Fischer Panda

Power - wherever you are

Generator manual

Panda 5000i PMS

Super silent technology

230V 50Hz 5kVA

120V 60Hz 5kVA

Fischer Panda GmbH

Current revision status

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1. General References and Regulations

since 1977	since 1978	since 1988	since 1988	since 1988
Icemaster GmbH	**Fischer Marine Generators**	**Conclusion Fischer - Icemaster GmbH**	**100 % water cooled Panda generators**	**Panda Vehicle Generators**

Fischer Panda

FISCHER GENERATORS have been manufactured since 1978 and are a well-known brand for first class diesel generators with especially effective sound-insulation. Fischer has been one of the leading manufacturers for marine generators in respect of quality and know-how during this period. FISCHER, as the worldwide manufacturer of modern marine diesel generators, developed the Sailor-Silent series for example and produced a GFK sound-insulated capsule as early as 1979 and the basis for new generator technology.

The companies Fischer and Icemaster amalgamated under the direction of Icemaster in 1988, in order to concentrate on the development of new products. Production was moved to Paderborn.The amalgamation of the two qualified companies led to the development of a complete new programme within a short space of time. The generators developed at that time set new technological standards worldwide.

The generators became more efficient and powerful than other generators in the same nominal performance range, because of the improved cooling. Panda generator demonstrated its superiority in several tests by renowned institutes and magazines during the past years. The patented VCS (voltage Control System) means it can meet all demands including motor speed. The start-booster (ASB) means Panda generators meet the highest demands in respect of voltage stability and starting values.

A water-cooled Fischer Panda generator, with the same drive motor, produces 15 % more effective output than the majority of conventional generators. This superiority in efficiency also ensures a fuel saving to the same extent.

The Fischer Panda generators are currently manufactured in the performance range from 2 to 200 kW in various versions. Fast running motors are preferred for performances up to approx. 30 kW (nominal speed 3000 resp. 3600 rpm). The heavier slow runners are preferred for the higher range. The fast running generators have proved themselves many times for many uses, that they meet the demands in quality of yachts and vehicles, and offer space and weight saving of 50 % compared to slow running generators.

In addition to the Panda series, Fischer Panda also supply the super compact high-tech sound-insulated battery charging generators from the DC/AC Panda AGT series, which is a very interesting solution for the production of mobile power.

The HTG-alternators ensure that a charging rate of 280 amps is achieved that was scarcely thought possible for this compact construction. This alternator replaces a separate shipboard generators (constant 230 volts AC with up to 3.500 W from the main machine)

1.1 Safety first symbols

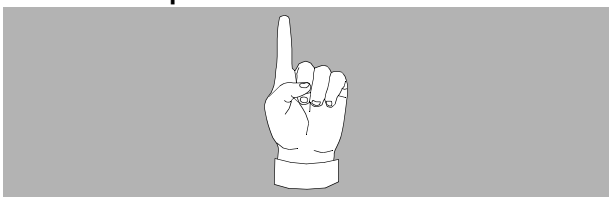
These symbols are used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury. Read these instructions carefully. It is essential that you read the instructions and safety regulations before you attempt to assemble or use unit.

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

Warning!: Toxic elements

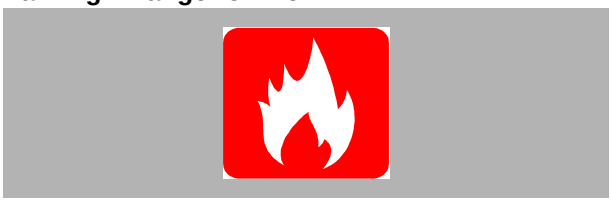
This warning symbol draws attention to special warnings, instructions or procedures which, if not strictly observed, may result in damage or destruction of equipment

Attention!: Important Advice



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!: Danger of fire



Do not smoke in that area / do not smoke during the describes works

Prohibitation!: No Smoking

Fires and open light are ignition sources, which must be avoided.

Prohibitation: Fire and open flames prohibited

Do not turn on or start operation. People are working at the generator and/or electrical system

Prohibitation: Turn on / start operation prohibited

Berühren der entsprechenden Teile und Anlagen verboten

Proscription!: Do not touch

Generator can be started by an external signal

Warning!: Automatic start.

These symbols refer to electrical danger and points to special warnings, instructions and advices, which must be noticed. Otherwise an electrical shock with personal injury or death can be the consequence.

Warning!: High voltage / danger by electricity - Danger for life

General Warning

Warning!: Danger for life and/or equipment

Substances can be harmful or lead to death, if accumulated or swallowed

Warning!: Harmful if accumulate

Warning of live parts, which can cause electrical impacts during contact. Special danger for persons with heart problems and/or pace makers.

Warning!: Electric shock

Danger of injury by drawing into the machine. Injury by crushes and eventually the separation of extremities. Danger of drawing during contact with extremities, loose clothes, scarf, ties etc.

Warning!: Rotating parts

Warning of materials, which can lead to explosions under certain conditions - e.g. heat or ignition sources

Warning!: Risk of explosion

Surfaces and substances may be hot. Danger of burn / scalding

Warning!: Hot surface

Warning of materials, which cause corrosive damage during contact. These materials can work contaminating when entering into the body.

Warning!: Danger carrosive material - contermination of persons possible

When opening the system the pressure can suddenly escape and drag along liquids. Danger of injury by parts flying around, danger of burn by liquids and gases.

Warning!: System can be under pressure!

Warning!: Hearing damage

Warning!: Magnetic field

Warning!: High pressure

Protective clothing is close fitting, with low resistance to tearing, with narrow sleeves and without protruding parts. It mainly provides protection against being entangled by moving machine parts.

Instruction!: Wear personal protective equipment (PPE)

Wear ear defenders to protect the ears against hearing damage.

Instruction!: Wear personal protective equipment (PPE)

Wear safety glasses to protect the eyes against parts flying around or squirts of fluids. Optical eyeglasses are not replacement for appropriate eye protectors.

Instruction!: Wear personal protective equipment (PPE)

Wearing protective gloves protects the hands against friction, graze, punctures or deep cuts as well as contact with hot surfaces.

Instruction!: Wear personal protective equipment (PPE)

Read and consider the regulations, safety instructions and installation guidelines of manual, in order to avoid dangers and accidents. You protect yourself and the generator.

Instruction!: Read the manual instructions

Environmental protection is the protection of our habitat. For you and your children

Instruction!: Environmental protection

1.2 Tools

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

	Spanners SW X = required size X mm
	Hook wrench for oil filter
	Screw driver, for slotted head screws and for recessed head screws
	Multimeter, multimeter with capacitor measuring
	Socket wrench set
	Hexagon wrench keys

	Current clamp (DC for synchron generators; AC for asynchron generators)
	Torque wrench

1.3 Manufacturer declaration in accordance with the machine guideline 98/37/EG

Manufacturer declaration in accordance with the machine guideline 98/37/EG

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

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

1.4 Customer registration and guarantee

Use the advantages of the customer registration:

- Thus you receive to extended product informations, which are sometimes safety-relevant
- you receive, if necessarily free Upgrades

Far advantages:

By your full information Fischer Panda technicians can give you fast assistance, since 90% of the disturbances result from errors in the periphery.

Problems due to errors in the installation can be recognized in the apron.

1.4.1 Technical Support

Technical Support per Internet: info@fischerpanda.de

1.4.2 Attention, important directions regarding operation!

1. The installation certificate must be completed when taken into use, and certified by a signature.
2. The installation certificate must be despatched within two weeks of use to Fischer Panda.
3. The official guaranty confirmation will be completed by Fischer Panda after receipt and sent to the customer.
4. A guaranty must be shown to make any claims.

Claims against the guaranty will not be accepted of the above said instructions are not, or only partially, carried out.

1.5 Safety instructions - Safety first!

1.5.1 Safe operation

Careful operation is your best assurance against an accident. Read and understand this manual carefully before operating the engine. All operators, no matter how much experience they may have, should read this and other related manuals befor operating the generator or any equipment attached to it. It is the owner´s obnligation to provide all operators with this information and instruct them on safe operation.

1.5.2 Observe safety instructions

Read and understand carefully this manual and „Labels at the engine“ before attempting to start and operate the generator. Learn how to operate and work safely. Know how your equipment and its limitations. Always keep the generator in good condition.

1.5.3 Wear personal protective equipment (PPE)

Do not wear loose, torn or bulky clothing around the maschine that may catch on working controls and prejections or into fans, pulleys ond other moving parts causing personal injury.

Use additional safety items-PPE, e.g. safety protection, safety googles, gloves , etc.

Do not operate the generator or any equipment attached to it while under the influence of alcohol, medication, or other drugs, or while fatigued.

Do not wear radio or music headphones while operating the generator.

1.5.4 Cleanness protect

Keep the engine and the surrounding clean.

Ensure that the generator is stopped before cleaning. Keep the generator clean and free of accumulated dirt, grease and trash to avoid fire. Store flammable liquids in proper containers and cabinets away from sparks and heat. Check for leak immidiately and repair if necessary.

1.5.5 Safe handling of fuel and lubricants - Keep away from fire

Keep away open fire from fuels and lubricants.

Always stop the generator before refueling and/or lubrivating and protect against unintentional starting.

Do not smoke or allow flames or sparks in your work area. Fuel is extremely flammable and explosive under certain conditions.

Refuel at a well ventilated and open place. When fuel and/or lubrication are spilled, refuel after letting the generator cool down.

Do not mix gasoline or alkohol with diesel fuel. The mixture can couse a fire or severe generator damage.

Do not use unapproved containers e.g. buckets, bottles, jars. Use approved fuel starrage containers and dispensers.

1.5.6 Exhaust gases and fire prevention

Generator exhaust fumes can be very harmful af allowed to accumulated. Be sure to run the engine in a well ventilated location and where there are no people or livestock near the engine.

Check the Generator and all pipes and hoses regularly of leaks and repair immediately if necessary.

The exhaust gas and the engine can be very hot during operation and afterwards. To prevent a fire, do not expose dry gras, moved gras, or any other combustible material to exhaust gas or the hot generator surface.

To prevent a fire, do not short electrical cables. Check regularly all electrical cables and wires. Uncoated wires and loose connections can cause electrical shock, electrical short circuit and fire.

The generator should be integrated in the local fire protecting system.

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 of diesel engines and some components are carcinogen and can cause deformations and other gene effects.

1.5.7 Cautions against burns and battery explosion

To avoid burns, be cautious of hot components, e.g. muffler, muffler cover, radiator, hoses, engine body, coolants, engine oil, ect. during operation and after the engine has been shut down.

The Coolant system can be under pressure, Open the coolant system only, when the generator is colled down. Wear „Personal Protective Equipment„.

Be shure that the coolant system is closed and all hose clamps are tightend before operating the generator.

The battery (Starter battery and AGT battery bank) presents an explosive hazard. When the battery is being charged, hydrogen and oxigen gasses are extremly explosive.

Do not use or charge a battery if its fluid level is below the lower mark. Otherwise, the component parts may deteriorate earlier than expected, which may shorten the the service life or cause an explosion. Immediatly, add distilled water until the fluid level is between the lower and the upper marks.

Keep sparks and open flames away from the battery, especially during charging. Do not strike a match near the battery.

Do not check the battery charge by placing a metal object across the terminals (danger of short circuit, battery damage and high danger of explosion). Use a Voltmeter or a hydrometer.

Do not charge a frozen battery. There is a riosk of explosion. When frozen, warm the battery up to at least 16℃.(61℉).

1.5.8 Keep hands away from rotating parts

Operate the generator with closed sound cover capsul only.

Be shure to stop the generator befor checking or adjusting the belt tension.

Keep your hands and body away from rotating parts, such as the cooing fan, V-Belt, fan drive belt, ra´w water pump drive belt, pulley or Flywheel.

Do not operate the generator without safety guards. Install safety guards securly before operation.

1.5.9 Anti-Freeze and disposal of fluids

Anti-freeze contains poison. Wear rubber gloves to avoid personal injury. In case of contact with skin, whash it off immideately. Do not mix different types of Anti-freeze. The mixture can produce chemical reactioncausing harmful substances. Use approved or genuine Fischer Panda Anti-freeze.

Protect the environment. When draining fluids from the generator, place a siutable container underneath the generator body. Consider the relevant enviromental protection regulations when disposing of oil, fuel, coolant, breakfluid, filters and batteries. Do not poor waste onto the ground, down a drain, or into any water source. Conducting safety checks and maintenance

1.5.10 Implementation of security and maintenance

Disconnect the battery from the generator before conducting service. Put a „DO NOT OPERATE“ tag on the remote control panel to avoid accidental starting. Disconnect any automatic starter device, e.g. battery monitor to prevent automatic starting.

To avoid sparks from an accidental short circuit always disconnect the battery´s ground cable (-) first and connect it last. be shure that the generator is stopped and cooleed down when conducting daily and periodic maintaenance, service and cleaning.

Always use the apprppirate tools and fixtures. Verify that they are in good conditions before performing any service work. Make shure you understand how to use them before service.

Keep first aid kit and fire extinguisher handy at all times.

1.6 Warning and caution labels

Keep warning and caution labels clean and free from obstructing material.

Clean warning and caution labels with soap and water, dry with a soft cloth.

Replace damaged or missing warning and caution labels with new labels.

1.6.1 Safety instructions concerning operating the generator

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

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

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

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

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

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.

1.6.1.1 Protective grounding and potential equalisation

In the low voltage board for current supply of the consumers therefore a protective conductor is grounded and connected with electrically conductive objects. The connection with an outer conductor with these object then leads to the earth fault. This earth fault leads to the release of an over-current protection mechanism and thus to the disconnection of the voltage.

1.6.1.2 Ground wire

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

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

There is full current in the AC control box when the generator is running. It must therefore be ensured that the control box is closed and cannot be touched when the generator is running.

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

1.6.1.3 Switch off all load when working on the generator

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

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

A) The working capacitors

B) The (Booster) capacitors

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

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

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

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

Potential equalisation at Panda AGT DC generators.

Further information for your generator see capture installation.

1.6.1.4 Safety instructions concerning the cables

Cable Type

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

Cable Size

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

Cable Installation

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

1.6.2 Recommended starter battery size

Only use batteries which are certified as starter battery by the manufacturer.

Only use batteries with capacity recommended by the engine manufacturer.

Attention !! Check before installation if the starter battery voltage correspond with the generator start system.

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

f.e. 24V starter battery for 24V start system

1.6.3 Important Advice for Batteries - Starting batteries and Traction batteries

ATTENTION!!! Initial operation:

Installation of battery lines.

Consider the regulations and installation instructions of the battery manufacturer.

Consider ABYC regulation E11 AC and DC electrical systems on boats and/or EN ISO 10133:2000 small watercrafts, electrical systems, low voltage (DC) systems !

Ensure a professional battery installation.

The battery separation can be made mechanically or by an appropriate power relay.

Consider the appropriate notes of the battery manufacturer concerning fire and explosion prevention.

Install a right sized fuse in the positive battery line as close as possible to the battery, but max. 12 inch, 300mm from the battery.

The length of the cable to the fuse, the cable must be protected by a sheath or conduit against damage of the insu-

lation.

Use only cable with self retardant and self extinguishing insulation suitable for high temperatures up to 195℉, 90℃.

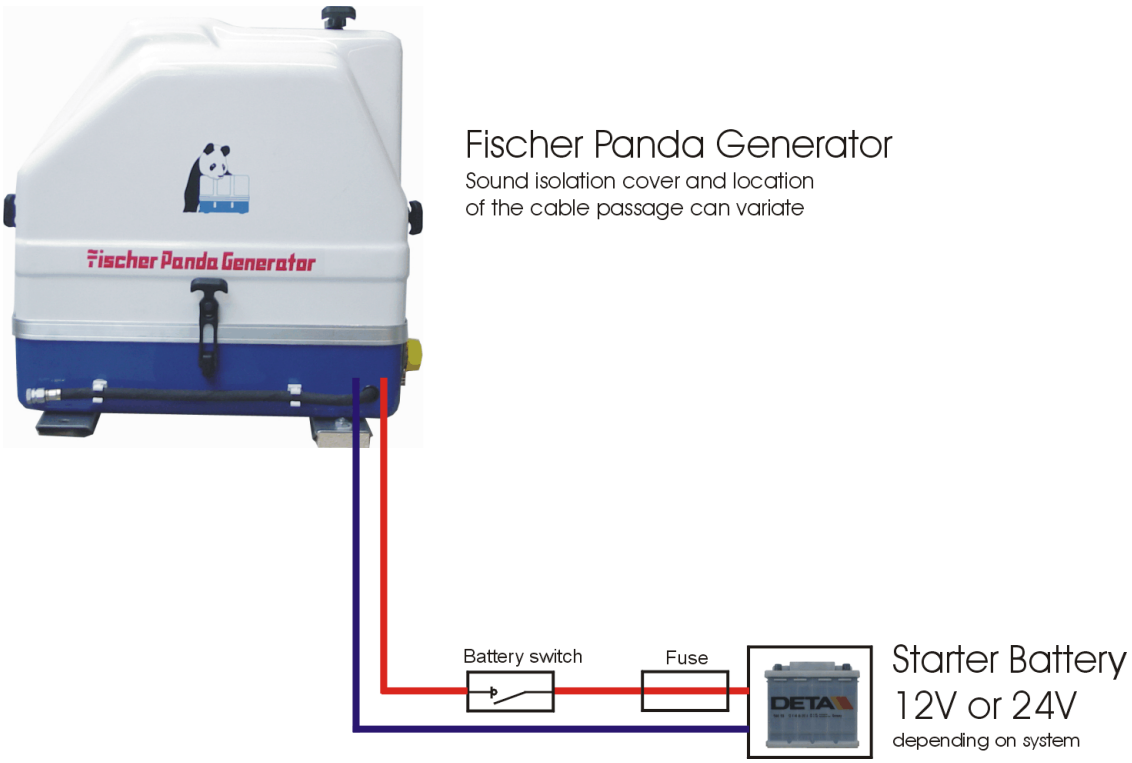
Install battery lines in a safe way that the cable insulation will not be shaved or damaged.

Battery poles must be protected against short circuits by error.

Inside the capsule of the Fischer Panda Generator the battery positive line must be protected against heat and vibration by a suitable conduit or sheath and must be routed that way it is not touching any area that will get hot under normal operation like entire engine itself, exhaust elbow and exhaust manifold or exhaust lines or the V-belt and pulleys. The cable shall not be to tight otherwise damage will happen.

Run the generator carefully after installation and double check, if there is any possibility for damage of the battery cable. Correct if necessary.

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



1.6.4 Safety Instructions for the Handling with Batteries

These instructions must be noticed additionally to the instructions of the battery manufacturer:

- If the batteries are working, someone should be in your near area to help you in a case of emergency.
- Water and soap must be hold ready if battery acid corrode your skin.
- Wear eye protection and protective clothing. During working with the batteries don´t touch the eyes.

- If you got a acid splash on your skin or clothing grow it with much water and soap out.
- If you got acid in your eyes rinse them immediately with clear water until no cauterization is noticeable. Visit immediate a doctor.

- Never smoke in the near of the batteries. Avoid naked flames or open fires. In the area of batteries exists danger of explosions.

- Pay attention that no tools fall on the battery poles, if necessary cover them.
- During the installation don´t wear a wrist watch or arm jewels, you can create under these circumstances a battery short-circuit. Burning of the skin could be the result.
- Protect every battery contact against unintentional touch.
- For battery banks: Use only cyclical profoundly dischargeable batteries. Starter batteries are not appropriate. Lead-gel batteries are commended. They are maintenance-free, profoundly dischargeable and not produce gas.

- Do not charge a frozen battery.
- Avoid a batterie short-curcuit.
- Take care of a good ventilation of the battery to drain off developing gas.
- The battery connection terminals must be checked of a tight contact at least before operating.
- The battery connection cable must be carefully mounted and checked about incorrect heating at operation with load. The vibrating devices must be regulary checked about scour points and flaw in the isolation.

Attention !! For battery charge generators (Fischer Panda AGT-DC)!

Check before installation if the battery bank voltage correspond with the generator output voltage

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

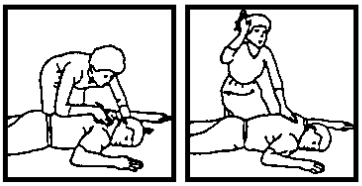
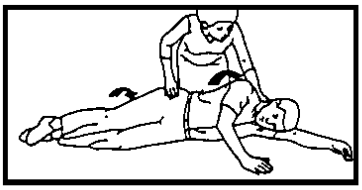
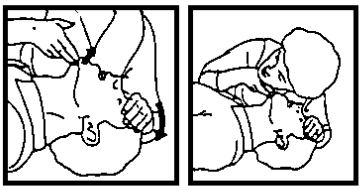
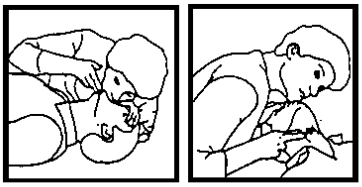


	First Aid in case of accidends by electrical shocks 5 Safety steps to follow if someone is the victim of electrical shock	
1	Do not touch the injured person while the generator is running.	
2	Switch off the generator immediately.	
3	if you cannot switch off the generator, pull, push, or lift the person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

2.7 WHEN AN ADULT STOPS BREATHING

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

Warning:

1 Does the Person Respond?		**2** Shout, "Help!"
Tap or gently shake victim. Shout, "Are you OK?"		Call people who can phone for help.
3 Roll Person onto Back.		
Roll victim toward you by pulling slowly.		
4 Open Airway.		**5** Check for Breathing.
Tilt head back, and lift chin. Shout, "Are you OK?"		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.		**8** Phone EMS for Help.
Feel for pulse for 5 to 10 seconds.		Send someone to call an ambulance.
9 Begin Rescue Breathing.		**10** Recheck Pulse Every Minute.
Keep head tilted back. Lift chin. Pinch nose shut. Give 1 full breath every 5 seconds. Look, listen, and feel for breathing between breaths.		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 maschine

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

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

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

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

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

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

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

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

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

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

3.1.1.1 Trained persons

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

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

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

3.1.2 Operator

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

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

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

3.1.2.1 User

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

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

3.2 Panda Transport Box

3.2.1 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

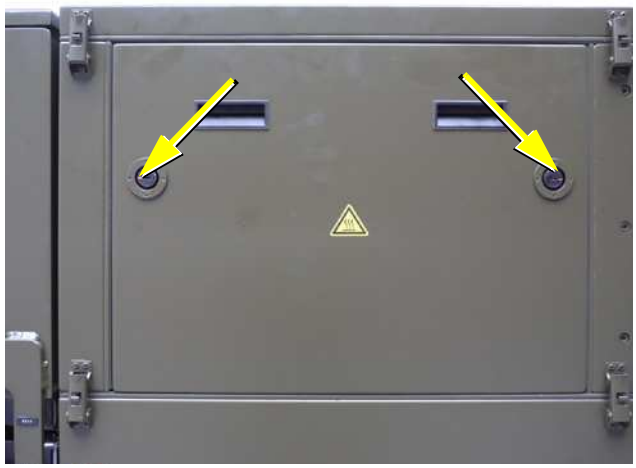
3.2.2 Fischer Panda Transport Box with metal tab closure

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

3.2.3 Opening the MPL sound insulation capsule .

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

Fig. 3.2-1: Sound insulation capsule, side part



Closure locked

Fig. 3.2.3-2: Closure locked

Closure open

Fig. 3.2-3: Closure open

3.2.4 Opening the GFK sound insulation capsule

GFK sound insulation capsule with lash closures

Fig. 3.2-1: Lash closures

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

Fig. 3.2-2: Lash closures

3.3 Transport and Loading/Unloading

3.3.1 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.

3.3.2 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. 3.3-1: Lifting yoke (example)

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

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)

3.4.1 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:

- 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℃. 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:

3.4.2 Measures for short downtimes

Short downtime (1 to 3 months)

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

3.4.3 Measures for medium term downtimes / hibernation

Medium term downtimes (3 to 6 months)

3.4.3.1 Surface protection measures:

- 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. Refill 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).

Let engine warm up for 10 min.

- 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!**

3.4.3.2 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.

3.4.4 Measures for extended downtimes / decommissioning

Downtimes (more than 6 months)

3.4.4.1 Surface protection measures:

- 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. Refill 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).

Let engine warm up for 10 min.

- 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. 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!

3.4.4.2 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:

3.5 Components

1. Panda i-Generator Permanent-Magnet-Generator

Fig. 3.5-1: Panda 5000i generator

2. Panel Panda iControl with electronic board at the generator.

Fig. 3.5-2: iControl

3. Panda PMGi Inverter AC/AC

Fig. 3.5-3: PMGi 5000

3.6 Range of operation

Reliable power supply on sailing boats

3.6.1 Main features of the Panda 5000i

- Extremely high starting capacity, perfect for a Bauer junior 2.2kW compressor!
- 230 V / 50 Hz (120V / 60Hz) system for all your domestic appliances!
- Compact and light, takes up less space!
- Super silent sound insulation capsule!
- Graphical Display, easy to operate!
- Option for reduce speed at lower loads, saves fuel!
- Pure sinus wave, higher frequency and voltage stability!
- Optimized engine rpm (2800 rpm) for a long generator life!

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4. Panda 5000i PMS generator

4.1 Type plate at the generator

Fig. 4.1-1: Type plate

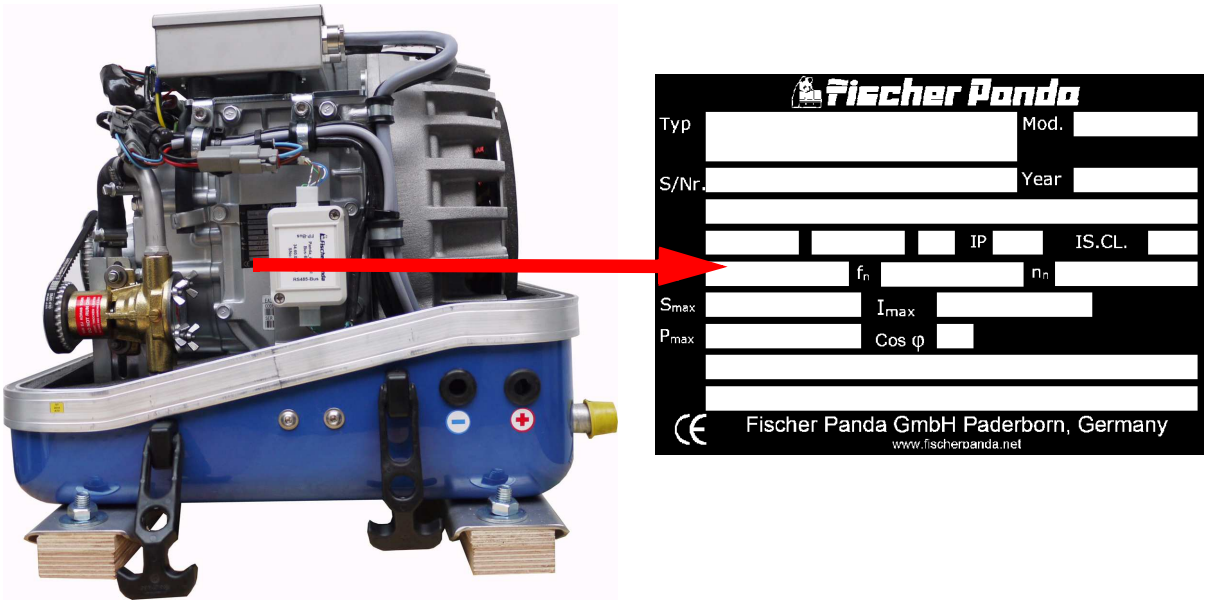
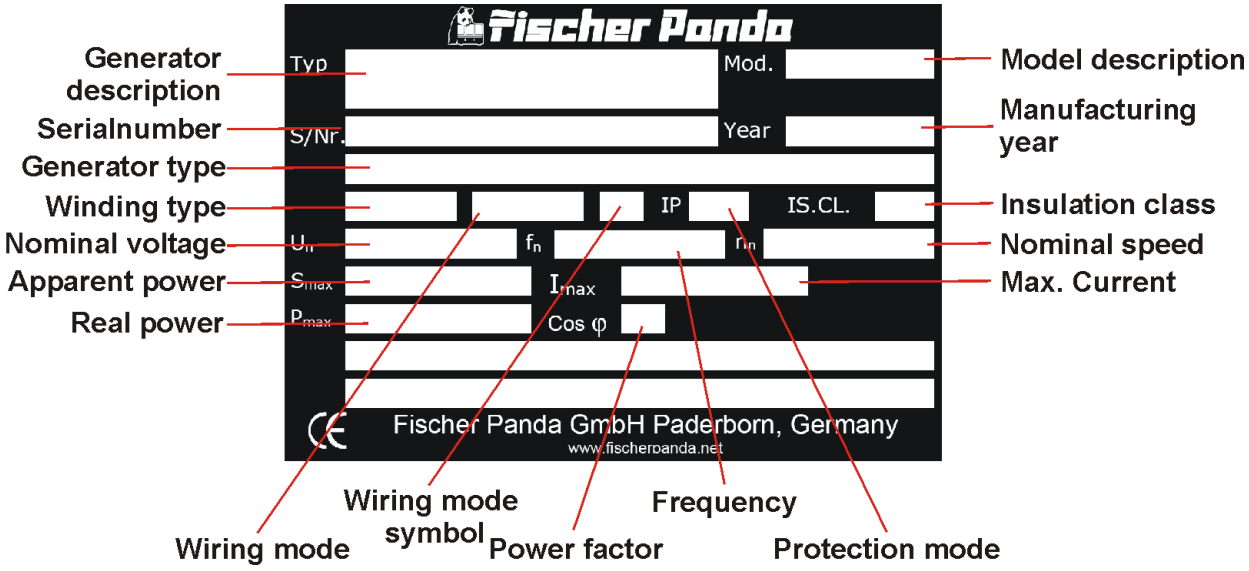


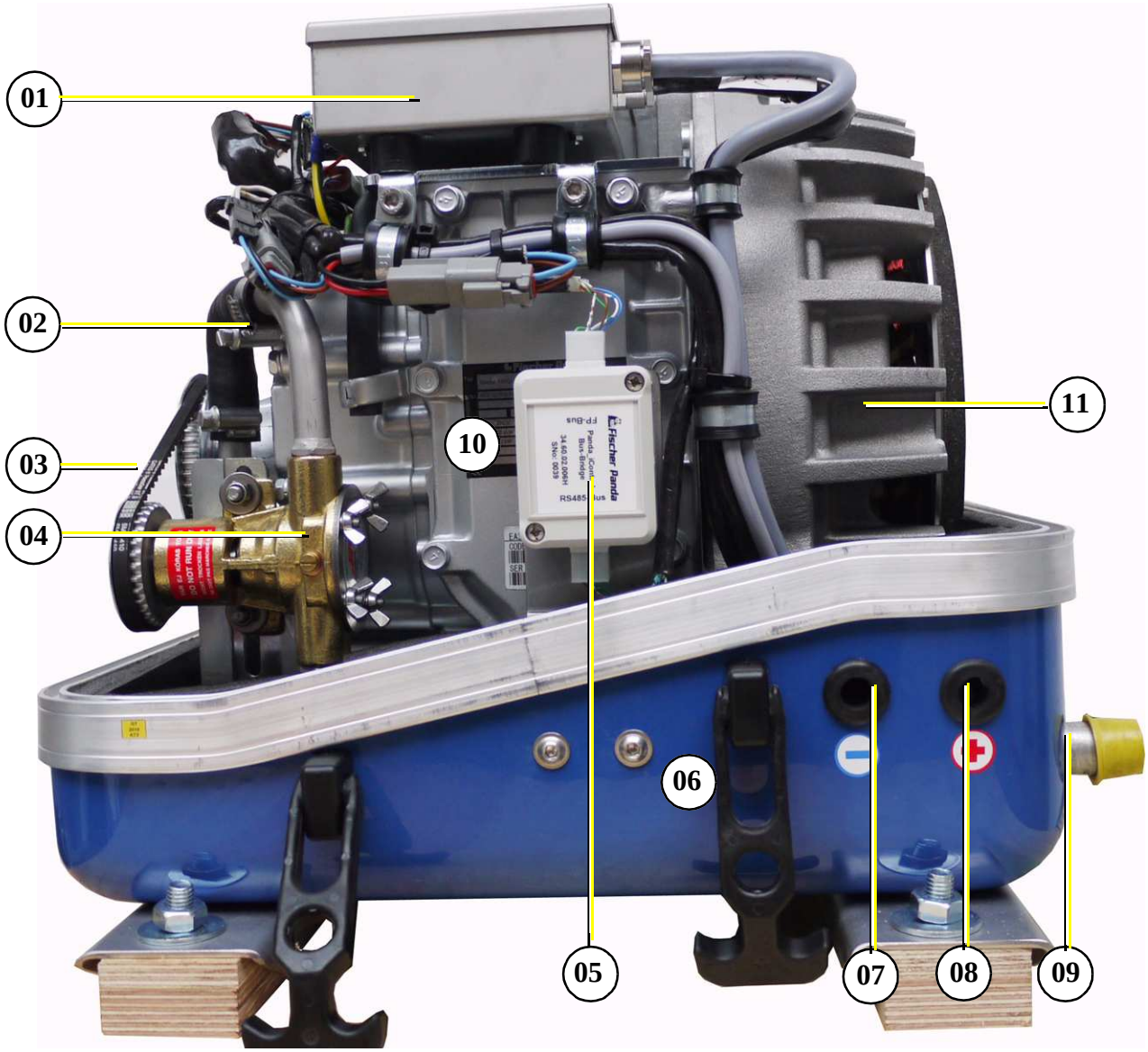
Fig. 4.1-2: Discription type plate



4.2 Description of the Generator

4.2.1 Right Side View

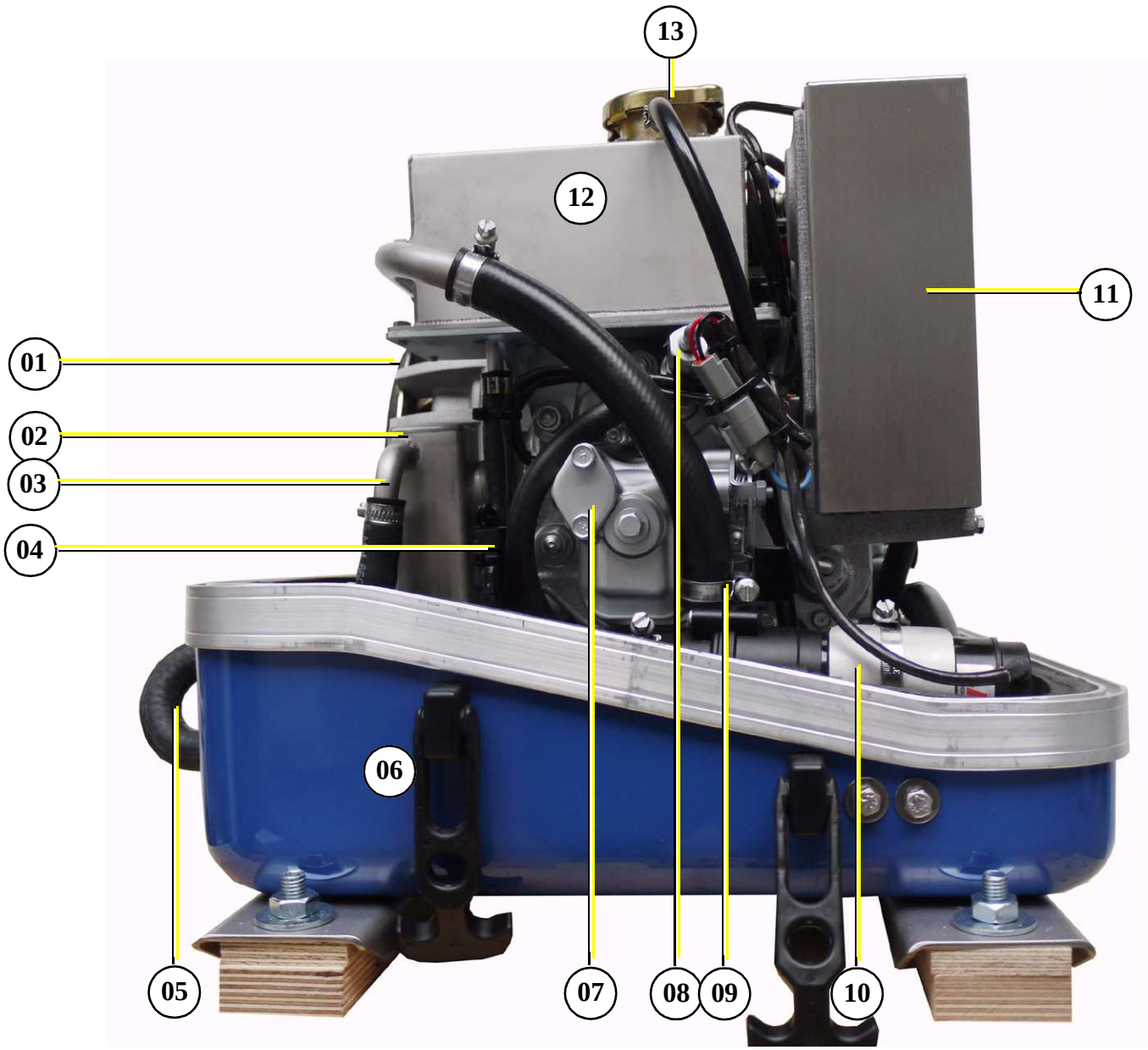
Fig. 4.2.1-1: Right side view



01) Housing with iControl electronic board (DO NOT OPEN)
02) Coolant pipe, raw water pump - heat exchanger
03) Toothed belt
04) Raw water pump
05) Bus adapter RS485 to FP bus - optional
06) Sound cover base part
07) Passage for battery cable (+)
08) Passage for batterie cable (-)
09) Raw water inlet
10) Engine Kubota EA300
11) Generator housing with coil

4.2.2 Left Side View

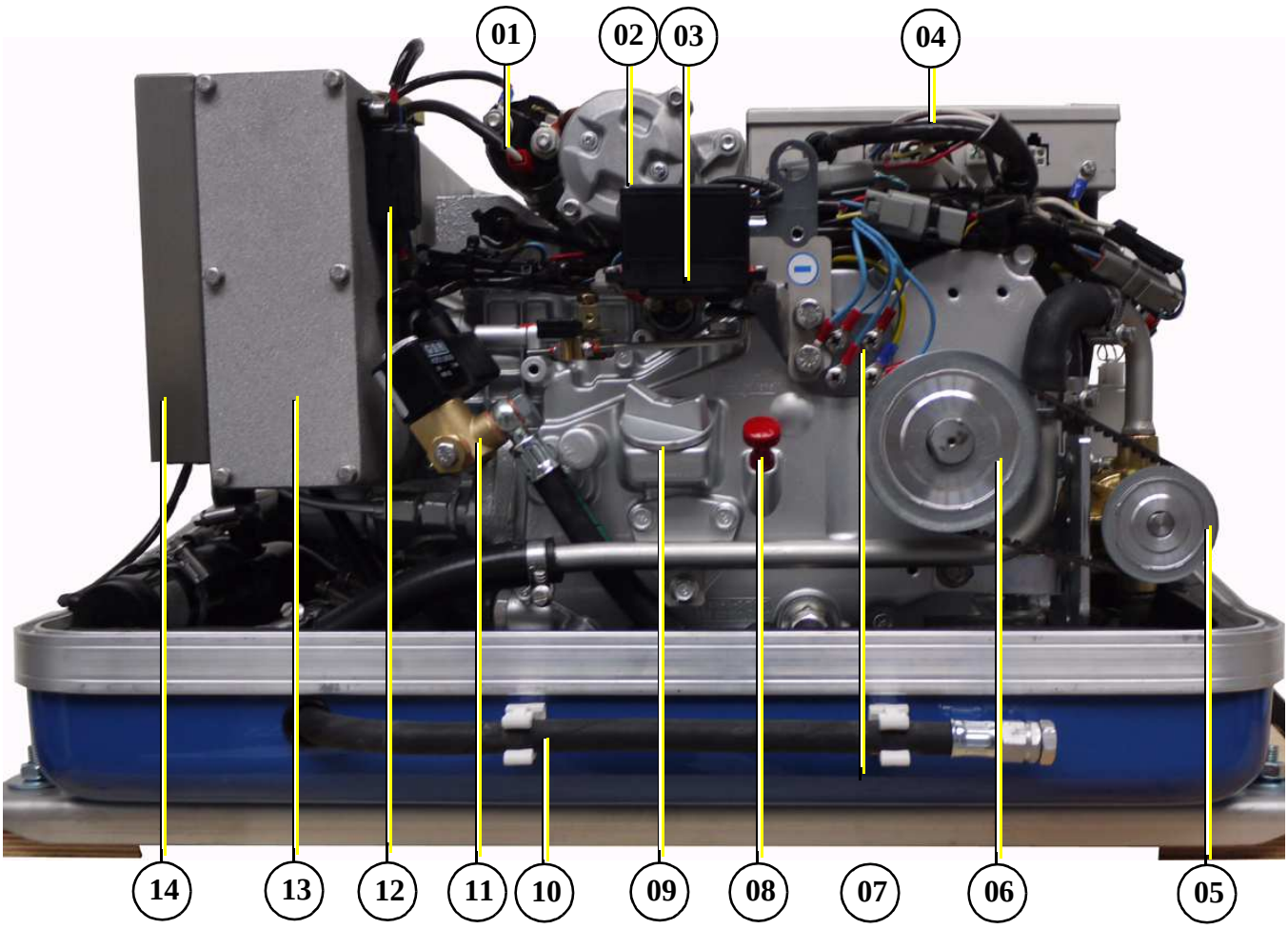
Fig. 4.2.2-1: Left side view



01) Generator housing with coil
02) Water-cooled exhaust elbow
03) Raw water injection pipe
04) Coolant pipe, water tank - heat exchanger
05) Connection external ventilation valve
06) Sound cover base part
07) Engine Kubota EA300
08) Injection nozzle
09) Coolant pipe, water pump - engine
10) Coolant water pump
11) Suction port at air suction housing
12) Cooling water tank
13) Cooling water filler neck

4.2.3 Front View

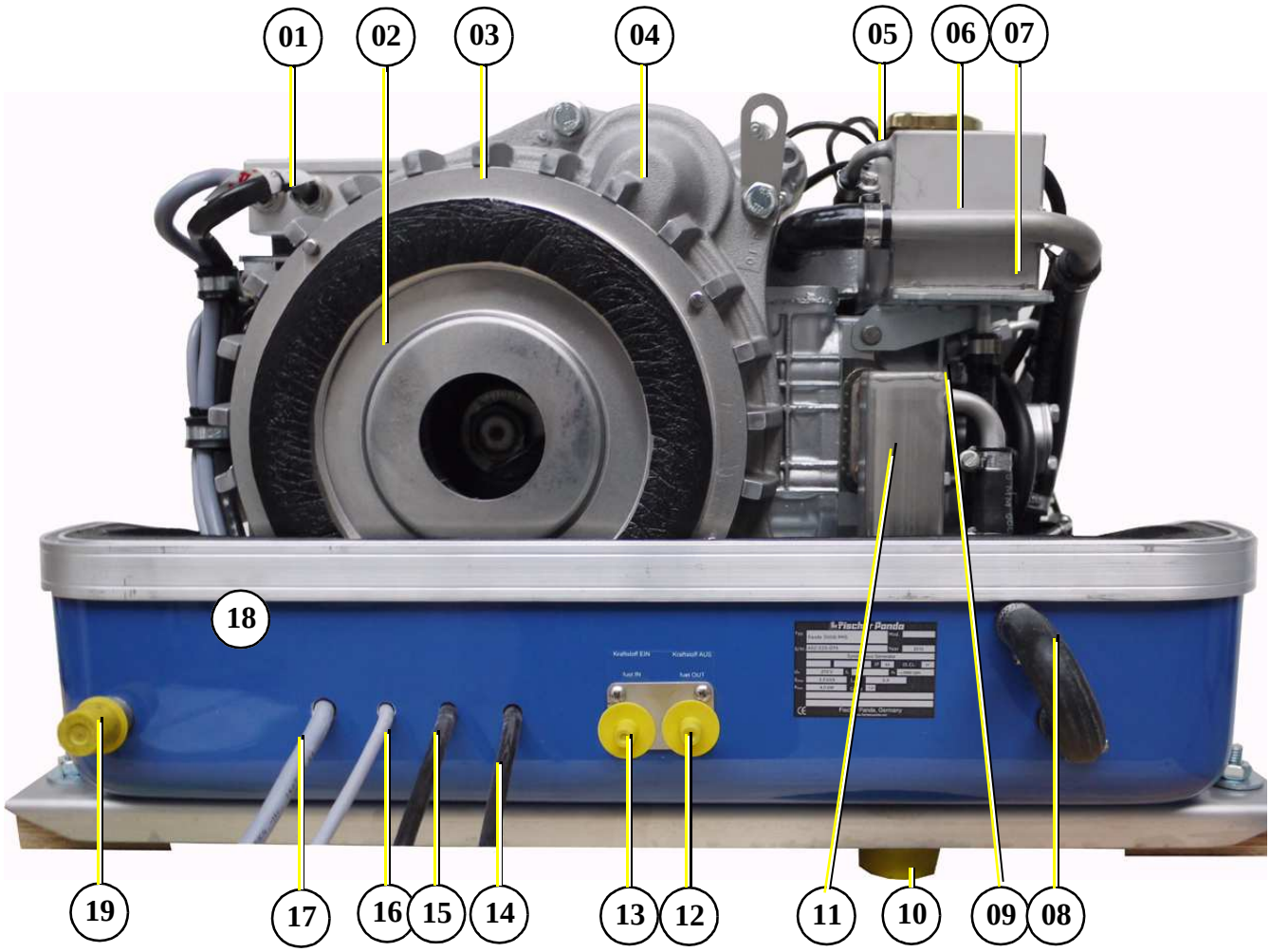
Fig. 4.2.3-1: Front side view



01) Solenoid switch for starter motor
02) Starter motor
03) Actuator
04) Housing with iControl electronic board „DO NOT OPEN“
05) Raw water pump
06) Pulley
07) Ground connection terminal
08) Oil dipstick
09) Engine oil filler neck
10) Oil drain hose
11) Fuel solenoid valve
12) Fuse 30A
13) Air suction housing with air filter inlet
14) Suction port

4.2.4 Back View

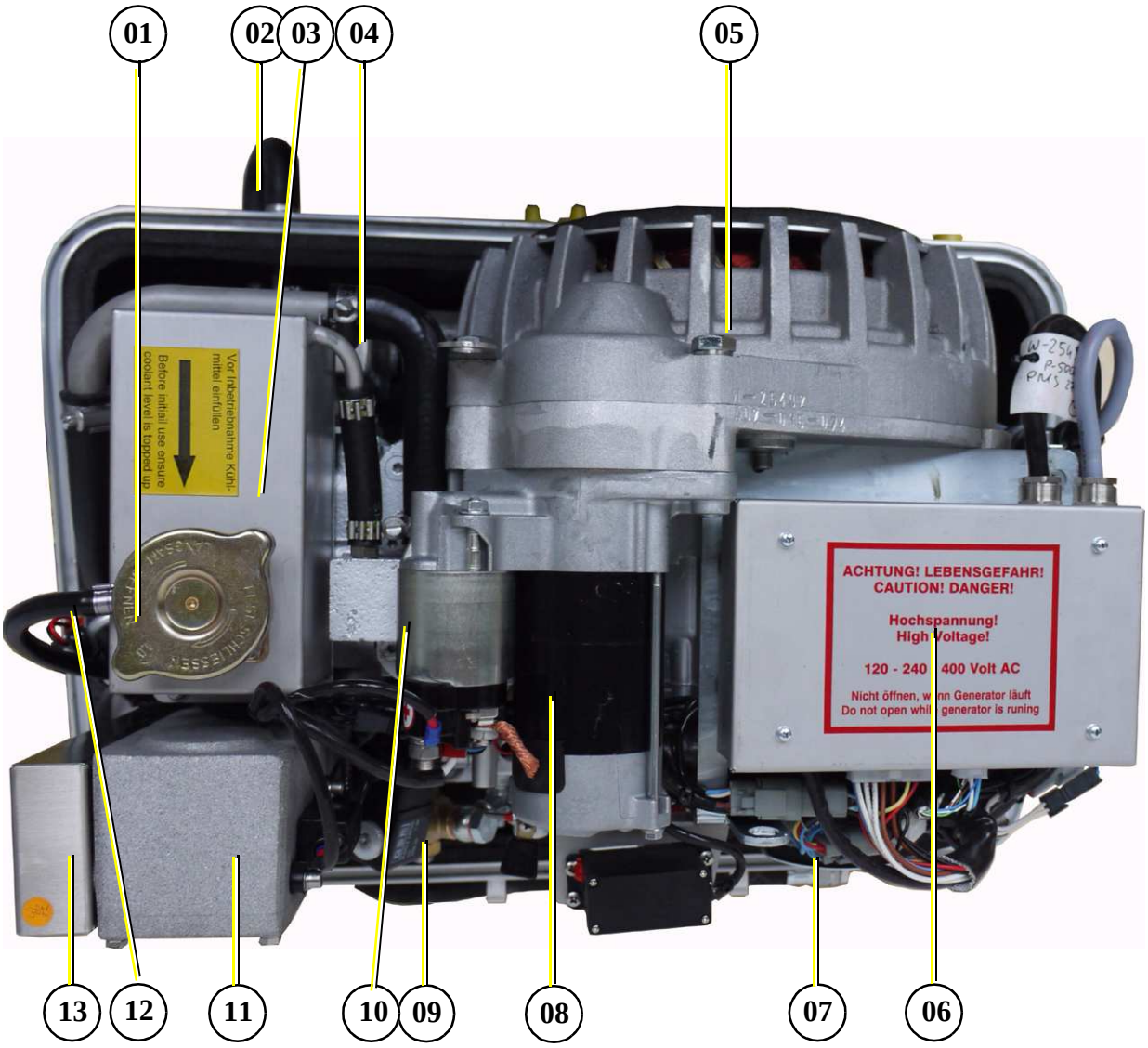
Fig. 4.2.4-1: Back side view



01) Housing with iControl electronic board „DO NOT OPEN“
02) Generator front cover
03) Generator housing with coil
04) Starter motor
05) Cooling water filler neck
06) Cooling water tank
07) Coolant pipe, water pump - engine
08) Connection external ventilation valve
09) Raw water injection nozzle
10) Exhaust outlet (through capsul bottem)
11) Exhaust elbow
12) Connection for fuel OUT
13) Connection for fuel IN
14) FP bus cable to PMGi
15) Cable for fuel pump
16) Cable for iControl
17) Cable for PMGi
18) Sound cover base part
19) Raw water inlet

4.2.5 View from Above

Fig. 4.2.5-1: Top side view



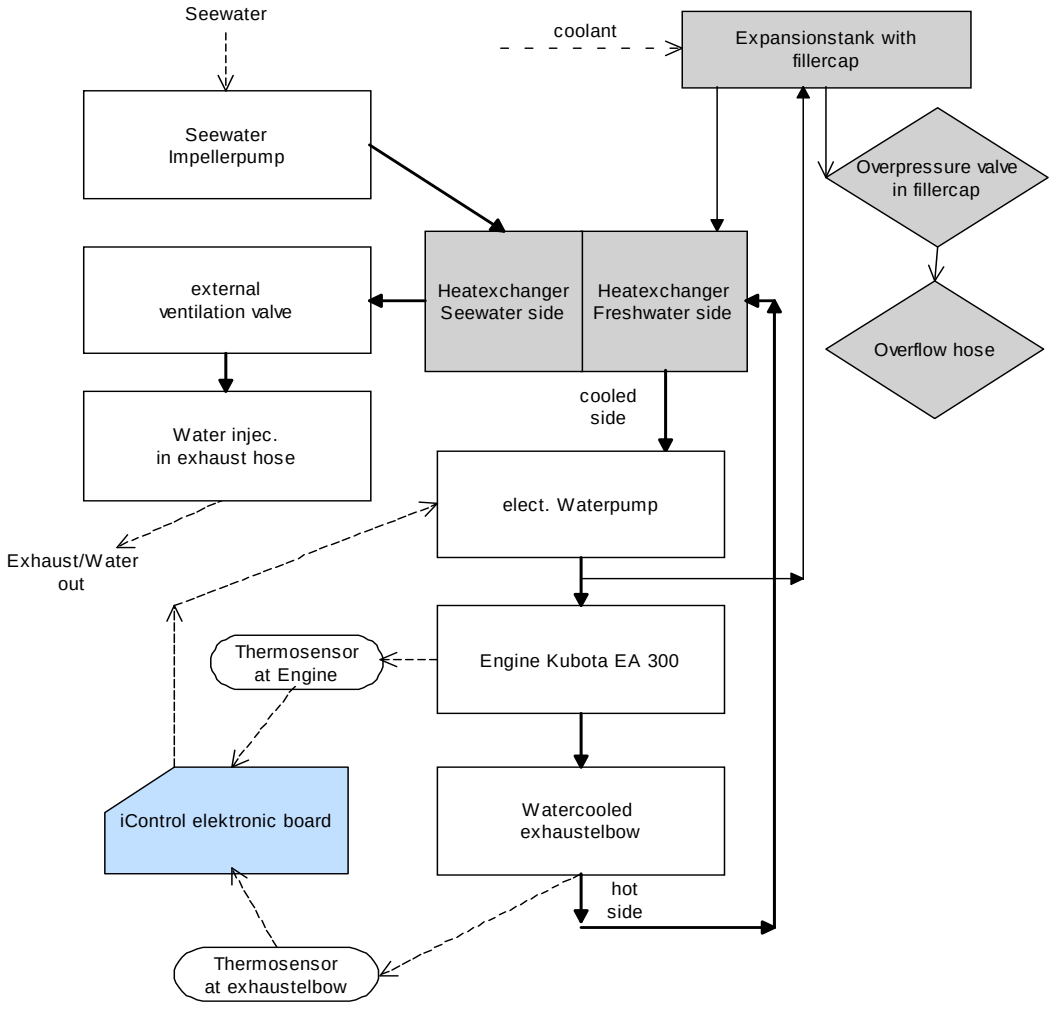
01) Cooling water filler neck
02) Connection external ventilation valve
03) Cooling water tank
04) Exhaust out (through capsul bottem)
05) Generator housing with coil
06) iControl electronic board under cover „DO NOT OPEN“
07) Pulley
08) Starter motor
09) Fuel solenoid valve
10) Solenoid switch for starter motor
11) Air suction housing with air filter inlet
12) Coolant overflow hose
13) Suction port

4.3 Details of function units

4.3.1 Remote control panel - see iControl manual

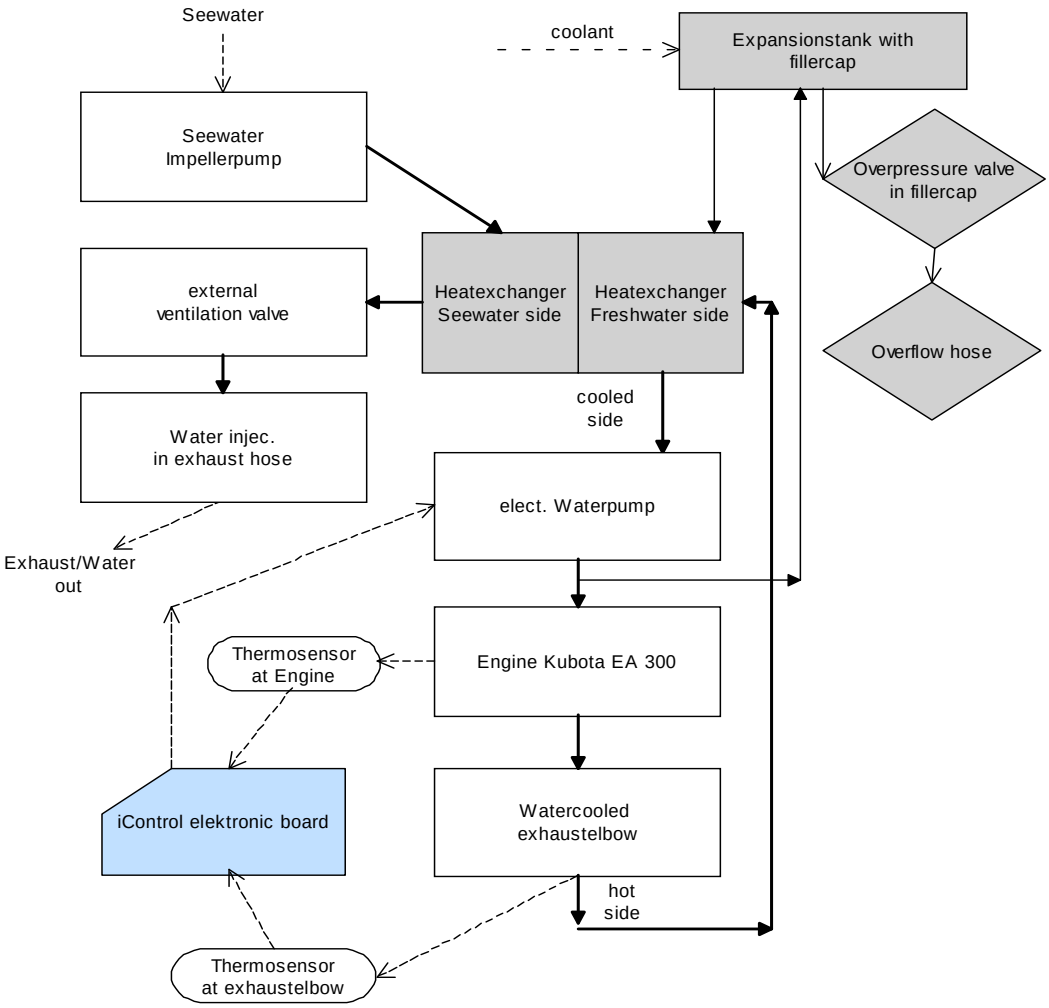
4.3.2 Components of the Cooling System (Raw Water)

Fig. 4.3.2-1: Cooling System (Raw Water)



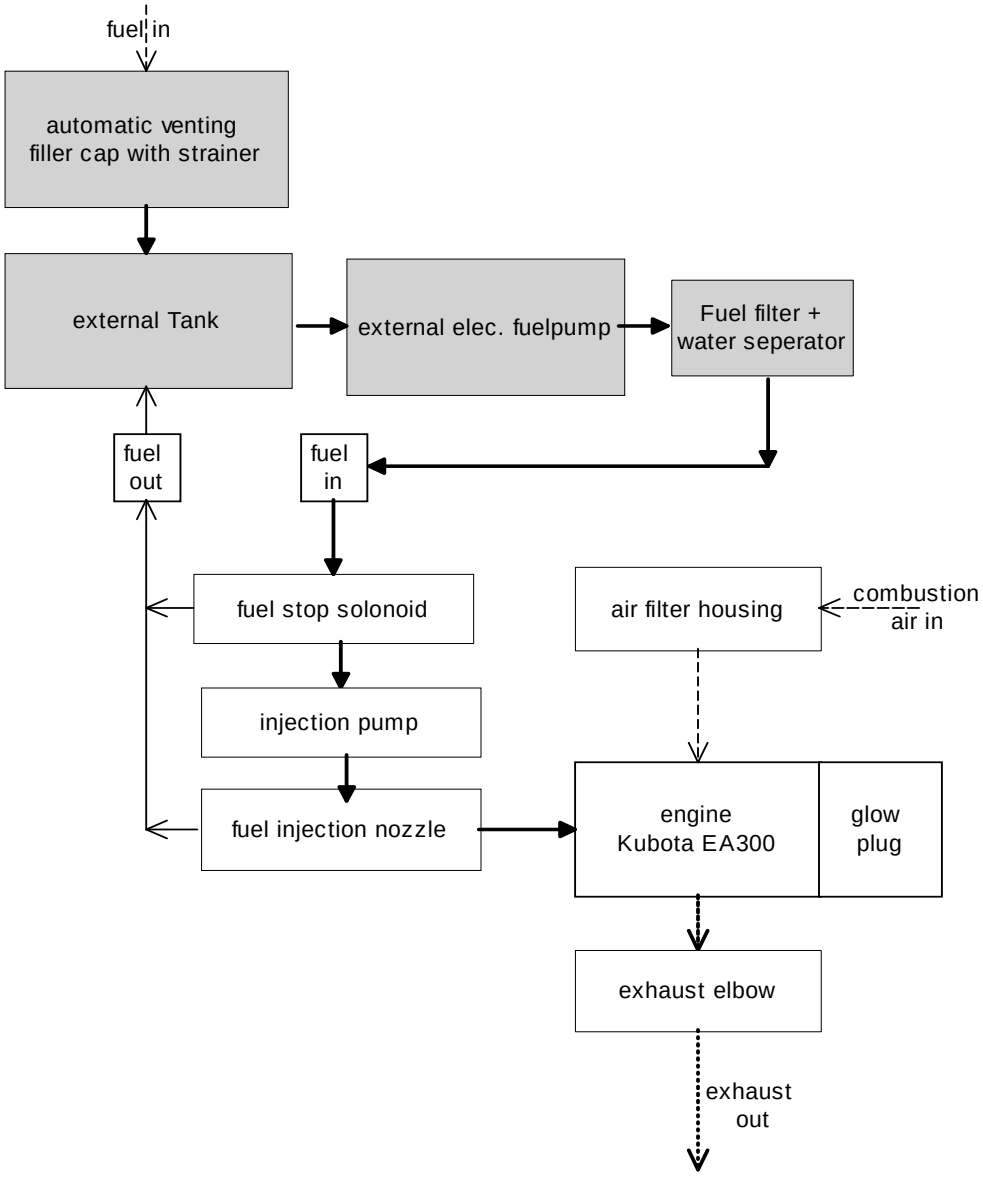
4.3.3 Components of the Cooling System (Fresh Water)

Fig. 4.3.3-1: ***Cooling System (Fresh Water)***



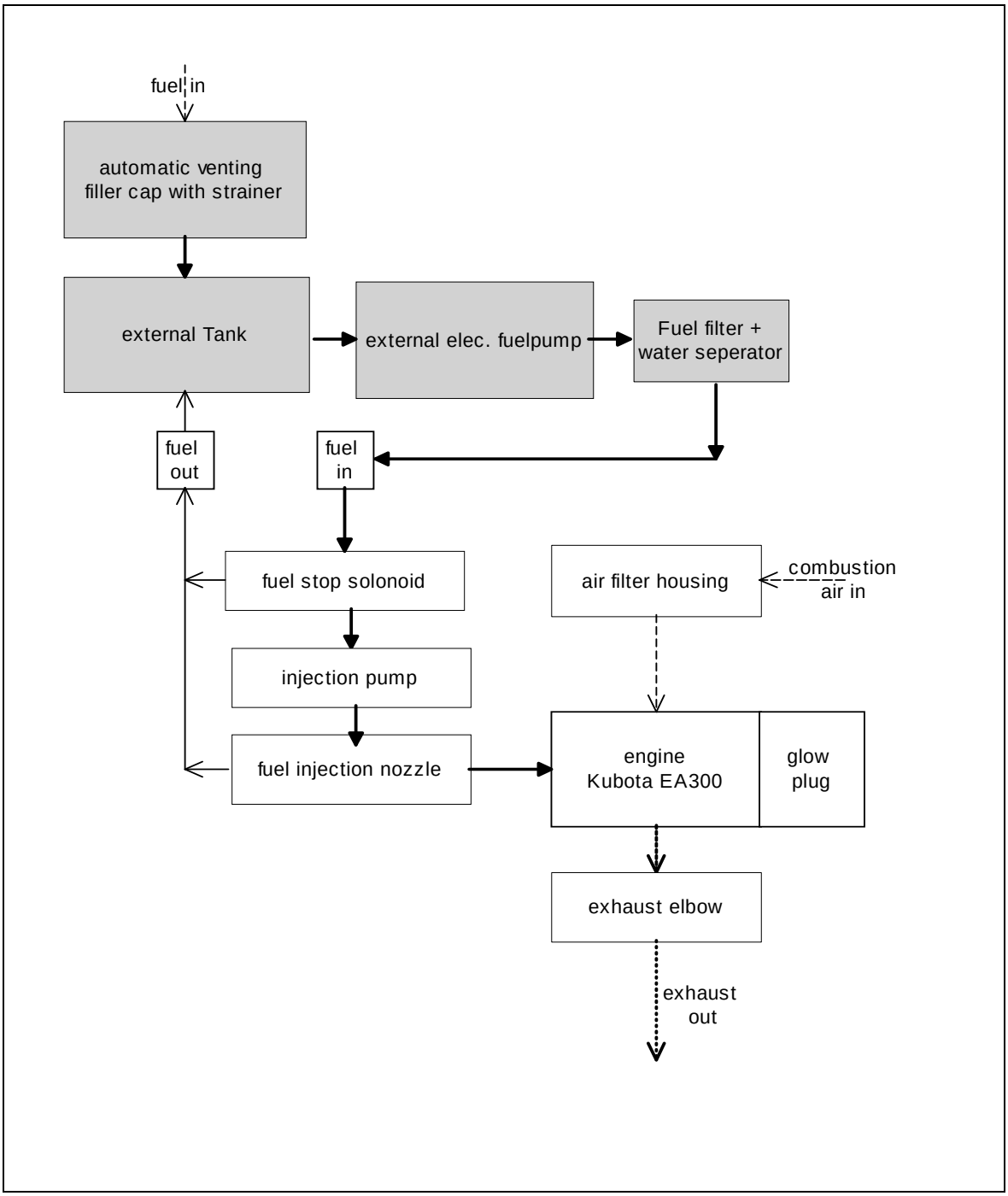
4.3.4 Components of the Fuel System

Fig. 4.3.4-1: Components of the Fuel System



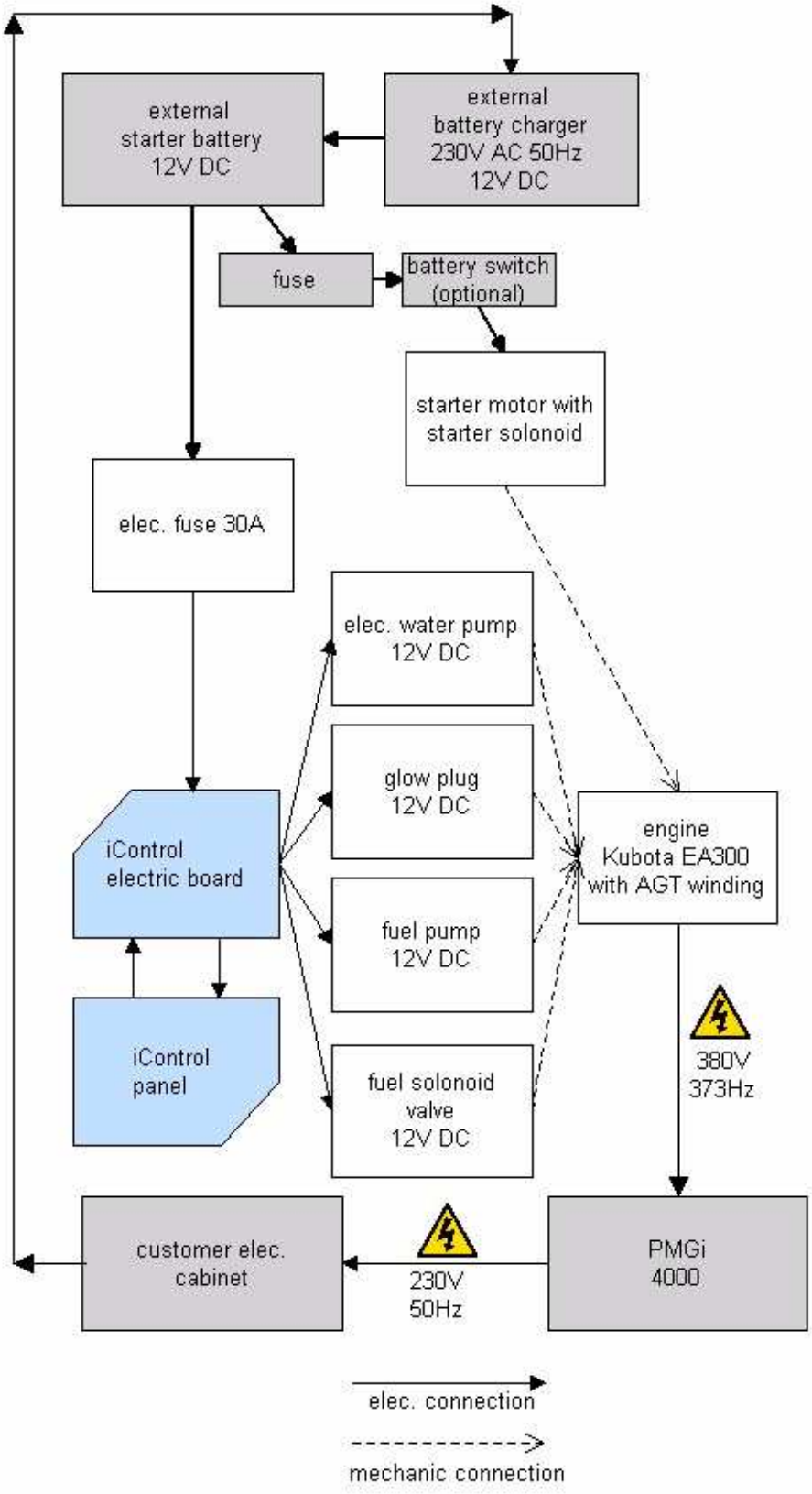
4.3.5 Components of Combustion Air

Fig. 4.3.5-1: Components of Combustion Air



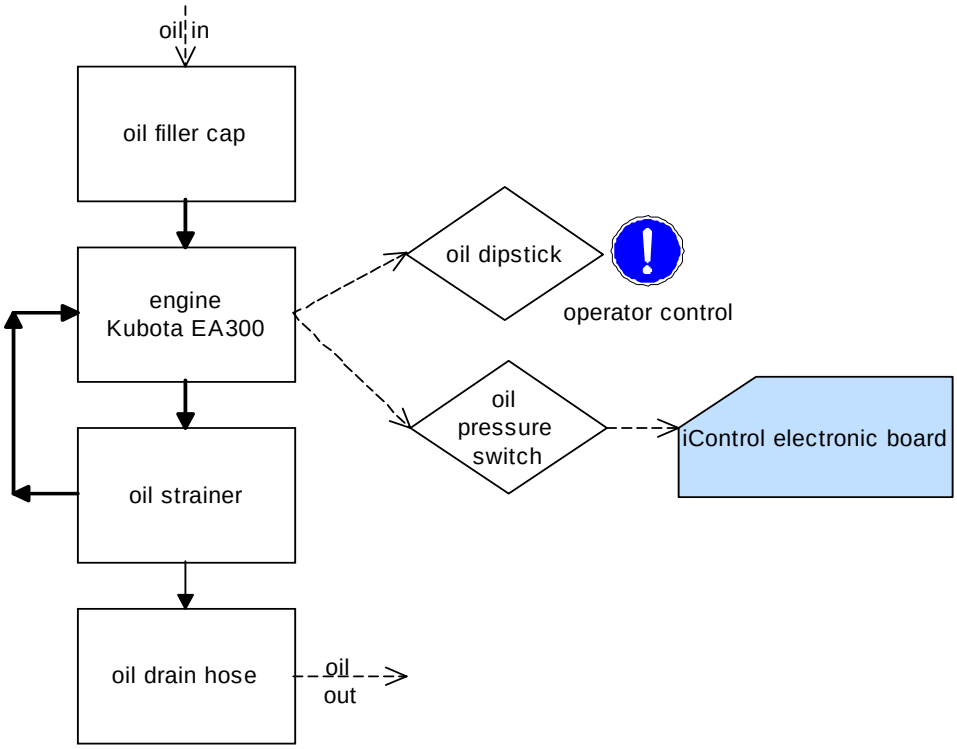
4.3.6 Components of the Electrical System

Fig. 4.3.6-1: Components of the Electrical System



4.3.7 Components of the Oil Circuit

Fig. 4.3.7-1: Components of the Oil Circuit

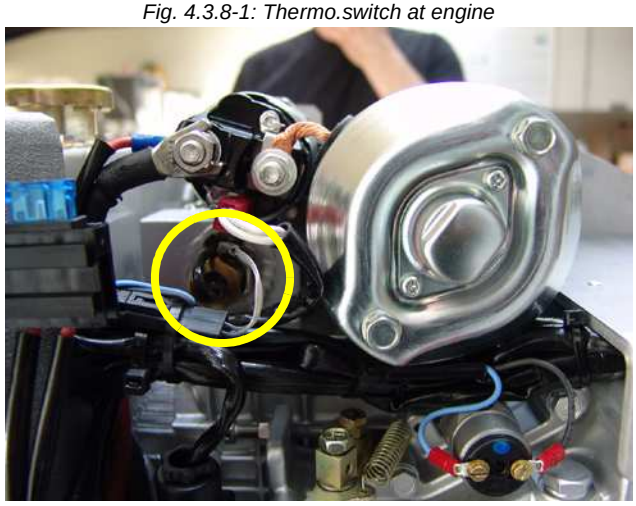


4.3.8 Sensors and switches for operating surveillance

Thermo-switch at engine

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

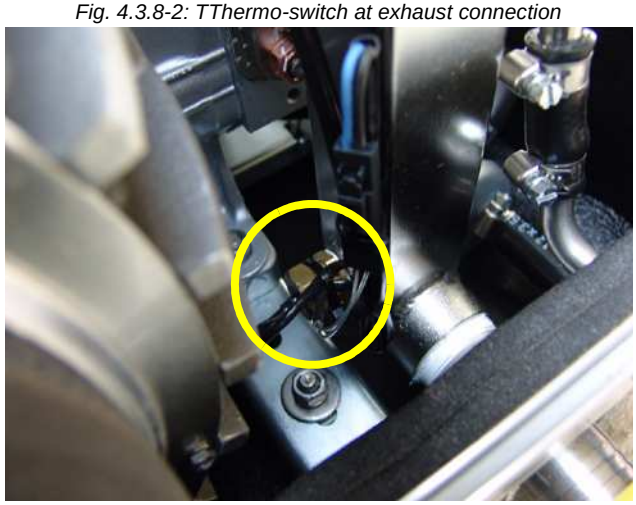
Fig. 4.3.8-1: Thermo.switch at engine



Thermo-switch at exhaust connection

If the impeller pump drops out and deliveres no more seawater, the exhaust connection becomes extremely hot.

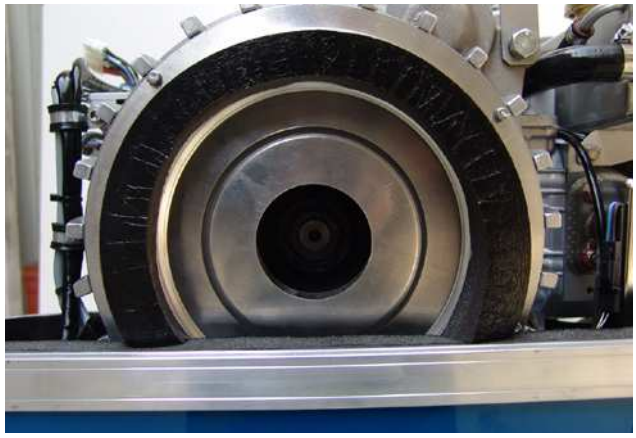
Fig. 4.3.8-2: TThermo-switch at exhaust connection



Thermo-switch coil

One thermo sensor is located in the stator winding

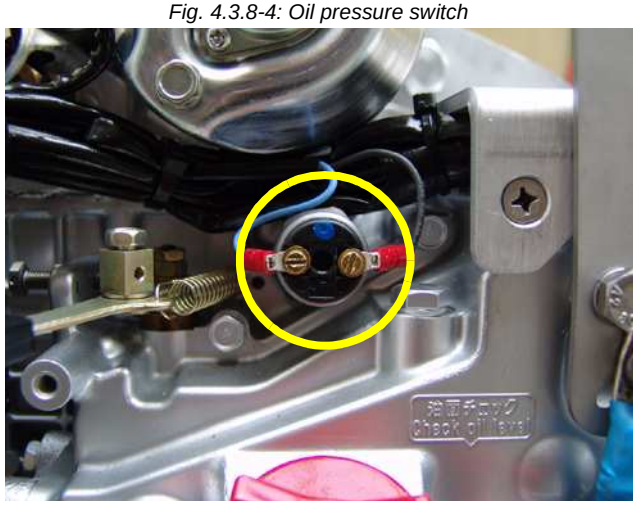
Fig. 4.3.8-3: Thermo-switch coil



Oil pressure switch

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

Fig. 4.3.8-4: Oil pressure switch



4.4 Operation Instructions - see separate control panel manual

4.4.1 Daily routine checks before starting - See iControl manual.

4.4.2 Starting Generator - See iControl manual.

4.4.3 Stopping the Generator - See iControl manual.

5. Installation Instructions

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

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

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

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

5.1 Personal requirements

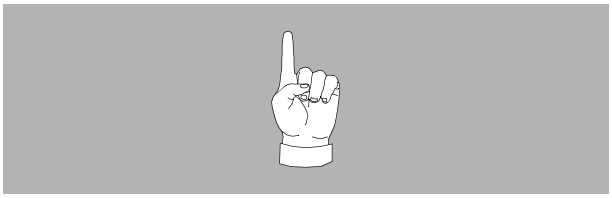
The described instrallation must be done by a technical trained person or a Fischer Panda service point.

5.1.1 Hazard notes for the installation

see “Safety instructions - Safety first!” on Page 18.

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

Notice!:



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

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

Warning!: Risk of injuryr

Improper installation can result in servere 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 avalilable tools and special tools. incorrect or damaged tools can result injuries.

Do not run the generator with removed sound isolation cover-

Warning!: Risk of injuryr

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

- No open flames during work on the generator.

- Do not smoke.

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

-Warning!: Danger of fire

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

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

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

- Do not inhale oil and fuel vapours.

Danger!: Danger of poisoning

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

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

ATTENTION!: Danger to Life - High voltage

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

Warning!: Hot surface/material

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

- Protective clothing

- safety boots

- protective gloves

- Ear defender

- safety glasses

Instructiont!: Personal protective equipment necessary.

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

Attention!: disconnect all load

5.2 Preparing the base - Placement

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

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

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

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

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

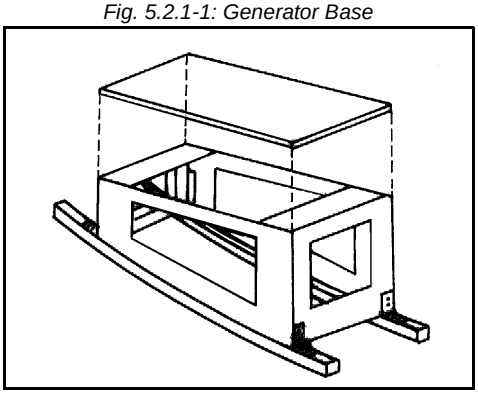
5.2.1 Advice for optimal sound insulation

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

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

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

Fig. 5.2.1-1: Generator Base



5.3 Generator Connections

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

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

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

ATTENTION!

5.4 Cooling System Installation - Raw water

5.4.1 General References

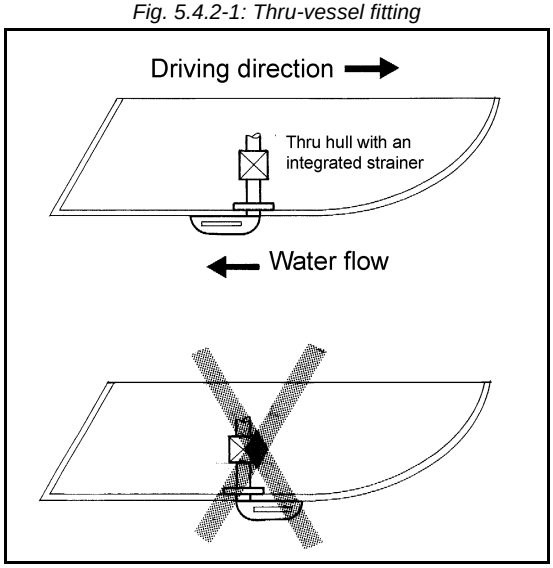
The generator should have its own raw water (coolant water) inlet and should not be connected to any other engine systems. Ensure that the following installation instructions are complied with:

5.4.2 Installation of the thru-vessel fitting in Yachts

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

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

Fig. 5.4.2-1: Thru-vessel fitting



5.4.3 Quality of the raw water sucking in line

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

This applies also to installation components such as thru-hull fitting, sea cock, raw water filter etc. The intake suction line should be kept as short as possible. Install the raw water inlet in close proximity to the genset.

Notice

After start-up the cooling water quantity must be measured (e.g. by catching at the exhaust). The flow rate, as well as the necessary cross section of the cooling water pipe take from Table 8.2-1, “Diameter of conduits,” on page 105.

5.4.4 Installation above waterline

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

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

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

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

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

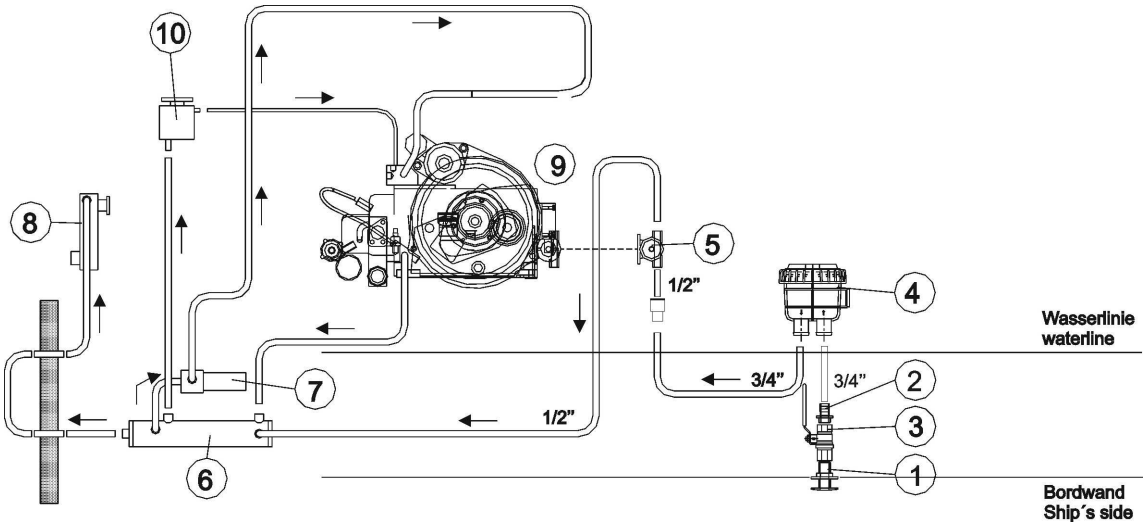
Notice

Never change the impeller for many years, without exchanging the old pump sealing ring. If the sealing ring is defective within the pump, seawater runs into the sound insulated capsule of the generator. A repair is then very expen-

sive.

Replacement impeller and also a spare pump should always be on board. The old pump can be sent back to Fischer Panda, where it is then economically overhauled completely.

Fig. 5.4.4-1: Installation example



1) Hull inlet
2) Reducer
3) Water cock
4) Raw water filter
5) Raw water pump
6) Heat exchanger
7) Electric water pump
8) Raw water injection into exhaust
9) Engine
10) Water tank

5.4.5 Installation below waterline

If the generator can not be attached at least 600 mm over the waterline, a vent valve must be installed into the seawater line. With location beside the "midship line" a possible heeling must be considered! The water hose for the external vent valve at the back of the sound insulated capsule splits on the pressure side of the pump and at both ends in each case extended with a connecting nipple by a hose end. Both hose ends must be led out outside of the sound insulated capsule to one point, if possible 600 mm over the waterline in the midship line. The valve is connected at the highest place with the two hose ends. If the valve is blocked, the cooling water pipe cannot be ventilated after the stop of the generator, the water column is not interrupted and the water can penetrate into the combustion chamber of the engine. This leads to the destruction of the engine!

Fig. 5.4.5-1: Ventilation valve

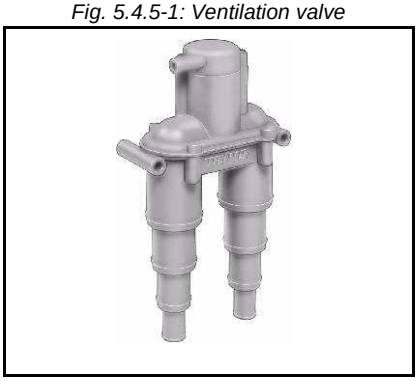
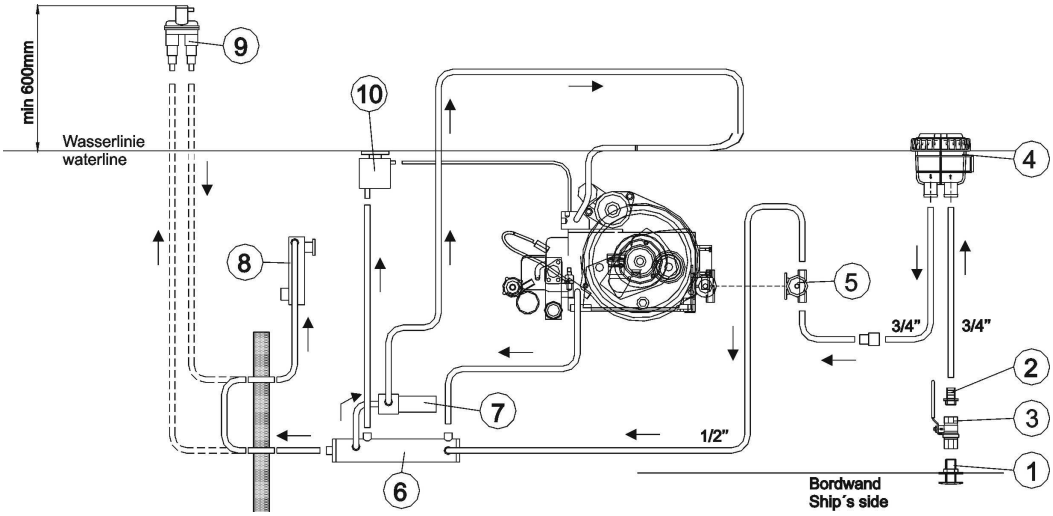


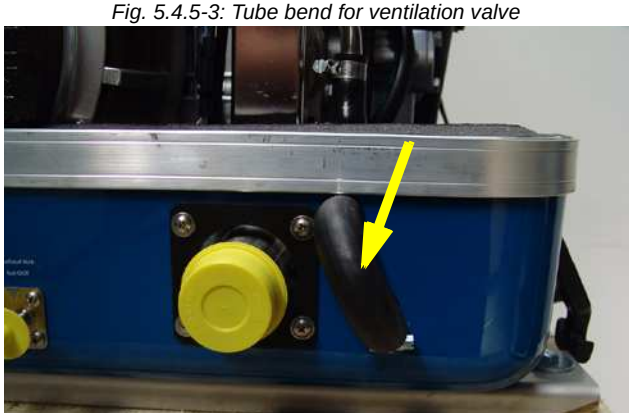
Fig. 5.4.5-2: Installation example



1) Hull inlet
2) Reducer
3) Water cock
4) Raw water filter
5) Raw water pump
6) Heat exchanger
7) Electric water pump
8) Raw water injection into exhaust
9) External ventilation valve
10) Water tank

The tube bend must be removed. Now the two ends are extended in each case with a hose and attached at a value of approx. 600 mm over the waterline with a ventilation valve.

Fig. 5.4.5-3: Tube bend for ventilation valve



5.5 The Freshwater - Coolant Circuit

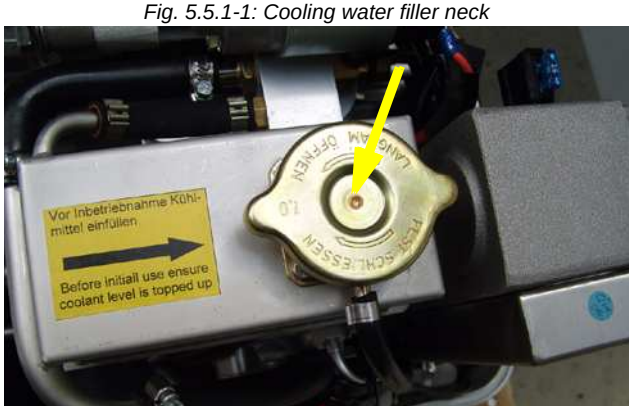
5.5.1 De-aerating at the first filling of the internal cooling water circuit

1. For the preparation of filling the following steps are to be undertaken:

a. Open the cooling water cap on the cooling water tank.

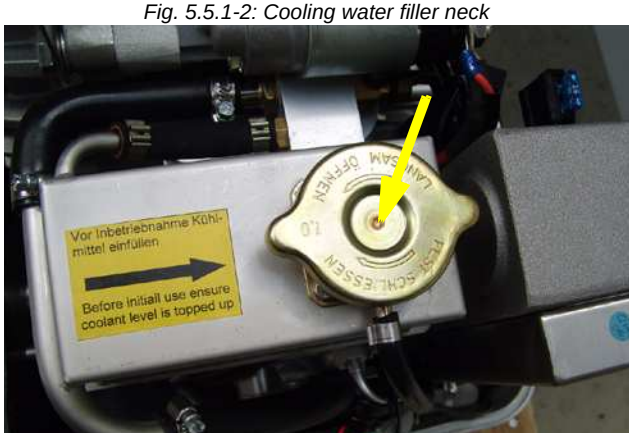
2. Filling the cooling water circle

Fig. 5.5.1-1: Cooling water filler neck



a. Fill in the prepared mixture (cooling water with anti-freeze protection according to the intended mixture) at the filler neck at the cooling water tank slowly so long, until cooling water reach the max. level at the neck.

Fig. 5.5.1-2: Cooling water filler neck



Anti-freeze

In the interest of safety, the freezing point of the closed circuit coolant should be **checked on a regular basis**. Be sure that the coolant/antifreeze mixture is good for at least -15℃ (5℉) and if it is possible that y our genset experiences lower temperatures, for example during storage or transportation, then the entire cooling system should be drained and purged. To purge the cooling system, compressed air at about 0.5 bar (7.5 psi) is sufficient.

Electric cooling water pump

Connect the cooling water pump to an external DC power supply and start the pump. Refill the the cooling water at the filler neck while the pump runs.

3. De-aerating

The cooling water circuit of the generator is self de-aerating.

During the de-aerating process it must be checked again and again if the cooling water is indeed circulating. If air bubbles established in the internal cooling water pump, it could be, that the cooling water circuit is not circulate. Then the generator would be warming very fast and switched off by overheating.

ATTENTION!

5.6 Watercooled Exhaust System

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

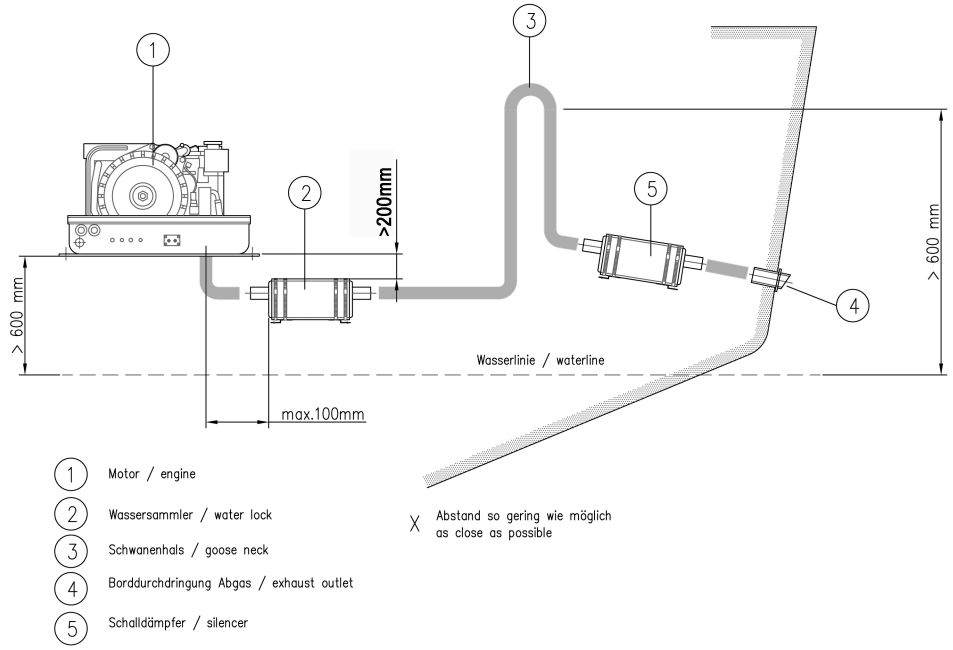
5.6.1 Installation of the standard exhaust system

The generator exhaust system must remain completely independent and separate from the exhaust system of any other unit(s) on board. The exhaust hose has an inner diameter of 40 mm (1.6") (Panda 15000 and above approx.

50 mm). The water lock must be installed at the lowest point of the exhaust system. An optional noise insulated water lock can also be installed. The exhaust hose descends from the capsule to the water lock. Then the hose rises via the "goose neck" to the silencer (see drawing). The goose neck must be vertical and sit preferably along the ship's keel centre line. The exhaust system must be installed so that the back pressure inside the exhaust does not exceed 0.4 bar (6 psi) and total length does not exceed 6 m (20 ft.).

Exhaust diameter see “Diameter of conduits” on Page 105.

Fig. 5.6.1-1: Installation example



5.6.2 Installation of the water collector

Unfortunately, it can occasionally occur that, because of an disadvantageous mounting position of the water collector, sea water gets into the diesel engines’ combustion chamber. This disables the diesel engine by irreversible damages. Quite frequently, this leads to discussions during which the parties involved in the yachts’ construction or the installation of the generator have to explain themselves.

One point in this situation can be clarified definitely:

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

Thereby, the position of the generator and the water collector, as well as the arrangement of the coolant and exhaust ducts plays the decisive role.

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

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

the engine with the starter motor.)

The coolant can reach the exhaust area via the exhaust duct as well as via the coolant feed.

5.6.3 Possible cause: Exhaust duct

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

a) Position of the water collector is too high. The water reaches the exhaust duct.

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

c) The water collector is too small relating to the length of the exhaust duct.

5.6.4 Possible cause: Coolant duct

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

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

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

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

As it consistently happens that funtioning risks are not realised during the laying of the exhaust duct, the following explanations refer explicitly to the exhaust duct. Here, the location, the size and the position of the 'exhaust water collector' play a very decisive part:

5.6.5 Installation area of exhaust water collector

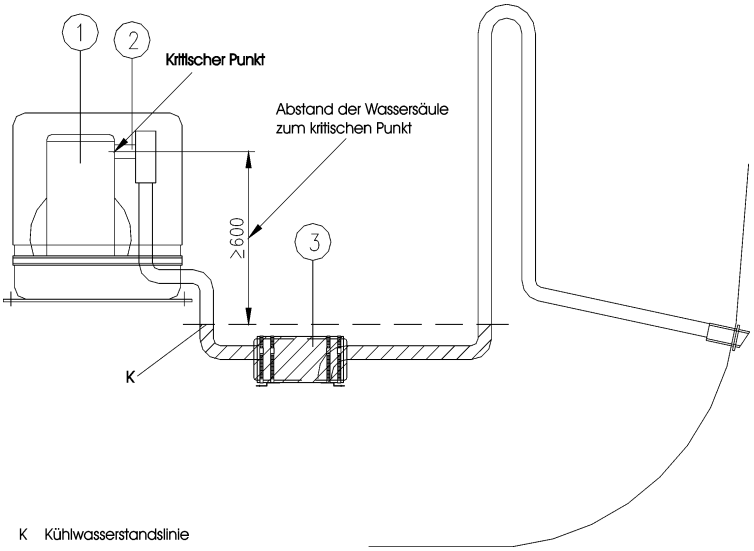
Concerning a water-cooled exhaust system, it must be regarded that - under no circumstances - coolant from the exhaust duct can get into the exhaust elbow area at the engine. If this happens, the coolant can get into the combustions chamber via an open discharge valve. This would lead to irreparable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

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

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

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

Fig. 5.6.5-1: Installation area of the exhaust water collector

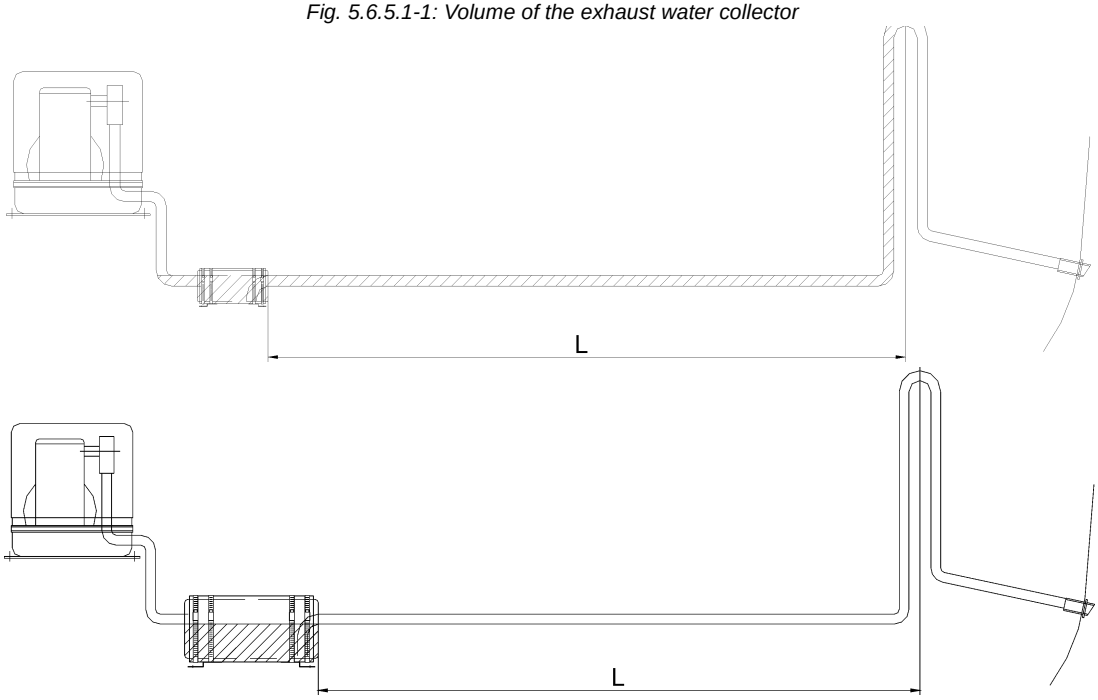


5.6.5.1 The volume of the exhaust water collector

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

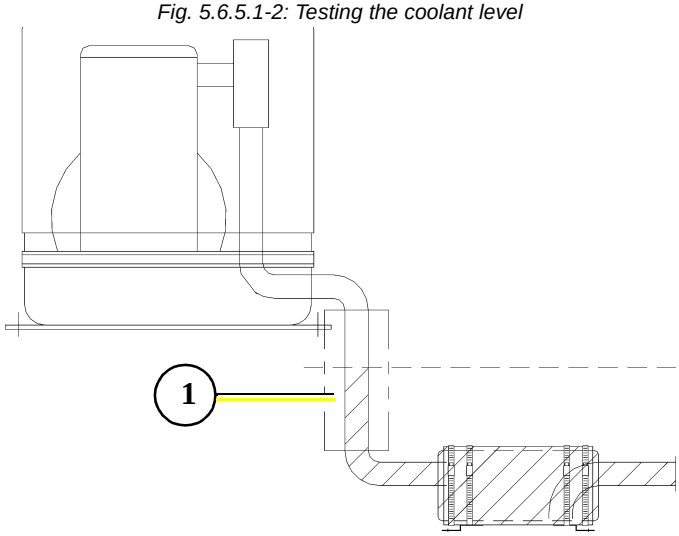
The water collector must necessarily be measured so large, that it can take the entire amount of coolant and, and the same time, does not exceed the prescribed vertical height of 600 mm up to the critical point at the exhaust elbow.

Fig. 5.6.5.1-1: Volume of the exhaust water collector



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

Fig. 5.6.5.1-2: Testing the coolant level



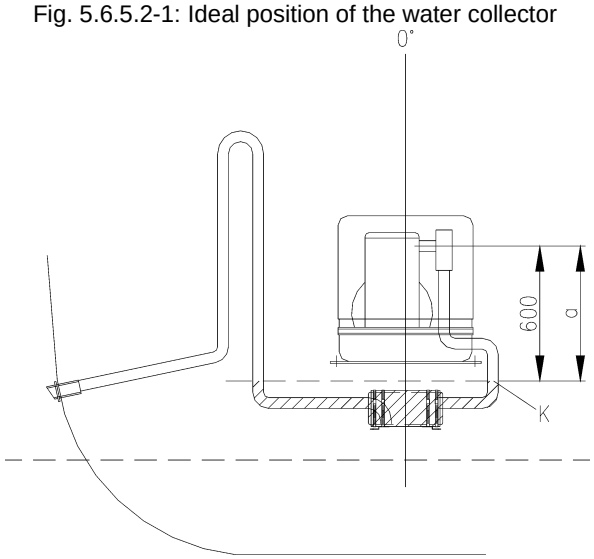
5.6.5.2 Position of the water collector

Important Note!

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

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

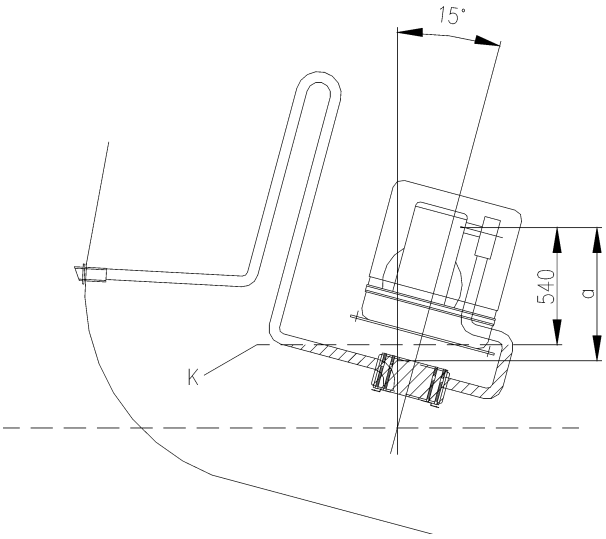
Fig. 5.6.5.2-1: Ideal position of the water collector



Tilted position 15 degrees

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

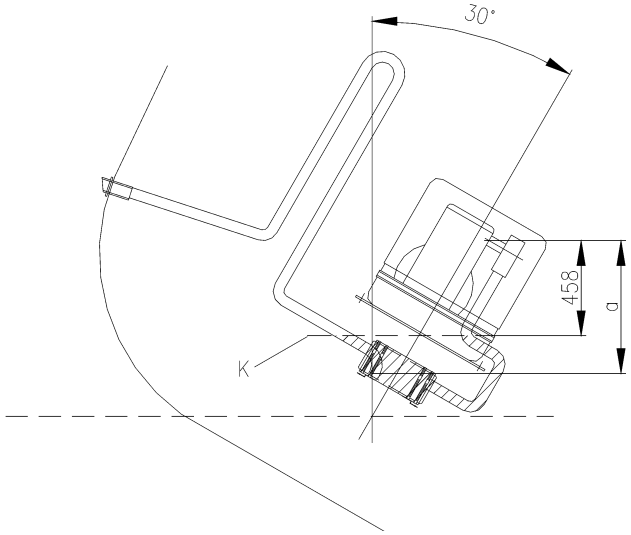
Fig. 5.6.5.2-2: Tilted position 15 degrees



Tilted position 30 degrees

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

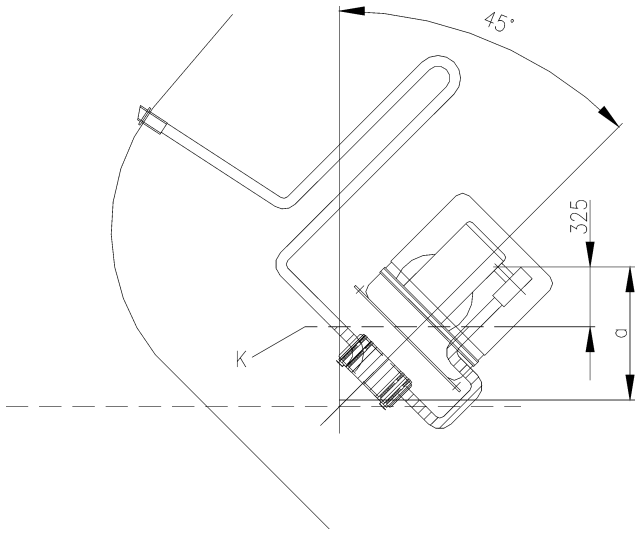
Fig. 5.6.5.2-3: Tilted position 30 degrees



Tilted position 45 degrees

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

Fig. 5.6.5.2-4: Tilted position 45 degrees



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

Summary:

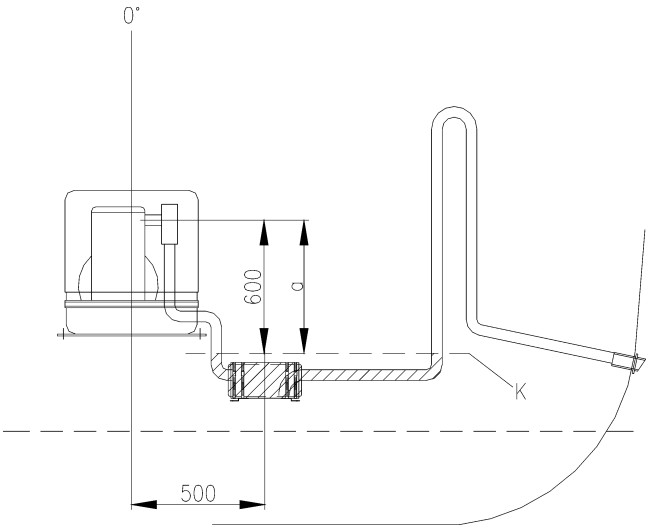
The preset minimum height of 600 mm must be regarded unconditionally and is only valid, if the water collector is mounted in its ideal position in center underneath the generator. A higher position is highly recommended if it has to be reckoned with tilted positions of 45 degrees.

5.6.5.3 Example of the installation of the water collector off-center and possible effects:

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

A) Installation of the water collector 500 mm next to the generators center line:

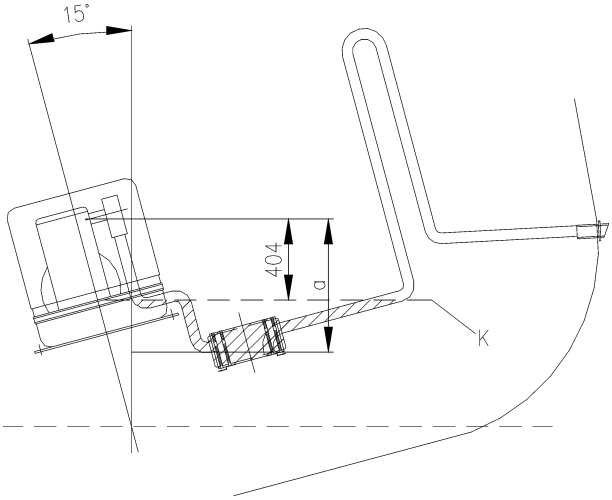
Fig. 5.6.5.3-1: Water collector, 500 mm next to the center line



Tilted position 15 degrees

Fig. 5.6.5.3-2: Tilted position, 15 degrees

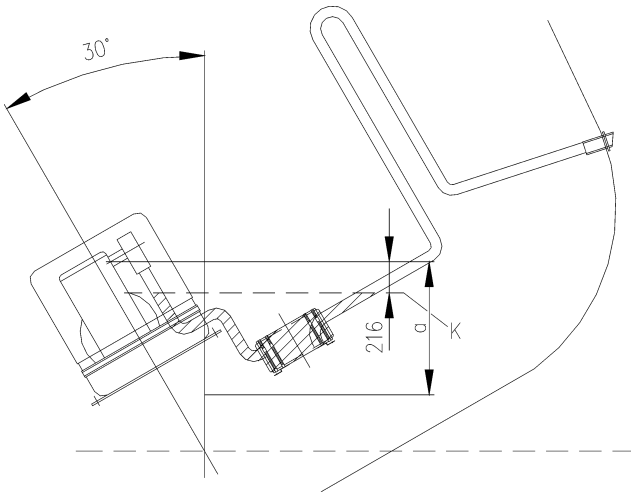
The distance is only 404 mm instead of the original 600 mm. So this is very close to the critical point.



Tilted position 30 degreed

Fig. 5.6.5.3-3: Tilted position 30 degreed

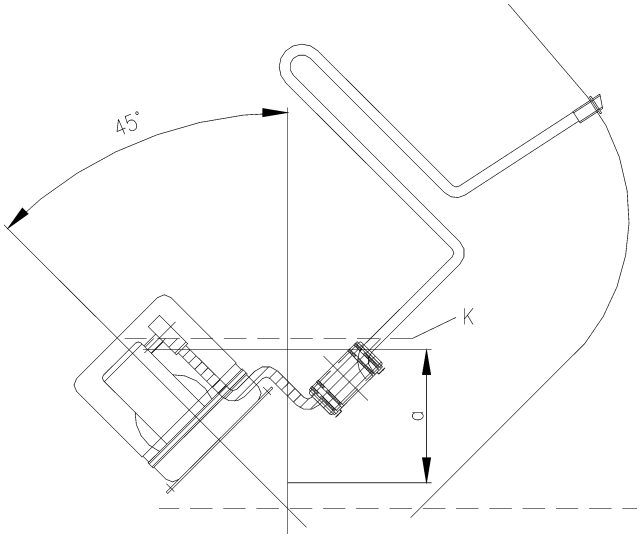
The distance between the hydrostatic head and the critical point at the exhaust elbow is only 216 mm. This means that in a tilted position of 30 degrees you already face the highest risk of sea water sloshing into the combustion chamber.



Tilted position 45 degrees

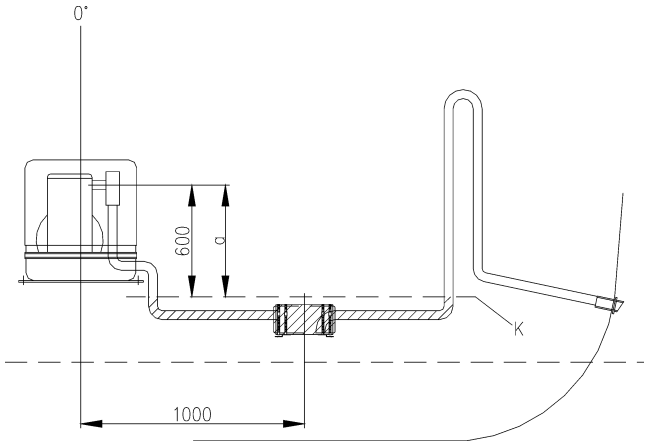
Fig. 5.6.5.3-4: Tilted position 45 degrees

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



B) Installation distance between exhaust water collector and generators' center line 1000 mm

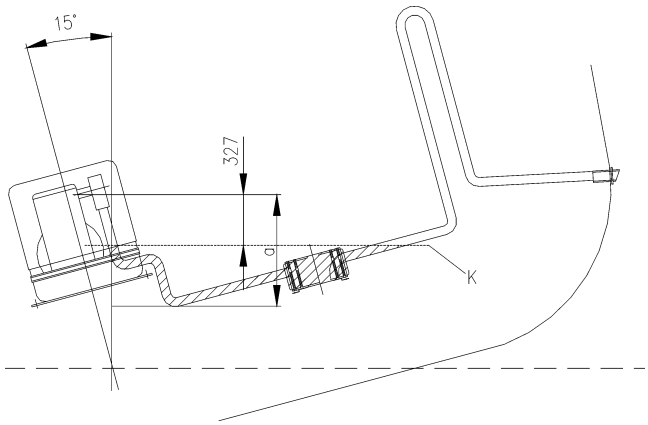
Fig. 5.6-5: Exhaust water collector, 1000 mm next to center line



Tilted position 15 degrees

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

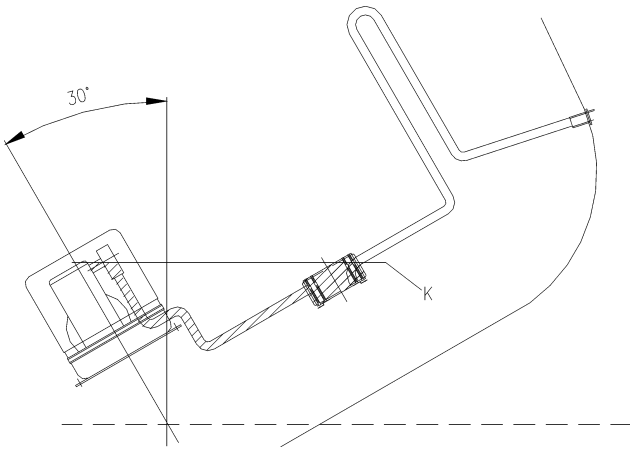
Fig. 5.6.5.3-6: Tilted position 15 degrees



Tilted position 30 degrees

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

Fig. 5.6.5.3-7: Tilted position 30 degrees



Summary:

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

The 'leaking' of the water collector leads to a rise of the water level which then gets too close to the exhaust elbows' critical point.

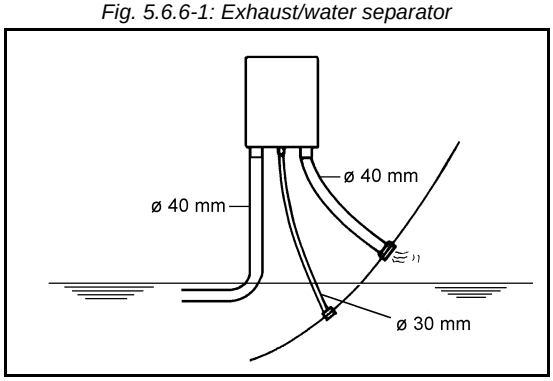
5.6.6 Exhaust / water separator

The exhaust/water separator

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

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

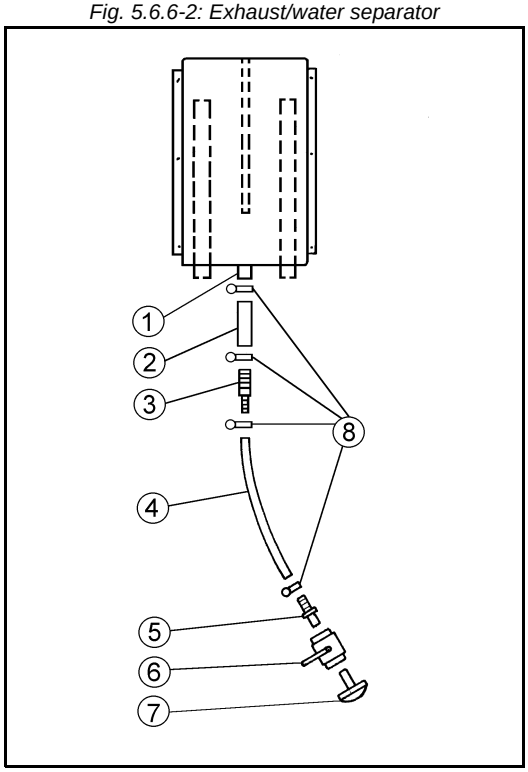
Fig. 5.6.6-1: Exhaust/water separator



1. Raw water outlet ø 30 mm
2. Hose connection ø 30 mm
3. Reducer 30/20 mm (if required)
4. Hose for hull inlet
5. Hose connector
6. Sea cock
7. Hull outlet

Hose clamps

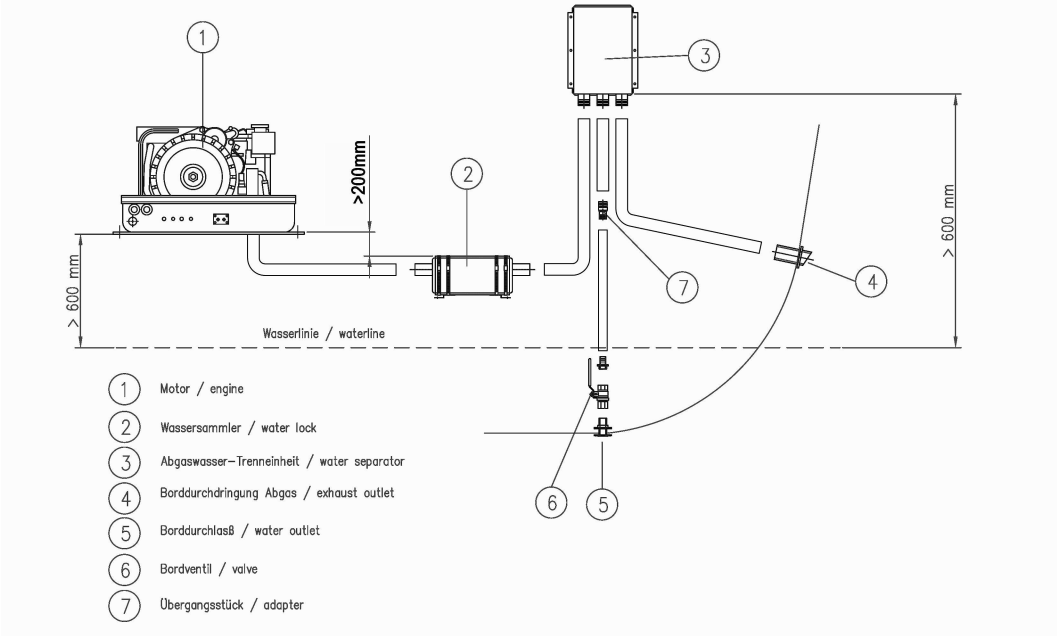
Fig. 5.6.6-2: Exhaust/water separator



5.6.7 Installation exhaust/water separator

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

Fig. 5.6.7-1: Installation example



If the thru-hull exhaust outlet has to be mounted far from the generator, an exhaust-water separator must definitely be installed. The sea water from the separator must then run along the shortest possible path is the thru-hull outlet. For such long exhaust routes, the exhaust hose diameter should also be increased from NW 40 mm to NW 50 mm in order to reduce the back-pressure. The exhaust may have a length of over 10 m (32 ft.), if the exhaust hose diameter is increased to 50 mm. An additional outlet exhaust muffler close to the hull outlet will help further to reduce noise emissions.

5.7 Installation of the fuel system

5.7.1 General references

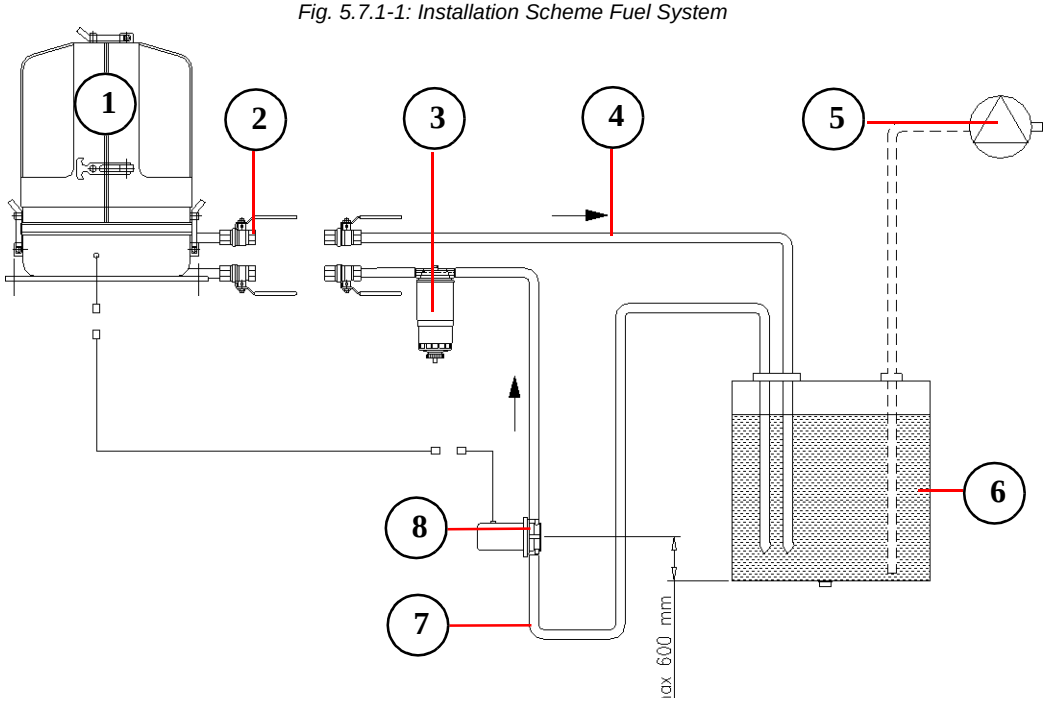
Inside the generator capsule itself, there is the fuel filter installed (exception: Panda 4200 and 4500). Additional fuel filters (with water separator) must be mounted outside the capsule in easily accessible places in the fuel lines between the tank intake fuel pump and the diesel motor's fuel pump.

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

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

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

Fig. 5.7.1-1: Installation Scheme Fuel System



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

5.7.2 The Electrical Fuel Pump

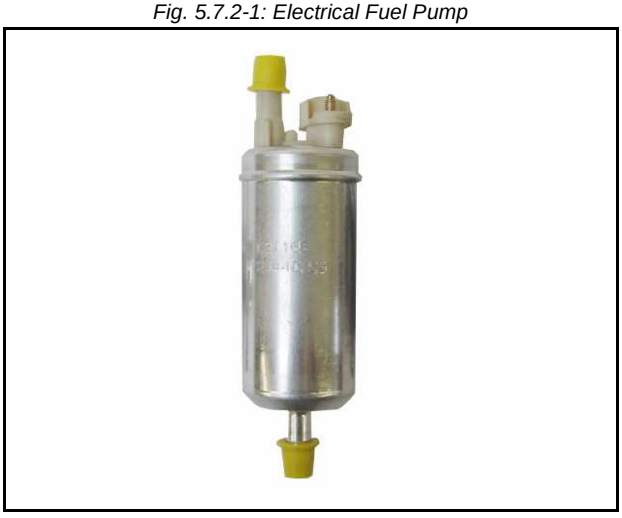
Electrical fuel pump

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

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

Diameter of fuel lines: section 8.2, “Diameter of conduits,” on page 105.

Fig. 5.7.2-1: Electrical Fuel Pump



5.7.3 Connection of the fuel lines at the tank

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

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

Non-return valve in the suction pipe

A non-return valve must be fitted to the suction pipe, which prevents the fuel flowing back after the generator has been switched off, if it is not possible to use the return flow pipe as a submerge pipe placed in the tank. The instruc-

tions "Bleeding Air from the Fuel System" must be read after initial operation or after it has stood still for a long period, in order to preserve the starter battery.

Non-return valve for the fuel return pipe

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

ATTENTION!

5.7.4 Position of the pre-filter with water separator

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

Fig. 5.7.4-1: Pre-filter with water separator

5.7.5 Ventilating air from the fuel system

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

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

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

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

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

5. Starting the generator

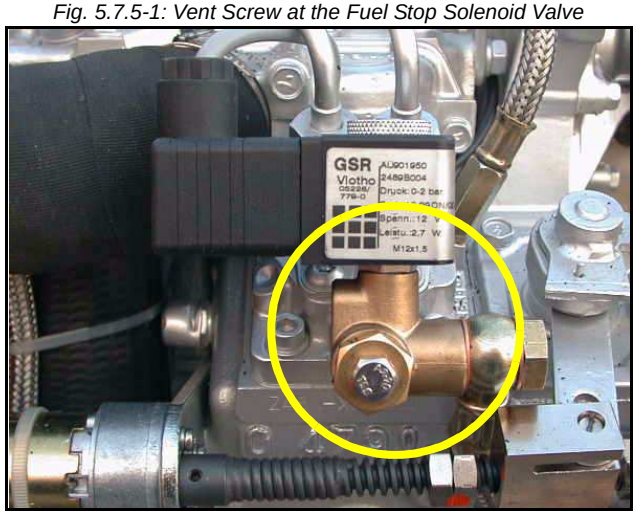
Now the generator can be started by pushing the "START"-button. The generator should start after a short while. One of the pipe union nuts of an injection hose has to be unscrewed, should the unit not start; then try to restart the generator. After the generator has started, the pipe union nut has to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

Main power switch "OFF"

Vent Screw at the fuel stop solenoid valve

Not installed at all models!

Fig. 5.7.5-1: Vent Screw at the Fuel Stop Solenoid Valve



5.8 Generator DC system installation

The Panda 5000i has no DC alternator to charge the Starter battery. The Starterbattery must be charged by an external device.

Notice

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.

5.8.1 Connection of the starter battery block

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

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

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

NOTE:

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

ATTENTION!

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

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

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

NOTE:

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

Attention!: Consider correct connection sequence

Battery connection

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

Attention!: Right connection of the battery.

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

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

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

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

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

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

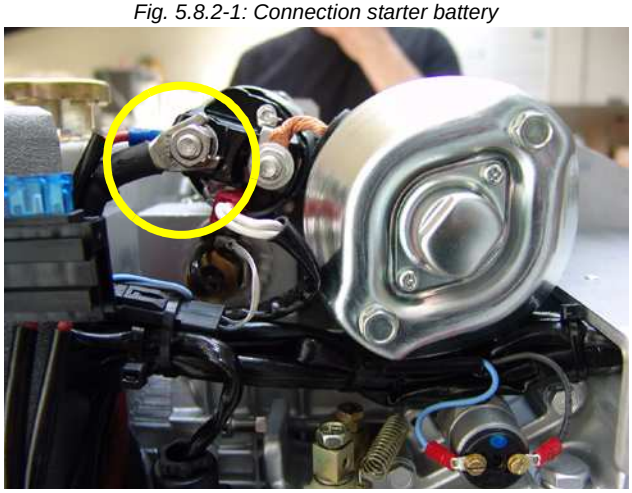
Make a test run after the installation and check the laying of the batteries during the test run and afterwards. If necessary, correct the laying.

Examine regularly the cable layings and the electrical connections.

5.8.2 Connection of the DC starter battery

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

Fig. 5.8.2-1: Connection starter battery



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

Fig. 5.8.2-2: Connection starter battery

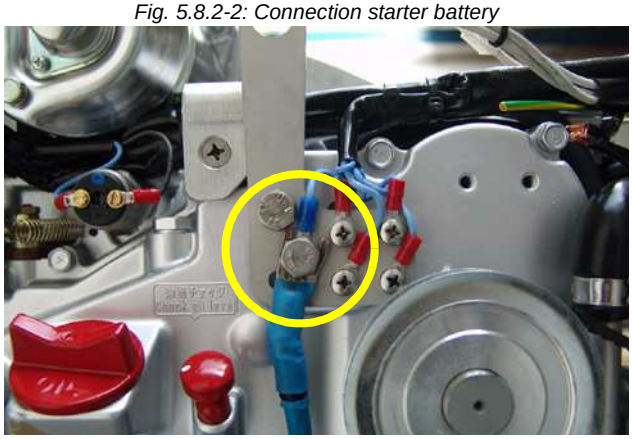
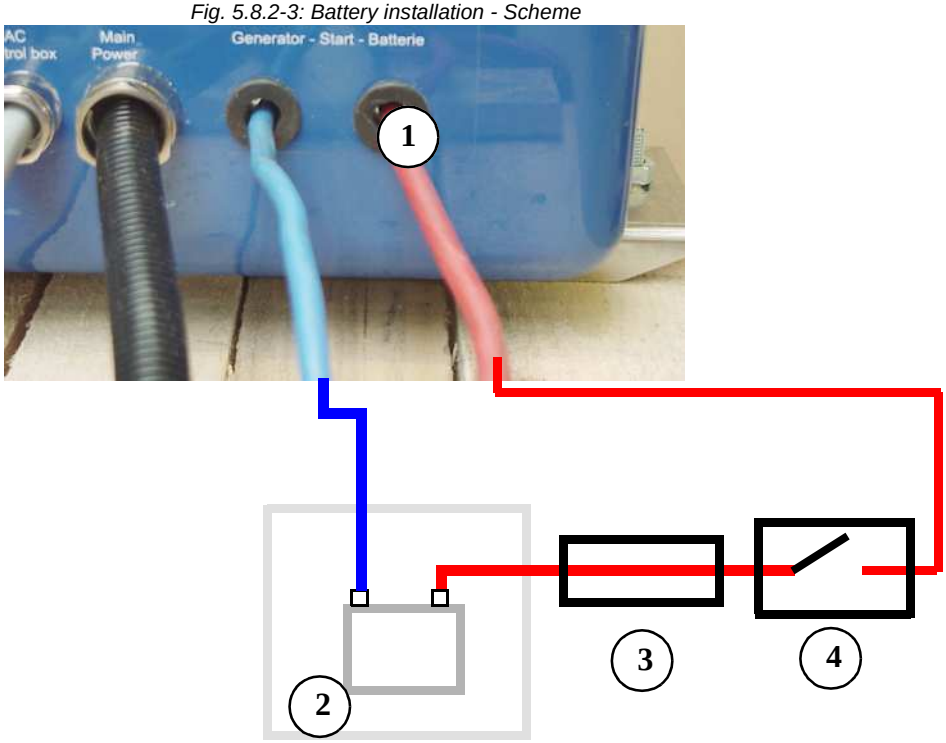


Fig. 5.8.2-3: Battery installation - Scheme

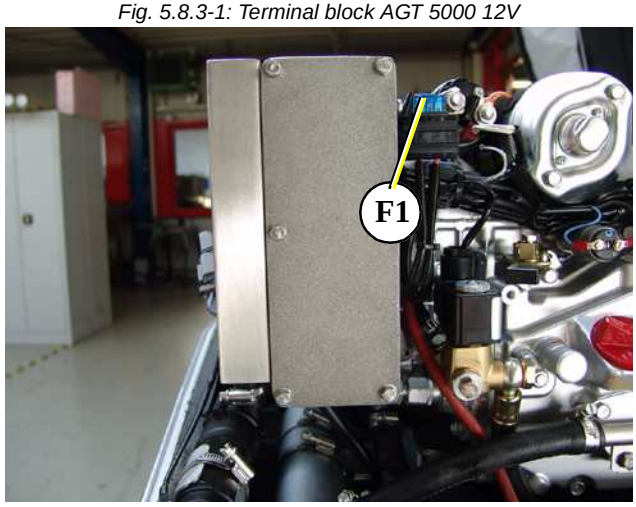


1. Generator
2. Battery block
3. Fuse
4. Battery main switch

5.8.3 Fuse

F1: Fuse 30 A for DC system

Fig. 5.8.3-1: Terminal block AGT 5000 12V



5.8.4 Installation of the iControl panel - See iControl Manual

5.9 Generator AC System Installation

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

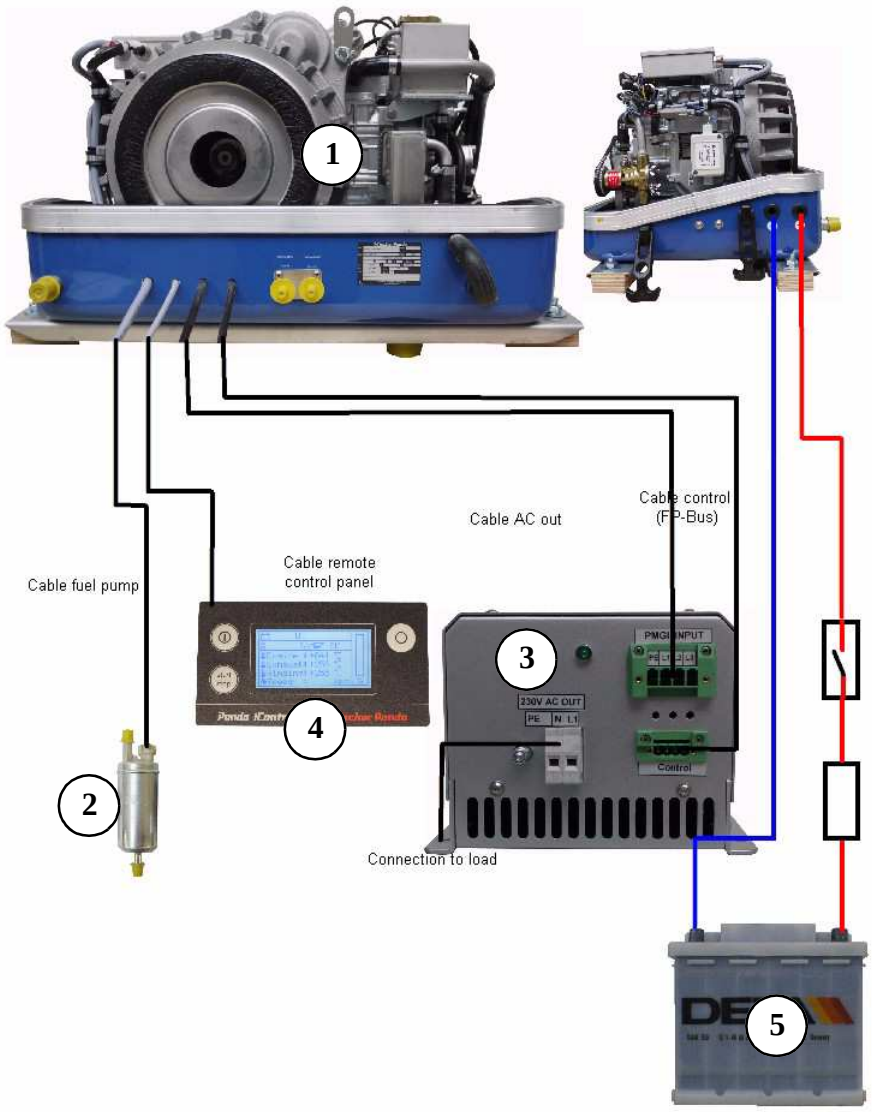
ATTENTION!

All electrical safety installations have to be made on board.

Required cable cross-sections

The following recommended electrical cable dimensions (cross sections) are the minimum required sizes for a safe installation ***(see "Cable cross section" on Page 105).***

Fig. 5.9-1: Electrical installation - example



1. Generator
2. Electrical fuel pump DC
3. PMGi 5000 inverter
4. iControl panel
5. Starter battery DC

5.9.1 Installation PMGi inverter - See separat PMGi 5000 inverter manual

All electrical safety installations have to be made on board.

5.9.2 Power source selector

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

separate.

3-Way Cam Switch

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

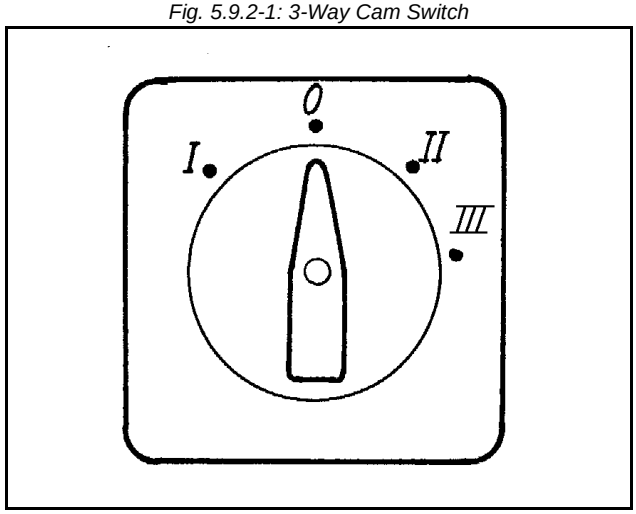
0. OFF

I. Generator

II. Shore power connection

III. Inverter

Fig. 5.9.2-1: 3-Way Cam Switch



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

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

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

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

Protection conductor

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

If a separate ground protection cable is necessary (i.e. due to national safety regulations), the bridge between the generator housing and ground (in the AC-Control box) must be disconnected. Once such a ground protection cable is installed, it must be connected to the ground straps of all on board electrical devices.

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

Electrical fuses

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

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

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

Required fuses see Tabelle 8.1, “Cable cross section,” auf Seite 105

Required cable cross-sections

The following recommended electrical cable dimensions (cross sections) are the minimum required sizes for a safe installation. (siehe Tabelle 8.1, “Cable cross section,” auf Seite 105)

5.9.3 Insulation test

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

ATTENTION:

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

2.) Start the generator.

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

a) generator housing and AC-Control box

b) generator housing and ground.

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

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

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

Checking the electrical connections

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

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

6. Maintenance Instructions

6.1 Personal requirements

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

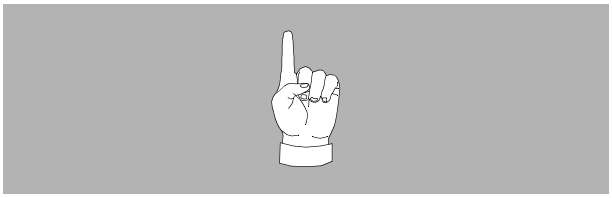
Further maintenance work must only be made by Technical personel or Fischer Panda service points.

6.2 Hazard notes for this chapter

see “Safety instructions - Safety first!” on Page 18.

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

Notice!:



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

Warning!: Automatic start

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

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

Do not run the generator with removed sound isolation cover.

Warning!: Risk of injury

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

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

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

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

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

Warning!: Risk of injury

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

- No open flames during work on the generator.

- Do not smoke.

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

Warning!: Danger of fire

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

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

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

- Do not inhale oil and fuel vapours.

Danger!: Danger of poisoning

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

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

ATTENTION!: Danger to Life - High voltage

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

Warning!: Hot surface/material

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

- Protective clothing

- safety boots

- protective gloves

- Ear defender

- safety glasses

Instruction!: Personal protective equipment necessary.

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

Attention!: Disconnect all load

Batteries contains acid or alkalis.

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

See the operation and safety instruction from your battery manufacturer.

Warning!:

6.3 Environmental protection

Danger to the environment due to mishandling!

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

– Always observe the instructions mentioned below.

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

The disposal must be performed by a specialist disposal company.

Environmental protection.

6.4 General maintenance instructions

6.4.1 Checks before each start

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

Once a month

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

Maintenance intervals - see seperate datasheet

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

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

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

6.5 Oil Change Intervals

The first oil change is to be accomplished after a period of operation from 35 to 50 hours. Afterwards the oil is to be

changed after 150 hours. For this, the oil SAE30 for temperatures over 20℃ and SAE20 for temperatures between 5℃ and 20℃ is to be used. At temperatures under 5 ℃ oil of the viscosity SAE10W or 10W-30 is prescri bed.

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

6.5.1 Checking oil-level

You require:

paper towels / cloth for the oildipstick

The generator must be placed at level.

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

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

Generator and coolant can be hot during and after operating.

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

Caution: Burn hazard!

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

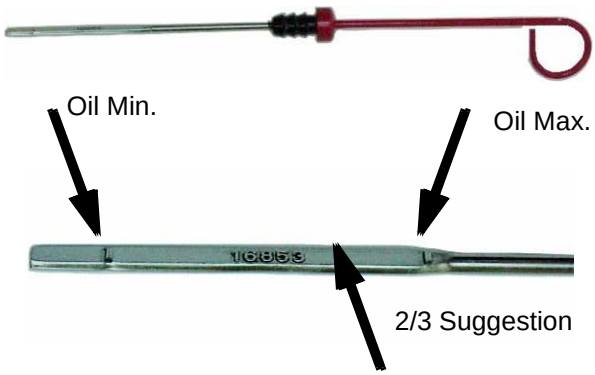
Oildipstick

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

We recommend an oil-level of 2/3.

Sample picture

Fig. 6.5-1: Oildipstick - Sample



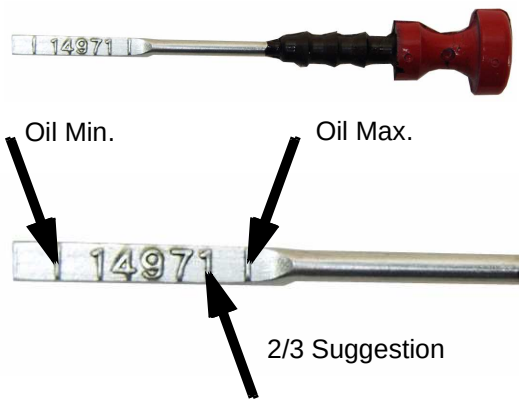
Oildipstick EA 300 Engine

Fig. 6.5-2: Samplepicture Oildipstick

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

We recommend an oil-level of 2/3.

Sample picture



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

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

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

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

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

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

6.5.2 Refilling Oil

You require:

Engine oil

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

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

6.5.3 After the oil level check and refilling the oil

- Put the oildipstick back into the check rail.

- Close the oil filling cap.

- Remove potential oil stains and splashs from the generator and surroundings.

- Close the generator casing.

- Remove lock against accidental generator start.

6.6 Exchanging engine oil and engine oil filter

You require:

- Engine oil. See attachment.

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

- Sealings for oil drain screw

- Personal protective gear

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

- Open-ended wrench for oil drain screw

- Paper towels and cloth

- Oil filter wrench

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

The generator must be placed at level.

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

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

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

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

Generator and coolant can be hot during and after operating.

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 oild drain hose.

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

2. Loosen oil filling cap

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

   Sample picture

Fig. 6.6-1: Oil filling cap

3. Open oil drain screw.

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

   Use spanner size 17mm.

Fig. 6.6-2: Oil drain hose

4. Discharge used oil.

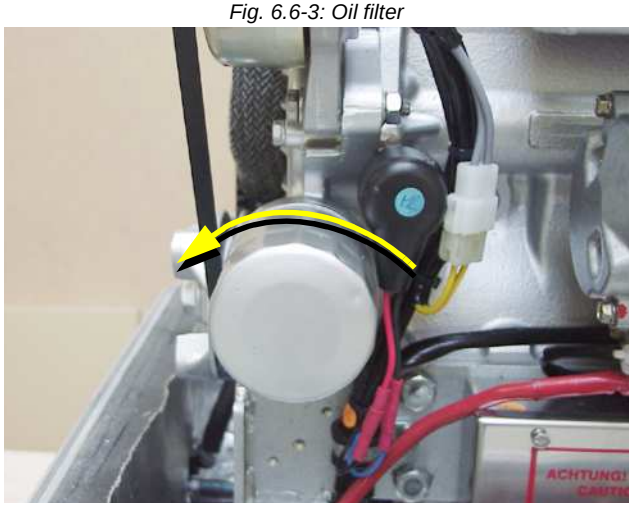
   Let the entire amount of oil drain out of the engine. This can take several minutes.

5. Remove used oil filter / clean oil screen

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

Sample picture

Fig. 6.6-3: Oil filter



Oil screen with generators with EA300 engines

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

Use spanner size 17mm.

Sample picture

Fig. 6.6-4: Oil screen

6. Preparing a new filte

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

Fig. 6.6-5: Oil screen sealing ring

7. Mounting the new filter

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

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

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

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

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

10. Clean up

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

6.6.1 After the oil change

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

11. Duly disposure of used oil and filter

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

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

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

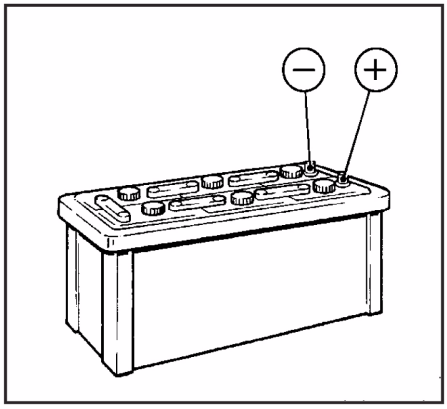
If from the battery manufakturer not otherwise mentioned

6.7.1 Battery

6.7.1.1 Check battery and cable connections

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

Fig. 6.7.1-1: Battery

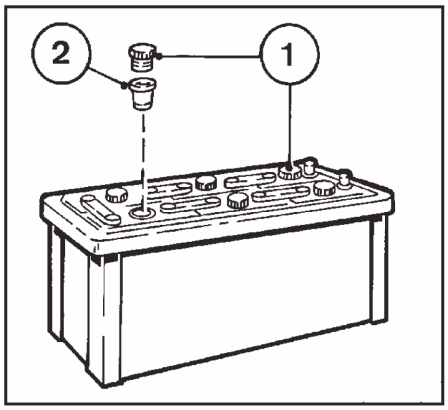


6.7.1.2 Check electrolyt level

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

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

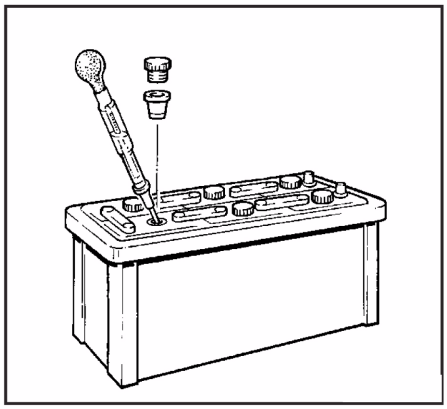
Fig. 6.7.1-1: Battery



6.7.1.3 Check electrolyt density

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

Fig. 6.7.1-1: Battery



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

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

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

Wear protective goggles!

Do not rest tools on the battery!

Attention

6.8 Checking the water separator in the fuel supply

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

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

Sample picture

Fig. 6.8-1: Pre-filter with water separator

6.8.1 Exchange of the Fuel Filter

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

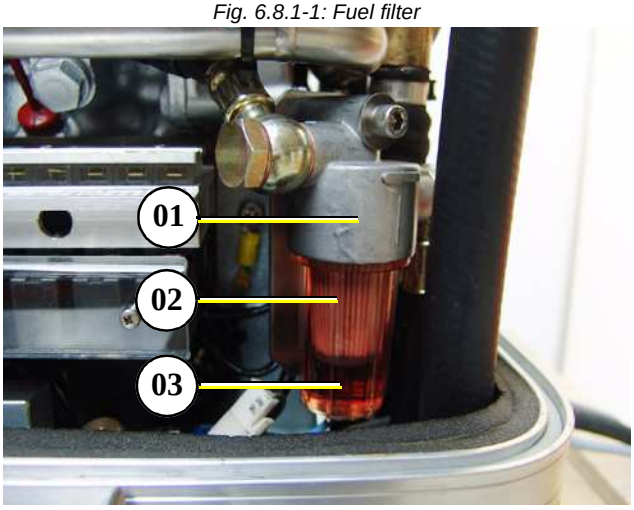
he inlet must be clamped, before exchanging the filter.

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

Fig. 6.8.1-1: Fuel Filter

6.8.1.1 Optional fuel filter with sight glass

Fig. 6.8.1-1: Fuel filter



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

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

Fig. 6.8.1-2: Fuel filter

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

Fig. 6.8.1-3: Fuel filter

Screw the new filter element into the mount.

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

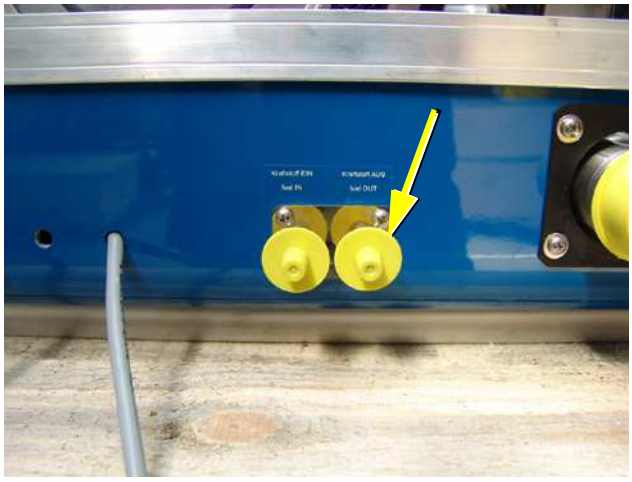
Fig. 6.8.1-4: Fuel filter

6.8.2 De-aerating the fuel system

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

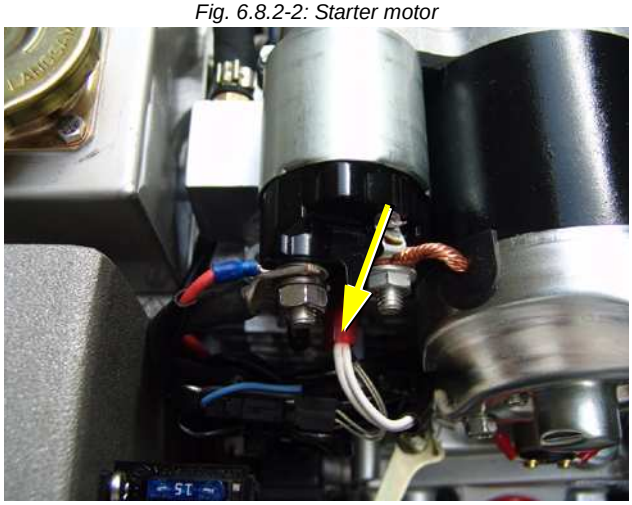
1. Put a container under the fuel return pipe to catch running out fuel to catch.

Fig. 6.8.2-1: Fuel return pippe



2. Take off the plug at the solenoid of the starter motor.

Fig. 6.8.2-2: Starter motor



3. Switch the panel „ON“.
4. Press „START“-button. The fuel pump runs audible.

5. Switch the panel „OFF“.
6. Switch the panel „ON“.
7. Press again the „START“-button.

Fig. 6.8.2-3: iControl

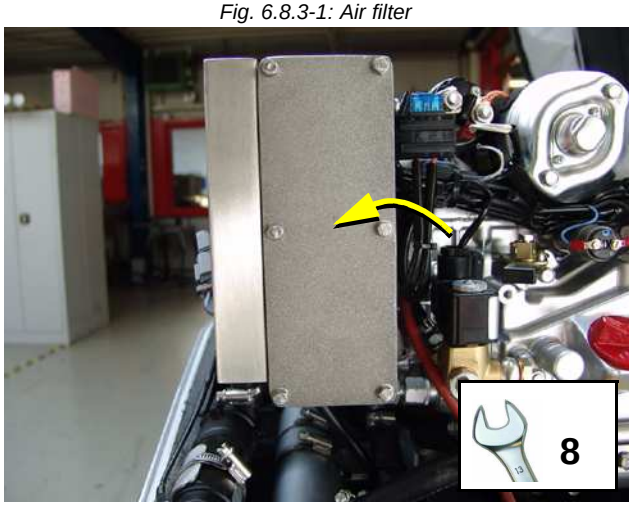
8. Switch the panel „OFF“.
9. Attach the plug at the solenoid of the starter motor.

This procedure must be repeated several times, until fuel (nonporously) withdraws perfectly at the fuel return pipe.

6.8.3 Replacement of the air filter

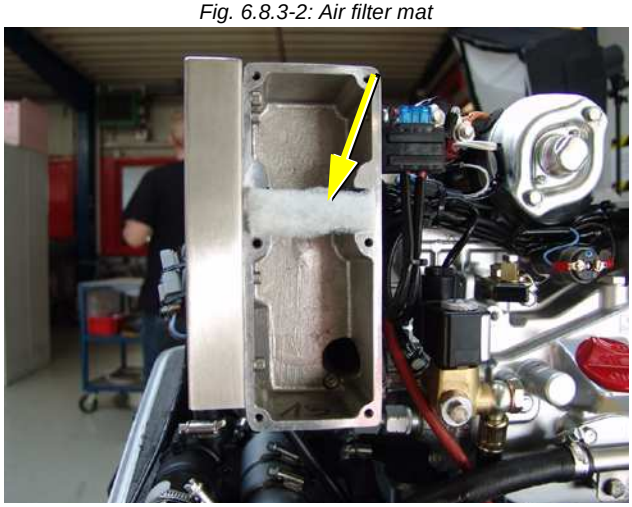
Open the air suctin housing by loosen the six hexagon head screws on the frame cover.

Fig. 6.8.3-1: Air filter



Change the air filter mat and close the cover again.

Fig. 6.8.3-2: Air filter mat



6.9 De-aerating of the coolant circuit / freshwater

The Panda 5000i PMS is self de-aerating.

6.10 The raw water circuit

6.10.1 Clean raw water filter

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

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

Fig. 6.10.1-1: Raw water filter

6.10.2 Causes with frequent impeller waste

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

Unfavorably affects the life span of the impeller, if the cooling water sucking in way is relatively long or the supply is handicapped, so that the cooling water sucking in range develops a negative pressure. This can reduce first of all the power of the cooling water pump extremely that the wings of the impeller are exposed to very strong loads. This can shorten the life span extremely.

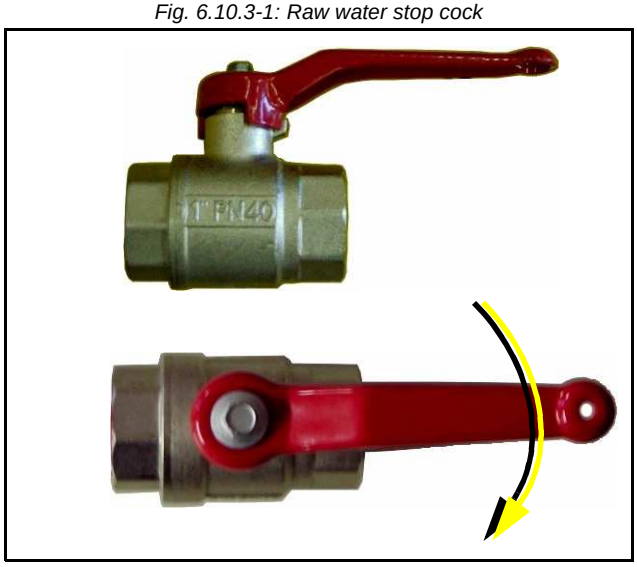
Further the operation of the impeller pump loaded in waters with a high portion of suspended matters. The use of the impeller pump is particularly critical in coral waterbodies. Cases are well-known, which a impeller pump had so strongly run after 100 hours already that the lip seal on the wave was ground in. In these cases sharp crystal parts of the coral sand assess in the rubber seal and affect like an abrasive the high-grade steel shank of the impeller pump.

If the generator were mounted over the water level it is particularly unfavorable for the impeller pump. After the first start some seconds will pass by, until the impeller can suck in cooling water. This short unlubricated operation time damages the impeller. The increased wear can lead after short time to the loss. (see special notes: "Effects on the impeller pump, if the generator is mounted over the waterline").

6.10.3 Replacement of the impeller

Close the raw water stop cock.

Fig. 6.10.3-1: Raw water stop cock

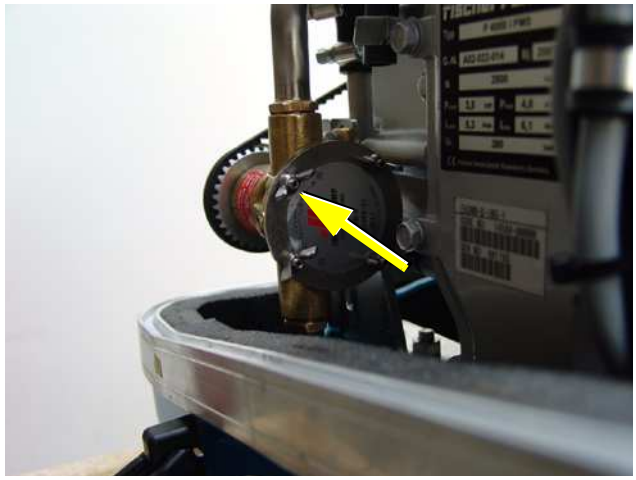


Raw water pump on the front side of the genset.

Fig. 6.10.3-2: Raw water pump

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

Fig. 6.10.3-3: Raw water pump



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

Mark the impeller, to make sure that these is used in the correct position at re-installation.

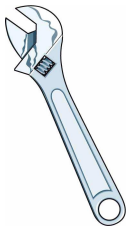
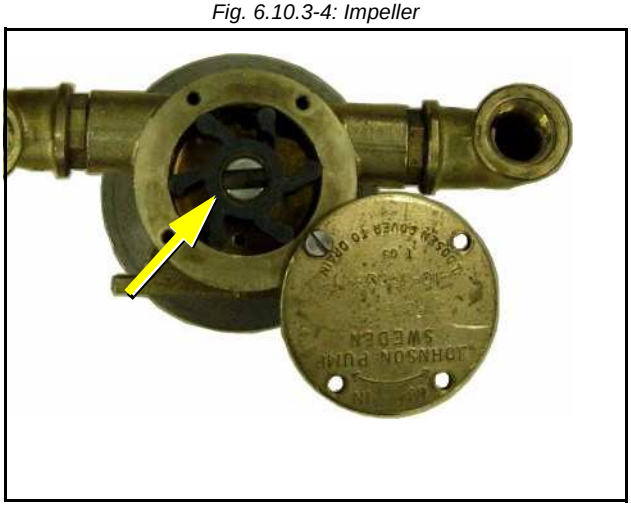


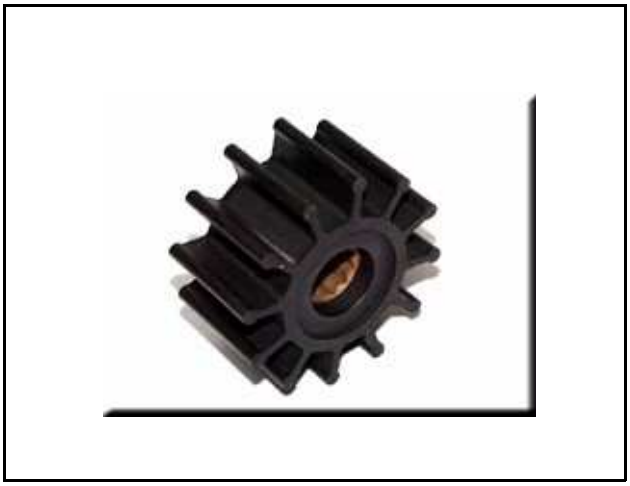
Fig. 6.10.3-4: Impeller



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

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

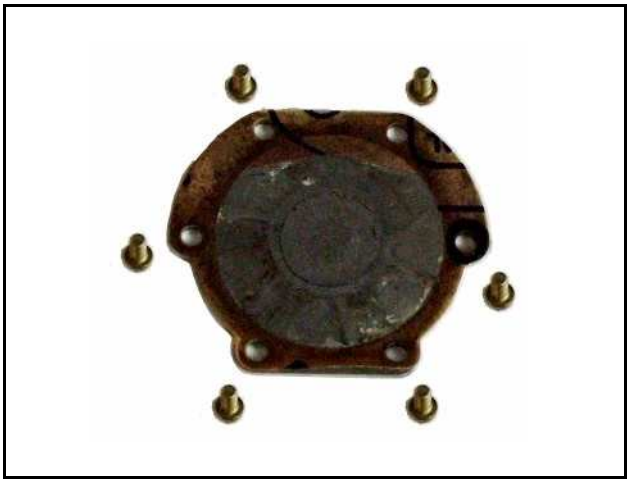
Fig. 6.10.3-5: Impeller



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

Fastening the cover and use a new seal.

Fig. 6.10.3-6: TImpeller seal



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7. Generator Faults

7.1 Personal requirements

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

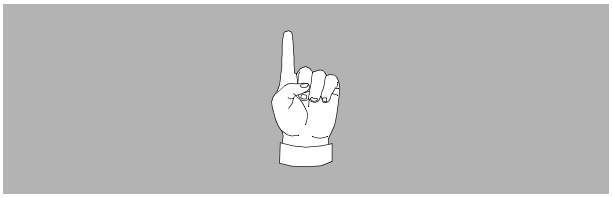
Any further repair work may be performed only by specially trained personnel or by authorized repair shops (Fischer Panda service points). This is especially for working on the valve timing, fuel injection system and the engine repair.

7.2 Hazard notes for this chapter

see “Safety instructions - Safety first!” on Page 18.

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

Note!:



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

Warning!: Automatic start

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

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

Do not run the generator with removed sound isolation cover.

Warning!: Risk of injury

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

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

- Ensure there is sufficient installation clearance before start working.

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

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

Warning!: Risk of injury

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

- No open flames during work on the generator.

- Do not smoke.

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

Warning!: Danger of fire

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

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

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

- Do not inhale oil and fuel vapours.

Danger!: Danger of poisoning

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

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

ATTENTION!: Danger to Life - High voltage

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

Warning!: Hot surface/material

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

- Protective clothing

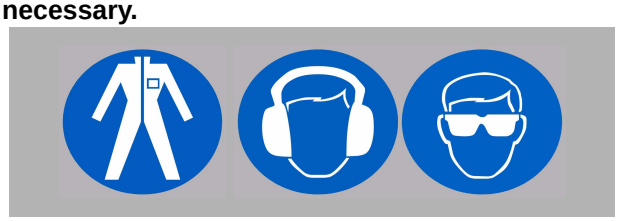
- safety boots

- protective gloves

- Ear defender

- safety glasses

Instruction!: Personal protective equipment necessary.



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

Attention!: Disconnect all load

7.3 Tools and measuring instruments

In order to be able to manage disturbances while driving, 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

7.4 Overloading the generator

Please ensure that the generator is not overloaded. This must be considered, especially with regards to multi power generators. In this case the extra load including the electrical performance can be considerably greater than the drive performance of the motor, which can eventually lead to a damaged motor.

The full nominal performance of the generator is fore-mostly for short term use. It is, however, required to start electric motors with high starting current or achieve special starting procedures at peak loads. 70% nominal load is ideal for a long motor life. (Continual use means uninterrupted use of the generator for many hours). This should be taken into consideration when connecting devices. This ensures extended motor life.

It is no problem for the motor to be run occasionally for 2 - 3 hours at full load. The complete conception of Panda Generator ensures that even during extreme conditions, an overheating of the motor will not occur. Accumulation of soot will occur if run for long periods at full load.

Effects of Short Circuiting and Overloading on the Generator

The generator cannot be damaged by short-circuiting or overloading. Short-circuiting and overloading suppress the magnetic excitation of the generator, thus, no current is generated and the voltage will collapse. This condition is immediately offset, once the short circuit has been eliminated and/or the electrical overload removed.

Overloading the Generator with Electric Motors

With the operation of electric motors it must be considered that these take up a multiple of their rated output as starting current (six to tenfold).

If the power of the generator for the engine is not sufficient, the voltage in the generator breaks down after switching on the engine. For special approach problems the manufacturer can give recommendations regarding the accomplishment of the situation (e.g. amplified condensers, gradual start switch or extra developed starting unit for electric motors).

The system efficiency can be improved up to 50 % and the starting current can be improved up to 100 % by a professional adjustment of the engines. If the inductive load (electrical motors etc.) lies over 20 % of the generator rated output compensation is appropriate (see in addition also the writing: "Operation Instructions for Generators with Inductive Loads").

7.5 Starting problems

7.5.1 Fuel solenoid valve

For start problems the possibility of an error exists with the solenoid for engine stop or fuel solenoid valve, which both effect affect simultaneous on the fuel system.

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".

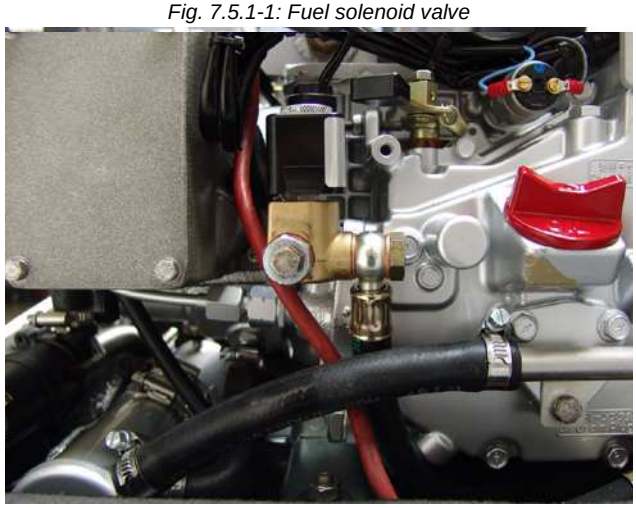
For this reason, it requires a few seconds before the motor comes to a full halt.

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.

Fuel solenoid valve

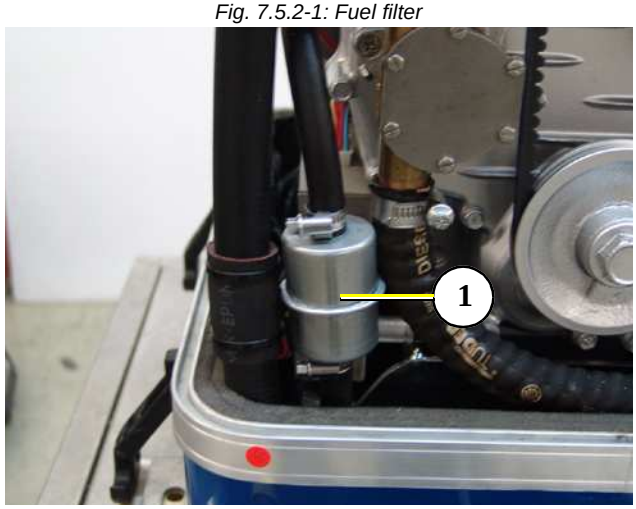
Fig. 7.5.1-1: Fuel solenoid valve



7.5.2 Dirty fuel filter

If the fuel filter is dirty change the filter element.

Fig. 7.5.2-1: Fuel filter



For replacing the filter element see section C.3.1, “Replacing fuel filter,” on page 79

1. Fuel filter element

At generators with EA300/330 engine the fuel filter must installed outside the sound cover

7.6 Troubleshooting table

7.6.1 Generator output voltage too low

For 50 Hz versions: less than 200 V

Cause	Solution
PGMi is overloaded.	Reduce the electrical load. (Switch off load)
Motor is not reaching the rated rpm.	Refer to "motor faults" section.

7.6.2 Diesel motor fails to start

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

7.6.3 Starter is turning motor, but fails to start

Cause	Solution
Fuel stop solenoid valve not opening.	Check wire connections and circuitry to solenoid valve. (ref. DC wiring diagram: Relay K2, Fuse)
Fuel pump not working.	Check fuel-filter and pump: clean if necessary.
Lack of fuel.	Check fuel supply.
Glow-plugs not working correctly.	Check glow plugs and heating time.
Too much air in fuel lines.	Test fuel system for leakage. Bleed air from fuel system (refer to section "Bleeding Air from Fuel System").
Fuel-filter blocked.	Replace fuel filter.

7.6.4 Motor does not achieve enough speed during starting process

Cause	Solution
Starter battery voltage insufficient.	Check battery.
Damaged bearing(s) piston (seized).	Repairs need to be carried out by Kubota-Service. (refer to Kubota motor-manual)
Cooling water in combustion chamber.	1. Turn generator "OFF" at control panel. 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.

7.6.5 Motor runs unsteady

Cause	Solution
Disruption in the area of the injection systems' automatic advance.	Repair / Check the automatic advance via the motor service.
Air in the fuel system.	Ventilate the fuel system.

7.6.6 Motor speed drops

Cause	Solution
Lack of fuel	Check fuel supply system: - fuel filter, renew if necessary - check fuel pump - check fuel lines (bleed if necessary)

Cause	Solution
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.

7.6.7 Motor runs in off position

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

7.6.8 Motor stops by itself

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

7.6.9 Sooty, black exhaust

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

7.6.10 Generator must be shut off immediately if:

Cause	Solution
- motor rpm suddenly rises or drops - unusual noise comes from genset - exhaust colour suddenly becomes dark - leakage in the cooling water system.	Refer to respective section of manual and if necessary, have repaired by Kubota-Service, or Panda representative.

8. Generator Tables

8.1 Cable cross section

Fig. 8.1.0-1: Kabelquerschnitte/Cable cross sectiion

Länge/length	1 - 3 m	4 - 6 m	7 - 10 m	11 - 15 m	16 - 20 m
2,5 mm²					
4 mm²					
6mm²					
10mm²					
16 mm²	70 A	63 A	55 A	48 A	42 A
25mm²	112 A	100 A	88 A	75 A	63 A
35mm²	145 A	130	110	100 A	90 A
50mm²	225 A	200 A	175 A	150 A	125 A
70mm²	275 A	250 A	225 A	195 A	170 A
95mm²	340 A	300 A	280 A	260 A	220 A

8.2 Diameter of conduits

Fig. 8.2-1: Diameter of conduits

Generator type	Ø Cooling water pipe		Ø Exhaust hose [mm]	Ø Fuel hose	
	Fresh water [mm]	Raw water [mm]		Supply [mm]	Return [mm]
Panda 5000i PMS	20	20	30	8	8

8.3 Technical Data

Fig. 8.3-1: Technical Data generator

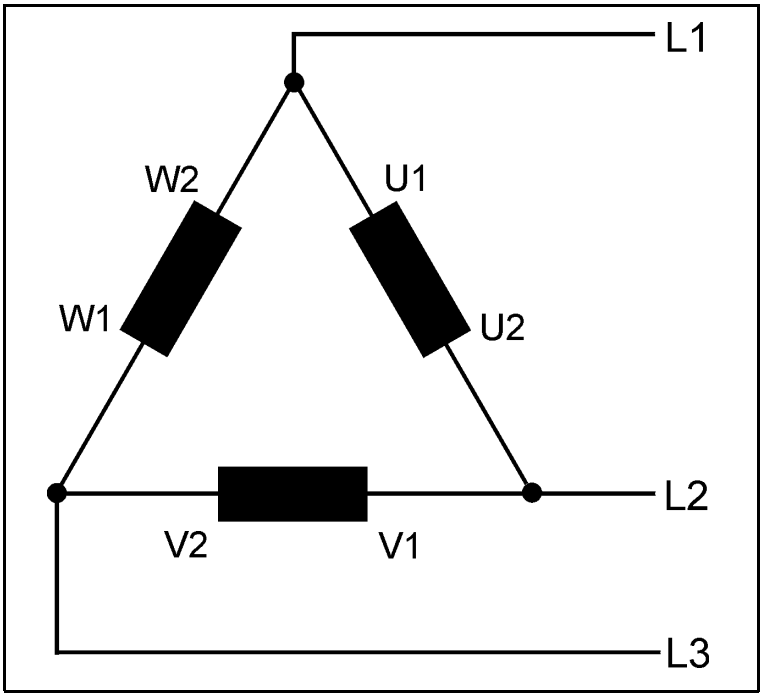
	Panda 5000i PMS	Panda 5000i PMS with Tier 4
Type	EA 300	EA330
Govenour	Servo	Servo
Cylinder	1	1
Bore	75mm	77
Stroke	70mm	70
Stroke volume	309cm^3	325cm³
max. Power (DIN 6270-NB) at 3000rpm	5,1kW	5,15kW
Rated speed	3000rpm	3000
Idle speed running [a]	2900rpm	2900
Valve clearance (engine cold)	0,16 - 0,20mm	0,16-0,20
Cylinder head torque	58,8 - 63,7Nm	58,8 - 63,7Nm
Lubrication oil capacity	1,3l	1,3l
Fuel consumption [b]	approx. 0,42 - 1,12 l	approx. 0,42 - 1,12 l

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

8.4 Types of coil

HP3 delta connection

Fig. 8.4-1: HP3 delta connection



8.5 Engine oil

8.5.1 Engine oil classification

8.5.1.1 Operating range:

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

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

8.5.1.2 Quality of oil:

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

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

API C for diesel engines

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

API C for diesel engine

Examples for diesel engine oil:

API CCEngine oil for small demands

API CDEngine oil for suction- and turbo diesel engine

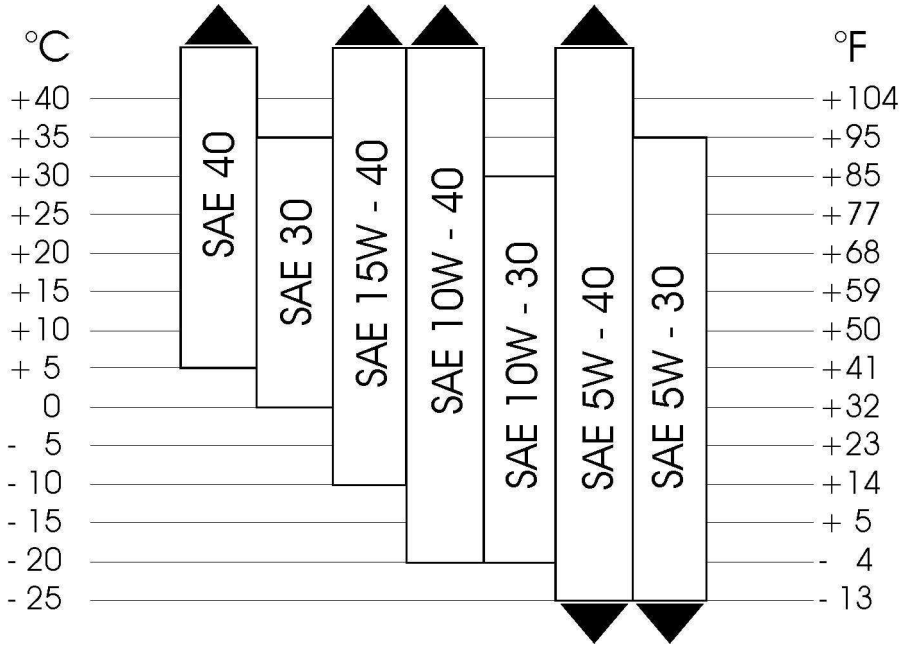
API CFReplace the specification API CD since 1994

API CGEngine oil for highest demands, turbo-tested

For the Fischer Panda Generator the API CF Oil is needed.

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

Fig. 8.5.1-1: Temp. range of the SAE classes



8.6 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.

8.7 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

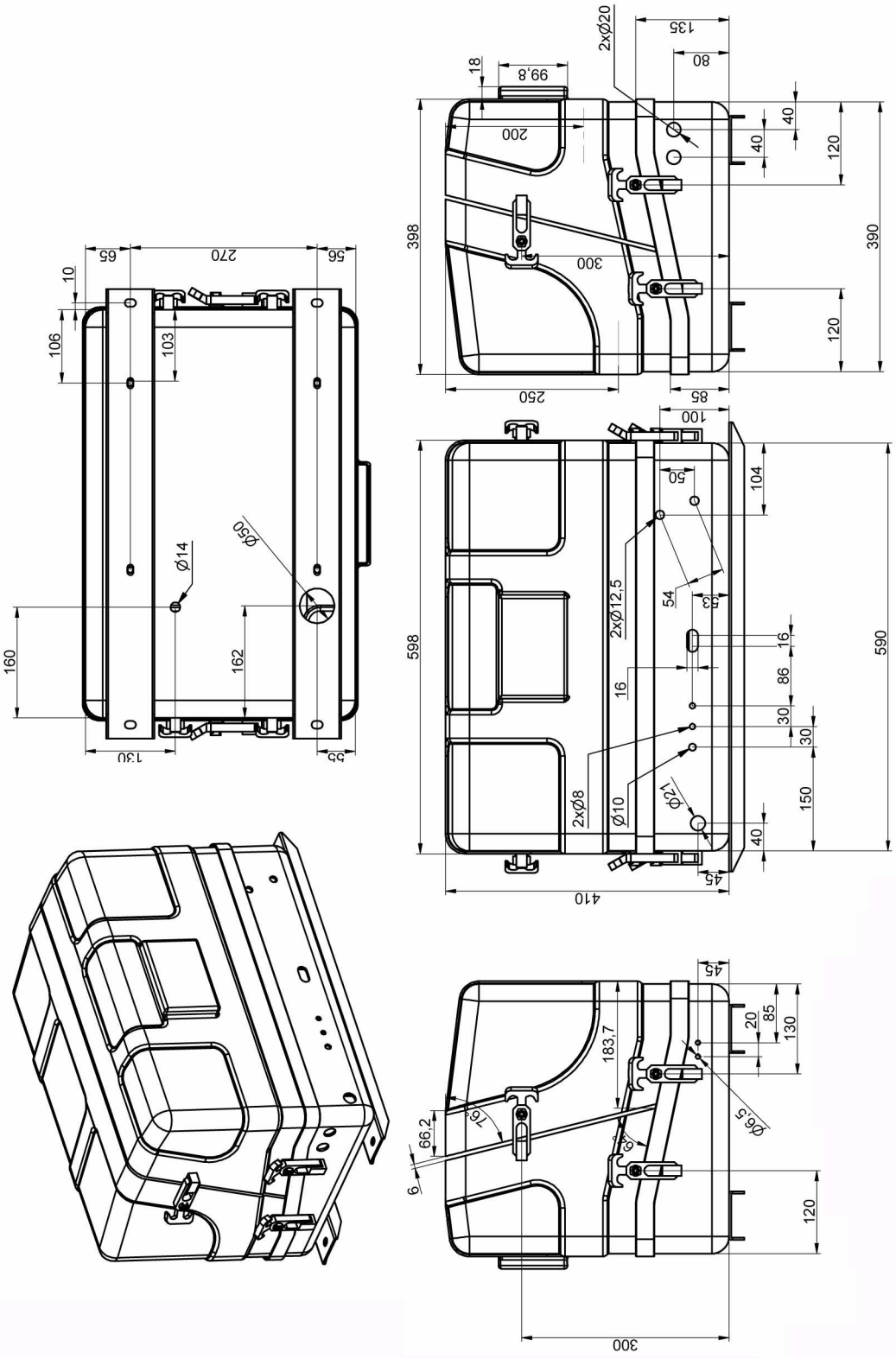
Chemical and physical properties.....		
Density, 20℃	DIN 51 757 procedure 4	1,121 – 1,123 g/ cm^3
Water content	DIN 51 777 part 1	max. 3,5 %
pH-value undiluted		7,1 – 7,3

8.7.1 Coolant mixture ratio

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

8.8 Diamensions

Fig. 8.8-1: Diamensions



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9. Remote control panel Panda iControl

Fischer Panda	**Art Nr.**	**21.02.02.101P**
Fischer Panda	**Bez.**	Panda iControl

	Document	**Hardware**	**Software**
Actual:	R04		
Replace:	R03		

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9.1 Safety instructions

The rotating parts (belt-pulley, belts, etc) must be covered and protected so that there is no danger to life and body!
If a sound insulation cover must be produced at the place of installation, then well-placed signs must show that the generator can only be switched on with a closed capsule.
All servicing-, maintenance or repair work may only be carried out, when the motor is not running.

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

DANGER TO LIVE!

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:

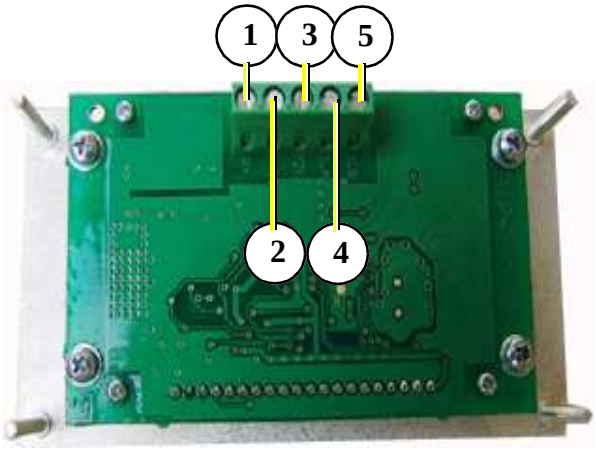
Before start working at the Panda i-series generator (service, repair ect), diconnect the starter battery (First minus cable, then positive cable), so that the generator cannot be unintentionally started.

9.2 Connection of the iControl

To connect the iConrol use the original prepared cable.

(6 wires shilded)

Fig. 9.2-1: iControl back side



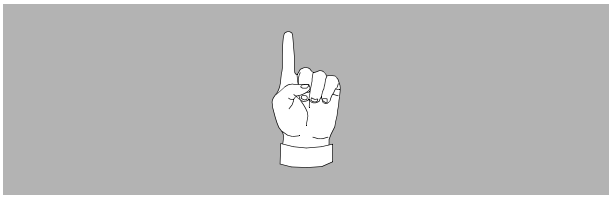
Terminator	U+ cablecolour	Gnd cablecolour	RZL cablecolour	D_A cablecolour	D_B cablecolour
cablecolour 5000i	brown	brown-white	green	blue	blue-white
cablecolour 8000i	brown	brown-white	green	blue	blue-white

Between clamp RZL(3) und Gnd(2) an automatik start device (Battery monitor) can be connected

Regarding to the open electric board the iControl panel has a protectrive class IP00.

Builded in a control board with a siutable seal (f.e. Sikaflex) IP66 can be reached.

Note



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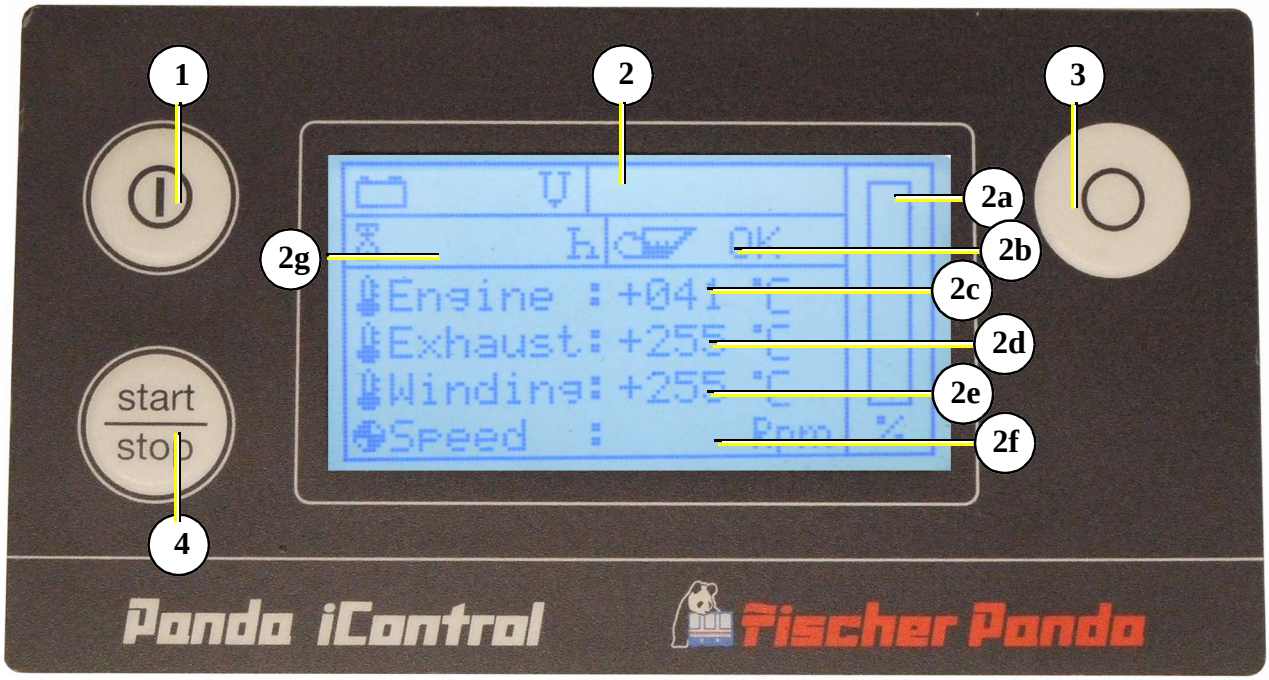
9.3 Buttons and display of the iControl

Fig. 9.3-1: Buttons and diplay of the iControl



1. Button „on/off“
2. Display
2a. Load indication in %
2b. Oil pressure indication „OK“ oder „Fault“
2c. Engine temp. indication
2d. Exhaust elbow temp. indication
2e. Stator Winding temp. indication
2f. Engine rpm indication
2g. Operation hours
3. Button „enter“
4. Button „start/stop“

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9.3.1 Additional information

Fig. 9.3.1-1: **Aditional Information screen 2/**

01. PMGi Inverter output voltage
02. PMGi Inverter output current
03. Generator operation hours
04. Oil pressure indication „OK“ oder „Fault“
05. PMGi Inverter temperature
06. Load indication in %
07. Generator speed

By pressing the Enter button while the genertor is runnung the second screen appear.

On this screen following additional information regarding the Inverter will be shown:

- Temperature of the cooling plate
- Inverter output voltage
- Inverter output current

1. The revision of the hard and software is stored in the electronic memory and can be read out by the service technican.

If the iControl is in the stand by mode and the battery voltage drops under 12.1V for more than 2 min., the iControl shut the system off to prevent the battery for total discharge.

At the Electronic board is an voltage of 450V. Only special trained persons are allowed to open the cover of the Electronic board. DANGER TO LIVE!

Warning!

9.4 Engine control

The iControl Panel and Electronic Board is for driving the Panda i-series generator. Push the „on/off“ button to start the panel(1). The panel will come up in the „stand by mode“.

„stand by mode“

in the stand by mode the iControl checks the generator

- Display shows welcome screen
- the Led-Light will switch off after 2 min. (energie save)
- push the „enter“ button“ to reset the LED-Light timer
- start the generator with the „start/stop“ button --> „run mode“
- start the generator with the „automatic start“ option --> „run mode“

„run mode“

Generator was started with the “start/stop“ button or with the „automatic start option“

- Display light is on
- Display shows generator data
- stop the generator with the „start/stop“ button --> „standby mode“
- stop the generator with the „automatic start“ option --> „standby mode“

9.5 Operation manual

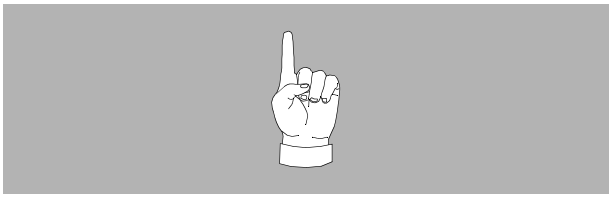
9.5.1 Daily routine checks before starting

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

OIL PRESSURE CONTROL!

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

ATTENTION!



2. State of cooling water.

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

3. Open sea cock for cooling water intake.(if necessary)

   For safety reasons, the seacock should be closed after the generator is switched off for a longer time. It should be re-opened before starting the generator.

4. Check raw water filter.

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

5. Check all hose connections and hose clamps are leakage.

   Leaks at hose connections must be immediately repaired, especially the raw water impeller pump. It is certainly possible that the raw water impeller pump will produce leaks, depending upon the situation. (This can be caused

by sand particles in the raw water etc.) In this case, immediately exchange the pump, because the dripping water will be sprayed by the belt pulley into the sound insulated casing and can quickly cause corrosion.

6. Check all electrical lead terminal contacts are firm.

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

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

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

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

   For the automatic option make shure that the load is connected to the PMGi only, when the nominal output of

9. Check the automatic controls functions and oil pressure.

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

Make sure that the PMGi is connected with the generator. Never connect or disconnect the PMGi when the generator is running. This will destroy the PMGi. (it may burn or explode)

Attention!

9.5.2 General

Very low Temperatures

The generator is disigned to start at temperatures up to -20℃. Please make sure, that the fuel is si utable for your temperature range.

The electronic of the iControl changes the pre-glow time at the generator start according to the actual generator temperature. The normal time at a cold engine is 8 sec. The pre-glow times rises at temperatures below 8°C and drops (down to 0 sec.) at temperatures over 40℃.

Tips regarding Starter Battery

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

Engine Oil at winter conditions.

Make sure using a siutable engine oil at winter conditions.

Do not use start help sprays or similar.

9.5.3 Long time run of the generator

Make sure the PMGi is not overloaded. The PMGi will switch off in this case.

We recommend to calculate the normal load should be at 80% of the nominal load of the generator and PMGi. Normel load is in this case the load you need for a very long period. Nearly 100% of the nominal power of the generator and PMGi can be used for 2-3 hours without any problems.

9.5.4 Start of the generator

1. Open the fuel valve (if necessary)
2. Close the battery switch (if necessary)
3. Push "on/off" button (turn iControl on).

   Panel comes up with „Welcome“ screen
4. Push the „start/stop“ button to switch from „Welcome“ to the „Main“ screen

   Screen switch to „Main“ screen
5. Push „start/stop“ button

   The Engine pre-glow and start. It is not allowed to run the starter motor for more than 10 sec. If the generator does not start within this time, the start is blocked for 20 sec.

   Please check if the fuel is present at the generator, before you try to start the generator again. (and if the fuel is siutable for the temperature range)
6. Switch on the load when the nominal output of 230V / 50Hz is reached at the PMGi. See “Automatic start” on page 117.

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 etc.) 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 seavalve as soon as the generator is started.

9.5.5 Stop of the generator

1. At higher temperatures (over 25℃) the generator should run 5 min. after the load has been switched off in order to cool down)
2. Push the „start/stop“ button to switch off the generator.
3. Close additional switches (battry, fuel ect.).
4. Push the „on/off“ button to turn off the iControl“.

9.5.6 Automatic start

The iControl has an „automatic start“ option at clamp RZL and Gnd. Close the connection of these clamps to start the generator. Open it to stop the generator.

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 starting current. You may use a relay which connects the load at 230V.

To activate the automatic start:

1. Turn the panel on („on/off“ button)
2. Switch to „Main“ screen („start/stop“ button)

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3. Activate automatic start („enter“ button)

To deactivate the automatic start, press the „enter“ button again or switch the panel off with the „on/off“ button

Fig. 9.5.6-1: Display automatic start

9.6 Error warnings

Error warnings are shown in the display. The screen switch from the temperature to „High“.

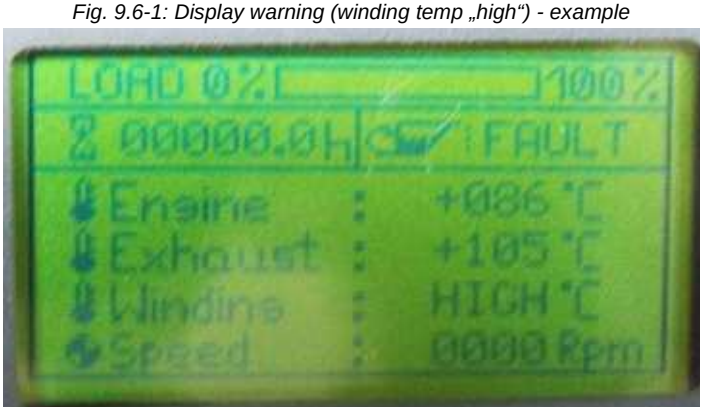
Following warnigs are displayed

Engine temp.	> 75 °C
Exhaust temp.	> 70 °C
Winding temp.	> 120 °C

Example for the warning on the display

(Winding temp. „HIGH“)

Fig. 9.6-1: Display warning (winding temp „high“) - example



9.7 Errors

The least 5 errors are stored in the electronic memory and can be read out by the service technican..

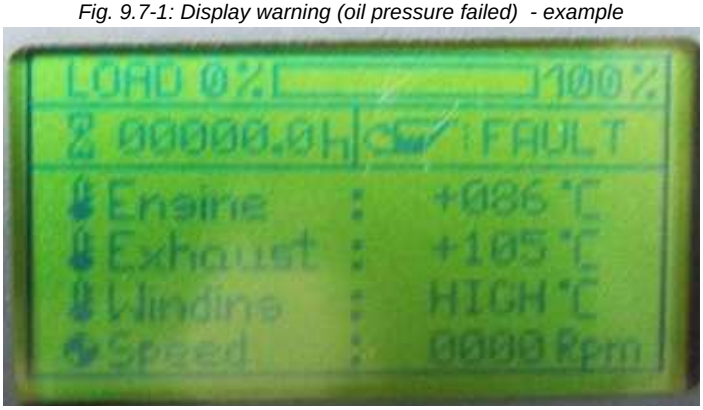
Push the „enter“ button to quitt errors which has stopped the generator

Unexpected stop	Generator stops during operation or RPM droped under 1100 RPM (Fuel low, overload ect.)
Fault: Oilpress	Oilpressure to low
Fault: Winding	Winding temp. over 135℃
Fault: Exhaust	Exhaust tem over> 75℃ (PMS version) or>100℃(vehicl es versions)
Fault: Cyl. Head	Cylinder head temp. over >90℃ (PMS version) or >95 ℃ (vehicles versions)
Starting Fail	Generator do not start after 10 sec.
Inverter failure Overtemp	Inverter to hot
Inverter failure Overload	To much load
Inverter failure Undervoltage	Inverter output voltage to low

Example for an error display after the generator was stopped.

(Oil Pressure failed)

Fig. 9.7-1: Display warning (oil pressure failed) - example



9.8 Electronic board

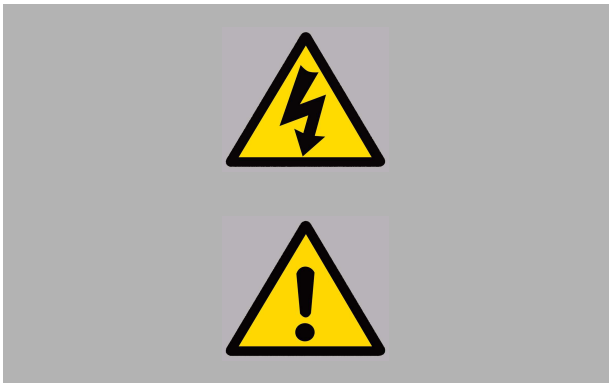
The iControl panel has an electronic board which is mounted at the Generator. This board controls all generator functions.

The bord is in a box and contains self healing fuses and relais.

For safety reasons it is not allowed to open the box of the electronic board. Inside there are up to450VAC. !!!DANGER TO LIFE.

Only special trained persons are allowed to change the board in case of an error.

Attention:!: DANGER TO LIFE



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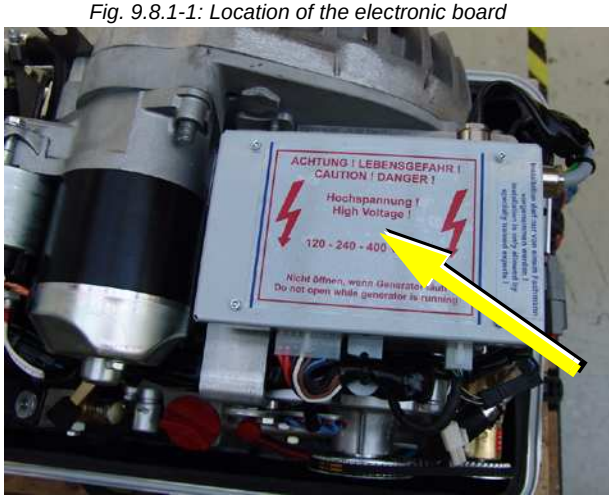
9.8.1 Location at the Panda i-series generator

Electronic board at the Panda 5000i PMS.

The location of the electronic board is depended on the generator type and can vary.

Sample picture

Fig. 9.8.1-1: Location of the electronic board



9.9 Technical data

9.9.1 Intended use

The Panda iControl is a part of the Panda i-series generator. It is not allowed to use the iControl at other generators or applications.

The iControl must be connected with the electronic board at the generator.

See also the safety instructions in the generator and the PMGi manual. 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!

9.10 Bus adapter RS485 to FP bus - optional

To use the iControl panel at the Generators with Fischer Panda bus system, an adapter is needed.

The adapter will be connectet between the icontrol panel and the generator.

The panel must be connected to the RS485 connector at the Bus adapter, the generator must be connected to the FB bus side of the Bus adapter.

Fig. 9.10.0-1: .Bus adaptert

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10. Inverter Panda PMGi 5000

Art Nr..	21.07.03.008P
Bez.	Panda PMGi 5000

	Document	Hardware	Software
Actual:	R01		
Replace:			

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10.1 Safety instruction

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

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

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

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

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

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

Electrical power: DANGER TO LIVE!

10.2 Type plate

1. Location of the type plate

Fig. 10.2-1: Location Type plate

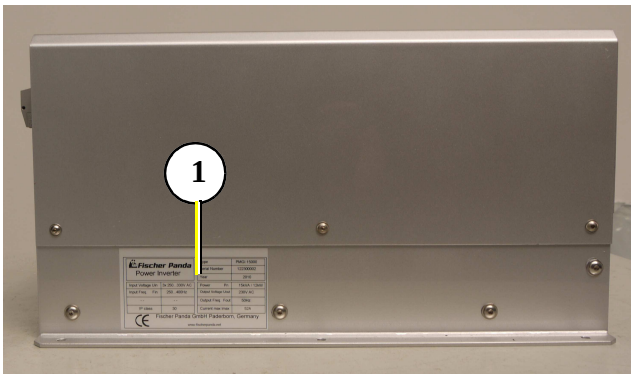

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Fig. 10.2-2: Type plate 230V 50 Hz version

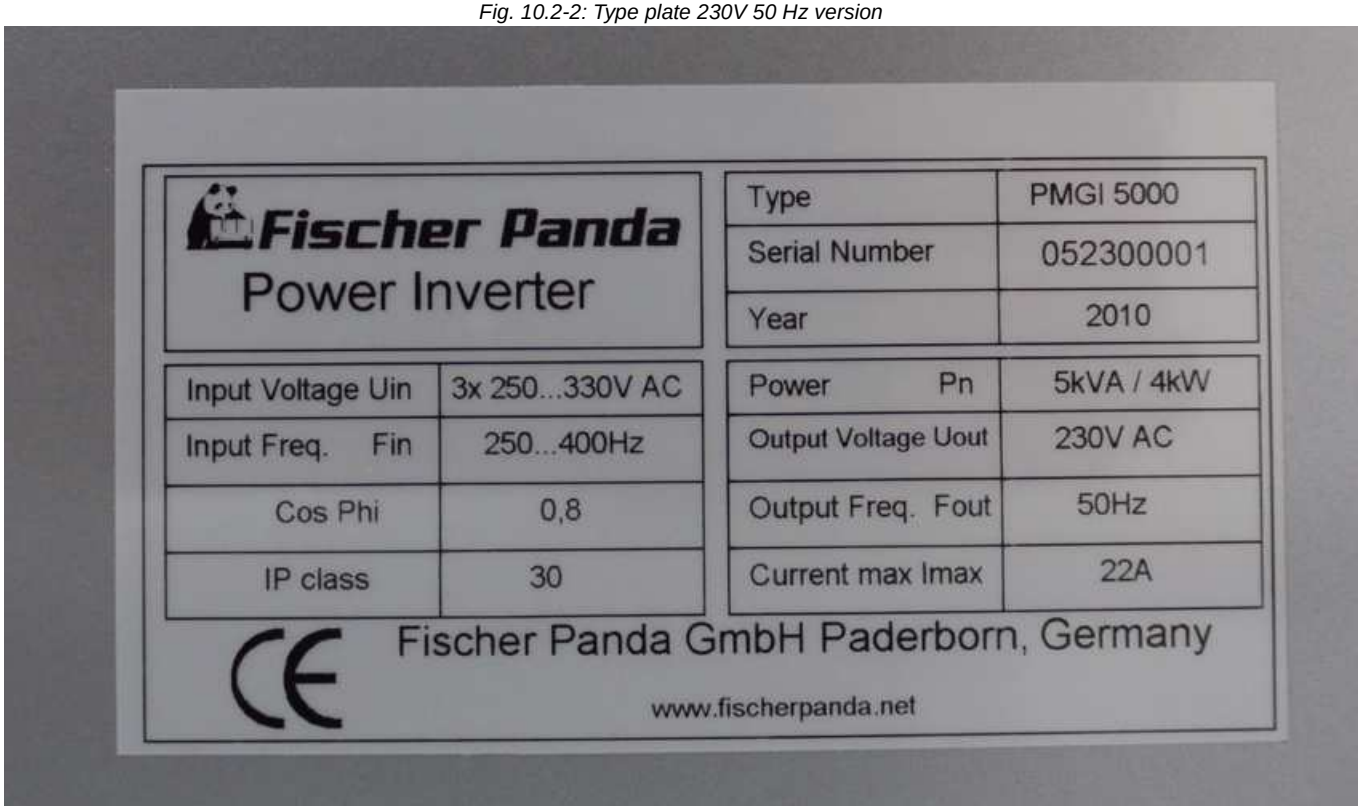
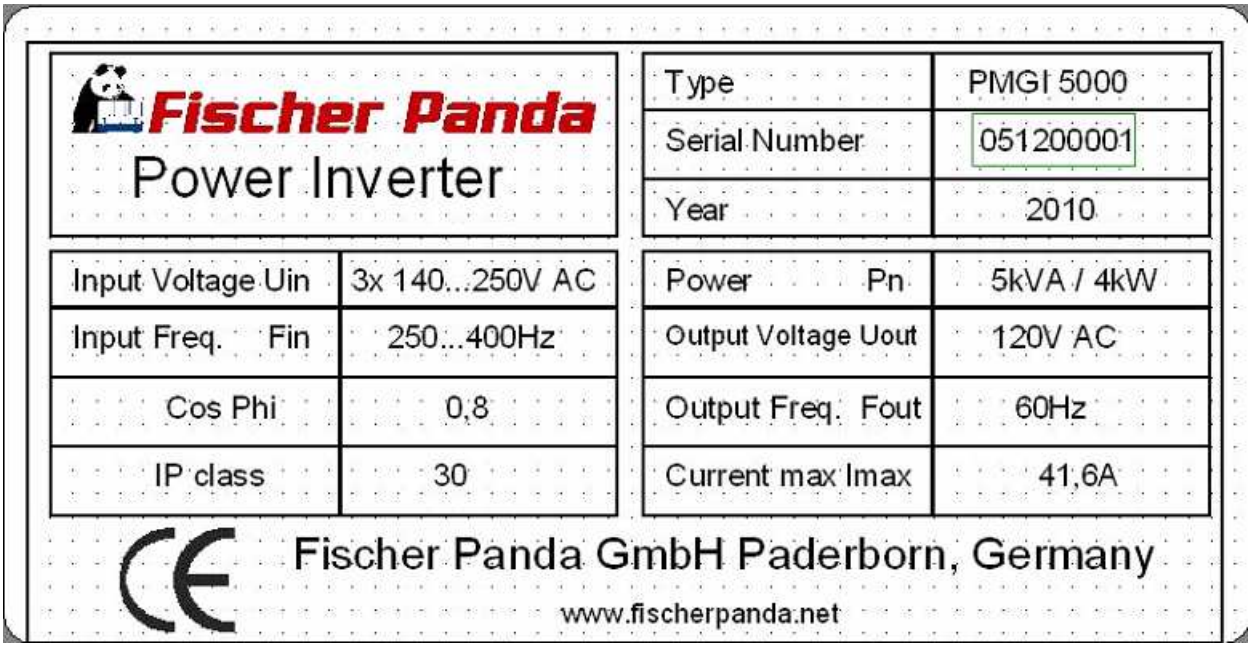


Fig. 10.2-3: Type plate 120V 60 Hz version



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10.3 Front side/connection side

Fig. 10.3-1: Connection side 230V Version

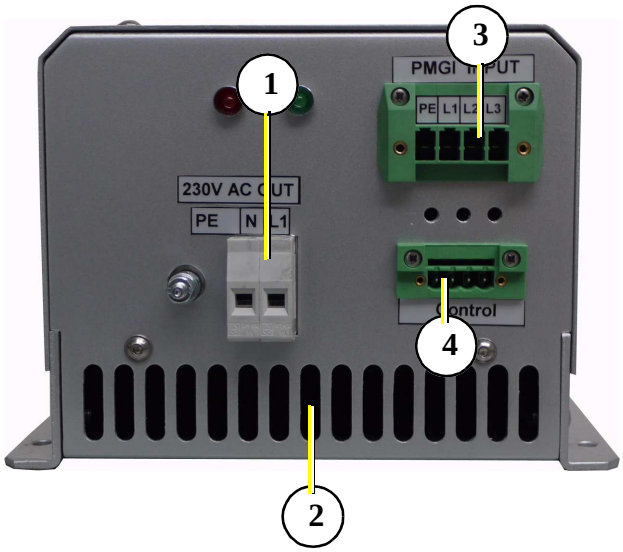


Fig. 10.3-2:

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

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

Do not cover the Air out grille (2)

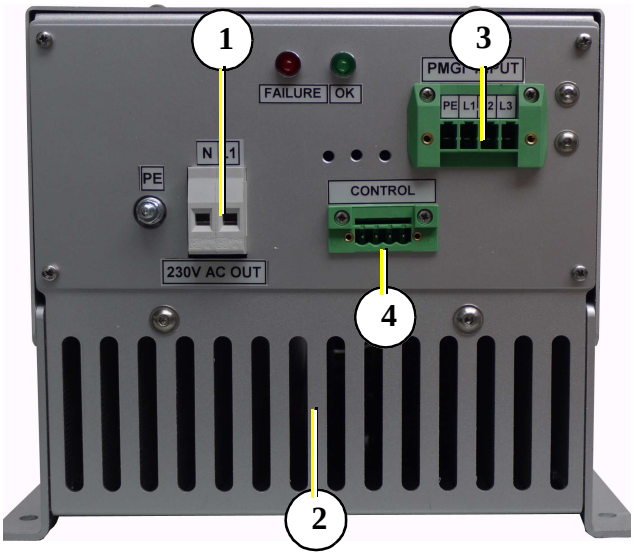
1. Socket for Load

2. Air out grille

3. Socket for generator connection

4. FP- Bus socket connection to generator

Fig. 10.3-3: Connection side 120V Version



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10.3.1 Socket pins of the PMGi 5000

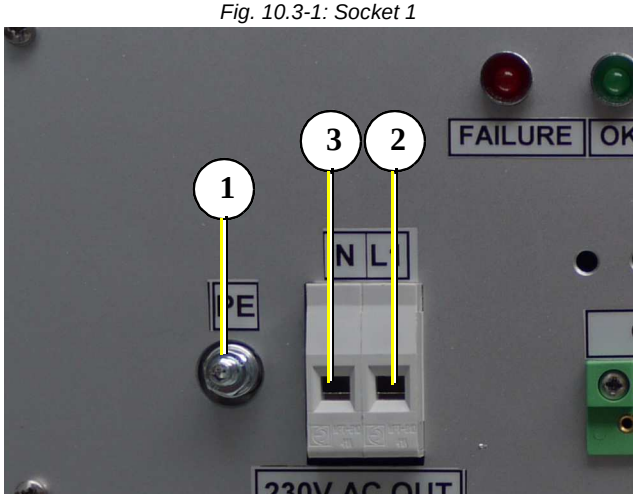
Socket 1 - 230V / 50Hz AC - PMGi out

1. Ground (cabel green/yellow)

2. Live (cabel brown)

3. Neutral (cabel blue)

Fig. 10.3-1: Socket 1



Attention!

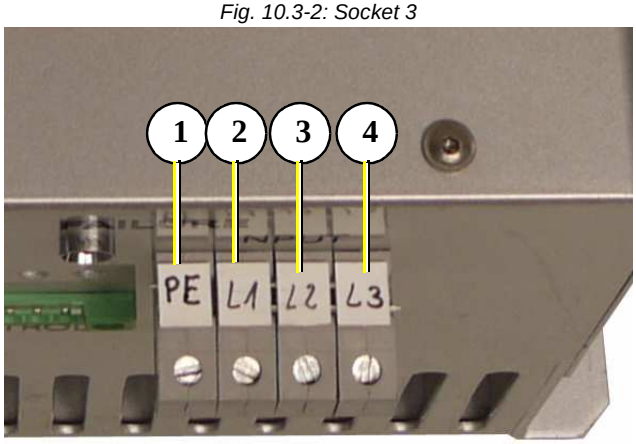
Connecting one of the three Phase with the earth pin will destroy the PGMi

Socket 3 - PMGi in

1. Ground

2-4. Phase 1-3

Fig. 10.3-2: Socket 3



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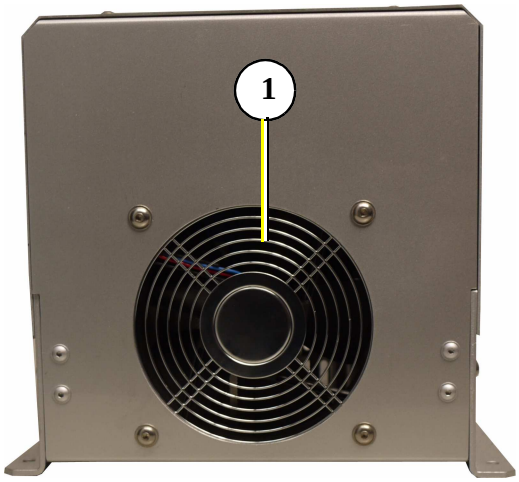
10.4 Back side - Top side

Fig. 10.4-1: Back side



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

01. Air holes

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

Attention!

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

Attention!

10.5 Operation manual

10.5.1 Primary remarks / Winter operation

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

10.5.2 Load at the PMGi

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

10.5.3 Automatic start

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

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

10.6 Status LED´s

Red - Green

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

10.7 Cooling of the PMGi

Inside of the PMGi a fan is mounted.

Do not cover the air holes and grille.

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

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10.8 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.

10.8.1 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 sheated flexible and fireproof cable. Limit length of extension cables depends on the voltage drop along the cable. This drop must be less than 2,5% value of the nominal output voltage.

Pay attention to the right pin assignment. See “Socket pins of the PMGi 5000” on page 127.

10.9 Technical Data

10.9.1 General Data

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

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

10.9.2 Generator Spezifikation

PMG Generator out		3 phase
Voltage Phase	minimum 250V AC	Maximum 550V AC
Frequency	minimum 250 Hz	Maximum 650 Hz

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10.9.3 PMGi out

Voltage

Nominal Voltage	NOV_{AC}	230 VAC +/- 5% without load 120 VAC +/- 5% without load
Regulation	R	5%
Stability (short term (30sec))	D_s	5%
Stability (Long term (4h))	D_l	5%
Voltage offset	V_{offset}	+-5V -20℃ bis +40℃
Current	$Current_{Nominal}$ @230$V_{eff.}$	see type plate
	$Current_{Maximum}$@230$V_{eff.}$	see type plate
Power	Nominal power	see type plate
	Long term	see type plate
Frequency	Nominal Frequency	see type plate
	Regulation	4%
	Stability (short term (30sec))	3%
	Stability (Long term (4h))	3%

10.10PMGi protections

10.10.1 Overload - switch point

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

10.10.2 Short circiut

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

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

Note!

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

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