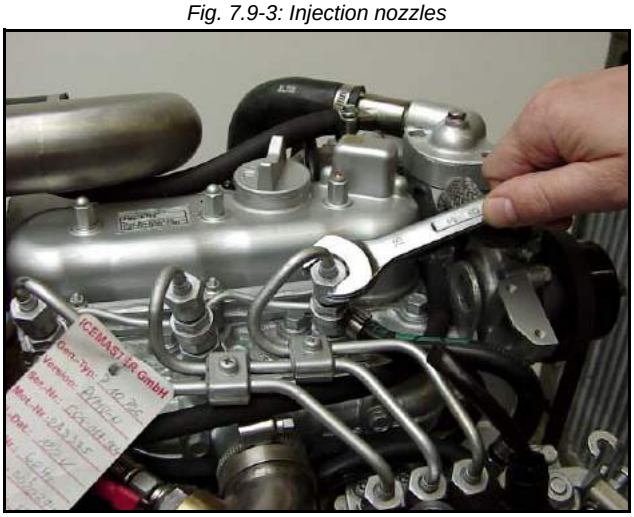
Note!:

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

   Use spanner size 17 mm.

6. Switch main switch „OFF“.

Fig. 7.9-3: Injection nozzles



7.9.1 Replacement of the fuel filter

Exchanging the filter, depending upon fuel contamination, should take place after 300 operational hours at the very least. The inlet must be clamped, before exchanging the filter.

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

Fig. 7.9.1-1: Fuel Filter

7.9.1.1 Optional fuel filter with sight glass

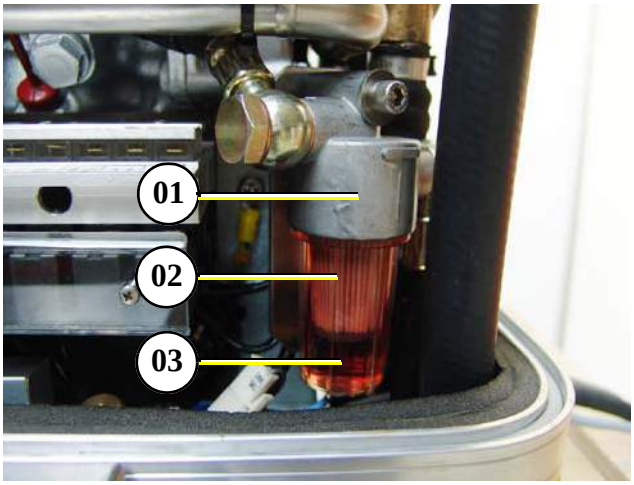
The filter change depends on the fuels' degree of pollution, but should be executed every 300 operating hours at the latest.

01. Fuel filter housing

02. Fuel filter element

03. Sight glass

Fig. 7.9.1.1-1: Fuel filter

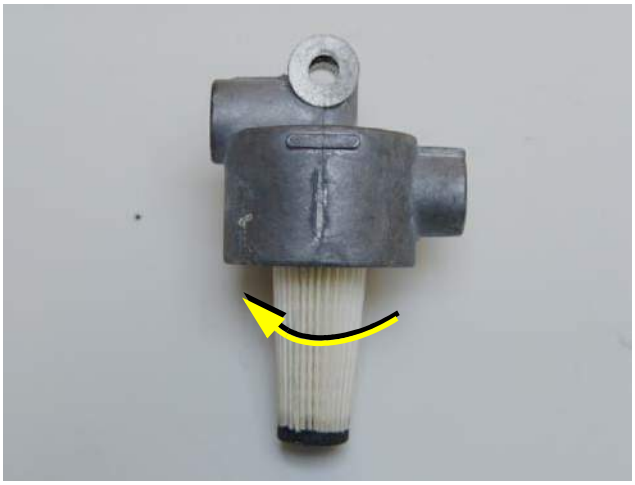


1. Unscrew the housing from its mount (left hand rotation).

Fig. 7.9.1.1-2: Fuel filter

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

Fig. 7.9.1.1-3: Fuel filter



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

Fig. 7.9.1.1-4: Fuel filter

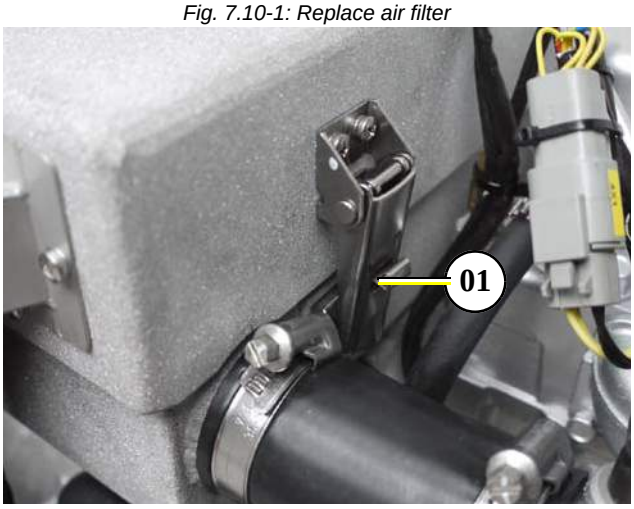
7.10 RReplacing the Air Filter

The replacement interval depends on the contaminations in the combustion air, but the air filter should be changed at least every 500 operating hours.

1. Open the closure on the right-hand side of the air intake housing

   01. Closure

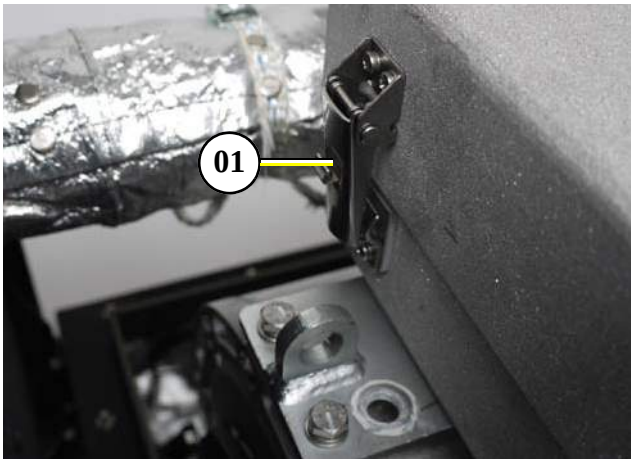
Fig. 7.10-1: Replace air filter



2. Open the closure on the left-hand side of the air intake housing.

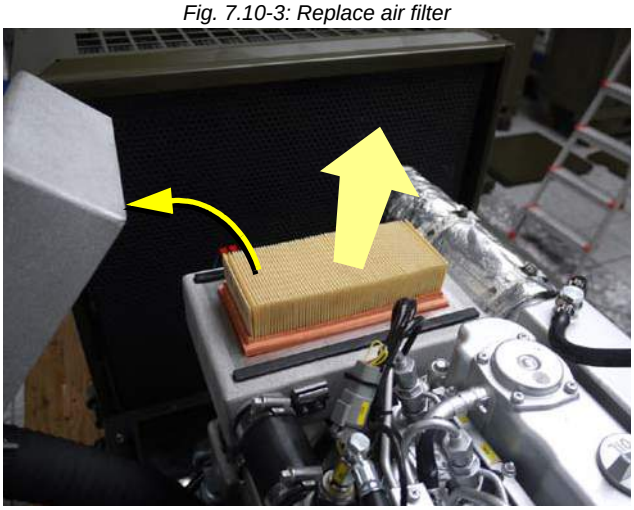
   01. Closure

Fig. 7.10-2: Replace air filter



3. Lift up the housing cover and pull it backwards.
4. Replace the air filter (MANN FILTER C2039).
5. To reinstall, reverse the order of steps.

Fig. 7.10-3: Replace air filter



7.10.1 Ventilation of the coolant circuit / freshwater

Special notes for the ventilation of the cooling system

Attention

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

This ventilating procedure must be repeated several times:

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

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

Further it should be guaranteed that the expansion tank is attached in sufficient height (600 m) over the level of the generator exhaust elbow union.

Expansion tank

Fig. 7.10-1: Expansion tank

1. Open the ventilating screw above the cooling water pump casing. Not present at all models

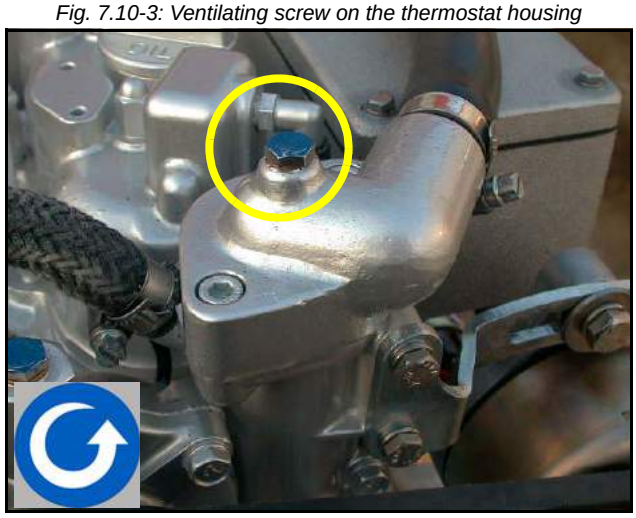
   Use spanner size 10 mm.

Not present at all models

Fig. 7.10-2: Ventilating screw

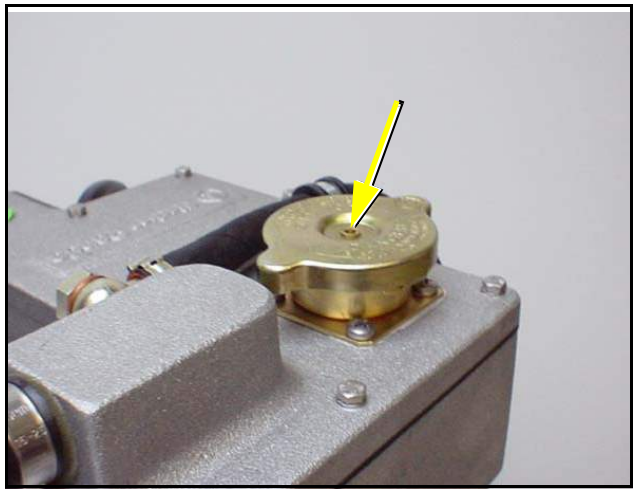
2. Open the ventilating screw on the thermostat casing.
   Use spanner size 10 mm.

Fig. 7.10-3: Ventilating screw on the thermostat housing



3. Pour cooling water into the cooling water filling necks. (At generators without filler, The cooling water can be filled into the external expansion tank instead)
4. If the cooling water level no longer drops (the cooling water level in cold waters must cover the tin in the exhaust elbow), close the filler cover and the cooling water screws and then start the generator.
5. Run the generator for approx. 60 Seconds, then switch off
6. Refill cooling water via the compensation tank.
7. The compensation tank is connected to the generator by two hoses.

Fig. 7.10-4: Cooling water filler cap



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

8. Repeat this procedure 1 - 5 times.

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

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

Fig. 7.10-5: Ventilation screw above the cooling water pump casing

7.10.2

7.11 V-belt replacement for the internal cooling water pump

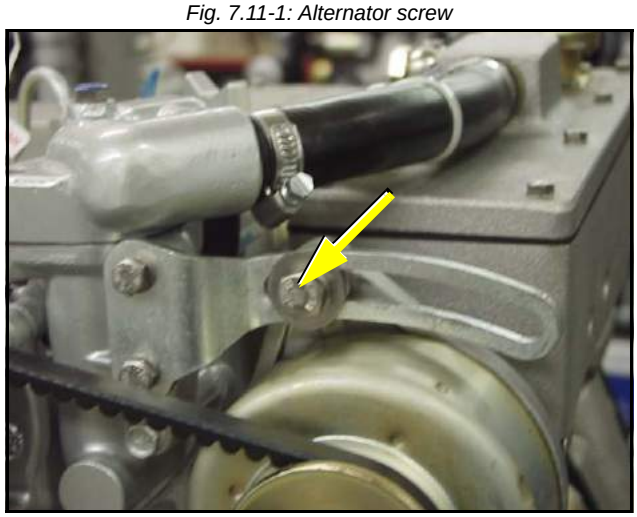
The V-belt wears in a short time due to high ambient temperature within the closed capsule (approx. 85 °C). The air in the generator capsule is not only warm but also very dry. Therefore it is possible, that the „softener“ in the rubber composers wear after a very short time of operation.

Therefore, the V-belt must be checked in short time distances. It may be possible, that the V-belt must be changed after a few weeks. Therefore the V-belt must be checked every 150 hours. The v-belt must be seen as a wearing part. Therefore it is necessary to have enough spare V-belts on board. We therefore recommend to have the Fischer Panda Service Kit on board.

1. Loose the screw on the upper alternator mounting.

Sample picture

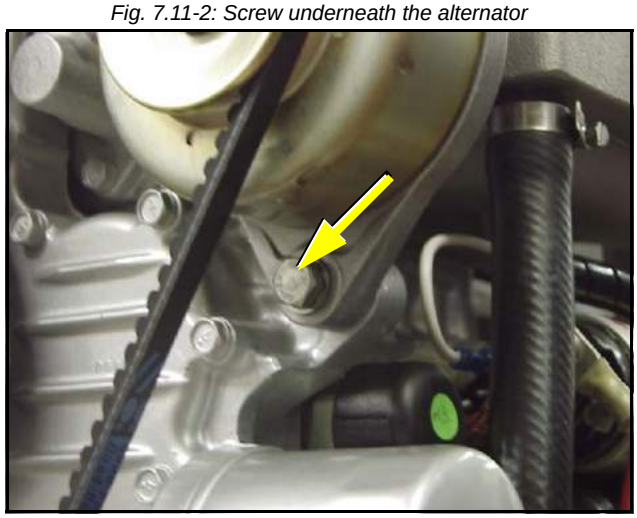
Fig. 7.11-1: Alternator screw



2. Loose the screw underneath the alternator.

Sample picture

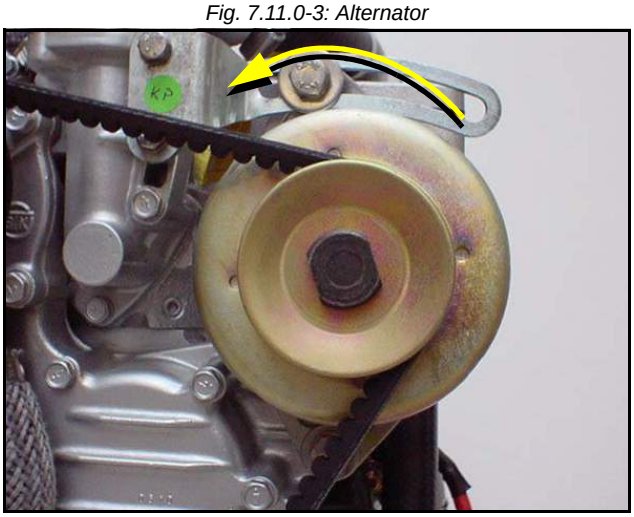
Fig. 7.11-2: Screw underneath the alternator



3. The alternator must be pressed in the direction of the thermostat housing.
4. Exchange the V-belt.

Sample Picture

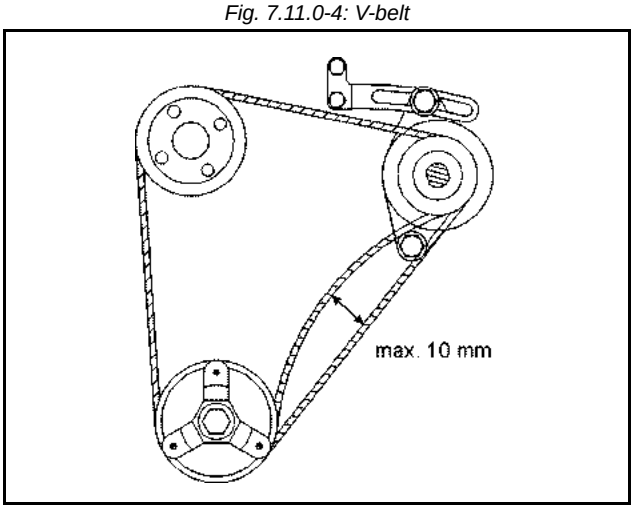
Fig. 7.11.0-3: Alternator



5. Afterwards, the V-belt must be tightened again.
6. The V-belt must be tightened in such a way, that it is possible to press it about approx. 10 mm.
7. Tighten the screws above and underneath the alternator.

Sample picture

Fig. 7.11.0-4: V-belt



7.12 Replacing the Electric Starter

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

NOTE:Representative procedure

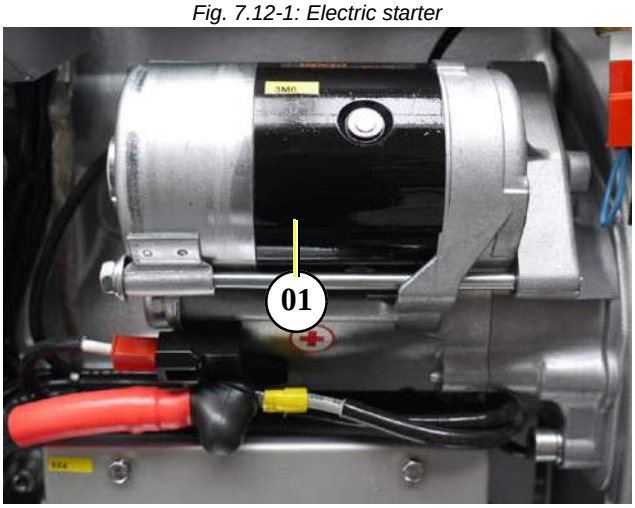
Ensure that the generator cannot be started up accidentally. Remove battery main switch.

ATTENTION!

For part numbers, refer to the spare parts catalogue.

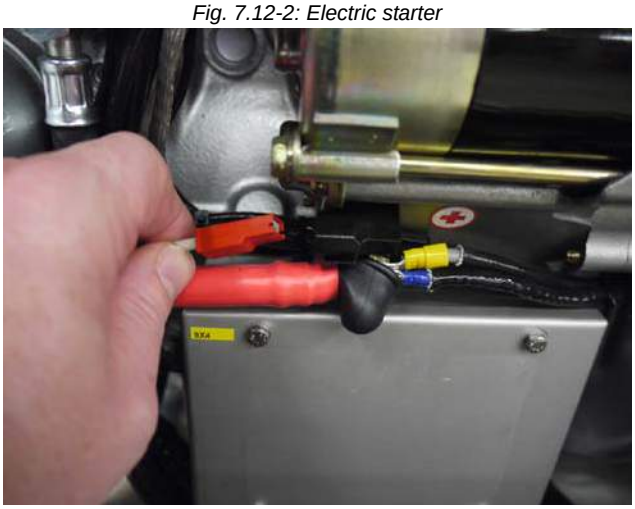
1. Open the capsule.
   01. Electric starter

Fig. 7.12-1: Electric starter



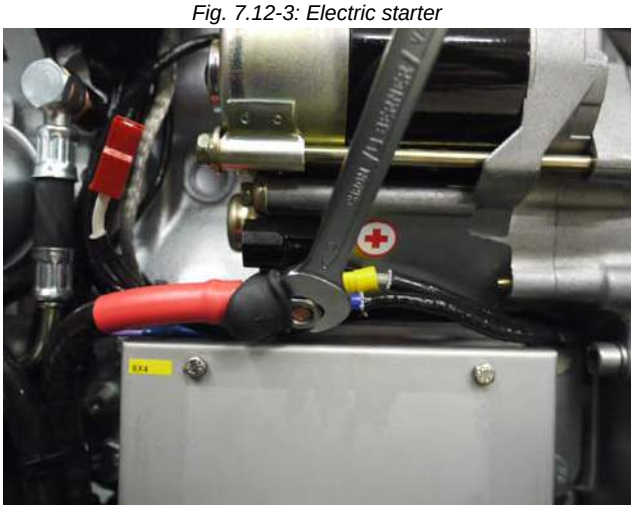
2. Pull off connector.

Fig. 7.12-2: Electric starter



3. Pull off rubber cap.
4. Loosen hex nut with wrench with W.A.F. 13 mm and remove the electric connections.

Fig. 7.12-3: Electric starter



5. Loosen the lower attachment screw with a hex socket wrench.

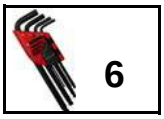
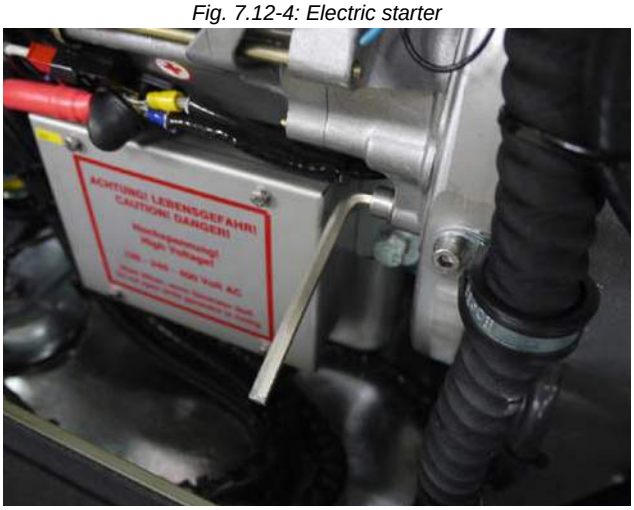


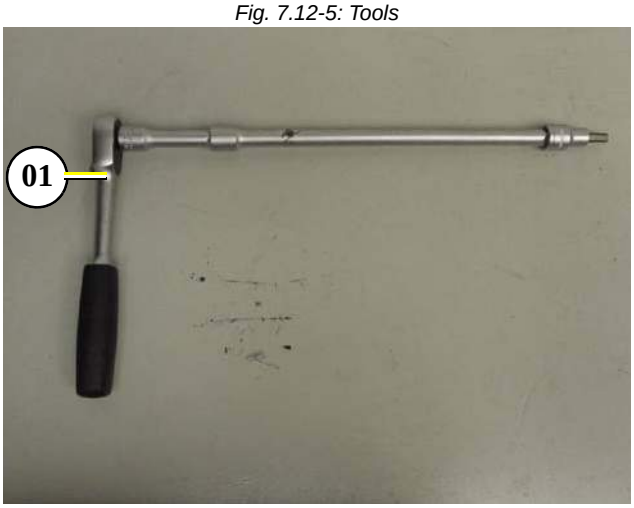
Fig. 7.12-4: Electric starter



Tools needed:

01. Socket wrench with long and short extension and size 6 mm socket

Fig. 7.12-5: Tools



The upper attachment screw is visible from up top, view between engine and exhaust manifold.

6. Slide the socket wrench fitted with both extensions under the exhaust manifold and insert in the hex socket screw. Loosen upper attachment screw.

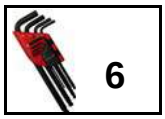
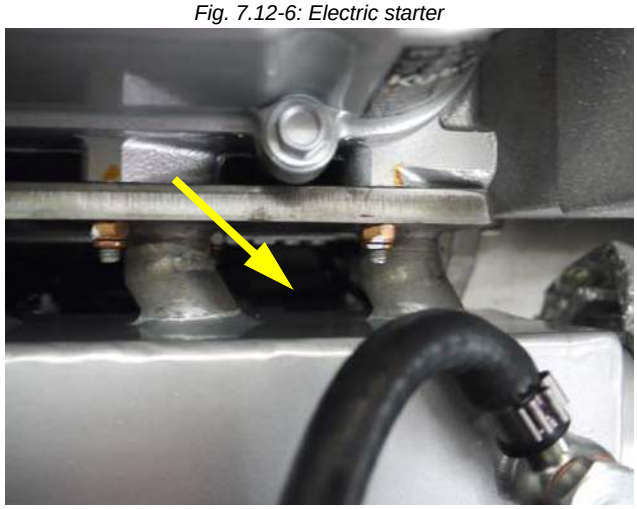
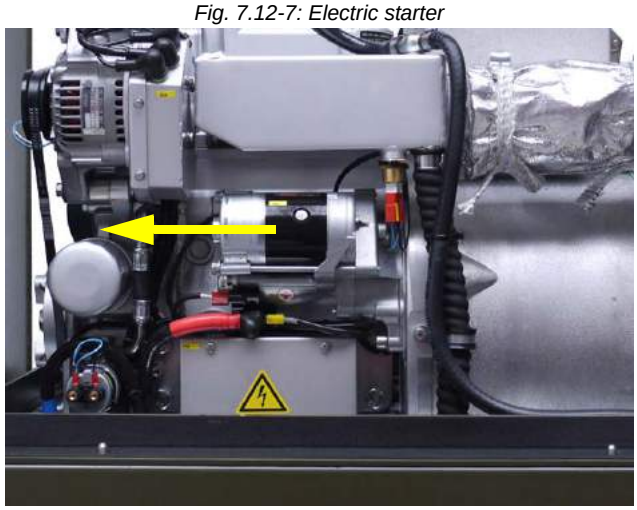


Fig. 7.12-6: Electric starter



7. Pull out electric starter.
8. To reinstall, reverse the order of steps.

Fig. 7.12-7: Electric starter



7.13 Replacing the Injection Nozzles

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

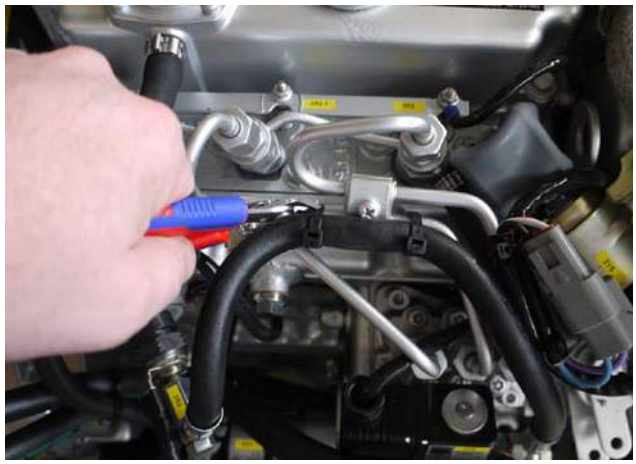
NOTE:Representative procedure

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

ATTENTION!

Injection lines

Fig. 7.13-1: Injection nozzles

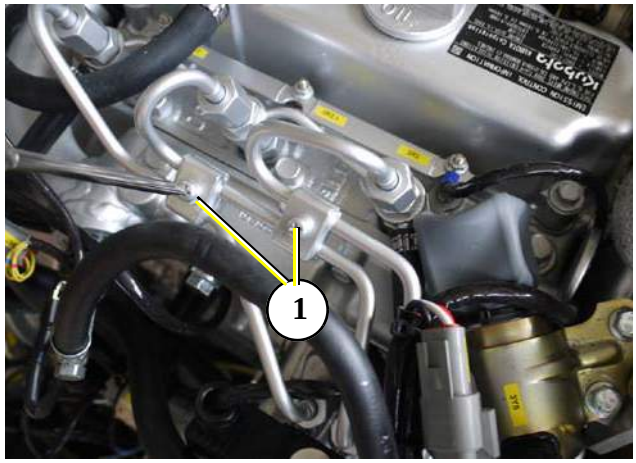


Figures similar!

1. Remove cable ties from the injection lines.

2. Loosen the pipe clamps (1) using a PH2 phillips screwdriver.

Fig. 7.13-2: Injection nozzles



3. Loosen the union nut on the injection lines (1). Wrench with W.A.F. of 17 mm.

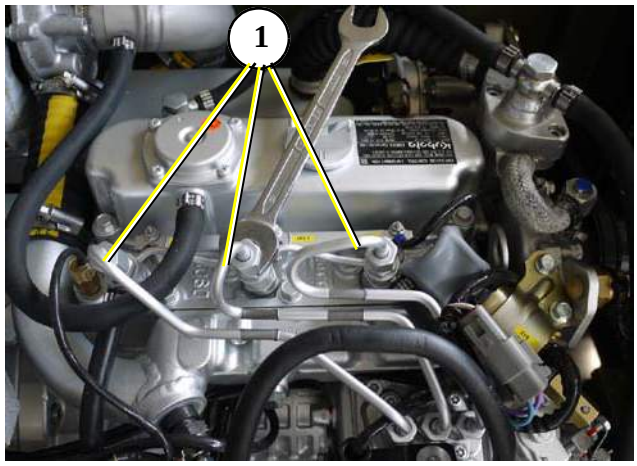
For assembly:

- Blast dust out of the lines using compressed air. Then, reassemble the lines by proceeding in the reverse order of steps.

(1) Injection line

Torque	Injection line union nut	24.5 to 34.3 Nm 2.5 to 3.5 kgm 18.1 to 25.3 pound-foot

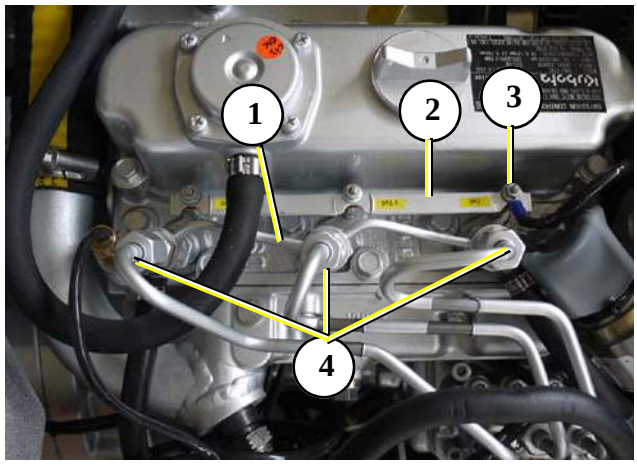
Fig. 7.13-3: Injection nozzles



Nozzle holder assembly and glow plug

1. Dismount the return line (1). Wrench with W.A.F. of 17 mm.
2. Remove the nozzle holder assembly (4). Wrench with W.A.F. of 21 mm.
3. Remove the copper seal (5) and the heat shield (6).
4. Dismount the connector (2) from the glow plugs (3) See Kapitel 7.14, “Replacing the Glow Plugs,” auf Seite 131.
5. Remove the glow plugs (3). See Kapitel 7.14, “Replacing the Glow Plugs,” auf Seite 131.

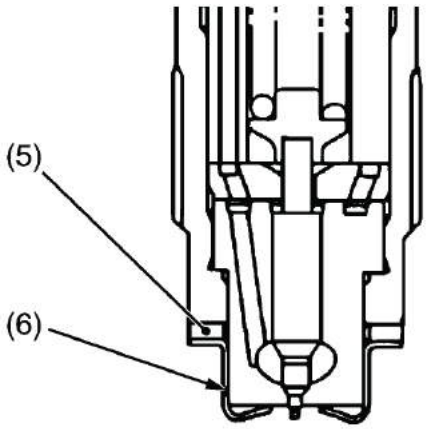
Fig. 7.13-4: Injection nozzles



For assembly:

- Replace the copper seal and the heat shield with new parts.

(1) Return line
(2) Connector
(3) Glow plug
(4) Nozzle holder assembly
(5) Copper seal
(6) Heat shield



Torque	Fixing nut for overflow oil line	19.6 to 24.5 Nm. 2.0 to 2.5 kgm 14.5 to 18.1 pound-foot
	Nozzle holder assembly	49.0 to 68.6 Nm 5.0 to 7.0 kgm 36.2 to 50.6 pound-foot
	Glow plug	7.8 to 14.7 Nm. 0.8 to 1.5 kgm 5.8 to 10.8 pound-foot

Removing the nozzle heat shield ring seal within the scope of the maintenance work.

IMPORTANT!

- Use a phillips screwdriver (1) with a diameter greater than the hole in the heat ring seal (approx. 6 mm (1/4 in)).

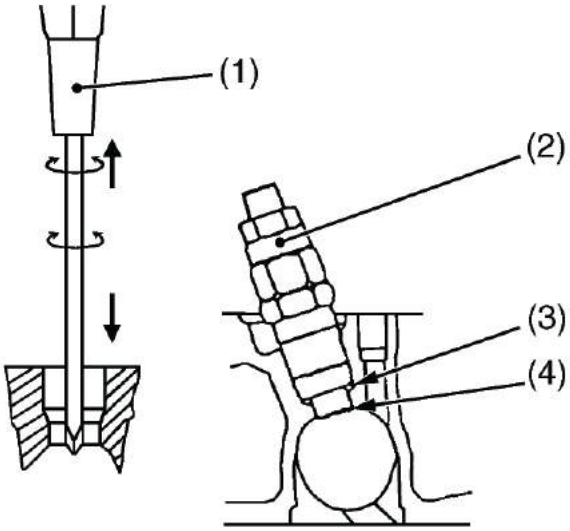
1. Lightly turn the screwdriver (1) into the hole in the heat ring seal.
2. Rotate the screwdriver three to four times in each direction.
3. When rotating the screwdriver, slowly extract the heat ring seal (4) together with the injection nozzle gasket (3).
4. If the heat ring seal drops back in, repeat the procedure above.

For assembly:

- If the injection nozzle is uninstalled for cleaning or maintenance purposes, the heat seal ring and the injection nozzle gasket must be replaced.

(1) Phillips screwdriver(2) Injection nozzle
(3) Injection nozzle gasket (4) Heat ring seal

Fig. 7.13-5: Injection nozzles



7.14 Replacing the Glow Plugs

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

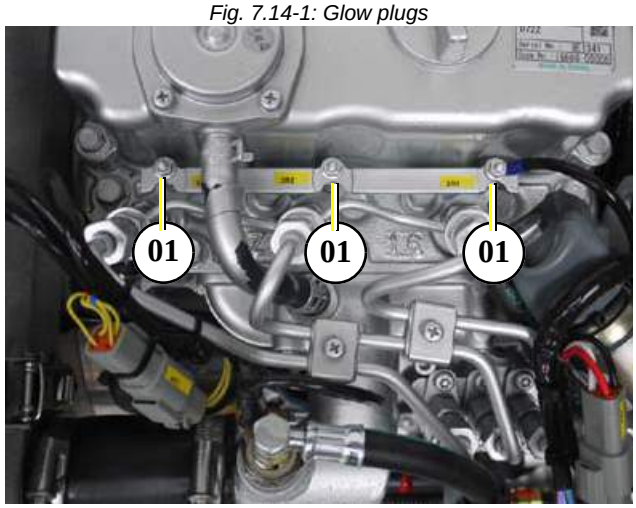
NOTE:Representative procedure

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

ATTENTION!

1. Open the capsule.
   01. Glow plugs

Fig. 7.14-1: Glow plugs



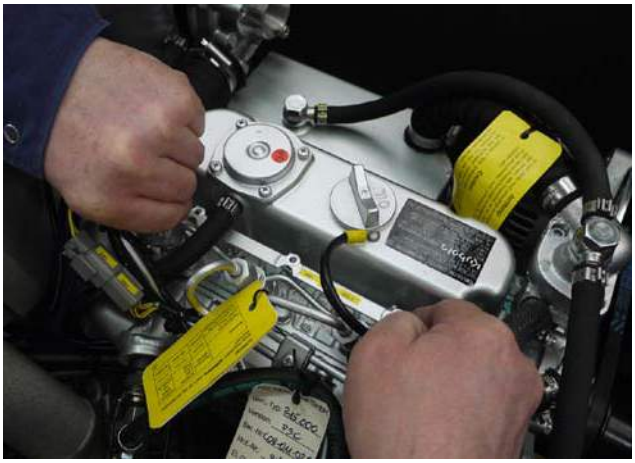
Figures similar!

2. Remove the three hex screws using a size 7 mm socket wrench .

Fig. 7.14-2: Glow plugs

3. Remove the glow plug connector.

Fig. 7.14-3: Glow plugs

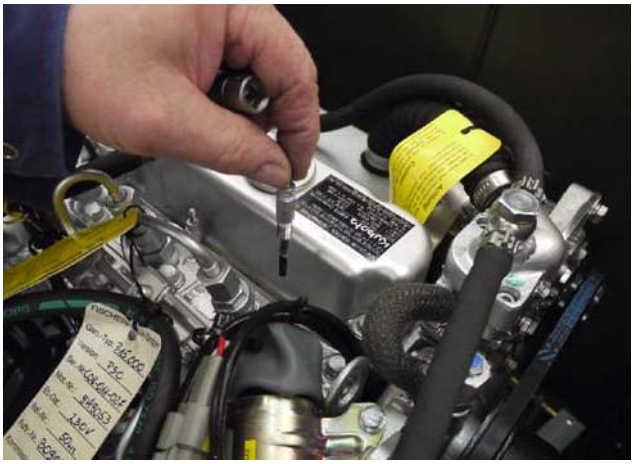


4. Loosen the glow plug using a socket wrench with a long size 10 mm socket.

Fig. 7.14-4: Glow plugs

5. Remove glow plug.
6. To reinstall, reverse the order of steps.

Fig. 7.14-5: Glow plugs



7.15 Replacing the Oil Pressure Switch

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

NOTE:Representative procedure

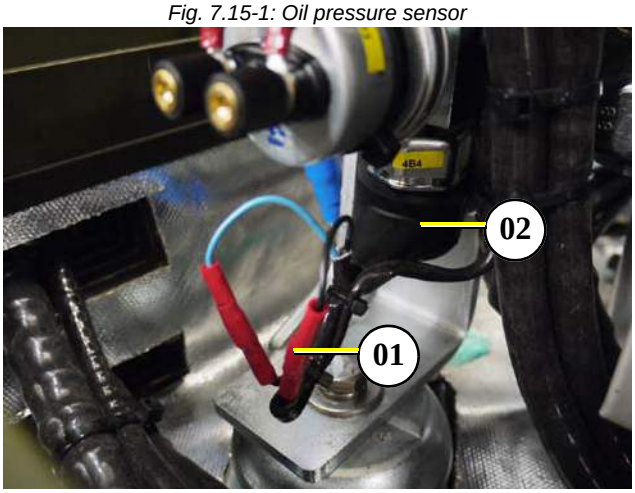
Ensure that the generator cannot be started up accidentally. Remove battery main switch.

ATTENTION!

For part numbers, refer to the spare parts catalogue.

1. Open both connectors (01) on the oil pressure switch.
2. Pull off rubber cap (02).

Fig. 7.15-1: Oil pressure sensor



3. Loosen and remove oil pressure switch 4B4 using a wrench with W.A.F. of 29 mm. A large piece of cloth or absorbent tissue must be placed under the connection to prevent escaping oil from running into the capsule.

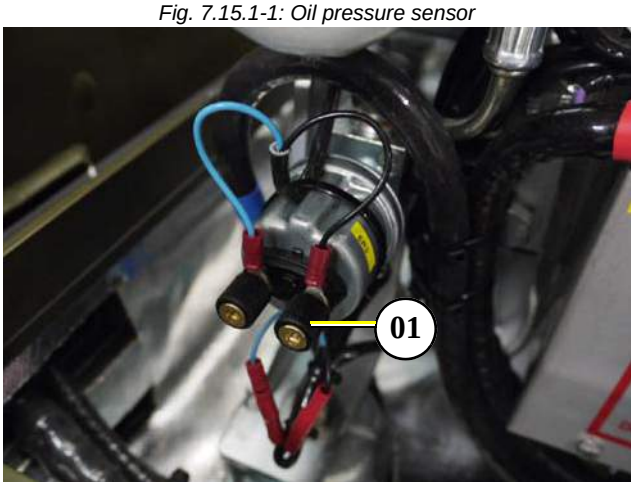
4. To reinstall, reverse the order of steps. The switch is fitted with a tapered thread and requires no special seal.

Fig. 7.15-2: Oil pressure sensor

7.15.1 Replacing the oil pressure sensor (optional component)

1. Unscrew both connectors (01) on the oil pressure sensor.

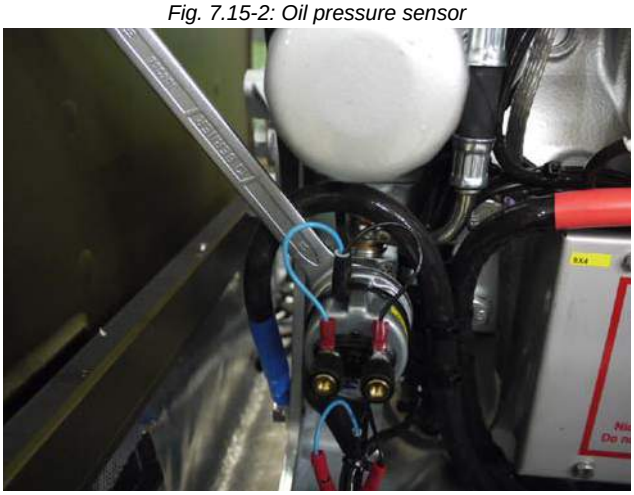
Fig. 7.15.1-1: Oil pressure sensor



2. Loosen and remove oil pressure sensor 6R3 using a wrench with W.A.F. of 17 mm. A large piece of cloth or absorbent tissue must be placed under the connection to prevent escaping oil from running into the capsule.

To reinstall, reverse the order of steps. The sensor is fitted with a tapered thread and requires no special seal.

Fig. 7.15-2: Oil pressure sensor



7.16 Replacing the Stop Solenoid (Energize to stop)

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

NOTE:Representative procedure

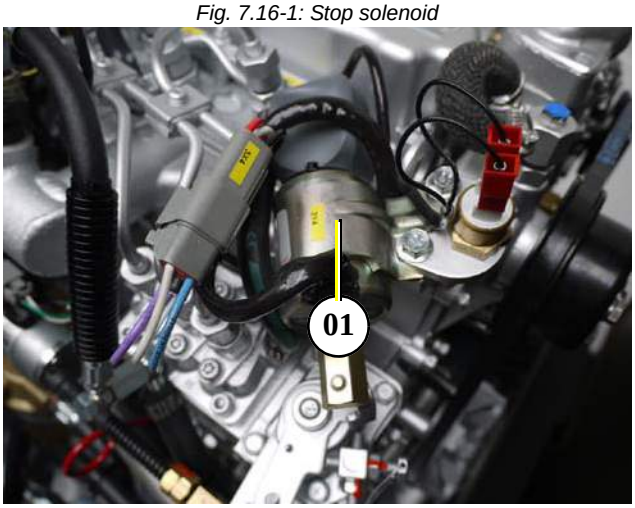
Ensure that the generator cannot be started up accidentally. Remove battery main switch.

ATTENTION!

For part numbers, refer to the spare parts catalogue.

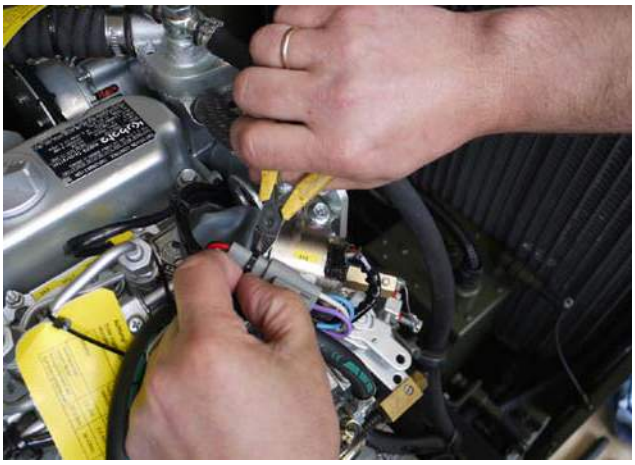
1. Open the capsule.
   01. Stop solenoid

Fig. 7.16-1: Stop solenoid



2. Remove cable ties.

Fig. 7.16-2: Stop solenoid

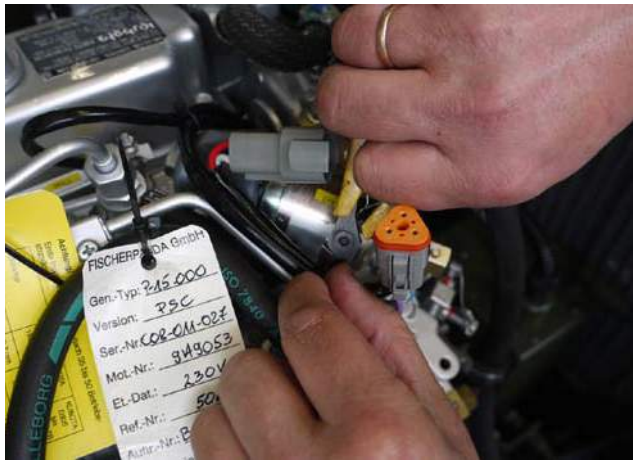


3. Disconnect electric supply line 3X4 from the stop solenoid.

Fig. 7.16-3: Stop solenoid

4. Remove cable ties.

Fig. 7.16-4: Stop solenoid

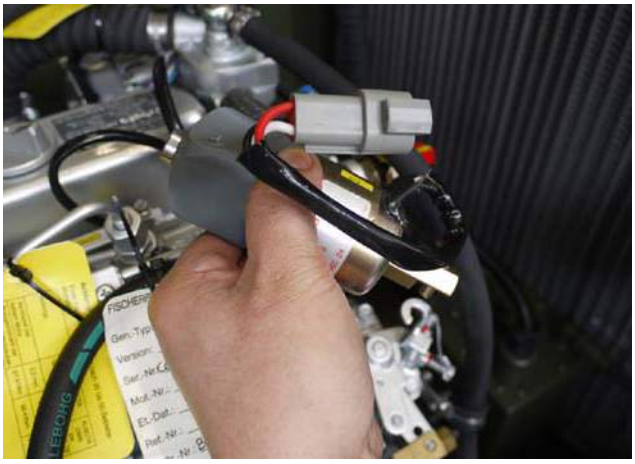


5. Remove the two fixing screws using a size 10 mm socket wrench.

Fig. 7.16-5: Stop solenoid

6. Replace the stop solenoid.
7. To reinstall, reverse the order of steps.

Fig. 7.16-6: Stop solenoid



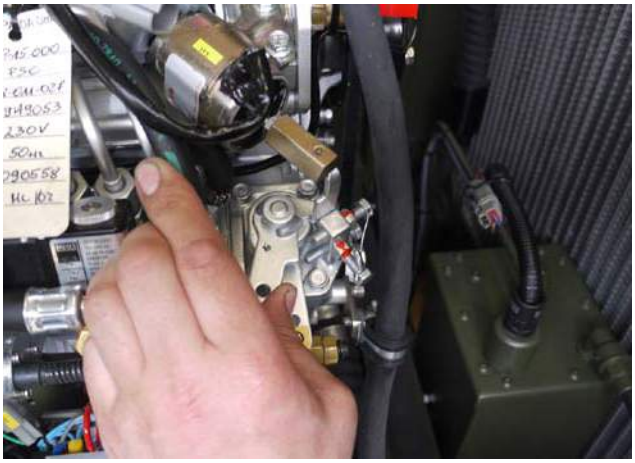
Please note for reinstallation:

8. Slide the pin into the throttle.

Fig. 7.16-7: Stop solenoid

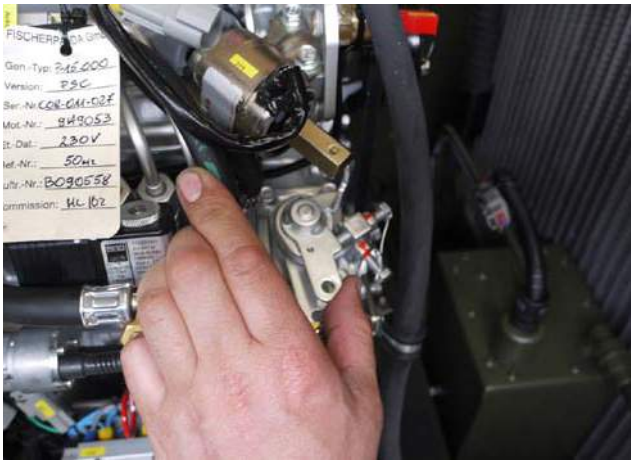
9. Push the throttle to the left and release.

Fig. 7.16-8: Stop solenoid



10. Ensure that the throttle jumps back to its starting position without friction .

Fig. 7.16-9: Stop solenoid



7.17 Replacing the valve cover gasket at Kubota 02 series

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

NOTE:Representative procedure

1. Remove de-aerating hose. Use Cobra pliers to open the Cobra clamp.

2. Clean during reinstallation.
3. Remove the cap nuts of the valve cover (3). Wrench with W.A.F. of 10 mm.

4. Remove the valve cover (1).
5. Replace the valve cover gasket (2) with new gasket.
6. Insert the valve cover (1) taking care not to damage the O-ring.
7. Tighten the cylinder head screws (3) after filling with engine oil. Torque: 3.9 to 5.9 Nm.

Fig. 7.17-1: De-aerating hose

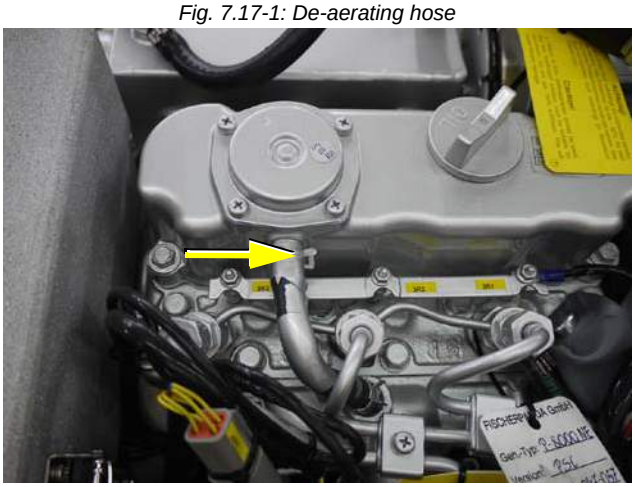
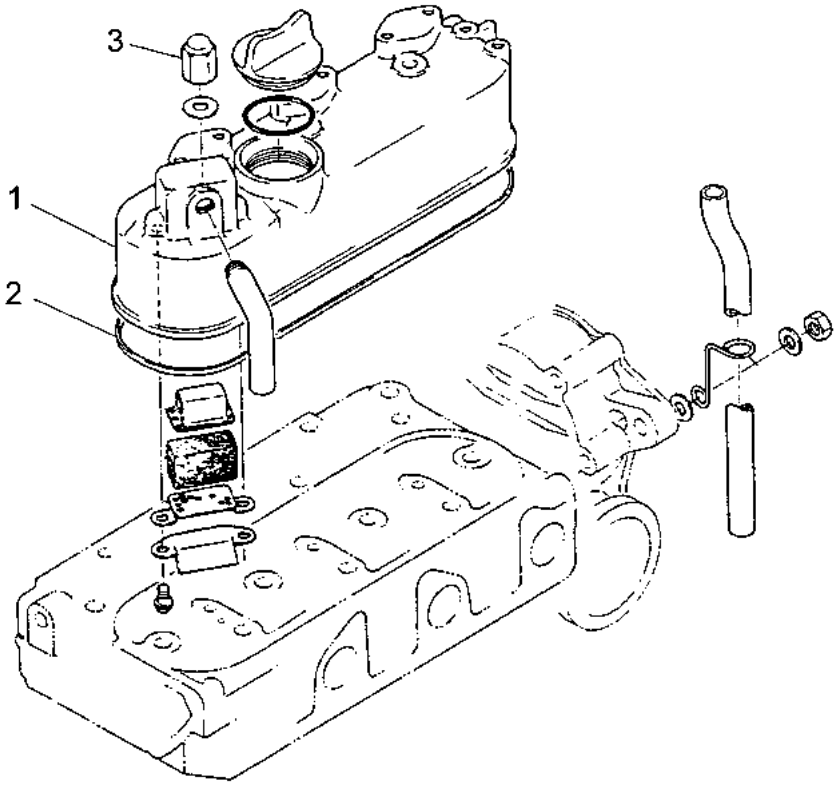


Fig. 7.17-2: Valve cover



1. Valve cover
2. Valve cover gasket
3. Hex nut

7.18 Replacing the Water Pump at Kubota 02 series

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

NOTE:Representative procedure

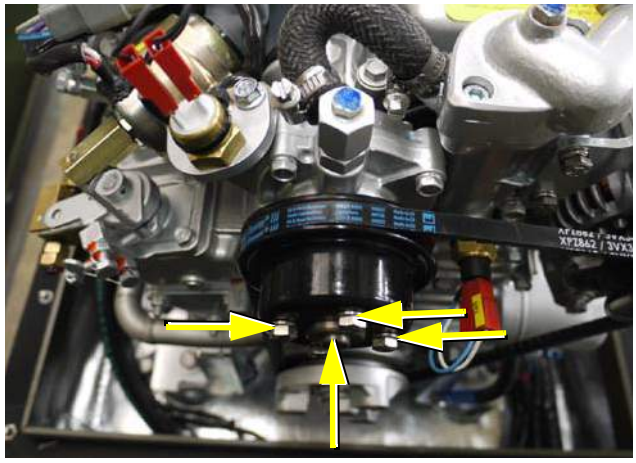
Hot surface! Burn hazard!

ATTENTION!

1. Drain cooling water from entire system.
2. Remove V-belts, see „Replacement of the V-Belt in this manual“
3. Remove all 4 screws on the pulley. W.A.F: 10 mm

4. Remove pulley.
5. For reinstallation, clean the pulley.
6. Remove the water pump fixing screws (2) and remove the water pump (1) from the transmission housing. Wrench with width across flats of 10 mm.

Fig. 7.18-1: Pulley

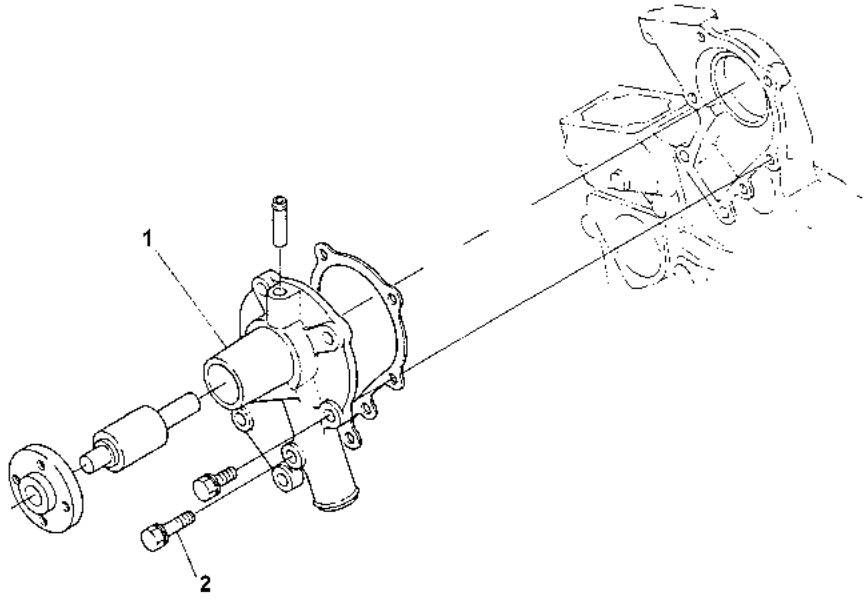


For reinstallation:

- Apply liquid sealant (Three Bond 1215 or equivalent) to both sides of the new water pump gasket.
- To reinstall, reverse the order of steps.

7. Refill cooling water.
8. De-aerate the cooling water system.
9. Perform test run.

Fig. 7.18-2: Water pump



1. Water pump
2. Hex screw

7.19 Adjusting the valve clearance at Kubota 02 series

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

NOTE:Representative procedure

Tools:

- Wrench for valve cover: W.A.F. of 10 mm
- Spanner for counter nut: W.A.F. of 11 mm
- Flat screwdriver for adjusting screw
- Feeler gauge

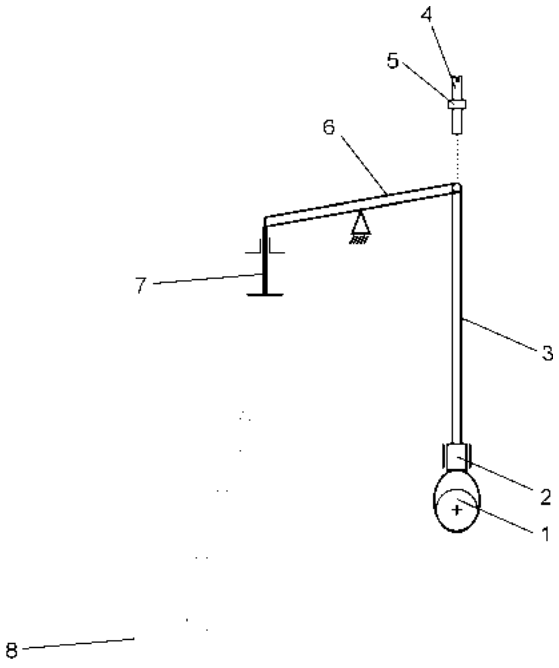
1. Unscrew valve cover.
2. Rotate crankshaft until the valve to be adjusted is fully open. If necessary, rotate back and forth to determine the dead centre. See Fig. 7.19-1, “Valve open,” on page 143.
3. Rotate crankshaft 360°. The valve is then closed, as the cam shaft was rotated 180°. See Fig. 7.19-2, “Valve closed,” on page 143.
4. Check the valve clearance with a feeler gauge! If the engine is cold, the valve clearance must be between 0.145mm and 0.185mm. The feeler gauge must slide between rocker arm and valve stem with light suction. Adjust the valve clearance as necessary using the screw on the rocker arm. Loosen the counter nut first. After adjusting, the counter nut must be retightened. Check the valve clearance again.
5. Perform the same procedure with the other valves.
6. Refit the valve cover and firmly tighten the screws.

Mark the valves that were already checked!

NOTE:

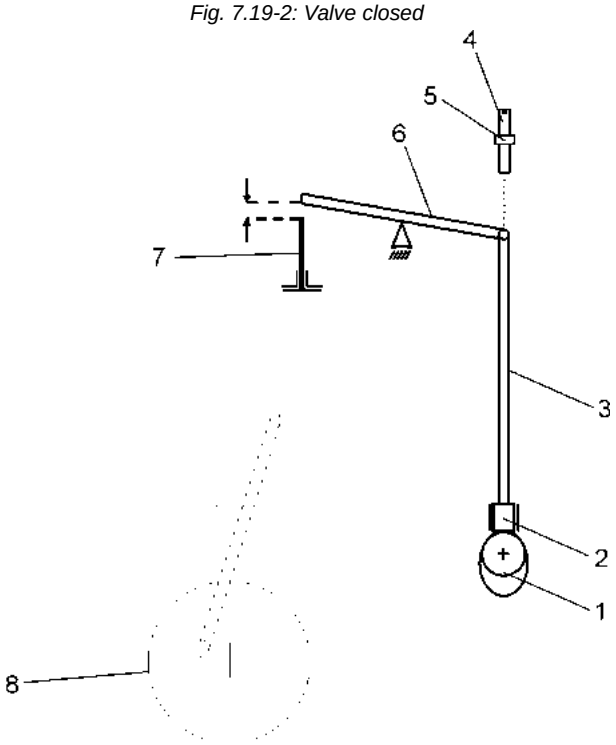
1. Cam shaft
2. Cam follower
3. Push rod
4. Adjusting screw
5. Counter nut
6. Rocker arm
7. Valve
8. Crankshaft

Fig. 7.19-1: Valve open



1. Cam shaft
2. Cam follower
3. Push rod
4. Adjusting screw
5. Counter nut
6. Rocker arm
7. Valve
8. Crankshaft

Fig. 7.19-2: Valve closed



Clearance of intake and discharge valve (cold)	Factory specification	0.145 to 0.185 mm 0.00571 to 0.00728 inch

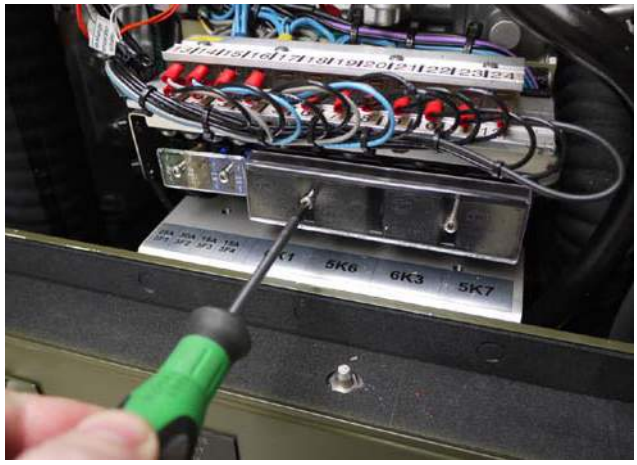
7.20 Replacing the Operating Current Relays

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

NOTE:Representative procedure

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

Fig. 7.20-1: Relay

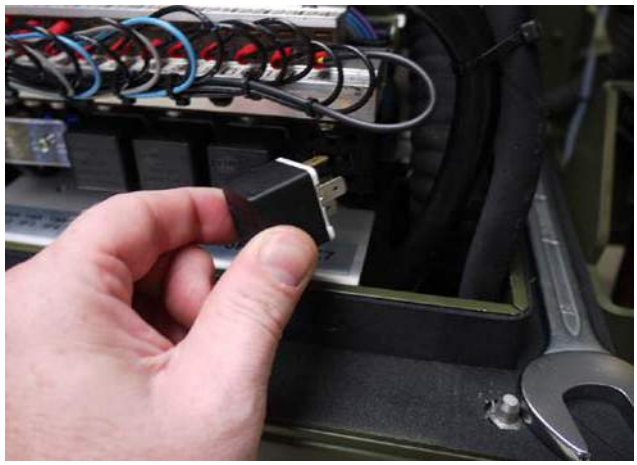


2. Remove the plastic cover.

Fig. 7.20-2: Relay

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

Fig. 7.20-3: Relay



7.21 Replacing the fuses

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

NOTE:Representative procedure

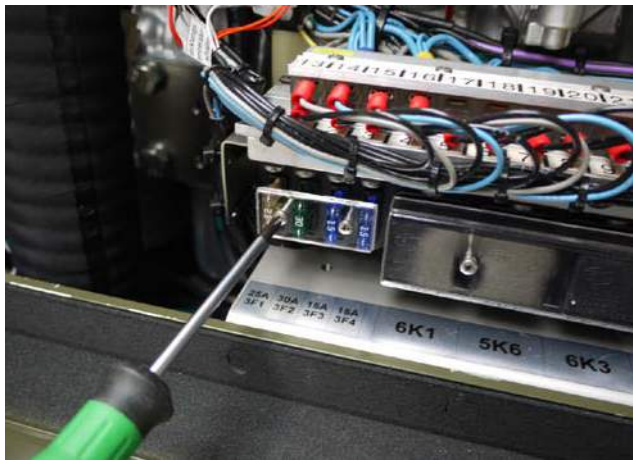
The fuses should be replaced every 2000 operating hours.

Figures similar!

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

Reprasentative picture

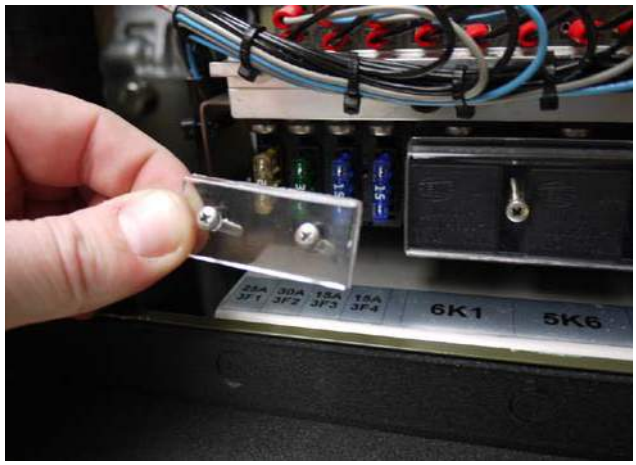
Fig. 7.21-1: Fuse



2. Remove the plastic cover.

Reprasentative picture

Fig. 7.21-2: Fuse

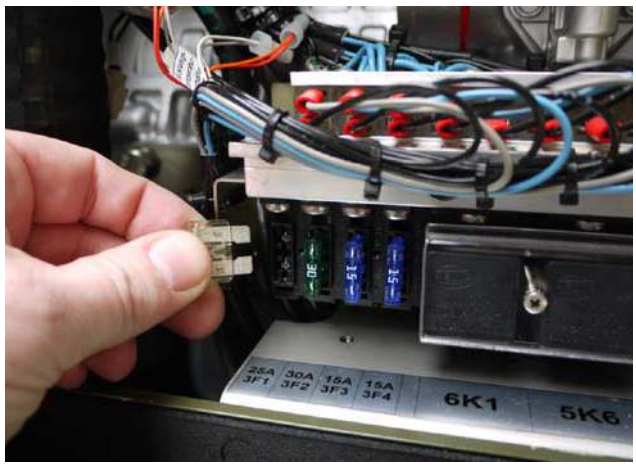


3. Using the fuse extraction tool, remove the fuse and replace it with a new one.

4. To reinstall, reverse the order of steps.

Reprasentative picture

Fig. 7.21-3: Fuse



7.22

8. Generator Failure

8.1 Personal requirements

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

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

8.2 Hazard notes for the maintenance

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

Notice!:

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

Warning!: Automatic start

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

Make sure that the generator is stopped and the starter battery is disconnected to guarantee that the generator cannot be inadvertently started.

Do not run the generator with removed sound isolation cover

Warning!: Risk of injury

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

- Always undertake installation/maintenance work when the generator is switched off.
- Ensure there is sufficient installation clearance before start working.
- Ensure tidiness and cleanliness at the workplace. Loose components and tools lying around or on top of each other are sources of accidents.
- Only perform installation work using commercially available tools and special tools. incorrect or damaged tools can result injuries.

Warning!: Risk of injury

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

- No open flames during work on the generator.
- Do not smoke.
- Remove oil and fuel residues from the generator and floor.

Warning!: Danger of fire

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

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

Danger!: Danger of poisoning

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

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

ATTENTION!: Danger to Life - High voltage

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

Warning!: Hot surface/material

During Installation/maintenance personal protective equipment is required to minimize the health hazards.

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

Instruction!: Personal protective equipment necessary.

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

Attention!: disconnect all load

Batteries contains acid or alkalis.

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

See the operation and safety instruction from your battery manufacturer.

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

Observe the instructions from your battery manufacturer.

Warning!:

8.3 Environmental protection

Danger to the environment due to mishandling!

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

- Always observe the instructions mentioned below.
- Take immediate action if environmentally hazardous materials reach the environment. Inform the responsible local authorities about the damage in the case of doubt.

The disposal must be performed by a specialist disposal company.

Environmental protection.

8.4 Tools and measuring instruments

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

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

8.5 Overloading the Generator

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

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

In order to prolong the genset´s life expectancy, the nominal electrical demand on the system should not be more than 70% of the rated genset power.

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

Continuous performance is the uninterrupted running of the generator for many hours. The genset can be run for several hours at partial load (i.e. 2/3 of rated power), however it is not advised that it is run for more than 2-3 hours at full load.

The Panda is designed so as not to overheat even under extreme conditions. Note: The exhaust gas will become sooty during peak-load operation.

8.5.1 Overloading the Generator with Electric Motors

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

If the supplied generator power is lower than what the electric motor requires, the generator voltage will collapse. For applications where a high current draw is required to start an electrical device (such as an electric motor), the motor

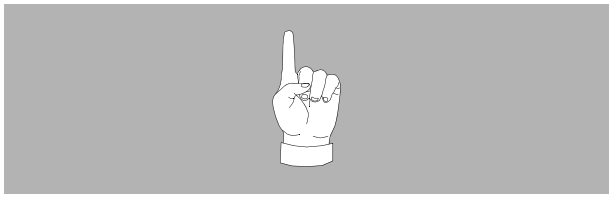
manufacturer should be consulted for possible solutions (for example: stronger capacitors, gradual power-up switches, or a specially designed starting unit for electric motors).

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

8.5.2 Generator Voltage Fluctuations and Monitoring

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

Notice!:



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

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

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

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

8.5.3 Automatic Voltage Monitoring and Auto-Shut Down

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

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

8.6 Starting Problems

8.6.1 Fuel Solenoid Valve

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

The fuel solenoid valve is located in front of the injection pump. It opens automatically, if the "START"-button is pressed on the remote control panel. The solenoid valve is CLOSED when the generator main power is switched "OFF". For this reason, it requires a few seconds before the motor comes to a full halt

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

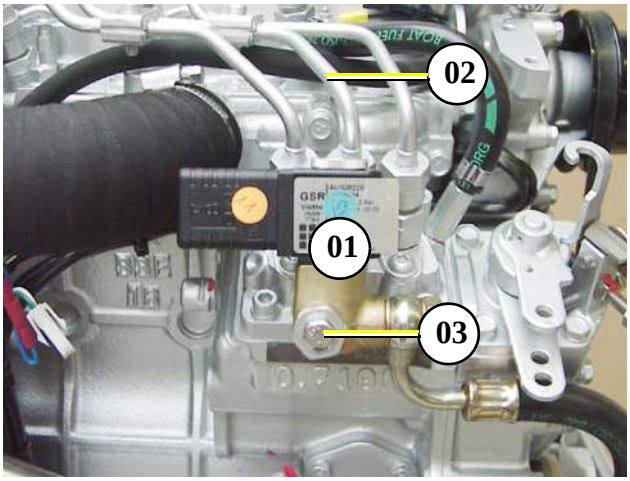
A check of the fuel solenoid valve by removing the plug from the fuel solenoid valve for a short period whilst in operation (first remove the small retention screw) and replace it immediately. The motor should "react immediately" by revving high.If the motor does not react sharply to the reconnection of the solenoid wire, it is a sign that the solenoid valve could be faulty.

01. Fuel solenoid valve

02. Fuel injector line

03. Ventilation screw

Fig. 8.6.1-1: Fuel solonoid



8.6.2 Stop solenoid - optional

There are two different variations:

A. Energized to stop

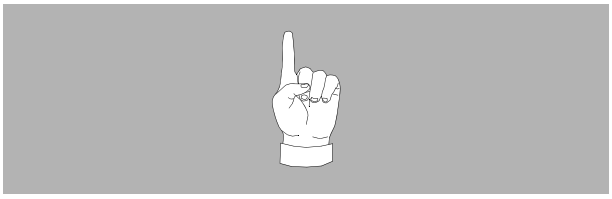
By pressing the „OFF“-button on the remote control panel the stop solenoid is supplied with voltage and operate, through this the injection nozzles resets to zero position and the generator stops.

B. Energized to run

This version is equipped with two solenoids an actuating and a stop solenoid. After being fed with current, the actuating solenoid attracts the adjusting lever of the fuel injection pump, through which the fuel can flow. The actuating solenoid is switched off once the final position has been reached, which is maintained by the stop solenoid for as long as the generator is running

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

.Notice!:



Stop solenoid (optional)

Fig. 8.6.2-1: Stop solonoid

8.6.3 Damage to starter motor

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

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

8.6.4 Dirty fuel filter

If the fuel filter is dirty change the filter element.

representing picture

Fig. 8.6.4-1: Fuel filter

8.7 Troubleshooting Table

GENERATOR OUTPUT VOLTAGE TOO LOW If the generator delivers less than 24V current ("undervoltage"), there can be various reasons for this:	
Cause	**Solution**
PGMi is overloaded.	Reduce the electrical load. (Switch off load)

Motor is not reaching the rated rpm.	Refer to "motor faults" section.

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

MOTOR TURNS OVER BUT DOES NOT START	
Cause	**Solution**
Stop solenoid valve not opening.	Check wire connections and circuitry to solenoid valve. (ref. DC wiring diagram: Relay K2, Fuse)
Fuel pump does not operate.	Check fuel-filter and pump: clean if necessary.
Lack of fuel.	Check fuel supply.
Glow-plugs not working correctly.	Check glow plugs and heating time.
Too much air in fuel lines.	Test fuel system for leakage. Bleed air from fuel system (refer to section "Air-bleeding of the Fuel System").
Fuel filter blocked.	Replace fuel filter.
Low compression pressure.	See Kubota motor-manual.

MOTOR DOES NOT TURN OVER AT THE NORMAL SPEED DURING THE STARTING PROCESS	
Cause	**Solution**
Starter battery voltage insufficient.	Check battery.
Damaged bearing(s) piston (seized).	Repairs need to be carried out by Kubota-Service. (refer to Kubota motor-manual)

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

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

DROP IN THE SPEED OF THE MOTOR	
Cause	**Solution**
Too much oil.	Drain oil.
Lack of fuel.	Check fuel supply system: - fuel filter, renew if necessary - check fuel pump - check fuel lines (bleed if necessary)
Lack of intake air.	Check air intake paths. Check and clean air filter (and intake muffler if installed).
Generator overloaded by too many load.	Reduce the electrical load (switch off load).
Defective generator (windings, bearings, or other).	Generator must be sent to manufacturer for repair of damaged bearings or winding.
Damaged engine.	Repair of bearing damage, etc., by Kubota-Service.

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

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

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

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

9. Tables

9.1 Technical Data

Fig. 9.1-1: Technical Data

	Panda 4000s	Panda 4200 FCB	4500FCB	Panda 4k	
Type	Farymann 18W430	Farymann 18W430	Farymann 18W430	Z482	
Governor	mechanic	mechanic	mechanic	mechanic	
Automatic start booster	yes	yes	yes	no	
Cylinder	1	1	1	2	
Bore	82 mm	82 mm	82 mm	67 mm	
Stroke	55 mm	55 mm	55 mm	68 mm	
Stroke volume	290 cm^3	290 cm^3	290 cm^3	479 cm^3	
Max. power (DIN 6271-NB) at 3000rpm	5,7 kW	5,7 kW	5,7 kW	9,32kW	
Rated speed	3600 rpm	3600 rpm	3600 rpm	3000 rpm	
Idle running speed [2]	3690 rpm	3690 rpm	3690 rpm	3120 rpm	
Valve clearance (engine cold)	0,2 mm	0,2 mm	0,2 mm	0,2 mm	
Cylinder head nut torque	30-33 Nm	30-33 Nm	30-33 Nm	42 Nm	
Compression ratio	20:1	20:1	20:1	23:1	
Lubrication oil capacity	1,25 l	1,25 l	1,25 l	2,8 l	
Fuel consumption [3]	approx 0,42- 1,12 l	approx. 0,42- 1,12 l	approx. 0,42- 1,12 l	approx. 0,5-1,4l	
Oil consumption	max. 1% of fuel consumption			max. 1% of fuel consumption	
Oil specification	API CF	API CF	API CF	API CF	
Cooling water requirement for seawater circuit (Marine generators only)	10-12 l/min	10-12 l/min	16-28l/min	16-28l/min	
Permissible max. permanent tilt of engine	a) 25° across the longitudinal axis b) 20° in the longitudinal direction				
Recommend starter battery size	12V 28Ah equivalent	12V 28Ah equivalent	12V 36Ah equivalent	12V 28Ah equivalent	
Recommend cable cross size starter battery cable *Length 4 meter max.*	25mm^2	25mm^2	25mm^2	25mm^2	
Max. exhaust back pressure	9,3 kPa 93 Millibar	9,3 kPa 93 Millibar[2]	9,3 kPa 93 Millibar	9,3 kPa 93 Millibar	

[2] progressive speed by VCS

[3] 0,35l/kW electrical power, the randomized values between 30% and 80% of the rated speed

Fig. 9.1-2: Technical Data

	Panda 6500 Panda 7 mini	Panda 8000 Panda 8 mini	Panda 9000	Panda 10000 Panda 9 mini	Panda 12000
Type	Z482	Z482	D722	Z602	D722
Governor	MIni VCS	VCS	mechanic	VCS	VCS
Automatic start booster	no	yes	no	yes	yes
Cylinder	2	2	3	2	3
Bore	67 mm	67 mm	67 mm	72 mm	67 mm
Stroke	68 mm	68 mm	68 mm	73,6 mm	68 mm
Stroke volume	479 cm^3	479 cm^3	719 cm^3	599 cm^3	719 cm^3
Max. power (DIN 6271-NB) at 3000rpm	9,32kW	9,32 kW	14,0 kW	11,6 kW	14,0 kW

	Panda 6500 Panda 7 mini	Panda 8000 Panda 8 mini	Panda 9000	Panda 10000 Panda 9 mini	Panda 12000
Rated speed	3000 rpm	3000 rpm	3000 rpm	3000 rpm	3000 rpm
Idle running speed [2]	3120 rpm	2900 rpm	3120 rpm	3100 rpm	2900 rpm
Valve clearance (engine cold)	0,2 mm	0,2 mm	0,2 mm	0,2 mm	0,2 mm
Cylinder head nut torque	42 Nm	42 Nm	42 Nm	42 Nm	42 Nm
Compression ratio	23:1	23:1	23:1	24:1	23:1
Lubrication oil capacity	2,8 l	2,8 l	3,8 l	2,8 l	3,8 l
Fuel consumption [3]	approx. 0,5-1,4l	approx. 0,7-1,8l	approx. 0,8-2,1l	approx. 1,0-2,66l	approx. 1,1-2,8l
Oil consumption	max. 1% of fuel consumption				
Oil specification	API CF	API CF	API CF	API CF	API CF
Cooling water requirement for seawater circuit (Marine generators only)	16-28l/min	16-28l/min	16-28l/min	16-28l/min	16-28l/min
Permissible max. permanent tilt of engine	a) 25° across the longitudinal axis b) 20° in the longitudinal direction				
Recommend starter battery size	12V 28Ah equivalent	12V 28Ah equivalent	12V 36Ah equivalent	12V 36Ah equivalent	12V 36Ah equivalent
Recommend cable cross size starter battery cable *Length 4 meter max.*	25mm²	25mm²	25mm²	25mm²	25mm²
Max. exhaust back pressure	9,3 kPa 93 Millibar	9,3 kPa 93 Millibar²	9,3 kPa 93 Millibar	9,3 kPa 93 Millibar	9,3 kPa 93 Millibar

[2] progressive speed by VCS
[3] 0,35l/kW electrical power, the randomized values between 30% and 80% of the rated speed

Fig. 9.1-3: Technical Data

	Panda 14000	Panda 15000 15 mini digital	Panda 18	Panda 24	Panda 30
Type	D782	D902	D1105	V1505	V1505 TD
Governor	VCS	VCS	VCS	VCS	VCS
Automatic start booster	yes	yes	yes	no	no
Cylinder	3	3	3	4	4TD
Bore	67 mm	72 mm	78 mm	78 mm	78 mm
Stroke	73,6 mm	73,6 mm	78,4 mm	78,4 mm	78,4 mm
Stroke volume	782 cm³	898 cm³	1123 cm³	1498 cm³	1498 cm³
Max. power (DIN 6271-NB) at 3000rpm	13,5 kW	17,5 kW	18,7 kW	23,3 kW	31,3 kW
Rated speed	3000 rpm	3000 rpm	3000 rpm	3000 rpm	3000 rpm
Idle running speed [2]	2900 rpm	2900 rpm	2900 rpm	2900 rpm	2900 rpm
Valve clearance (engine cold)	0,2 mm	0,2 mm	0,2 mm	0,2 mm	0,2 mm
Cylinder head nut torque	68 Nm	42 mm	68 Nm	68 Nm	68 Nm
Compression ratio	23:1	24:1	22:1	22:1	23:1
Lubrication oil capacity	3,8 l	3,7 l	5,1 l	6,0 l	6,7 l
Fuel consumption [3]	approx. 1,3-3,4l	approx. 1,3-3,6l	approx. 1,7-4,5l	approx. 2,2-5,9	approx. 2,7-7,2l
Oil consumption	max. 1% of fuel consumption				
Oil specification	API CF	API CF	API CF	API CF	API CF
Cooling water requirement for seawater circuit (Marine generators only)	16-28l/min	6-28l/min	28-40l/min	28-40l/min	40-50l/min
Permissible max. permanent tilt of engine	a) 25° crosswise to the longitudinal axis b) 20° in longitudinal direction				
Recommend starter battery size	12V 36Ah equivalent	12V 52Ah equivalent	12V 65Ah equivalent	12V 70Ah equivalent	12V 70Ah equivalent
Recommend cable cross size starter battery cable *Length 4 meter max.*	25mm²	25mm²	25mm²	25mm²	25mm²

	Panda 14000	Panda 15000 15 mini digital	Panda 18	Panda 24	Panda 30
Max. exhaust back pressure	9,3 kPa 93 Millibar	9,3 kPa 93 Millibar[2]	10,7 kPa 107 Millibar	10,7 kPa 107 Millibar	10,7 kPa 107 Millibar

[2] progressive speed by VCS
[3] 0,35l/kW electrical power, the randomized values between 30% and 80% of the rated speed

Fig. 9.1-4: Technical data

	Panda 30 IC	Panda 40 LN	Panda 47 LN	Panda 60 MB	Panda 75 MB
Type	Kubota V 1505 TB	LDW 2204 MT	LDW 2204T	Mercedes Benz OM602	Mercedes OM603A
Governor	VCS	VCS	VCS	mechanical + VCS	mechanical + VCS
Automatic start booster	yes	no	no	no	no
Cylinder	4	4	4	5	6
Bore	78 mm	88 mm	88 mm	89 mm	89 mm
Stroke	78,4 mm	90,4 mm	90,4 mm	92,4 mm	92,4 mm
Stroke volume	1498 cm^3	2199 cm^3	2199 cm^3	2874 cm^3	3500 cm^3
Max. power (DIN 6271-NB) at 3000rpm	31,3 kW	36 kW	36 kW	69 kW	69 kW
Rated speed	3000 rpm	3000 rpm	3000 rpm	4000 rpm	3000 rpm
Idle running speed [2]	2900 rpm	3000 rpm	3000 rpm		2900 rpm
Valve clearance (engine cold)	0,2 mm	Hydro	Hydro		0,2 mm
Cylinder head nut torque	63,7 - 68,6 Nm	68 Nm	68 Nm		25 Nm
Compression ratio	22,5:1	22:16	22:16		22:1
Lubrication oil capacity	5,0 l	6,4 l	6,4 l	7,5 l	7,5l
Fuel consumption [3]	approx. 2,7 - 7,1l	approx. 4,9-13,1l	approx. 3,78-10,1l	approx. 6,3 - 16,8 l	approx. 6,7 - 17,9l
Oil consumption	max. 1% of fuel consumption			max. 0,5% of fuel consumption	
Oil specification	API CF	API CF	API CF-4	API CF	API CF
Cooling water requirement for seawater circuit (Marine generators only)	40-50l/min	40-50l/min	40-50l/min		
Permissible max. permanent tilt of engine	a) 25° crosswise to the longitudinal axis b) 20° in longitudinal direction				
Recommend starter battery size	12V 70Ah equivalent	12V 88 Ah equivalent	12V 88 Ah equivalent	12V 95 Ah equivalent	12V 95 Ah equivalent
Recommend cable cross size starter battery cable *Length 4 meter max.*	25mm²	50mm²	50mm“	70mm²	70mm²
Max. exhaust back pressure	10,7 kPa 107 Millibar	10 kPa 100 Millibar	10kPa 100 Millibar		

[2] progressive speed by VCS
[3] 0,35l/kW electrical power, the randomized values between 30% and 80% of the rated speed

Fig. 9.1-5: Technical data

	Panda 7,5-4	Panda 9-4	Panda 12-4	Panda 17-4	Panda 22-4
Type	Kubota D905	Kubota D1105	Kubota V1505	Kubota V2203	Kubota V2403
Governor	mechanical + VCS	VCS	VCS	VCS	VCS
Automatic start booster	no	no	no	no	no
Cylinder	3	3	4	4	4
Bore	72 mm	78 mm	78mm	87	87 mm
Stroke	73,6 mm	78,4 mm	78,4mm	92,4	102,4 mm
Stroke volume	898 ccm	1123 ccm	1498cm^3	2197	2434 ccm
Max. power (DIN 6271-NB) at 3000rpm	17,5 kW	18,7 kW	23,3kW	20,1 KW	31,1 kW

	Panda 7,5-4	Panda 9-4	Panda 12-4	Panda 17-4	Panda 22-4
Rated speed	1500 rpm	1500 rpm	1500 rpm	1500 rpm	1500 rpm
Idle running speed [2]	1500 rpm	1500 rpm	1800 rpm	1500 rpm	1800 rpm
Valve clearance (engine cold)	0,145 - 0,185 mm	0,145 - 0,185 mm	0,2mm	0,2mm	0,18 - 0,22 mm
Cylinder head nut torque	63,7 - 68,6 Nm	63,7 - 68,6 Nm	68Nm	68Nm	93,1 - 98 Nm
Compression ratio	23:1	23:1	22:1	22:1	
Lubrication oil capacity	5,1 l	5,1 l	6,0l	9,5	9,5 l
Fuel consumption [3]	0,7 - 1,8 l	0,84 - 2,24 l	ca. 1,20-3,36 l	ca. 1,8-4,9 l	approx. 1,95 - 5,2
Oil consumption	max. 1% of fuel consumption				
Oil specification	API CF	API CF	API CF	API CF	API CF
Cooling water requirement for seawater circuit (Marine generators only)	6-28l/min	28-40l/min	28-40l/min	28-40l/min	40-50l/min
Permissible max. permanent tilt of engine	a) 25° crosswise to the longitudinal axis b) 20° in longitudinal direction				
Recommend starter battery size	12V 65Ah equivalent	12V 65Ah equivalent	12V 70Ah equivalent	12V 120Ah equivalent	12V 136Ah equivalent
Recommend cable cross size starter battery cable *Length 4 meter max.*	25mm²	25mm²	25mm²	70mm²	70mm²
Max. exhaust back pressure	10,7 kPa 107 Millibar	10,7 kPa 107 Millibar	10,7 kPa 107 Millibar	10,7 kPa 107 Millibar	10,7 kPa 107 Millibar

[2] progressive speed by VCS

[3] 0,35l/kW electrical power, the randomized values between 30% and 80% of the rated speed

Fig. 9.1-6: Technical Data

	Panda 30/4	Panda 30/4	Panda 40/4	Panda 50/4	Panda 70/4
Type	Mitsubishi S-DTS	V3600	V3600	V3800 DI-T	BF4M 1013EC
Governor	VCS	VCS	VCS	Mechanical + GAC	VCS
Automatic start booster	no	no	no	no	no
Cylinder	4	4	4	4	4
Bore	94	98 mm	98 mm	100 mm	108
Stroke	120	120 mm	120 mm	120 mm	130
Stroke volume	3331	3620 ccm	3620 ccm	3769 ccm	4764
Max. power (DIN 6271-NB) at 3000rpm		45,8 kW	58,8 kW	62,0 kW	85,0 kW
Rated speed	1500 rpm	1500 rpm	1500 rpm	1500 rpm	1500 rpm
Idle running speed [2]	1500 rpm	1800 rpm	2800 rpm	1800 rpm	1800 rpm
Valve clearance (engine cold)	0,25mm	0,2 mm	0,2 mm	0,2 mm	Inlet $0,3^{+0,1}$ / Outlet $0,5^{+0,1}$
Cylinder head nut torque	118	68 Nm	68 Nm	68 Nm	
Compression ratio	20.5:1	22,6:1	22,6:1	19,0:1	17,6:1
Lubrication oil capacity	10,0	13,2 l	13,2 l	13,2 l	14,0 l
Fuel consumption [3]	approx. 3,15-8,4 l	approx. 3,15-8,4 l	approx. 3,78-10,1 l	approx. 4,2-11,2 l	approx. 6,5-17,3 l
Oil consumption					
Oil specification	API CF4 (SAE30)	API CF	API CF	API CF	API CF
Cooling water requirement for seawater circuit (Marine generators only)	40-50l/min	40-50l/min	40-50l/min	40-50l/min	
Permissible max. permanent tilt of engine					
Recommend starter battery size	12V 136Ah equivalent	12V 136Ah equivalent	12V 136Ah equivalent	12V 136Ah equivalent	
Recommend cable cross size starter battery cable *Length 4 meter max.*	70mm²	70mm²	70mm²	70mm²	

	Panda 30/4	Panda 30/4	Panda 40/4	Panda 50/4	Panda 70/4
Max. exhaust back pressure	4 kPa 40 Millibar	10,7 kPa 107 Millibar	10,7 kPa 107 Millibar	10,7 kPa 107 Millibar	

² progressive speed by VCS

³ 0,35l/kW electrical power, the randomized values between 30% and 80% of the rated speed

Fig. 9.1-7: Technical Data igenerators

	Panda 5000i	Panda 8000i	Panda 10000i	Panda 15000i	Panda 25i
Type	EA300	Z482	Z602	D902	Kubota V1505
Governor	iControl2	iControl2	iControl2	iControl2	iControl2
Automatic start booster	no	no	no	no	no
Cylinder	1	2	2	3	4
Bore	75mm	67mm	72 mm	72mm	78mm
Stroke	70mm	68mm	73,6 mm	73,6mm	78,4mm
Stroke volume	309cm^3	479cm³	599cm³	898cm³	1498cm^3
Max. power (DIN 6271-NB) at 3000rpm	5,1kW	9,32kW	11,6kW	17,5kW	23,3kW
Rated speed	3000rpm	3000rpm	3000rpm	3000UpM	1500 rpm
Idle running speed	2900rpm	2900rpm	3100rpm	2900UpM	1800 rpm
Valve clearance (engine cold)	0,16 - 0,20mm	0,2mm	0,2mm	0,2mm	0,2mm
Cylinder head nut torque	58,8 - 63,7Nm	42Nm	42Nm	42mm	68Nm
Compression ratio	--	23:1	24:1	24:1	22:1
Lubrication oil capacity	1,3l	2,8l	2,8l	3,7l	6,0l
Fuel consumption ³	approx. 0,42 - 1,12l	approx. 0,7-1,8l	approx. 1,0-2,66l	approx. 1,3-3,6l	approx. 1,20-3,36l
Oil consumption	max. 1% of fuel consumption				
Oil specification	API CF	API CF	API CF	API CF	API CF
Cooling water requirement for seawater circuit (Marine generators only)	--	16-28l/min	16-28l/min	16-28l/min	28-40l/min
Permissible max. permanent tilt of engine	a) 25° crosswise to the longitudinal axis b) 20° in longitudinal direction				
Recommend starter battery size	12V 28Ah equivalent	12V 28Ah equivalent	12V 36Ah equivalent	12V 52Ah equivalent	12V 70Ah equivalent
Recommend cable cross size starter battery cable *Length 4 meter max.*	25mm²	25mm²	25mm²	25mm²	25mm²
Max. exhaust back pressure	--	9,3 kPa 93 Millibar²	9,3 kPa 93 Millibar	9,3 kPa 93 Millibar²	10,7 kPa 107 Millibar

³ 0,35l/kW electrical power, the randomized values between 30% and 80% of the rated speed

Fig. 9.1-8: Technical Data igenerators

	Panda 45i				
Type	Kubota V2403				
Governor	VCS				
Automatic start booster	no				
Cylinder	4				
Bore	87 mm				
Stroke	102,4 mm				
Stroke volume	2434 ccm				
Max. power (DIN 6271-NB) at 3000rpm	31,1 kW				
Rated speed	2700 rpm				
Idle running speed	1600 rpm				

	Panda 45i				
Valve clearance (engine cold)	0,18 - 0,22 mm				
Cylinder head nut torque	93,1 - 98 Nm				
Compression ratio					
Lubrication oil capacity	9,5 l				
Fuel consumption [3]	approx. 1,95 - 5,2l				
Oil consumption	max. 1% of fuel consumption				
Oil specification	API CF				
Cooling water requirement for seawater circuit (Marine generators only)	55-80 l/min				
Permissible max. permanent tilt of engine	a) 25° crosswise to the longitudinal axis b) 20° in longitudinal direction				
Recommend starter battery size	12V 136Ah equivalent				
Recommend cable cross size starter battery cable *Length 4 meter max.*	70mm²				
Max. exhaust back pressure	10,7 kPa 107 Millibar				

[3] 0,35l/kW electrical power, the randomized values between 30% and 80% of the rated speed

9.2 Diameter of conduits vehicle generators

Fig. 9.2-1: Diameter of conduits

Generatortyp **Generator type**	**Kühlwasser** **Cooling water**	**Abgas** **Exhaust**	**Kraftstoff** **Fuel**	
			Zulauf **Feed**	**Rücklauf** **Return**
Panda PVMV-N 4000i/5000i	20	40	8	8
Panda PVMV-N 4,5 ND	20	40	8	8
Panda PVMV-N 5000 LPE	20	40	8	8
Panda PVMV-N 6000 ND	25	40	8	8
Panda PVMV-N 6000i/8000i	20	40	8	8
Panda PVMV-N 8000 NE	25	40	8	8
Panda PVMV-N 9000 ND	25	40	8	8
Panda PVMV-N 12000NE	25	40	8	8
Panda PVMV-N 14000 NE	25	40	8	8
Panda PVMV-N 15000 NE / 15000i	25	40	8	8
Panda PVMV-N 18 NE	25	40	8	8
Panda PVMV-N 24 NE	25	40	8	8
Panda PVMV-N 30 NE	25	40	8	8
Panda PVMV-N 35 YA	30	50	8	8
Panda PVMV-N 22/4	30	50	8	8
Panda PVMV-N 47 YA	30	60	8	8
Panda PVMV-N 60 MB				
Panda PVMV-N 75MB				
Panda PVMV-N 100 MB				
Panda PVM-NE 4000i/5000i	20	40	8	8
Panda PVM-NE 4,5 ND	20	40	8	8
Panda PVM-NE 5000 LPE	20	40	8	8

Generatortyp Generator type	Kühlwasser Cooling water	Abgas Exhaust	Kraftstoff Fuel	
			Zulauf Feed	Rücklauf Return
Panda PVM-NE 6000 ND	25	40	8	8
Panda PVM-NE 6000i/8000i	20	40	8	8
Panda PVM-NE 8000 NE	25	40	8	8
Panda PVM-NE 9000 ND	25	40	8	8
Panda PVM-NE 12000 NE	25	40	8	8
Panda PVM-NE 14000 NE	25	40	8	8
Panda PVM-NE 15000 NE / 15000i	25	40	8	8
Panda PVM-NE 18 NE	25	40	8	8
Panda PVM-NE 24 NE	25	40	8	8
Panda PVM-NE 30 NE	25	40	8	8
Panda PVM-NE 35 YA	30	50	8	8
Panda PVM-NE 47 YA	30	60	8	8
Panda PVM-NE 40 LN	30	60	8	8
Panda PVM-NE 60 MB	40	76	8	8
Panda PVM-NE 75 MB	40	76	8	8
Panda PVM-NE 100 MB	50	76	8	8
Panda PVM-NE 110 DZ	50	76	8	8
Panda PVMH 8000 NE	25	40	8	8
Panda PVMH 12000 NE	25	40	8	8
Panda PVMH 14000 NE	25	40	8	8

Fig. 9.2-2: Diameter of conduits

Generatortyp Generator type	Kühlwasser Cooling water	Abgas Exhaust	Kraftstoff Fuel	
			Zulauf Feed	Rücklauf Return
Panda PVK-U 4000i/5000i	20	40	8	8
Panda PVK-U 4,5 ND	20	40	8	8
Panda PVK-U 5000 LPE	20	40	8	8
Panda PVK-U 6000 ND	25	40	8	8
Panda PVK-U 6000i/8000i	20	40	8	8
Panda PVK-U 8000 NE	25	40	8	8
Panda PVK-U 9000 ND	25	40	8	8
Panda PVK-U 12000 NE	25	40	8	8
Panda PVK-U 14000 NE	25	40	8	8
Panda PVK-U 15000 NE / 15000i	25	40	8	8
Panda PVK-U 18 NE	25	40	8	8
Panda PVK-U 24 NE	25	40	8	8
Panda PVK-U 30 NE	25	40	8	8
Panda PVK-U 35 YA	30	50	8	8
Panda PVK-U 47 YA	30	60	8	8
Panda PVK-U 60 MB	40	76	8	8
Panda PVK-U 75 MB	40	76	8	8
Panda PVK-U 100 MB	50	76	8	8
Panda PVK-UK 4000i/5000i	20	40	8	8
Panda PVK-UK 4,5 ND	20	40	8	8

Generatortyp Generator type	Kühlwasser Cooling water	Abgas Exhaust	Kraftstoff Fuel	
			Zulauf Feed	Rücklauf Return
Panda PVK-UK 5000 LPE	20	40	8	8
Panda PVK-UK 6000 ND	20	40	8	8
Panda PVK-UK 6000i/8000i	20	40	8	8
Panda PVK-UK 8000 NE	25	40	8	8
Panda PVK-UK 9000 ND	25	40	8	8
Panda PVK-UK 12000 NE	25	40	8	8
Panda PVK-UK 14000 NE	25	40	8	8
Panda PVK-UK 15000 NE / 15000i	25	40	8	8
Panda PVK-UK 9-4	25	40	8	8
Panda PVK-UK 18 NE	25	40	8	8
Panda PVK-UK 24 NE	25	40	8	8
Panda PVK-UK 30 NE	25	40	8	8
Panda PVK-UK 35 YA	30	50	8	8
Panda PVK-UK 47 YA	30	60	8	8
Panda PVK-UK 60 MB	40	76	8	8
Panda PVK-UK 75 MB	40	76	8	8
Panda PVK-UK 100 MB	50	76	8	8

9.3 Cable cross section for vehicle generator

Fig. 9.3.0-1: Kabelquerschnitte/Cable cross sectiion

Wiring for vehicles. single phase, not tin-plated, PVC-isolated.		
nominal wire cross-section [mm²]	allowed continous current (reference point) [a]	
	at +30°C [A]	at +50°C [A]
1	19	13,5
1,5	24	17,0
2,5	32	22,7
4	42	29,8
6	54	38,3
10	73	51,8
16	98	69,6
25	129	91,6
35	158	112
50	198	140
70	245	174
95	292	207
120	344	244

a. DIN VDE 0298, part4.

9.4 Coolant specifications

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

Fischer Panda recommend to use the product: GLYSANTIN PROTECT PLUS/G 48

Engine coolant automotive industry Product description	
Product name	GLYSANTIN ® PROTECT PLUS / G48
Chemical nature	Monoethylenglycol with inhibitors
Physical form	Liquid

Chemical and physical properties		
Reserve alkalinity of 10ml	ASTM D 1121	13 – 15 ml HCl 01 mol/l
Density, 20°C	DIN 51 757 procedure 4	1,121 – 1,123 g/cm^3
Water content	DIN 51 777 part 1	max. 3,5 %
pH-value undiluted		7,1 – 7,3

9.4.1 Coolant mixture ratio

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

9.5 Engine oil

9.5.1 Engine oil classification

9.5.1.1 Operating range:

The operating range of an engine oil is determined by SAE class. „SAE“ is for the union of American auto engineers (Society of Automotives Engineers).

The SAE class of an engine oil only informs over the viscosity of the oil (larger number = more viscous, smaller number = more highly liquidly) e.g. to 0W, 10W, 15W, 20, 30, 40. The first number shows the liquid of the oil with cold weather, the second number refers to the fluidity with heat. Complete yearly oils have usually SAE classes of SAE 10W-40, SAE 15W-40 etc.

9.5.1.2 Quality of oil:

The quality of an engine oil is specified by the API standard („American Petroleum Institutes“).

The API designation is to be found on each engine oil bundle. The first letter is always a C.

API C for diesel engines

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

API C for diesel engine

Examples for diesel engine oil:

API CC Engine oil for small demands

API CD Engine oil for suction- and turbo diesel engine

API CF Replace the specification API CD since 1994

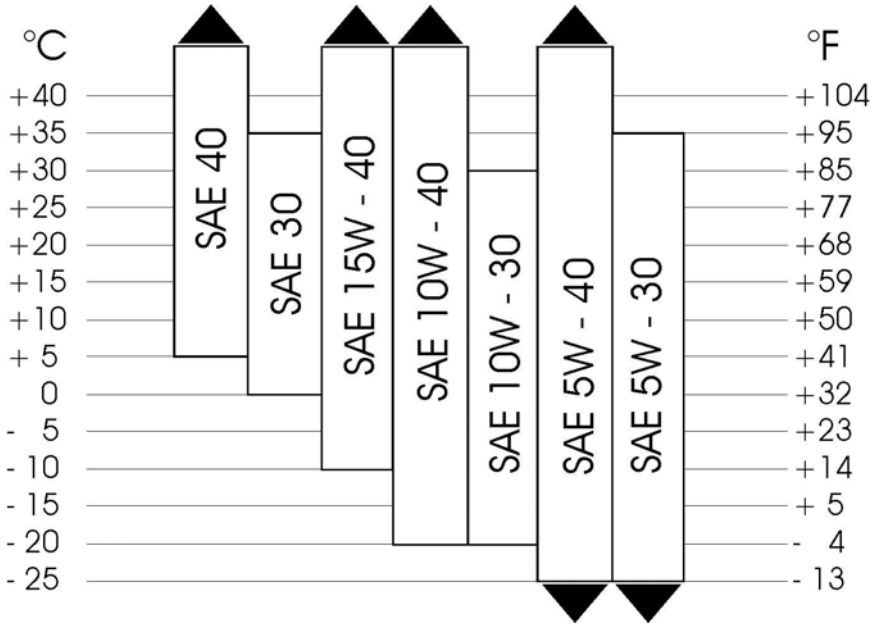
API CG Engine oil for highest demands, turbo-tested

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

Fig. 9.5.1.2-1: Engine oil type.

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

Fig. 9.5.1-2: Temp. range of the SAE classes



9.6 Fuel

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

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

Panda iControl2

Operating Manual

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

Current revision status

	Document
Current:	Panda iControl2_eng.R07_16.1.15
Replaces:	Panda iControl2_eng.R06

Revision	Page
Kontrolltätigkeiten vor dem Start eingefügt	

Hardware

Generator	Revision	Modification Strike Plate	Date	Upgrade

Created by

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web: www.fischerpanda.de

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10. Safety instructions for the Panda iControl2

10.1 Personnel

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

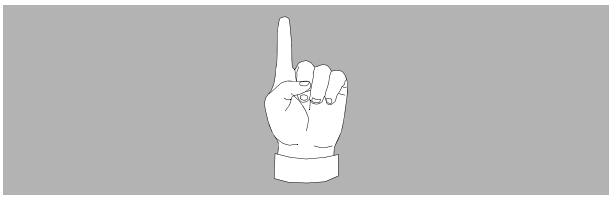
The installation should be implemented by specially trained technical personnel or by authorised workshops (Fischer Panda Service Points), only.

10.2 Safety instructions

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

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

NOTE:



An external signal may trigger an automatic start-up.

WARNING: Automatic start-up

The generator must not be operated with the cover removed.

WARNING:

If the generator is being installed without a sound insulation capsule, it must be ensured that all rotating parts (belt pulley, belts etc.) are covered and protected so that there is no danger to life and body!

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

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

Electric voltage - DANGER TO LIFE!

WARNING: Electric voltage

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

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

Disconnect battery before working on the generator

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

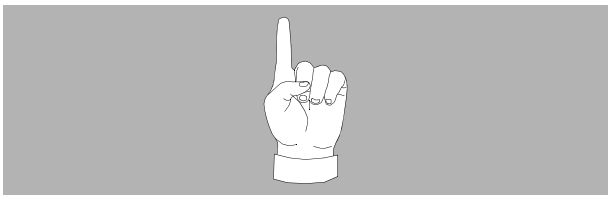
This applies in particular to systems with an automatic start-up function. The automatic start-up function shall be deactivated before starting work.

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

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

WARNING:

NOTE:



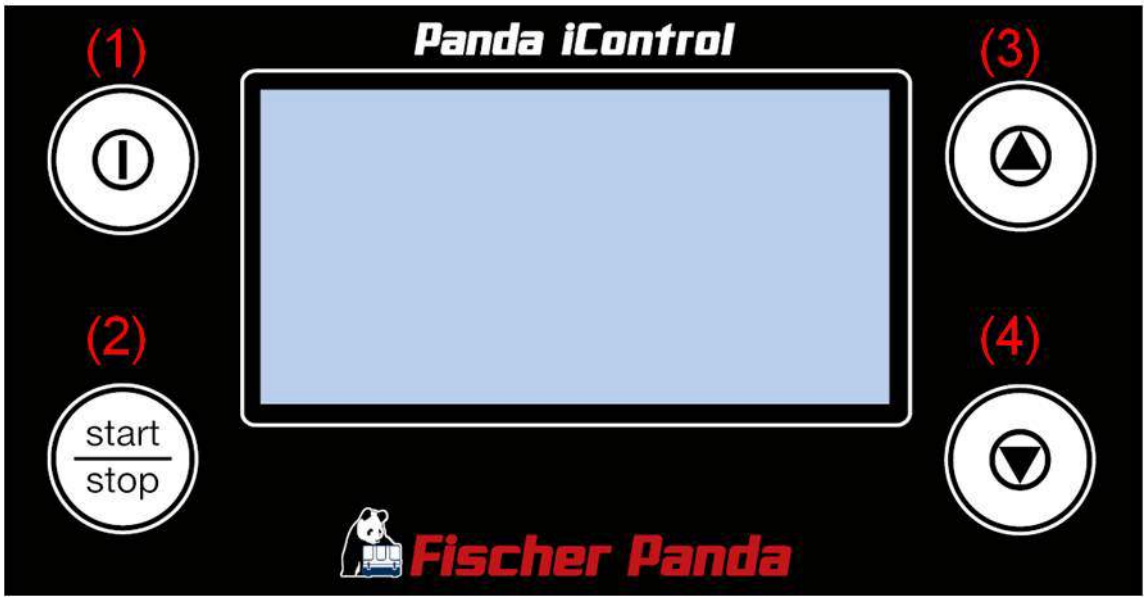
11. General operation

11.1 The Panda iControl2 panel

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

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

Fig. 11.1-1: Panda iControl 2 panel



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

11.2 Starting preparation / Checks (daily)

11.2.1 Marine version

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

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

   Further, if installed, the oil level of the oil-cooled bearing must be controlled before each start - see sediment bowl at generator front cover!.

2. State of cooling water.

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

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

   For safety reasons, the sea cock must be closed after the generator has been switched off. It should be re-opened before starting the generator.

4. Check raw water filter.

   The raw water filter must be regularly checked and cleaned. The impeller fatigue increases, if residual affects the raw water intake.

5. Visual inspection.

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

6. Switch off the load.

   The generator should only be started without load.
7. Open fuel valve, if installed.
8. Close battery main switch (on).

11.2.2 Vehicle version

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

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

   Further, if installed, the oil level of the oil-cooled bearing must be controlled before each start - see sediment bowl at generator front cover!.

2. State of cooling water.

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

3. Visual inspection.

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

4. Switch off the load.

   The generator should only be started without load.
5. Open fuel valve, if installed.

Close battery main switch (on).

11.3 Operation

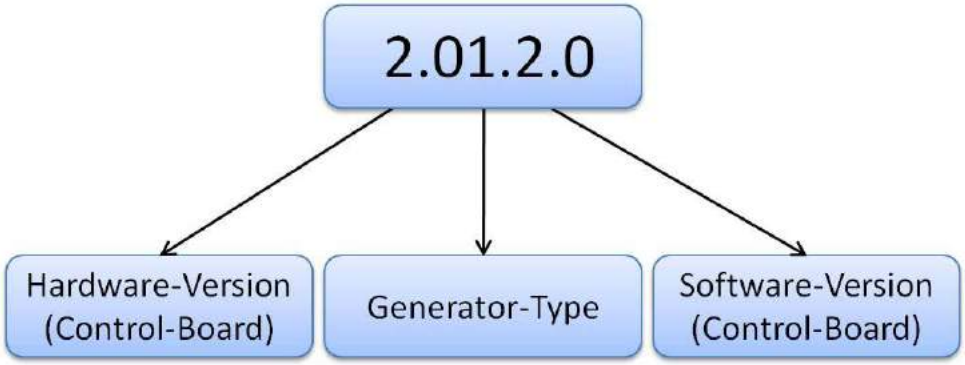
11.3.1 Switching the controller on and off

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

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

Fig. 11.3.1-1: .Panda iControl2 start screen

Fig. 11.3.1-2: Hardware version, generator type, and software version in default display



Example:

Hardware version:2 **à** iControl2 controller

Generator type:01 **à** Panda 5000i PMS

Software version: 2.0 **à** iControl2, compatible with iControl-Panel2

Note:

11.3.2 The default display screen

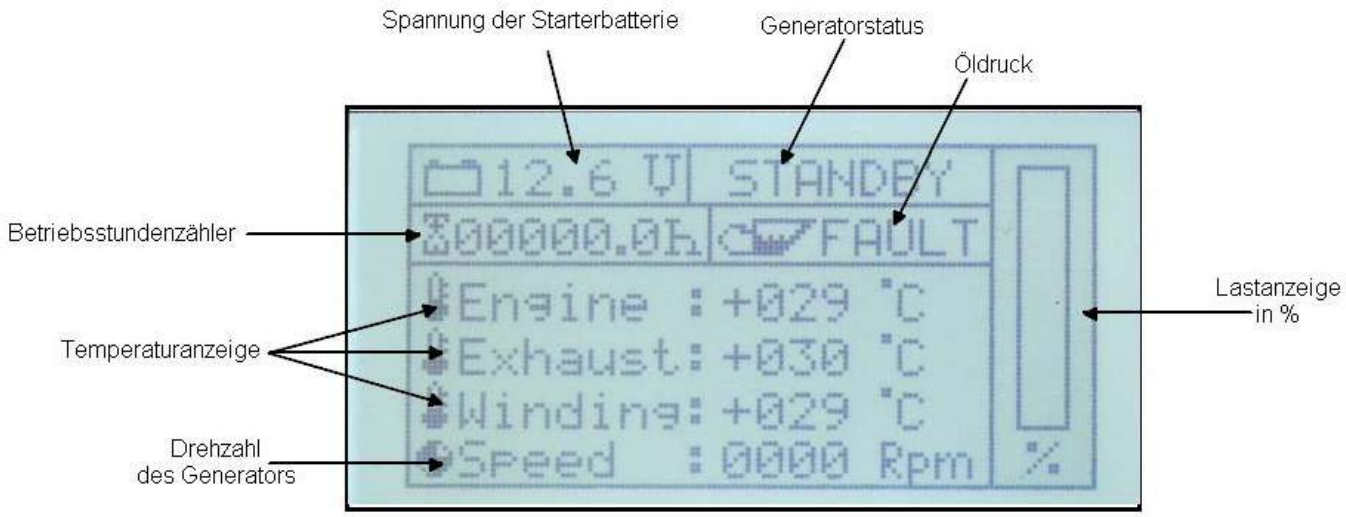
Five seconds after the controller is switched on, the display will change to the default display screen. On the default display screen, you will find information on the battery voltage, operating hours of the generator, temperatures of cylinder head, exhaust manifold, and winding, RPM, and the oil pressure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

Data output on the default display screen:

- Battery voltage (supply voltage)
- Status field for operating modes (stand-by, pre-heat, starting, override, running, autostart, stopping)
- Operating hours of the generator

- Oil pressure status
- Cylinder head temperature
- Temperature of exhaust manifold
- Winding temperature
- Speed/RPM
- Utilisation in percent

Fig. 11.3.2-1: Default display screen



The Display shows the iControl board input voltage.

At generator systems with 12 V starter system these is equal with the starter battery voltage.

At generator system with 24 V starter system the starter battery voltage can not be displayed.

Note:

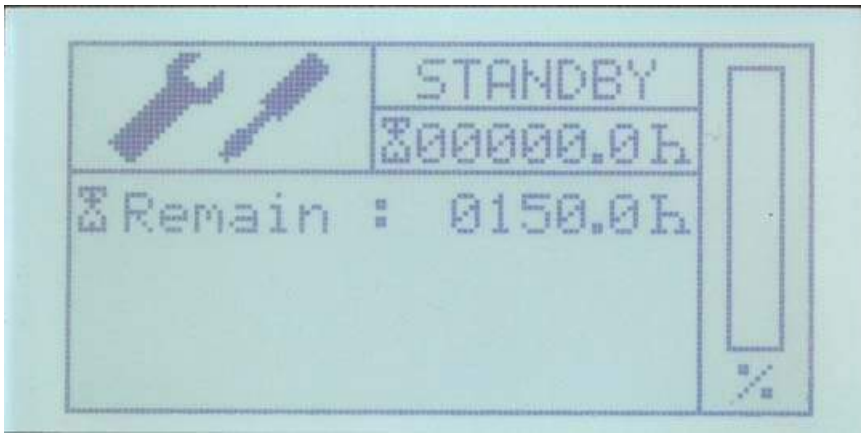
11.3.3 Operating modes

The Panda iControl2 controller offers different operating modes.

11.3.3.1 Stand-by mode

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

Fig. 11.3.3.1-1: Service information screen



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

With the dynamic operation hours the service interval can be raised up to 30% (200h max.). Make sure that the dynamic operation hours are not reset accidently between the service interval. see “Resetting the service interval ("Service")” on page 185.

Note:

In the set-up menu of the controller, you can reset the service interval after performing maintenance. Siehe “Set-up menu” auf Seite 181.

11.3.3.2 Start-up mode

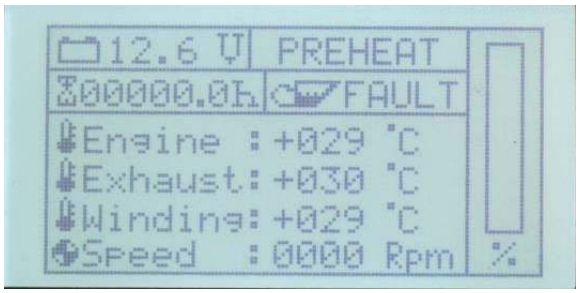
The start-up mode represents the transition from stand-by mode to operation mode, i.e., generator operation. By actuating the Start/Stop button in stand-by mode, you can initiate the start-up process of the generator.

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

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

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

Fig. 11.3.3.2-1: Default display screen during pre-heating



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

Fig. 11.3.3.2-2: Default display screen during start-up

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

Note:

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

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

ATTENTION:

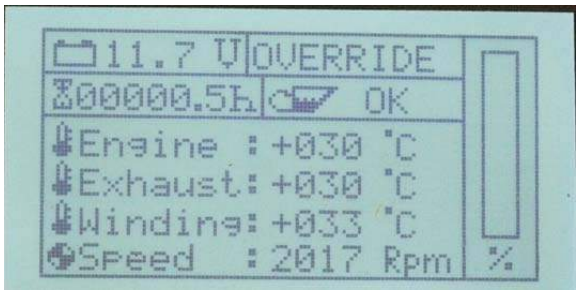
If the generator engine does not start immediately and further start attempts are necessary, then the seacock MUST be closed (i.e. for ventilating the fuel lines ect.) The cooling water impeller pump turns automatically and draws cooling water as long as the motor is turning. If the diesel motor is running,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

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

11.3.3.3 Override mode

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

Fig. 11.3.3.3-1: Default display screen in override mode



11.3.3.4 Operation mode

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

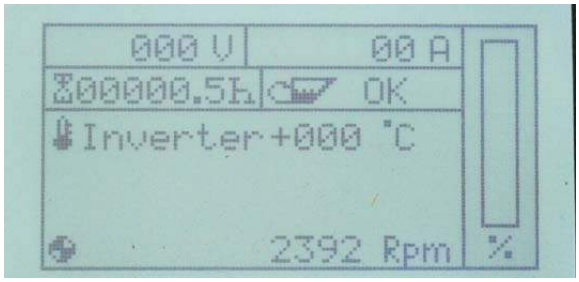
In operation mode, the electrical load is given on the right hand side of the default display screen and in the inverter screen as a bar graph. The bar graph merely provides a guide value for the load of the generator and gives the values as a percentage.

Fig. 11.3.3.4-1: Default display screen in operation mode

Display screen for single phase generators

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

Fig. 11.3.3.4-2: Inverter screen in operation mode



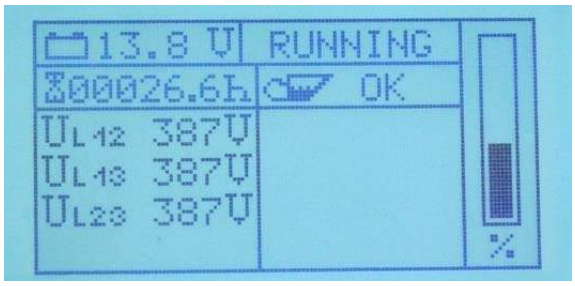
Display screens for 3-phase generators

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

Fig. 11.3.3.4-3: Inverter screen coil-voltage and conductor current

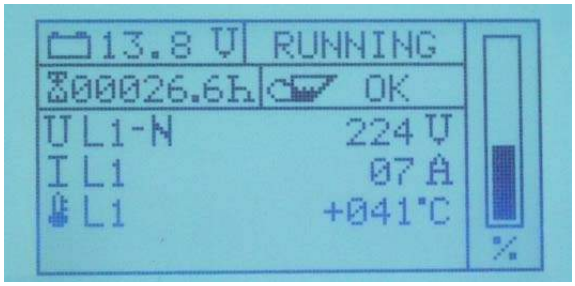
This screen provides the latest inverter phase voltages. You can access the inverter screen by actuating the cursor-up button while in operation mode.

Fig. 11.3.3.4-4: Inverter screen phase voltages



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

Fig. 11.3.3.4-5: Phase voltage L1

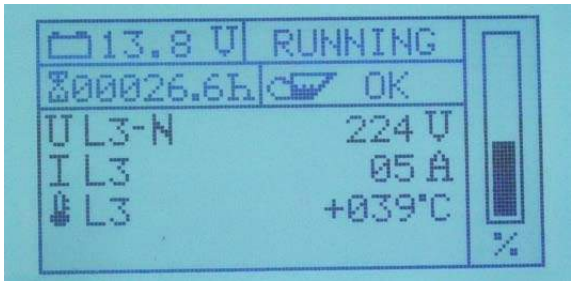


This screen provides the latest inverter output voltage of the single phases with the matching conductor current and the circuit board temperature. The inverter will be switched off at a circuit board temperature of 75 °C. You can access the inverter screen by actuating the cursor-up button while in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

Fig. 11.3.3.4-6: Phase voltage L2

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

Fig. 11.3.3.4-7: Phase voltage L3



11.3.3.5 Stop mode

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

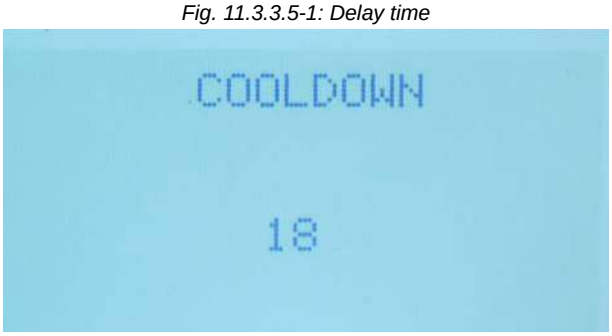
If the icontrol system detect a high cylinder head temperature (for example after a long time running with high load) the icontrol start a stopping delay timer. The Display shows „Cooldown“ and a countdown.

During this timer the icontrol system will shut of the PMGi and run the engine at idle speed. During the delay time an automatic start request will be ignored.

After the delay time, the generator will be stopped automatically.

You can interrupt the delay time by pressing the start/stop button. (Not recommend by Fischer Panda. The Engine may overheat)

Fig. 11.3.3.5-1: Delay time



Never use an emergency stop switch for a regular stop of the generator.

The engine may overheat and can be damaged/destroyed

Attention:

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

If necessary, the autostart mode must be reactivated.

Note: Manual start in autostart mode

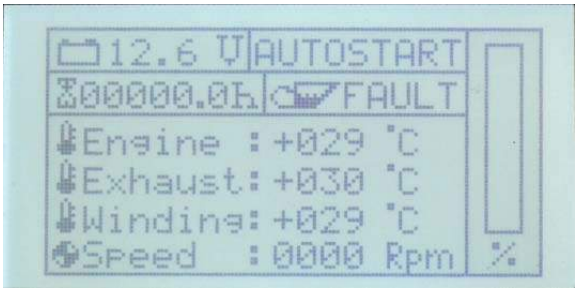
11.3.3.6 Autostart mode

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

To activate the autostart function, you must first check the "Autostart" flag in the set-up menu. To activate the autostart function, read Siehe “Activating/deactivating the autostart function ("Autostart")” auf Seite 183.

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

Fig. 11.3.3.6-1: Default display screen in autostart mode



The autostart function will remain active even after the controller is switched off and on again with the On/Off button. To deactivate the autostart function, the flag in the EEPROM must be reset with "Disable". Siehe “Activating/deactivating the autostart function ("Autostart")” auf Seite 183.

.Warning!: Automatic start-up

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

Note: Manual start in autostart mode

If necessary, the autostart mode must be reactivated.

11.4 Other operating functions

11.4.1 Set-up menu

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

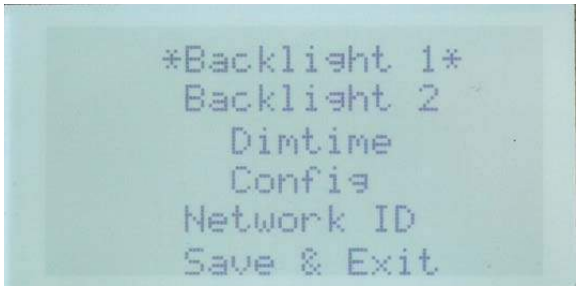
Fig. 11.4.1-1: Set-up menu

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

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

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

Fig. 11.4-2: Set-up menu

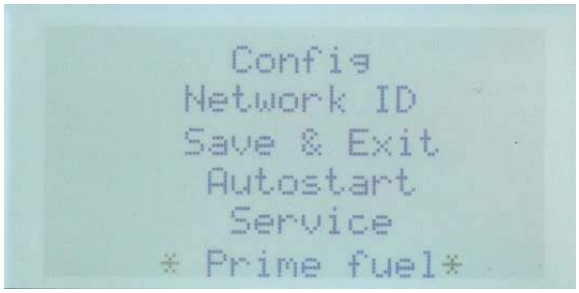


The Start/Stop button is used for confirming a selection in the set-up menu. If you confirm the row marked with the * with the Start/Stop button, you will access the selected sub-menu.

Note:

Set-up menu

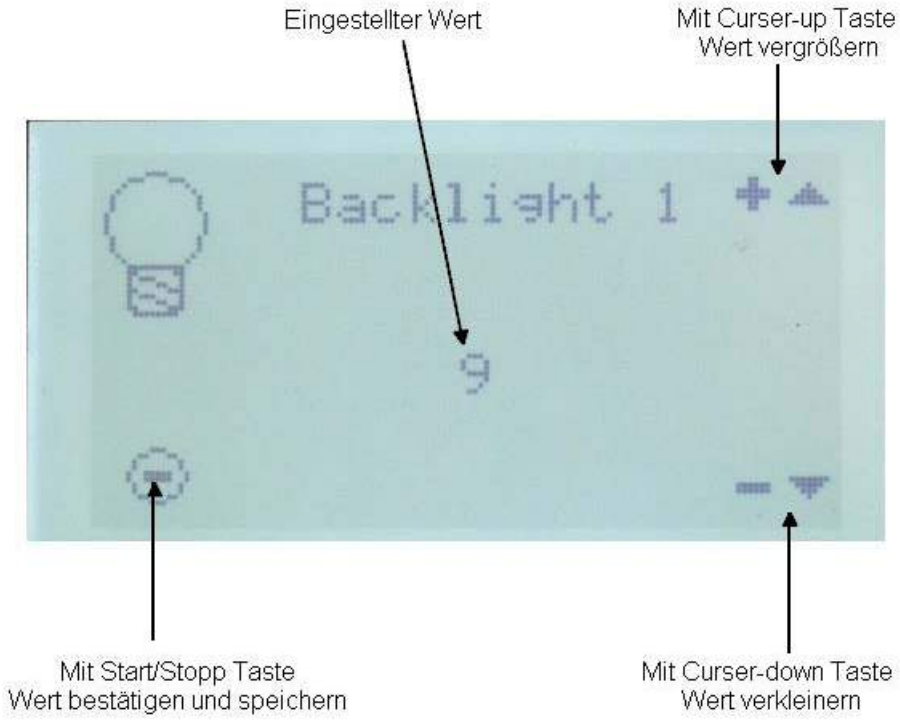
Fig. 11.4-3: Set-up menu



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

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

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



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

Note:

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

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

11.4.3 The configuration menu ("config")

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

STOP!

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

11.4.4 The network ID

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

Changing the network ID can result in malfunction.

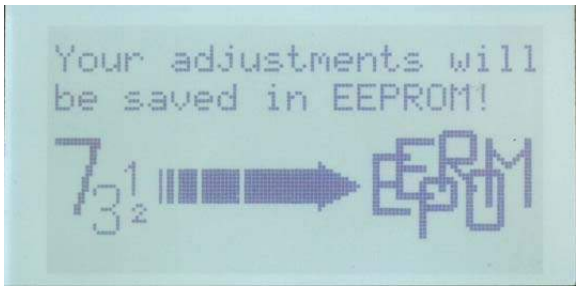
STOP! Network ID must not be modified

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

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

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

Fig. 11.4.5-1: Saving the values to the EEPROM



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

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

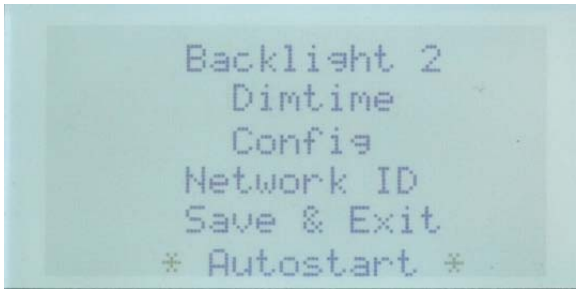
DANGER TO LIFE! - Improper operation can result in health impairment and death.

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

WARNING: Automatic start-up

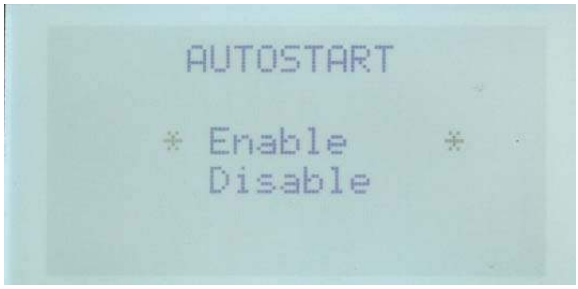
To activate the autostart function, select the item "Autostart" in the set-up menu using the cursor buttons and confirm the selection with the Start/Stop button.

Fig. 11.4.6-1: Set-up menu



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

Fig. 11.4.6-2: "Autostart" sub-menu



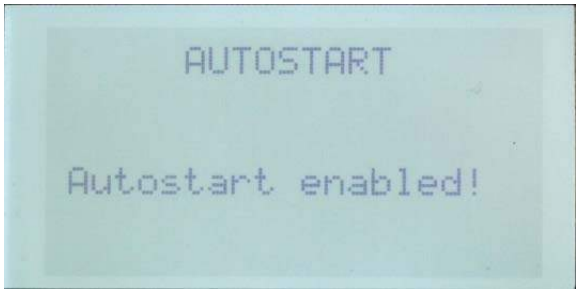
To activate the autostart function, select "Enable" and again confirm your selection with the Start/Stop button.

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

The Panda iControl will then confirm your input:

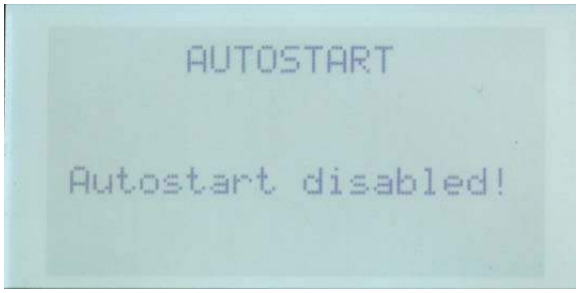
Message "Autostart enabled" after confirming the selection

Fig. 11.4.6-3: Message "Autostart enabled" after confirming the selection



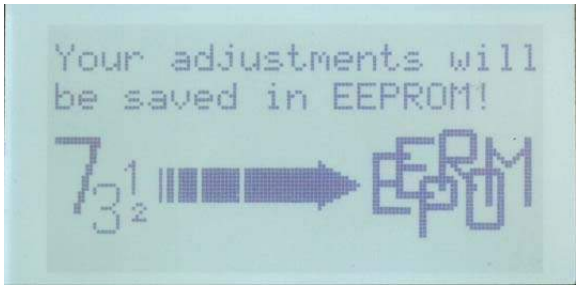
Message "Autostart disabled" after confirming the selection

Fig. 11.4.6-4: Message "Autostart disabled" after confirming the selection



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

Fig. 11.4.6-5: Selection is saved to the EEPROM



Then, the controller is shut down.

Fig. 11.4.6-6: Goodbye screen prior to shutting down

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

Fig. 11.4.6-7: Default display screen in autostart mode

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

.Warning!: Automatic start-up

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

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

Note: Manual start in autostart mode

If necessary, the autostart mode must be reactivated.

11.4.7 Resetting the service interval ("Service")

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

Note

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

Note:

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

Resetting the time until the next service

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

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

Fig. 11.4.7-1: Resetting the time until the next service

11.4.8 Priming the fuel system ("Prime Fuel")

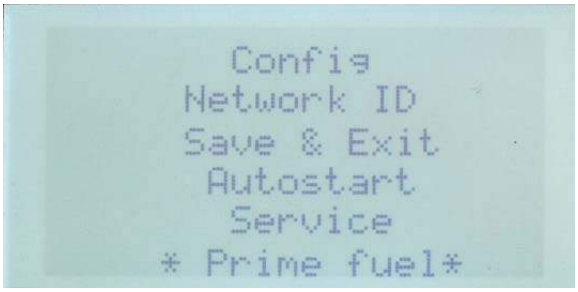
To prime the fuel system, the Panda iControl2 offers the option of separately activating the fuel pump. In the set-up menu, select the menu item "Prime fuel" and confirm your selection using the Start/Stop button.

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

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

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

Fig. 11.4.8-1: Set-up menu



11.4.9 Selecting and saving a unit for the temperature value output

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

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

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

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

Settings options:

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

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

12. Installation

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

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

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

WARNING: Properly dimension your system.

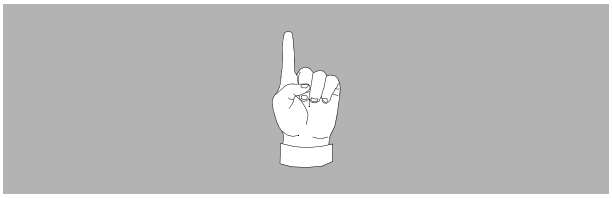
12.1 Personnel

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

12.1.1 Hazard warnings for installation

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

Note:



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

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

.Warning!: Automatic start-up

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

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

WARNING: Risk of injury!

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

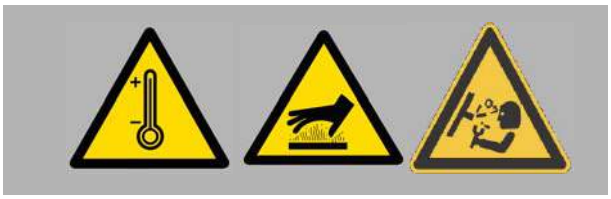
Electric voltages of more than 48 V are potentially lethal in any situation. The rules of the respective regional authority must be adhered to during installation. For safety reasons, only an electrician may carry out the installation of the electrical connections of the generator.

WARNING: Electric voltage

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

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

WARNING: Hot surface/material



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

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

MANDATORY INSTRUCTION: Protective equipment required

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

WARNING: Switch off all loads.

12.2 Disposal of the components

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

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

MANDATORY INSTRUCTION: Protect the environment.

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

12.2.1 Panda iControl2 panel with installation housing

Fig. 12.2.1-1: Panda iControl2 panel with panel connecting cable and closed housing

12.2.2 Terminal assignments on the Panda iControl2 panel

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

Fig. 12.2.2-1: Terminal assignment on the Panda iControl2 panel

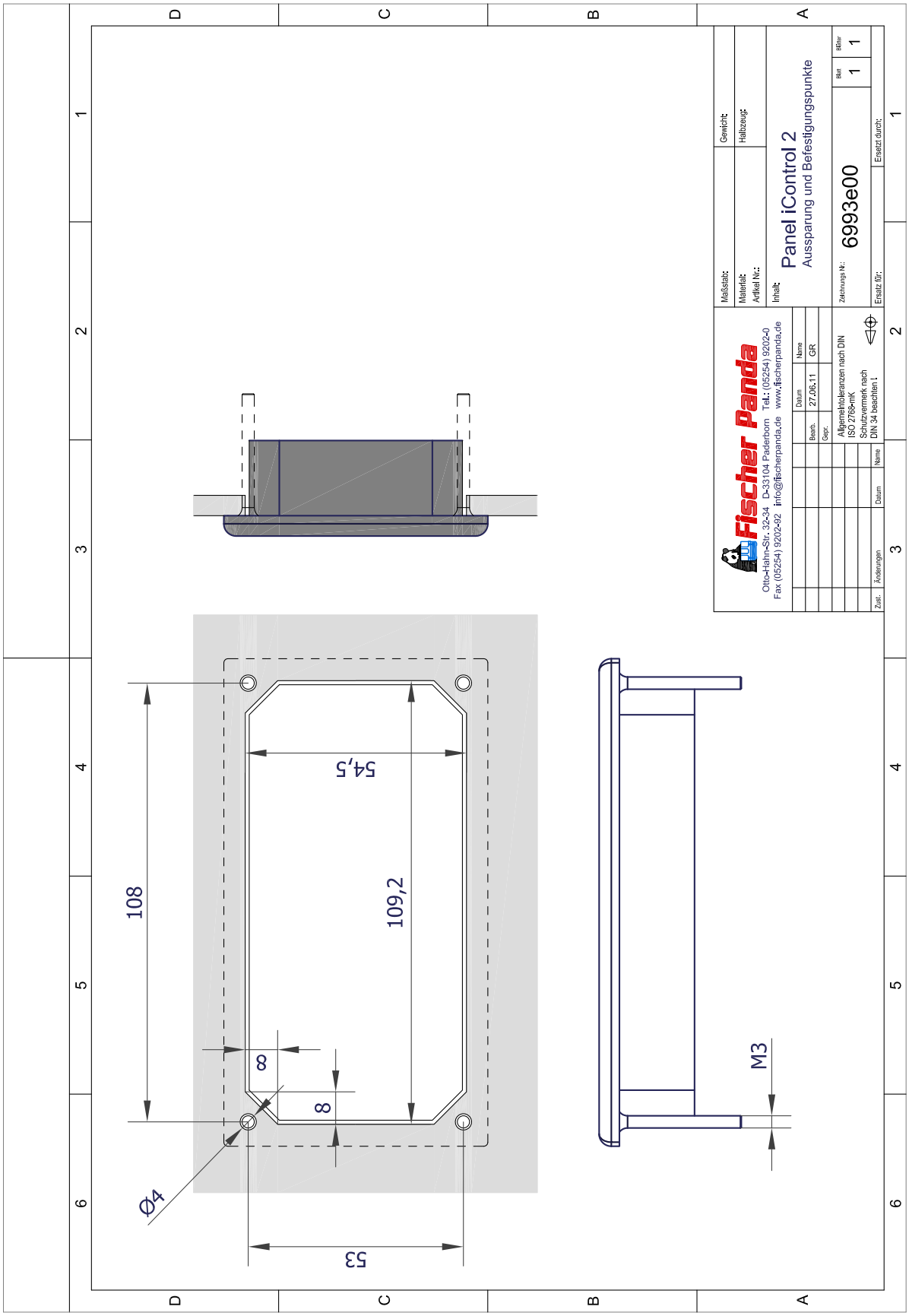
Terminal	Terminal description	Cable colour	Function
1	UBUS	white (WH)	Bus supply voltage
2	GND	brown + shielding (BN)	Fischer Panda bus ground, ground connection between Panda iController and Panda iControl panel
3	REIZ	green (GN)	Exciter wire, is switched to ground if the controller is to switch on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

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

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

12.3 Dimensions

Fig. 12.3-1: Housing of the Panda iControl2 panel



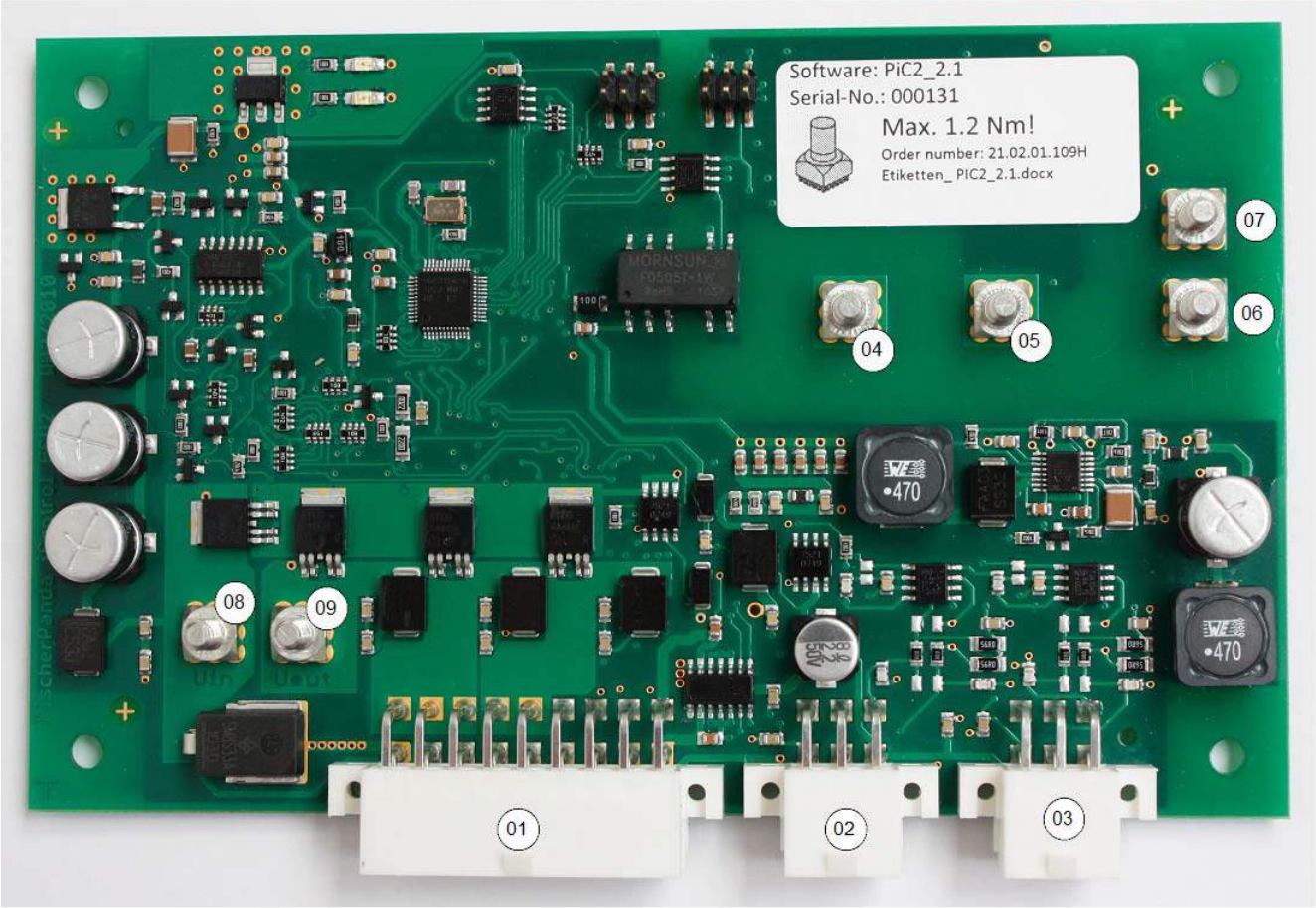
Due to the terminals being exposed, the protection class IP 04 applies to the iControl2 panel.

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

Please note!

12.4 Wiring of the Panda iControl2 controller

Fig. 12.4-1: Wiring of the Panda iControl2 controller



The Panda iControl2 controller is connected to the wire harness with the 18-pin jack. The centre 6-pin jack is designed for the Fischer Panda standard bus. The Panda iControl2 panel is connected to this jack. The Fischer Panda CAN bus is connected to the 6-pin jack at the bottom right of the circuit board. The configuration of the connectors is given in the subsequent tables. Siehe “Terminal assignments on the Panda iControl2 controller” auf Seite 192.

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

12.4.1 Terminal assignments on the Panda iControl2 controller

12.4.1.1 Terminal assignment of 18-pin connector

Fig. 12.4.1.1-1: Terminal assignment of 18-pin connector

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

12.4.1.2 Fischer Panda standard bus

Fig. 12.4.1.2-1: Fischer Panda standard bus terminal assignment

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

12.4.1.3 Fischer Panda CAN bus

Fig. 12.4.1.3-1: Fischer Panda CAN bus terminal assignment

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

12.5 Start-up

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

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

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

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

Note:

The corresponding forms are included in the generator manual.

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13. Maintenance

13.1 Maintenance of the iControl2 controller

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

13.1.1 Cleaning the iControl2 controller

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

13.2 Maintenance of the iControl2 remote control panel

The iControl2 remote control panel is maintenance-free.

13.2.1 Cleaning the iControl2 controller

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

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14. Warnings and error messages

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

14.1 Warnings

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

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

Note:

14.1.1 Examples of warnings on the display:

Warning: „Battery power too low“

Fig. 14.1.1-1: Warning: „Battery power too low“

Warning: „Winding temperature too high“

Fig. 14.1.1-2: Warning: „Winding too high“

14.1.2 Warning messages

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

Fig. 14.1.2-1: Warning messages

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

14.2 Faults

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

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

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

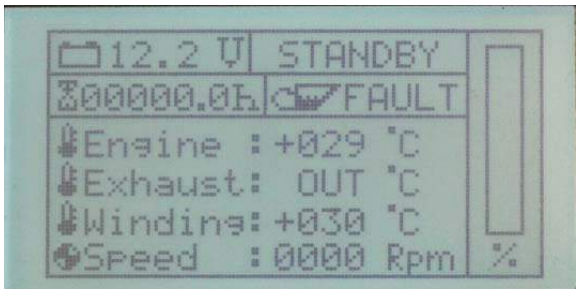
Faults result in the generator shutting down. If a fault occurs due to the battery voltage being too low, the controller is completely shut down to prevent the battery from discharging too much.

Examples of an error message on the display:

Fault: „Exhaust manifold temperature out of range“

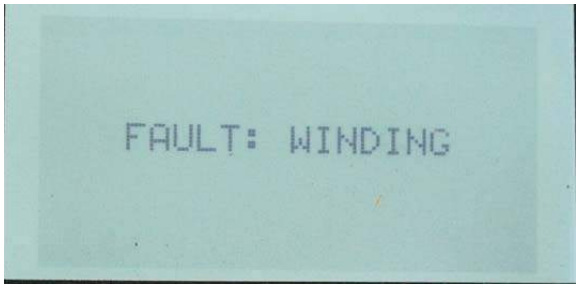
(broken cable)

Fig. 14.2-1: Fault: „Cylinder head temperature out of range“



Fault: „Winding“, winding temperature too high

Fig. 14.2-2: Fault: „STARTING FAILS“, start-up process was not successful



14.2.1 Error messages

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

Fig. 14.2.1-1: Error messages

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

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

14.2.2 Warning and fault thresholds

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

Fig. 14.2.2-1: Warning and fault thresholds for different generator types

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

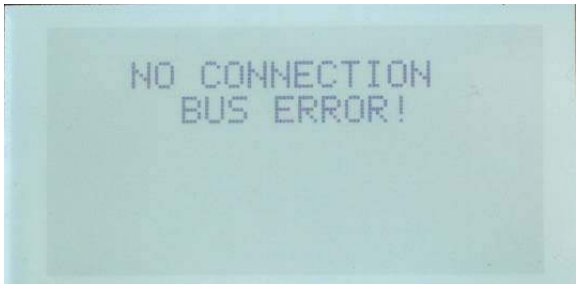
Generator type	Warning/fault	Warning threshold	Fault threshold
P8-P50 marine	Cylinder head temperature Delay	90 °C 5 s	95 °C 5 s
	Winding temperature Delay	130 °C 5 s	135 °C 5 s
	Exhaust manifold temperature Delay	70 °C 1 s	75 °C 1 s
P8-P50 vehicle	Cylinder head temperature Delay	95 °C 5 s	100 °C 5 s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

14.2.3 Bus errors

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

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

Fig. 14.2.3-1: Error: „NO CONNECTION“, error in the communication (Fischer Panda bus)



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

15. Annex

15.1 Technical data

15.1.1 Technical data for iControl2 control unit

Fig. 15.1.1-1: Technical data for iControl 2 control unit

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

15.1.2 Technical data for iControl2 remote control panel

Fig. 15.1.2-1: Technical data for iControl2 remote control panel

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

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16. Inverter Panda PMGi 8000 / PMGi 10000

Art Nr.	21.07.03.033P (PMGi 8000) / 21.07.03.041P (PMGi 10000) 21.07.03.019P (PMGi 5000)
Bez.	Panda PMGi 8000 / PMGi 10000 (230 V 50 Hz) PMGi 5000 120 V/240 V 60 Hz)

	Document	Hardware	Software
Actual:	R04		
Replace:	R03		

16.1 Safety instruction

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

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

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

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

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

Electrical power: DANGER TO LIVE!

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

16.2 Type plate

1. Location of the type plate

Fig. 16.2-1: Location Type plate

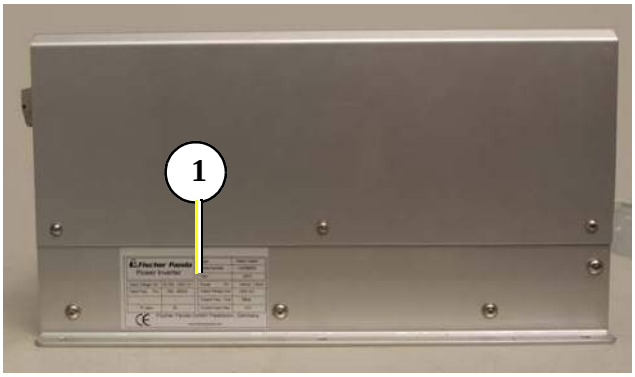
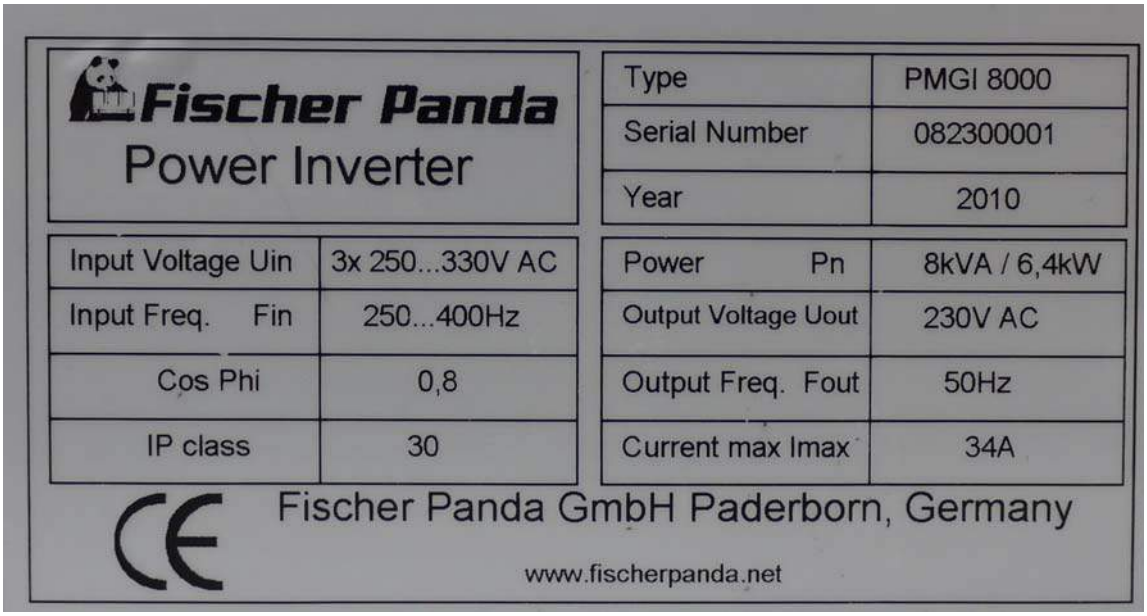


Fig. 16.2-2: Type plate



16.3 Front side/connection side

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

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

Do not cover the Air out grille (2)

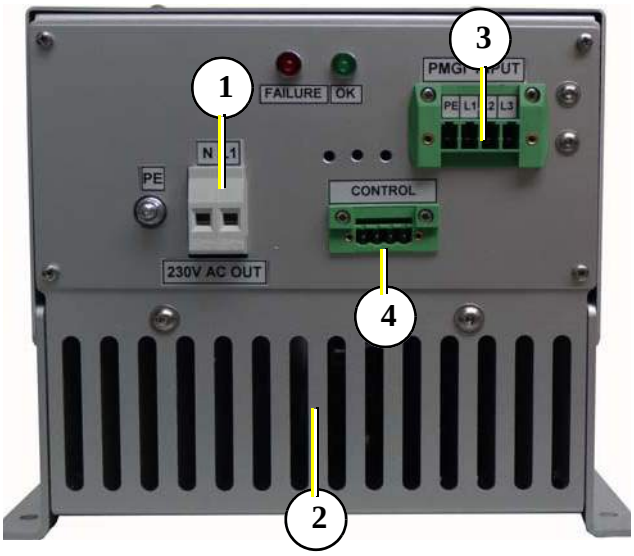
1. Socket for Load

2. Air out grille

3. Socket for generator connection

4. FP- Bus socket connection to generator

Fig. 16.3-1: Connection side



16.3.1 Socket pins of the PMGi 8000

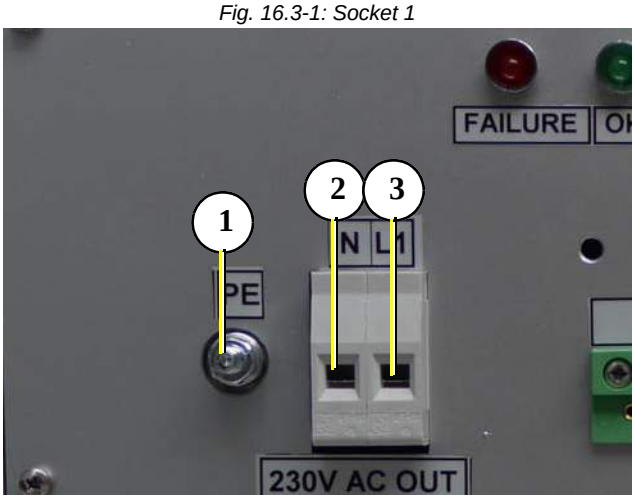
Socket 1 - 230V / 50Hz AC - PMGi out

1. Ground (cable green/yellow)

2. Neutral (cable blue)

3. Live (cable brown)

Fig. 16.3-1: Socket 1



Attention!

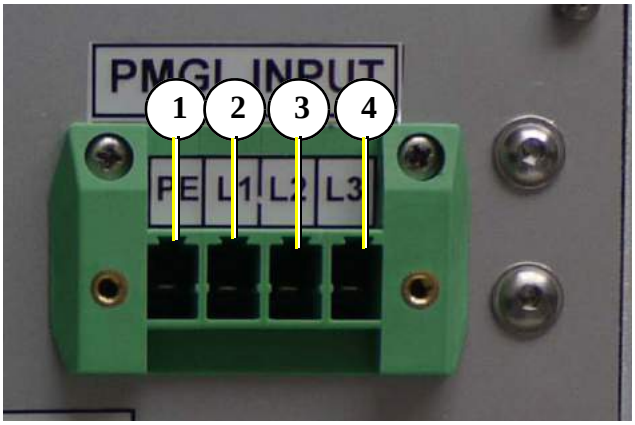
Connecting one of the three Phase with the earth pin will destroy the PGMi

Socket 3 - PMGi in

1. Ground

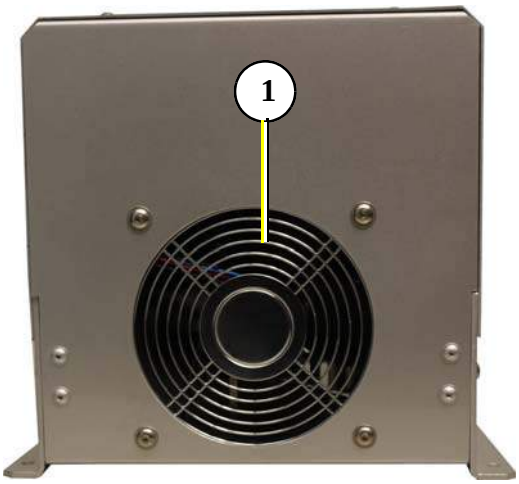
2-4. Phase 1-3

Fig. 16.3-2: Socket 3



16.4 Back side

Fig. 16.4-1: Back side



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

01. Air holes

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

Attention!

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

Attention!

16.5 Settings for the use of iGenerators with power inverter

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

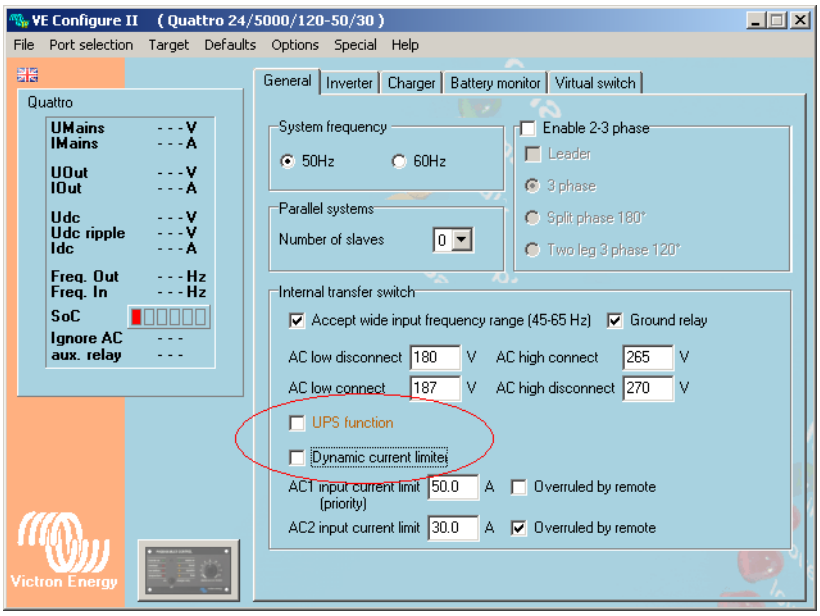
ATTENTION: Wrong settings can destroy the PMGi

Wrong settings can damage or destroy the PMGi.

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

16.5.1 Settings in the Victron VE Configure II Software - General

Fig. 16.5.1-1: Settings in the Victron VE configure II Software



16.5.1.1 Uninterrupted AC power (UPS function)

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

UPS Function must be deactivated.

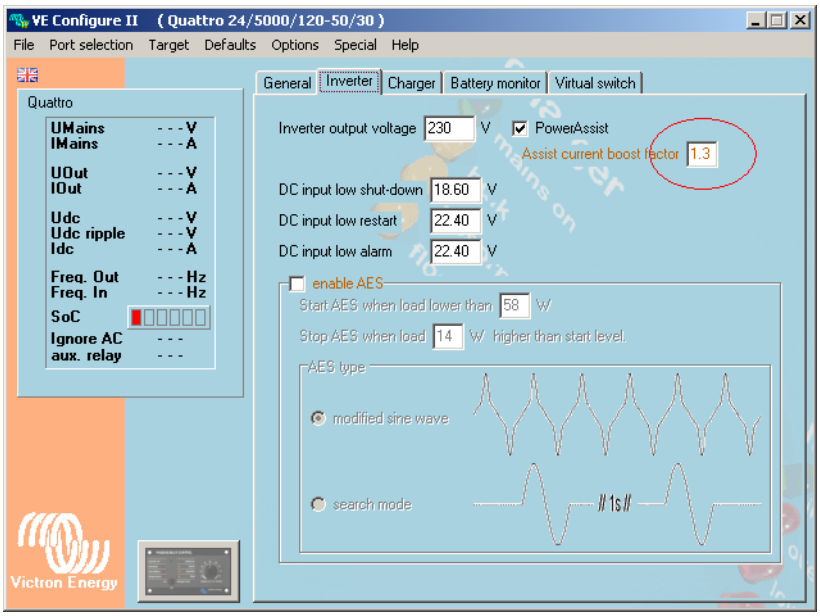
16.5.1.2 Dynamic current limiter

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

Dynamic current limiter must be deactivated.

16.5.2 Settings in the Victron VE Configure II Software - Inverter

Fig. 16.5.2-1: Settings in the Victron VE configure II Software



16.5.2.1 Assist current boost factor

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

16.6 Operation manual

16.6.1 Primary remarks / Winter operation

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

16.6.2 Load at the PMGi

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

16.6.3 Automatic start

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

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

16.7 Status LED´s

Red - Green

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

16.8 Cooling of the PMGi

Inside of the PMGi a fan is mounted.

Do not cover the air holes and grille.

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

16.9 Installation of the PMGi

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

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

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

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

The rules of the respective regional authority must be adhered to. Only an electrician may carry out installation of the electrical connections for safety reasons.

16.9.1 Electrical connection.

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

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

Pay attention to the right pin assignment. See “Socket pins of the PMGi 8000” on page 206.

16.9.1.1 Connection to a system with RCD

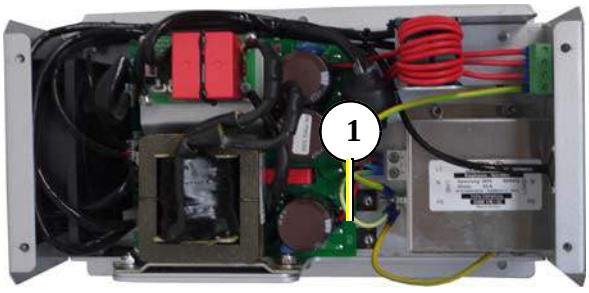
The PMGi is prepared for the use in a RCD protected grid.,

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

PE-N Bridge

Fig. 16.9-1: PE-N bridge

Inside of the PMGi a PE-N bridge



16.9.1.2 Connection to a system with isolation control

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

A Manual for this modification can be downloaded under:

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

16.10Technical Data

16.10.1 General Data

PMGi is part of the Panda i-series generator. Its not allowed to be used with other generators or applications.

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

16.10.2 Generator Specification

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

16.10.3 PMGi out

Fig. 16.10.3-1: Technische Daten PMGit / Technical Data PMGi / PMGi Out

		PMGi 4000 230 V	**PMGi 5000 230 V**	**PMGi 5000 120 V**
Nominale Ausgangsspannung **Nominal Voltage** Tension de sortie nominale:	NOV_{AC}	230 V VAC +/- 5 % ohne Last / without Load / sans charge	230 V VAC +/- 5 % ohne Last / without Load / sans charge	120 V VAC +/- 5 % ohne Last / without Load / sans charge
Regelung **Regulation** Réglage	R	5 %	5 %	5 %
Stabilität (Kurzzeit (30sec)) **Stability (short term (30sec))** Stabilité (courte durée (30s))	D_S	5 %	5 %	5 %
Stabilität (Langzeit (4h)) **Stability (Long term (4h))** Stabilité (longue durée (4h))	D_I	5 %	5 %	5 %
Spannungsabweichung **Voltage offset** Divergence de tension	V_{offset}	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C
Stromstärke **Current** Courant	$Stromstärke_{Nominal}$ $Current_{Nominal}$ $Courant_{Nominal}$	17.4 A @230$V_{eff.}$	17,4 A @230$V_{eff.}$	33 A @ 120$V_{eff.}$
	$Stromstärke_{Maximum}$ $Current_{Maximum}$ $Courant_{Maximum}$	19.5 A @ cos phi 0,8 @230$V_{eff.}$	22 A @ cos phi 0,8 @230$V_{eff.}$	42 A @ cos phi 0,8 @120$V_{eff.}$
Leistung **Power** Puissance	Nominal Nominal power Nominale	4,3 kVA	5,0 kVA	5,0 kVA
	Dauer Long term	3,6 kW	3,6 kW	3,6 kW

		PMGi 4000 230 V	PMGi 5000 230 V	PMGi 5000 120 V
Frequenz **Frequency** Fréquence	Nominale Frequenz Nominal Frequency Fréquence nominale	50 Hz +/-2 %	50 Hz +/-2 %	60 Hz +/-2 %
	Regulierung Regulation Réglage	4 %	4 %	4 %
	Stabilität (Kurzeitig) (30sec)) Stability (short term (30sec)) Stabilité (courte durée (30s))	3 %	3 %	3 %
	Stabilität (Langzeit (4h)) Stability (Long term (4h)) Stabilité (longue durée (4h))	3 %	3 %	3 %
Krestfaktor **Crestfactor** Facteur de crête		3:1	3:1	3:1
Empfohlene Absicherung **Recommend protection fuse** Sécurisation recommandée		20 A	25 A	40 A
Empfohlener Kabelquerschnitt **Recommend cable cross** Section de câble recommandée		2,5 mm²	2,5 mm²	6mm²
Umgebungstemperatur max. **Ambient temperature**		40°C	40°C	40°C

Fig. 16.10.3-2: Technische Daten PMGi / Technical Data PMGi / PMGi Out

		PMGi 8000 230 V	PMGi 8000 120V	PMGi 10000 230 V
Nominale Ausgangsspannung **Nominal Voltage** Tension de sortie nominale:	NOV_{AC}	230 V VAC +/- 5 % ohne Last / without Load / sans charge	120 V VAC +/- 5 % ohne Last / without Load / sans charge	230 V VAC +/- 5 % ohne Last / without Load / sans charge
Regelung **Regulation** Réglage	R	5 %	5 %	5 %
Stabilität (Kurzzeit (30sec)) **Stability (short term (30sec))** Stabilité (courte durée (30s))	D_S	5 %	5 %	5 %
Stabilität (Langzeit (4h)) **Stability (Long term (4h))** Stabilité (longue durée (4h))	D_l	5 %	5 %	5 %
Spannungsabweichung **Voltage offset** Divergence de tension	V_{offset}	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C
Stromstärke **Current** Courant	$Stromstärke_{Nominal}$ $Current_{Nominal}$ $Courant_{Nominal}$	26,0 A @230$V_{eff.}$	53 A @ 120$V_{eff.}$	34,8 A @230$V_{eff.}$
	$Stromstärke_{Maximum}$@230 V eff. $Current_{Maximum}$@230 $V_{eff.}$ $Courant_{Maximum}$@230 $V_{eff.}$	34 A @ cos phi 0,8 @230$V_{eff.}$	67 A @ cos phi 0,8 @120$V_{eff.}$	43,5 A @ cos phi 0,8 @230$V_{eff.}$
Leistung **Power** Puissance	Nominal Nominal power Nominale	8,0 kVA	8 kVA	10,0 kVA
	Dauer Long term	6,4 kW	6,4 kW	8,0 kW

		PMGi 8000 230 V	PMGi 8000 120V	PMGi 10000 230 V
Frequenz **Frequency** Fréquence	Nominale Frequenz Nominal Frequency Fréquence nominale	50 Hz +/-2 %	60 Hz +/-2 %	50 Hz +/-2 %
	Regulierung Regulation Réglage	4 %	4 %	4 %
	Stabilität (Kurzeitig) (30sec)) Stability (short term (30sec)) Stabilité (courte durée (30s))	3 %	3 %	3 %
	Stabilität (Langzeit (4h)) Stability (Long term (4h)) Stabilité (longue durée (4h))	3 %	3 %	3 %
Krestfaktor [1)] **Crestfactor** [1)] Facteur de crête		3:1	3:1	3:1
Empfohlene Absicherung **Recommend protection fuse** Sécurisation recommandée		32 A	63 A	40 A
Empfohlener Kabelquerschnitt **Recommend cable cross** Section de câble recommandée		4 mm²	10 mm²	6 mm²
Umgebungstemperatur max. **Ambient temperature**		40°C	40°C	40°C

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

Fig. 16.10.3-3: Technische Daten PMGi / Technical Data PMGi / PMGi Out

		PMGi 10000 120 V		
Nominale Ausgangsspannung **Nominal Voltage**	NOV_{AC}	120 V VAC +/- 5 % ohne Last / without Load / sans charge		
Regelung **Regulation**	R	5 %		
Stabilität (Kurzzeit (30sec)) **Stability (short term (30sec))**	D_s	5 %		
Stabilität (Langzeit (4h)) **Stability (Long term (4h))**	D_l	5 %		
Spannungsabweichung **Voltage offset** Divergence de tension	V_{offset}	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C		
Stromstärke **Current** Courant	$Stromstärke_{Nominal}$ $Current_{Nominal}$ $Courant_{Nominal}$	66,7 A @120$V_{eff.}$		
	$Stromstärke_{Maximum}$ $Current_{Maximum}$ $Courant_{Maximum}$	83,3 A @ cos phi 0,8 @120$V_{eff.}$		
Leistung **Power** Puissance	Nominal Nominal power Nominale	10,0 kVA		
	Dauer Long term Continue	8,0 kW		

		PMGi 10000 120 V		
Frequenz **Frequency**	Nominale Frequenz Nominal Frequency Fréquence nominale	60 Hz +/-2 %		
	Regulierung Regulation Réglage	4 %		
	Stabilität (Kurzeitig) (30sec)) Stability (short term (30sec)) Stabilité (courte durée (30s))	3 %		
	Stabilität (Langzeit (4h)) Stability (Long term (4h)) Stabilité (longue durée (4h))	3 %		
Krestfaktor **Crestfactor** Facteur de crête		3:1		
Empfohlene Absicherung **Recommend protection Fuse** Sécurisation recommandée		80 A		
Empfohlener Kabelquerschnitt **Recommend cable cross** Section de câble recommandée		25 mm²		
Wassertemperatur max. **Water temperature max.**		40 °C		
Umgebungstemperatur max. **Ambient temperature**		60 °C		

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

Fig. 16.10.3-4: Technische Daten PMGi / Technical Data PMGi / PMGi Out

		PMGi 15000 400 V	PMGi 15000 230 V	PMGi 15000 120 V
Nominale Ausgangsspannung **Nominal Voltage**	NOV_{AC}	400 V VAC +/- 5 % ohne Last / without Load / sans charge	230 V VAC +/- 5 % ohne Last / without Load / sans charge	120 V VAC +/- 5 % ohne Last / without Load / sans charge
Regelung **Regulation**	R	5 %	5 %	5 %
Stabilität (Kurzzeit (30sec)) **Stability (short term (30sec))**	D_S	5 %	5 %	5 %
Stabilität (Langzeit (4h)) **Stability (Long term (4h))**	D_l	5 %	5 %	5 %
Spannungsabweichung **Voltage offset** Divergence de tension	V_{offset}	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C
Stromstärke **Current** Courant	$Stromstärke_{Nominal}$ $Current_{Nominal}$ $Courant_{Nominal}$	3x 17,4 A @ 400 $V_{eff.}$	52 A @230$V_{eff.}$	100 A @120$V_{eff.}$
	$Stromstärke_{Maximum}$ $Current_{Maximum}$ $Courant_{Maximum}$	3x 21,7 A @ cos phi 0,8 @400 $V_{eff.}$	52 A @ cos phi 0,8 @230$V_{eff.}$	100 A @ cos phi 0,8 @120$V_{eff.}$
Leistung **Power** Puissance	Nominal Nominal power Nominale	15 kVA	15 kVA	15 kVA
	Dauer Long term Continue	10,8 kW	12 kW	12 kW
Frequenz **Frequency**	Nominale Frequenz Nominal Frequency Fréquence nominale	50 Hz +/-2 %	50 Hz +/-2 %	60 Hz +/-2 %
	Regulierung Regulation Réglage	4 %	4 %	4 %
	Stabilität (Kurzeitig) (30sec)) Stability (short term (30sec)) Stabilité (courte durée (30s))	3 %	3 %	3 %
	Stabilität (Langzeit (4h)) Stability (Long term (4h)) Stabilité (longue durée (4h))	3 %	3 %	3 %
Krestfaktor **Crestfactor** Facteur de crête		3:1	3:1	3:1
Empfohlene Absicherung **Recommend protection Fuse** Sécurisation recommandée		3x 25 A	63 A	100 A
Empfohlener Kabelquerschnitt **Recommend cable cross** Section de câble recommandée		4 mm² (PUR Kabel einsetzen / use PUR cable / Mise en place du câble PUR)	10 mm² (PUR Kabel einsetzen / use PUR cable / Mise en place du câble PUR)	25 mm² (PUR Kabel einsetzen / use PUR cable /)Mise en place du câble PUR
Wassertemperatur max. **Water temperature max.**			40 °C (nur bei wassergekühlter Version / watercooled version only)	40 °C
Umgebungstemperatur max. **Ambient temperature**		40 °C (nur bei wassergekühlter Version / watercooled version only)	60 °C (nur bei wassergekühlter Version / watercooled version only)	60 °C

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

Fig. 16.10.3-5: Technische Daten PMGi / Technical Data PMGi / PMGi Out

		PMGi 25 230 V	PMGi 25 400 V	PMGi 45 400 V
Nominale Ausgangsspannung **Nominal Voltage**	NOV_{AC}	230 V VAC +/- 5 % ohne Last / without Load / sans charge	400 V VAC +/- 5 % ohne Last / without Load / sans charge	400 V VAC +/- 5 % ohne Last / without Load / sans charge
Regelung **Regulation**	R	5 %	5 %	5 %
Stabilität (Kurzzeit (30sec)) **Stability (short term (30sec))**	D_S	5 %	5 %	5 %
Stabilität (Langzeit (4h)) **Stability (Long term (4h))**	D_l	5 %	5 %	5 %
Spannungsabweichung **Voltage offset** Divergence de tension	V_{offset}	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C	+-5 V -20 °C bis +40 °C +-5 V -20 °C to +40 °C +-5 V -20 °C à +40 °C
Stromstärke **Current** Courant	$Stromstärke_{Nominal}$ $Current_{Nominal}$ $Courant_{Nominal}$	87 A @230V	3x29 A @400V	3x52 A @400V
	$Stromstärke_{Maximum}$ $Current_{Maximum}$ $Courant_{Maximum}$	108 A @ cos phi 0,8 @230 V	3x36,2 A @ cos phi 0,8 @400 V	65 A @ cos phi 0,8 @400 V
Leistung **Power** Puissance	Nominal Nominal power Nominale	25 kVA	25 kVA	45 kVA
	Dauer Long term Continue	18 kW	20 kW	Nominal 36 kW Dauer 33 kW
Frequenz **Frequency**	Nominale Frequenz Nominal Frequency Fréquence nominale	50 Hz +/-2 %	50 Hz +/-2 % (Alternative 60 Hz +/- 2 % on special order)	50 Hz +/-2 % (Alternative 60 Hz +/- 2 % on special order)
	Regulierung Regulation Réglage	4 %	4 %	4 %
	Stabilität (Kurzeitig) (30sec)) Stability (short term (30sec)) Stabilité (courte durée (30s))	3 %	3 %	3 %
	Stabilität (Langzeit (4h)) Stability (Long term (4h)) Stabilité (longue durée (4h))	3 %	3 %	3 %
Krestfaktor **Crestfactor** Facteur de crête		3:1	3:1	3:1
Empfohlene Absicherung **Recommend protection Fuse** Sécurisation recommandée		125 A	40 A	80 A
Empfohlener Kabelquerschnitt **Recommend cable cross** Section de câble recommandée		35 mm²	6 mm²	min. 16 mm² (PUR Kabel einsetzen / use PUR cable / Mise en place du câble PUR)
Wassertemperatur max. **Water temperature max.**		40 °C	40 °C	40 °C (nur bei wassergekühlter Version / watercooled version only)
Umgebungstemperatur max. **Ambient temperature**		60 °C	50 °C	50 °C (nur bei wassergekühlter Version / watercooled version only)

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

Fig. 16.10.3-6: PMGi protections

16.10.4 Overload - switch point

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

16.10.5 Short circuit

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

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

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

Note!