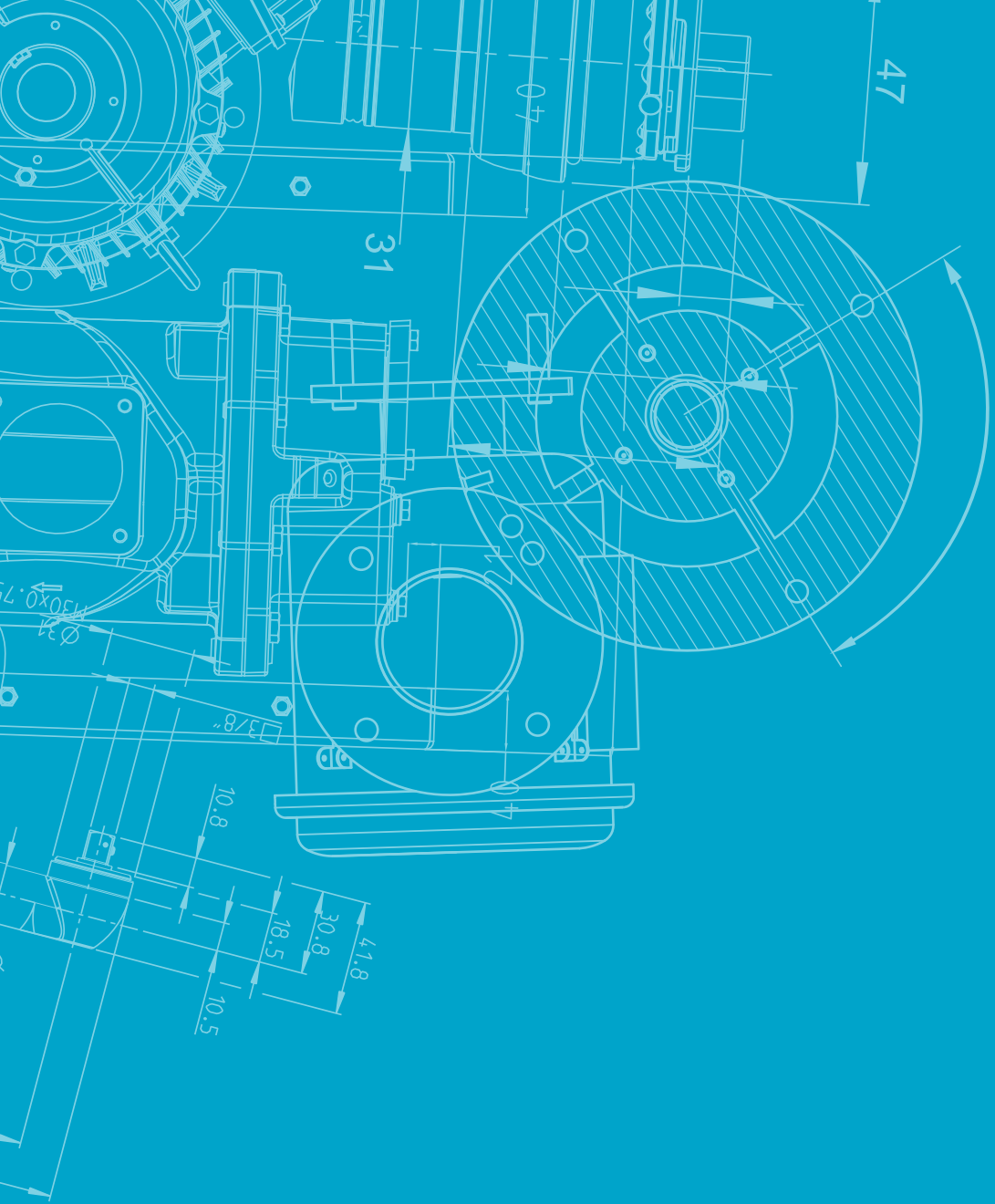


# Instruction book

## PAS Series Pump

PAS 100-150 MF ITH
KOHLER 1903 M KDI / KOHLER 2504 M KDI /
DEUTZ 2011 L03i / HATZ 3M41

# Atlas Copco

## PAS Series Pump

PAS 100-150 MF ITH

## Instruction book

Original instructions

**WARNING**

**Read all safety warnings, instructions, illustrations and specifications provided with this product. Failure to follow all instructions listed in this instruction book may result in personal injury, death and/or property damage.**



This instruction book is valid for CE, non-CE as well as UKCA labelled machines. It meets the requirements for instructions specified by the applicable European directives or UK statutory instruments as identified in the Declaration of Conformity.


2025 July

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www.atlascopco.com

# Table of contents

# 1 Safety precautions for pumps

## 1.1 Safety icons

**DANGER**

**Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.**

**WARNING**

**Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.**

**CAUTION**

**Indicates a hazard with a low level of risk, which if not avoided results in minor or moderate injury.**

**NOTICE**

**Indicates a potential situation which, if not avoided, might result in property damage or in an undesirable result or state.**

**NOTE**

**Indicates important information.**

## 1.2 Introduction

The policy of Atlas Copco is to provide the users of their equipment with safe, reliable and efficient products. Factors taken into account are among others:

- the intended and predictable future use of the products, and the environments in which they are expected to operate,
- applicable rules, codes and regulations,
- the expected useful product life, assuming proper service and maintenance,
- providing the manual with up-to-date information.

Before handling any product, take time to read the relevant instruction manual. Besides giving detailed operating instructions, it also gives specific information about safety, preventive maintenance, etc.

Keep the manual always at the unit location, easy accessible to the operating personnel.

See also the safety precautions of the engine and possible other equipment, which are separately sent along or are mentioned on the equipment or parts of the unit.

These safety precautions are general and some statements will therefore not always apply to a particular unit.

Only people that have the right skills should be allowed to operate, adjust, perform maintenance or repair on Atlas Copco equipment. It is the responsibility of management to appoint operators with the appropriate training and skill for each category of job.

**Skill level 1: Operator**

An operator is trained in all aspects of operating the unit with the push-buttons, and is trained to know the safety aspects.

**Skill level 2: Mechanical technician**

A mechanical technician is trained to operate the unit the same as the operator. In addition, the mechanical technician is also trained to perform maintenance and repair, as described in the instruction manual, and is allowed to change settings of the control and safety system. A mechanical technician does not work on live electrical components.

**Skill level 3: Electrical technician**

An electrical technician is trained and has the same qualifications as both the operator and the mechanical technician. In addition, the electrical technician may carry out electrical repairs within the various enclosures of the unit. This includes work on live electrical components.

**Skill level 4: Specialist from the manufacturer**

This is a skilled specialist sent by the manufacturer or its agent to perform complex repairs or modifications to the equipment.

In general it is recommended that not more than two people operate the unit, more operators could lead to unsafe operating conditions. Take necessary steps to keep unauthorized persons away from the unit and eliminate all possible sources of danger at the unit.

When handling, operating, overhauling and/or performing maintenance or repair on Atlas Copco equipment, the mechanics are expected to use safe engineering practices and to observe all relevant local safety requirements and ordinances. The following list is a reminder of special safety directives and precautions mainly applicable to Atlas Copco equipment.

Neglecting the safety precautions may endanger people as well as environment and machinery:

- endanger people due to electrical, mechanical or chemical influences,
- endanger the environment due to leakage of oil, solvents or other substances,
- endanger the machinery due to function failures.

All responsibility for any damage or injury resulting from neglecting these precautions or by non-observance of ordinary caution and due care required in handling, operating, maintenance or repair, also if not expressly mentioned in this instruction manual, is disclaimed by Atlas Copco.

The manufacturer does not accept any liability for any damage arising from the use of non-original parts and for modifications, additions or conversions made without the manufacturer’s approval in writing.

If any statement in this manual does not comply with local legislation, the stricter of the two shall be applied.

Statements in these safety precautions should not be interpreted as suggestions, recommendations or inducements that it should be used in violation of any applicable laws or regulations.

## 1.3 General safety precautions

- The goods must be examined on arrival to ascertain any damage caused during shipment. Loss or damage must be notified immediately to the carriers and to the sender. Check that the goods correspond exactly to the description on the shipping documents and report any differences as soon as possible to the sender. Always quote the pump type and serial number stamped on the data plate.
- The owner is responsible for maintaining the unit in a safe operating condition. Unit parts and accessories must be replaced if missing or unsuitable for safe operation.
- The supervisor, or the responsible person, shall at all times make sure that all instructions regarding machinery and equipment operation and maintenance are strictly followed and that the machines with all accessories and safety devices, as well as the consuming devices, are in good repair, free of abnormal wear or abuse, and are not tampered with.
- Whenever there is an indication or any suspicion that an internal part of a machine is overheated, the machine shall be stopped but no inspection covers shall be opened before sufficient cooling time has elapsed; this to avoid the risk of spontaneous ignition of oil vapour when air is admitted.
- Normal ratings (pressures, temperatures, speeds, etc.) shall be durably marked.
- Operate the unit only for the intended purpose and within its rated limits (pressure, temperature, speeds, etc.).
- The machinery and equipment shall be kept clean, i.e. as free as possible from oil, dust or other deposits.
- To prevent an increase in working temperature, inspect and clean heat transfer surfaces regularly. See the Maintenance.
- All regulating and safety devices shall be maintained with due care to ensure that they function properly. They may not be put out of action.
- Pressure and temperature gauges shall be checked regularly with regard to their accuracy. They shall be replaced whenever outside acceptable tolerances.
- Safety devices shall be tested as described in the Maintenance schedule of the instruction manual to determine that they are in good operating condition.
- Mind the markings and information labels on the unit.
- In the event the safety labels are damaged or destroyed, they must be replaced to ensure operator safety.
- Keep the work area neat. Lack of order will increase the risk of accidents.
- When working on the unit, wear safety clothing. Depending on the kind of activities these are: safety glasses, ear protection, safety helmet (including visor), safety gloves, protective clothing, safety shoes. Do not wear the hair long and loose (protect long hair with a hairnet), or wear loose clothing or jewellery.
- Take precautions against fire. Handle fuel, oil and anti-freeze with care because they are inflammable substances. Do not smoke or approach with naked flame when handling such substances. Keep a fire-extinguisher in the vicinity.
- Place Electrical Main Disconnect in OFF position. Attach multiple lockout devices, locks and tags. You must verify that system must not start.
- Close manual valve slowly. Attach multiple lockout devices, locks and tags. You must verify for no fluid movement in machine and it does not hold residual pressure.
- Disconnect the pump from the suction and delivery pipes.
- Remove and clean eventual residues still left inside the pump casing.

## 1.4 Safety during transport and installation

To lift a unit, all loose or pivoting parts, e.g. doors and towbar, shall first be securely fastened. Do not attach cables, chains or ropes directly to the lifting eye; apply a crane hook or lifting shackle meeting local safety regulations. Never allow sharp bends in lifting cables, chains or ropes. Helicopter lifting is not allowed. It is strictly forbidden to dwell or stay in the risk zone under a lifted load. Never lift the unit over people or residential areas. Lifting acceleration and retardation shall be kept within safe limits.

- Before handling the pump, check its dimensions and weight, which can be found on the data plate.
- The transport and transfer operations may be very dangerous if not carried out with the maximum caution. Clear and define the transfer zone; check the integrity and suitable conditions of the means available.
- Before towing the unit:
    - check the towbar, the brake system and the towing eye. Also check the coupling of the towing vehicle,
    - check the towing and brake capability of the towing vehicle,
    - check that the towbar, jockey wheel or stand leg is safely locked in the raised position,
    - ascertain that the towing eye can swivel freely on the hook,
    - check that the wheels are secure and that the tires are in good condition and inflated signalization cable is connected, check all lights and connect the pneumatic brake couplers,
    - attach the safety break-away cable or safety chain to the towing vehicle,
    - remove wheel chocks, if applied, and disengage the parking brake.
- To tow a unit use a towing vehicle of ample capacity. Refer to the documentation of the towing vehicle.
- Never exceed the maximum towing speed of the unit (mind the local regulations).
- Place the unit on level ground and apply the parking brake before disconnecting the unit from the towing vehicle. Unclip the safety break-away cable or safety chain. If the unit has no parking brake or jockey wheel, immobilize the unit by placing chocks in front of and/or behind the wheels. When the towbar can be positioned vertically, the docking device must be applied and kept in good order.
- The unit must be transported in horizontal position and stowed safely. In case of transporting a non trailer unit on a truck, fasten it to the truck by attaching straps via fork lift slots, via the holes in the frame at the front and back or via the lifting beam. To prevent damage, never put straps on the roof surface of the unit.
- To lift heavy parts, a hoist of ample capacity, tested and approved according to local safety regulations, shall be used.
- Lifting hooks, eyes, shackles, etc., shall never be bent and shall only have stress in line with their design load axis. The capacity of a lifting device diminishes when the lifting force is applied at an angle to its load axis.
- For maximum safety and efficiency of the lifting apparatus all lifting members shall be applied as near to perpendicular as possible. If required, a lifting beam shall be applied between hoist and load.
- Never leave a load hanging on a hoist.
- A hoist has to be installed in such a way that the object will be lifted perpendicular. If that is not possible, the necessary precautions must be taken to prevent load-swinging, e.g. by using two hoists, each at approximately the same angle not exceeding 30° from the vertical.

- Locate the unit away from walls. Take all precautions to ensure that hot air exhausted from the engine and driven machine cooling systems cannot be recirculated. If such hot air is taken in by the engine or driven machine cooling fan, this may cause overheating of the unit; if taken in for combustion, the engine power will be reduced.
- Pumps shall be stalled on an even, solid floor, in a clean location with sufficient ventilation. If the floor is not level or can vary in inclination, consult Atlas Copco.
- The electrical connections shall correspond to local codes. The machines shall be earthed and protected against short circuits by fuses or circuit breakers.
- Before transportation of the unit, switch off all the circuit breakers.

## 1.5 Safety during use and operation

- When the unit has to operate in a fire-hazardous environment, each engine exhaust has to be provided with a spark arrestor to trap incendiary sparks.
- The exhaust contains carbon monoxide which is a lethal gas. When the unit is used in a confined space, conduct the engine exhaust to the outside atmosphere by a pipe of sufficient diameter; do this in such a way that no extra back pressure is created for the engine. If necessary, install an extractor. Observe any existing local regulations. Make sure that the unit has sufficient air intake for operation. If necessary, install extra air intake ducts.
- When operating in a dust-laden atmosphere, place the unit so that dust is not carried towards it by the wind. Operation in clean surroundings considerably extends the intervals for cleaning the air intake filters and the cores of the coolers.
- Never remove a filler cap of the cooling water system of a hot engine. Wait until the engine has sufficiently cooled down.
- Never refill fuel while the unit is running. Keep fuel away from hot parts such as air outlet pipes or the engine exhaust. Do not smoke when fuelling. When fuelling from an automatic pump, an earthing cable should be connected to the unit to discharge static electricity. Never spill nor leave oil, fuel, coolant or cleansing agent in or around the unit.
- All doors shall be shut during operation so as not to disturb the cooling air flow inside the bodywork and/or render the silencing less effective.
- Periodically carry out maintenance works according to the maintenance schedule.
- Stationary housing guards are provided on all rotating or reciprocating parts not otherwise protected and which may be hazardous to personnel. Machinery shall never be put into operation, when such guards have been removed, before the guards are securely reinstalled.
- Noise, even at reasonable levels, can cause irritation and disturbance which, over a long period of time, may cause severe injuries to the nervous system of human beings. When the sound pressure level, at any point where personnel normally has to attend, is:
    - below 70 dB(A): no action needs to be taken,
    - above 70 dB(A): noise-protective devices should be provided for people continuously being present in the room,
    - below 85 dB(A): no action needs to be taken for occasional visitors staying a limited time only,
    - above 85 dB(A): room to be classified as a noise hazardous area and an obvious warning shall be placed permanently at each entrance to alert people entering the room, for even relatively short times, about the need to wear ear protectors,
    - above 95 dB(A): the warning(s) at the entrance(s) shall be completed with the recommendation that also occasional visitors shall wear ear protectors,

  - above 105 dB(A): special ear protectors that are adequate for this noise level and the spectral composition of the noise shall be provided and a special warning to that effect shall be placed at each entrance.
- The unit has parts of which the temperature can be in excess of 80 °C (176 °F), and which may be accidentally touched by personnel when opening the machine just after operation. Insulation or safety guards protecting these parts shall not be removed before the parts have cooled down sufficiently, and must be reinstalled before operating the machine. As it is not possible to insulate or protect all hot parts by guards (e.g. exhaust manifold, exhaust turbine), the operator / service engineer must always be aware not to touch hot parts when opening a machine door.
- Never operate the unit in surroundings where there is a possibility of taking in flammable or toxic fumes.
- If the working process produces fumes, dust or vibration hazards, etc., take the necessary steps to eliminate the risk of personnel injury.
- When using compressed air or inert gas to clean down equipment, do so with caution and use the appropriate protection, at least safety glasses, for the operator as well as for any bystander. Do not apply compressed air or inert gas to your skin or direct an air or gas stream at people. Never use it to clean dirt from your clothes.
- When using compressed air or inert gas to clean down equipment, do so with caution and use the appropriate protection, at least safety glasses, for the operator as well as for any bystander. Do not apply compressed air or inert gas to your skin or direct an air or gas stream at people. Never use it to clean dirt from your clothes.
- When washing parts in or with a cleaning solvent, provide the required ventilation and use appropriate protection such as a breathing filter, safety glasses, rubber apron and gloves, etc.
- Safety shoes should be compulsory in any workshop and if there is a risk, however small, of falling objects, wearing of a safety helmet should be included.
- If there is a risk of inhaling hazardous gases, fumes or dust, the respiratory organs must be protected and depending on the nature of the hazard, so must the eyes and skin.
- Remember that where there is visible dust, the finer, invisible particles will almost certainly be present too; but the fact that no dust can be seen is not a reliable indication that dangerous, invisible dust is not present in the air.
- Never operate the pump in excess of its limits as indicated in the technical specifications.
- Never operate the unit in a humid atmosphere. Excessive moisture causes worsening of the insulation.
- Do not open electrical cabinets, cubicles or other equipment while voltage is supplied. If such cannot be avoided, e.g. for measurements, tests or adjustments, have the action carried out by a qualified electrician only, with appropriate tools, and ascertain that the required bodily protection against electrical hazards is applied.
- Whenever an abnormal condition arises, e.g. excessive vibration, noise, odor, etc., stop the engine. Correct the faulty condition before restarting.
- Check the electric cables regularly. Damaged cables and insufficient tightening of connections may cause electric shocks. Whenever damaged wires or dangerous conditions are observed, switch the circuit breakers to OFF and stop the engine. Replace the damaged wires or correct the dangerous condition before restarting. Make sure that all electric connections are securely tightened.
- When operating the pump in Remote or Auto mode, observe all relevant local legislation.
- If the pump does not prime, do not operate it for more than 2 minutes to avoid overheating the liquid and damaging the seal.

- Engine driven pumps should be brought up gradually to running speed. Never change the accelerator limit stop: at speeds higher than that for which the engine is set, the pump would absorb more power than the engine can supply.
- If the pump does not seem to be operating normally, it must be stopped. The cause of the malfunctioning must be found and solved before starting again.
- In case of emergency, shut down the engine pressing the emergency stop button and notify the person responsible for running the plant immediately.

## 1.6 Safety during maintenance and repair

Maintenance, overhaul and repair work shall only be carried out by adequately trained personnel; if required, under supervision of someone qualified for the job.

- Use only the correct tools for maintenance and repair work, and only tools which are in good condition.
- Parts shall only be replaced by genuine Atlas Copco replacement parts.
- All maintenance work, other than routine attention, shall only be undertaken when the unit is stopped. Steps shall be taken to prevent inadvertent starting. In addition, a warning sign bearing a legend such as "work in progress; do not start" shall be attached to the starting equipment. On electrically driven units the main switch shall be locked in open position and the fuses shall be taken out. A warning sign bearing a legend such as "work in progress; do not supply voltage" shall be attached to the fuse box or main switch.
- Prior to stripping engine/motor or other machine or undertaking major overhaul on it, prevent all movable parts from rolling over or moving.
- Make sure that no tools, loose parts or rags are left in or on the machine. Never leave rags or loose clothing near the engine/motor air intake.
- Never use flammable solvents for cleaning (fire risk).
- Take safety precautions against toxic vapours of cleaning liquids.
- Never use machine parts as a climbing aid.
- Observe scrupulous cleanliness during maintenance and repair. Keep away dirt, cover the parts and exposed openings with a clean cloth, paper or tape.
- Never weld on or perform any operation involving heat near the fuel or oil systems. Fuel and oil tanks must be completely purged, e.g. by steam-cleaning, before carrying out such operations. Never weld on, or in any way modify, pressure vessels. Disconnect the alternator cables during arc welding on the unit.
- Do not remove any of, or tamper with, the sound-damping material. Keep the material free of dirt and liquids such as fuel, oil and cleansing agents. If any sound-damping material is damaged, replace it to prevent the sound pressure level from increasing.
- Use only lubricating oils and greases recommended or approved by Atlas Copco or the machine manufacturer. Ascertain that the selected lubricants comply with all applicable safety regulations, especially with regard to explosion or fire-risk and the possibility of decomposition or generation of hazardous gases. Never mix synthetic with mineral oil.
- Protect the engine/motor, alternator, air intake filter, electrical and regulating components, etc., to prevent moisture ingress, e.g. when steam-cleaning.
- When performing any operation involving heat, flames or sparks on a machine, the surrounding components shall first be screened with nonflammable material.
- Never use a light source with open flame for inspecting the interior of a machine.

- When repair has been completed, the machine shall be barred over at least one revolution for reciprocating machines, several revolutions for rotary ones to ensure that there is no mechanical interference within the machine or driver.
- Maintenance and repair work should be recorded in an operator's logbook for all machinery. Frequency and nature of repairs can reveal unsafe conditions.
- When hot parts have to be handled, e.g. shrink fitting, special heat-resistant gloves shall be used and, if required, other body protection shall be applied.
- When using cartridge type breathing filter equipment, ascertain that the correct type of cartridge is used and that its useful service life is not surpassed.
- Make sure that oil, solvents and other substances likely to pollute the environment are properly disposed of.
- Before clearing the pump for use after maintenance or overhaul, submit it to a test run.

## 1.7 Tool applications safety

Apply the proper tool for each job. With the knowledge of correct tool use and knowing the limitations of tools, along with some common sense, many accidents can be prevented.

Special service tools are available for specific jobs and should be used when recommended. The use of these tools will save time and prevent damage to parts.

## 1.8 Battery safety precautions

When servicing batteries, always wear protecting clothing and glasses.

- The electrolyte in batteries is a sulphuric acid solution which is fatal if it hits your eyes, and which can cause burns if it contacts your skin. Therefore, be careful when handling batteries, e.g. when checking the charge condition.
- Install a sign prohibiting fire, open flame and smoking at the post where batteries are being charged.
- When batteries are being charged, an explosive gas mixture forms in the cells and might escape through the vent holes in the plugs. Thus an explosive atmosphere may form around the battery if ventilation is poor, and can remain in and around the battery for several hours after it has been charged. Therefore:
  - never smoke near batteries being, or having recently been, charged,
  - never break live circuits at battery terminals, because a spark usually occurs.
- When connecting an auxiliary battery (AB) in parallel to the unit battery (CB) with booster cables: connect the + pole of AB to the + pole of CB, then connect the - pole of CB to the mass of the unit. Disconnect in the reverse order.

## 1.9 Conversion and spare parts

Conversions are only allowed after written consent of the manufacturer. Always use original spare parts. Unauthorised conversion and/or the use non-original spare parts will void any warranty claims.

## 1.10 Unintended use

The reliability of the machine is only guaranteed when it used according to the specifications in this manual. The limits as indicated are not be exceeded under any circumstances.

Do not use pump in flammable or explosive environment.

Do not use the machine to transport water for human consumption or for installation in an explosive atmosphere.

Caustic, slightly inflammable and other explosive substances such as petrol, petroleum, diluted nitrogen, greases, oils, salt water and waste water from toilets as well as sludgy water has a slower-flow capacity than water, should not be transported using the machine.

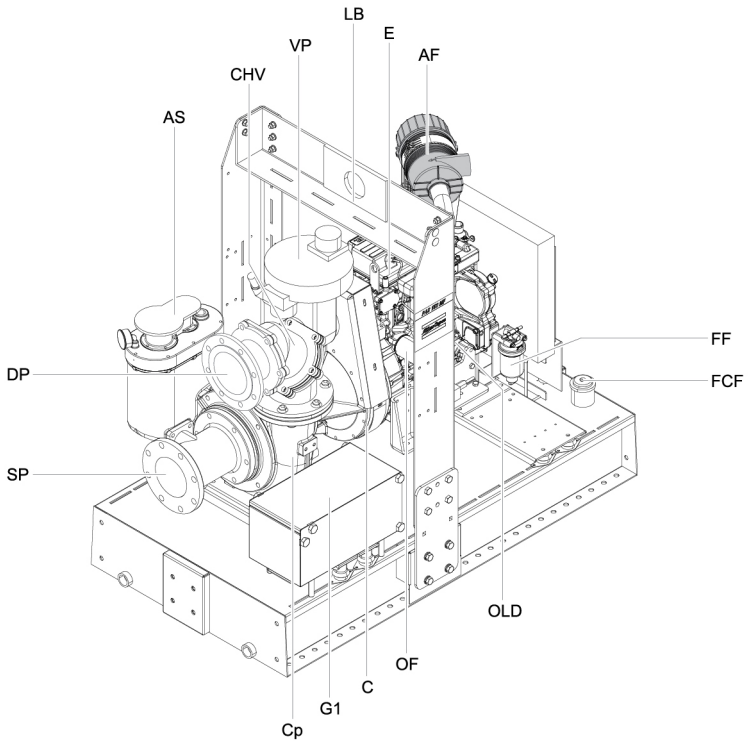
In case of fluids with specific gravity different than water, contact your Atlas Copco representative.

Dedicated pumps are available for salted water.

# 2 Main parts

## 2.1 General description

The PAS 100-150 MF dry-prime centrifugal pumps, are suitable for handling clean water, dirty water or liquids up to 50°C, containing solids in suspension. The PAS 100-150 MF pumps are driven by a water-cooled/air-cooled diesel engine. An overview of the main parts is given in the diagram below.




| Reference | Description |
|---|---|
| AF | Air Filter |
| AS | Air Separator |
| C | Coupling |
| CHV | Check valve assembly |
| Cp | Centrifugal Pump |
| DP | Discharge Pipe |
| E | Engine |
| FCF | Filler cap fuel |
| FF | Fuel filter |
| G1 | Battery |
| LB | Lifting beam |
| OF | Oil filter |
| OLD | Oil Level Dipstick |
| SP | Suction Pipe |
| VP | Vacuum Pump |

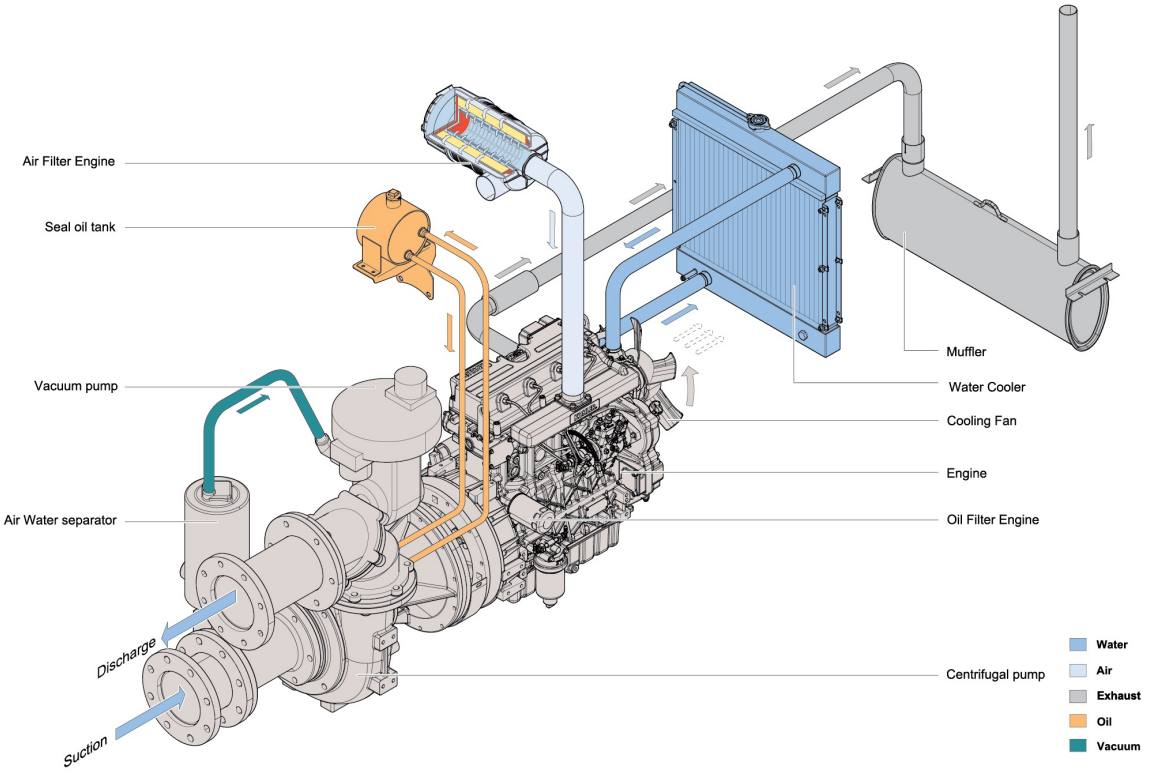
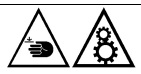


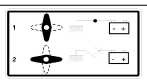
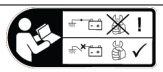
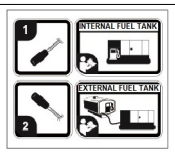

**Figure 1: Flow Diagram**

## 2.2 Markings and labels

Markings provide instructions and information. They also warn of hazards. For convenience and safety, keep all markings in legible condition, replacing them when damaged or missing. Replacement markings are available from the factory.

A brief description of all markings provided on the pump is given hereafter. The precise location of all markings can be found in the parts manual of this pump.

| Markings | Description |
|---|---|
|  | Indicates the presence of electric shock hazards. Enclosures marked with these symbols should only be opened by trained or instructed people. |
|  | Indicates that these parts can become very hot during operation (e.g. engine, cooler, etc.). Always make sure that these parts are cooled down before touching them. |
|  | Indicates potential Mechanical hazard - Belts |
|  | Indicates potential Mechanical hazard |

| Markings | Description |
|---|---|
|  | Indicates a lifting point of the unit. |
|  | Indicates the battery switch. |
|  | Read the instruction manual before using the lifting eye. |
|  | Read the instruction manual before servicing. |
|  | Disconnect the battery before servicing. |
|  | External fuel filling |
|  | Check engine oil daily. |
|  | Automatic start/stop by float level control |
|  | Sound power level in accordance with Directive 2000/14/EC (expressed in dB (A)). |

## 2.3 Field of application

The PAS 100-150 pumps are suitable for handling clean water, dirty water or liquids up to 50°C with viscosity till 50 cSt, containing solids in suspension.

The maximum diameter of the solids depends on the size of the unit:

- PAS 100 : 45 mm
- PAS 150 : 76 mm

The maximum density is 1.1 kg/dm$^3$

In order to reduce the risk of clogging, it is recommended to use a strainer in the suction.

The maximum suction lift at sea level is 7.5 meters. This value will be restricted by NPSHr of the pump, elevation from sea level, fluid temperature and friction losses in the suction line.

Despite the pump is able to deal with air in the suction line, Atlas Copco recommends to avoid this situation as far as possible in order to guarantee a better performance and lifetime of the pump.

**CAUTION**

**It is forbidden to use these pumps in a potentially explosive atmosphere.**

## 2.4 Mechanical features

The mechanical features described in this chapter are standard features of this pump. For all other mechanical features, see section *General description*.

### 2.4.1 Pump

The dry-prime centrifugal pump is partly completed machinery, in compliance with the Machinery directive. It is an automatic dry-prime centrifugal pump, pre-arranged to be mounted to the engine.

The pump is fitted with a semi-open impeller able to manage solids in suspension.

The machine can only operate if it is primed. In order to allow priming of the pump, a diaphragm vacuum pump is incorporated.

Vacuum created in the suction pipe by the vacuum pump, forces water to penetrate the pump. When liquid enters the volute, the impeller pushes the fluid out of the volute chamber, towards the discharge pipe.

This centrifugal movement creates an under pressure that draws more water through the suction pipe.

A solid air/water separator is placed before the diaphragm vacuum pump in order to keep the membranes of the diaphragm free of water.

Additionally, as a safety device, a ball valve is installed at the inlet of the diaphragm vacuum pump. This valve must be closed when working in flooded areas, where the water level rises above the pump. For other applications, the valve must be completely opened to allow the creation of vacuum in the suction pipe. To avoid likely problems of contamination, the diaphragm vacuum pump is water-tolerant.

### 2.4.2 Engine

The pumps are assembled to and driven by air-cooled / water-cooled diesel engines.

### 2.4.3 Cooling system

The engine is provided with a water cooler. The cooling air is generated by a fan, driven by the engine.

### 2.4.4 Safety devices

The engine is equipped with the following safety devices:

| | |
|---|---|
| Low oil pressure shut down | Over speed shut down |
| High temperature coolant shut down | Automatic start/stop by float level control |
| Fuel level shut down | |

### 2.4.5 Data plate and serial number

The unit is furnished with a data plate showing the product code, the dimension and weight. See section *Data plate*.

The serial number is located on the right-hand front side of the frame.

### 2.4.6 Drain plugs and filler caps

The drain holes for the engine oil, the coolant and the plug for the fuel, are located and labelled on the frame. The fuel drain plug is located at the front, the others at the service side.

The drain flexible for engine oil can be brought to the outside of the bodywork through the drain hole.

The filler cap for the engine coolant is accessible via an opening in the roof. The fuel filler cap is located in the side panel.

## 2.5 Electrical features

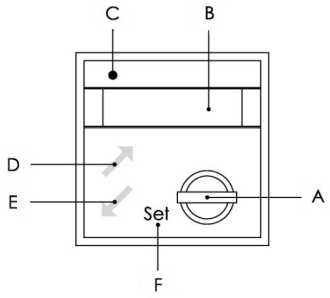
The electrical features described in this chapter are standard provided on this pump.

# 3 Controller

## 3.1 Control panel

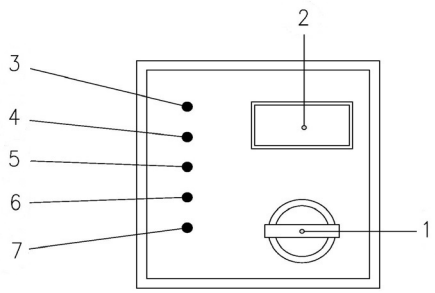
The 100-150 MF pumps are fitted with the controller shown below. This is located on the frame and communicates via a display section in the front. It carries out the entire necessary task to control and protect the Pump.

### Control panel for Turbo Common Rail Engines (KDI 1903 TCR)




| Reference | Description |
|---|---|
| A | Ignition starter key |
| B | Display |
| C | LED: The operating mode is indicated by the green led light. When there is an error the red light starts to flash and the corresponding message appears as test. |
| D | Arrow button (up). Increases value and number. |
| E | Arrow button (down). Reduces value and number. |
| F | Set button. Display the selected operating values. Switches off the flashing error LED. |

### Control panel for Mechanical Engines




| Reference | Description |
|---|---|
| 1 | Ignition key switch. Position: "0 - 1 - 2". |
| | 0: Unit is turned off. |
| | 1: Ignition is turned on. |
| | 2: Engine start with mechanical starter protection. |
| 2 | Display (the hourmeter starts counting if the signals at input engine oil pressure and input D+ are valid. |
| 3 | LED green, OK-LED (Smiley). |

| Reference | Description |
|---|---|
| 4 | LED red. Battery charge indicator (alternator D+). |
| 5 | LED red, engine oil pressure failure. |
| 6 | LED red, engine coolant temperature failure. |
| 7 | LED red, airfilter maintenance / auxiliary failure. |

# 4 Installation and connection

## 4.1 Lifting

To lift the unit by means of a hoist with lifting strap, a lifting eye has been integrated in the structure and is easily accessible from the top of the unit.

**NOTE**

**With an appropriate hoist equipped with a scale of adequate capacity, do not hook the ropes to parts of the engine or pump.**

Before lifting the unit, check its dimensions and weight, which can be found on the data plate, see section *Technical specifications* for more detail.

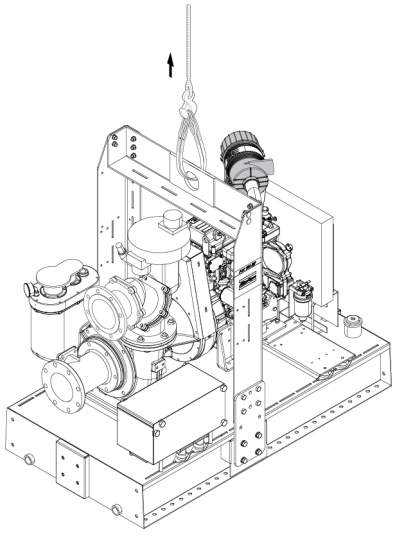
When lifting the unit, the hoist has to be placed in such a way that the pump, which must be placed level, will be lifted vertically. The machine can be lifted with empty tank at the loading surface in following way. refer the figure.

**WARNING**

**Never use the guiding rods to lift the unit.**

**NOTE**

**Lifting acceleration and deceleration must be kept within safe limits (maximum 2 g). Helicopter lifting is not allowed.**



The transport and transfer operations may be very dangerous if not carried out with the maximum caution: thus all personnel who are considered non operators should stand clear of the defined transfer zone; check integrity and suitable conditions of the means available.

One also has to ascertain that the zone in which one is operating is free from obstacles and that there is sufficient “escape room”, by this term one intends a free and secure zone in which one can quickly move away if the load were to fall.

The surface on which one intends to load the machine must be horizontal to avoid possible shifting of the load.

Once the machine is placed on the eventual means of transportation, ensure that it remains locked in its position through the use of ropes and suitable wedges.

## 4.2 Installation

### 4.2.1 Indoor installation

**CAUTION**

**During operation, the machine can move several centimeters. Take all precautions according to current legislation to avoid damage to property or people.**

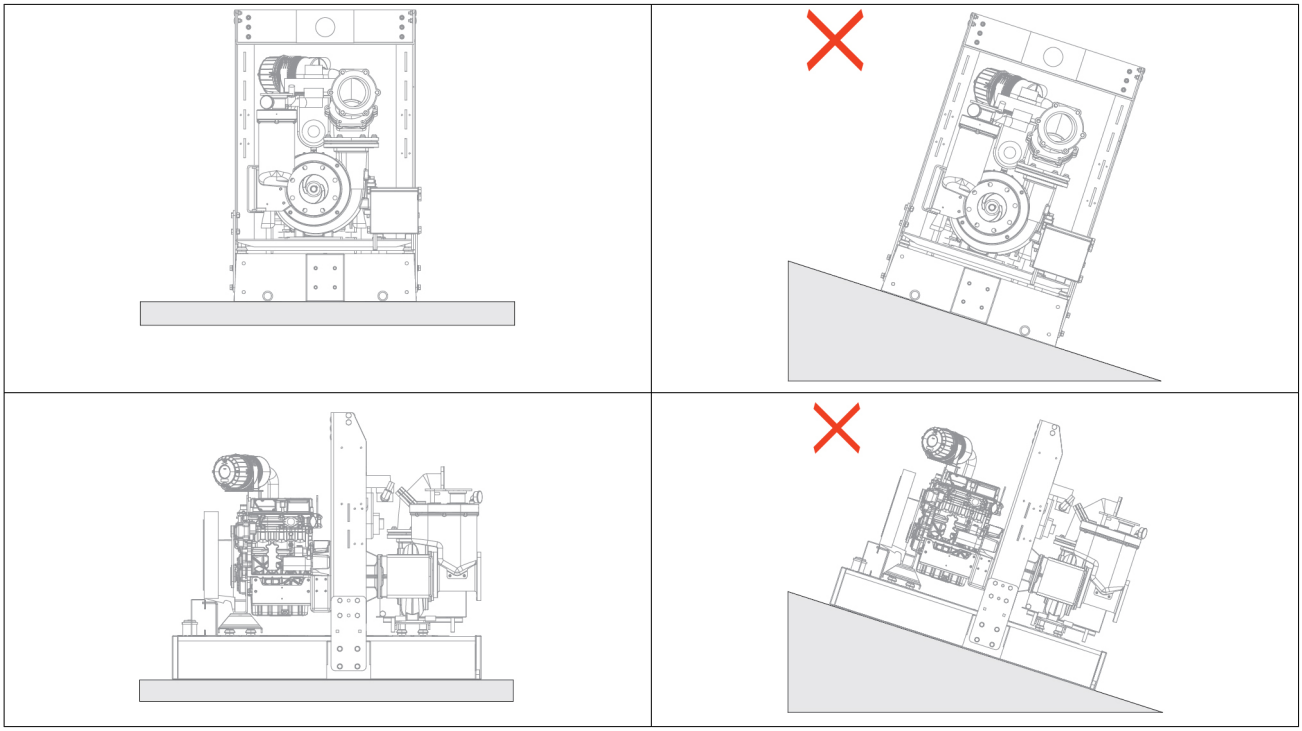
1. Install an exhaust pipe of sufficient diameter to duct the engine exhaust towards the outside. Check for sufficient ventilation so that the cooling air is not recirculated, if the pump is operated indoors.
2. Refer to engine manual for a detailed explanation of the indoor installation. There should be sufficient light in the installation area.
3. Place the pump on a horizontal, even, and a solid floor. The pump can operate in a slant position not exceeding 3% (in both senses: front/rear and left right). Contact the Atlas Copco technical office for installations at the limit of the prescribed inclination.

**NOTE**

**For more information about indoor installation, consult your local Atlas Copco dealer.**

### 4.2.2 Outdoor installation

- Place the pump on a horizontal, even and solid floor. The pump can operate in a slant position not exceeding 3% (in both senses: front/rear and left/ right).
- The pump should be kept with the doors closed, in order to avoid the ingress of water and dust. Dust ingress reduces the lifetime of filters and may reduce your unit's performance.
- Check that the engine exhaust is not directed towards people.
- Locate the rear end of the pump upwind, away from contaminated wind streams and walls. Avoid recirculation of exhaust air from the engine. This causes overheating and engine power decrease.
- Leave enough space for operation, inspection and maintenance (at least 1 meter at each side).
- Check that the inner earthing system is in compliance with the local legislation.
- Use coolant for the engine cooling system. Refer to the Engine instruction book for the proper coolant mixture.
- Check the tightness of the bolts and nuts.



## Suction and discharge pipework

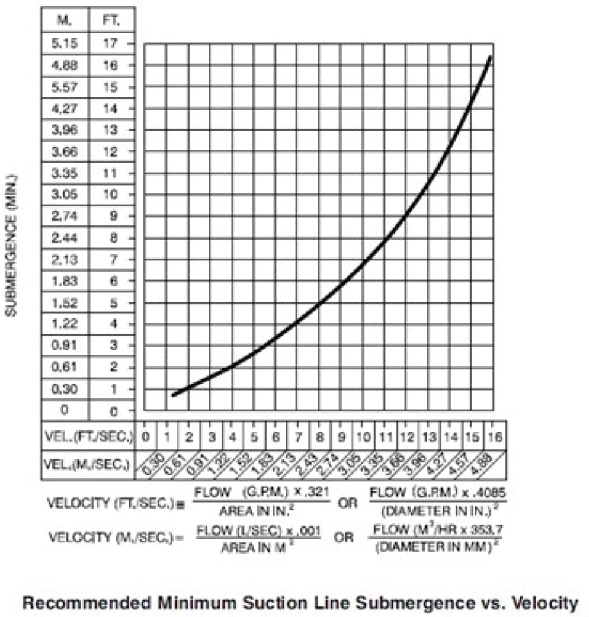
In order to prevent misuse of the equipment, which could cause misalignment, excessive forces, cavitation, hot bearings, vibration and the possible failure of the pump casing, the following actions should be strictly followed:

- Prevent excessive external loads on piping.
- Support the pipelines to prevent distortion of pump components.
- Never draw piping into place by applying force to pump flange connections.
- Clean the hoses or pipes thoroughly before connecting them to the pump.
- In case of using hazardous liquids, ensure that the piping is arranged to allow pump flushing before pump removal.
- In order to minimize friction losses and hydraulic noise in the pipework it is a good practice to choose pipework that is one or two sizes larger than the pump suction and discharge. In the same way, bends in the suction should be avoided as much as possible. Atlas Copco recommends fluid velocities up to 2 m/s (6 ft/sec) on the suction and 3 m/s (9 ft/sec) on the discharge.
- The inlet pipe should be one or two sizes larger than the pump inlet bore and in case of pipe bends, they should have as large a radius as possible.
- On suction lift, the piping should incline towards the pump inlet with eccentric reducers incorporated to prevent air locks.
- It is strongly recommended to use a strainer in the suction side to prevent clogging in the impeller. Strainers for the PAS 100-150 can be ordered as accessories from Atlas Copco.
- Where the NPSH margin is not large, it is recommended that the pipe straight is 5 to 10 pipe diameter.
- If a valve is present in the suction pipe, then maintain it as open as possible.
- Take suction lift into account in the $NPSH_{available}$, which must be higher than 1 meter than the $NPSH_{required}$ of the pump.

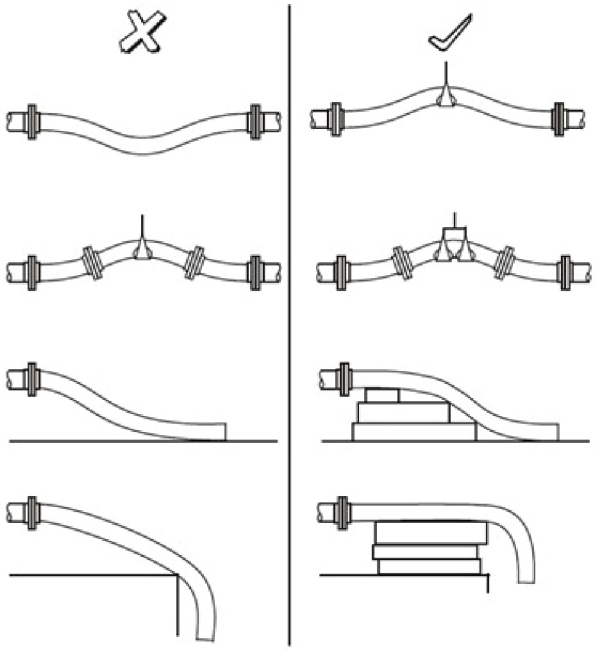
- Install the pump as close as possible to the liquid to be pumped, trying, where possible, to reduce the suction lift (never exceed the level 7.5 m).
- The suction line connections must be completely airtight: check pipe threads, flange gaskets, quick couplings, etc.
- The suction and discharge lines must be mounted in such a way as not to create a strain on the pump casing.
- Avoid using hoses instead of rigid pipe on discharge. Hoses are hazardous and consume more of the energy that pumps supply to the liquid to keep them open.

**WARNING**

**Never use the pump as a support for piping.**




Recommended Minimum Suction Line Submergence vs. Velocity



# 5 Operating instructions

**NOTE**

**The pump may not be used in an explosive (inflammable) environment or to pump inflammable liquids.**

**NOTE**

**When there is device for remote controlling on machine, it may start automatically and thus unexpectedly. The operator can exclude the Remote Controlling and chose the operating mode: Local and Remote Controlling.**

## 5.1 Before starting

**NOTE**

**When there is a device on machine for remote controlling, it may start automatically and thus unexpectedly. The operator can exclude the Remote Controlling and chose the operating mode: Local and Remote Controlling.**

1. Check the engine oil level and top up if necessary with the pump standing level. The oil level must be near to, but not exceed the high mark on the engine oil level dipstick.
2. Check the coolant level in the expansion tank of the engine cooling system. The coolant level must be near to the FULL mark. Add coolant if necessary.
3. Drain any water and sediment from the fuel prefilter. Check the fuel level and top up if necessary. It is recommended to fill the tank after the day's operation to prevent water vapor in a nearly empty tank from condensing.
4. Check the level of fuel.
5. Check the unit for leakage, tightness of wire terminals, etc. Correct if necessary.
6. Check that the vacuum pump oil.

## 5.2 Starting

Start the engine with the control panel.

- Insert the starting key and turn to position "I".
- When all leds are off, turn the starting key to position "I".
- As soon as the engine is running release the starting key.

The key spring back to position "I" and remains in this position during operation.

## Priming

**WARNING**

**If the pump does not prime, do not operate it for more than 2 minutes to avoid overheating the liquid and damaging the seal.**

Engine driven pumps should be brought up gradually to running speed.

Never change the accelerator limit stop: at speeds higher than that for which the engine is set, the pump would absorb more power than the engine can supply.

Never exceed the maximum speed shown on the pump name plate.

When the pump has primed:

- Check the shaft seal for leaks;
- If the pump does not seem to be operating normally, it must be stopped and the cause found.

# 6 Maintenance

## 6.1 Maintenance schedule

The maintenance schedule contains a summary of the maintenance instructions. Read the respective section before taking maintenance measures. For engine maintenance refer to Engine Operation Manual. The maintenance schedule has to be seen as a guideline for units operating in a dusty environment typical to the pump's applications. The maintenance schedule can be adapted depending on application, environment and quality of maintenance.

| **Regular service period** | | **Each start up** | **Every 500 hrs** | **When needed** |
|---|---|---|---|---|
| **General** | | | | |
| Control panel | Check for alarms and warnings | x | | |
| Condensate and water from spillage-free frame or catch basin (if applicable) | Drain | | x | |
| Locks and hinges | Grease | | x | |
| Emergency stop | Check function | | x | |
| Battery | Check electrolyte level | | x | |
| | Check terminals of battery | | x | |
| Torque on critical bolt connections (when needed) | Check | | | x |
| Hoses and clamps | Inspect (if necessary replace) | | x | |
| Rubber flexibles | Inspect (if necessary replace) | | | x |

**Table 1: Maintenance schedule - PAS 100-150 MF**

| **Regular service period** | | **Each start up** | **Every 250 hrs** | **Every 500 hrs** | **Every 1000 hrs** | **Months** |
|---|---|---|---|---|---|---|
| **Pump core** | | | | | | |
| Mechanical seal oil | Check oil level (if necessary top up) | x | | | | |
| | Replace | | | x | | 12 |
| Seal leaks | Check | | | x | | |
| Seal kit | Replace | | | | | * |
| Impeller | Inspect and adjust (if necessary replace) | | x | | | ** |
| Wear plates | Inspect (if necessary replace) | | x | | | ** |
| Separator | Inspect function of floater and valve | | x | | | |
| | Clean components | | x | | | |
| Separator gasket | Replace | | | | x | * |
| Rubber couplings | Inspect (if necessary replace) | | | | | * |
| Bearings | Regrease | | x | | | 24 |
| | Replace | | | | | *** |
| Bearing grease | Replace | | | x | | 24 |
| NRV flap | Replace | | | | x | 24 |

| Regular service period | | Each start up | Every 250 hrs | Every 500 hrs | Every 1000 hrs | Months |
|---|---|---|---|---|---|---|
| Clapet valve (NRV) | Inspect | x | x | | | 24 |

**NOTE**

*** - Replace when necessary**

**NOTE**

**** - Use wear kit when necessary**

**NOTE**

***** - 5000 hour at BEP**

| Regular service period | | Each startup | Every 250 hrs | Every 500 hrs | Every 1000 hrs | Months |
|---|---|---|---|---|---|---|
| **Vacuum pump** | | | | | | |
| Vacuum pump oil | Check oil level (if necessary top up) | x | | | | |
| | Replace | | | x | | 6 |
| Maximum vacuum | Check | | x | | | |
| Rubber parts kit** | Replace | | | | x | 24 |
| Vacuum pump belt | Inspect (if necessary tension or replace) | | x | | | |
| | Replace | | | | x | 24 |
| Vacuum pump diaphragm and valves | Inspect (if necessary replace) | | x | | | |
| | Replace | | | | x | 24 |

**NOTE**

*** - With volmetric vacuum pumps**

**NOTE**

**** - With rotative vacuum pumps**

| Regular service period | | Each start up | Every 500 hrs | 3000 hrs or 12 months | When needed |
|---|---|---|---|---|---|
| **Engine - KDI 1903 M and 2504 M** | | | | | |
| Engine oil | Check oil level (if necessary top up) | x | | | |
| | Replace | | x | x | |

| Regular service period | | Each start up | Every 500 hrs | 3000 hrs or 12 months | When needed |
|---|---|---|---|---|---|
| Oil filter. Replace (every time the lubricating oil is changed) | Replace | | x | x | |
| Air filter | Check air intake vacuum indicator | x | | | |
| | Replace | | x | x | |
| Emptying water in the fuel prefilter | Check | x | | | |
| Fuel prefilter | Replace | | | x | x |
| Fuel filter | Replace | | x | x | |
| Coolant | Check level (if necessary top up) | x | | | |
| | Check additive concentration | | x | x | |
| | Replace | | | x | |
| Engine leaks | Check | x | | | |
| Exhaust after treatment components leaks | Check | x | | | |
| V-belt alternator | Check | | x | | |
| | Replace | | | | x |
| Radiator | Clean | | x | | |

| Regular service period | | Each start up | Every 500 hrs | When needed |
|---|---|---|---|---|
| **Engine - KOHLER 1903 TCR** | | | | |
| Engine oil | Check oil level (if necessary top up) | x | | |
| | Replace | | x | |
| Oil filter. Replace (every time the lubricating oil is changed) | Replace | | x | |
| Air filter | Check air intake vacuum indicator | x | | |
| | Replace | | x | |
| Emptying water in the fuel prefilter | Check | x | | |
| Fuel prefilter | Replace | | | x |
| Fuel filter | Replace | | x | |
| Coolant* | Check level (if necessary top up) | x | | |
| | Check additive concentration | | x | |
| | Replace | | | x |
| Engine tightness (visual inspection for leaks) | Check | x | | |
| Exhaust system including exhaust after treatment components for leaks | Check | x | | |
| V-belt alternator | Check | | x | |
| | Replace | | | x |
| Radiator | Clean | | x | |

**NOTE**

*** - It is recommended to replace coolant every 1000 hours; in cases of low or no use, consider replacing it every 24 months.**

| Regular service period | Each start up | Every 10 hrs | Every 500 hrs | Every 1000 hrs | Every 2 yrs |
|---|---|---|---|---|---|
| **Engine - Deutz 2011 L03i** | | | | | |
| Top Lube oil if necessary | x | x | | | |
| Change oil | | | x | | |
| Oil filter cartridge | | | x | | |
| Fuel filter cartridge | | | | x | |
| Change air filter | | | | x | x |
| Check battery and connectors | | | x | | |
| Check warning system | x | | | | x |
| Change V Belt | | | | x | x |

| Regular service period | Each start up | Every 250 hrs | Every 500 hrs | Every 1000 hrs |
|---|---|---|---|---|
| **Engine - Hatz 3M41** | | | | |
| Check engine oil level (if necessary top up) | x | | | |
| Check the intake area of the combustion air | x | | | |
| Check the cooling air area | x | | | |
| Replace engine oil | | | x | |
| Clean the cooling fan, cooling fins and oil cooler | | x | | |
| Check the screew connections | | x | | |
| Clean the screen insert in the exhaust pipe | | x | | |
| Check the fuel prefilter for contamination and change it necessary | | x | | |
| Replace the fuel prefilter | | | x | |
| Maintain the dry air filter | | | x | |
| Replace the filter cartridge | | | x | |
| Check the air filter maintenance indicator | | x | x | |
| Check and set the tappet clearance | | | x | |
| Replace the oil filter | | | x | |
| Replace the fuel filter | | | | x |

**NOTE**

**In highly dusty environments, these service intervals do not apply. Check and/or replace filters and clean radiator on a regular basis.**

1. **More frequently when operating in a dusty environment.**
2. **Refer to engine operation manual.**
3. **Yearly is only valid when using PARCOOL. Change coolant every 5 years.**
4. **Gummed or clogged filters will lead to fuel starvation and reduced engine performance. Reduce service interval in heavy duty application.**
5. **The following part numbers can be ordered from Atlas Copco to check on inhibitors and freezing points:**
   - **2913 0028 00: refractometer**

- **2913 0029 00: pH meter**

6. **Replace all rubber flexibles every 5 years.**
7. **Water in fuel tank must be detected. Drain fuel tank when water is detected.**

## 6.2 Use of maintenance schedule

The maintenance schedule contains a summary of the maintenance instructions. Read the respective section before taking maintenance measures.

When servicing, replace all disengaged packing, e.g. gaskets, O-rings, washers.

For engine maintenance refer to Engine Operation Manual.

The maintenance schedule has to be seen as a guideline for units operating in a dusty environment typical to the pump's applications. The maintenance schedule can be adapted depending on application, environment and quality of maintenance.

## 6.3 Use of service paks

Service Paks include all genuine parts needed for normal maintenance of both pump and engine. Service Paks minimize downtime and keep your maintenance budget low.

The order number of the Service Paks are listed in the Atlas Copco Parts list (ASL). Order Service Paks at your local Atlas Copco dealer.

## 6.4 Pump maintenance procedures

### GENERAL RECOMMENDATIONS

- Handling must be carried out by specialized personnel to avoid damage to the pump and to persons.
- When handling the pump, take in account its weight:
- After each use, drain and clean the casing with clean water.
- When the pump has to be lifted out for maintenance activities:
  - Drain the water,
  - Disconnect the pipes,
  - Use the lifting point on top of the pump,
  - Make sure to use suitable slings

**NOTE**

**Before carrying out maintenance on the unit, it is essential to:**

- Stop the motor of the pump;
- Disconnect the pump from the suction and delivery pipes;
- Remove and clean eventual residues still left inside the pump casing.

**NOTE**

**Residual liquid may be found in the pump casing, head, and suction line. Take the necessary precautions if the liquid is hazardous (inflammable, corrosive, poisonous, infected).**

## INSPECTION AND CHECKS

Check from time to time that the pump is working correctly. Periodic maintenance of the parts subject to wear, in particular, the impeller and wear plate, is recommended. Refer to *Maintenance schedule* to check that the pump is working correctly.

## DISCHARGE OF RESIDUAL WATER OF THE PUMP

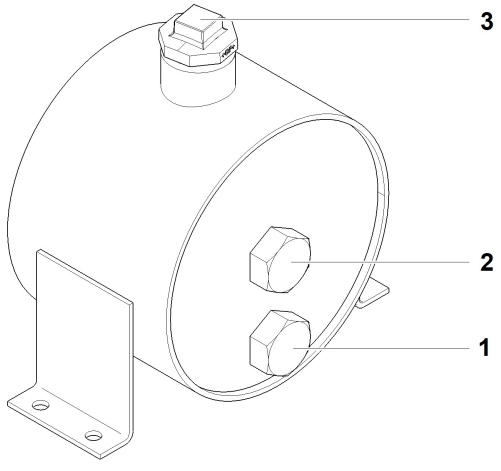
Discharge the residual water of pump in the case that the machine is used with a temperature near 0°C, or in the case of a long period of inactivity.

## LUBRIFICATING THE PUMP

Check the oil level using indicators (min. oil level, max. oil level) and if necessary, top up through the cap (3). Refer to *Maintenance schedule*.

## MECHANICAL SEAL CHECK

- To avoid the risk of running dry, an oil tank with thermosiphon circuit is provided. This system cools and lubricates the sliding faces of the seal when the pump is running dry.
- Replace the oil when required. For the intervals, see section *Maintenance schedule*.
- Always use PAROIL MS.
- Remove the oil filler cap and top up the oil level until the oil level monitor shows approximately 1.3 litre.

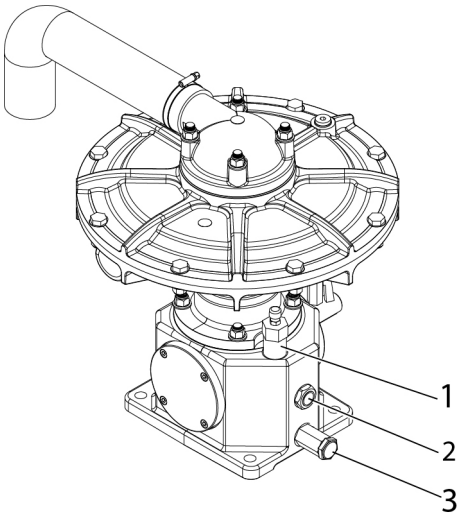



| Reference | Description |
|---|---|
| 1 | Oil level viewing plug (min) |
| 2 | Oil level viewing plug (max) |
| 3 | Oil filling plug |

## LUBRIFICATING THE DIAPHRAGM VACUUM PUMP

- The vacuum pump is of diaphragm type; its lubrication is oil bath type.

- Running the vacuum pump with an insufficient amount of oil can damage it.
- The vacuum pump is equipped with an oil filler extension to prevent this, the level must be between the minimum and maximum levels (the optimal level is halfway).
- Oil prescribed for top-up: PAROIL E. Refer the section *Engine oil specifications* for engine oil PN.




| Reference | Description |
|---|---|
| 1 | Oil filing plug |
| 2 | Oil level control |
| 3 | Oil discharge plug |

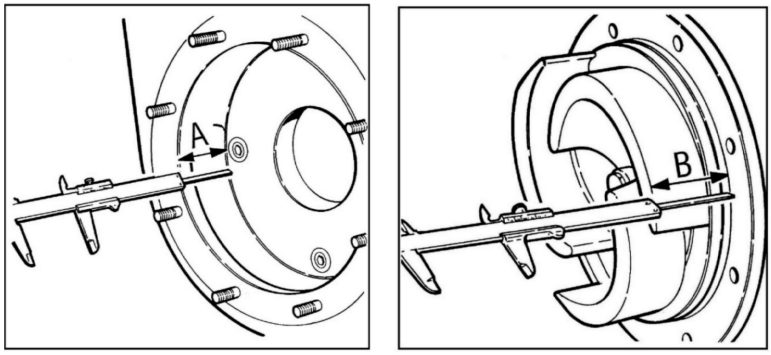
## 6.5 Adjustments and service procedures

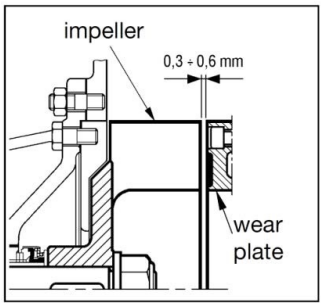
### 6.5.1 Positioning the impeller with reference to the wear plate(s)

In all models, the distance between the top of the impeller blades and the surface of the wear plate must be between 0.3 - 0.6 mm.

To achieve this, check dimensions A and B.

To this end, use the shims supplied with spare mechanicals seals. These shims are used to move the impeller further forward if it is too far from the front wear plate or too near the rear wear plate (when foreseen). The shims should be mounted between the seal support ring and the impeller. Further adjustments can be carried out using casing gaskets and rear wear plate gaskets. The presence of the casing gasket 0.5 mm thick then creates the correct distance.

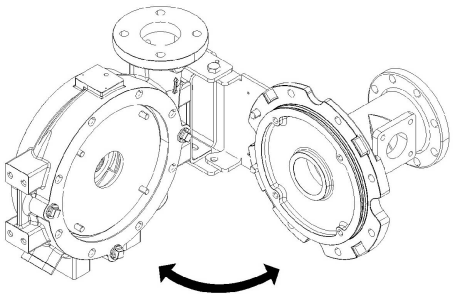


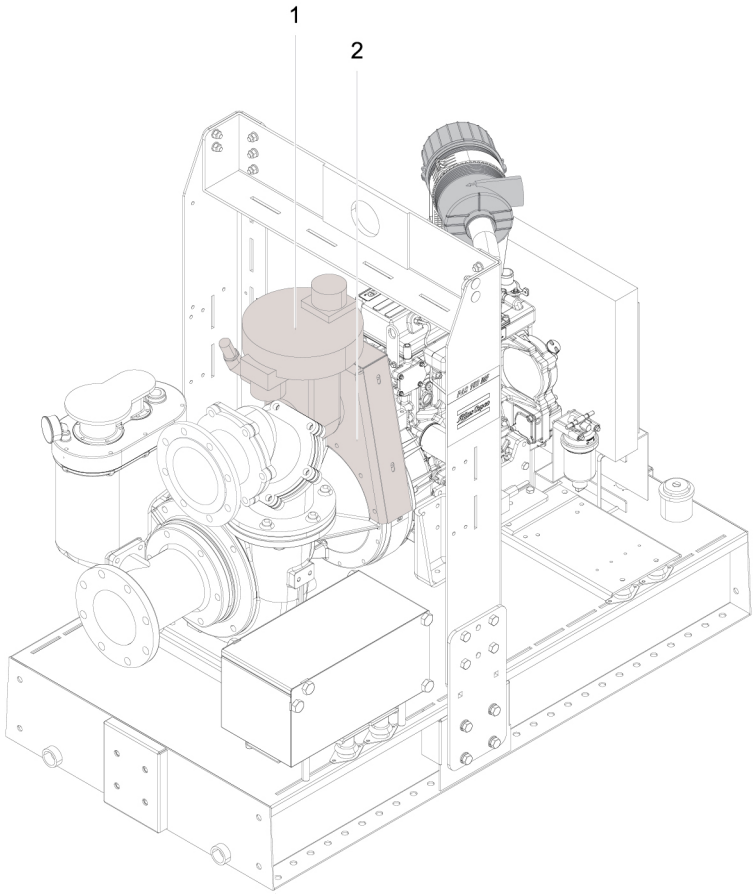

### 6.5.2 Servicing of impeller

#### Pump Hinge

The Atlas Copco Pump is integrated with a Hinge mechanism to access the impeller in order to perform basic cleaning and examining the impeller and wear plate conditions.



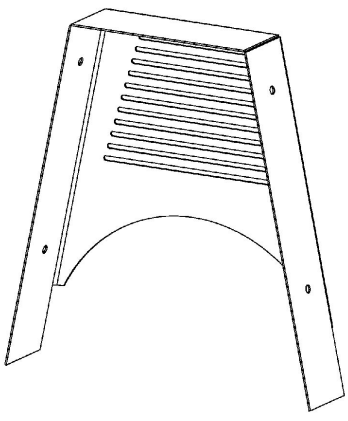
### 6.5.3 Replacement belt

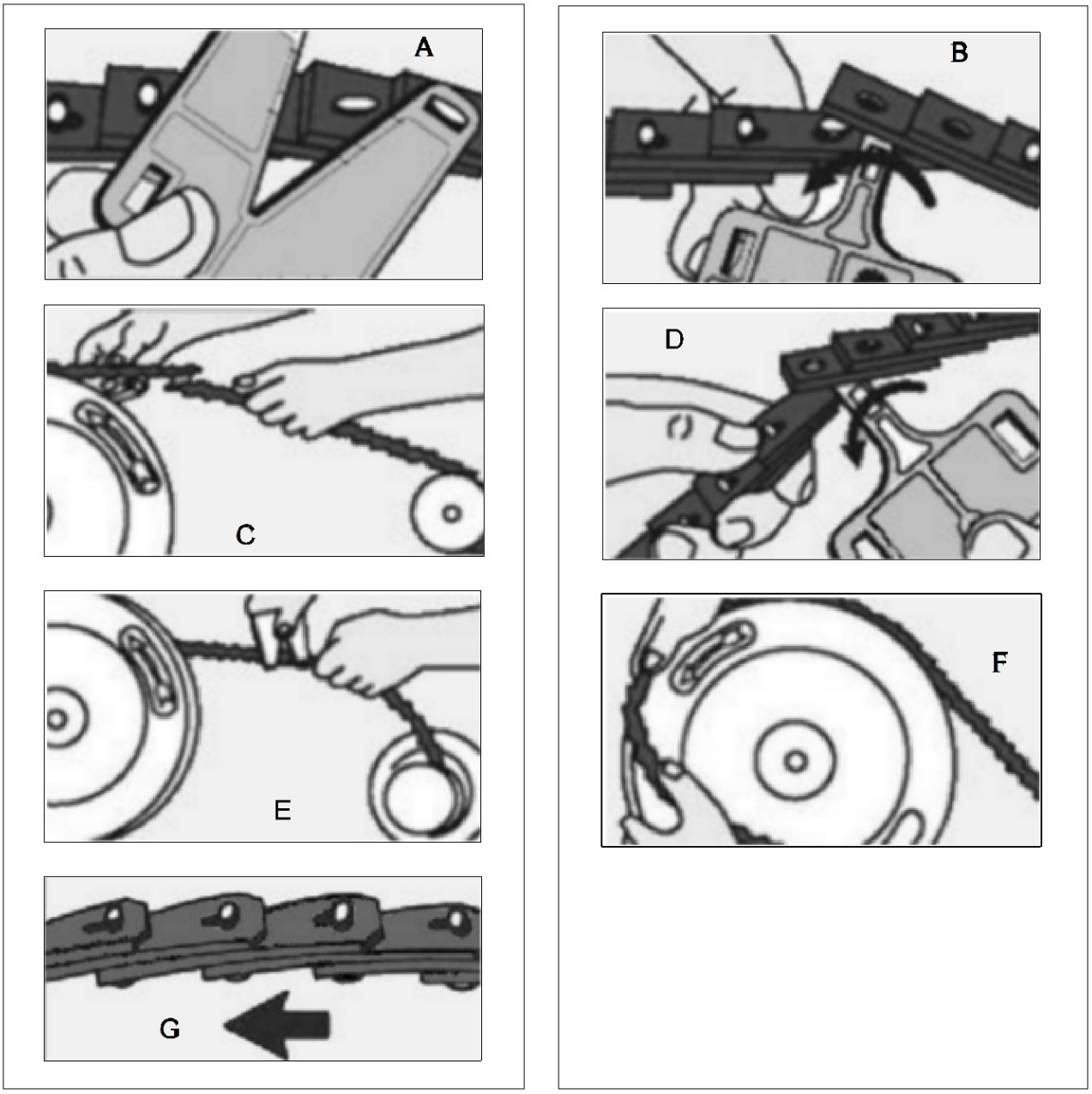



The vacuum pump (1) and shaft (2) are coupled with belts and pulleys. Remove the guard belt. Check that the belts are not damaged or broken every 500 hours or 6 months; at the same time check the alignment of the pulleys (for example, using a square ruler). If a belt is broken or damaged, replace both belts; if you only replace one belt, the other one will be more stretched and therefore more stressed.

This increased stress could make the belt break.

To change or check the condition of the belts, switch the engine off, letting it cool down properly to prevent scalding and then dismantle the casing.






The belts used are the detachable link type; to remove the belt release the link, turning the head of the pin by 90 degrees Fig.A.

Insert the tool turning it (to reassemble the belt, overlap the last link by inserting it on the head of the pin and turn it by 90°), Fig.B.

Place the belt on the pulley (shaft side), close the belt in a loop and place it around the pulley on the vacuum pump side, Fig.C.

Attention, count the number of belt links (old and new), the belts must have the same number of links. Add or remove links from the new belt until reaching the same number of links of the old belt, Fig.D.

Close the belt in a loop as shown in Fig.E.

Mount the belt on the smaller pulley and insert it in the larger one, making the latter rotate slowly, Fig.F. The belts will rotate equally well in both directions, the preferable direction is that shown in Fig.G.

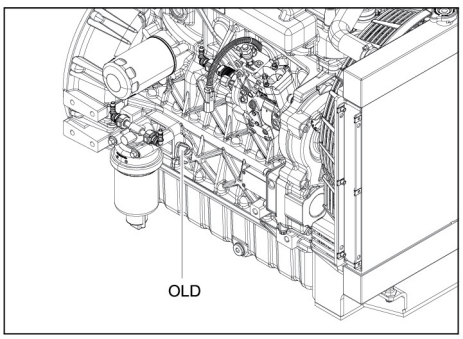
## 6.6 Engine maintenance procedures Kohler 1903 M and 2504 M

### 6.6.1 Engine oil level check

Refer the Engine Operation Manual for the oil specifications, viscosity recommendations and oil change intervals. For the intervals, see section Maintenance schedule.

**CAUTION**

**Check the engine oil level before starting or more than 5 minutes after stopping the engine.**




- Check the engine oil level by using the oil level dipstick (OLD).
- Remove the oil filler plug and add new oil to the prescribed level, if necessary.

Refer to the Engine Operation Manual for more detailed instructions.

### 6.6.2 Engine oil and oil filter change

Refer to the Engine Operation Manual for more detailed instructions. For the intervals, see section Maintenance schedule.

**WARNING**

**Do not drain oil after running the engine. Allow the engine to cool down sufficiently.**

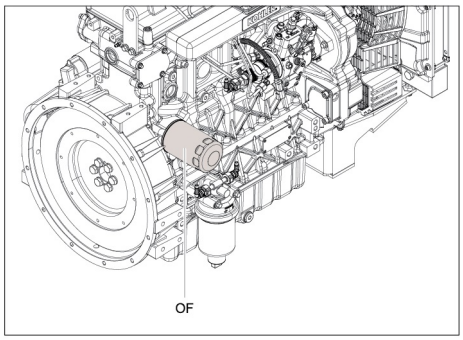



**Figure 2: Replacing the oil filter element**

**WARNING**

**Observe all relevant environmental and safety precautions.**

- Place an appropriate drain pan under the oil drain flexible.
- Remove the drain plug from the oil drain flexible to drain the oil.
- Replace the seal of the drain plug.
- Install and tighten the drain plug on the oil drain flexible.
- Unscrew the oil filter element (OF) from the adapter head.
- Clean the adapter head sealing surface. Lightly oil the gasket of the new element and screw the latter onto the adapter head until the gasket is properly seated, then tighten with both hands.

**NOTE**

**Never leave spilled liquids such as fuel, oil, water and cleansing agents in or around the unit.**

- Top up the engine oil level.
- Run the engine for 1 minute and check the oil level using the oil level dipstick.

### 6.6.3 Coolant check

**Monitoring coolant condition**

In order to guarantee the lifetime and quality of the product, thus to optimise engine protection, regular coolant-condition-analysis is advisable.

The quality of the product can be determined by three parameters.

**Visual check**

- Verify the outlook of the coolant regarding colour and make sure that no loose particles are floating around.

**NOTE**

**Long service intervals 5-year drain interval to minimize service costs (when used in accordance with the instructions).**

**pH measurement**

- Check the pH value of the coolant using a pH measuring device.
- The pH-meter can be ordered from Atlas Copco with part number 2913 0029 00.

- Typical value for EG = 8.6.
- If the pH-level is below 7 or above 9.5, the coolant should be replaced.

**Glycol concentration measurement**

- To optimise the unique engine protection features of the PARCOOL Green, the concentration of the Glycol in the water should be always above 33 vol.%.
- Mixtures with more than 68 vol.% mix ratio in water are not recommended, as this will lead to high engine operating temperatures.
- A refractometer can be ordered from Atlas Copco with part number 2913 0028 00.

**NOTE**

**In case of a mix of different coolant products this type of measurement might provide incorrect values.**

**Topping up of coolant**

- Verify if the engine cooling system is in a good condition (no leaks, clean).
- Check the condition of the coolant.
- If the condition of the coolant is outside the limits, the complete coolant should be replaced. See section Replacing the coolant.
- Always top-up with PARCOOL Green. Refer section Engine coolant specification for more information.
- Topping up the coolant with water only, changes the concentration of additives and is therefore not allowed.

**Replacing the coolant**

**Drain**

- Completely drain the entire cooling system.
- Used coolant must be disposed or recycled in accordance with laws and local regulations.

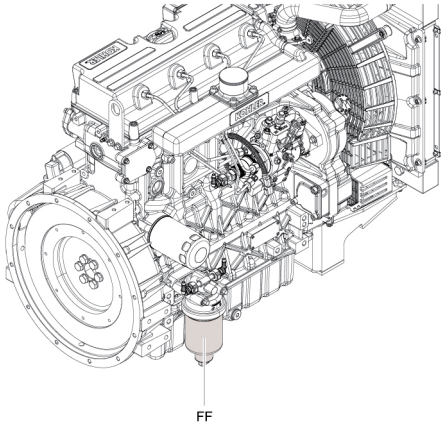
**Flush**

- Flush twice with clean water. Used coolant must be disposed or recycled in accordance with laws and local regulations.
- From the Atlas Copco Instruction book, determine the amount of PARCOOL Green required and pour into the radiator top tank.
- It should be clearly understood that the risk for contamination is reduced in case of proper cleaning.
- In case a certain content of ‘other’ coolant remains in the system, the coolant with the lowest properties influences the quality of the ‘mixed’ coolant.

**Fill**

- To assure proper operation and the release of trapped air, run the engine until normal engine operation temperature is reached. Turn off the engine and allow to cool.
- Recheck coolant level and add if necessary.

### 6.6.4 Replacing fuel filter element

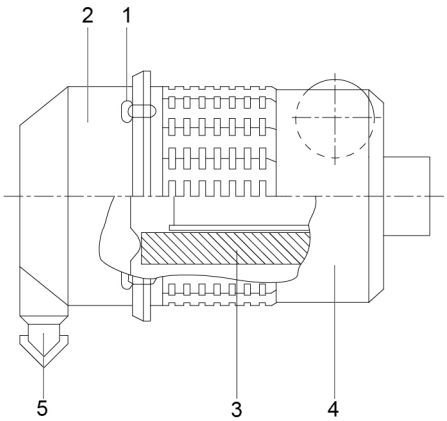



Replacing the filter element:

- Unscrew the filter element (FF) from the adapter head.
- Clean the adapter head sealing surface. Lightly oil the gasket of the new element and screw the latter onto the header until the gasket is properly seated, then tighten with both hands.
- Check for fuel leaks once the engine has been restarted.

### 6.6.5 Servicing air filter engine

#### Main parts




| Reference | Description |
|---|---|
| 1 | Snap clips |
| 2 | Dust trap |
| 3 | Filter element |
| 4 | Filter housing |
| 5 | Evacuator valve |

**Recommendation**

**NOTE**

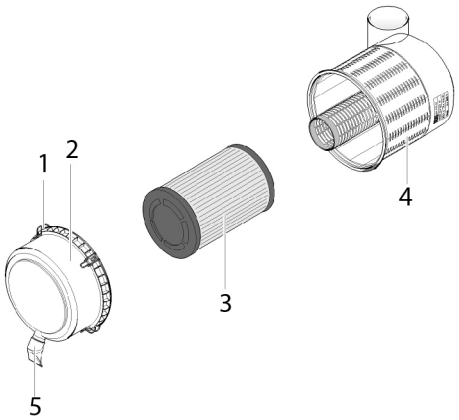
**The Atlas Copco air filters are specially designed for the application. The use of non-genuine air filters may lead to severe damage of engine and/or alternator. Never run the unit without air filter element (3).**

- New elements must also be inspected for tears or punctures before installation.
- Open the evacuator valve (5) once a week under normal conditions, or daily in dusty environments.
- Discard the filter element (3) when damaged.
- In heavy duty applications it is recommended to install a safety cartridge which can be ordered with part no.: 2914 9304 00.
- A dirty safety cartridge is an indication of a malfunctioning air filter element (3). Replace the element and the safety cartridge in this case.
- The safety cartridge cannot be cleaned.

**Cleaning the dust trap**

To remove dust from the dust trap (2), clean it with a dry rag.

### 6.6.6 Replacing the filter element




New elements must also be inspected for tears or punctures before installation.

1. Release the snap clips (1) and remove the dust trap cover (2). Clean the inside of the cover.
2. Remove the element (3).
3. Reassemble in reverse order of dismantling. Make sure the Evacuator valve (5) points down.
4. Inspect and tighten all air intake connections.

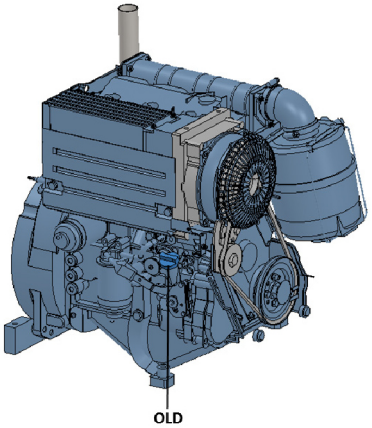
## 6.7 Engine maintenance procedures - Deutz 2011 L03i

### 6.7.1 Engine oil level check

Refer the Engine Operation Manual for the oil specifications, viscosity recommendations and oil change intervals. For the intervals, see section Maintenance schedule.

**CAUTION**

**Check the engine oil level before starting or more than 5 minutes after stopping the engine.**




- Check the engine oil level by using the oil level dipstick (OLD).
- Remove the oil filler plug and add new oil to the prescribed level, if necessary.

Refer to the Engine Operation Manual for more detailed instructions.

### 6.7.2 Engine oil and oil filter change

Refer to the Engine Operation Manual for more detailed instructions. For the intervals, see section Maintenance schedule.

**WARNING**

**Do not drain oil after running the engine. Allow the engine to cool down sufficiently.**

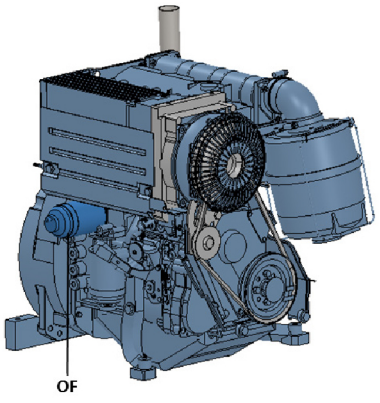



**Figure 3: Replacing the oil filter element**

**WARNING**

**Observe all relevant environmental and safety precautions.**

- Place an appropriate drain pan under the oil drain flexible.
- Remove the drain plug from the oil drain flexible to drain the oil.

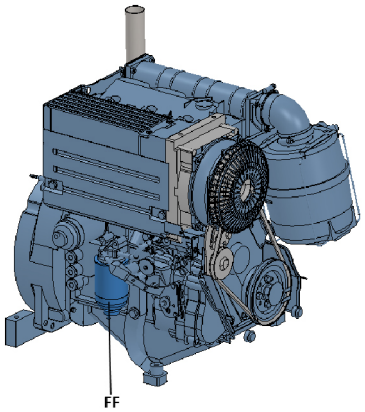
- Replace the seal of the drain plug.
- Install and tighten the drain plug on the oil drain flexible.
- Unscrew the oil filter element (OF) from the adapter head.
- Clean the adapter head sealing surface. Lightly oil the gasket of the new element and screw the latter onto the adapter head until the gasket is properly seated, then tighten with both hands.

**NOTE**

**Never leave spilled liquids such as fuel, oil, water and cleansing agents in or around the unit.**

- Top up the engine oil level.
- Run the engine for 1 minute and check the oil level using the oil level dipstick.

### 6.7.3 Replacing fuel filter element

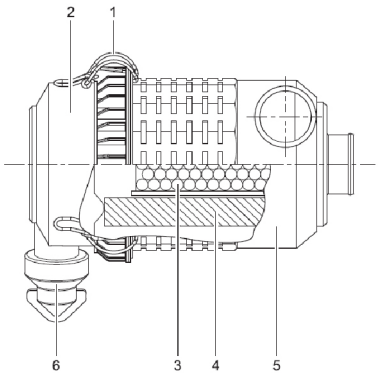



Replacing the filter element:

- Unscrew the filter element (FF) from the adapter head.
- Clean the adapter head sealing surface. Lightly oil the gasket of the new element and screw the latter onto the header until the gasket is properly seated, then tighten with both hands.
- Check for fuel leaks once the engine has been restarted.

### 6.7.4 Servicing air filter engine

**Main parts**



| Reference | Description |
|---|---|
| 1 | Snap clips |
| 2 | Dust trap |
| 3 | Safety cartridge |
| 4 | Filter element |
| 5 | Filter housing |
| 6 | Evacuator valve |

### Recommendation

**NOTE**

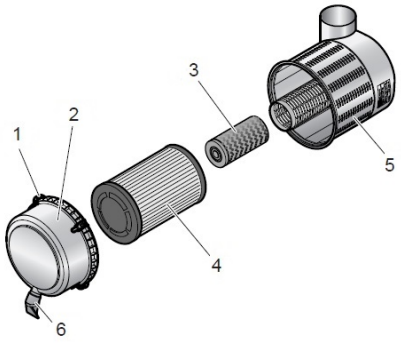
**The Atlas Copco air filters are specially designed for the application. The use of non-genuine air filters may lead to severe damage of engine and/or alternator. Never run the unit without air filter element.**

- New elements must also be inspected for tears or punctures before installation.
- Open the evacuator valve (6) once a week under normal conditions, or daily in dusty environments.
- Discard the filter element (4) when damaged.
- In heavy duty applications it is recommended to install a safety cartridge which can be ordered with part no.: 2914 9304 00.
- A dirty safety cartridge (3) is an indication of a malfunctioning air filter element (4). Replace the element and the safety cartridge in this case.
- The safety cartridge (3) cannot be cleaned.

### Cleaning the dust trap

To remove dust from the dust trap (2), clean it with a dry rag.

## 6.7.5 Replacing the filter element




New elements must also be inspected for tears or punctures before installation.

A dirty safety cartridge (3) is an indication of a malfunctioning filter element.

1. Release the snap clips (1) and remove the dust trap cover (2). Clean the inside of the cover.
2. Remove the element (4) and the safety cartridge (3).
3. Reassemble in reverse order of dismantling. Make sure the Evacuator valve (6) points down.
4. Inspect and tighten all air intake connections.

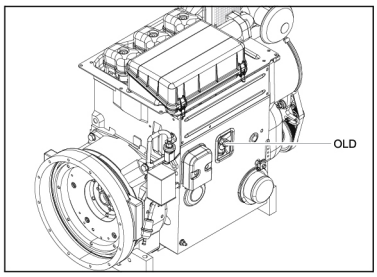
## 6.8 Engine maintenance procedures Hatz 3M41

### 6.8.1 Engine oil level check

Refer the Engine Operation Manual for the oil specifications, viscosity recommendations and oil change intervals. For the intervals, see section Maintenance schedule.

**CAUTION**

**Check the engine oil level before starting or more than 5 minutes after stopping the engine.**




- Check the engine oil level by using the oil level dipstick (OLD).
- Remove the oil filler plug and add new oil to the prescribed level, if necessary.

Refer to the Engine Operation Manual for more detailed instructions.

### 6.8.2 Engine oil and oil filter change

Refer to the Engine Operation Manual for more detailed instructions. For the intervals, see section Maintenance schedule.

**WARNING**

**Do not drain oil after running the engine. Allow the engine to cool down sufficiently.**

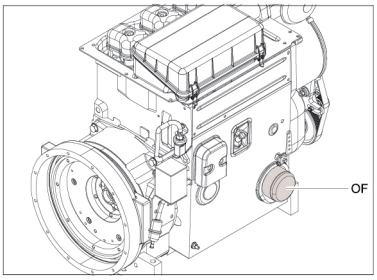



**Figure 4: Replacing the oil filter element**

**WARNING**

**Observe all relevant environmental and safety precautions.**

- Place an appropriate drain pan under the oil drain flexible.
- Remove the drain plug from the oil drain flexible to drain the oil.

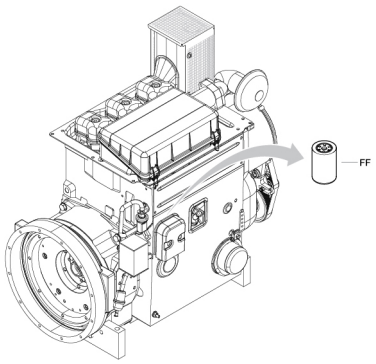
- Replace the seal of the drain plug.
- Install and tighten the drain plug on the oil drain flexible.
- Unscrew the oil filter element (OF) from the adapter head.
- Clean the adapter head sealing surface. Lightly oil the gasket of the new element and screw the latter onto the adapter head until the gasket is properly seated, then tighten with both hands.

**NOTE**

**Never leave spilled liquids such as fuel, oil, water and cleansing agents in or around the unit.**

- Top up the engine oil level.
- Run the engine for 1 minute and check the oil level using the oil level dipstick.

### 6.8.3 Replacing fuel filter element




Replacing the filter element:

- Unscrew the filter element (FF) from the adapter head.
- Clean the adapter head sealing surface. Lightly oil the gasket of the new element and screw the latter onto the header until the gasket is properly seated, then tighten with both hands.
- Check for fuel leaks once the engine has been restarted.

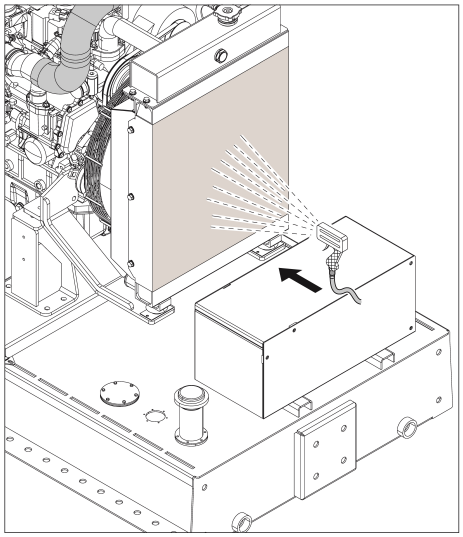
### 6.8.4 Servicing air filter engine

Refer section *Servicing air filter engine* for more detail.

### 6.8.5 Replacing the filter element

Refer section *Replacing the filter element* for more detail.

### 6.8.6 Cleaning cooler



1. Keep the water cooler clean to maintain the cooling efficiency.
   - The engine water cooler is accessible via the service door at the front of the unit.

**WARNING**

**Remove any dirt from the coolers with a fibre brush. Never use a wire brush or metal objects.**

2. Steam cleaning in combination with a cleansing agent may be applied.

**NOTE**

**To avoid damaging the coolers, angle between jet and coolers should be approx. 90°. Protect the electrical and controlling equipment, air filters, etc. against penetration of moisture.**

**CAUTION**

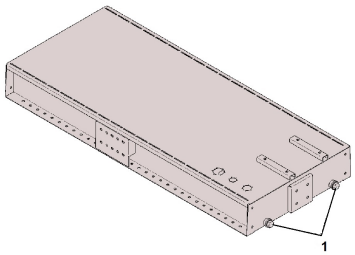
**Make sure to not steam clean the alternator.**

3. Close the service door(s).

**WARNING**

**Never leave spilled liquids such as fuel, oil, water and cleansing agents in or around the unit.**

### 6.8.7 Cleaning the fuel tank




**WARNING**

**Observe all relevant environmental and safety precautions.**

1. Place an appropriate drain pan under the drain plug of the fuel tank.
2. Remove the flange and the drain plug (1).
3. Slope the unit. approx. 15° to remove all fuel, dirt and water.
4. Clean the fuel tank and fix the drain plug and flange hand-tight.

**WARNING**

**Never leave spilled liquids such as fuel, oil, water and cleansing agents in or around the unit.**

5. Refill the fuel tank with clean fuel.

### 6.8.8 Battery care

**NOTE**

**Before handling batteries, read the relevant safety precautions and act accordingly.**

If the battery is still dry, it must be activated as described in section Activating a dry-charged battery.

The battery must be in operation within 2 months from being activated; if not, it needs to be recharged first.

#### Electrolyte

**WARNING**

**Read the safety instructions carefully.**

Electrolyte in batteries is a sulphuric acid solution in distilled water.

The solution must be made up before being introduced into the battery.

#### Activating a dry-charged battery

1. Take out the battery.
2. Battery and electrolyte must be at equal temperature above 10°C.
3. Remove cover and/or plug from each cell.
4. Fill each cell with electrolyte until the level reaches 10 to 15 mm above the plates, or to the level marked on the battery.

5. Rock the battery a few times so that possible air bubbles can escape; wait 10 minutes and check the level in each cell once more; if required, add electrolyte.
6. Refit plugs and/or cover.
7. Place the battery in the unit.

### Recharging a battery

Before and after charging a battery, always check the electrolyte level in each cell; if required, top up with distilled water only. When charging batteries, each cell must be open, i.e. plugs and/or cover removed.

**NOTE**

**Use a commercial automatic battery charger according to its manufacturer's instructions.**

Apply with preference the slow charging method and adjust the charge current according to the following rule of thumb: battery capacity in Ah divided by 20 gives safe charging current in Amp.

### Make-up distilled water

The amount of water evaporating from batteries is largely dependant on the operating conditions, i.e. temperatures, number of starts, running time between start and stop, etc.

If a battery starts to need excessive make-up water, this points to overcharging. Most common causes are high temperatures or a too high voltage regulator setting.

If a battery does not need any make-up water at all over a considerable time of operation, an undercharged battery condition may be caused by poor cable connections or a too low voltage regulator setting.

### Periodic battery service

1. Keep the battery clean and dry.
2. Keep the electrolyte level at 10 to 15 mm above the plates or at the indicated level; top up with distilled water only. Never overfill, as this will cause poor performance and excessive corrosion.
3. Record the quantity of distilled water added.
4. Keep the terminals and clamps tight, clean, and lightly covered with petroleum jelly.
5. Carry out periodic condition tests. Test intervals of 1 to 3 months, depending on climate and operating conditions, are recommended.
6. If doubtful conditions are noticed or malfunctions arise, keep in mind that the cause may be in the electrical system, e.g. loose terminals, voltage regulator maladjusted, poor performance of the pump, etc

### Battery switch

The battery switch is situated inside the soundinsulated bodywork. It allows to open or to close the electrical connection between the battery and the engine circuits.

**WARNING**

**Never turn the battery switch to OFF during operation.**

## 6.9 Engine consumable specifications

### 6.9.1 Engine fuel specifications

For fuel specifications, please contact Atlas Copco Customer Center.

### 6.9.2 Engine oil specifications

**NOTE**

**It is strongly recommended to use Atlas Copco branded lubrication oils.**

High-quality, mineral, hydraulic or synthesized hydrocarbon oil with rust and oxidation inhibitors, anti-foam and anti-wear properties is recommended. The viscosity grade should correspond to the ambient temperature and ISO 3448, as follows:

| Engine | Type of lubricant |
|---|---|
| between -15°C and +40°C | PAROIL E |
| between -30°C and +40°C | PAROIL Extra |
| between -15°C and +40°C | PAROIL E Mission Green |
| between -10°C and +40°C | PAROIL MS |

**NOTE**

**Never mix synthetic with mineral oil. When changing from mineral to synthetic oil (or the other way around), you will need to do an extra rinse. After doing the complete change procedure to synthetic oil, run the unit for a few minutes to allow good and complete circulation of the synthetic oil. Then drain the synthetic oil again and fill again with new synthetic oil. To set correct oil levels, proceed as in normal instruction.**

**Specifications PAROIL**

PAROIL from Atlas Copco is the ONLY oil tested and approved for use in all engines built into Atlas Copco compressors, generators, and pumps.

**PAROIL E**

PAROIL E is a mineral based high performance diesel engine oil with a high viscosity-index. Atlas Copco PAROIL E is designed to provide a high level of performance and protection in standard ambient conditions as from -10°C (14°F).

| | Litre | US gal | Imp gal | cu.ft | Order number |
|---|---|---|---|---|---|
| can | 5 | 1.3 | 1.1 | 0.175 | 1615 5953 00 |
| can | 20 | 5.3 | 4.4 | 0.7 | 1615 5954 00 |
| barrel | 209 | 55.2 | 46 | 7.32 | 1615 5955 00 |
| barrel | 1000 | 264 | 220 | 35 | 1630 0096 00 |

### PAROIL Extra

PAROIL Extra is a synthetic ultra high performance diesel engine oil with a high viscosity-index. Atlas Copco PAROIL Extra is designed to provide excellent lubrication from start-up in temperatures as low as -30°C (-22°F).

| | Litre | US gal | Imp gal | cu.ft | Order number |
|---|---|---|---|---|---|
| can | 5 | 1.3 | 1.1 | 0.175 | 1630 0135 00 |
| can | 20 | 5.3 | 4.4 | 0.7 | 1630 0136 00 |
| barrel | 209 | 55.2 | 46 | 7.32 | 1626 0102 00 |

### PAROIL E Mission Green

PAROIL E Mission Green is a high-performance engine oil intended for the lubrication of all diesel engines as used in our compressors, generators and self-priming diesel pumps. It meets stringent quality control specifications to ensure your equipment will run smoothly and reliably.

| | Litre | US gal | Imp gal | cu.ft | Order number |
|---|---|---|---|---|---|
| can | 5 | 1.3 | 1.1 | 0.175 | 1630 0471 00 |
| can | 20 | 5.3 | 4.4 | 0.7 | 1630 0472 00 |
| barrel | 210 | 55.5 | 46.2 | 7.4 | 1630 0473 00 |

### PAROIL MS

PAROIL MS creates a durable film that seals pump's elements perfectly, even under harsh conditions. PAROIL MS is a premium oil for the mechanical seals.

| | Litre | US gal | Order number |
|---|---|---|---|
| can | 1 | 0.26 | 4810 0800 69 |

### Engine oil level check

Also consult the Engine Operation Manual for the oil specifications, viscosity recommendations and oil change intervals.

Check engine oil level in accordance with the instructions in the Engine Operation Manual and if necessary, top up with oil.

# 7 Checks and troubleshooting

**NOTE**

**When a failure occurs, always report what you experienced before, during and after the failure. Information with regard to the vibrations, exhaust gas colour, insulation check, odours, leaks and damaged parts, ambient temperature, daily and normal maintenance and altitude might be helpful to quickly locate the problem. Also report any information regarding the humidity and location of the pump (e.g. close to sea).**

## 7.1 Engine troubleshooting

The table below gives an overview of the possible engine problems and their possible causes.

| Symptom | Possible cause |
|---|---|
| **The starter motor turns the engine too slowly** | Battery capacity too low. |
| | Bad electrical connection. |
| | Fault in starter motor. |
| | Wrong grade of lubricating oil. |
| **The engine does not start or is difficult to start** | Starter motor turns engine too slowly. |
| | Fuel tank empty. |
| | Fault in fuel control solenoid. |
| | Restriction in a fuel pipe. |
| | Fault in fuel lift pump. |
| | Dirty fuel filter element. |
| | Air in fuel system. |
| | Fault in atomisers. |
| | Cold start system used incorrectly. |
| | Fault in cold start system. |
| | Restriction in fuel tank vent. |
| | Wrong type or grade of fuel used. |
| | Restriction in exhaust pipe. |
| **Not enough power** | Restriction in a fuel pipe. |
| | Fault in fuel lift pump. |
| | Dirty fuel filter element. |
| | Restriction in air filter/cleaner or induction system. |
| | Air in fuel system. |
| | Fault in atomisers or atomisers of an incorrect type. |
| | Restriction in fuel tank vent. |
| | Wrong type or grade of fuel used. |
| | Restricted movement of engine speed control. |
| | Restriction in exhaust pipe. |
| | Engine temperature is too high. |
| | Engine temperature is too low. |
| **Misfire** | Restriction in a fuel pipe. |
| | Fault in fuel lift pump. |
| | Dirty fuel filter element. |
| | Air in fuel system. |
| | Fault in atomisers or atomisers of an incorrect type. |

| Symptom | Possible cause |
|---|---|
| | Fault in cold start system. |
| | Engine temperature is too high. |
| | Incorrect valve tip clearances. |
| **The pressure of the lubricating oil is too low** | Wrong grade of lubricating oil. |
| | Not enough lubricating oil in sump. |
| | Defective gauge. |
| | Dirty lubricating oil filter element. |
| **High fuel consumption** | Restriction in air filter/cleaner or induction system. |
| | Fault in atomisers or atomisers of an incorrect type. |
| | Fault in cold start system. |
| | Wrong type or grade of fuel used. |
| | Restricted movement of engine speed control. |
| | Restriction in exhaust pipe. |
| | Engine temperature is too low. |
| | Incorrect valve tip clearances. |
| **Black exhaust smoke** | Restriction in air filter/cleaner or induction system. |
| | Fault in atomisers or atomisers of an incorrect type. |
| | Fault in cold start system. |
| | Wrong type or grade of fuel used. |
| | Restriction in exhaust pipe. |
| | Engine temperature is too low. |
| | Incorrect valve tip clearances. |
| | Engine overload. |
| **Blue or white exhaust smoke** | Wrong grade of lubricating oil. |
| | Fault in cold start system. |
| | Engine temperature is too low. |
| **The engine knocks** | Fault in fuel lift pump. |
| | Fault in atomisers or atomisers of an incorrect type. |
| | Fault in cold start system. |
| | Wrong type or grade of fuel used. |
| | Engine temperature is too high. |
| | Incorrect valve tip clearances. |
| **The engine runs erratically** | Fault in fuel control. |
| | Restriction in a fuel pipe. |
| | Fault in fuel lift pump. |
| | Dirty fuel filter element. |
| | Restriction in air filter/cleaner or induction system. |
| | Air in fuel system. |
| | Fault in atomisers or atomisers of an incorrect type. |
| | Fault in cold start system. |
| | Restriction in fuel tank vent. |
| | Restricted movement of engine speed control. |
| | Engine temperature is too high. |
| | Incorrect valve tip clearances. |
| **Vibration** | Fault in atomisers or atomisers of an incorrect type. |
| | Restricted movement of engine speed control. |
| | Engine temperature is too high. |
| | Fan damaged. |
| | Fault in engine mounting or flywheel housing. |
| **The pressure of the lubricating oil is too high** | Wrong grade of lubricating oil. |
| | Defective gauge. |
| **The engine temperature is too high** | Restriction in air filter/cleaner or induction system. |
| | Fault in atomisers or atomisers of an incorrect type. |

| Symptom | Possible cause |
|---|---|
| | Fault in cold start system. |
| | Restriction in exhaust pipe. |
| | Fan damaged. |
| | Too much lubricating oil in sump. |
| | Restriction in air or coolant passages of radiator. |
| **Crankcase pressure** | Restriction in breather pipe. |
| | Vacuum pipe leaks or fault in exhaust. |
| **Bad compression** | Restriction in air filter/cleaner or induction system. |
| | Incorrect valve tip clearances. |
| **The engine starts and stops** | Dirty fuel filter element. |
| | Restriction in air filter/cleaner or induction system. |
| | Air in fuel system. |
| **The engine shuts down after approx. 15 sec.** | Bad connection towards oil pressure switch/ coolant temperature switch |

## 7.2 Pump troubleshooting

The paragraph reports the most common problems that may occur during use of the pump and the possible remedies.

In case operation defects founded in the starting phase or after a period of operating time, before intervene on the pump is necessary:

- Stop the pump.

- Check that there is not pressure inside the pump.

- Check that the pump can't start for wrong movement or automatic commands.

### 7.2.1 Overview of possible operating problems

| Symptom | Possible cause | Corrective action |
|---|---|---|
| Pump does not prime | Suction tubes or inlet filter clogged. The vacuum gauge indicates a high value. | Remove the obstruction. |
| | Suction tube collapse. | Use reinforced suction tube. |
| | The air that goes into the suction tubes is more than the air that the vacuum pump can extract. | Check for any opening in the suction tubes and seal accordingly. |
| | Coupling gaskets of suction tubes are leaking. | Replace gaskets. |
| | | Check gaskets of complete pump for leakage and replace accordingly. |
| | | Check non return valve on discharge for proper sealing, cleanness, function and damages. |
| | | Check mechanical seal for leakage and replace accordingly. |
| | | Make sure discharge valve on pump body is closed. |
| | | Make sure ball valve between separator and vacuum pump is open. |

| Symptom | Possible cause | Corrective action |
|---|---|---|
| | | Make sure complete vacuum system (separator, connection tubes, check valves and vacuum pump) is working properly without any defect or leakage. |
| | The suction lift is too high. | Reduce the suction lift. |
| | The vacuum pump is broken or doesn't rotate. | Restore or replace the vacuum pump. |
| | Pump speed is too low. | Only increase speed once you have checked the contract data and pump performance curves. |
| | Delivery tube or discharge valve is blocked and water cannot be moved away. | Make sure, water can be discharged. |
| Low or no flow | The pump does not prime | See causes given in Pump does not prime. |
| | Head required by the system is greater than the rated head of the pump. | Revise system design or select a different pump. |
| | Excessive flow resistance along suction line. | Revise distribution of elbows, valves, constrictions etc. Where necessary, increase diameter of the pipework. |
| | Impeller clogged by foreign debris. | Disassemble casing and remove foreign matter. |
| | Suction/delivery pipes/ strainer may be obstructed or clogged. | Locate the obstructed or clogged area and clean. |
| | Air leaks in suction line. | Check joints are airtight and inspect suction pipe. |
| | Impeller and / or wear plate may be worn. | Replace them by disassembling the pump. |
| | Diameter of the suction pipe too small. | Increase size of suction tube. |
| | Foreign debris trapped in the impeller. | Disassemble the pump casing and remove the foreign debris. |
| | Pump speed is too low. | Only increase speed once you have checked the contract data and pump performance curves. |
| | Cavitation on pump related to less flow. | See chapter cavitation. |
| Excessive power absorption | Rotation speed too high. | Check correct rotation speed. |
| | Pump operates under conditions that are different from those specified in the contract. | Check operating conditions of pump and compare them to those on the pumps nameplate (e.g. density of liquid). |
| | Mechanical friction inside the pump between rotating and non-rotating components. | Disassemble pump casing and check for scratches on surfaces. |
| | Particles in the impeller. | Disassemble pump casing and remove materials. Use suction strainer. |
| Pump does not provide enough pressure | Viscosity of the liquid is higher than expected. | Contact the pump manufacturer once you have measured the viscosity of the liquid. Viscosity for centrifugal pumps should not exceed 50 cSt. Check for other possible causes: see Low or no flow. |
| | Impeller worn, worn wear plates, bad adjustment/trimming between impeller and wear plate. | Gap should be as per technical specification data. |
| | Pump speed is too low. | Only increase speed once you have checked the contract data and pump performance curves. |

| Symptom | Possible cause | Corrective action |
|---|---|---|
| | Pump volute worn. | Change pump volute. |
| Pump vibrates and is noisy | Pump is operating with a flow rate that is too low. | Increase pump speed, check settings of the valves in the system and readings on the pressure and vacuum gauges. |
| | Pump or pipework is not fixed securely. | Make sure system pipework is correctly fastened. |
| | Pump cavitates. | Check possible causes: see Pump does not prime and Low or no flow. |
| | Particles in the impeller. | Disassemble pump casing and remove materials. Use suction strainer. |
| Excessive bearing temperatures | Lubrication not sufficient | Check operation limits |
| | Low pump flow rate | |
| | Water temp too high | |
| | Excessive ambient temperature | |
| | Excessive Viscosity and/or Density | |
| | Excessive flange loads | |
| | Motor - Pump misalignment | |

# 8 Storage of the pump

## 8.1 Storage

1. Store the pump in a dry, frost-free room which is well ventilated.
2. Run the engine regularly, e.g. once a week, until it is warmed up. If this is impossible, extra precautions must be taken:
   - Refer the engine's operator manual.
   - Remove the battery. Store it in a dry, frost-free room. Keep the battery clean and its terminals lightly covered with petroleum jelly. Recharge the battery regularly.
   - Clean the pump and protect it against moisture.
   - Place silica gel bags, VCI paper (Volatile Corrosion Inhibitor) or another drying agent inside the unit and close the doors.
   - Stick sheets of VCI paper with adhesive tape on the bodywork to close off all openings.
   - Wrap the pump, except the bottom, with a plastic bag.

**Short term**

1. Drain and clean the pump.
2. Put inhibitors or grease on wear plate or wear rings.
3. Put grease or inhibitor on machined and unpainted surfaces (such as pump flanges, shaft ends, motor coupling bell, ...)

**Long term**

1. Rotate the shaft periodically to avoid sticking impeller and mechanical seal.
2. Protect battery connections with grease.
3. Empty the tank and put on a rust inhibitor

## 8.2 Preparing for operation after storage

Before operating the pump again, remove the wrapping.

| | |
|---|---|
| Refer the engine's operator manual. | Check tubes. |
| Replace the fuel filter and fill the fuel tank. | Check electrical contacts. |
| When the machines is resumed to work, it is necessary to remove and substitute the lubrication oil. | Check the battery. |
| Check that the cooling water and fuel are up to level. | Submit the pump to a test run. |

# 9 Disposal

## 9.1 General

- When developing products and services, Atlas Copco tries to understand, address, and minimize the negative environmental effects that the products and services may have, when being manufactured, distributed, used and disposed.
- Recycling and disposal policies are part of the development of all Atals Copco company products. Atlas Copco company standards determine strict requirements.
- Material selection, substantial recyclability, disassembly possibilities and separability of materials and assemblies are considered, as well as environmental perils and dangers to health during the recycling and disposal of the unavoidable rates of non-recyclable materials.
- Your Atlas Copco pump consists most of metallic materials, that can be remelted in steel and melting works, and are therefore amost infinitely recyclable.

## 9.2 Disposal of materials

**WARNING**

**Do not discard the pump, or any part of it, in the environment.**

- Metal parts can be recycled as scrap.
- Grease and oil must be recovered and stored as prescribed by the relevant legislation for disposal by approved agencies.
- Elastomer gaskets must be removed and disposed off in an approved waste disposal unit.
- The battery must be kept separate and disposed off through an authorized collection centre in accordance with the law.

**NOTE**

**This concept can only succeed with your help. Support us by disposing professionally. By assuring correct disposal of the product, you help prevent possible negative consequences for environment and health as a result of inappropriate waste handling. Recycling and re-usage of material helps to preserve natural resources.**

# 10 Available option

## 10.1 Undercarriage

To tow a unit, use a towing vehicle of ample capacity. Refer to the documentation of the towing vehicle. Never exceed the maximum towing speed of the unit (mind the local regulations).

**Before Towing the Unit**

1. Check the towbar, the brake system, and the towing eye of the vehicle.
2. Check the towing and brake capability of the towing vehicle.
3. Check that the towbar, jockey wheel or stand leg is safely locked in the raised position.
4. Ascertain that the towing eye can swivel freely on the hook.
5. Check that the wheels are secure and that the tyres are in good condition and inflated correctly.
6. Connect the signalization cable, check all lights and connect the pneumatic brake couplers (if applicable).
7. Attach the safety break-away cable or safety chain to the towing vehicle (if applicable).
8. Remove wheel chocks, if applied, and disengage the parking brake (if applicable).

**When using this option**

1. Make sure that the towing equipment of the vehicle matches the towing eye before towing the unit.
2. Never move the pump while piping is connected to the unit.
3. Apply the hand brake when parking.
4. Leave enough space for operation, inspection, and maintenance (at least 1 meter at each side).
5. Place wheel chocks in front of or behind the wheels to immobilize the unit. Wheel chocks allow to park the unit on sloping ground.
6. Place the unit on level ground and apply the parking brake before disconnecting the unit from the towing vehicle.

**NOTE**

**The unit must be transported in horizontal position and stowed safely.**

**To maintain the undercarriage**

1. Check the tightness of the towbar bolts, the axle bolts, and the wheel nuts at regular intervals.
2. Grease the wheel axle suspension bearings, the drawbar to the steering gear shaft and the spindle of the brake handle regularly and as per needs. Use ball bearing grease for the wheel bearings and graphite grease for the drawbar and spindle.
3. Check the brake system and condition of the vibration dampers on regular basis.
4. Re-pack the wheel hub bearings using grease as per requirements.
5. Place wheel chocks in front of or behind the wheels to immobilize the unit. Wheel chocks allow to park the unit on sloping ground.

### Trailer

### Skid

The Heavy duty skid allows the machine to be lifted via Fork lift and pulled when placed on the round using the circular hooks provided.

The skid is galvanised and hence is suitable to be used in a variety of conditions without any consequences.

Always check the bolted connections on the skid and make sure they are tightened properly in order to avoid accidents and hazards.

While pulling the machine make sure that the hooks/clamps are properly attached.

### Stack

1. Pumps are designed to be stackable for the purpose of storage and storage only.

**WARNING**

**Do not stack the pumps and use for pumping application.**

2. While stacking, the pump side of the machines should be on the same side.

**WARNING**

**Do not stack more than one pump.**

3. Stacking to be done with similar size pump.

**NOTE**

**While stacking care must be taken to place the pump in the correct position and not dropped.**

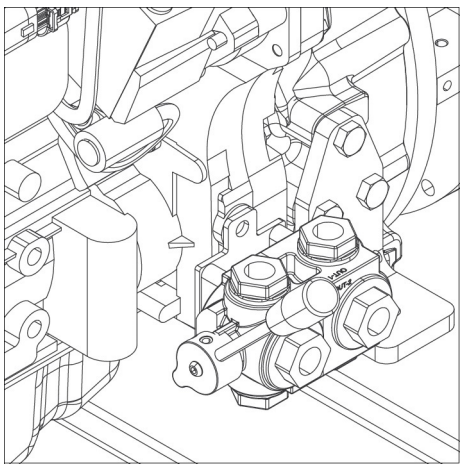
**CAUTION**

**Pump stacking during application prohibited. Stacking force must be within safe limits (max 1g).**

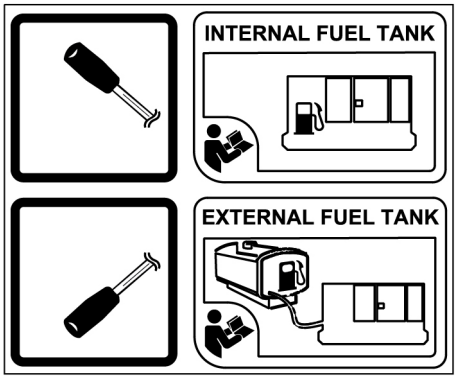
## 10.2 External fuel tank connection (with/without quick coupling)

The option external fuel tank connection allows to bypass the internal fuel tank and to connect an external fuel tank to the unit.

**View inside**



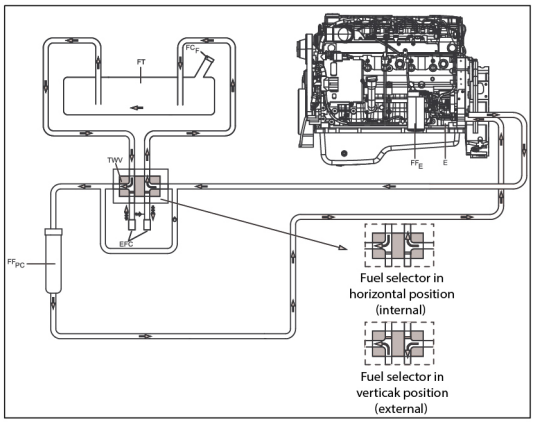
When using this option, make sure to connect the fuel supply line as well as the fuel return line. Connections to fuel lines ought to be air-tight to prevent air from entering the fuel system. Turn the handle of 3-way valve to desired condition.




Position 1: Indicates that the fuel supply line to the engine is connected to the internal fuel tank.

Position 2: Indicates that the fuel supply line to the engine is connected to the external fuel tank.

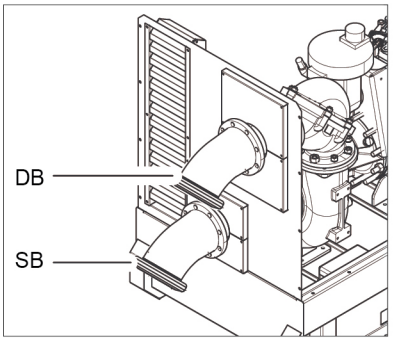
## Overview




| Reference | Description | Reference | Description |
|---|---|---|---|
| E | Engine | $FF_{PC}$ | Primary coarse fuel filter / water separator |
| EFC | External fuel supply coupling | FT | Fuel tank |
| $FC_F$ | Filler cap (fuel tank) | TWV | 3-way valve |
| $FF_E$ | Fuel filter engine | | |

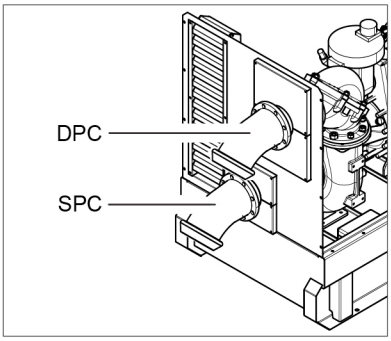
## 10.3 Suction and discharge pipes

Bauer



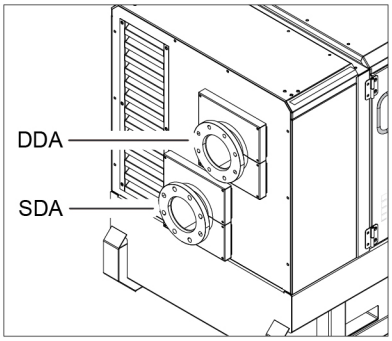

| | |
|---|---|
| DB | Discharge Bauer |
| SB | Suction Bauer |

Perrot/Cardan




| | |
|---|---|
| DPC | Discharge Perrot/Cardan |
| SPC | Suction Perrot/Cardan |

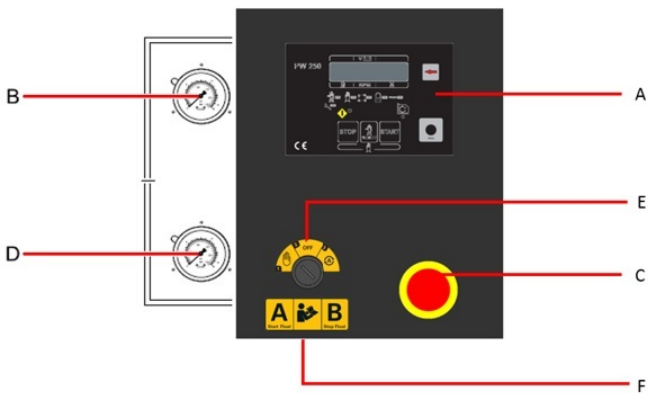
DIN / ASME




| | |
|---|---|
| DDA | Discharge DIN / ASME |
| SDA | Suction DIN / ASME |

## 10.4 Contoller PW 250

The PAS MF range of pumps are fitted with PW 250 - 500 controller. This is located inside the canopy and communicates via a display section in the front. It carries out the entire necessary task to control and protect the Pump.




| Reference | Description |
|---|---|
| A | Controller |
| B | Vacuum Gauge |
| C | Emergency Stop Button |
| D | Pressure gauge |
| E | Operation Mode Selection key |
| F | Float connections |


**Figure 5: Operation Mode Selection key**

| Reference | Description |
|---|---|
| 1 | Manual Operation |
| 2 | Power Off |
| 3 | Automatic Operation |

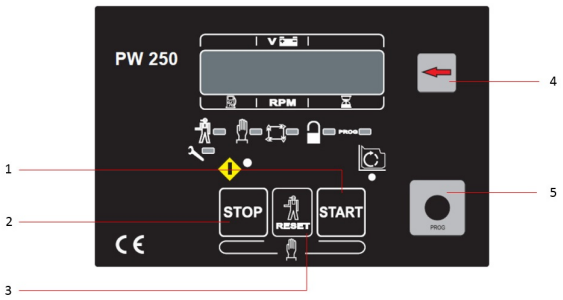



**Figure 6: General description of controller PW 250**

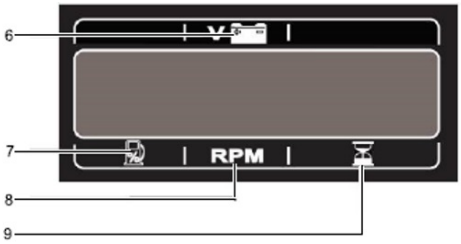



**Figure 7: Graphical Display**

| Reference | | Description |
|---|---|---|
| 1 | START | START BUTTON<br>Pressing this button in Manual Mode will start the Pump. |
| 2 | STOP | STOP BUTTON<br>Pressing this button in manual mode will stop the pump in a controlled way. |
| 3 | RESET | RESET BUTTON<br>Press Reset Button to reset the alarms. |
| 4 | | ARROW BUTTON<br>Press Briefly to Show the instruments. Hold down to verify the LED test.<br>General Alarm silencing. |

| Reference | | Description |
|---|---|---|
| 5 |  | OPERATION MODE BUTTON<br>Press to select the operation mode.<br>1. Manual<br>2. Automatic<br>3. Off<br>4. User Programming |
| 6 | | Battery |
| 7 | | Fuel level indicator |
| 8 | | Tachometer |
| 9 | | Total Hour Meter |

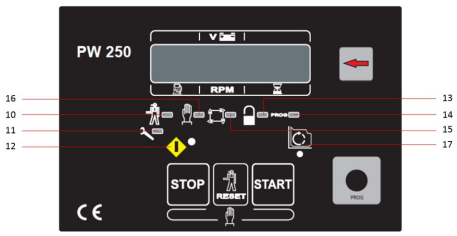



**Figure 8: Led Functions**

| Reference | Description |
|---|---|
| 10 | Cumulative alarm with Engine stop |
| 11 | Preventive maintenance and cumulative alarm without engine stop |
| 12 | Start Float Call Closed |
| 13 | Operation Mode Light - Controller Off |
| 14 | Operation Mode Light - Controller in Programmed |
| 15 | Operation Mode Light - Controller in Automatic Mode |
| 16 | Operation Mode Light - Controller in Manual Mode |
| 17 | Engine in Operation |

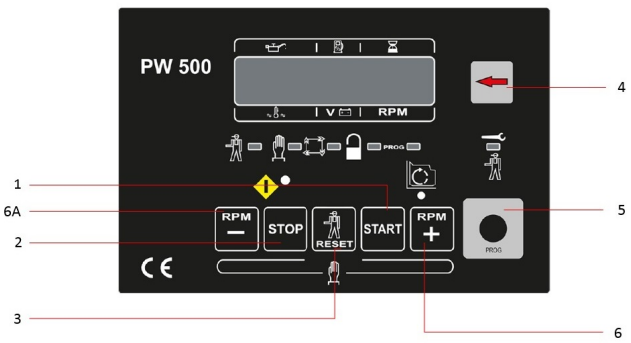



**Figure 9: General description of controller PW 500**

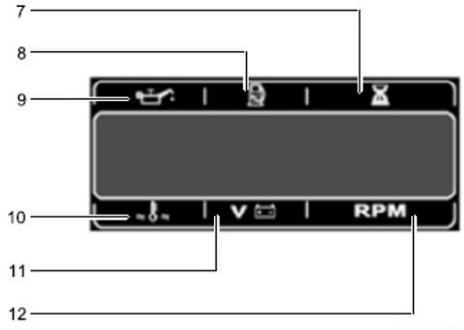



**Figure 10: Graphical Display**

| Reference | | Description |
|---|---|---|
| 1 | START | START BUTTON<br>Pressing this button in Manual Mode will start the Pump. |
| 2 | STOP | STOP BUTTON<br>Pressing this button in manual mode will stop the pump in a controlled way. |
| 3 | RESET | RESET BUTTON<br>Press Reset Button to reset the alarms. |
| 4 | | ARROW BUTTON<br>Press Briefly to Show the instruments. Hold down to verify the LED test.<br>General Alarm silencing. |
| 5 | PROG | OPERATION MODE BUTTON<br>Press to select the operation mode.<br>1. User Programming |
| 6 | RPM + | ACCELARATE BUTTON<br>Pressing this button in Manual Mode will increase the pump speed |
| 6A | RPM − | DECCELARATE BUTTON<br>Pressing this button in Manual Mode will decrease the pump speed |
| 7 | | Hour Meter |
| 8 | | Fuel level indicator |
| 9 | | Oil Pressure Gauge |
| 10 | | Water/Oil Thermometer |
| 11 | | Battery Voltmeter |
| 12 | | Tachometer |

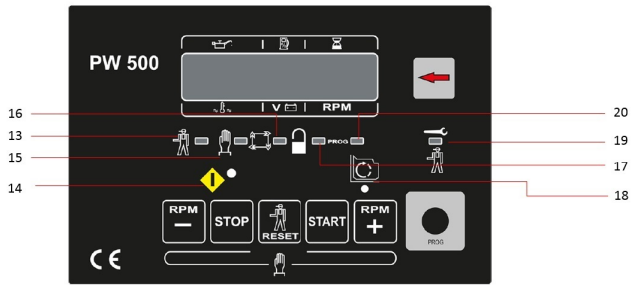



**Figure 11: Led Functions**

| Reference | Description |
|---|---|
| 13 | Cumulative alarm with Engine stop |
| 14 | Start Float Call Closed. |
| 15 | Operation Mode Light - Controller in Manual Mode |
| 16 | Operation Mode Light - Controller in Automatic Mode |
| 17 | Operation Mode Light - Controller Off |
| 18 | Engine in Operation |
| 19 | Preventive maintenance and cumulative alarm without engine stop |
| 20 | Operation Mode Light - Controller in Programmed Mode |

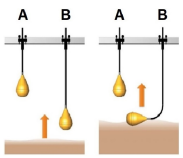
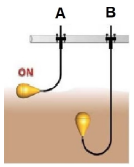
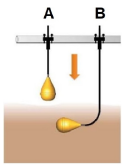
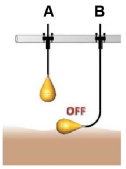
### 10.4.1 Float switches

The pump is fitted with two float switches for operation in Auto mode. These float switches must be coupled to the connectors, located at the side of the machine.

Set the float switches in such a way that frequent starting/stopping is minimized.

Operating procedure:

1. Connect the float switches as follows:
   - Connect the Start float to Connector indicated by label “A Start float”.
   - Connect the Stop float to Connector indicated by label “B Stop float”.
2. Put the controller in Auto mode.
3. The pump operates as follows:

| | |
|---|---|
| The tank fills:<br>  | High level starts the pump:<br>  |
| The tank drains:<br>  | Low level stops the pump:<br>  |

## 10.5 Operating instructions

### 10.5.1 Selecting the mode of operation

1. Automatic Operation Mode

   Auto mode allows the unit to operate fully automatically, starting and stopping as required with no user intervention.

**NOTE**

**Always use float switches when Auto Mode is on.**

2. Manual Operation Mode

   Manual mode allows the operator to start and stop the unit manually. In this mode, float switches are not used. Atlas Copco recommends using the machine in automatic mode in order to prevent dry running.

**Automatic operation mode**

**Starting**

1. Switch on the battery switch.
2. Check that the Floats connected to Controller are correct as per application.
3. If there is a starting request, the starting sequence will begin.
4. Starting requests can be from the following sources:
   - When call contact is close, i.e. activation of an auxiliary input configured to remote start e.g. float switches.
5. The closing of call for the “start float” illuminates the LED.
6. START DELAY AFTER CALL (Programmed to 1 sec.) once elapsed, switches on the preheating glow plugs and starts the engine.
7. In order to avoid fail start, controller makes a series of programmable starts (programmed to 4). The number and the duration of the starts are programmable.
8. If the whole series of attempts is unable to start the engine, “STARTING FAILURE” appears on controller and stop signal is activated.
9. When the engine fires, the starter motor is promptly disengaged. Speed detection is from the main alternator output frequency.

**During the Operation**

Regularly carry out following checks.

- Check the controller display for normal readings.
- Check for leakage of oil, fuel, or coolant.
- Check the Call connection (float connections) for obstructions.
- Check if the engine runs at the specified RPM. Manually control it via throttle switch if necessary.

**Stopping**

1. When the float call is open, i.e. the auxiliary input not active, the stopping sequence will begin.
2. The cooling timer allows the unit to cool before stopping.
3. After the cooling time has expired, the unit stops.

**NOTE**

**The limiting Ambient temperature for the Engine coolant is 55°C**

## 10.6 Manual operation mode

**Starting**

1. Switch on the battery switch.
2. Flip the operation mode selection key to position 1.

3. Display shows “GLOW PLUGS PREHEATING” while the preheating is active.
4. START DELAY AFTER CALL (Programmed to 1 sec.) once elapsed, switches on the preheating glow plugs and starts the engine.
5. In order to avoid fail start, controller makes a series of programmable starts (programmed to 4). The number and the duration of the starts are programmable.
6. If the whole series of attempts is unable to start the engine, “STARTING FAILURE” appears on controller and stop signal is activate.
7. When the engine fires, the starter motor is promptly disengaged. Speed detection is from the main alternator output frequency.

**During the Operation**

Regularly carry out following checks.

- Check the controller display for normal readings.
- Check for leakage of oil, fuel or coolant.
- Check if the engine runs at the specified RPM. Manually control it via throttle switch if necessary.

**Stopping**

Flip the operation mode selection key to position 2.

**NOTE**

**Before stopping machine in normal running condition, reduce the RPM to a lower level for better performance of engine.**

## 10.7 Settings PW 250

### 10.7.1 Acknowledge an alarm and faults

When the engine protection device intervenes or when there are fault detections, the controller displays the fault codes or messages (based on settings) with flashing of ALARM LED. It may cause engine to either stop or display fault code/message without stopping engine.

By pressing RESET button, the protection devices and faults reset themselves and alarm switches off.

**Fault codes**

| Fault Code | Alarm Text | Fail Class |
|---|---|---|
| 120 | Battery under-voltage | Warning |
| 121 | Battery over-voltage | Warning/shut down* |
| 125 | Over temperature detected by thermostatic switch | Shut down |
| 129 | Fuel reserve | Warning |
| 130 | No fuel | Warning/shut down* |
| 132 | Low oil pressure | Shut down |
| 133 | Stopping failure | |
| 136 | Charging alternator anomaly (belt breakage) | Warning/shut down* |
| 137 | Number of start up attempts (staring failure) | Shut down |
| 138 | Start in case of low battery charge | |
| 139 | Over speed | Shut down |

| Fault Code | Alarm Text | Fail Class |
|---|---|---|
| 140 | Interrupted fuel float | Warning |
| 419 | Emergency stop | Shut down |
| 440 | Memory error | Warning |
| 441 | Memory not installed | Warning |
| 443 | Incorrect fuel float table | Warning |

**Table 2:**

**NOTE**

*** Warning/shut down:- These parameter are programmable to shut down. In factory setting these set not to stop.**

## 10.8 Settings PW 500

### 10.8.1 Acknowledge an alarm and faults

**NOTE**

*** Warning/shut down:- These parameter are programmable to shut down. In factory setting these set not to stop.**

When the engine protection device intervenes or when there are fault detections, the controller displays the fault codes or messages (based on settings) with flashing of ALARM LED. It may cause engine to either stop or display fault code/message without stopping engine.

By pressing RESET button, the protection devices and faults reset themselves and alarm switches off.

| Fault Code | Alarm Text | Fail Class |
|---|---|---|
| 120 | Battery under-voltage | Warning |
| 121 | Battery Over-voltage | Warning/shut down* |
| 125 | Over temperature detected by thermostatic switch | Shut down |
| 129 | Fuel reserve | Warning |
| 130 | No fuel | Warning/shut down* |
| 132 | Low oil pressure | Shutdown |
| 133 | Stopping failure | |
| 136 | Charging alternator anomaly (belt breakage) | Warning/shut down* |
| 137 | Number of start up attempts (staring failure) | Shut down |
| 138 | Start in case of low battery charge | |
| 139 | Over speed | Shut down |
| 140 | Interrupted fuel float | Warning |
| 419 | Emergency stop | Shut down |
| 440 | Memory error | Warning |
| 441 | Memory not installed | Warning |
| 443 | Incorrect fuel float table | Warning |

**Table 3: Fault Codes**

### Cumulative Alarms

- POS 10 LED (RED flashing light) : Anomaly managed by the controller will cause the engine to Stop.
- POS 11 LED (YELLOW Flashing Light): indicates preventative maintenance operation. Anomaly managed by the controller will not cause the engine to stop.

### Acknowledge An Alarm And Faults PW 500

| Fault Code | Alarm Text | Fail Class |
|---|---|---|
| 120 | Battery under-voltage | Warning |
| 121 | Battery Over-voltage | Warning/shut down* |
| 123 | Overheating warning | Warning |
| 124 | Engine overheating | Shut down |
| 125 | Over temperature detected by thermostatic switch | Shut down |
| 129 | Fuel reserve | Warning |
| 130 | No fuel | Warning/shut down* |
| 131 | Low oil pressure warning | Warning |
| 132 | Low oil pressure | Shut down |
| 133 | Stopping failure | |
| 135 | Low coolant level | Shut down |
| 136 | Charging alternator anomaly (belt breakage) | Warning/shut down* |
| 137 | Number of start up attempts (staring failure) | Shut down |
| 138 | Start in case of low battery charge | |
| 139 | Over speed | Shut down |
| 140 | Interrupted fuel float | Warning |
| 145 | Under speed | Warning |
| 419 | Emergency stop | Shut down |
| 430 | Can bus anomaly | Warning |
| 440 | Memory error | Warning |
| 441 | Memory not installed | Warning |
| 443 | Incorrect fuel float table | Warning |
| 446 | Oil press. table not correct | Warning |
| 447 | Oil temp. table not correct | Warning |

**Table 4: Fault Codes**

### Anomaly Messages

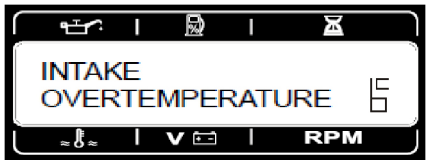
In the event of no communication with the injection control unit of the engine, the anomaly fault activates.

**NOTE**

**All the messages or instruments displayed on the display regarding the injection control unit and the CAN bus are identified by the character at the bottom right.**

The fault messages collected by the injection control unit of the engine is indicated with its code.

For example:




### Can Bus Instruments

The following parameters read by the injection control unit are displayed on the screen when the engine is running. The injection control unit manages all anomalies regarding these instruments.

| Instruments | Description | Unit |
|---|---|---|
| Tachometer | Displays Engine RPM | rpm |
| Oil Pressure Gauge | Displays Engine Oil Pressure | Bar/kPa |
| Thermometer | Displays Engine water/oil temperature | °C/°F |
| Used Fuel | Total fuel used | 1 |
| Instantaneous Consumption | Fuel Consumed per unit of time | l/h |
| Fuel Temperature | Fuel temperature at injector inlet | °C/°F |
| Turbocharger temperature | Turbocharger Lubricant temperature | °C/°F |
| Oil Temperature | Temperature of the engine lubricant oil | °C/°F |
| Intercooler Temperature | Intercooler liquid temperature | °C/°F |
| Intake Temperature | Temperature of Pre-combustion air | °C/°F |
| Coolant Level | Level of Coolant | % |
| Fuel Pressure | Pressure of fuel between the supply pump and the injection pump | Bar/kPa |
| Coolant Pressure | Pressure of the coolant in the system | Bar/kPa |
| Engine Torque | Torque at engine outlet | Nm |
| Engine Load | Load percentage delivered by the engine | % |
| Engine Power | Power at engine outlet | kW |

### Cumulative Alarms

- POS 10 LED (RED Steady light): Anomaly managed by the injection unit will cause the engine to Stop
- POS 10 LED (RED flashing light): Anomaly managed by the controller will cause the engine to Stop.
- POS 11 LED (YELLOW Steady Light): Anomaly managed by the injection unit will not cause the engine to stop.
- POS 11 LED (YELLOW Flashing Light): indicates preventative maintenance operation. Anomaly managed by the controller will not cause the engine to stop.

## 10.8.2 General feature settings

1. Press the PROG (program) button on OPERATION MODE BUTTON panel.
2. The display will show “USER PROGRAMMING”
3. Pressing the arrow button will toggle the list of options available for programming.

### A. Calendar Clock Adjustment

Press and hold RESET button (approx. 2 sec) so that the cursor flashes.

Use the RESET button to move the cursor and Start and Stop to increase and decrease the time/ date values.

**NOTE**

**If the battery leads are disconnected (power is cut off), calendar clock must be re-adjusted.**

### B. Language Settings

Press START and STOP buttons to browse between the languages required.

Available options include:

| | |
|---|---|
| • Italian (factory setting) | • German |
| • English | • Spanish |
| • French | • Portuguese |

Once selection made, Press the ARROW button make configure the modifications.

### C. Weekly Automatic Test

| | |
|---|---|
| With this option, the engine performs a test cycle when operating in Automatic Mode. | The selections are "ENGAGED" or "OFF". Choose the necessary selection based on application. |
| Press ARROW button to display the option. | Factory setting has the controller always in "OFF" configuration. |
| Press START and STOP button to make the selection. | Once selection made, press the ARROW button make configure the modifications. |

### D. Daily timer start

| | |
|---|---|
| This is applicable only in Automatic Mode. It starts the pump at a specific configured time. | Select the time to start the operation. |
| Press ARROW button to display the option. | Once selection made, press the ARROW button make configure the modifications. |
| Use START and STOP button to Increase. | |

### E. Daily timer stop

| | |
|---|---|
| This is applicable only in Automatic Mode. It stops the pump at a specific configured time. | |
| Press ARROW button to display the option. | Select the time to stop the operation. |
| Use START and STOP button to Increase. | Once selection made, press the ARROW button make configure the modifications. |

**NOTE**

**To use Option D) and E) make sure that the Calendar Clock updated and displays correct time.**

## 10.8.3 Preventive maintenance

When preventive maintenance operation needs to carry out, the yellow PREVENTIVE MAINTENACE LED flashes while number of Intervened maintenance appears on the display. The engine manufacturer can program the timing for the maintenance operations.

### 10.8.4 Emergency stop

When an emergency stop button is pressed, power to all outputs is terminated by the emergency stop itself (hardware) as well as by the software. The display reads "EMERGENCY STOP".

**NOTE**

**The emergency stop button is only to use in emergencies, not for stopping procedures.**

#### Priming

**CAUTION**

**Do not operate the pump for more than 2 minutes if the pump does not prime to avoid overheating the liquid and damaging the seal.**

#### Battery switch

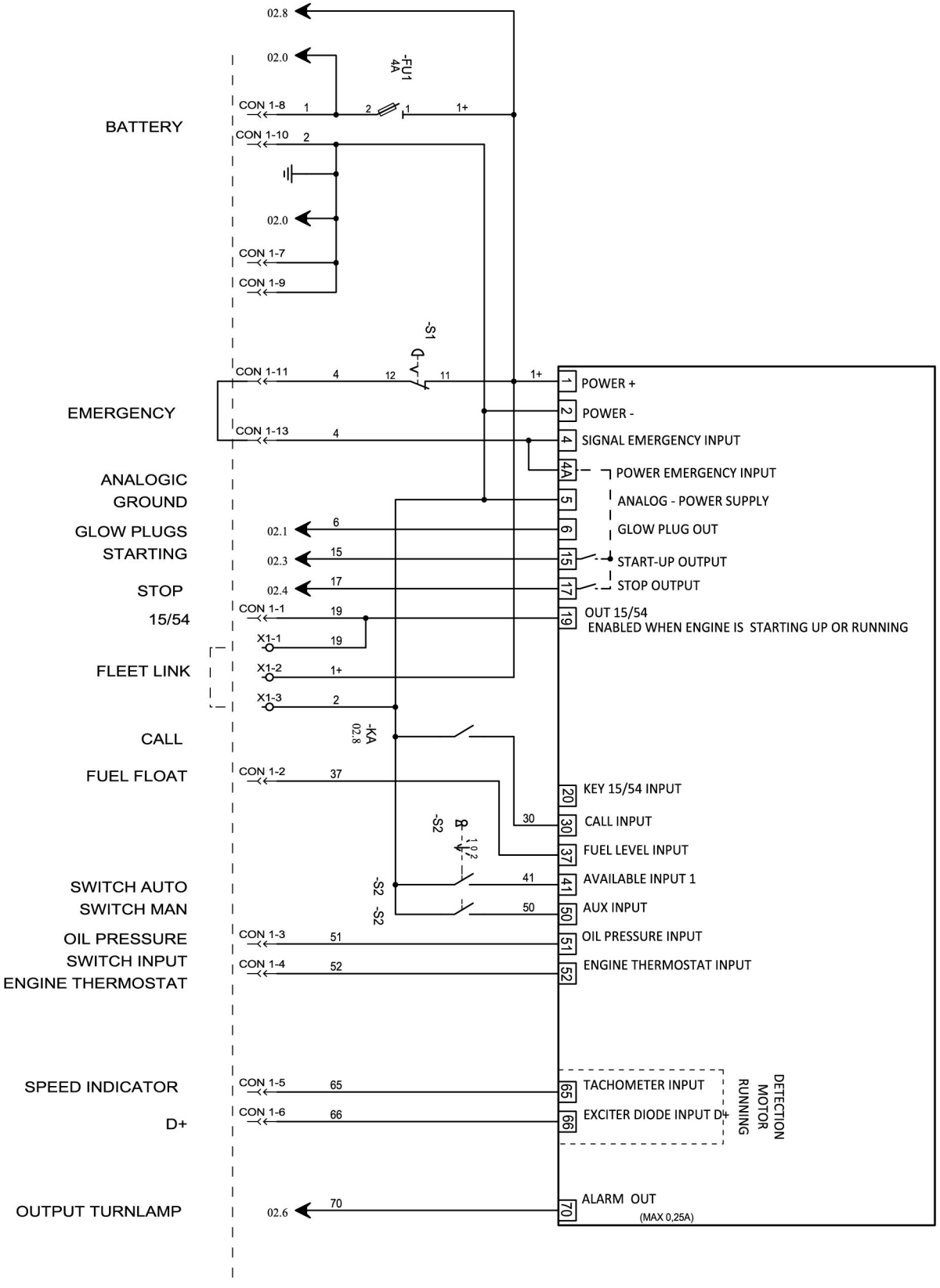
The battery switch is situated inside the soundinsulated bodywork. It allows to open or to close the electrical connection between the battery and the engine circuits.

**WARNING**

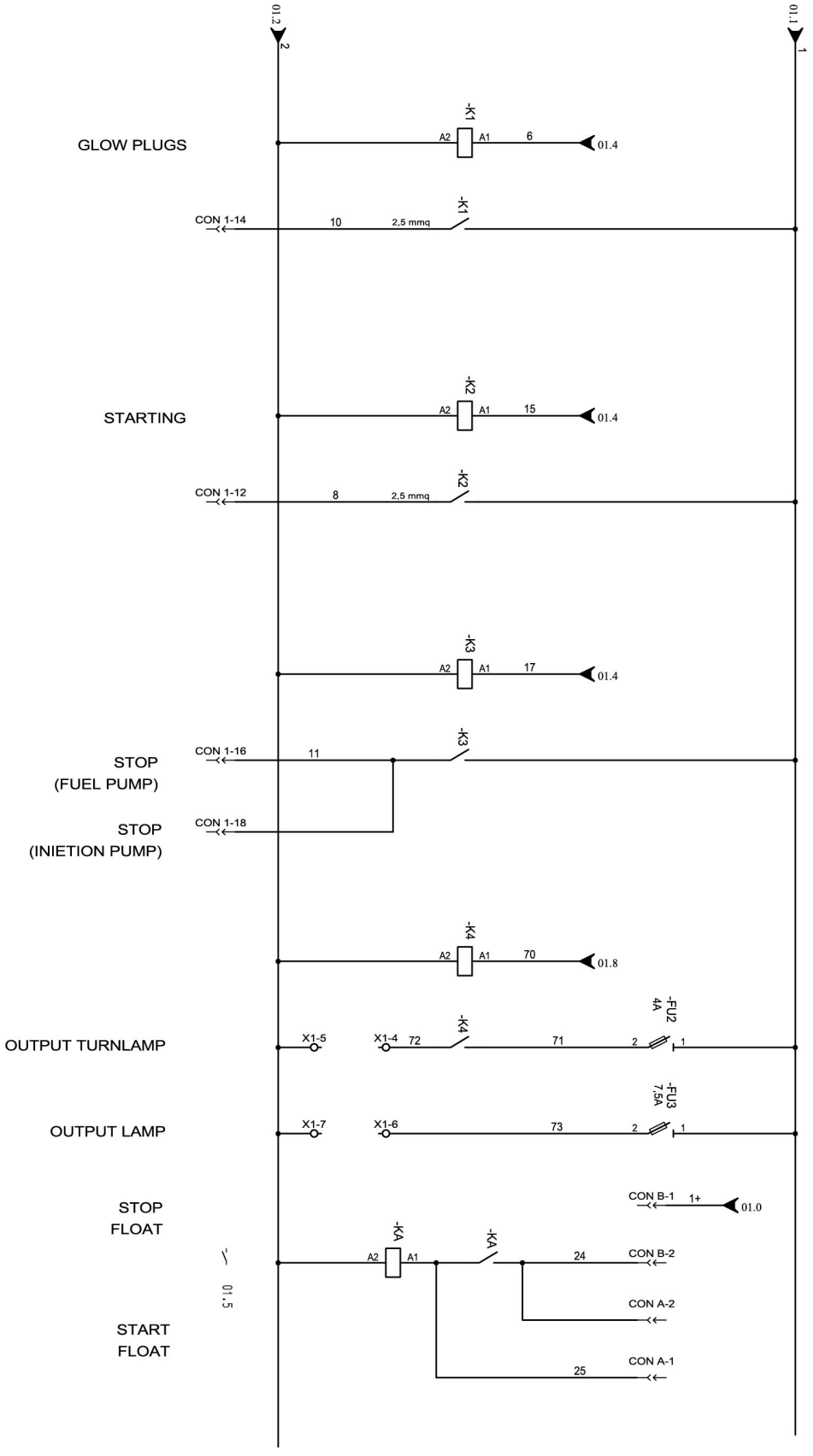
**Never turn/use the battery switch to OFF during operation/to stop the machine.**

# 11 Circuit diagrams

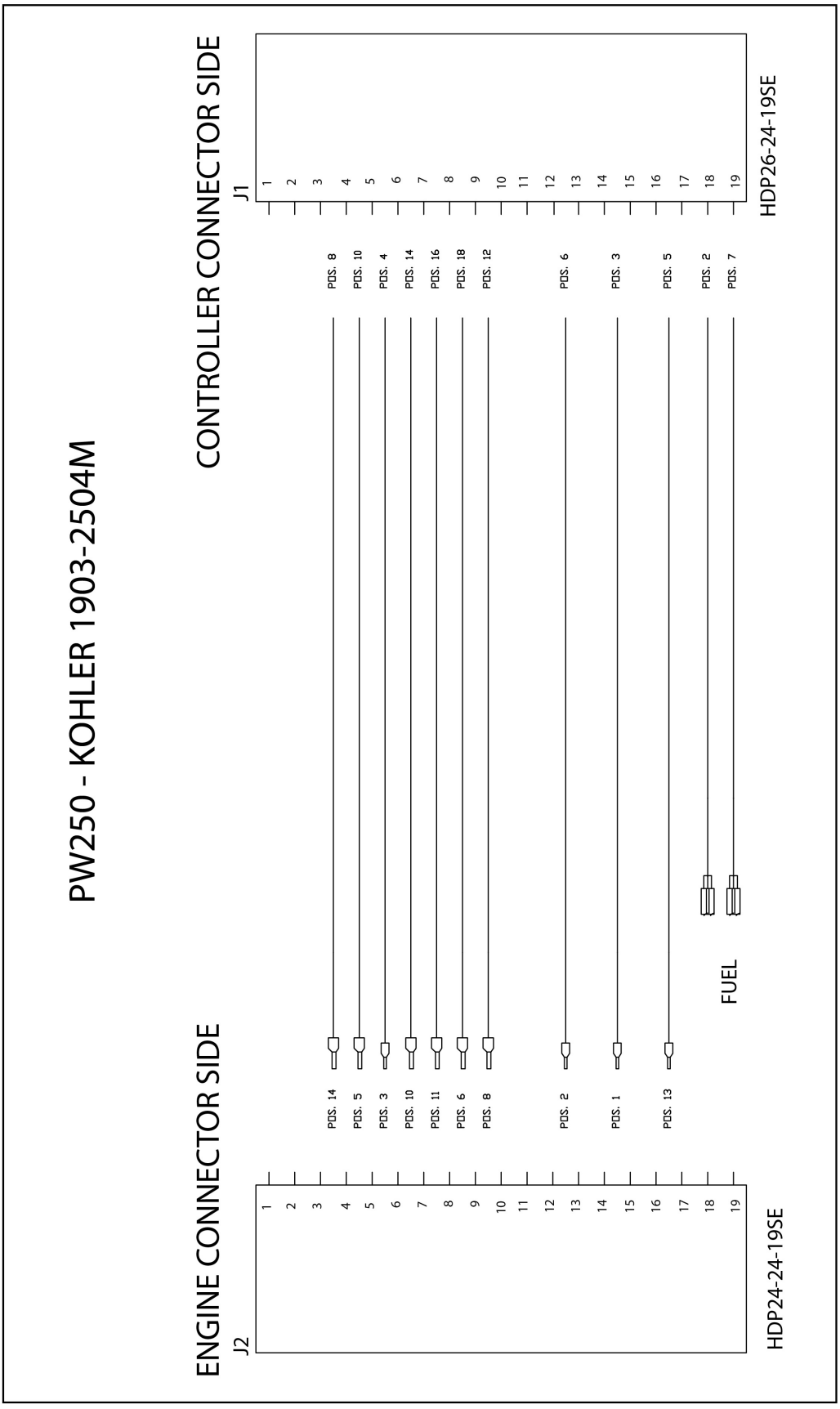
## Circuit diagrams PW 250 - Sheet 1



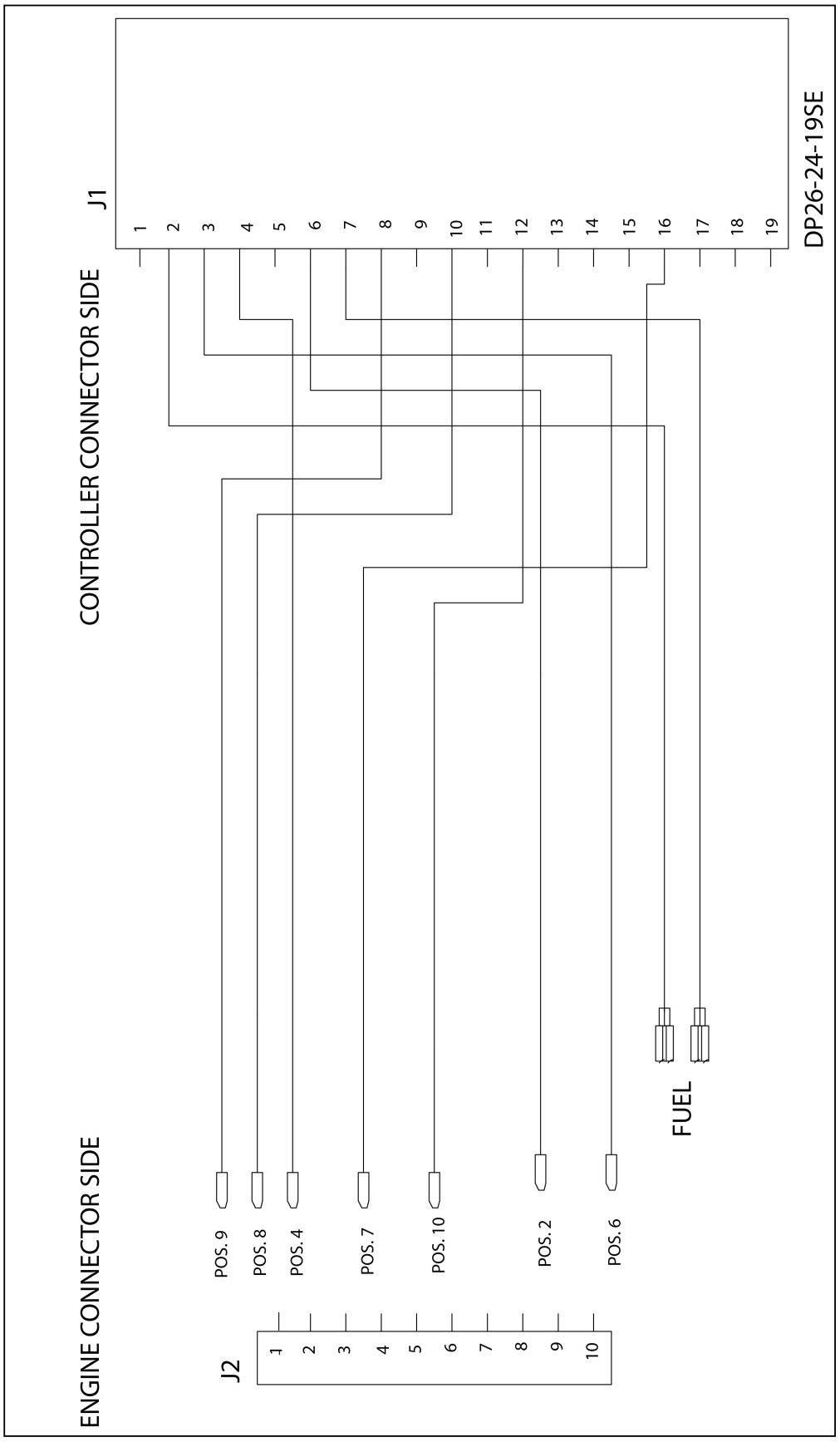
## Circuit diagrams PW 250 - Sheet 2



## Circuit diagrams - Harness-Kohler engine

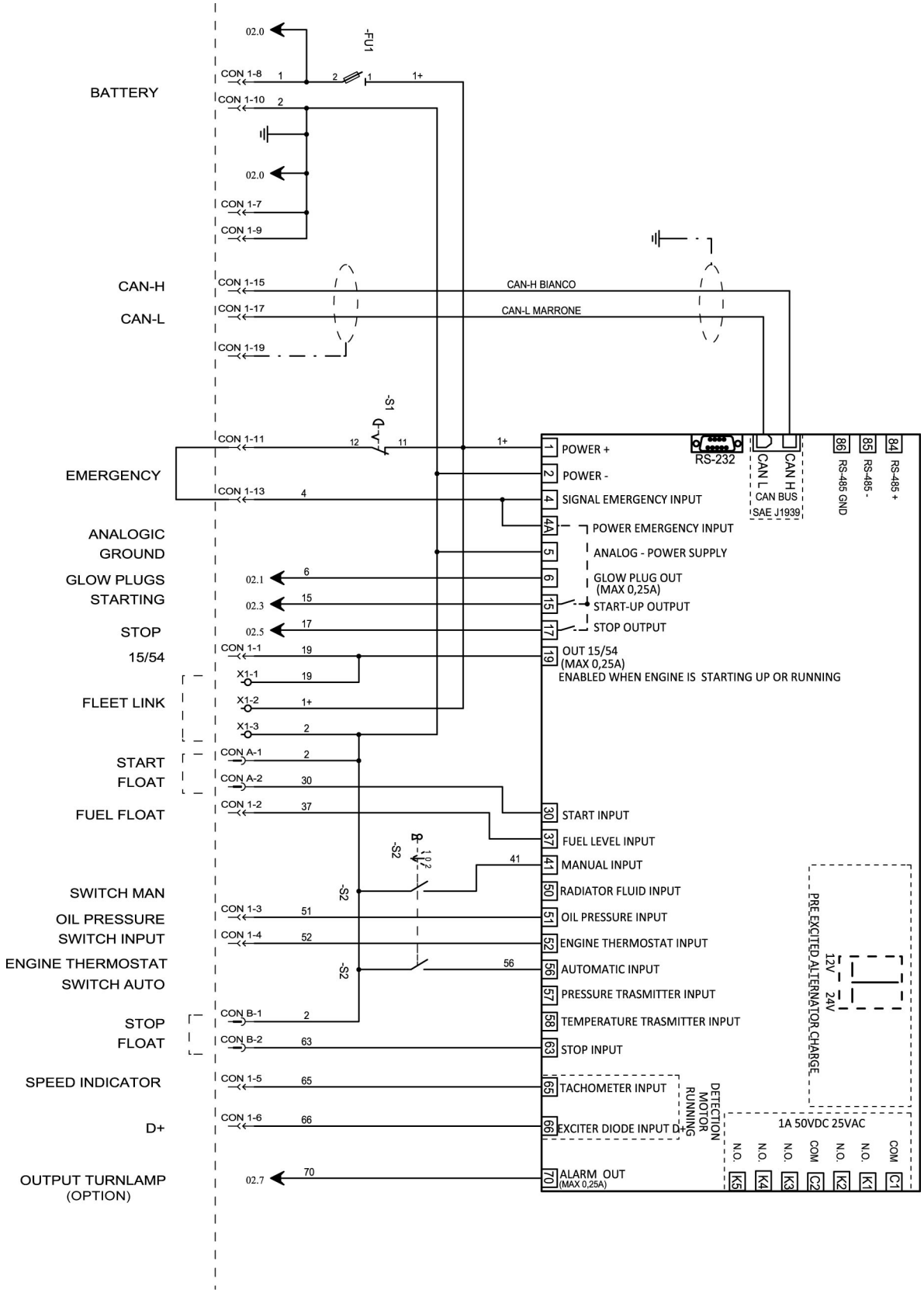


## Harness-D2011L41

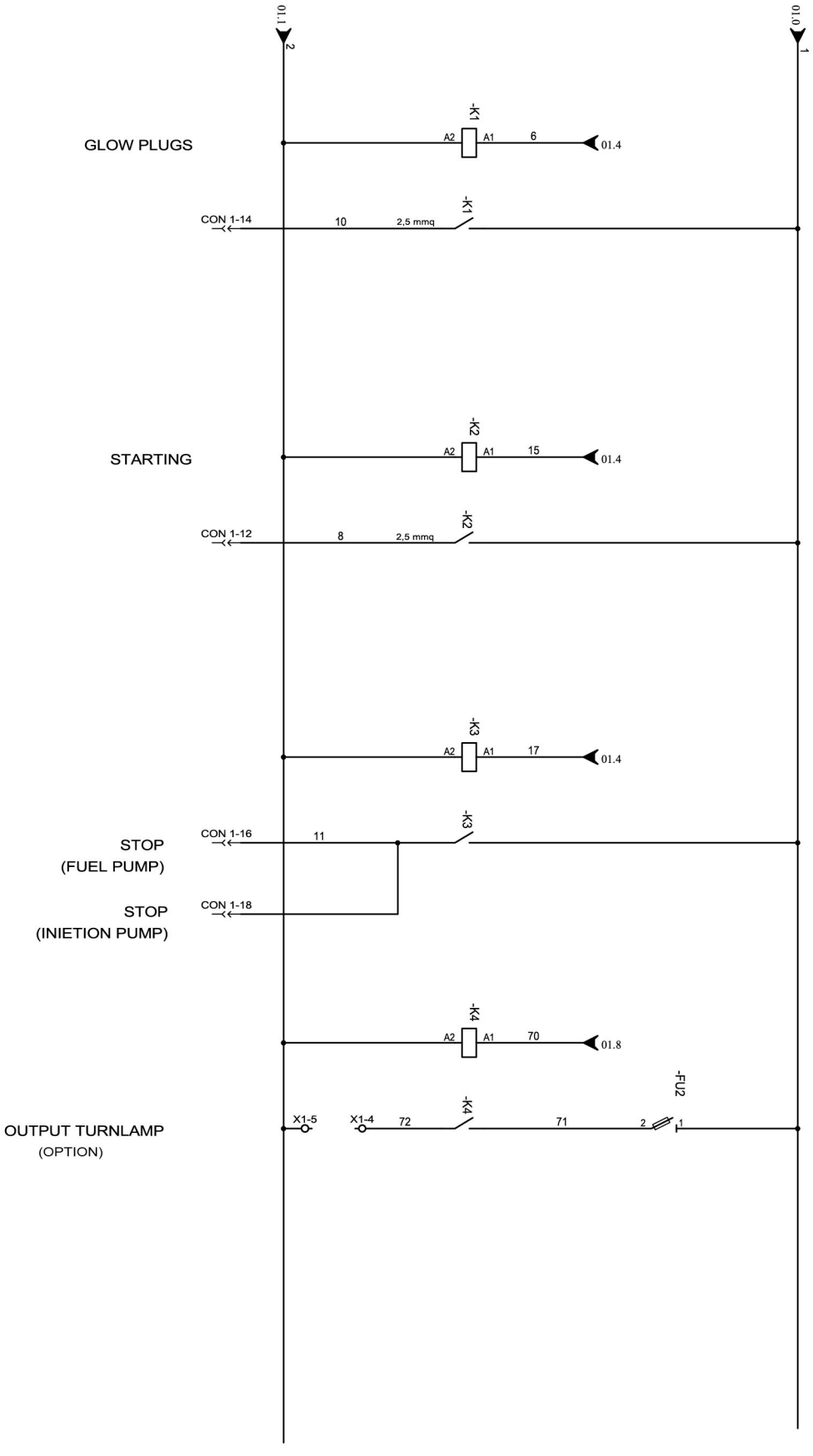


# 11.1 Circuit diagrams PW 500

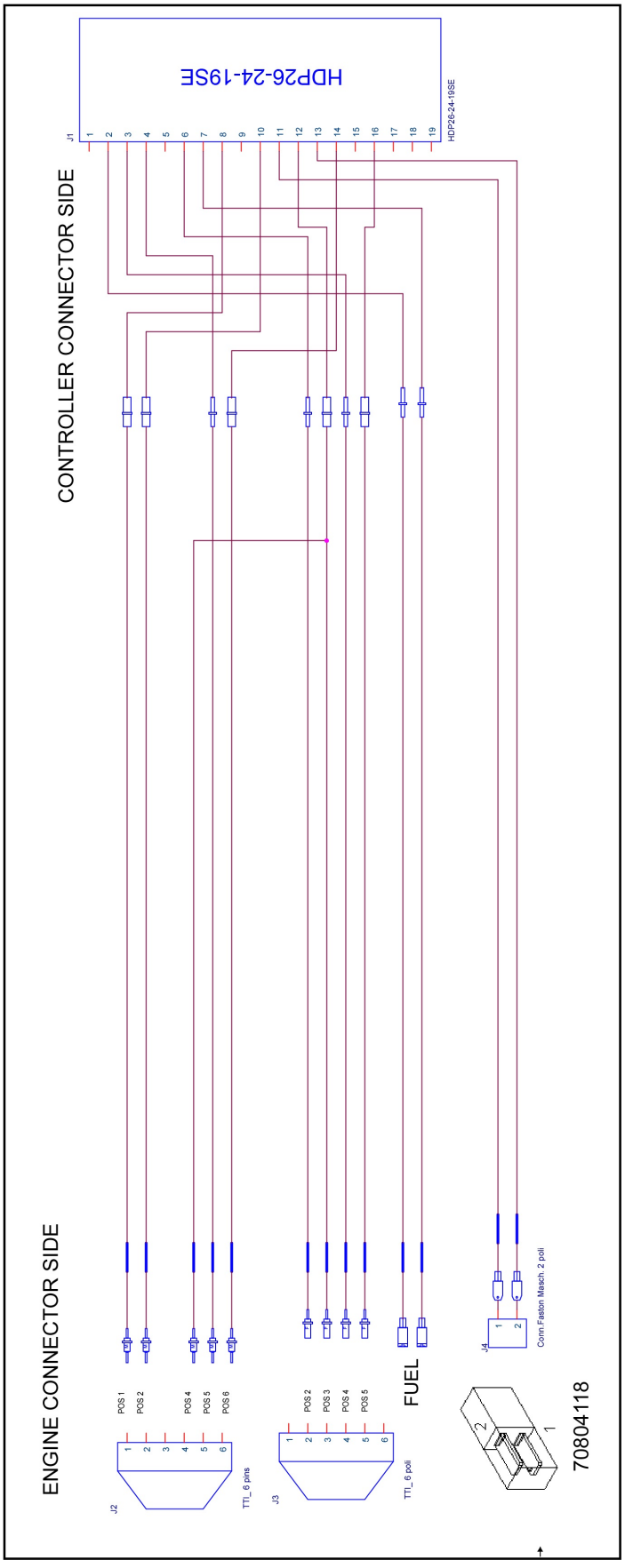
## Circuit diagrams PW 500 - Sheet 1



## Circuit diagrams PW 500 - Sheet 2



## Wiring harness-KOHLER engine

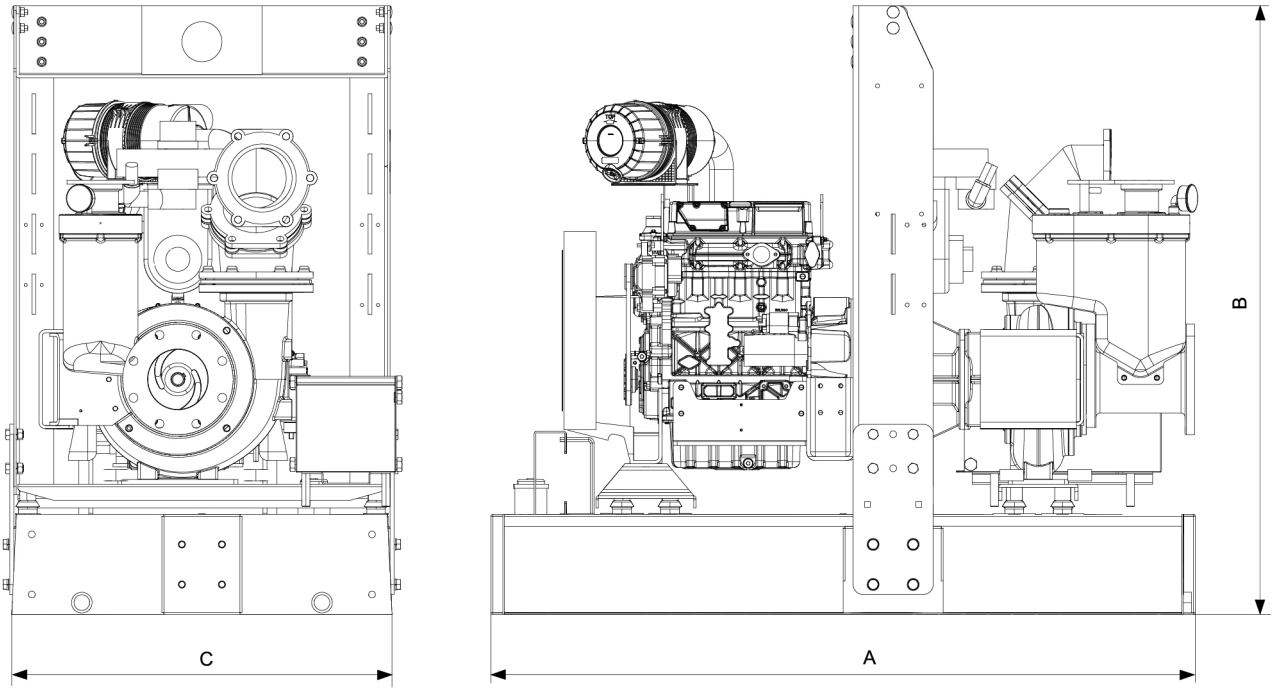


# 12 Technical specifications

## 12.1 Technical specifications of unit/engine/pump

| Unit | PAS 100 MF 250 | PAS 100 MF 260 | PAS 150 MF 250 | PAS 150 MF | PAS 150 MF 250 | PAS 150 MF 250 PAS 150 MF 255 |
|---|---|---|---|---|---|---|
| Connection (mm/in) | 100/4" | | 150/6" | 150" | 150/6" | |
| Weight (kg) | 950 | 995 | 1090 | 1185 | 1050 | 1040 |
| Fuel tank Capacity (l) | 315 | | 315 | | 325 | |
| Solid Handlings (mm) | 45 | | 76 | | 76 | |
| Dimensions AxBxC (mm) | 2020x1520x995 | | | | 2350x1880x1410 | 2180x1880x1410 |
| **Engine** | | | | | | |
| Brand | Kohler KDI1903 M | Kohler KDI2504M | Kohler KDI 2504M | Deutz D2011 L03 | Hatz 3M41 | Kohler KDI1903M |
| Displacement | 1861 | 2482 | 2482 | 3620 | 2574 | 1861 |
| Cylinders | 3 | 4 | | 4 | 3 | 3 |
| Cooling System | Water Cooled | | | Air Cooled | | Water Cooled |
| Exhasut emission compliance | Stage IIIA | | | | | |
| Lubrication Oil Capacity (l) | 8.9 | | | 10 | 11 | 8.9 |
| Coolant Capacity (l) | 6.8 | | | NA | | 6.8 |
| Coolant LAT (°C) | 50 | | | 45 | | 50 |
| Combustion system | Naturally aspirated | | | | | |
| Engine oil | Paroil E | | | | | |
| Engine coolant | PARCOOL Green | | | | | PARCOOL Green |
| **Pump** | | | | | | |
| Max Speed | 2000 | | | | | 1800 |
| Flow Max ($m^3/h$) | 280 | 325 | 540 | | | 480 |
| Head Max (m) | 36 | 42 | 37 | - | 37 | 30 |
| Diaphragm Vacuum pump ($m^3/h$) | 50 | | | | | |
| Vacuum pump oil tank (l) | 0.7 | | | | | |
| Mechanical seal oil tank (l) | 1.5 | | | | | |
| Non return check valve | Flap type | | | | | |
| Vacuum pump oil | PAROIL E | | | | | |
| Mechanical seal oil | ISO VG 32 | | | | | |

## 12.2 Dimension drawing




## 12.3 Torque values

### 12.3.1 General torque values

The following tables list the recommended torques applied for general applications at assembly of the pump.

| Thread size | Torque value (Nm / lbf.ft) (Grade 8.8) | Torque value (Nm / lbf.ft) (Grade A2/A4) | Thread size | Torque value (Nm / lbf.ft) (Grade 8.8) | Torque value (Nm / lbf.ft) (Grade A2/A4) |
|---|---|---|---|---|---|
| M5 | 6 (4.4) | 3.5 (2.6) | M18 | 283 (208.7) | 175 (129.1) |
| M6 | 10 (7.4) | 6 (4.4) | M20 | 400 (295) | 280 (206.5) |
| M8 | 24 (17.7) | 16 (11.8) | M22 | 532(392.4) | - |
| M10 | 50 (36.9) | 32 (23.6) | M24 | 691 (509.7) | 455 (335.6) |
| M12 | 84 (62) | 56 (41.3) | M27 | 1010 (745) | - |
| M14 | 135 (99.6) | 80 (59) | M30 | 1370 (1010.5) | 1050 (774.4) |
| M16 | 205 (151.2) | 135 (99.6) | | | |

**Table 5: For hexagon screws and nuts with strength grade 8.8 abd A2/A4**

| Thread size | Torque value (Nm / lbf.ft) | Thread size | Torque value (Nm / lbf.ft) |
|---|---|---|---|
| M6 | 15 (11.07) | M12 | 135 (99.63) |
| M8 | 39 (28.78) | M14 | 210 (154.98) |
| M10 | 78 (57.56) | M16 | 345 (254.61) |

**Table 6: For hexagon screws and nuts with strength grade 12.9**

**NOTE**

**Tighten the impeller nut (M30x2) with a torque value of 400Nm (295 lb ft)**

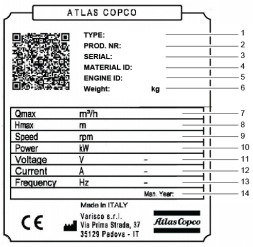
### 12.3.2 Critical torque values

| **Assemblies** | |
|---|---|
| **Pump:** | **Engine to frame:** |
| Impeller | Bolts, engine/support |
| **Axles to frame:** | Bolts, support/buffer |
| Wheel nuts | Bolts, buffer/frame |
| Bolts, axle/frame | **Lifting beams to frame:** |
| Bolts, rear axle/frame | Bolts, lifting beams/yoke (M12) |
| **Pump to frame:** | Bolts, lifting beams/yoke (M16) |
| Bolts, pump/coupling | Bolts, lifting beams/A-frames |
| Bolts, pump/support | Bolts, A-Frames/frame |
| Bolts, support/buffer | **Hose clamps:** |
| Bolts, buffer/frame | Pebra hose clamps on all IC/radiator hoses |

**NOTE**

**Secure the drain cap and tank cap of the fuel tank hand tight.**

# 13 Data plate




Every electrically driven pump is equipped with an identification plate which gives the following information:

| Reference | Description | Reference | Description |
|---|---|---|---|
| 1 | Type of unit | 8 | Maximum head (m) |
| 2 | Product Number | 9 | Maximum speed (rpm) |
| 3 | Serial Number | 10 | Power (kW) |
| 4 | Material ID | 11 | Voltage (V) |
| 5 | Engine ID | 12 | Current (A) |
| 6 | Weight (kg) | 13 | Frequency (Hz) |
| 7 | Maximum capacity of the pump ($m^3$/h) | 14 | Year of Manufacture |

**NOTE**

**The values indicated on the nameplate refer to testing with water at 20°C and with a density 1000 kg/$m^3$.**

**QR code**

The unit is equipped with a QR code label. You will find the QR code next to the operating panel. Scanning the code with your smart-phone or tablet will lead you to a website with additional information about the pump.

**NOTE**

**Some parts of this website may be password protected.**

## 13.1 Ordering spare parts

For spare parts see parts list.

To avoid errors in delivery, please give the following information when ordering spare parts:

| | |
|---|---|
| • Model name | • Quantity required |
| • Pump type | • Part number |
| • Pump serial number | • Part description |

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