



# **Fischer Panda**

Power - wherever you are



## **Manual**

**Panda 4000s PMS SC**

**Panda 4000s PMS FC**

230 V - 50 Hz / 3,8 kW

Super silent technology

**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

#### Prohibition!: No Smoking



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

#### Prohibition: Fire and open flames prohibited



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

#### Prohibition: 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 corrosive material - contamination 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**



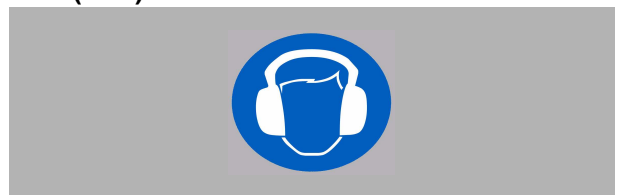
Protective clothing is close fitting, with low resistance to tearing, with narrow sleeves and without protruding parts. It mainly provides protection against being entangled by moving machine parts.

**Instruction!: Wear personal protective equipment (PPE)**



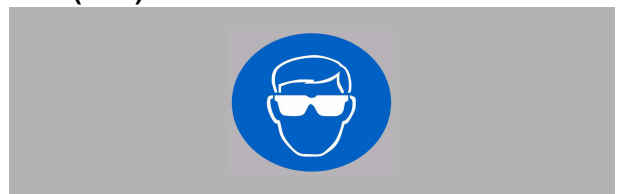
Wear ear defenders to protect the ears against hearing damage.

**Instruction!: Wear personal protective equipment (PPE)**



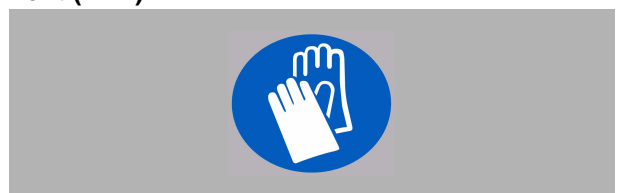
Wear safety glasses to protect the eyes against parts flying around or squirts of fluids. Optical eyeglasses are not replacement for appropriate eye protectors.

**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.

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



	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**

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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**

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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**

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Technical Support per Internet: [info@fischerpanda.de](mailto:info@fischerpanda.de)

#### **1.4.2 Attention, important directions regarding operation!**

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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!

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#### 1.5.1 Safe operation

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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 before operating the generator or any equipment attached to it. It is the owner's obligation 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 machine that may catch on working controls and projections or into fans, pulleys and other moving parts causing personal injury.



Use additional safety items-PPE, e.g. safety protection, safety goggles, 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 Cleanliness 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 immediately 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 lubricating 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 alcohol with diesel fuel. The mixture can cause a fire or severe generator damage.

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



**1.5.6 Exhaust gases and fire prevention**

Generator exhaust fumes can be very harmful if allowed to accumulate. 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 for 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 grass, moved grass, 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 carcinogenic 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°C.(61°F).

### 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.

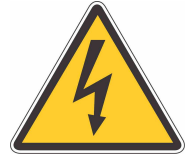
### 1.6.1.2 Ground wire

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 195F, 90°C.

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

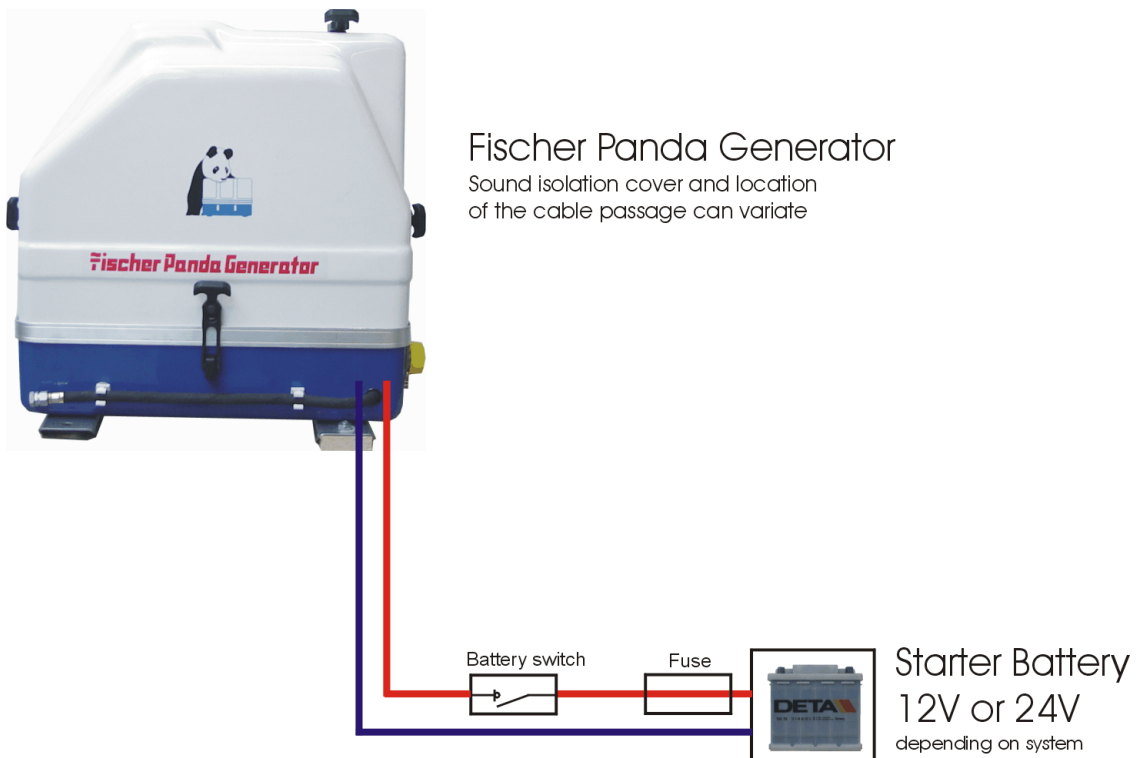
Battery poles must be protected against short circuits by error.

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 too 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**

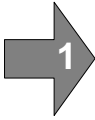
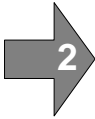
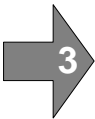
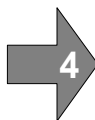
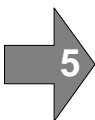


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## 2. In case of Emergency First Aid / Im Notfall - Erste Hilfe



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

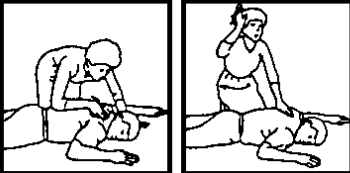
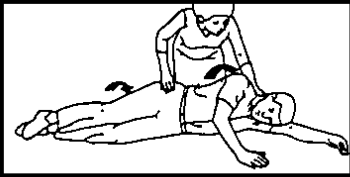
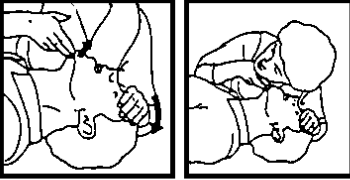








## 2.7 WHEN AN ADULT STOPS BREATHING

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:**



<p><b>1</b> Does the Person Respond?</p>		<p><b>2</b> Shout, "Help!"</p>
<p>Tap or gently shake victim. Shout, "Are you OK?"</p>		<p>Call people who can phone for help.</p>
<p><b>3</b> Roll Person onto Back.</p>		
<p>Roll victim toward you by pulling slowly.</p>		
<p><b>4</b> Open Airway.</p>		<p><b>5</b> Check for Breathing.</p>
<p>Tilt head back, and lift chin. Shout, "Are you OK?"</p>		<p>Look, listen, and feel for breathing for 3 to 5 seconds.</p>
<p><b>6</b> Give 2 Full Breaths.</p>		
<p>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.</p>		
<p><b>7</b> Check for Pulse at side of Neck.</p>		<p><b>8</b> Phone EMS for Help.</p>
<p>Feel for pulse for 5 to 10 seconds.</p>		<p>Send someone to call an ambulance.</p>
<p><b>9</b> Begin Rescue Breathing.</p>		<p><b>10</b> Recheck Pulse Every Minute.</p>
<p>Keep head tilted back. Lift chin. Pinch nose shut. Give 1 full breath every 5 seconds. Look, listen, and feel for breathing between breaths.</p>		<p>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.</p>



## 3. Basics

### 3.0.1 Intended use of the machine

---

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

The diesel fuel is converted to mechanical 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 controlled by the external components, like the remote control panel and the voltage control system (VCS).

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

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

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

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

---

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

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

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

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

#### 3.0.2.1 Trained persons

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

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

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

### 3.0.3 Operator

---

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

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

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

#### 3.0.3.1 User

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

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



## 3.1 Panda Transport Box

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### 3.1.1 Bolted Fischer Panda Transport Box

---

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

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

---

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

## 3.2 Transport and Loading/Unloading

---

---

### 3.2.1 Transporting the generator

---

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

### 3.2.2 Loading/unloading of the generator

---

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



An adequate lifting yoke shall be used for transport/ loading

Fig. 3.2-1: Lifting yoke (example)



## 3.3 Scope of delivery

The Fischer Panda PMS generator system contains following components:

### 3.3.1 Asynctron Genertoren:

#### Fischer Panda Generator

*representative picture*

Fig. 3.3-1: Fischer Panda Generator



#### Remote control panel

*representative picture*

Fig. 3.3-2: Remote control panel



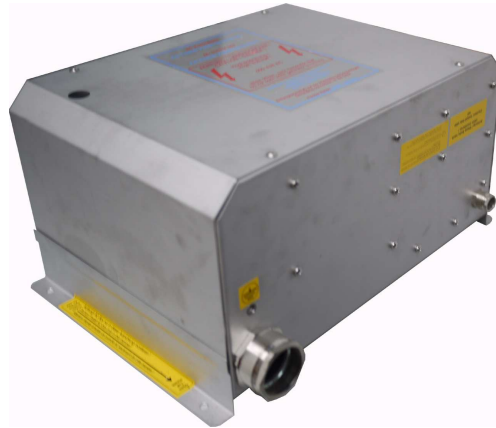
### AC Control Box

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

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

*representative picture*

Fig. 3.3-3: AC Control Box



### Fischer Panda Manual

The Fischer Panda Manual contains the following components:

- Clear foil bag with general information etc.
- Generator manual with added remote control panel manual
- Spare part catalog „Installation & Service Guide“
- Engine manual from the engine manufacturer.
- Wiring diagram for the generator

*representative picture*

Fig. 3.3.1-4: Fischer Panda Manual





## Optionales components

f.e.:

- Fuel pump
- Installation kit
- Water lock
- ect.

## 3.4 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.



Closure locked

Fig. 3.4-1: Sound insulation capsule, side part

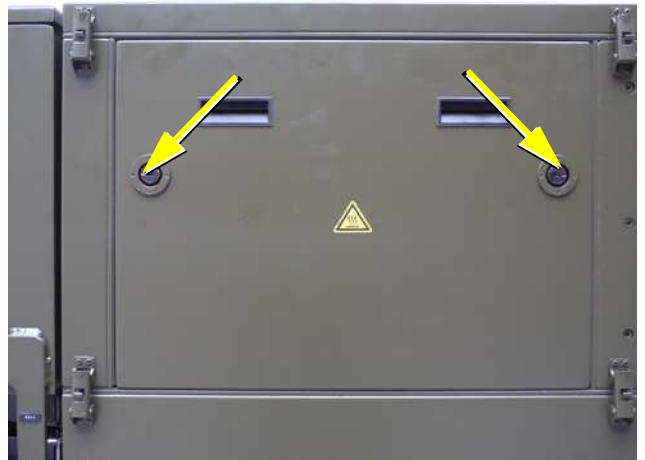


Fig. 3.4.0-2: Closure locked



Closure open

Fig. 3.4-3: Closure open



### 3.4.1 Opening the GFK sound insulation capsule

GFK sound insulation capsule with lash closures

Fig. 3.4-1: 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 parts can be removed.

Fig. 3.4-2: Lash closures





## 4. The Panda Generator

### 4.1 Type plate at the Generator

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

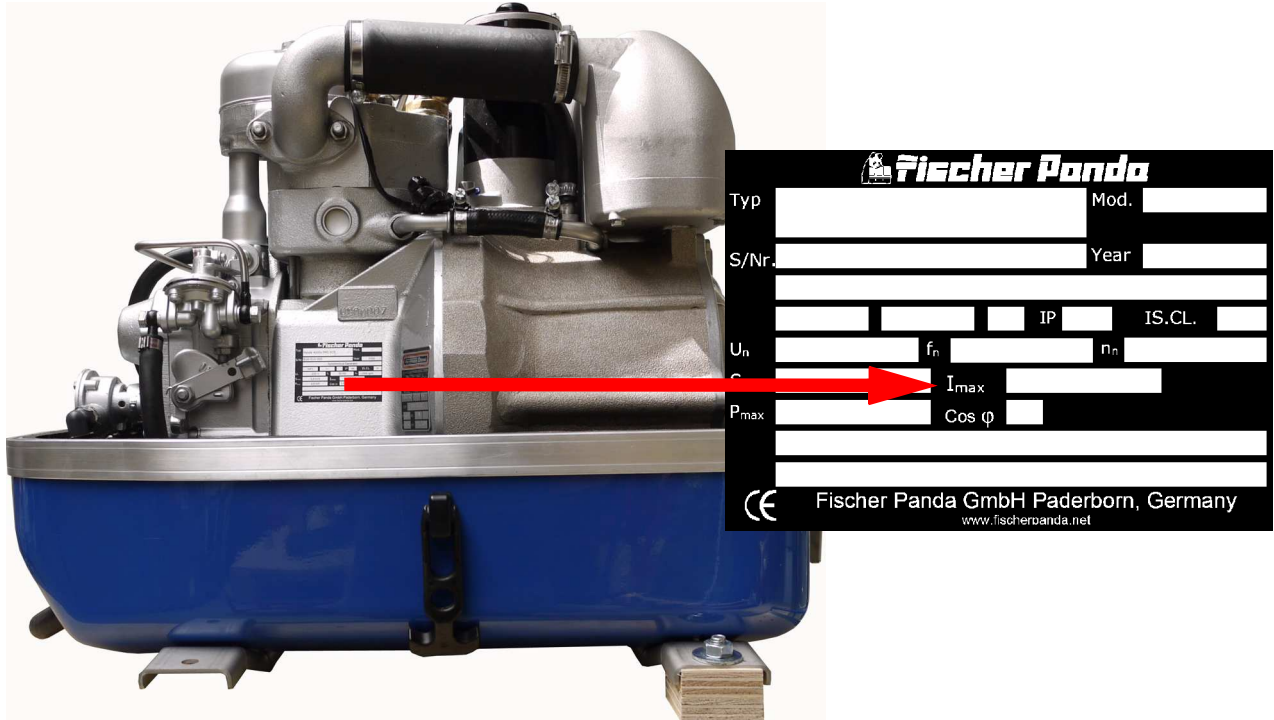
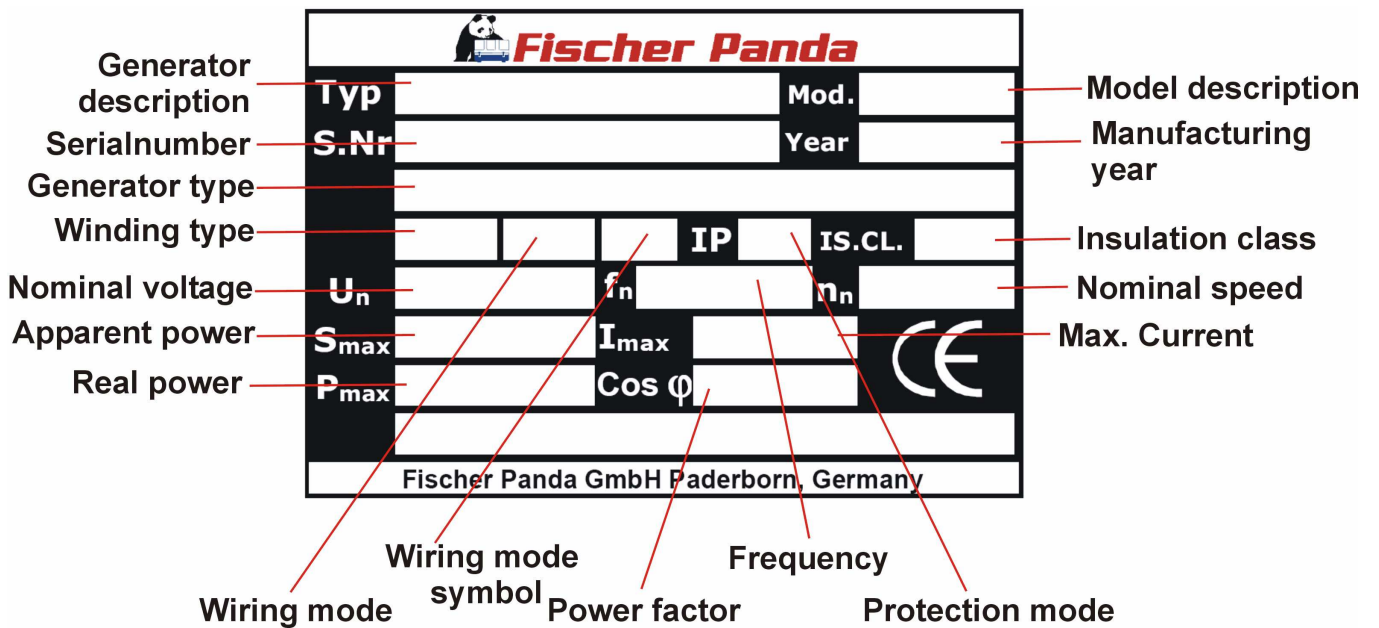


Fig. 4.1-2: Discription type plate

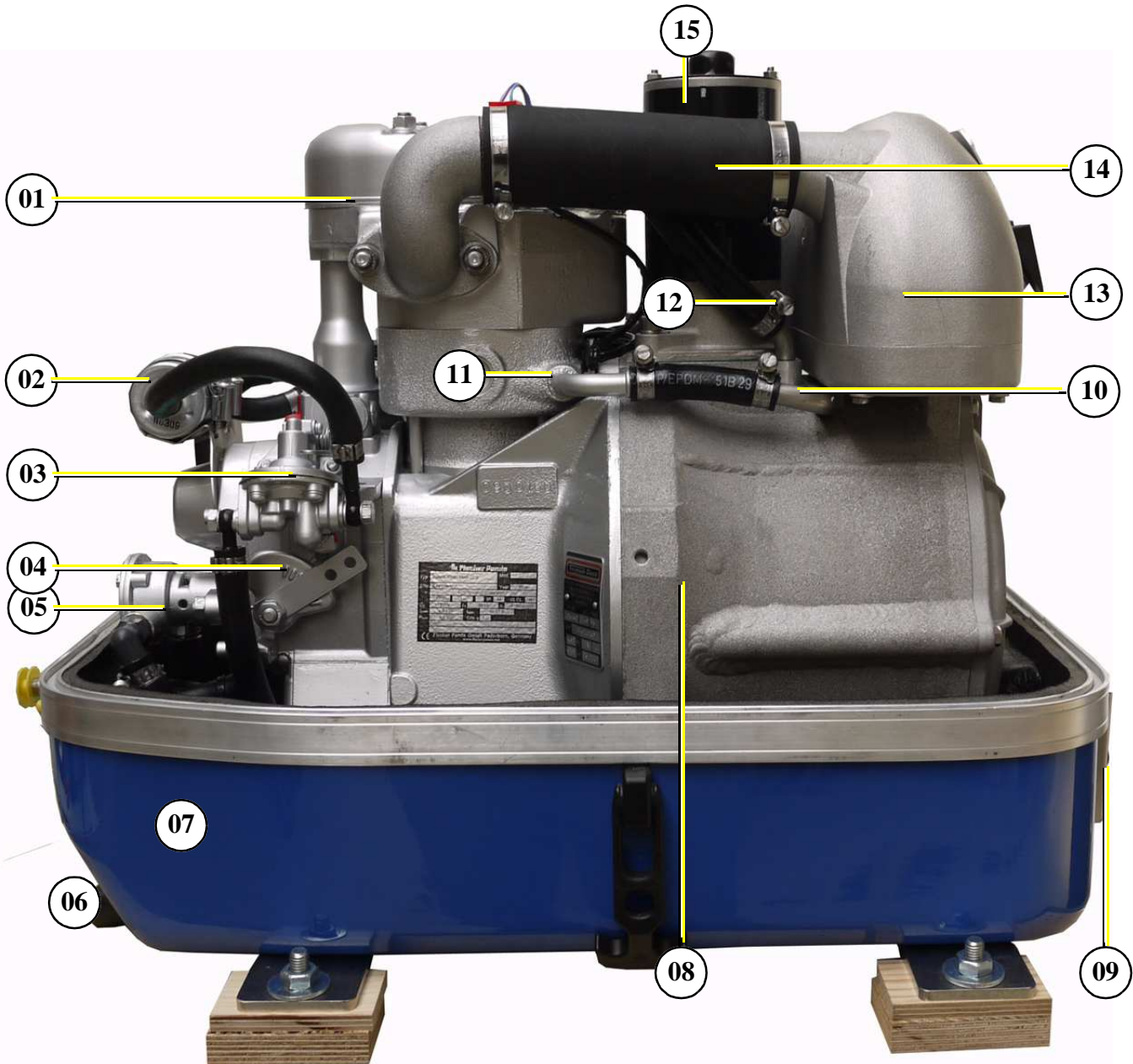




### 4.2 Description of the Generator 4000s SC PMS

#### 4.2.1 Right Side View 4000s SC PMS

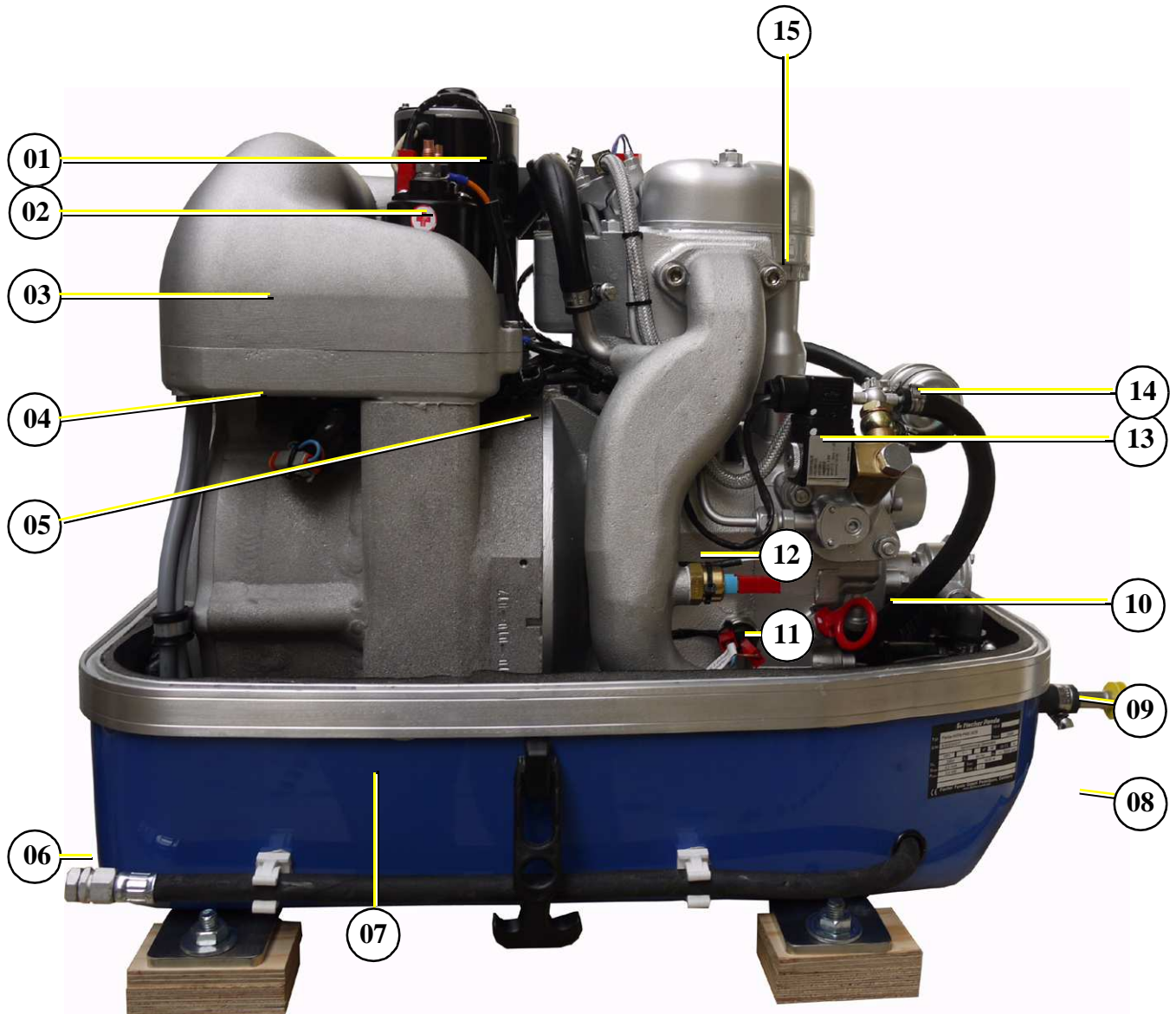
Fig. 4.2.1-1: Right side view



- |  |   |
|--|---|
| 01) Cylinder head  | 09) Combustion air intake                               |
| 02) Fuel filter  | 10) Cooling water out at winding                        |
| 03) Mechanical fuel pump                                 | 11) Cooling water in at engine                          |
| 04) Speed adjust lever                                   | 12) Cooling water bypass from winding out to engine out |
| 05) Raw water pump                                       | 13) Generator power terminal box and airfilter housing  |
| 06) Connection hose for cooling circle ventilation valve | 14) Air suction hose                                    |
| 07) Sound cover base part                                | 15) Starter motor                                       |
| 08) Generator housing with coil                          |   |

## 4.2.2 Left Side View 4000s SC PMS

Fig. 4.2.2-1: Left side view



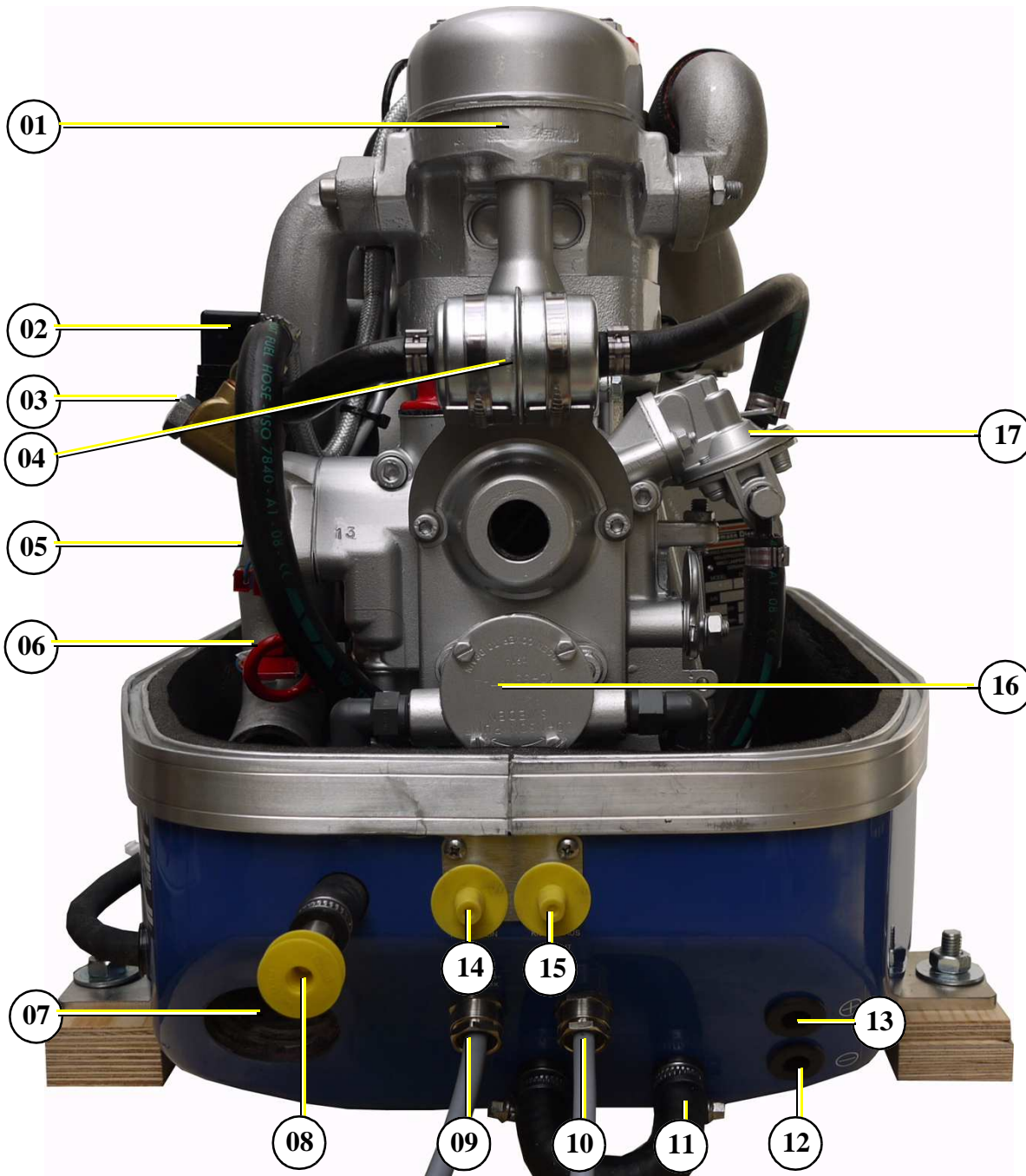
- |  |                                 |
|--|---------------------------------|
| 01) Starter motor                                      | 10) Oil dipstick                |
| 02) Solenoid switch for starter motor                  | 11) Oil pressure switch         |
| 03) Generator power terminal box and airfilter housing | 12) Thermo switch exhaust elbow |
| 04) Circuit breaker 015A                               | 13) Fuel solenoid valve         |
| 05) Plug for optional electrical fuel pump             | 14) Fuel filter                 |
| 06) Oil drain hose                                     | 15) Cylinder head               |
| 07) Sound cover base part                              |                                 |
| 08) Cable for load and remote control panel            |                                 |
| 09) Raw water in                                       |                                 |





### 4.2.3 Front View 4000s SC PMS

Fig. 4.2.3-1: Front view

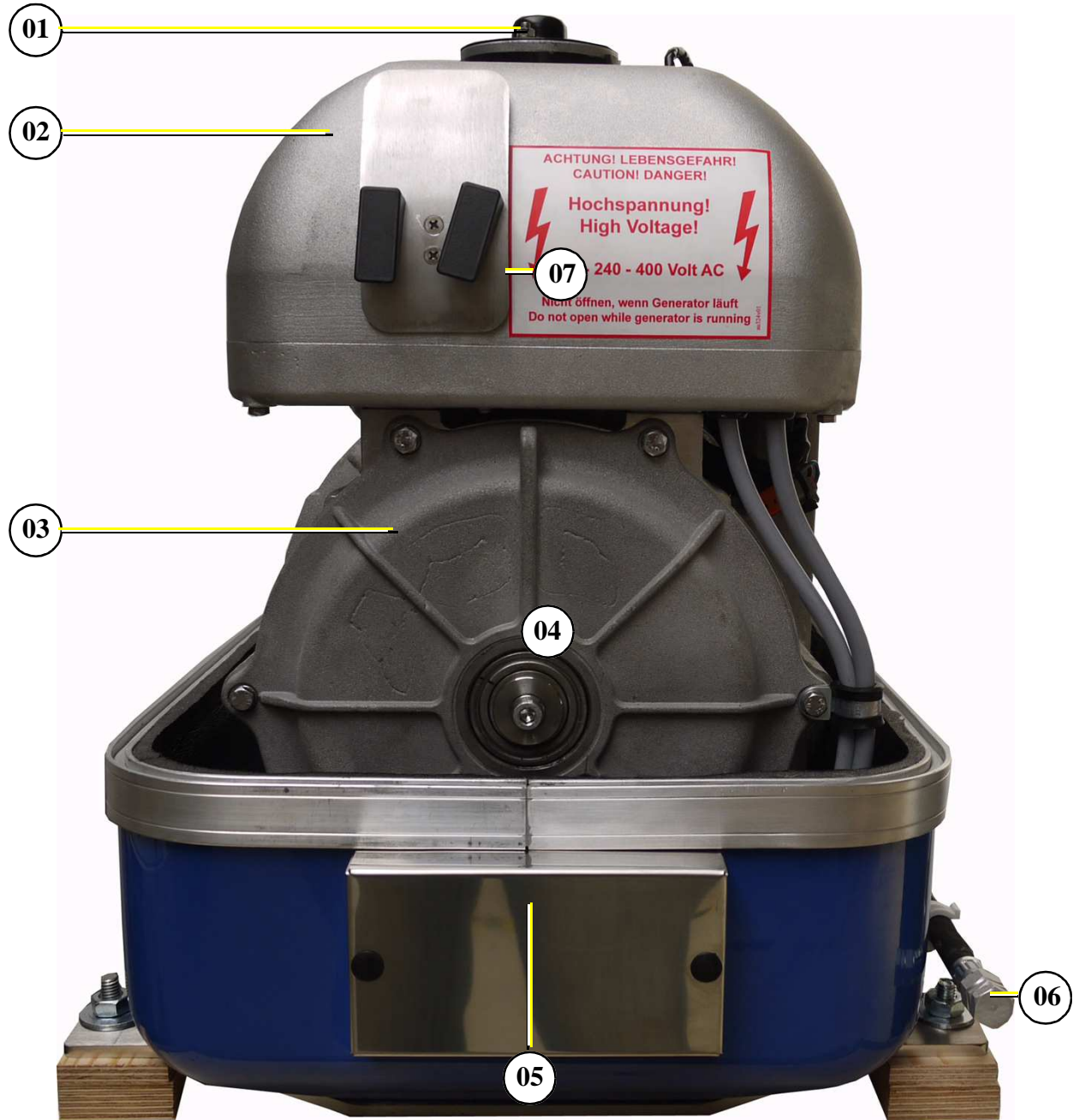


- |                                      |  |
|--------------------------------------|--|
| 01) Cylinder head                    | 10) Cable for control panel                              |
| 02) Fuel solenoid valve              | 11) Connection hose for cooling circle ventilation valve |
| 03) Ventilation screw solenoid valve | 12) Passage for battery cable (-)                        |
| 04) Fuel filter                      | 13) Passage for battery cable (+)                        |
| 05) Water cooled exhaust elbow       | 14) Connection fuel IN                                   |
| 06) Engine oil dipstick              | 15) Connection fuel OUT                                  |
| 07) Passage exhaust hose             | 16) Raw water pump                                       |
| 08) Cooling water in                 | 17) Fuel pump  |
| 09) Cable for load                   |  |



#### 4.2.4 Back View 4000s SC PMS

Fig. 4.2.4-1: Back view



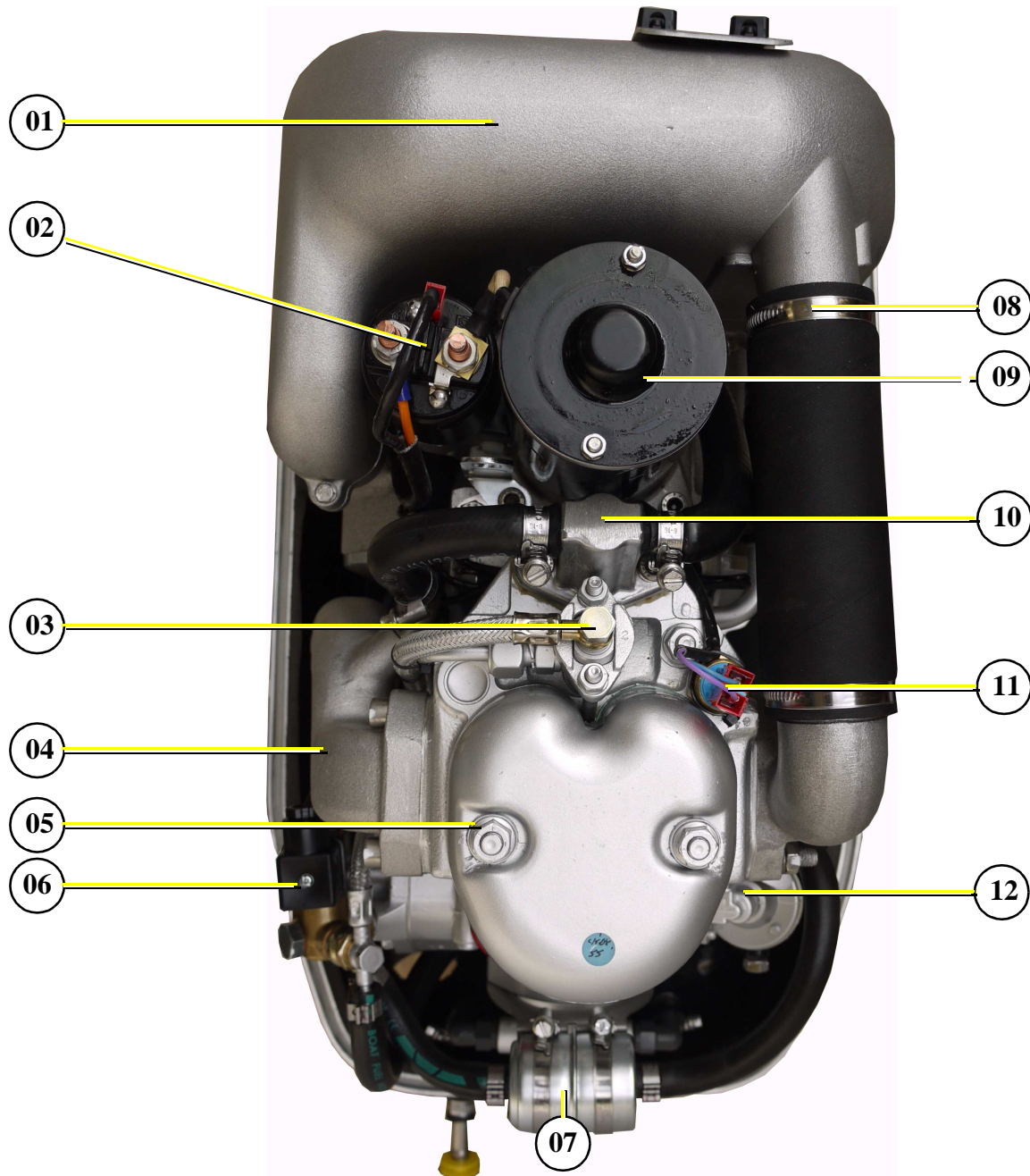
- 01) Starter motor
- 02) Generator power terminal box and airfilter housing
- 03) Front plate
- 04) Ball bearing

- 05) Air inlet
- 06) Oil drain hose
- 07) Air filter holder



### 4.2.5 View from above 4000s SC PMS

Fig. 4.2.5-1: View from above



- 01) Generator power terminal box and airfilter housing
- 02) Solenoid switch for starter motor
- 03) Injection nozzle
- 04) Water-cooled exhaust elbow
- 05) Cylinder head
- 06) Fuel solenoid valve
- 07) Fuel filter

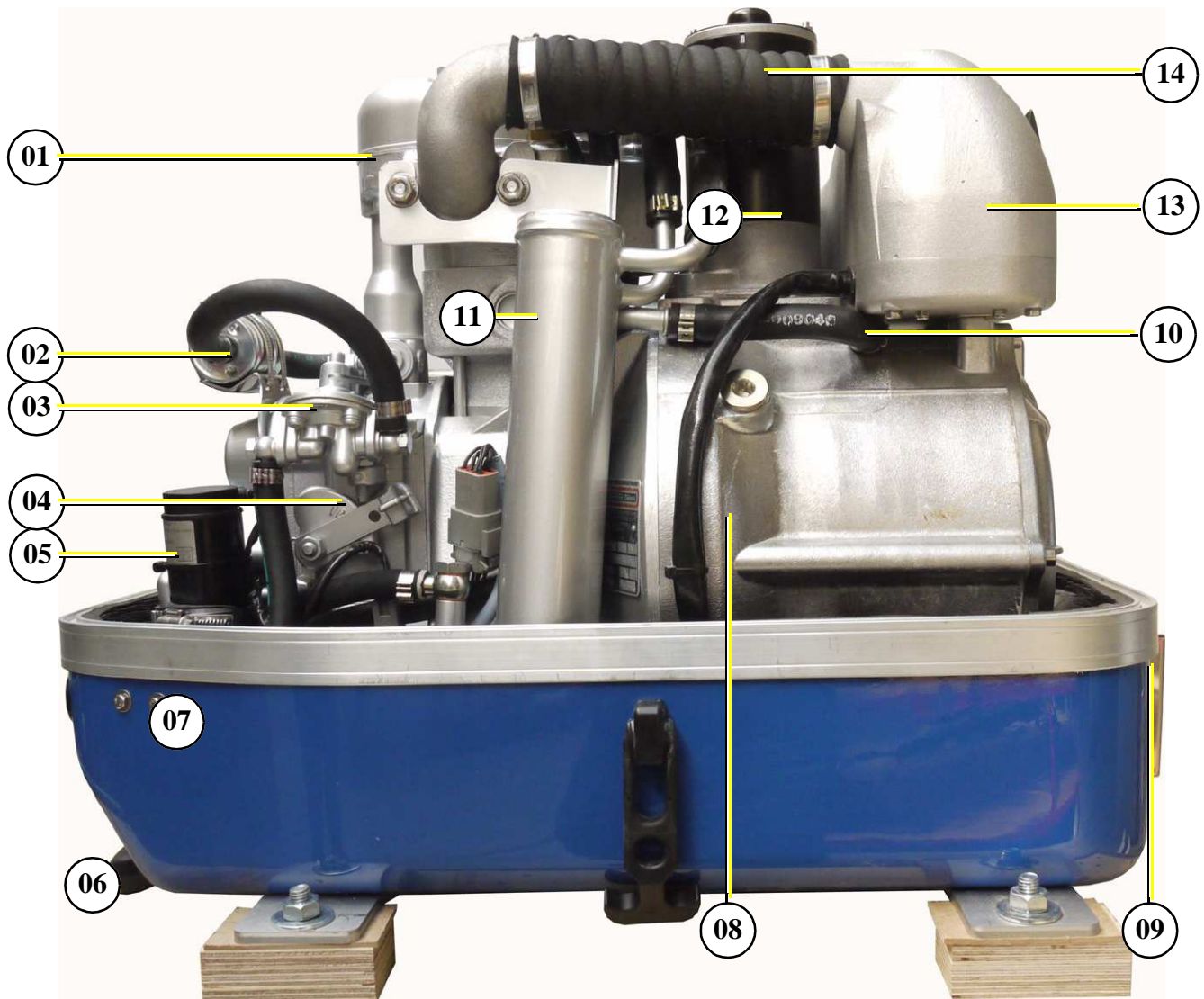
- 08) Air suction hose
- 09) Starter motor
- 10) Cooling water connection block
- 11) Thermo-switch cylinder head
- 12) Fuel pump



## 4.3 Description of the Generator 4000s FC PMS

### 4.3.1 Right Side View 4000s FC PMS

Fig. 4.3.1-1: Right side view

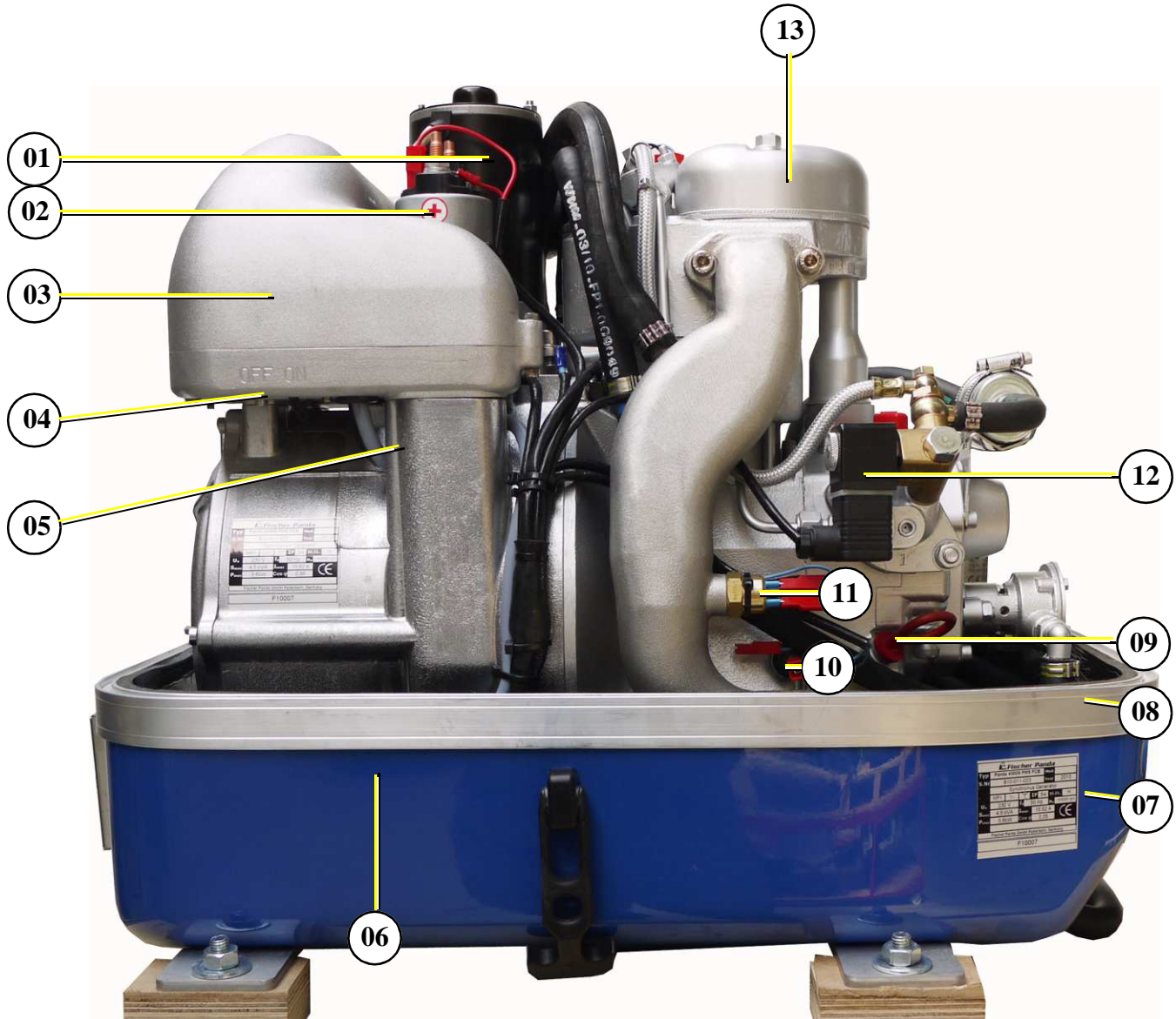


- |  |  |
|--|--|
| 01) Cylinder head  | 08) Generator housing with coil                        |
| 02) Fuel Filter  | 09) Combustion air intake                              |
| 03) Mechanical fuel pump                                 | 10) Cooling water out at winding                       |
| 04) Speed adjust lever                                   | 11) Heat exchanger                                     |
| 05) Fresh water pump                                     | 12) Starter motor                                      |
| 06) Connection hose for cooling circle ventilation valve | 13) Generator power terminal box and airfilter housing |
| 07) Sound cover base part                                | 14) Air suction hose                                   |



### 4.3.2 Left Side View 4000s FC PMS

Fig. 4.3.2-1: Left side view



- 01) Starter motor
- 02) Solenoid switch for starter motor
- 03) Generator power terminal box and airfilter housing
- 04) Circuit breaker 015A
- 05) Plug for optional electrical fuel pump i(inside box)
- 06) Sound cover base part
- 07) Cable for load and remote control panel

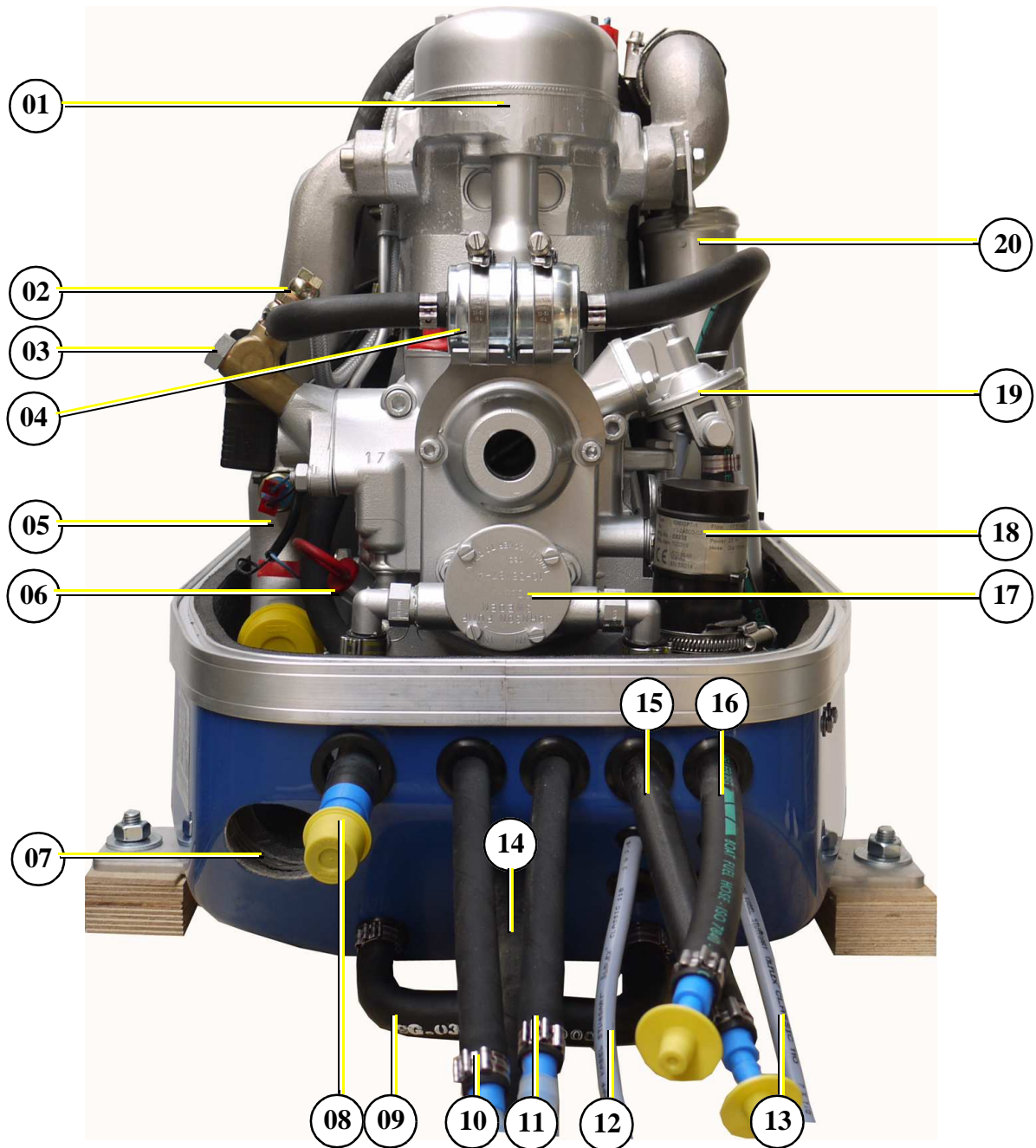
- 08) Raw water in
- 09) Oil dipstick
- 10) Oil pressure switch
- 11) Thermo switch exhaust elbow
- 12) Fuel solenoid valve
- 13) Cylinder head





### 4.3.3 Front View 4000s 4000s FC PMS

Fig. 4.3.3-1: Front view

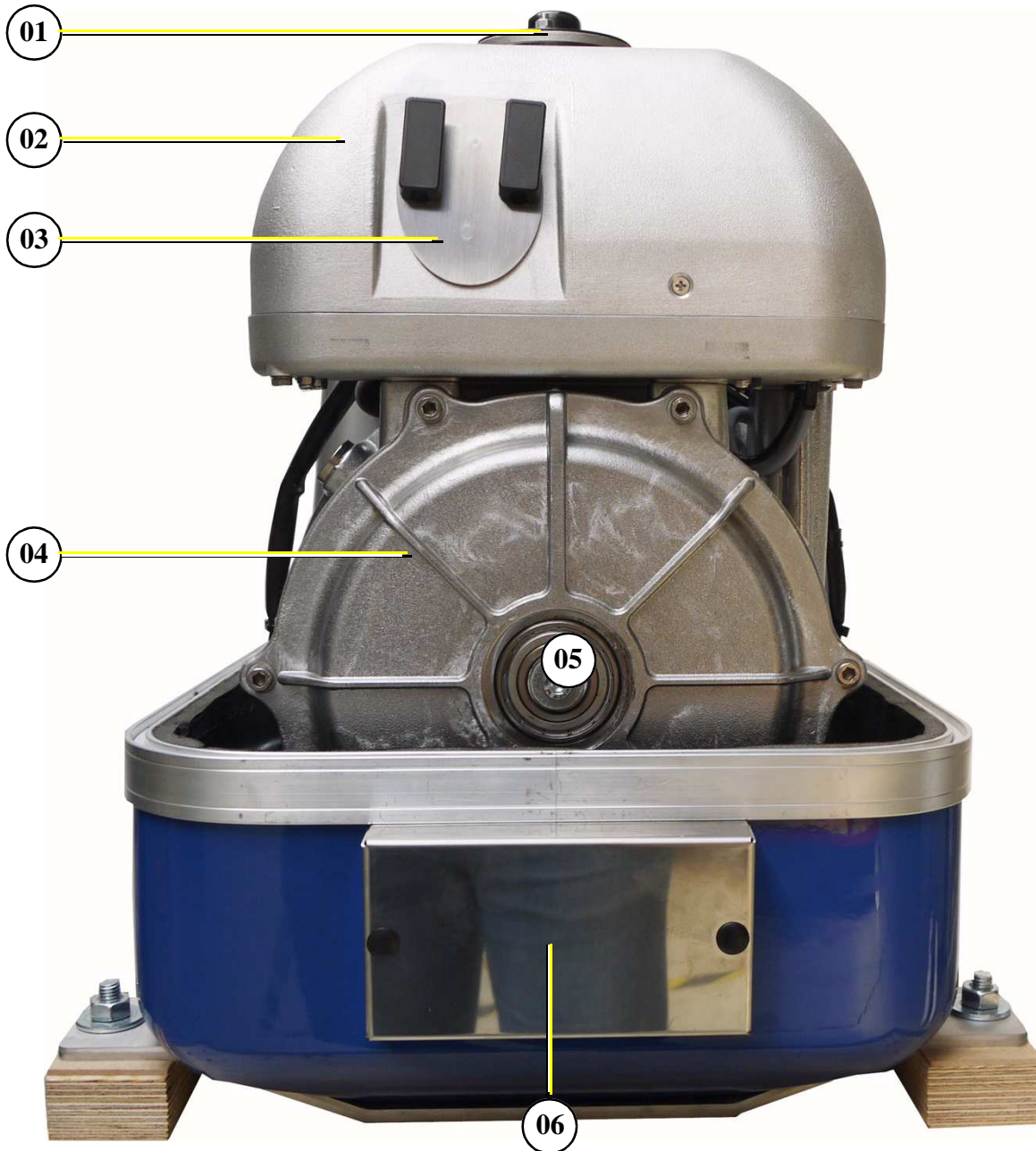


- |  |   |
|--|---|
| 01) Cylinder head  | 11) Connection hose for external expansion tank |
| 02) Fuel solenoid valve                                  | 12) Cable for load                              |
| 03) Ventilation screw solenoid valve                     | 13) Cable for control panel                     |
| 04) Fuel filter  | 14) Oil drain hose                              |
| 05) Water cooled exhaust elbow                           | 15) Connection fuel IN                          |
| 06) Engine oil dipstick                                  | 16) Connection fuel OUT                         |
| 07) Passage exhaust hose                                 | 17) Raw water pump                              |
| 08) Cooling water in                                     | 18) Fresh water pump                            |
| 09) Connection hose for cooling circle ventilation valve | 19) Fuel pump                                   |
| 10) Connection hose for external expansion tank          | 20) Heat exchanger                              |



## 4.3.4 Back View 4000s FC PMS

Fig. 4.3.4-1: Back view



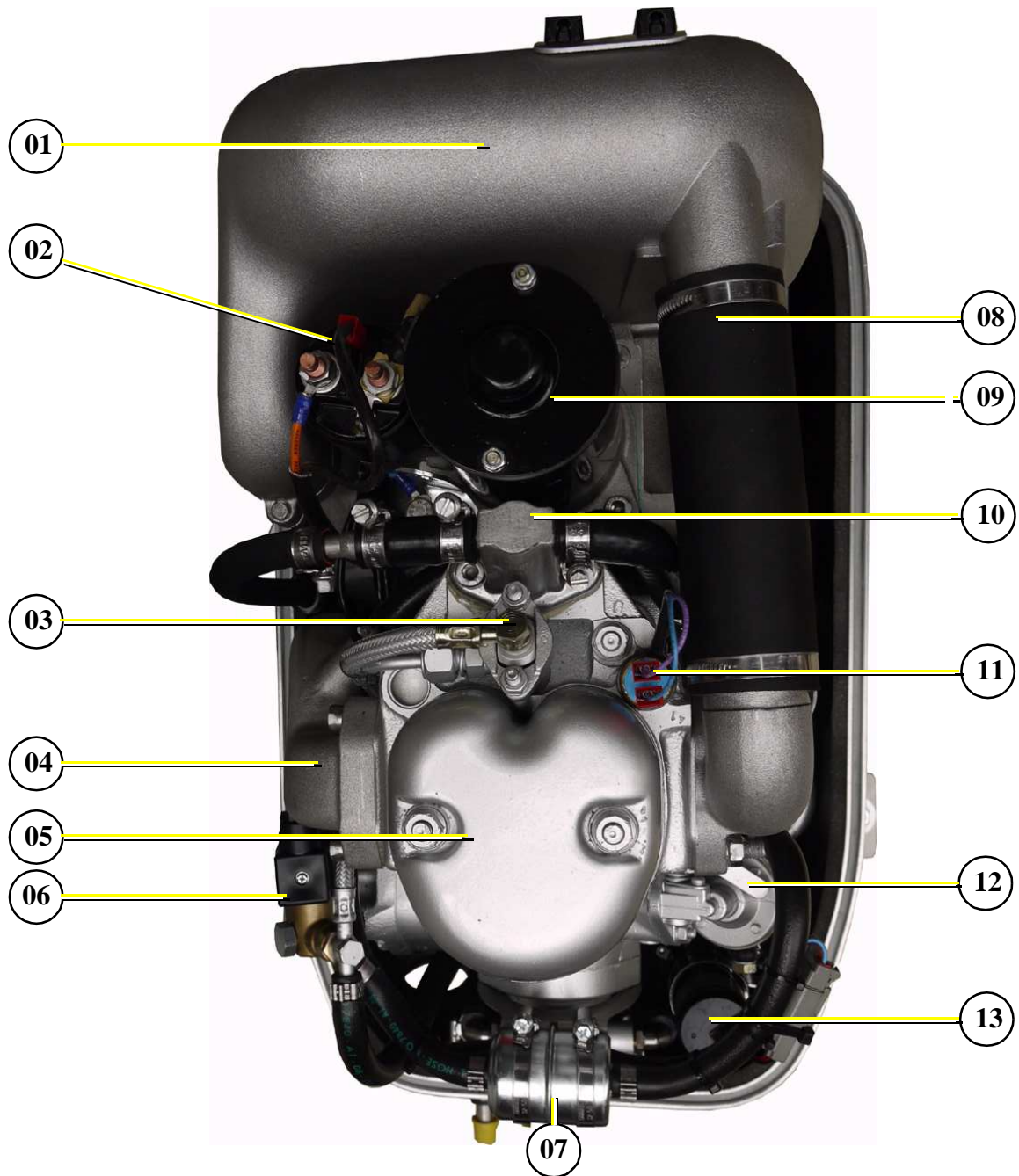
- 01) Starter motor
- 02) Generator power terminal box and airfilter housing
- 03) Air filter holder

- 04) Front plate
- 05) Ball bearing
- 06) Air inlet



### 4.3.5 View from above 4000s FC PMS

Fig. 4.3.5-1: View from above



- 01) Generator power terminal box and airfilter housing
- 02) Solenoid switch for starter motor
- 03) Injection nozzle
- 04) Water-cooled exhaust elbow
- 05) Cylinder head
- 06) Fuel solenoid valve
- 07) Fuel filter

- 08) Air suction hose
- 09) Starter motor
- 10) Cooling water connection block
- 11) Thermo-switch cylinder head
- 12) Fuel pump
- 13) Fresh water pump



## 4.4 Details of Functional Units

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### 4.4.1 Remote Control Panel - see Remote Control Panel Datasheet

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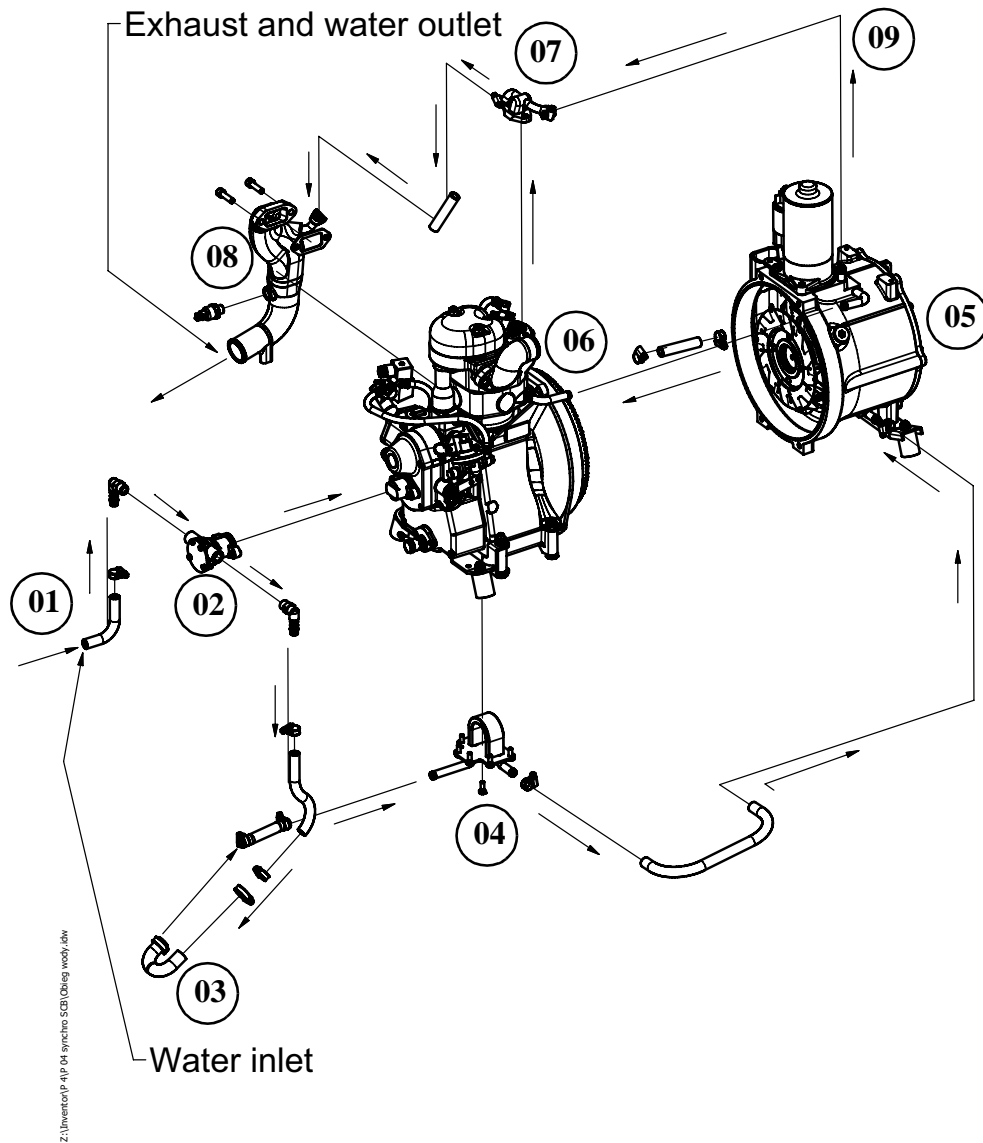
#### Remote Control Panel

The remote control panel is necessary to control the generator and to evaluate the motor/generator properties. The generators will automatically cutout, if it does not run as required. The generator may not be run without the remote control panel.



#### 4.4.2 Components of Cooling System (Raw water) 4000s SC

Fig. 4.4.2-1: One circle system



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



### Raw water intake

The diagram shows the supply pipes for the generator. The connection neck for the raw water connection is shown on the right hand side. The cross-section of the intake pipe should be nominally larger than the generator connection.

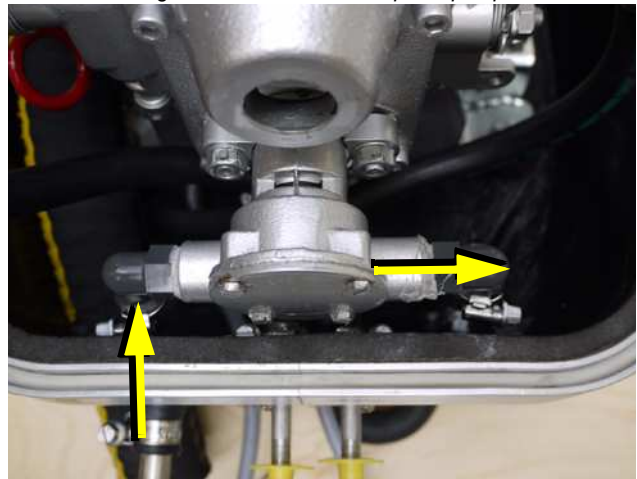
Fig. 4.4.2-2: Raw water intake



### Raw water impeller pump

The raw water pump is fitted with a rubber impeller. This pump is self-inductive. If, for example, you forget to open the sea valve, then you must expect the impeller to be destroyed after a short period of time. It is recommended to store several impellers on board as spare parts.

Fig. 4.4.2-3: Raw water impeller pump

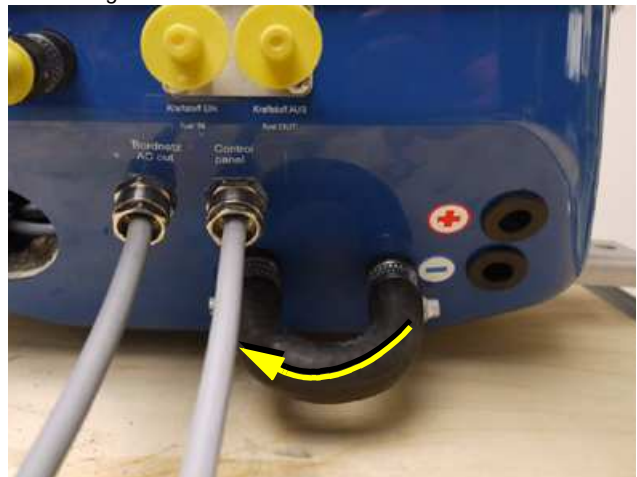


### Ventilation valve

An appropriate ventilation line must be installed, if the danger exists that the generator can stand only briefly by movements of the ship below the waterline. For this generally a hose line is prepared at the generator housing. The two pipe unions are bridged by a hose shaped part, which can be removed.

The raw water flows then through the oil cooler, which is mounted under the engine.

Fig. 4.4.2-4: Connection external ventilation valve

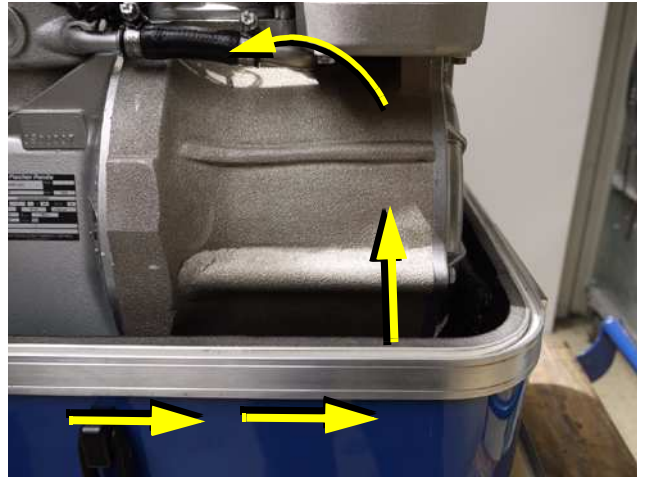




### Generator housing

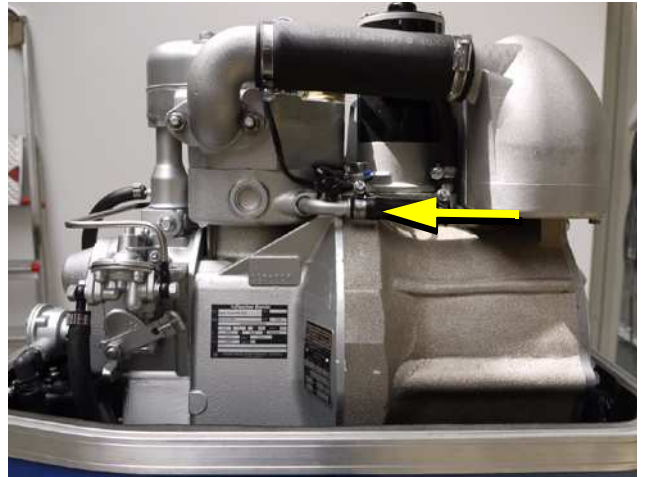
The water in is at the bottom of the Generator housing. The water out is at the top of the generator.

Fig. 4.4.2-5: Generator housing



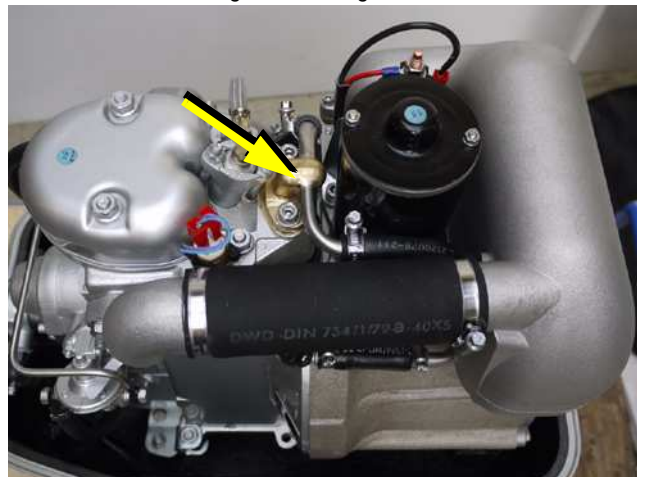
### Engine in

Fig. 4.4.2-6: Engine in



### Engine out (water connection block)

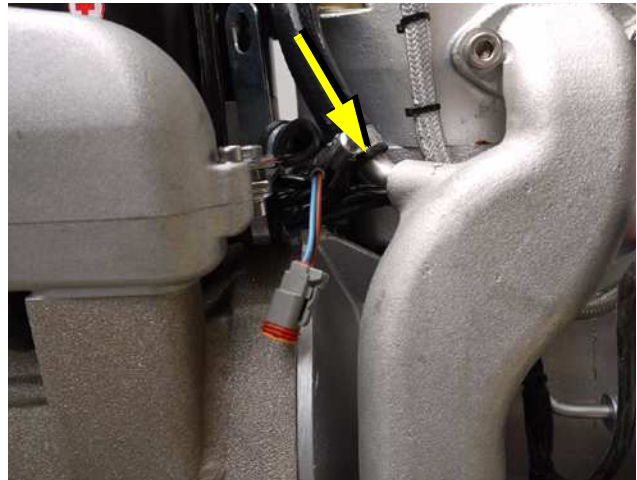
Fig. 4.4.2-7: Engine out



### Injection Port Raw Water

The point of introduction (point of injecting) for the raw water cooled exhaust system of the marine generator is at the exhaust elbow. The exhaust elbow must be checked regularly carefully for traces by corrosion.

Fig. 4.4.2-8: Injection raw water



### Raw Water Output

The raw water discharges together with the exhaust.

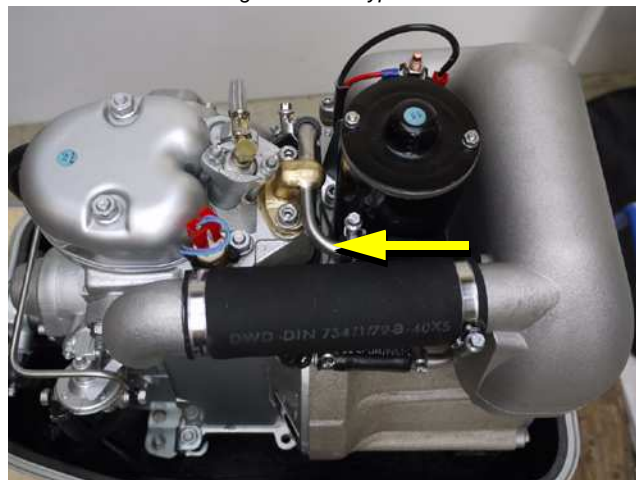
Fig. 4.4.2-9: Raw water output



### Bypass

There is a bypass from the generator housing to the water connection block.

Fig. 4.4.2-10: Bypass

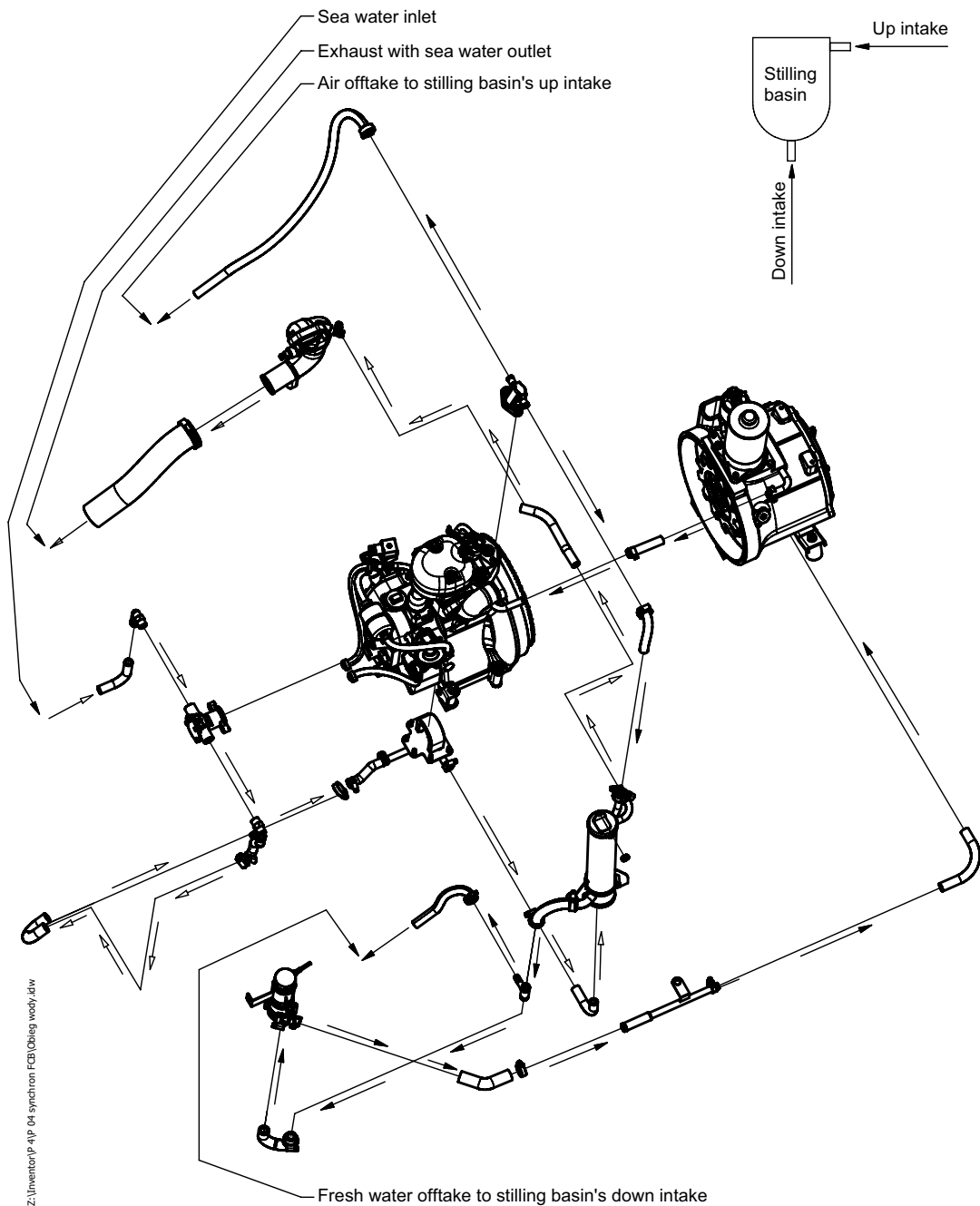






### 4.4.3 Components of Cooling System (Raw water + Fresh water) 4000s FC

Fig. 4.4.3-1: Two circle system



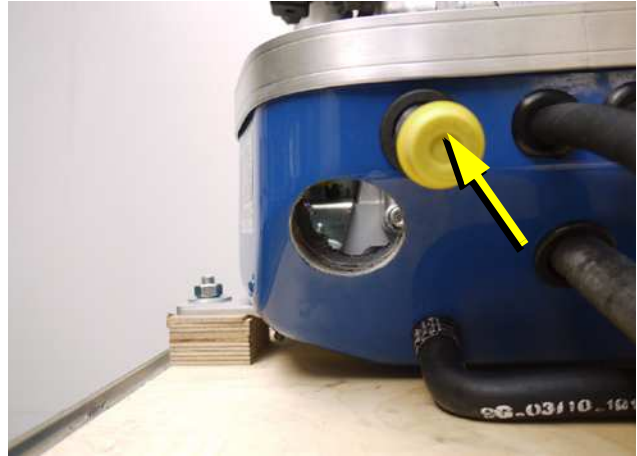
- |  |   |
|--|---|
| 01) Cooling water in (raw water in)                      | 07) Water connection block (cooling water out at engine)                |
| 02) Raw water pump                                       | 08) Water cooled exhaust elbow  |
| 03) Connection hose for cooling circle ventilation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

#### 4.4.3.1 Components of Cooling System (Raw water) 4000s FC

##### Raw water intake

The diagram shows the supply pipes for the generator. The connection neck for the raw water connection is shown on the right hand side. The cross-section of the intake pipe should be nominally larger than the generator connection.

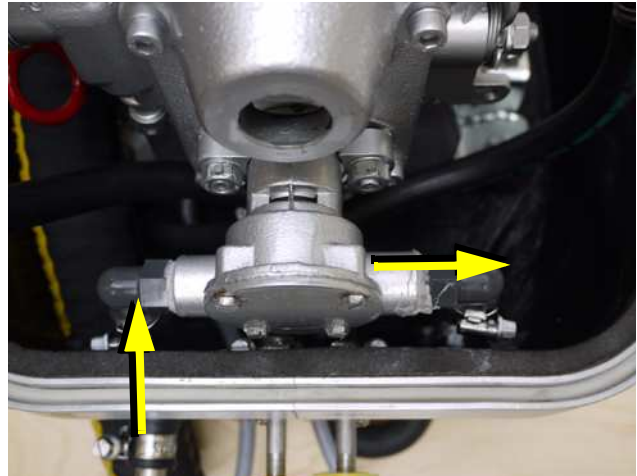
Fig. 4.4.3-1: Raw water intake



##### Raw water impeller pump

The raw water pump is fitted with a rubber impeller. This pump is self-inductive. If, for example, you forget to open the sea valve, then you must expect the impeller to be destroyed after a short period of time. It is recommended to store several impellers on board as spare parts.

Fig. 4.4.3-2: Raw water impeller pump



##### Ventilation valve

An appropriate ventilation line must be installed, if the danger exists that the generator can stand only briefly by movements of the ship below the waterline. For this generally a hose line is prepared at the generator housing. The two pipe unions are bridged by a hose shaped part, which can be removed.

The raw water flows then through the oil cooler, which is mounted under the engine.

Fig. 4.4.3-3: Connection external ventilation valve

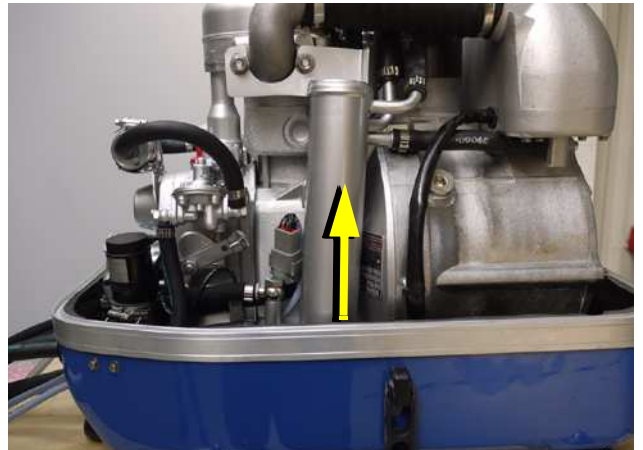




## Heat exchanger

The internal fresh water cooling circle is separated by the heat exchanger from the raw water cooling circle. It is reached that the raw water circle does not come with the construction units of the generator into contact. The raw water comes from the oil cooler and is led at the discharge of the heat exchanger directly into the exhaust elbow.

Fig. 4.4.3-4: Heat exchanger



## Injection port raw water

The point of introduction (point of injecting) for the raw water cooled exhaust system of the marine generator is at the exhaust elbow. The exhaust elbow must be checked regularly carefully for traces by corrosion.

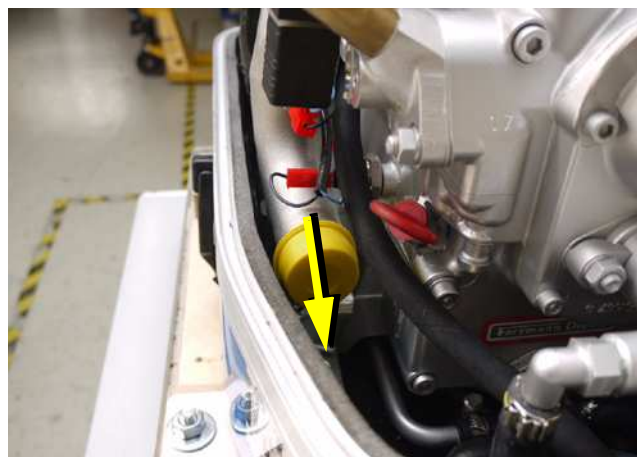
Fig. 4.4.3-5: Injection raw water



## Raw water output

The raw water discharges together with the exhaust.

Fig. 4.4.3-6: Raw water output

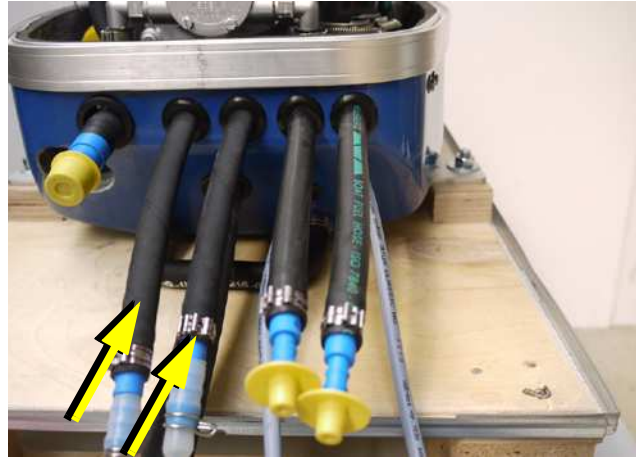


### 4.4.3.2 Components of Cooling System (Fresh water)4000s FC

#### Connection external expansion tank

The external expansion tank is connected by two hose connections.

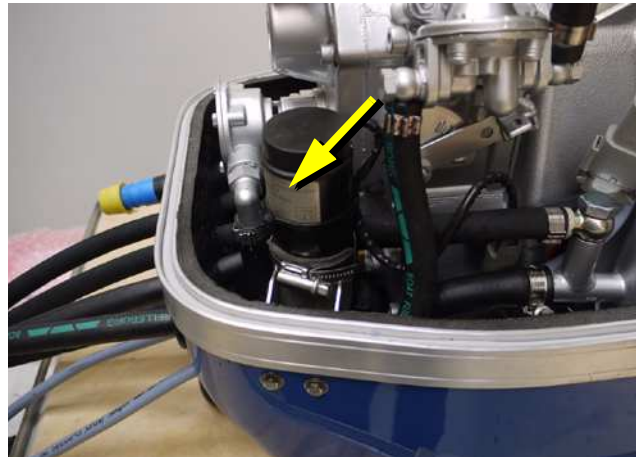
Fig. 4.4.3-1: Connection external expansion tank



#### Cooling water pump

The cooling water pump pumps the fresh water from the heat exchanger to the generator housing.

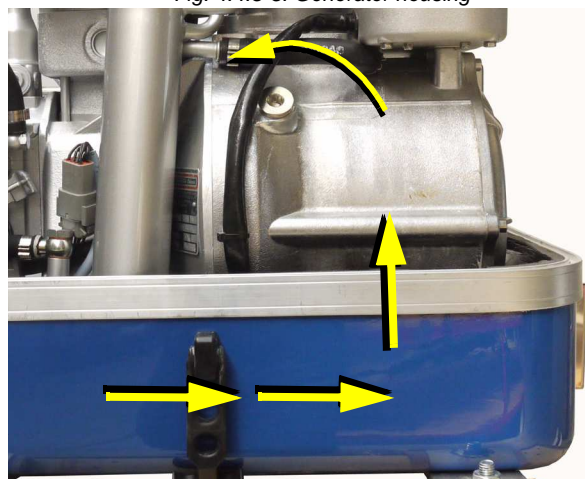
Fig. 4.4.3-2: Cooling water pump



#### Generator housing

The water in is at the bottom of the Generator housing. The water out is at the top of the generator.

Fig. 4.4.3-3: Generator housing

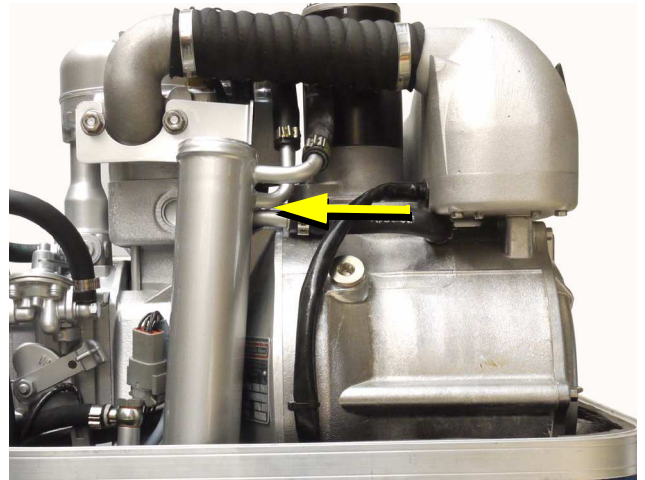






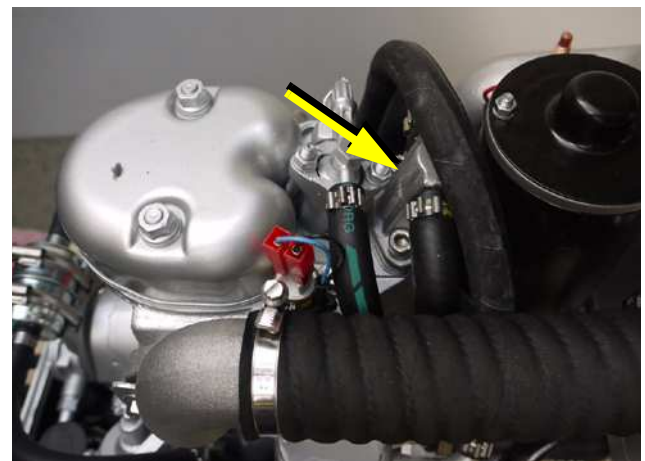
**Engine in**

Fig. 4.4.3-4: Engine in



**Engine out (water connection block)**

Fig. 4.4.3-5: Engine out

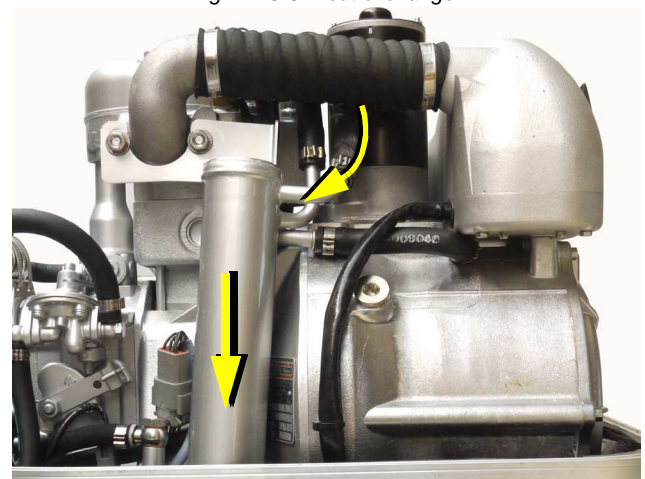


**Heat exchanger**

The heat exchanger separates the internal fresh water cooling circle from the raw water cooling circle, so that the generator components do not have contact with the raw water circulation system. The raw water is fed directly to the exhaust connection piece at the heat exchanger outlet.

The fresh water flows to the cooling water pump.

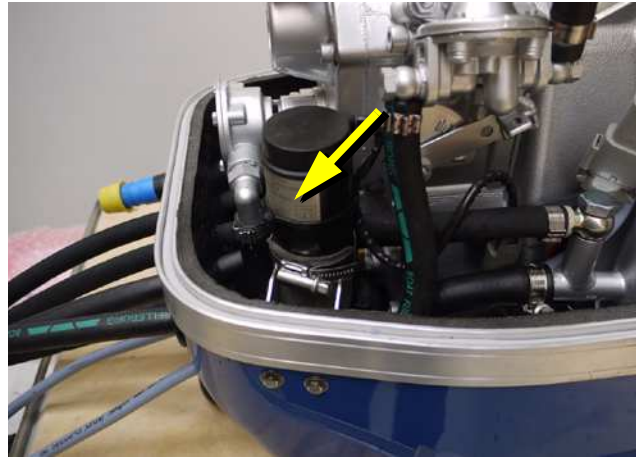
Fig. 4.4.3-6: Heat exchanger



### Cooling water pump

The cooling water pump pumps the fresh water from the heat exchanger to the generator housing.

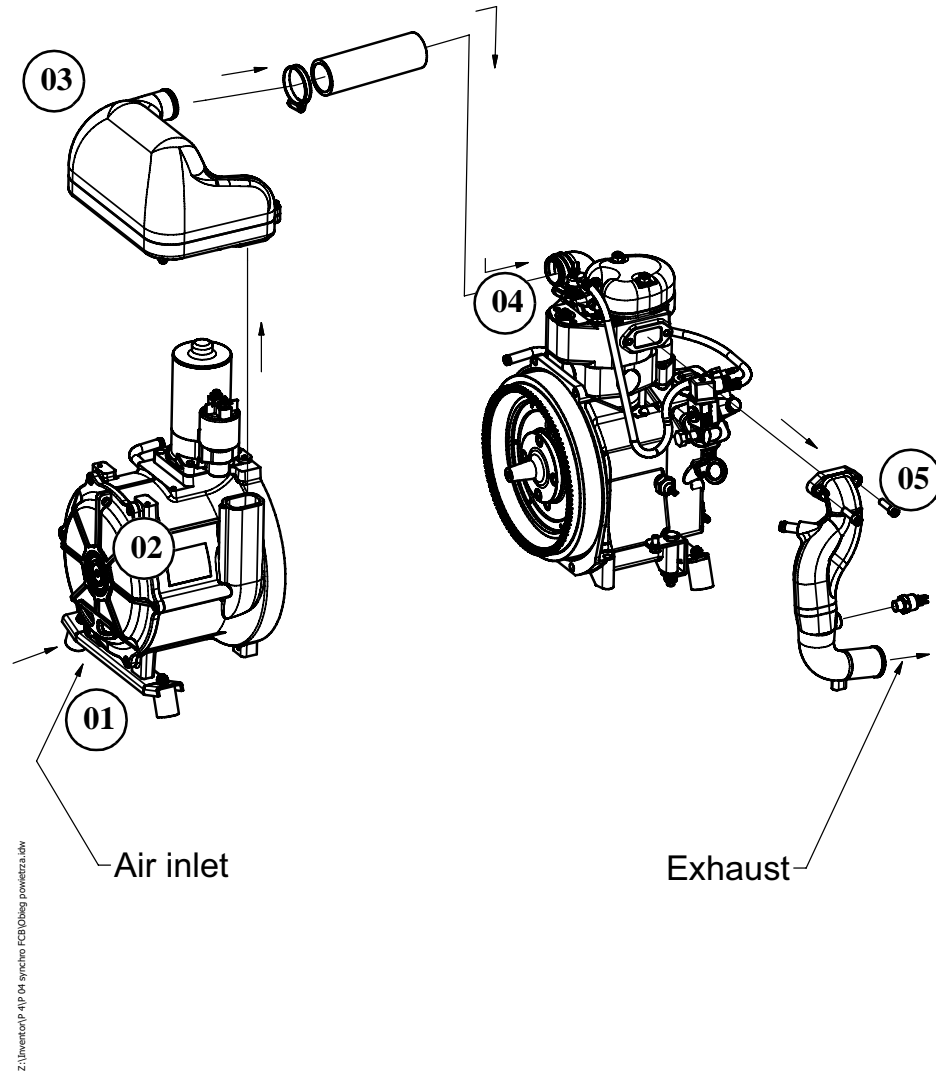
*Fig. 4.4.3-7: Cooling water pump*





#### 4.4.4 Components of combustion air 4000s SC + 4000s FC

Fig. 4.4.4-1: Combustion Air circle



- 01) Air inlet
- 02) Generator housing with coil
- 03) Generator power terminal box and airfilter housing

- 04) Air in at engine
- 05) Water cooled exhaust elbow

### Combustion air intake

The sound insulated capsule for the marine generator is normally provided at the side surface with drillings, through which the combustion air can influx.

*Sample picture 4000s FC*

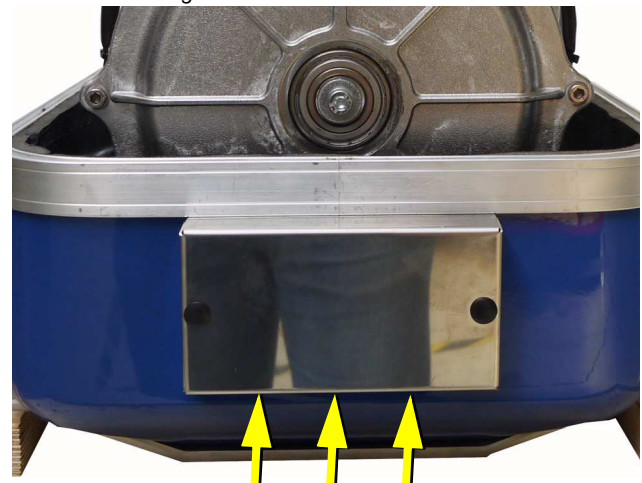


Fig. 4.4.4-2: Combustion air intake

### Cooling of the generator housing

The combustion air is pre-warmed in the generator housing. This supports the cooling of the winding.

*Sample picture 4000s FC*



Fig. 4.4.4-3: Combustion air intake

### Air suction housing

If the capsule is removed, the inside of the air suction housing becomes visible. In these air suction housing is a filter element. In the marine version, the filter is normally not changed. It should be checked once in a while.

*Sample picture 4000s FC*



Fig. 4.4.4-4: Air suction housing





### Exhaust elbow

At the back of the engine is the water-cooled exhaust elbow.+

Sample picture 4000s FC

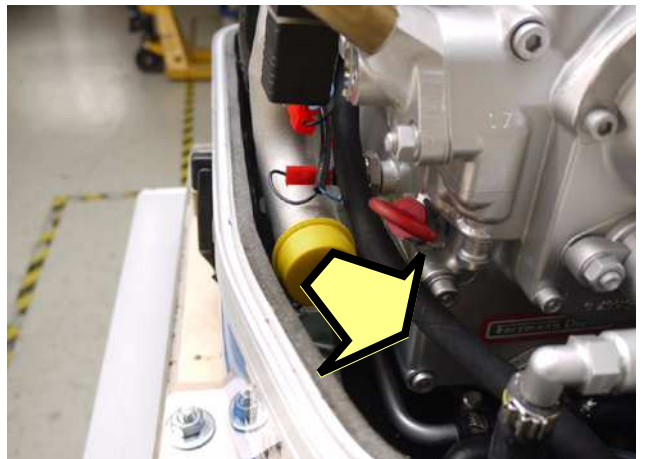
Fig. 4.4.4-5: Exhaust elbow



### Exhaust outlet

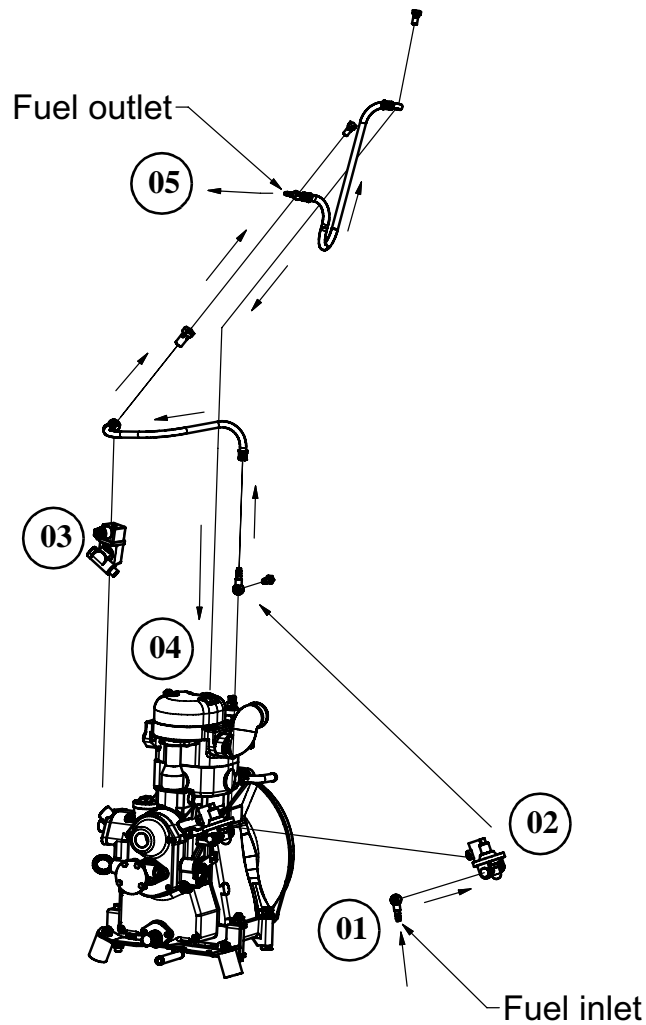
Connect the exhaust pipe with the water lock.

Fig. 4.4.4-6: Exhaust output



#### 4.4.5 Components of the Fuel System 4000s SC + 4000s FC

Fig. 4.4.5-1: Fuel circle



mventor/p/4p/04/synchro/FCB/0b0g/pallwa.idw

- 01) Fuel in
- 02) Fuel pump
- 03) Fuel stop solenoid

- 04) Injection nozzle at engine
- 05) Fuel out (Fuel return line)

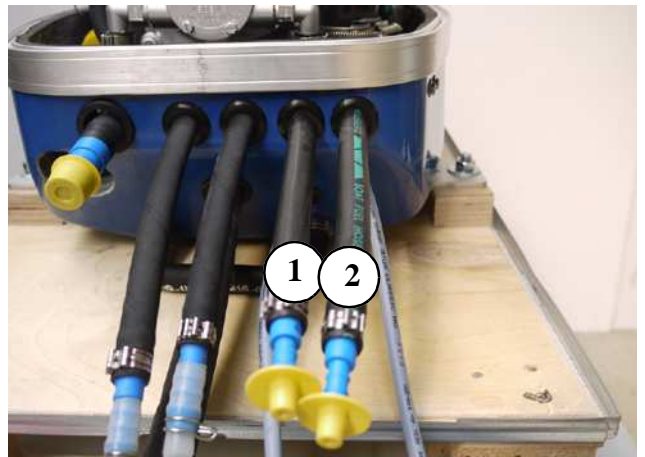


## Connecting pieces for the fuel pipes

1. Fuel IN
2. Fuel OUT

Sample picture 4000s FC

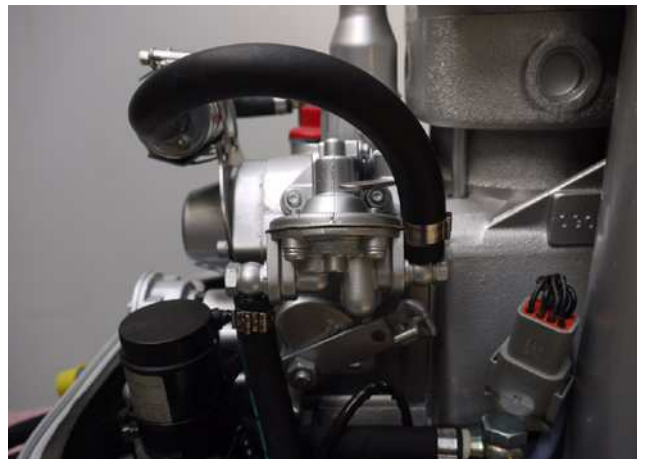
Fig. 4.4.5-2: Fuel connections



## Fuel pump

Sample picture 4000s FC

Fig. 4.4.5-3: internal fuel pump



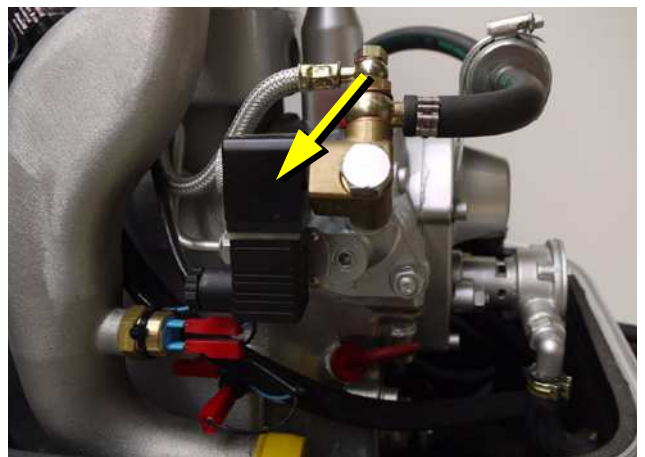
## Fuel solenoid valve

The fuel solenoid valve opens automatically if „START“ is pressed on the remote control panel. The solenoid closes, when the generator is switched to „OFF“ position. It takes a few seconds before the generator stops.

If the generator does not start or does not run smoothly (i.e. stutters), or does not attain full speed, then the cause is fore-mostly the solenoid.

Sample picture 4000s FC

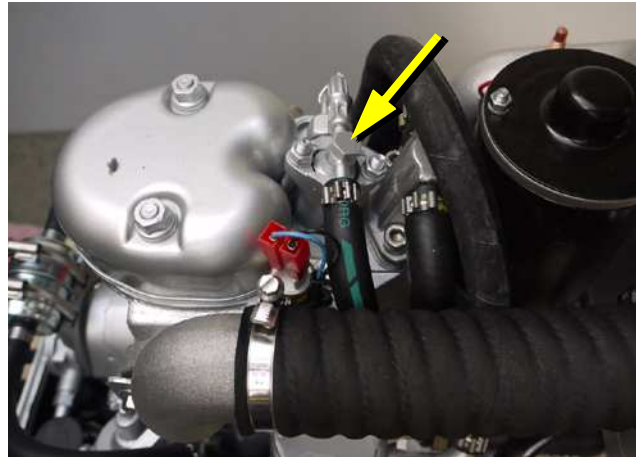
Fig. 4.4.5-4: Fuel solenoid valve



### Injection nozzle at engine

Sample picture 4000s FC

Fig. 4.4.5-5: Injection nozzle at engine



## 4.4.6 Components of Electrical System 4000s SC + 4000s FC

### Connection starter battery

1. Passage for starter battery cable (plus)
2. Passage for starter battery cable (minus)

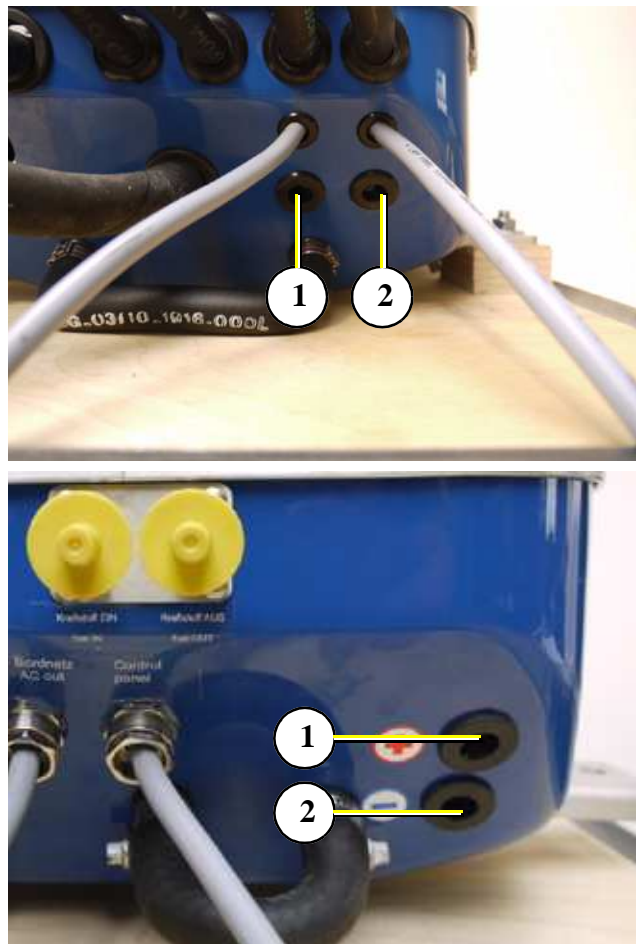
During the connection to the starter battery it must always be ensured that the contact is perfectly guaranteed.

4000s FC picture 1

4000s SC picture 2

Sample picture 4000s FC

Fig. 4.4.6-1: Connections for starter battery





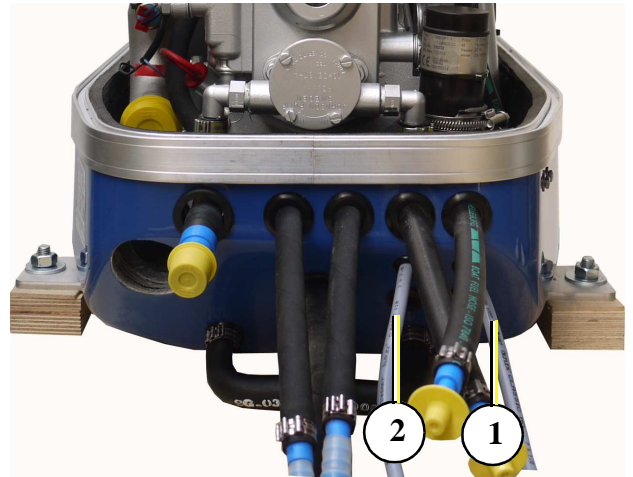
## Electrical connections for control and load

At the front of the generator are also all remaining cables for the electrical connections depending upon type.

1. Remote control panel
2. AC out

Sample picture 4000s FC

Fig. 4.4.6-2: Load



## Fuel Pump connection point

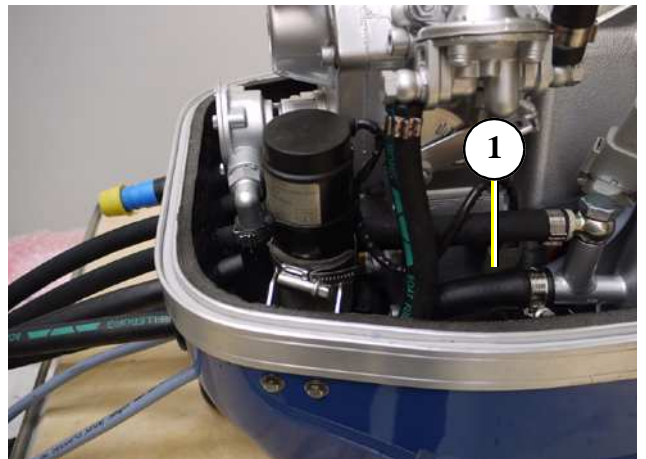
An optional electrical fuel pump can be connected at the right side of the generator.

1. Plug Type „Deutsch“ for external electrical fuel pump

Cable marked with „fuel pump“

Sample picture 4000s FC

Fig. 4.4.6-3: Electrical connections



## Starter motor

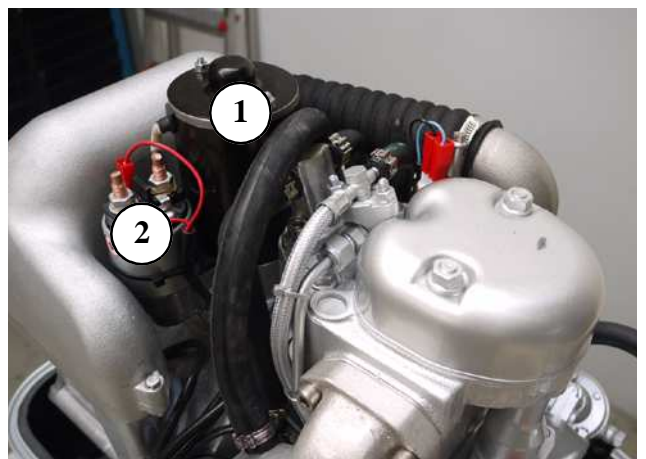
1. Starter motor and
2. Solenoid switch

The Diesel engine is started electrically.

The electrical starter with the solenoid switch is located at the back of the engine.

Sample picture 4000s FC

Fig. 4.4.6-4: Starter motor





### Generator power terminal box

Above the winding housing is the generator power terminal box. In this box, the electrical connection points for the AC generator are blocked.

Here is also the bridge for the protective grounding of the generator. The cover may only be removed, if it is guaranteed that the generator cannot be inadvertently started.

Sample picture 4000s FC

Fig. 4.4.6-5: Generator power terminal box

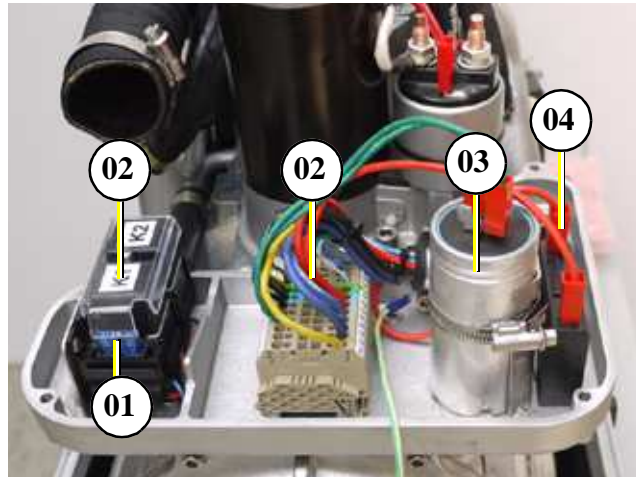


### Terminal block for remote control cable with fuses and power relays inside of the generator power terminal box

- 01. Fuse DC 25A
- 02. Relais for Starter and Fuel stop solenoid
- 03. Generator power terminal block
- 03. **Capacitor**
- 04. Circuit breaker AC 15A

Sample picture 4000s FC

Fig. 4.4.6-6: Terminal block



### Circuit breaker for load

The circuit breaker for the load can be controlled from the outside of the power terminal box

- 01. Circuit breaker AC 15A

Sample picture 4000s FC

Fig. 4.4.6-7: Terminal block





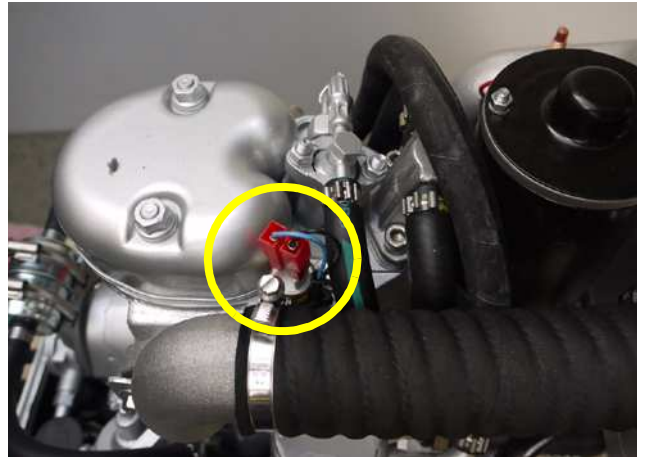
#### 4.4.7 Sensors and Switches for Operation Surveillance

##### Thermo-switch at cylinder head

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

Sample picture 4000s FC

Fig. 4.4.7-1: TThermo-switch at cylinder head

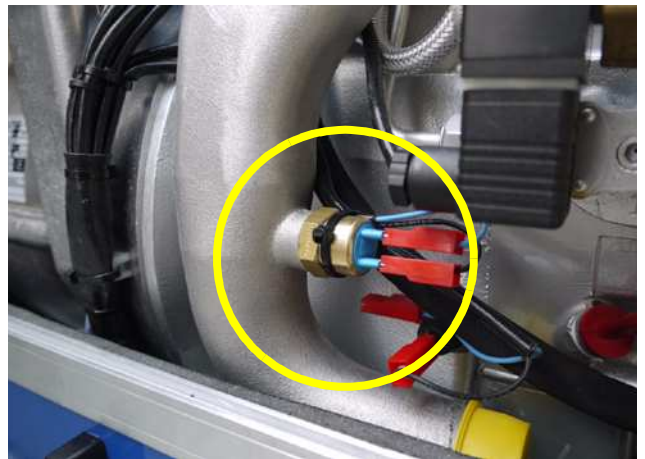


##### Thermo-switch at water-cooled exhaust elbow

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

Sample picture 4000s FC

Fig. 4.4.7-2: Thermo-switch at exhaust elbow



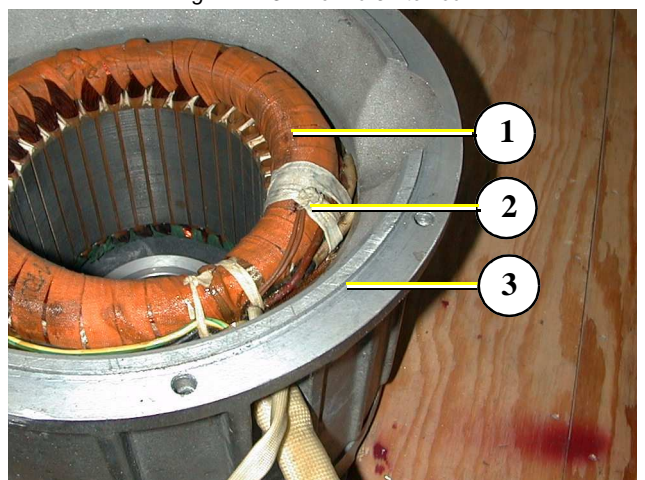
##### Thermo-switch in the generator coil

1. Generator coil
2. Thermo-switch
3. Housing

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

Sample picture

Fig. 4.4.7-3: Thermo-switch coil

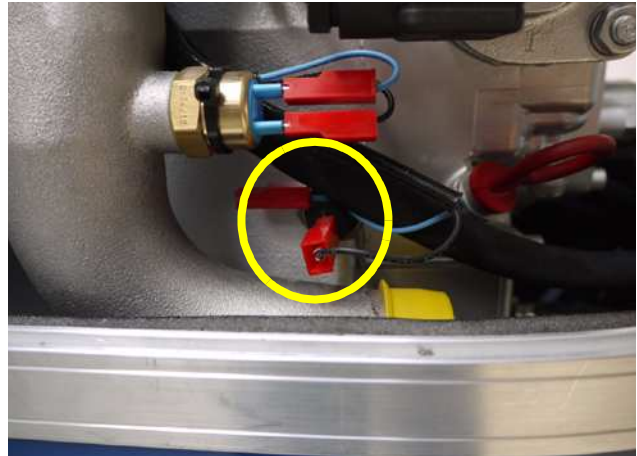


### Oil pressure switch

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

*Sample picture 4000s FC*

Fig. 4.4.7-4: Oil pressure switch



## 4.4.8 Components of Oil Circuit 4000s SC + 4000s FC

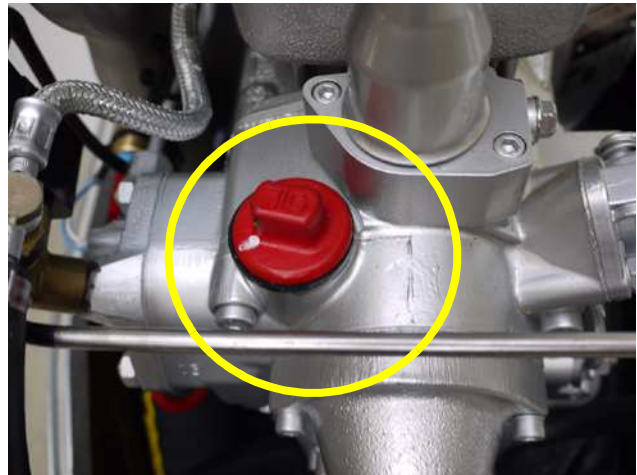
### Oil filler neck with cap

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

Consider also the references to the engine oil specification.

*Sample picture 4000s FC*

Fig. 4.4.8-1: Engine oil filler neck

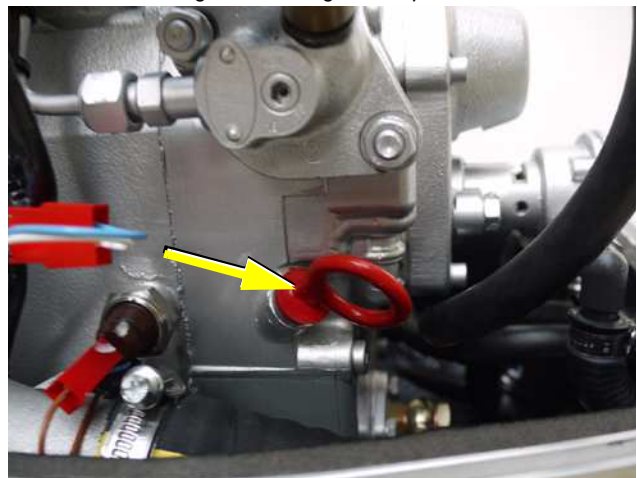


### Oil dipstick

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

*Sample picture 4000s FC*

Fig. 4.4.8-2: Engine oil dipstick







## Engine oil strainer

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

*Sample picture 4000s FC*

Fig. 4.4.8-3: Engine oil strainer



## Oil drain hose

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

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

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

*Sample picture 4000s FC*

Fig. 4.4.8-4: Engine oil drain hose



## 4.5 Operation manual

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### 4.5.1 Preliminary remarks

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#### Advices regarding Starter Battery

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

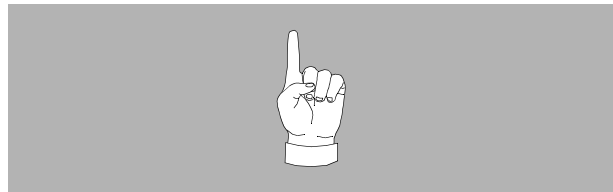
### 4.5.2 Daily routine checks before starting

---

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

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

**Notice!: OIL PRESSURE CONTROL!**



*You should change the oil independently from the ambient temperature - see section 8.3, "Engine oil," on page 125. Engine oil volume see section 8.2, "Technical Data Engine," on page 124.*

#### 2. State of cooling water.

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

#### 3. Open sea cock for cooling water intake.

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

#### 4. Check raw water filter.

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

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

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

#### 6. Check all electrical lead terminal contacts are firm.

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

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

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



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

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

9. Check the automatic controls functions and oil pressure.

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

### 4.5.3 Starting Generator- see remote control panel datasheet

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**In the event of starting problems, close the sea water inlet cock. Panda marine generators only.**

Should there be any reason to turn the engine (over) or start the engine i.e. to bleed the fuel system, the sea water inlet cock must be closed! During the starting process, the cooling water pump is driven with the motor. The cooling water is discharged to the exhaust outlet and, since the motor has not run, the exhaust pressure is not high enough to expel the sea water which has been brought to the exhaust outlet. To avoid filling the exhaust outlet with water and causing further problems, close the inlet sea water valve.

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

**Attention!:**

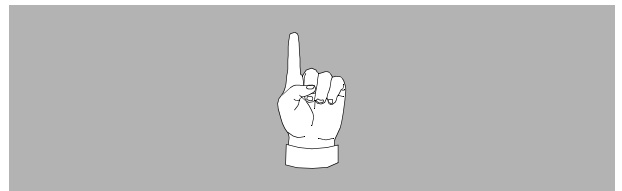


### 4.5.4 Stopping Generator - see remote control panel datasheet

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

**Notice!:**





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## 5. Installation Instructions

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

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

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

#### 5.1.1 Hazard notes for the installation

see "Safety instructions - Safety first!" on Page 14.

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

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

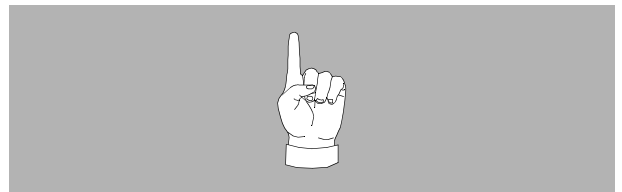
Make shure that the generator ist stopped and the starter battery is diconnected to guarantee that the generator cannot be inadvertently started.

**Do not run the generator with removed sound isolation cover**

**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 availible tools and special tools. incorrect or damaged tools can result injuries.

**Notice!:**



**Warning!: Risk of injury**



**Warning!: Risk of injury**



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

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

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

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

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

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

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

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

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

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

**-Warning!: Danger of fire**



**Danger!: Danger of poisoning**



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



**Warning!: Hot surface/material**



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



**Attention!: Disconnect all load**







## 5.2 Placement

### 5.2.1 Placement and Basemount

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 installed in the proximity of light walls, which can get into resonant vibrations by airborne sound. If this is not possible, these surfaces should line with 1 mm lead foil, so the mass and the swinging behavior are changed.

Avoid to install the generator on a smooth surface with small mass (e.g. plywood plate). This affects in the unfavorable case like an amplifier the airborne sound waves. An improvement can be achieved by reinforcing these surfaces by 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 condition.

There must be sufficient free space between the fundament and the capsule base, since the motor takes in combustion air through several holes in the capsule base, to ensure an intake of air (at least 12 mm ( $\frac{1}{2}$ ")).

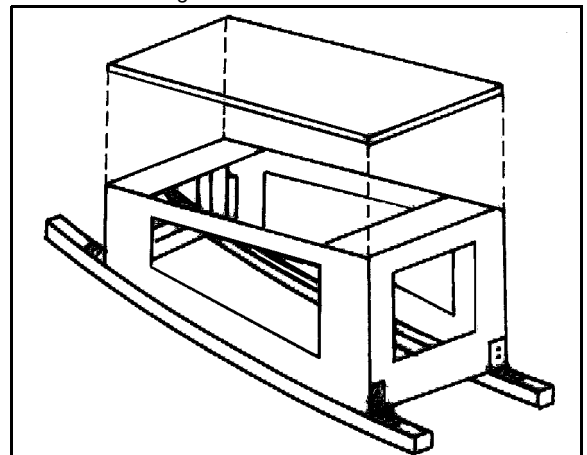
The generator takes in air from the surrounding machine room. It must therefore be ensured that sufficient ventilation openings are available, so that the generator cannot overheat.

If the inducted air has a high temperature, the generator performance deteriorates and raises the cooling water temperature. Air temperatures of more than 40 °C reduce the performance by 2 % for each 5 °C temperature increase. The temperature in the machine room should not be more than 15 °C higher than the outside temperature.

### 5.2.2 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 generator 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. 5.2.2-1: Convenient base



## 5.3 Generator Connections - Scheme

See chapter 3 for the original position of the connections

**All electrical wires are connected tightly to the motor and the generator. This is also the case for fuel lines and cooling water lines.**

The electrical connections must be carried out according to the respective valid regulations. This also concerns used cable materials. The cables supplied are meant for laying „protected“ (i.e. in pipe) at a temperature up to a max. of

70 °C (160 °F). The on-board circuit must also be fitted with all essential fuses.

**Before working (installation) on the System read the section Cooling System Installation - Raw water**

See chapter 3 for the original position of the connections

**ATTENTION! 7**



### 5.3.1 General References

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

#### Avoid galvanic corrosion

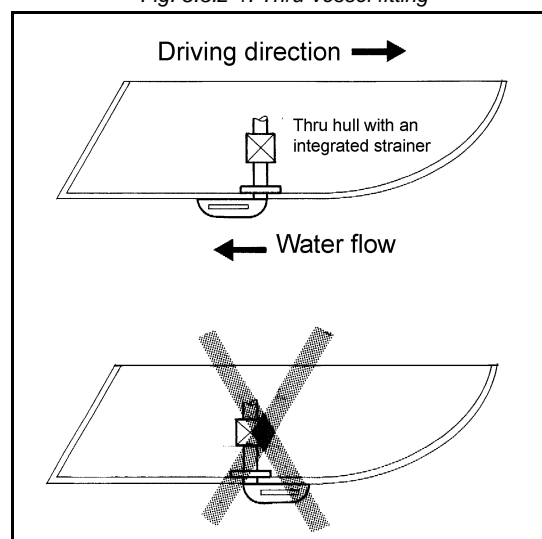
For the avoidance of galvanic corrosion refer to the chapter "Service instruction for marine gensets (corrosion protection)".

### 5.3.2 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 the pump can handle and your generator will flood!**

Fig. 5.3.2-1: Thru-vessel fitting





### 5.3.3 Quality of the raw water sucking in line

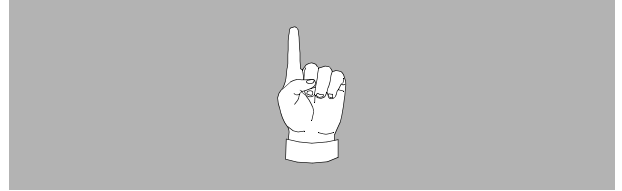
In order to keep the suction resistance in the line at a minimum, the raw water intake system (i.e. sea cock, thru-hull fitting, inlet filter, etc.) must have an inner diameter of at least 1" (25mm).

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

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

**After start-up the cooling water quantity must be measured (e.g. by catching at the exhaust). The flow rate, as well as the necessary cross section of the cooling water pipe is taken from Table 8.2.1, "Technical Data Generator 4000s SC + FC," on page 124.**

*Notice!:*



### 5.3.4 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 some time. Ensure that the genset is installed such that the intake pump can be easily accessed. If this is not possible, an external intake pump could be installed in an easily accessed location.

If the generator is installed above the waterline it is possible that the impeller wearout will be stronger. After the start the pump runs dry some seconds.

The raw water hose should describe a loop as near as possible to the raw water inlet of the generator (see picture below). With it the pump only sucks in air for a short time. The impeller will be lubricated by the raw water and its life time will rise.

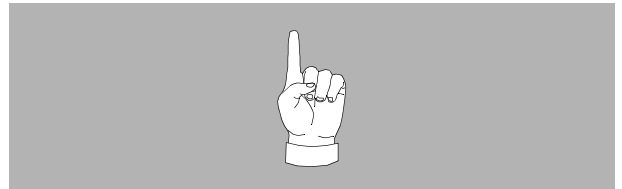
By the installation of a check valve in the sea water inlet line, which is under the waterline, this problem can be limited a little .

It is very important to change the impeller every few month. When starting the generator you should pay attention and listen when raw water comes out from the exhaust. If this lasts longer than 5 seconds the impeller has to be changed, because he sucks to much air before raw water reaches the impeller and the impeller wears out strongly. In this case the impeller loses its function, which leads to an overheating of the engine.

If the impeller isn't exchanged early enough, the impeller wings can break into pieces and clog the cooling circuit. Therefore it is very important to change the impeller every few month.

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

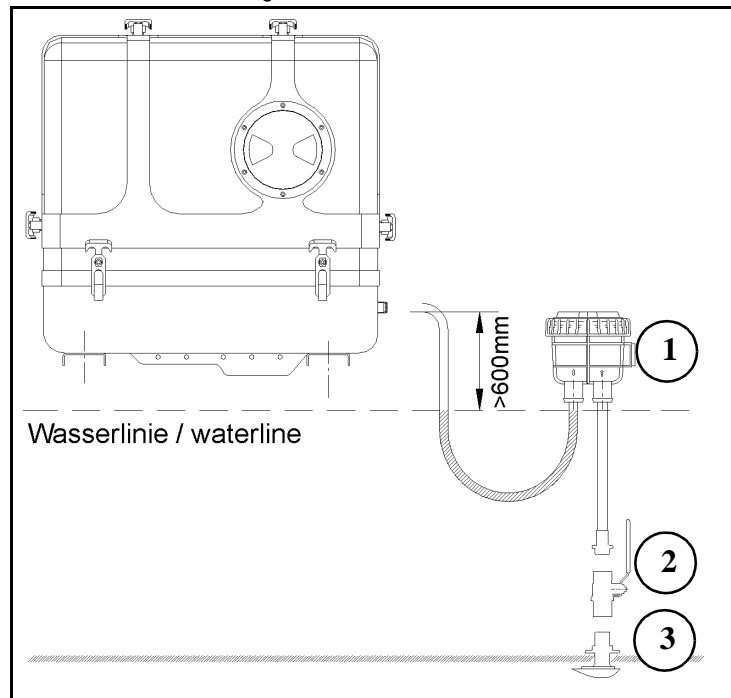
*Notice!:*



**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. 5.3.4-1: Raw water filter

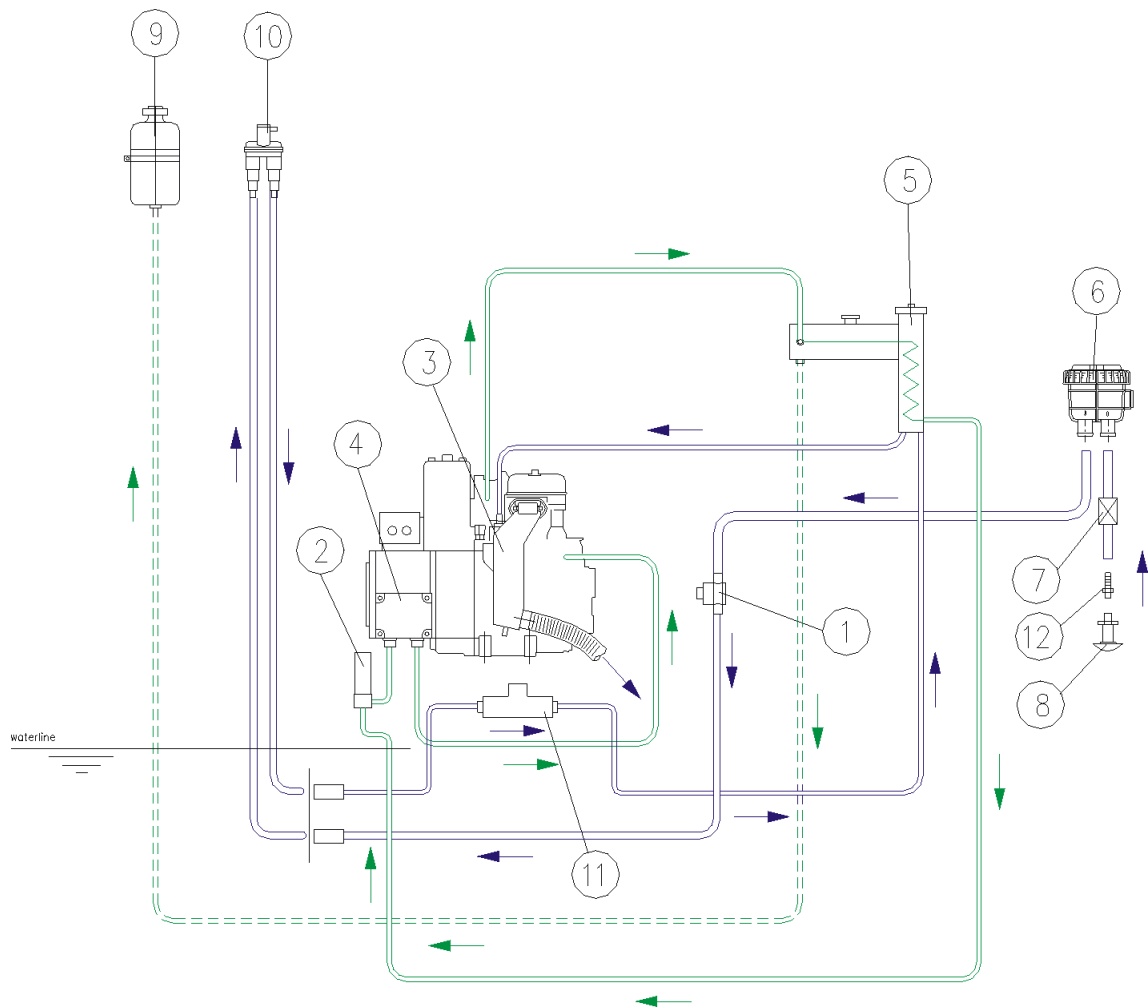


1. Raw water filter
2. Water cock
3. Hull inlet

Make certain that the raw water filter lies above the water level, otherwise with cleaning water can penetrate by the hull inlet.

An external pre-pump can relieve the impeller.

Fig. 5.3.4-2: Installation example over the waterline FC version



- |                                   |                    |
|-----------------------------------|--------------------|
| 1. Raw water impeller pump        | 7. Water cock      |
| 2. Freshwater pump                | 8. Raw water inlet |
| 3. Water-cooled exhaust elbow     | 9. Expansion tank  |
| 4. Cooling water connection block | 10. Vent valve     |
| 5. Heat exchanger                 | 11. Oil cooler     |
| 6. Raw water filter               | 12. Reducer        |

### 5.3.5 Installation below waterline

If the generator can not be attached at least 600mm over the waterline, a vent valve must be installed into the raw water line. Possible heeling must be taken into consideration if installed at the „mid-ship line“! This hose is split in the middle and extended respectively at each end by an additional hose and a connecting pipe. Both hose ends must be led out outside of the sound cover to one point, if possible 600mm over the waterline in the mid-ship line. The valve is connected at the highest place to the two hose ends.

If the valve is jammed, then the cooling water line cannot be ventilated after the generator has been stopped, the water column is not interrupted and water can enter the combustion compartment of the motor. This can quickly cause damage to the motor!

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

Sample picture 4000s FC

Fig. 5.3.5-1: Connection external ventilation valve

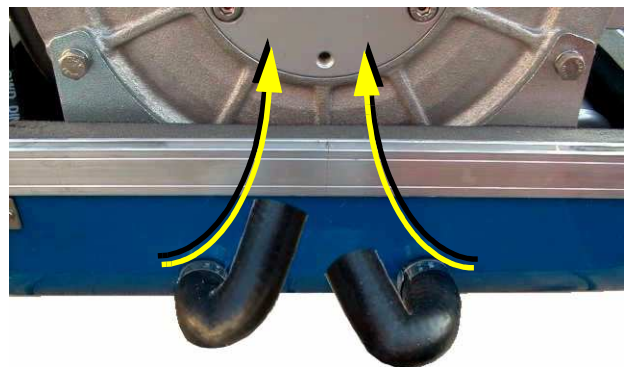


### ...and bent it upwards.

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

sample picture

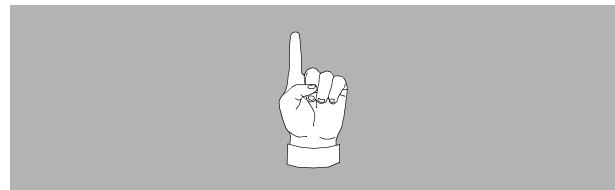
Fig. 5.3.5-2: .Connection external ventilation valve



**NOTE: The ventilation valve must be installed directly behind the water pump.**

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

Notice!:



### Ventilation valve

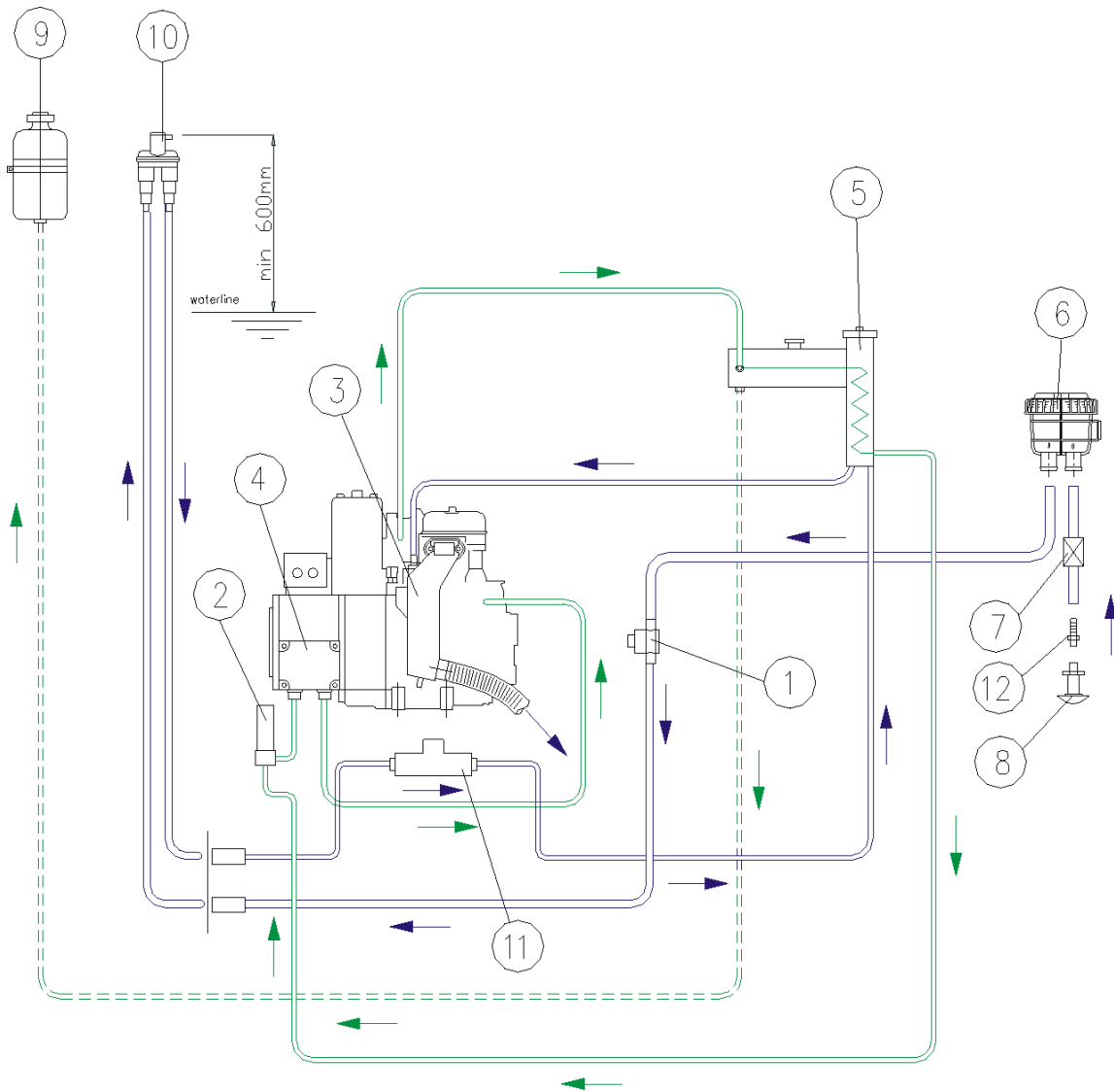
Fig. 5.3.5-3: Ventilation valve







Fig. 5.3.5-4: Installation example under the waterline FC

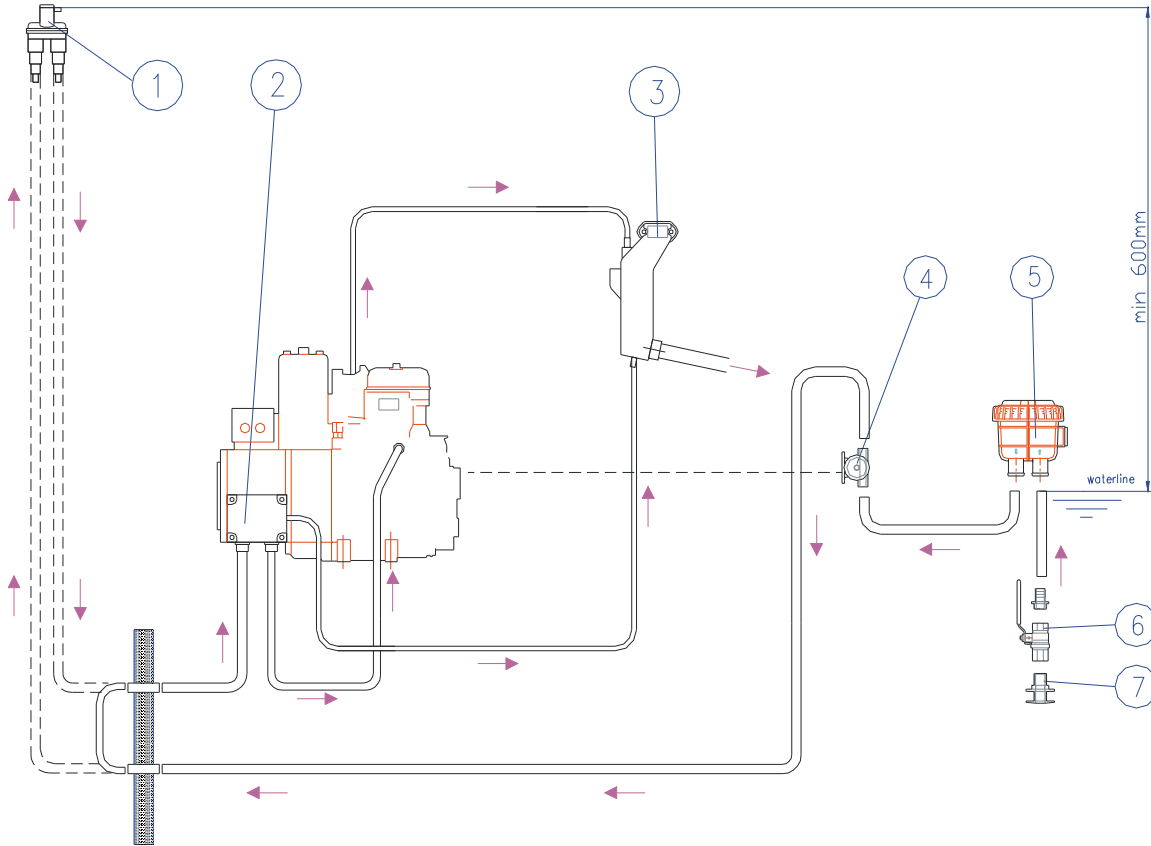


- |                                   |                    |
|-----------------------------------|--------------------|
| 1. Raw water impeller pump        | 7. Water cock      |
| 2. Freshwater pump                | 8. Raw water inlet |
| 3. Water-cooled exhaust elbow     | 9. Expansion tank  |
| 4. Cooling water connection block | 10. Vent valve     |
| 5. Heat exchanger                 | 11. Oil cooler     |
| 6. Raw water filter               | 12. Reducer        |



### 5.3.6 Raw water single circuit cooling system

Fig. 5.3.6-1: Installation example under the waterline SC



- |                             |                     |
|-----------------------------|---------------------|
| 1. Vent valve               | 5. Raw water filter |
| 2. Coolant connection block | 6. Sea cock         |
| 3. Exhaust elbow            | 7. Hull inlet       |
| 4. Raw water pump           |                     |

### 5.3.7 Ventilating at the first filling of the Fresh water cooling circuit - FC only

The Fresh water circle of the Panda 4000s FC PMS is self venting while the electrical coolant pump is running. Make shure, that the generator is aligned horizontally to all sides.

Fill up the external cooling water expansion tank with coolant.

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

The cover of the external expansion tank temporarily must be opened.

Make shure that during the filling procedure everytime enough coolant (min 1/3) is in the expansion tank.

Fig. 5.3.7-1: Expansion tank

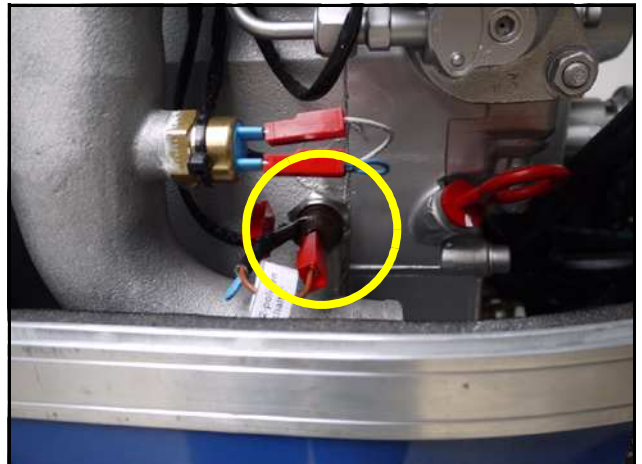




**2. When the coolant level in the expansion tank do not drop any more, disconnect the oil pressure switch.**

While disconnecting the oil pressure switch, the remote control panel get a „Oil pressure OK“ and the electrical colling water pump can be turned on and off by switching the panel on and off.

Fig. 5.3.7-2: Oil pressure switch



3. Turn the remote control panel on and let the coolant pump run for at least 10 minutes.

4. Turn the remote control panel off, reconnect the oil pressure switch and fill up the coolant level at the expansion tank to max. Close the expansion tank.

## 5.4 Watercooled Exhaust System

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

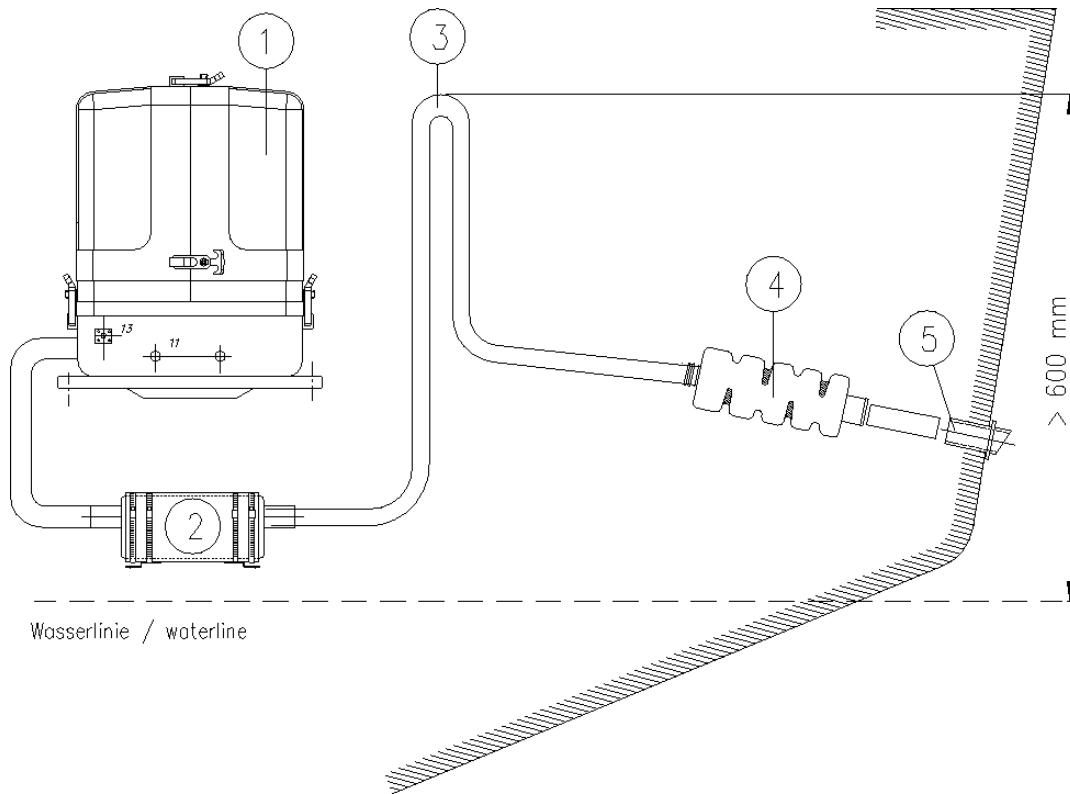
### 5.4.1 Installation of the standard exhaust system

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 30mm. 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 6m (20 ft.).

*Exhaust diameter see Table 8.2.1, "Technical Data Generator 4000s SC + FC," on page 124.*



Fig. 5.4.1-1: Installation example - standard exhaust system



- 1. Generator
- 2. Water lock
- 3. Goose neck

- 4. Silencer
- 5. Hull outlet

### 5.4.2 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 is started under these conditions, the water and the oil are mixed into an emulsion. The oil will quickly become so viscous that one will have to call it a paste. In this phase the fine oil ducts are blocked and a few moments later the machine gets destroyed because of insufficient lubrication. Before this happens, an immediate oil change should be made. (Since the water can only reach the engine via the combustion chamber, it can be assumed that the com-**



pression 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.

### **5.4.3 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.

### **5.4.4 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 checked regularly.)

As it consistently happens that functioning 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:

### **5.4.5 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 combustion chamber via an open discharge valve. This would lead to irreparable damage at the engine.

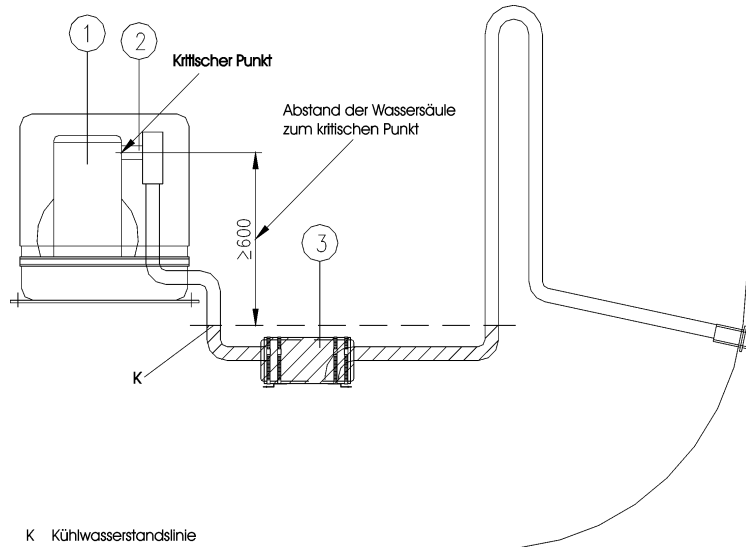
In addition to that, one has to reckon with possible tilted positions of sailing yachts, which makes the position of the water collector even more important. In general one could say that:

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. 5.4.5-1: Installation area of the exhaust water collector

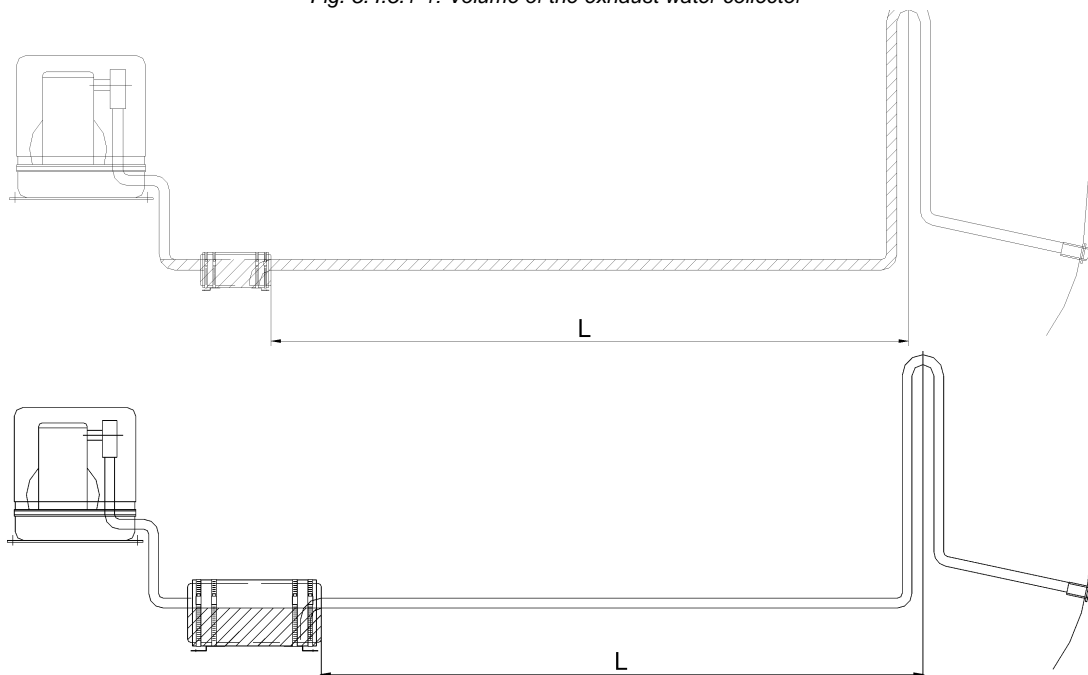


### 5.4.5.1 The volume of the exhaust water collector

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. 5.4.5.1-1: Volume of the exhaust water collector

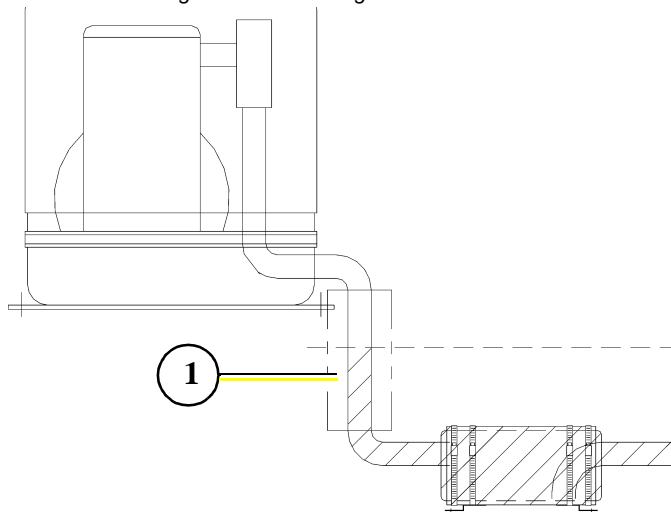


If there are any doubts, a verification can easily be made by temporarily using a clear-sighted hose as exhaust hose. In that way, the coolant level can be checked very easily.





Fig. 5.4.5.1-2: Testing the coolant level



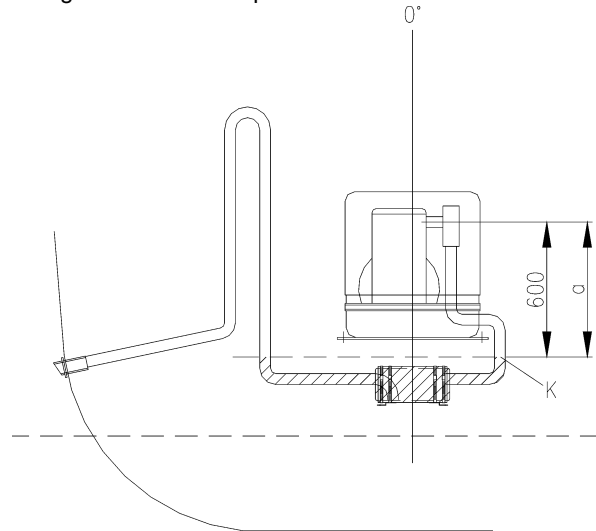
### 5.4.5.2 Position of the water collector

#### 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.

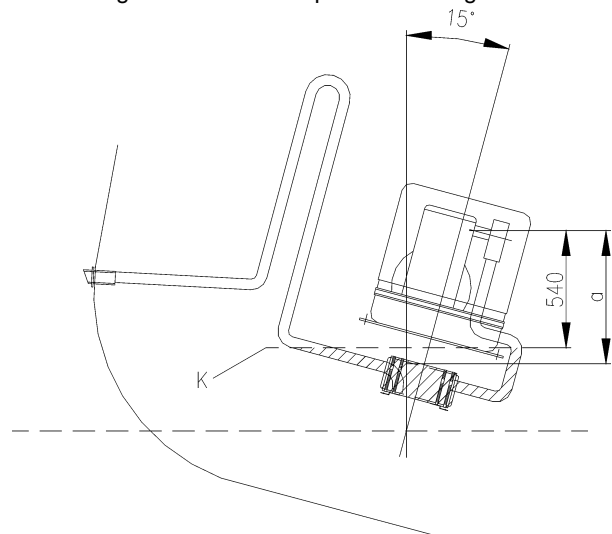
Fig. 5.4.5.2-1: Ideal position of the water collector



#### Tilted position 15 degrees

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

Fig. 5.4.5.2-2: Tilted position 15 degrees

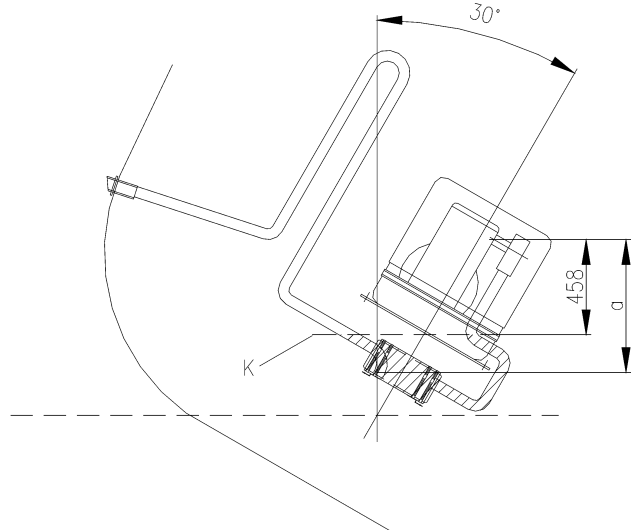




**Tilted position 30 degrees**

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.

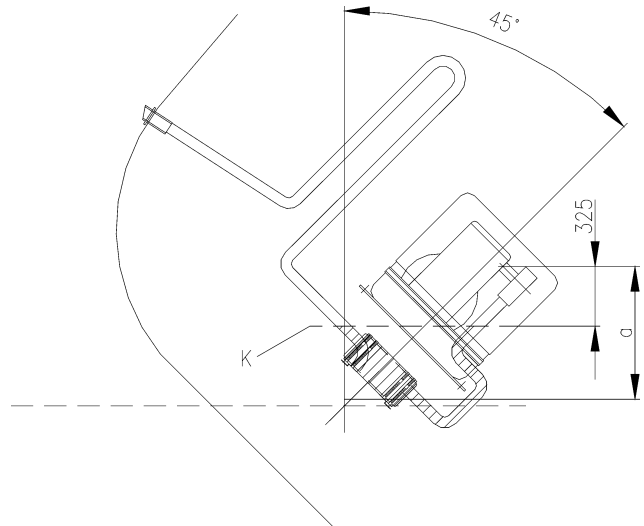
Fig. 5.4.5.2-3: Tilted position 30 degrees



**Tilted position 45 degrees**

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

Fig. 5.4.5.2-4: 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:**

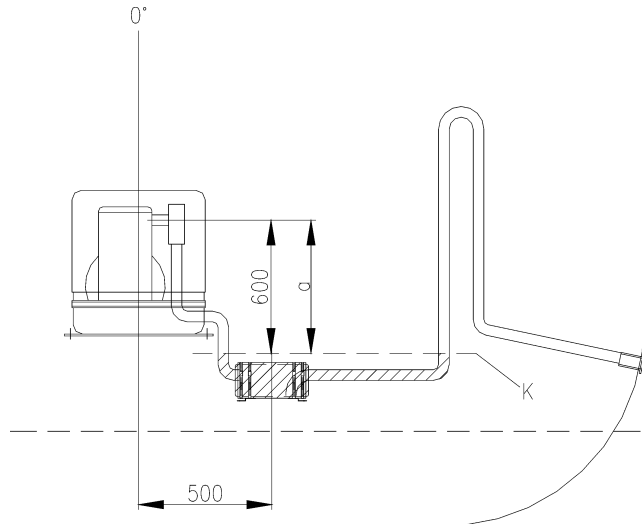
The preset minimum height of 600 mm must be regarded unconditionally and is only valid, if the water collector is mounted in its ideal position in center underneath the generator. A higher position is highly recommended if it has to be reckoned with tilted positions of 45 degrees.

### 5.4.5.3 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 back and 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:

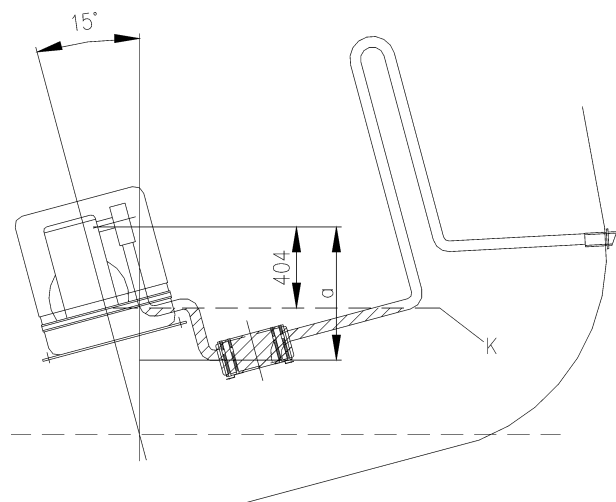
Fig. 5.4.5.3-1: Water collector, 500 mm next to the center line



#### 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.

Fig. 5.4.5.3-2: Tilted position, 15 degrees

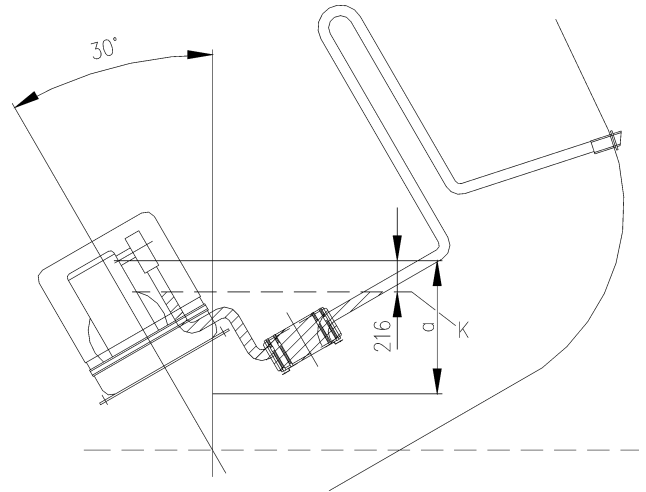




**Tilted position 30 degrees**

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

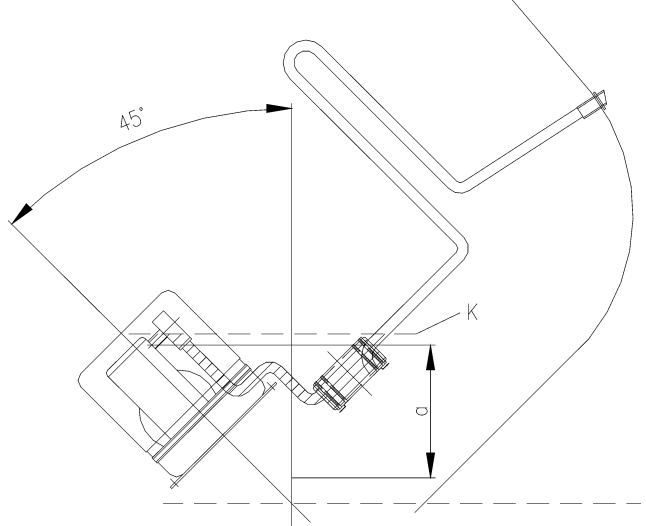
Fig. 5.4.5.3-3: Tilted position 30 degrees



**Tilted position 45 degrees**

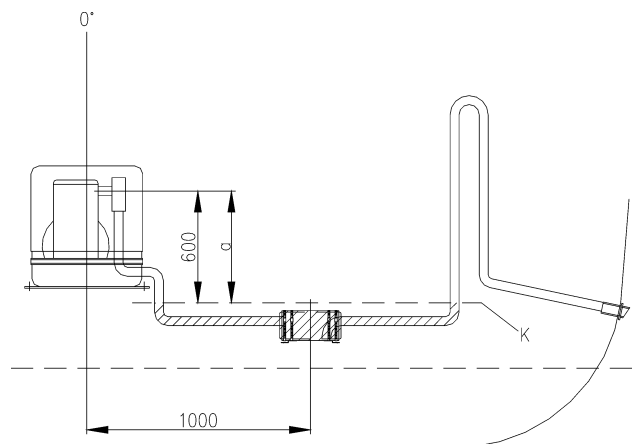
The water level is now at the same height as the critical point at the exhaust elbow. If the ship is sailed in a tilted position of 45 degrees with an installation like this, the infiltration of coolant into the combustion chamber is inevitable. Irreparable damages are preprogrammed.

Fig. 5.4.5.3-4: Tilted position 45 degrees



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

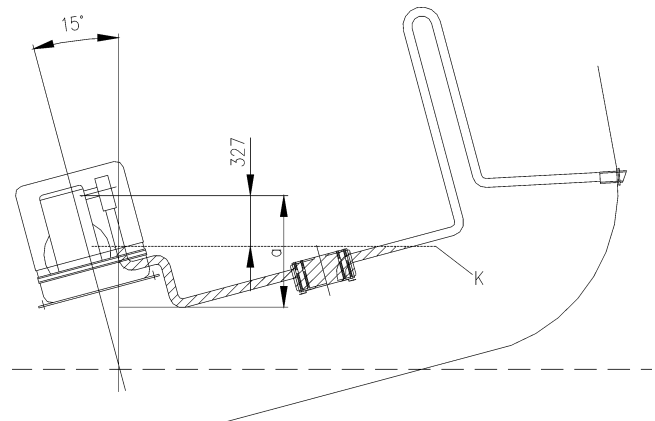
Fig. 5.4-5: Exhaust water collector, 1000 mm next to center line



### 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.

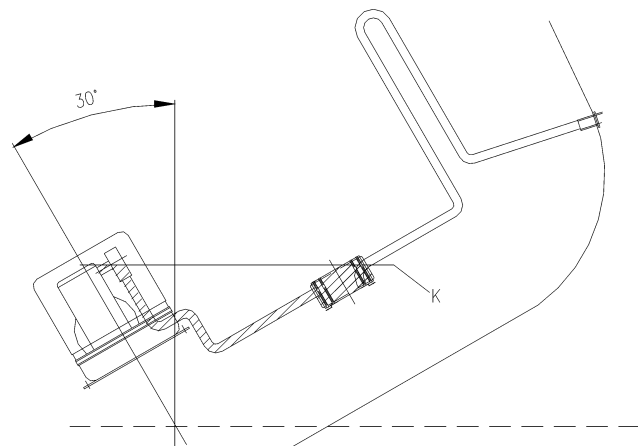
Fig. 5.4.5.3-6: Tilted position 15 degrees



### 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. 5.4.5.3-7: 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.

## 5.4.6 Exhaust / water separator

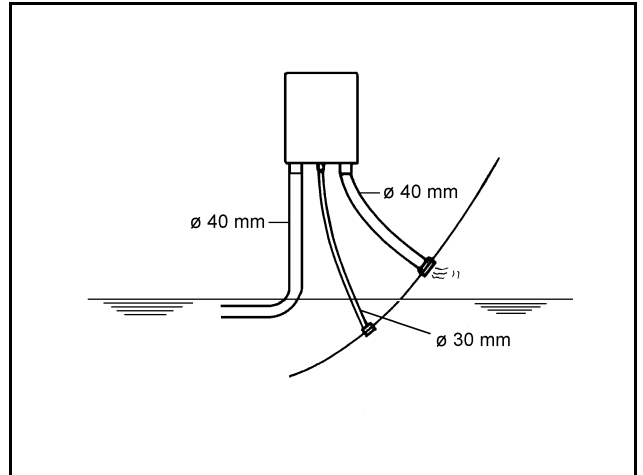
### The exhaust/water separator

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



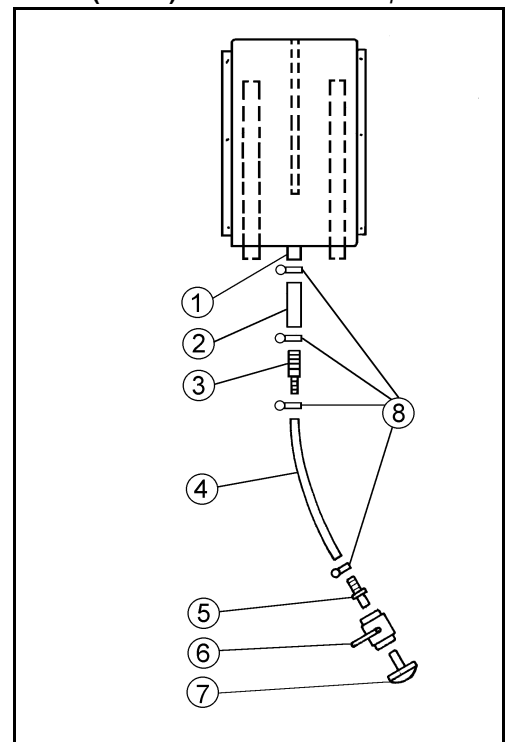


Fig. 5.4.6-1: Exhaust/water separator



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

Fig. 5.4-2: The water flow on the exhaust/water separator unit has an inner diameter (ID) of 30mm. If the path from the water separator to the sea water outlet is very short, the hose can be further reduced to 1" (25mm) ID. Exhaust/water separator

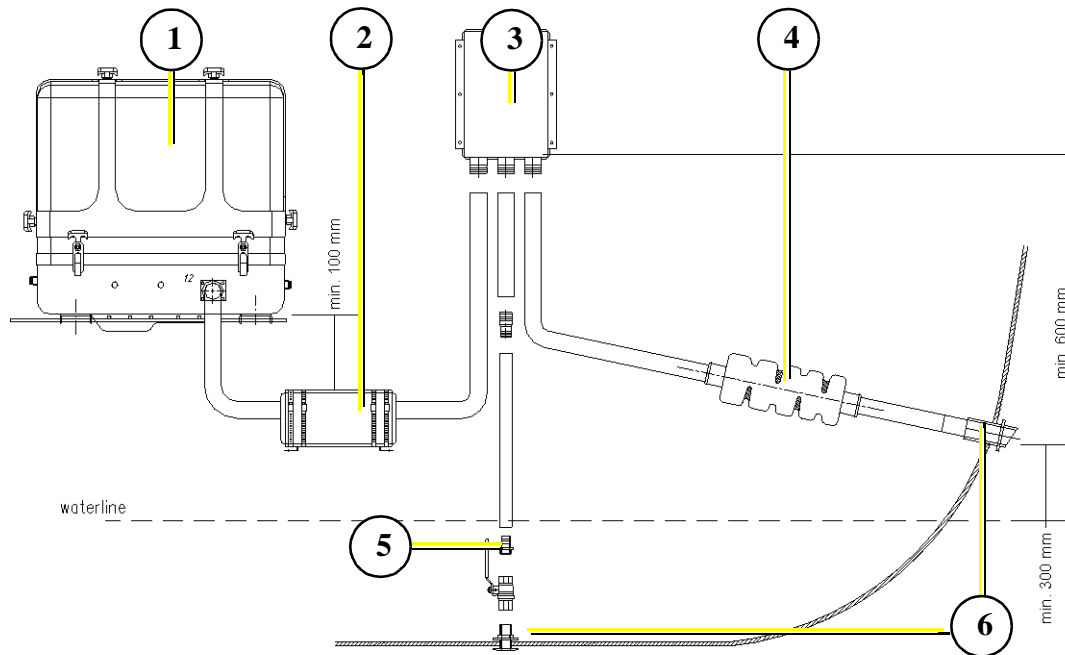


### 5.4.7 Installation exhaust/water separator

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. 5.4.7-1: Installation example - exhaust/water separator



- 1. Generator
- 2. Silencer / Water lock
- 3. Exhaust/Water-separator

- 4. Silencer
- 5. Sea cock
- 6. Hull outlet

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 to the thru-hull outlet. For such long exhaust routes, the exhaust hose diameter should also be increased from NW40mm to NW50mm in order to reduce the back-pressure. The exhaust may have a length of over 10m (32 ft.) if the exhaust hose diameter is increased to 50mm. An additional outlet exhaust muffler close to the hull outlet will help further to reduce noise emissions.

### An unfavorable installation:

- water lock not deeply enough under the height level of the generator
- distance water lock to exhaust/water separator too largely

## 5.5 Fuel System Installation

### 5.5.1 General References

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.

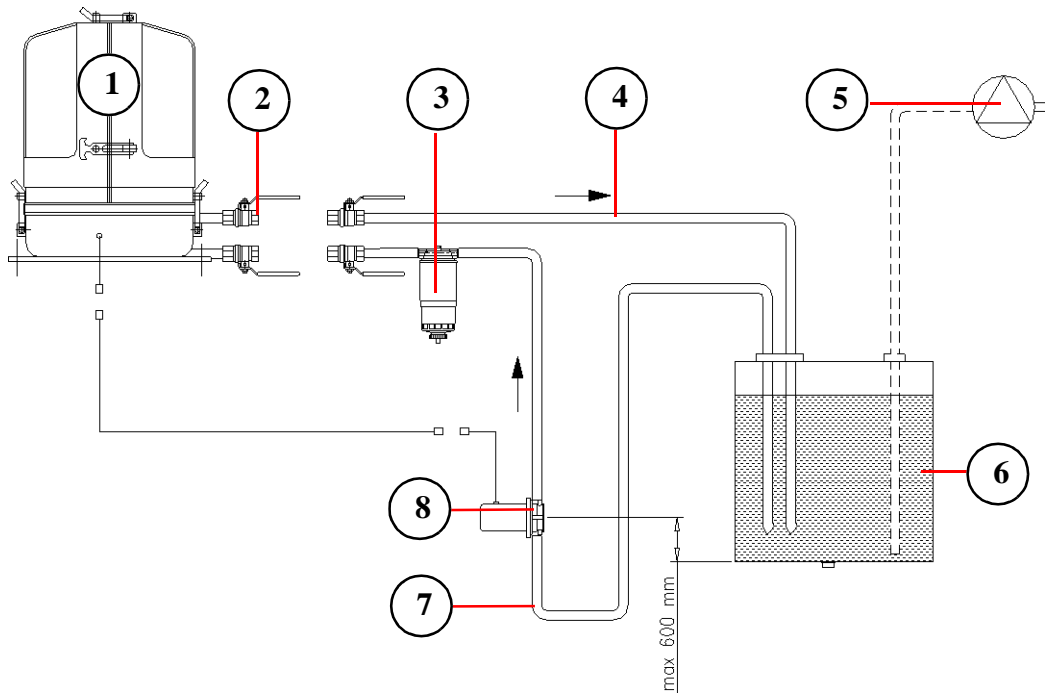
Generally forward and return fuel flow pipes must be mounted to the diesel tanks. Do not connect the generator fuel supply lines with any other fuel lines of other diesel systems.

The following items need to be installed:

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



Fig. 5.5.1-1: Installation example - fuel



- 1. Generator
- 2. Fuel stop cock
- 3. Fuel filter
- 4. Fuel return

- 5. Condensation water suction pump
- 6. Fuel tank
- 7. Fuel supply
- 8. Electrical fuel pump (12V-DC) (optional)

## 5.5.2 Connection of the fuel lines at the tank

The return pipe connected to the tank must be dropped to the same depth as the suction pipe, 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 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 by placing it in the tank. The instructions Table 6.6, "Ventilating the fuel system," on page 101 must be read after initial operation or after it has stood still for a long period.

### 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 non-return valve must be installed into the fuel return pipe to guaranteed that through the return pipe no fuel is led into the injection pump.

### Attention!:



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

Additionally to the standard fine filter a prefilter with water separator must be installed outside of the sound cover in the fuel system line. (is not included in delivery.)

Fig. 5.5.3-1: Fuel filter with water separator



## 5.6 Generator 12V DC System-Installation

The Panda 4000s needs a battery with a capacity of at least 44Ah for the start. The generator can be attached to the existing starting battery of the main engine or be supplied with its own battery.

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

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

### 5.6.1 Connection of the 12V starter battery

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

**Attention!:**





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

### Connection of the battery (-)

Sample picture 4000s FC

Fig. 5.6.1-1: Connection starter battery plus cable

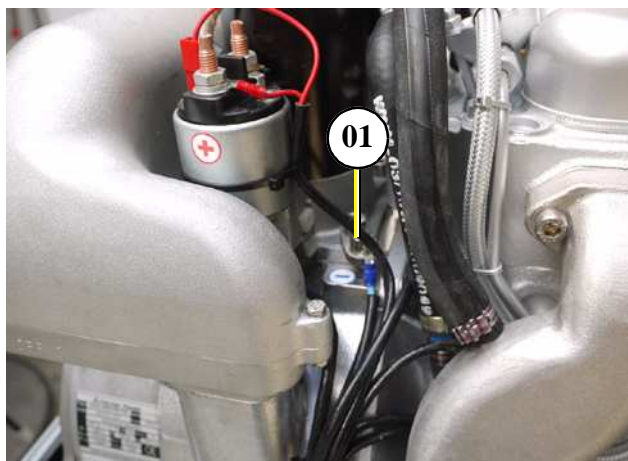


### Connect the battery (-) with the connection point at the engine foot

1. Battery (-) connection point

Sample picture 4000s FC

Fig. 5.6.1-2: Connection starter battery minus cable



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

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

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

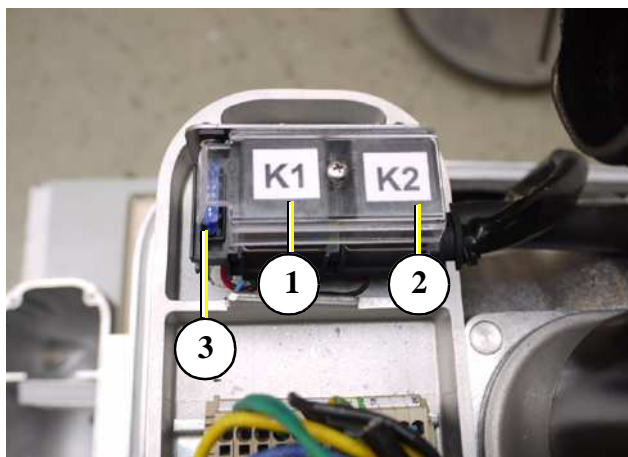
1. Starter relay K1
2. Fuel pump start relay K2
3. Electrical fuse (15A)

Sample picture 4000s FC

### Attention!



Fig. 5.6.1-3: Relays and fuse

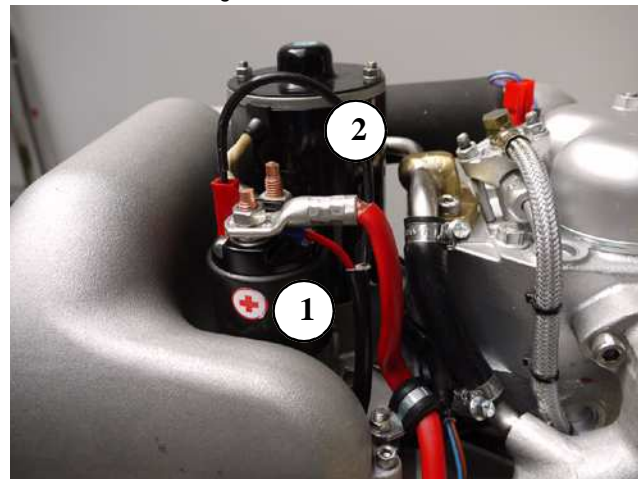


All Panda generators are equipped with an independent 12V-DC starter motor. The connecting lines cross-section from the battery to the DC system should measure 25mm<sup>2</sup>.

1. Solenoid switch for starter motor
2. Starter motor

Sample picture 4000s FC

Fig. 5.6.1-4: Starter motor



### 5.6.1.1 Additional information for battery connection

#### Commissioning:

Installation of battery lines.

! 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.

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 insulation

Use only cable with self retardant and self extinguishing insulation suitable for high temperatures up to 195F, 90°C

Install battery lines in a safe way 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 too 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 .

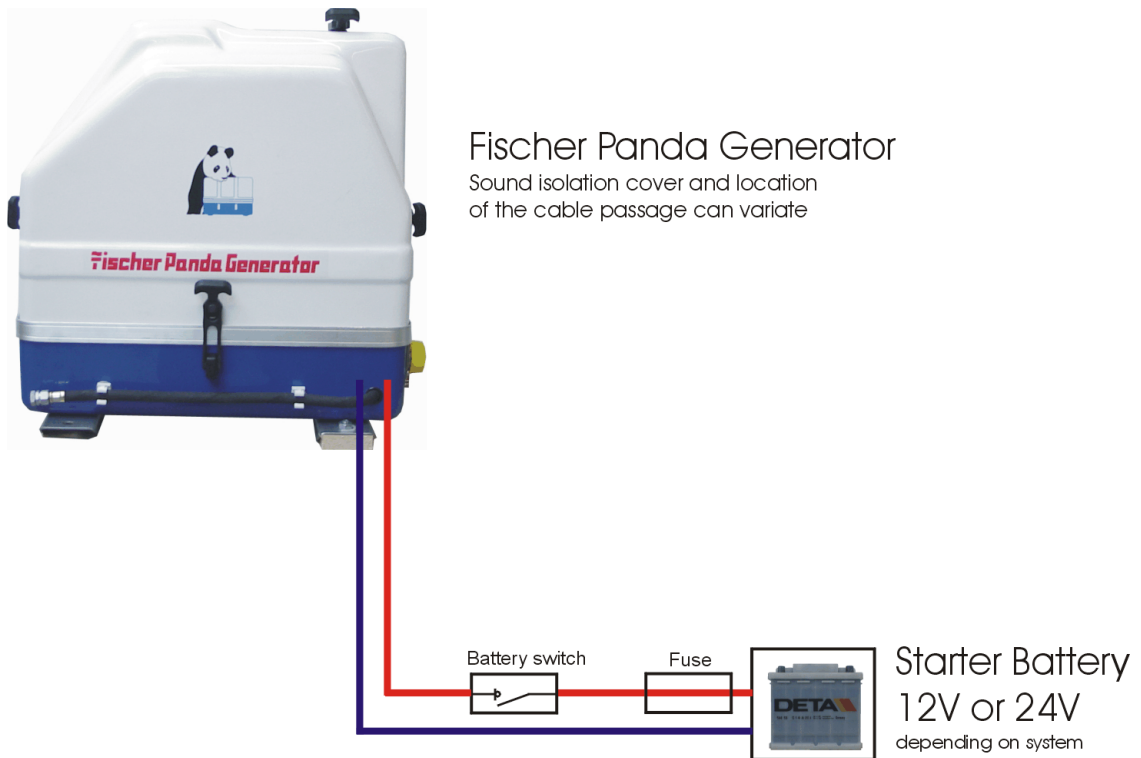
Use multi-core stranded wire only, for the battery connection.

#### Attention!:





Fig. 5.6.1-1: Sample diagram for starterbattery installation



## 5.6.2 Connection of the load

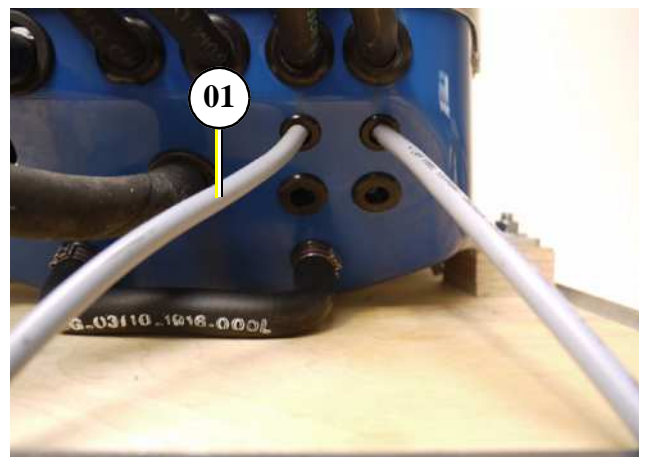
### Connection of the load

Connect the load at the prepared cable

01. Cable for load

Sample picture 4000s FC

Fig. 5.6.2-1: Connection for load



### 5.6.3 Connection of the remote control panel - see remote control panel datasheet

#### Remote control panel cable

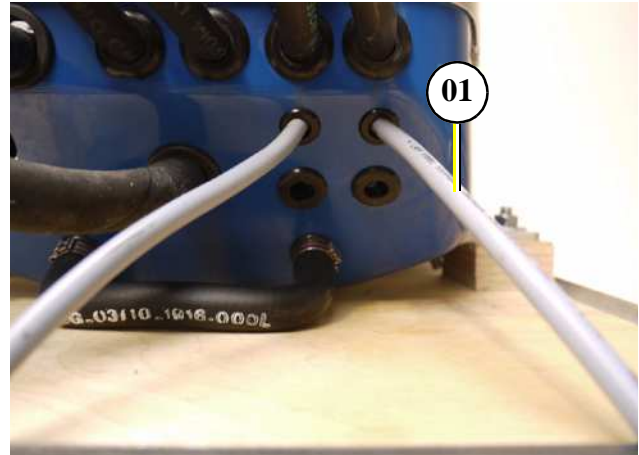
As standard a 7 core connection-cable, 7m long, is included in the supply. Cores are numbered from 1 to 7. The control cables are securely connected to the genset. On the back of the control panel there are terminals numbered from 1 - 7. Connect the cores of the control-cable in respective order.

Please ensure that the remote control panel is installed in a protected, dry and easily accessible place.

01. Cable for remote control panel

Sample picture 4000s FC

Fig. 5.6.3-1: Remote control panel



## 5.7 Generator AC System-Installation

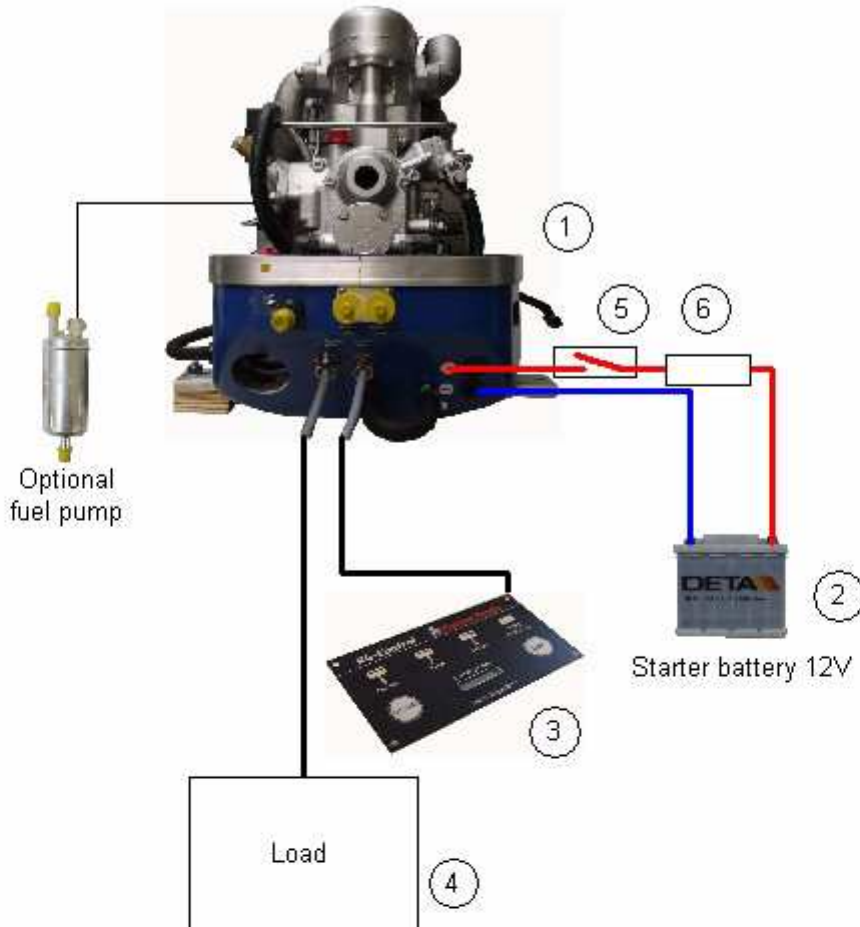
Before the electrical system is installed, READ the section "Safety instructions - Safety first!" on page 14 of this manual **FIRST!** Be sure that all electrical installations (including all safety systems) comply with all required regulations of the regional authorities. This includes lightning conductor, personal protection switch etc.

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



### 5.7.1 Electrical connection scheme

Fig. 5.7.1-1: Installation example - with separat load output



- |                         |                    |
|-------------------------|--------------------|
| 1. Generator            | 4. Load connection |
| 2. Starter battery      | 5. Battery switch  |
| 3. Remote control panel | 6. Fuse            |

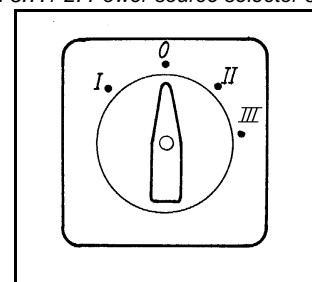
All electrical safety installations have to be made on board.

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 be used to ensure that all AC load can be switched off at once. This switch should also be installed to keep the generator and shore (grid) power systems separate.

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

- 0. OFF
- I. Generator
- II. Shore power connection
- III. Inverter

Fig. 5.7.1-2: Power source selector switch



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

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



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

### **Electrical fuses**

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

### **Required cable cross-sections**

The following recommended electrical cable dimensions (cross sections) are the minimum required sizes for a safe installation. (see *Table 8.2.1, "Technical Data Generator 4000s SC + FC," on page 124.*



## 6. Maintenance Instructions

### 6.1 Personal requirements

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

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

### 6.2 Hazard notes for this chapter

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see "Safety instructions - Safety first!" on Page 14.

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

**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 disconnected before start working at the generator.**

**Working at a running generator can result in severe personal injury. Therefore 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.

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

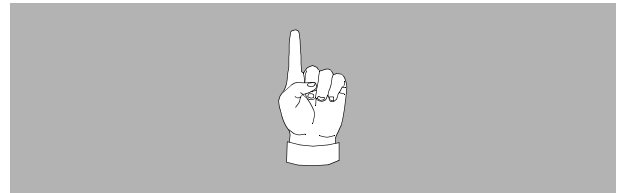
- Always make installation/maintenance work only when the generator is switched off.

- 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 available tools and special tools for maintenance work. Incorrect or damaged tools can lead to injuries.

**Note!**



**Warning!: Automatic start**



**Warning!: Risk of injury**



**Warning!: Risk of injury**





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

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

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

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

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

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

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

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

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

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

**Warning!: Danger of fire**



**Danger!: Danger of poisoning**



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



**Warning!: Hot surface/material**



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



**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

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### 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 starting

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

### 6.4.2 Hose elements and rubber formed component in the sound cover

---

Check all hoses and hose connections for good condition. The rubber hoses are very sensitive to environmental influences. They can season fast with dry air, in which environment of muted oil and fuel steams and increased temperature. The hoses must be checked regularly for elasticity. There are operating situations, at which the hoses must be renewed once in the year.

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

**For maintenance intervalls see „General information for PMS-Generators“**

## 6.5 Oil circuit maintenance

---

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°C

and SAE20 for temperatures between 5°C and 20°C is to be used. At temperatures under 5°C oil of the viscosity SAE10W or 10W-30 is prescribed.

Type and amount of required oil see:

See "Engine oil" on page 125 and "Technical Data Engine" on page 124.

## 6.5.1 Engine oil change

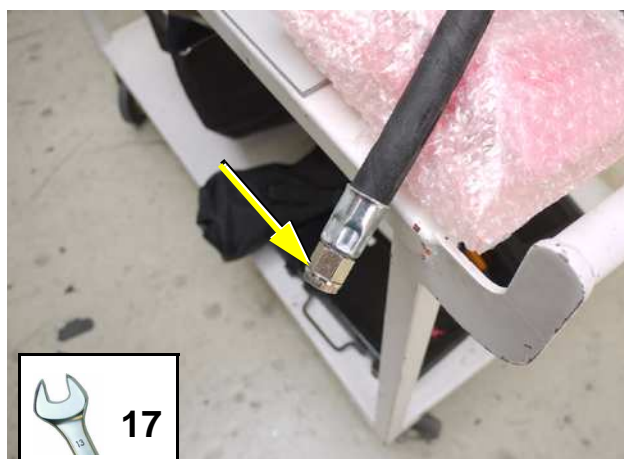
### Oil drain screw

For the oil change an oil drain hose is lead through the sound cover.

The oil can be discharged by opening the oil drain screw. For countering use a second wrench.

Sample picture 4000s FC

Fig. 6.5.1-1: Oil drain screw



### Oil drain pump

If discharging of the oil is not possible, we recommend the employment of a hand pump, which can be attached to the oil drain hose.

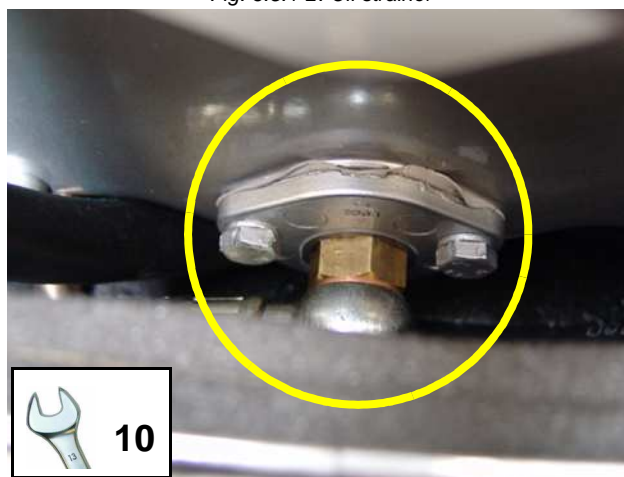
Afterwards the oil drain screw is closed again.

### Oil strainer

The Farymann engine type 18W430 is not equipped with a replaceable oil filter. Instead the engine has an oil strainer (at the face down, see picture). The strainer is to be cleaned every 500 hours. For this the engine must be lifted with the front from the sound cover. The Panda 4000s possesses an oil drain hose at the oil strainer for discharging the engine oil with the oil change.

Sample picture 4000s FC

Fig. 6.5.1-2: Oil strainer



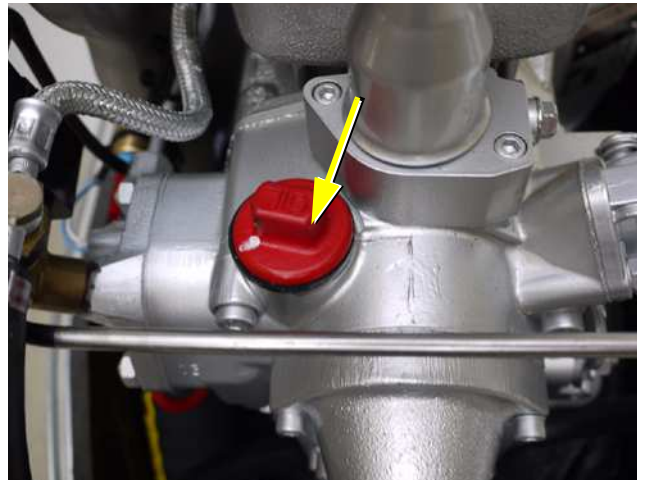


**Open the oil filler neck**

After opening the cap of the oil filler neck the new oil is refilled.

Please wait instant, before measure the oil level, the oil must set off in the sump.

Fig. 6.5.1-3: Oil fillerneck



**Oil dipstick**

With the help of the engine oil dipstick the oil level is to be examined. The prescribed filling level may not exceed the „Max“ marking.

We recommend 2/3 oil level.

Fig. 6.5.1-4: Oil dipstick

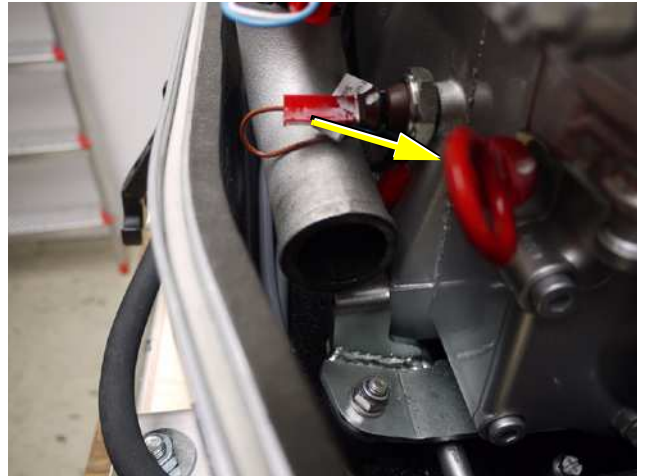
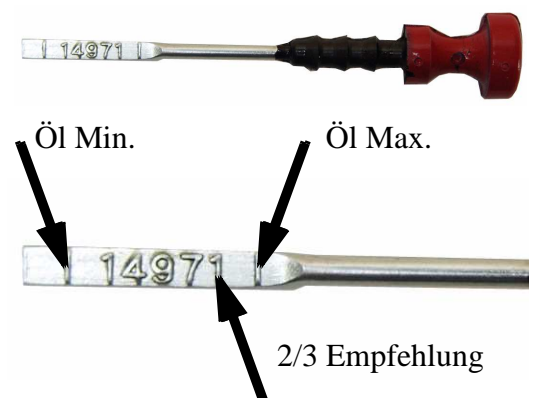


Fig. 6.5-5: Beispielbild Ölpeilstab



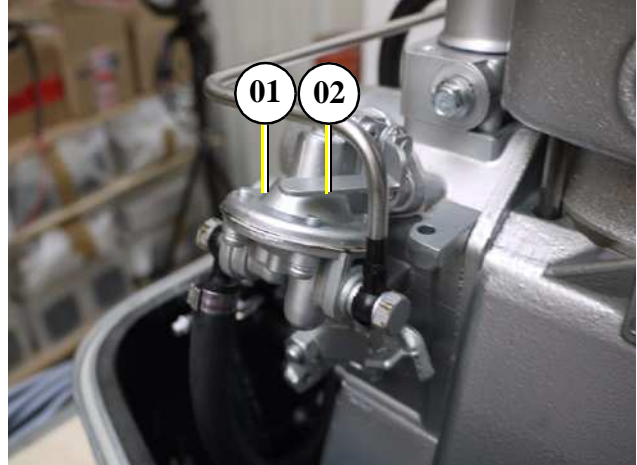
**6.6 Ventilating the fuel system**

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

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

01. Fuel pump
02. lever at fuel pump

*Fig. 6.6.0-1: Terminal block*





### 6.6.1 Checking the water separator in the fuel supply

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

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

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

Fig. 6.6.1-1: Fuel filter with water separator



### 6.6.2 Replace of the Fuel Filter

Replacing

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

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

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

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

Fig. 6.6.2-1: Fuel Filter

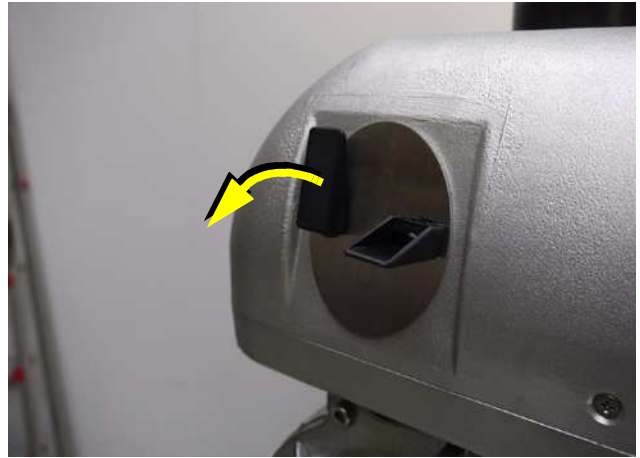


## 6.7 Replace the air filter element

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Pull the holder out to change the element.

*Fig. 6.7-1: Air suction housing*



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

*Fig. 6.7-2: Air filter element*



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

It is meaningful to repeat the de-aeration procedure also after some days again to guarantee that in the system remained bubbles are removed.





### 6.7.1 Draining the coolant

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

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

Fig. 6.7.1-1: Ventilation valve



## 6.8 The raw water circuit

### 6.8.1 Clean raw water filter

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

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

Fig. 6.8.1-1: Raw water filter



### 6.8.2 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 gensets. 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

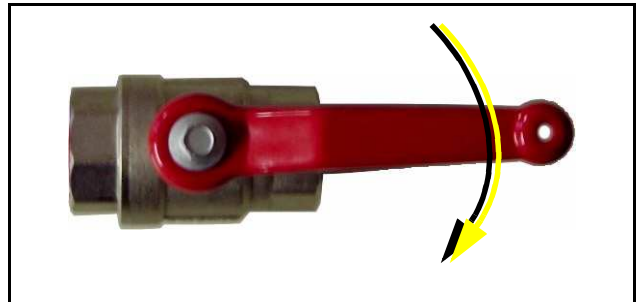


impeller are exposed to very strong loads. This can shorten the life span extremely. Further the operation of the impeller pump loaded in waters with a high portion of suspended matters. The use of the impeller pump is particularly critical in coral waterbodies. Cases are well-known, which a impeller 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")

### 6.8.3 Replace the impeller

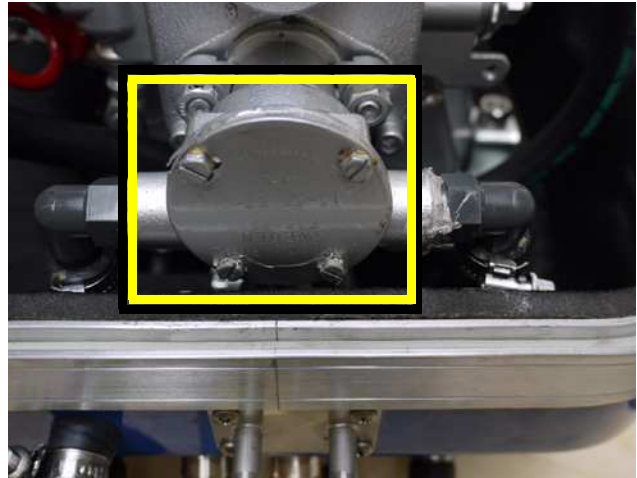
Close the raw water stop cock.

Fig. 6.8.3-1: Raw water stop cock



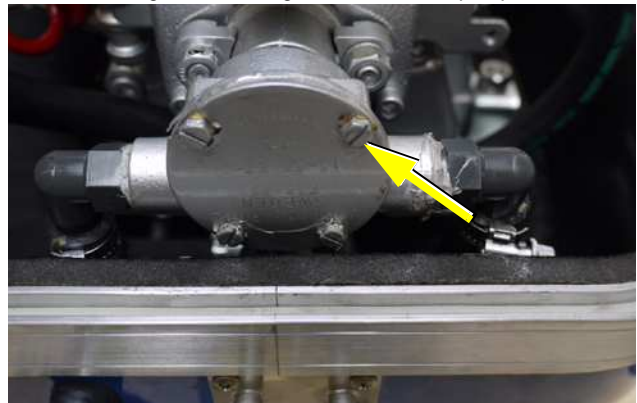
Raw water pump on the front side of the genset.

Fig. 6.8.3-2: Raw water pump



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

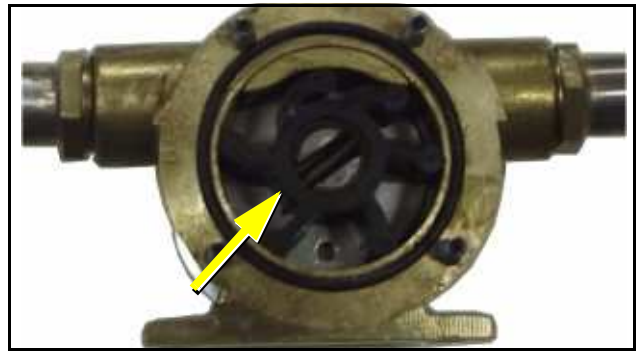
Fig. 6.8.3-3: wing screw raw water pump





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

Fig. 6.8.3-4: Impeller



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

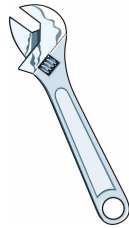


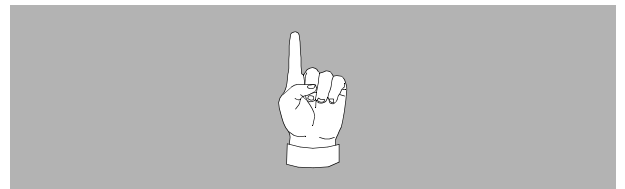
Fig. 6.8.3-5: Impeller



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

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

*Notice!:*



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

Fig. 6.8.3-6: Gasket

Fastening the cover and use a new gasket.



## 6.9 Conservation at longer operation interruption

### 6.9.1 Measures on preparation of the winter storage

1. Rinse raw water circuit with an anti-freeze solution, even if this contains a corrosion protection means. The raw water inlet must be removed at the water cock. Over a hose connector the anti-freeze protection mixture is to be sucked in from a container. The leaked cooling water with the exhaust is to be led back into the sucking in contain-



- ner. The circuit must be kept upright some minutes to guaranteed that the anti-freeze protection mixture reaches all ranges of the cooling system.
2. The concentration of the anti-freeze mixture in the internal cooling circuit must be checked with a suitable measuring instrument. The concentration must be furnished according to the lowest temperatures which can be expected.
  3. Clean raw water filter and check seal.
  4. Check water cock for practicability. And spray with a corrosion protection oil from the inside or lubricate with acidless grease.
  5. Check all hoses and hose connectors for good condition. The rubber hoses are very sensitive to environmental influences. They can age fast with dry air, in environment of light oil and fuel steams and increased temperature. The hoses must be checked regularly for elasticity. There are operating situations, which the hoses must be renewed once in the year.
  6. Check the hose connectors at all raw water valves doubly and if possible protect them with double hose clamps.
  7. Dismount the impeller of the cooling water pump and check for wear. The impeller may not remain in the pump. It must be greased with vaseline and be kept at a dark place. It can be reinserted in the spring again into the pump, if it is in good condition. The impeller is a wearing part, it is recommended to renew it always in the spring, independently how many operating hours the genset ran.
  8. Control of the vent valve at the raw water inlet. If the generator is installed below the waterline, always a vent valve is necessary. The vent valve must be checked also during the season regularly. In the winter storage the vent valve should always be disassembled, checked and greased. Hardens or got parts dirty are to be replaced.
  9. Check water lock: If the generator were rinsed with an anti-freeze mixture, the antifreeze mixture can leave in the water lock. If the generator were rinsed with fresh water, the water in the water lock must be drained. Otherwise the danger exists that the collector is blown up and destroyed by ice.
  10. Check the exhaust/water separator on leakage and if the hose connectors at the lower surface of the separation unit are in normal condition. (with extremely sulfurous fuels it is possible that also high-grade steel tube ends are attacked.)
  11. Check all construction units at the generator inside the sound cover for leakages. If there are traces of humidity in the sound cover, the cover must be dried. Further the cause for the wetness must be searched and eliminated.
  12. During the winter storage the upper section of the sound cover must be taken off, in order to avoid condensed moisture formation, if traces of humidity remain in the sound cover inside casing by leakages in the raw water circuit.
  13. The generator housing and the housing of the engine should be sprayed with a corrosion protection oil before the winter storage. This procedure is recommended also in the season. This procedure can avoid that arising and humidity marks on the surface of the aluminum construction units be noticed too late.
  14. Disconnect the starter battery (positive and negative pole).
  15. Lubricate the spindle for the number of revolutions adjustment device with a special lubricant (Antiseize grease).
  16. Check cooling water connection block at the generator housing on traces of corrosion and if necessary renew. (only such traces are to be considered, which refer to clear "blossoming" of the material. If the surface is only grey coated, this is only an indication for the fact that aluminum came into contact with condensed moisture.)
  17. Use of a air dehumidifier. The best way to protect a yacht in the winter storage against damage by humidity is, to place a air dehumidifier inside the ship and lock all hatches. The devices have a hygrometer, which switches the device off, if the humidity is under the adjusted value. There is no better method, in order to protect pads, cable, electronics, wood, engines etc. optimally against any rotting by humidity.

### 6.9.2 Initiation at spring

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- Before the first start turn the engine once with the hand, in order to eliminate necessary existing corrosion beginnings in the bushing. If necessarily carry out normal engine inspection.
- Change engine oil and engine oil filters.
- Reinsert the impeller of the cooling water pump and check pump for leakage.
- Charge starter battery of the generator, connect cables and check battery voltage.



- Start generator and check the basic adjustments of the generator such as voltage, speed regulation etc..
- Check all switching off devices for function by operational procedures.

**Fischer Panda does not take over adhesion for possible damages!**



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## 7. Generator Failure

### 7.1 Personal requirements

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

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

### 7.2 Safety instructions for this chapter

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see “Safety instructions - Safety first!” on Page 14.

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

**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 disconnected before start working at the generator.**

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

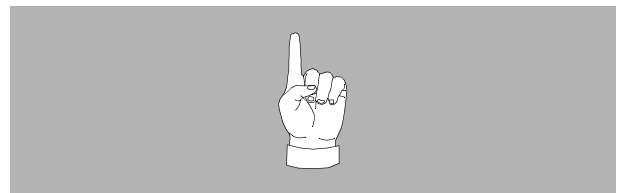
Make shure that the generator ist stopped and the starter battery is diconnected to guarantee that the generator cannot be inadvertently started.

Do not run the generator with removed sound isolation cover.

**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 available tools and special tools. incorrect or damaged tools can result injuries.

**Notice!**



**Warning!: Automatic start**



**Warning!: Risk of injury**



**Warning!: Risk of injury**



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

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

**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 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.

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

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

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

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

**Warning!: Danger of fire**



**Danger!: Danger of poisoning**



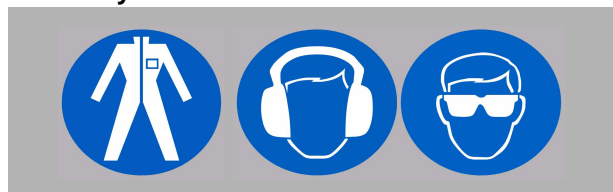
**Attention!: Danger to Life - High voltage**



**Warning!: Hot surface/material**



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



**Attention!: Disconnect all load**





## 7.3 Tools and measuring instruments

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**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

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Please ensure that the genset is not overloaded. Overloading occurs when the electrical load (demand) induces a load torque in the generator which is higher than that which the diesel drive motor can provide. Overloading causes the engine to run rough, burn oil, creates excessive exhaust (environmentally unfriendly) and even to stall. Extra caution should be practised with multi-power units (single and 3-phase current generation) to avoid overloading the diesel drive engine.

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

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

Keep PEAK LOADING demand in mind when switching on electrical devices (esp. fridge compressors, electric motors, battery chargers, kettles, etc.) which are fed by the generator. Careful "powering up" (gradual loading) of the electrical demand on the generator will help prolong the life of your genset! The genset can be run for several hours at partial load (i.e. 2/3 of rated power), however it is not advised that it is run for more than 2-3 hours at full load. The Panda is designed so as not to overheat even under extreme conditions. Note: The exhaust gas will become sooty during peak-load operation.

### **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 capacitors, 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 a compensation is appropriate (see in addition also the writing: "Operation Instructions for Generators with Inductive Loads").

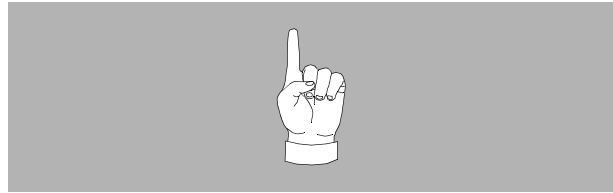
### 7.4.1 Monitoring the Generator Voltage

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see "Safety instructions - Safety first!" on Page 14.

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

**Notice!:**



The voltage range of the power stations normally lies between 100V and 130V in the 60Hz version. In some countries even substantially larger tension deviations are being called "normally". The PANDA generators are aligned that they keep these default values during normal load.

With high load or overload it can occur that the voltage drops on 95V in the 60Hz version and partly still more deeply. That can become critical for certain devices (e.g. for electric motors, cooling compressors and possibly for electronic devices). It must be paid attention that the voltage for such loads are sufficient. This can be supervised by a voltmeter.

The voltmeter should be always installed behind the change over switch generator/land power, so that each voltage source is shown. No further voltmeter is provided for the generator itself.

If additional loads are switched on, the voltage must be controlled in each case at the voltmeter. Sensitive devices must be switched off so long, until the voltage exceed the critical parameter.

Under certain circumstances the generator provides overvoltage. This arises if the number of revolutions of the generator is increased. Changing the number of revolutions may be made only with a tachometer and/or a voltmeter.

If sensitive and/or valuable devices are used, which are to be protected against this risk, an automatic overvoltage protection must be mounted. (voltage control with disconnection).

### 7.4.2 Automatic Voltage Monitoring and Auto-Shut Down

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If air conditioning units (compressors) or other such valuable equipment is installed on-board, it is recommend that an automatic voltage monitoring unit be installed to protect this equipment from possible sharp voltage drops. The voltage monitoring system shuts down the entire system (and therefore all users) by means of a circuit breaker relay as soon as the voltage falls below a set value (the monitor will also shut down the on-board grid automatically when the generator is stopped). Such a relay with contactor can be obtained from the installator or as a complete unit from your Panda dealer.

**During any operation at the generator all load have to be switched off to avoid damages at the equipments. Also the solid state relay, which is installed in the AC-control box must be disconnected to avoid an accidentally activation of the booster capacitors.**

Re-connect the connections if the electrical supply lines in the AC-control box were also be disconnected.

The generator can't be damaged by an overload because the winding is overload- and short-circuit safety. But damages are possible in the periphery. Especially connected loads are endangered because a lower voltage can damage them by order.

## 7.5 Low Generator-Output Voltage

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If the produced alternating voltage is too low, switch the load off, in order to relieve the generator. Mostly the problem already solved. If the output voltage is still too low, even if all loads are switched off, the generator runs without load, you can assume one or more condensers are defective.



### 7.5.1 Discharge the capacitors

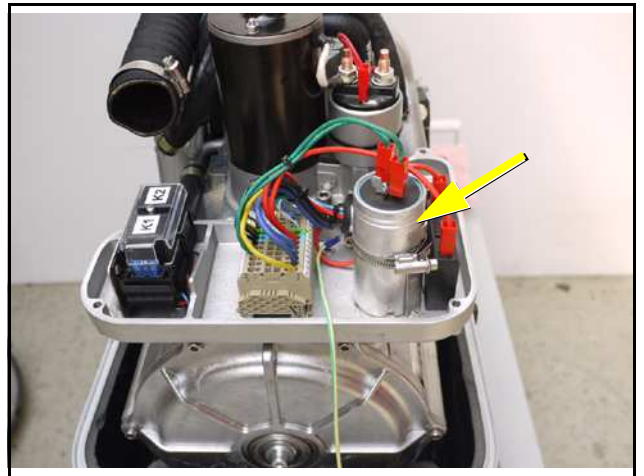
- 1) Switch off generator
- 2) Disconnect starter battery
- 3) Generator power terminal box
- 4) Remove the caps

The capacitor is discharged, by short circuit the two contacts. In addition use the cone end of an isolated screwdriver.



Sample picture 4000s FC

Fig. 7.5.1-1: Capacitors



### 7.5.2 Check and discharge the capacitors

Before working (installation) on the System read the section "Safety Precautions" auf Seite 6 in this Manual.

**ATTENTION!**



**NEVER** check the capacitors whilst the generator motor is running! Charged capacitors can be lethal. Do not contact the capacitors with bare fingers or non-insulated metallic objects! In order to test the capacitors, the terminal lead wires have to be disconnected using pliers or a screwdriver with insulated handle(s). Once the wires have been removed, the capacitors must be discharged by bridging the capacitor terminals with a discharge reactor.

**Attention!:**



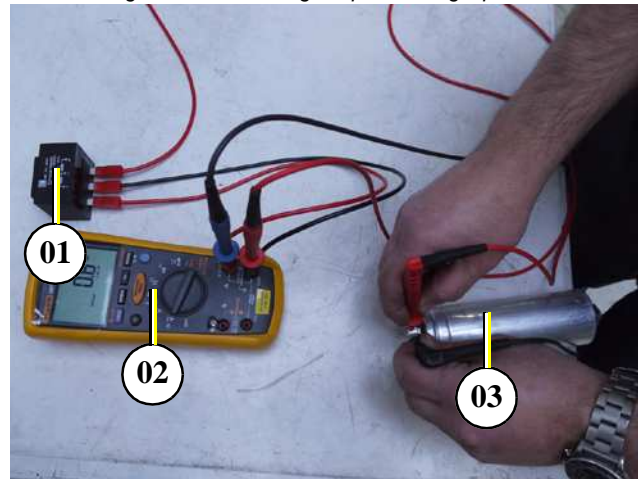
The capacitors can be checked using a multimeter with capacitor measuring.

The capacitors fitted inside the cabinet are discharged over the soldered resistor at every capacitor. The discharge over the discharge reactor (see special tools) is security because the capacitor voltage is lethal.

### Discharge the capacitor - single phase

03. Capacitor

Fig. 7.5.2-1: Discharge capacitor single phase



### Discharge the capacitor - three phase

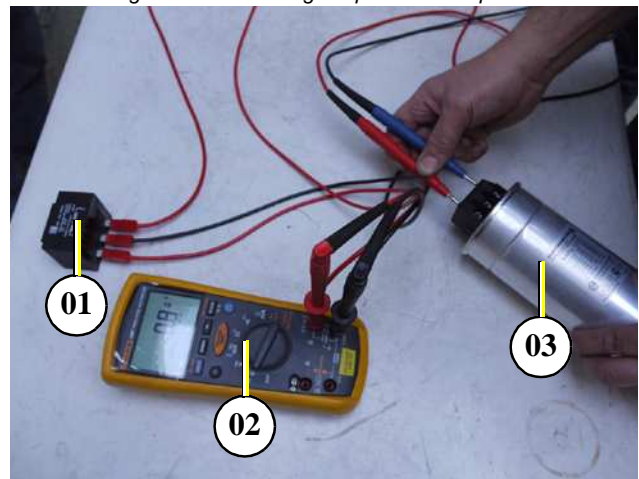
01. Discharge reactor (5-10kOhm)

02. Multimeter

03. Capacitor

At three phase capacitors the discharge must be made between every phase (L1-L2; L2-L3; L1-L3)

Fig. 7.5.2-2: Discharge capacitor three phase



### Checking

Switch the multimeter to capacitor measuring and connect the meter end probes to the capacitor terminals. Measure capacity of the capacitor.

Fig. 7.5.2-3: Capacitor checking



### Check all capacitors in the electrical cabinet

Test each capacitor by touching the multimeter (set on capacitor measuring) probes on the capacitor terminals: measure the capacity of the capacitors.

The capacitors should not be removed from the electrical cabinet before the check is made.

### Checking the electrical connections to the Capacitor

It must be ensured that the electrical connections to the capacitor are always tight fitting. Loose connections with transitional resistance can mean that the contact surfaces will become heated externally. This can lead to faster deterioration of the capacitors.

transitional resistance can mean that the contact surfaces will become heated externally. This can lead to faster





deterioration of the capacitors.

### 7.5.3 Checking the generator voltage

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**In order to test, whether the fixed winding produces enough voltage, proceed in such a way:**

1. Guarantee that the connection to the electrical system is interrupted.
2. Remove all conductions in the power terminal box of the generator.
3. Starter battery must be connected with the generator.
4. Start the generator start.
5. Measure with a voltmeter the voltage between the phase(s) and N. If the measured values are under the substantially values in Table 8.2.1, "Technical Data Generator 4000s SC + FC," on Page 124, a coil damage is to be accepted.

### 7.5.4 Measuring the coil resistance

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**For this a measuring instrument must be used that is suitable for low impedance values.**

- Adjust the measuring instrument to resistance test. If hold the poles of the measuring instrument hold together, 0.00 ohms should be indicated. If the poles are isolated, the display should indicate an overflow. Please implement this test, in order to examine the equipment.
- Measure of the resistance within the individual windings.

If there are large deviations, it must be assumed that there is a windings short circuit. This also leads to non-excitation of the generator.

The actual values between the windings parts and the earth cannot, however, be exactly determined. Fore-mostly, the values of all three measurements must be the same, if possible. Deviations from each other show there is windings short-circuit. In this case, the generator windings must be renewed by an electrician.

### 7.5.5 Checking the coil(s) to short-circuit

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In order to check the coils for short-circuit, first all lines, which lead to the electrical system, must be interrupted. This happens on the power terminal box of the generator or, if available, in the electrical system junction box. Guarantee that no voltage lies at the lines, before they are interrupted (see "Discharge the capacitors" on Page 115").

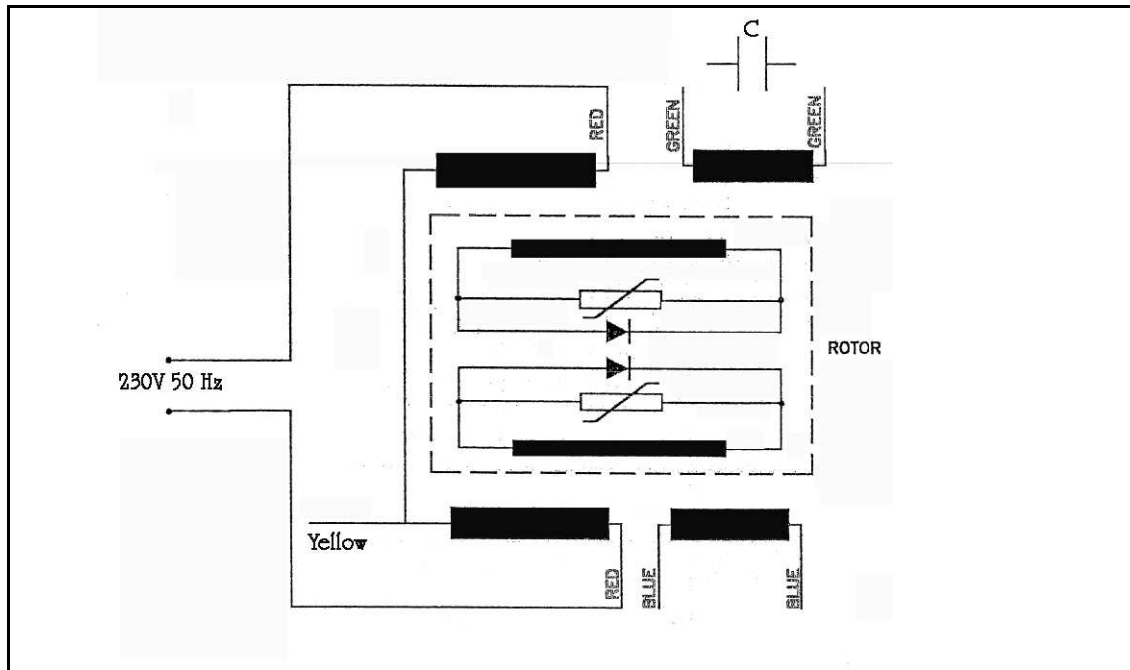
Now remove the bridge between "N" and "PE", so that coils and housing are electrically separate from each other.

Check with a circuit indicator (multimeter) in the power terminal box if between the individual connection points of the coil and the housing (PE) a pass exists.





Fig. 7.5.5-1: Coilplan



If a pass (beep) should be determined, the generator must be returned for examination in the plant, or it can also be wound again locally. For this coil data can be requested.

### 7.5.6 Measuring the inductive resistance

Unfortunately the checking of the ohmic resistance permits still no reliable statement about the condition of the coil. If the ohmic resistance values arise inequalities between the coils, that is a safe indication for the fact that the coil is defective. To be exactly sure the inductive resistance of the coil have to be measured. For this a special measuring instrument is necessary, which measures the inductance of a coil.

Inductance is measured in the same way as the ohmic resistance, i.e. the coils are compared. The value is indicated in mH (milli Henry).

The arranging value for the inductive resistance can take from the Table 8.2.1, "Technical Data Generator 4000s SC + FC," on Page 124.

Note: These values depends strongly from the measuring method (kind of the measuring instrument)

## 7.6 Starting Problems

### 7.6.1 Fuel Solenoid Valve

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

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

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

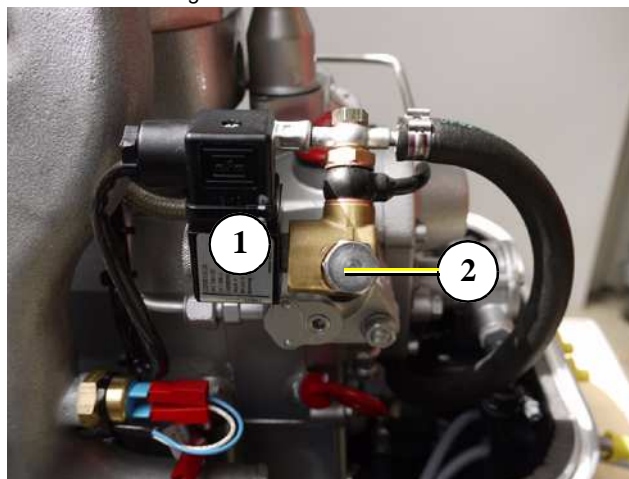


## 1. Fuel solenoid valve

## 2. Ventilation screw

Sample picture 4000s FC

Fig. 7.6.1-1: Fuel solenoid valve



## 7.6.2 Damage to starter motor

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

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

## 7.6.3 Troubleshooting Table

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For troubleshooting see "Troubleshooting" on Page 121.



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## 8. Tables

### 8.1 Troubleshooting

#### GENERATOR OUTPUT VOLTAGE TOO LOW

For 60Hz versions: less than 100V

Cause	Solution
Generator is overloaded.	Reduce the electrical load. (Switch off load)
Motor is not reaching the rated rpm.	Refer to "motor faults" section.
Defective capacitor(s).	Check capacitors and replace if necessary.

#### GENERATOR VOLTAGE TOO HIGH (MORE THAN 135V-60Hz)

If the generator is providing excessively high voltage, the following potential causes should be investigated:

Cause	Solution
Over-energizing due to wrong capacitors.	Check capacitors type and replace if necessary.

#### GENERATOR VOLTAGE FLUCTUATES

Cause	Solution
1. Disturbances on the electrical system/user side. 2. Motor disturbances.	1. Check if electrical load is fluctuating. 2. Refer to section: "Motor runs irregular".

#### GENERATOR NOT ABLE TO START ELECTRIC MOTOR

Cause	Solution
If the generator is unable supply enough power to start an electric motor, it is usually because the motor draws too much current during starting process.	Check the motor's current draw required for starting Enquire at your nearest Panda dealer or directly at the manufacturer.

#### DIESEL MOTOR FAILS TO START

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



## STARTER IS TURNING MOTOR, BUT FAILS TO START

Cause	Solution
Fuel inlet solenoid valve not opening.	Check wire connections and circuitry to solenoid valve. (ref. DC wiring diagram: Relay K2, Fuse)
Fuel pump not working.	Check fuel-filter and pump: clean if necessary.
Lack of fuel.	Check fuel supply.
Glow-plugs not working correctly.	Check glow plugs and heating time.
Too much air in fuel lines.	Test fuel system for leakage. Bleed air from fuel system (refer to section 6.6, "Ventilating the fuel system," on page 101).
Fuel-filter blocked.	Replace fuel filter.

## MOTOR RUNS IRREGULARLY

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

## MOTOR DOES ACHIEVE ENOUGH SPEED DURING STARTING PROCESS

Cause	Solution
Starter battery voltage insufficient.	Check battery.
Damaged bearing(s) piston (seized).	Repairs need to be carried out by Farymann-Service. (refer to Farymann motor-manual)
Cooling water in combustion chamber.	<ol style="list-style-type: none"> <li>1. Turn generator "OFF" at control panel.</li> <li>2. Remove the glow plug (see Farymann-manual).</li> <li>3. Rotate the motor by hand carefully.</li> <li>4. Check if there is water in the oil and change both oil and filter if necessary.</li> <li>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.</li> </ol>

## MOTOR SPEED DROPS

Cause	Solution
Lack of fuel	Check fuel supply system: <ul style="list-style-type: none"> <li>- fuel filter, renew if necessary</li> <li>- check fuel pump</li> <li>- check fuel lines (bleed if necessary)</li> </ul>
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).



MOTOR SPEED DROPS	
Generator overloaded by over-energizing.	Check that the proper capacitor type is installed and that they are connected correctly.
Defective generator (windings, bearings, or other).	Generator must be sent to manufacturer for repair of damaged bearings or winding.
Damaged engine.	Repair of bearing damage, etc., by Farymann-Service.

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

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

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

GENERATOR MUST BE SHUT OFF IMMEDIATELY IF:	
Cause	Solution
<ul style="list-style-type: none"> <li>- motor rpm suddenly rises or drops</li> <li>- unusual noise comes from genset</li> <li>- exhaust colour suddenly becomes dark</li> <li>- leakage in the cooling water system.</li> </ul>	Refer to respective section of manual and if necessary, have repaired by Farymann-Service, or Panda representative.

## 8.2 Technical Data Engine

Fig. 8.2-1: Technical Data Engine

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

a. progressive governor by VCS

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

### 8.2.1 Technical Data Generator 4000s SC + FC

Fig. 8.2.1-1: Technical Data Generator 4000s SC + FC

Generator	Panda 4000S SC
Nominal power	3.8 kW , 3000mtr nn., 50°C
Nominal voltage	230V / 50 Hz single phase
max. current	15 A
Frequency	50Hz
Cable cross-section	single-phase: 3x 2,5mm <sup>2</sup>





ohmic resistance coil	Exciting wiring = Green-Green Cable 2,3 Ohm Generator wiring = Red-Red Cable 1,2 Ohm Generator wiring = Red-Yellow Cable 0,6 Ohm
inductive resistance coil	Exciting wiring = Green-Green Cable 12,2 mH Generator wiring = Red-Red Cable 5,4 mH Generator wiring = Red-Yellow Cable 2,3 mH
Voltage stator coil	single-phase: L-N: 2-4V
Coolant hoses [Ø / mm]	Raw water: 12
Exhaust hose [Ø / mm]	40
Fuel hose [Ø / mm]	Supply / return: 8

## 8.3 Engine oil

### 8.3.1 Engine oil classification

#### 8.3.1.1 Operating range:

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

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

#### 8.3.1.2 Quality of oil:

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

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

##### API C for diesel engines

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

API C for diesel engine

Examples for diesel engine oil:

API CCEngine oil for small demands

API CDEngine oil for suction- and turbo diesel engine

API CFReplace the specification API CD since 1994

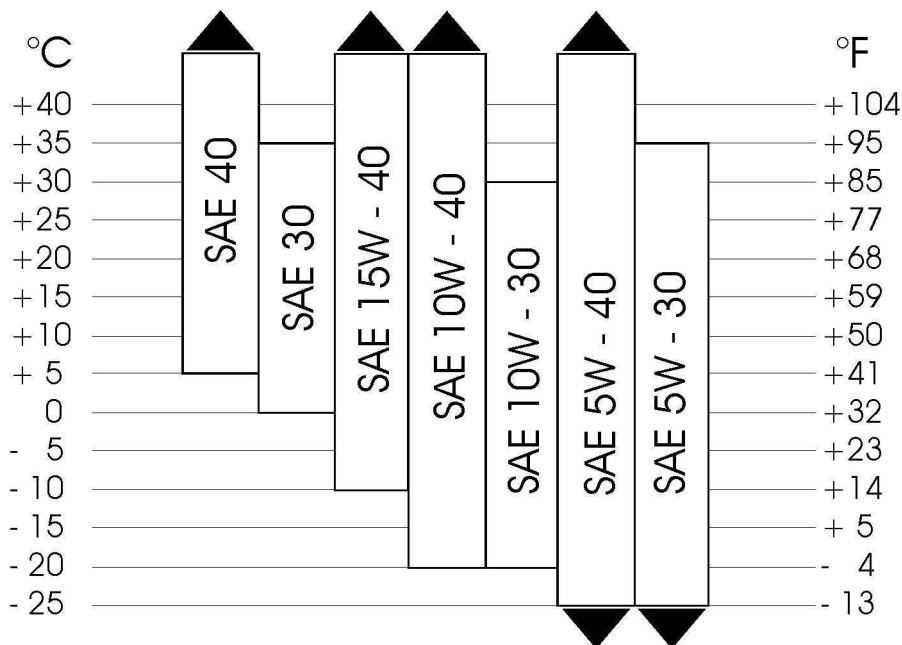
API CGEngine oil for highest demands, turbo-tested

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

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

Engine oil type	
below 0°C	SAE10W or SAE10W-30 SAE10W-40

Fig. 8.3.1-1: Temp. range of the SAE classes



## 8.4 Coolant specifications

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

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

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

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

### 8.4.1 Coolant mixture ratio

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



## 8.5 Fuel

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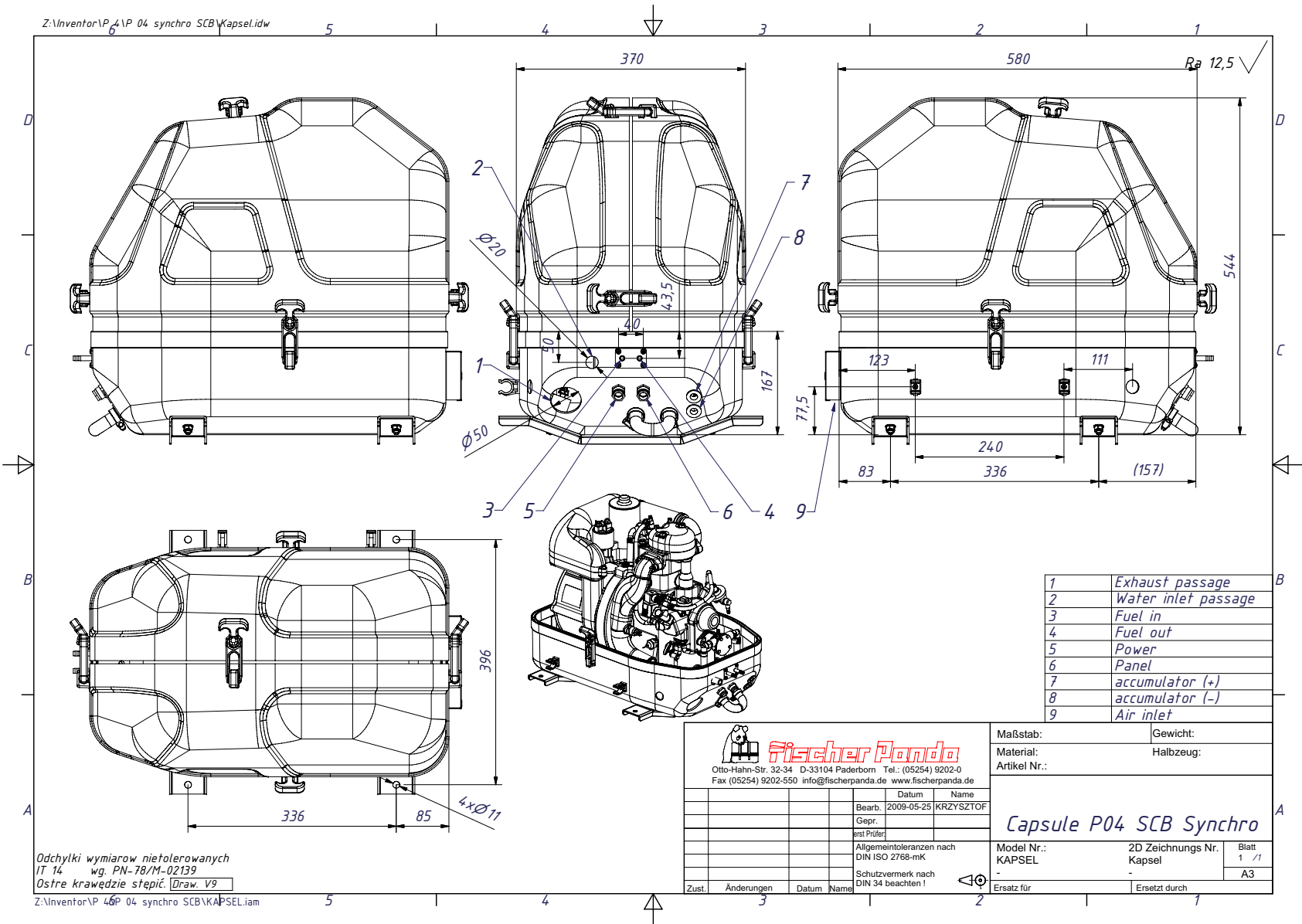
Use a clean No. 2 Diesel fuel oil (SAE J313 JUN87) according to ASTM D975 and EN 590.

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 affects the engine.





## 8.6 Capsule measurements

Fig. 8.6-1: Capsule measurements



## Fischer Panda Datenblatt / Datasheet

### 9. Remote Control Panel P4 Control

 <b>Fischer Panda</b>	<b>Art Nr..</b>	21.02.02.032H
 <b>Fischer Panda</b>	<b>Bez.</b>	Remote Control Panel P4 Control

	Dokument	Hardware	Software
Aktuell:	R02	V1.00	-----
Ersetzt:	R01	V1.00	-----

#### 9.1 Remote control panel

##### Remote control panel P4 Control

The remote control panel is necessary to control the generator and to evaluate the motor/generator properties. The generators will automatically cutout, if it does not run as required. The generator may not be run without the remote control panel.

Fig. 9.1-1: Remote control panel





### Fischer Panda Datenblatt / Datasheet

#### 9.1.1 Cleaning and Replacing parts at the generator

##### Disconnect the battery when working on the generator

The battery must always be disconnected (first negative then positive pole), when work on the generator or the electrical system of the generator are made, so that the generator can not be started accidentally.

This is especially true for systems with an automatic start function. The automatic start function is to be deactivated before the work.

*Sea valve must be closed. (only PMS version)*

##### Note also the safety of the other components of your system.

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

##### Attention!:



##### Note!:



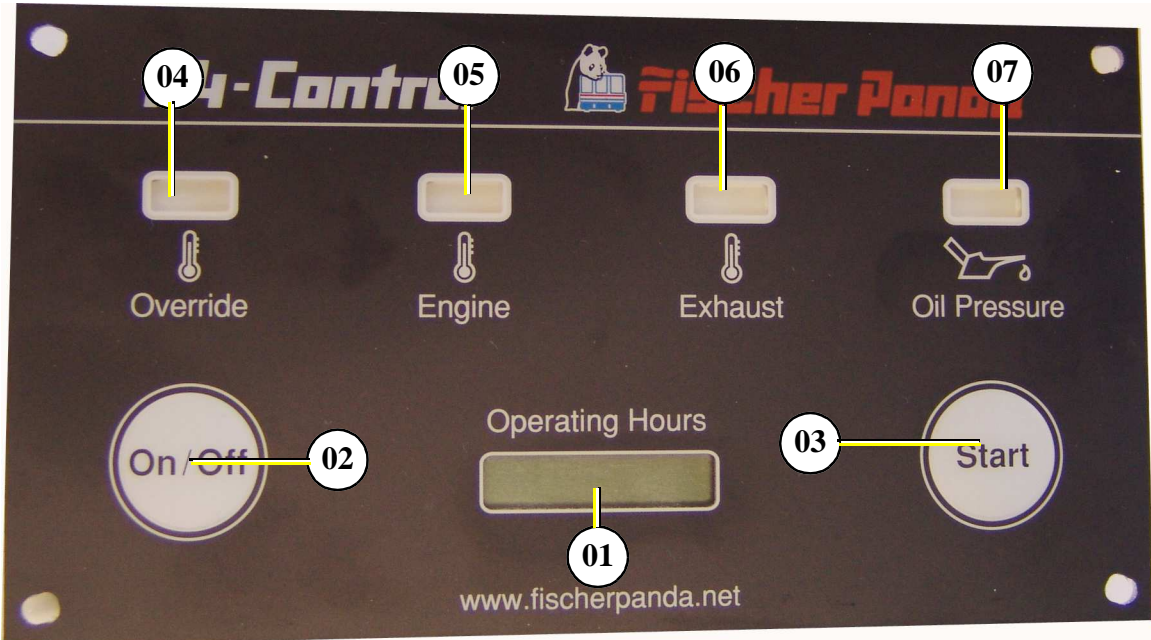
##### Warning!: Hot surface/material



## Fischer Panda Datenblatt / Datasheet

### 9.2 Front side

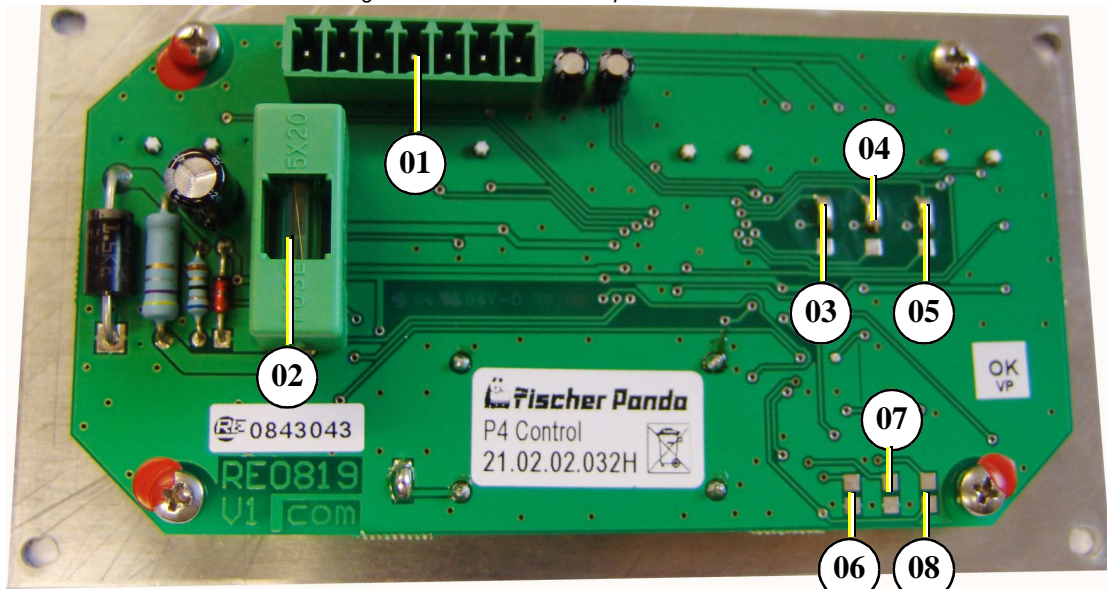
Fig. 9.2-1: Remote Control Panel - Front Side



- |                              |   |
|------------------------------|---|
| 01) Display operating hours  | 05) Warning light for engine temperature  |
| 02) Power „ON/OFF“-button    | 06) Warning light for exhaust temperature |
| 03) Generator „Start“-button | 07) Warning light for oil pressure        |
| 04) Control light „Override“ |   |

#### 9.2.1 Back Side

Fig. 9.2.1-1: Remote control panel - back side



- |                                   |                 |
|-----------------------------------|-----------------|
| 01) Connector for generator cable | 05) Jumper J101 |
| 02) Fuse 0,5A                     | 06) Jumper J104 |
| 03) Jumper J103                   | 07) Jumper J105 |
| 04) Jumper J102                   | 08) Jumper J106 |





## Fischer Panda Datenblatt / Datasheet

### 9.3 Operation Manual

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#### 9.3.1 Preliminary Remarks

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##### Advices concerning the starter battery

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

#### 9.3.2 Override Function

---

Depending on the installation situation, a heat accumulation inside the generator sound insulated capsule may occur (especially after longer run time with high load). According to this situation the engine overheat switch release after the generator has already stopped. The generator can not be started until the engine has cooled down.

To prevent this, the P4 Control panel has an override mode. While the start button is pressed and several seconds after it (can be modified with jumpers on the panel back side), the temperature error is ignored. The circulation of the cooling water cool down the engine and the generator can be started normal.

The control light „Override“ is turned on:

- if the panel is on and the generator is stopped (funktion control)
- during the „Start“ button is pressed (Override activ)
- during the setted time after the „Start button is released“ (Override activ)

**Not in use at the Panda 4000s serie.**

#### 9.3.3 Daily routine checks before starting

---

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

**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 level, if the level drops below the min. mark**

**Notice!: OIL PRESSURE CONTROL!**



2. State of Cooling Water.

The external compensation tank should be filled up to a maximum 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. (only Marine)

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

4. Check Raw water Filter. (only Marine)

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.



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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.(only Marine)

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

### 9. Check the Automatic Controls Functions and Oil Pressure.

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

## 9.3.4 Starting the Generator

---

1. Open sea lock and close battery switch if necessary.
2. Push „ON/OFF“ button to switch panel on.
3. Push „Start/Stop“ button to start the generator.
4. Switch on load.

**In the event of starting problems, close the sea water inlet cock. Panda marine generators only.**

Should there be any reason to turn the engine (over) or start the engine i.e. to bleed the fuel system, the sea water inlet cock must be closed! During the starting process, the cooling water pump is driven with the motor. The cooling water is discharged to the exhaust outlet and, since the motor has not run, the exhaust pressure is not high enough to expel the sea water which has been brought to the exhaust outlet. To avoid filling the exhaust outlet with water and causing further problems, close the inlet sea water valve.

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

**Attention!**



## 9.3.5 Stopping Generator

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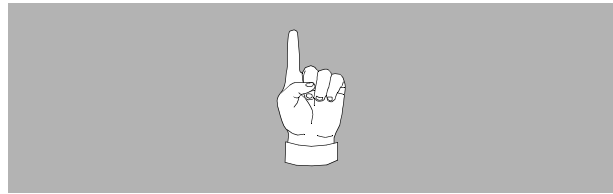
1. Switch off load.
2. If the load is higher than 70% of the nominal load, the generator temperatures should be stabilised by switching off the load for at least 5 minutes.  
At higher ambient temperatures (more than 25°C) the generator should always run for at least 5 minutes without load, before it is switched off, regardless of the load.
3. Press „OFF“ button and switch off the generator.
4. Activate additional switches (Battery switch, fuel stop valve etc.).

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Never switch off the battery until the generator has stopped.

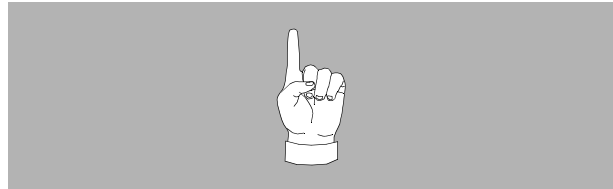
5. If necessary, close sea cock.

*Notice!:*



If the generator switches itself off with the operation with load for temperature reasons, must be examined immediately, which the cause is. That can be an error at the cooling system or any error in the range of the outside cooling system.

*:Notice!:*



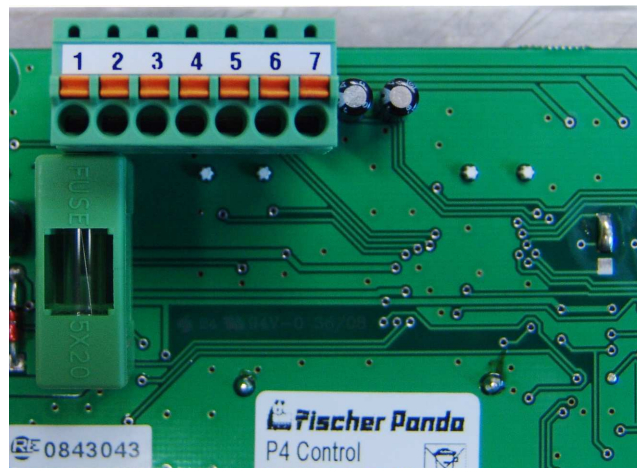
### 9.4 Installation of the Panel

#### 9.4.1 Connection of the remote control panel

As standard a 7 core connection-cable, 7m long, is included in the supply. Cores are numbered from 1 to 7. The control cables are securely connected to the genset. On the back of the control panel there are terminals numbered from 1 - 7. Connect the cores of the control-cable in respective order.

Please ensure that the remote control panel is installed in a protected, dry and easily accessible place.

Fig. 9.4.1-1: Remote control panel - back side



Ter..-Nro	Terminator.-name	i / o	Description
1	Vbat	i	Power supply 12V (+)
2	GND	i	Power supply 12V( -)
3	T-Cyl	i	<p>Error „engine temp“. Temperature switch engine head in.</p> <p>Can be setted up by jumper as NC or NO</p> <p>Gives 22mA (12V +) on the switch.</p> <p>This error is ignored while the „Start“ button is pressed and several seconds after it is released (time set up by jumpers)</p> <p>The yellow „Override“ LED is on while the error is ignored.</p> <p>Status is displayed by green/red LED.</p>



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4	T-EXH	i	Error „exhaust temp.“. Temperature switch exhaust elbow in. Can be setted up by jumper as NC or NO Gives 22mA (12V +) on the switch. Status is displayed by green/red LED.
5	Oil-Press	i	Error „oil pressure“. Oil pressure switch in. Can be setted up by jumper as NC or NO Gives 22mA (12V +) on the switch. Status is displayed by green/red LED.
6	Start	o	Start relay out . Is activ while the „Start“ button is pressed. The supply voltage is switched on the relay. (see remarks 1-3)
7	Fuel-Pump	o	Fuel pump relay out. Is activ, if no error (temp. or oil press. at 3, 4, 5) is accured. Is activ during the „Override“. The supply voltage is switched on the relay. (see remarks 1-3)

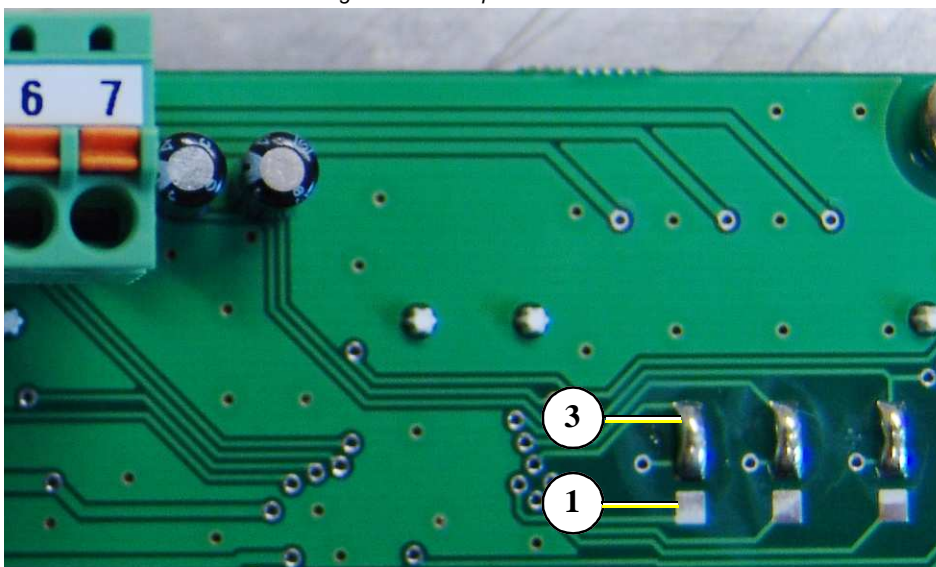
- 1) Max. current out continous operation: 0,25A short time 0,4A
- 2) Max. current out is limited by the panel fuse (minus 0,1A for the panel).
- 3) The out is protected by an freewheeling diode.

## 9.5 Jumperconfiguration

### 9.5.1 Jumper configuration for the input

### 9.5.2 Jumper J101-J103

Fig. 9.5.2-1: Jumper J101 - J103



At the 3 pin jumpers J101-J103 the pin 3 is at the termination block side.

Jumper	Status	Desc.
J101	1-2	Temp. switch engine head is NC



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	2-3	Temp. switch engine head is NO
J102	1-2	Temp switch exhaust elbow is NC
	2-3	Temp switch exhaust elbow is NO
J103	1-2	Oil pressure switch is NC
	2-3	Oil pressure switch is NO

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### 9.5.3 Jumper for configuraton odf the „Override“ time

	J104	J105	J106	Test-Mode	Override time [s]
<b>1</b>	<b>open</b>	<b>open</b>	<b>open</b>	<b>no</b>	<b>40</b>
2	closed	open	open	no	20
3	open	closed	open	no	10
4	closed	closed	open	no	5
<b>5</b>	<b>open</b>	<b>open</b>	<b>closed</b>	<b>no</b>	<b>0,16</b>
6	closed	open	closed	no	0,08
7	open	closed	closed	no	0,04
8	closed	closed	closed	no	0,02
<b>9</b>	<b>open</b>	<b>open</b>	<b>- -</b>	<b>yes</b>	<b>2,5</b>
10	closed	open	- -	yes	1,25
11	open	closed	- -	yes	0,63
12	closed	closed	- -	yes	0,31

1 is atandard for „override“ activated

2 is standard for „Override“deactivated“

9 is standard for „Test mode“

The Test mode is activ as long as the button „on/off“ is pressed by turning on the panel.

## 9.6 Maximum ratings

Operation outside of the maximum ratings can causes damage at the panel and the generator

In not indicated otherwise the ambient temperature is assumed. All oltage data are against GND (X1.2).

Operation Voltage  $U_b$  is the voltage at terminator X1.1

Parameter	Desc.	min.	max.	
Betriebsspannung	without time limit. full function	10,5	15	V
	without time limit, full function (except H-Meter, LED light lower)	6		V
	maximal 60min, $T_a = 65^\circ\text{C}$ , full function		17	V
	maximal 60s, $T_a = 65^\circ\text{C}$ , full function		18	V
	maximal 100ms, $T_a = 65^\circ\text{C}$ , full funktion		22	V
	maximal 100ms, full funktion, except H-Meter, some LED out of ordert	4,5		V
ambient temperature for operation		0	+85	$^\circ\text{C}$
capacity of the outputs	without time limit		0,25	A
	without time limit (1 output only)		0,4	A
External voltage on the out-puts	Outputs with freewheeling diode for short out negative external voltage	-0,3	$U_b$	V
External Voltage on the inputs	without time limit. Voltage which are out of the rating will be short out by the Z- diode.	-0,3	$U_b$	V
Internal F1	Microfuse 5 x 20mm glass fuse slow to blow		0,5	A

