

Atlas Copco Instruction Manual



Instruction manual
for PAS Series Pump
English

PAS 100 HF T4F CNP ITH
PAS 150 HF T4F CNP ITH

DEUTZ D2.9L4
DEUTZ TD2.9L4



**PAS 100 HF T4F CNP ITH
PAS 150 HF T4F CNP ITH**

Instruction Manual for PAS Series Pump

Instruction manual5
Circuit diagrams 63

Original instructions

Printed matter N°
2960 1490 00
07/2018



ATLAS COPCO - PORTABLE ENERGY DIVISION
www.atlascopco.com

Warranty and Liability Limitation

Use only authorized parts.

Any damage or malfunction caused by the use of unauthorized parts is not covered by Warranty or Product Liability.

The manufacturer does not accept any liability for any damage arising from modifications, additions or conversions made without the manufacture's approval in writing.

Neglecting maintenance or making changes to the setup of the machine can result in major hazard.

While every effort has been made to ensure that the information in in this manual is correct, Atlas Copco does not assume responsibility for possible errors.

Copyright 2018, Varisco SpA, PADOVA, ITALY.

Any unauthorized use or copying of the contents or any part thereof is prohibited. This applies in particular to trademarks, model denominations, part numbers and drawings.



Congratulations on the purchase of your PAS centrifugal pump. It is a solid, safe and reliable machine, built according to the latest technology. Follow the instructions in this booklet and we guarantee you years of trouble free operation. Please read the following instructions carefully before starting to use your machine.

While every effort has been made to ensure that the information in this manual is correct, Atlas Copco does not assume responsibility for possible errors. Atlas Copco reserves the right to make changes without prior notice.

Contents

1	Safety precautions for pumps . . . 7	2.4.3	Cooling system..... 17	5.1	Pump maintenance procedures.....41
1.1	Introduction..... 7	2.4.4	Safety devices..... 17	5.2	Adjustments and service procedures43
1.2	General safety precautions 8	2.4.5	Bodywork..... 18	5.2.1	Positioning the impeller with reference to the wear plate(s)43
1.3	Safety during transport and installation.....9	2.4.6	Control panel 18	5.2.2	Servicing of impeller.....44
1.4	Safety during use and operation 10	2.4.7	Data plate and serial number 18	5.2.3	Replacement belt.....45
1.5	Safety during maintenance and repair..... 11	2.4.8	Drain plugs and filler caps..... 18	5.2.4	Inspection ball valve (only 100 -150 HF)47
1.6	Tool applications safety 12	2.4.9	Spillage free skid..... 18	5.3	Engine maintenance procedures...48
1.7	Battery safety precautions..... 12	2.5	Electrical features..... 18	5.3.1	Engine oil level check.....48
1.8	Conversion and spare parts 12	2.6	Control panel..... 19	5.3.2	Engine oil and oil filter change48
1.9	Unintended use..... 12	2.6.1	Display interface..... 23	5.3.3	Coolant check49
2	Main parts 13	2.6.2	Float switches..... 30	5.3.4	Replacing fuel filter element50
2.1	General description 13	3	Installation and connection . . . 31	5.3.5	Servicing air filter engine 50
2.2	Markings 16	3.1	Lifting31	5.3.6	Replacing the filter element51
2.3	Field of application 17	3.2	Installation31	5.3.7	Cleaning cooler.....52
2.4	Mechanical features..... 17	3.2.1	Indoor installation31	5.3.8	Cleaning the fuel tank52
2.4.1	Pump..... 17	3.2.2	Outdoor installation 31	5.3.9	Battery care.....53
2.4.2	Engine 16	3.2.3	Suction and discharge pipework ...33	5.4	Engine consumable specifications .54
		4	Operating instructions 34	5.4.1	Engine fuel specifications.....54
		4.1	Starting34	5.4.2	Engine oil specifications54
		5	Maintenance 36	5.4.3	Engine coolant specifications..... 55

6	Checks and trouble shooting.	57	10.3	Torque values.....	82
6.1	Engine troubleshooting.....	57	10.4	Data plate.....	84
6.2	Pump troubleshooting	60	11	Spare parts	85
6.2.1	Overview of possible operating problems	61	11.1	Ordering spare parts.....	85
7	Storage of the pump	64			
7.1	Storage	64			
7.2	Stacking	64			
7.3	Preparing for operation after storage.....	64			
8	Disposal	65			
8.1	General.....	65			
8.2	Disposal of materials	65			
9	Options	66			
9.1	Undercarriage	66			
9.2	External fuel tank connection (with/ without quick couplings)	67			
9.3	Suction and discharge pipes.....	69			
9.4	Circuit diagrams.....	72			
9.5	Wiring - Harness - PAS 100-150 HF	74			
10	Technical specifications	79			
10.1	Technical specifications of unit/ engine/pump.....	79			
10.2	Dimension Drawing - PAS 100-150 HF	81			

1 Safety precautions for pumps

To be read attentively and acted accordingly before operating, performing maintenance or repairing the unit.

1.1 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.

1.2 General safety precautions

- 1 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.
- 2 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.
- 3 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.
- 4 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.

- 5 Normal ratings (pressures, temperatures, speeds, etc.) shall be durably marked.
- 6 Operate the unit only for the intended purpose and within its rated limits (pressure, temperature, speeds, etc.).
- 7 The machinery and equipment shall be kept clean, i.e. as free as possible from oil, dust or other deposits.
- 8 To prevent an increase in working temperature, inspect and clean heat transfer surfaces regularly. See the maintenance schedule.
- 9 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.
- 10 Pressure and temperature gauges shall be checked regularly with regard to their accuracy. They shall be replaced whenever outside acceptable tolerances.
- 11 Safety devices shall be tested as described in the maintenance schedule of the instruction manual to determine that they are in good operating condition.
- 12 Mind the markings and information labels on the unit.
- 13 In the event the safety labels are damaged or destroyed, they must be replaced to ensure operator safety.
- 14 Keep the work area neat. Lack of order will increase the risk of accidents.

- 15 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.
- 16 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.

1.3 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..

- 1 Before handling the pump, check its dimensions and weight, which can be found on the data plate.
- 2 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.
- 3 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 tyres are in good condition and inflated correctly,-connect the signalisation cable, 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.
- 4 To tow a unit use a towing vehicle of ample capacity. Refer to the documentation of the towing vehicle.
 - 5 Never exceed the maximum towing speed of the unit (mind the local regulations).
 - 6 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.
 - 7 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.
 8. To lift heavy parts, a hoist of ample capacity, tested and approved according to local safety regulations, shall be used.
 9. 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.

10. 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.
11. Never leave a load hanging on a hoist.
12. 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.
13. 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.
14. 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.
15. The electrical connections shall correspond to local codes. The machines shall be earthed and protected against short circuits by fuses or circuit breakers.
16. Before transportation of the unit, switch off all the circuit breakers.

1.4 Safety during use and operation

1. When the unit has to operate in a fire-hazardous environment, each engine exhaust has to be provided with a spark arrester to trap incendiary sparks.
2. 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.
3. 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.
4. Never remove a filler cap of the cooling water system of a hot engine. Wait until the engine has sufficiently cooled down.
5. Never refill fuel while the unit is running, unless otherwise stated in the Atlas Copco Instruction Book (AIB). 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.
6. 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. A door should be kept open for a short period only e.g. for inspection or adjustment.
7. Periodically carry out maintenance works according to the maintenance schedule.
8. 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.
9. 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.
10. 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 during or just after operation. Insulation or safety guards protecting these parts shall not be removed before the parts have cooled down sufficiently, and must be re-installed before operating the machine.
11. Never operate the unit in surroundings where there is a possibility of taking in flammable or toxic fumes.
10. If the working process produces fumes, dust or vibration hazards, etc., take the necessary steps to eliminate the risk of personnel injury.
12. 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.
13. 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.
14. 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.

15. 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.
16. 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.
17. 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.
18. Never operate the pump in excess of its limits as indicated in the technical specifications.
19. Never operate the unit in a humid atmosphere. Excessive moisture causes worsening of the insulation.
20. 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.
21. Whenever an abnormal condition arises, e.g. excessive vibration, noise, odor, etc., stop the engine. Correct the faulty condition before restarting.
22. 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.

23. When operating the pump in Remote or Auto mode, observe all relevant local legislation.
24. If the pump does not prime, do not operate it for more than 2 minutes to avoid overheating the liquid and damaging the seal.
25. 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.
26. 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.
27. In case of emergency, shut down the engine pressing the emergency stop button and notify the person responsible for running the plant immediately.

1.5 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.

1. Use only the correct tools for maintenance and repair work, and only tools which are in good condition.
2. Parts shall only be replaced by genuine Atlas Copco replacement parts.
3. 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.

4. Prior to stripping an engine or other machine or undertaking major overhaul on it, prevent all movable parts from rolling over or moving.
5. 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 air intake.
6. Never use flammable solvents for cleaning (fire risk).
7. Take safety precautions against toxic vapours of cleaning liquids.
8. Never use machine parts as a climbing aid.
9. Observe scrupulous cleanliness during maintenance and repair. Keep away dirt, cover the parts and exposed openings with a clean cloth, paper or tape.
10. 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.
11. 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.

12. 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.
13. Protect the engine, alternator, air intake filter, electrical and regulating components, etc., to prevent moisture ingress, e.g. when steam-cleaning.
14. When performing any operation involving heat, flames or sparks on a machine, the surrounding components shall first be screened with nonflammable material.
15. Never use a light source with open flame for inspecting the interior of a machine.
16. 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.
17. Maintenance and repair work should be recorded in an operator's logbook for all machinery. Frequency and nature of repairs can reveal unsafe conditions.
18. 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.
19. 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.

20. Make sure that oil, solvents and other substances likely to pollute the environment are properly disposed of.
21. Before clearing the pump for use after maintenance or overhaul, submit it to a test run.

1.6 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.

1.7 Battery safety precautions

When servicing batteries, always wear protecting clothing and glasses.

1 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.

2 Install a sign prohibiting fire, open flame and smoking at the post where batteries are being charged.

3 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.

4 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.

1.8 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.

1.9 Unintended use

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

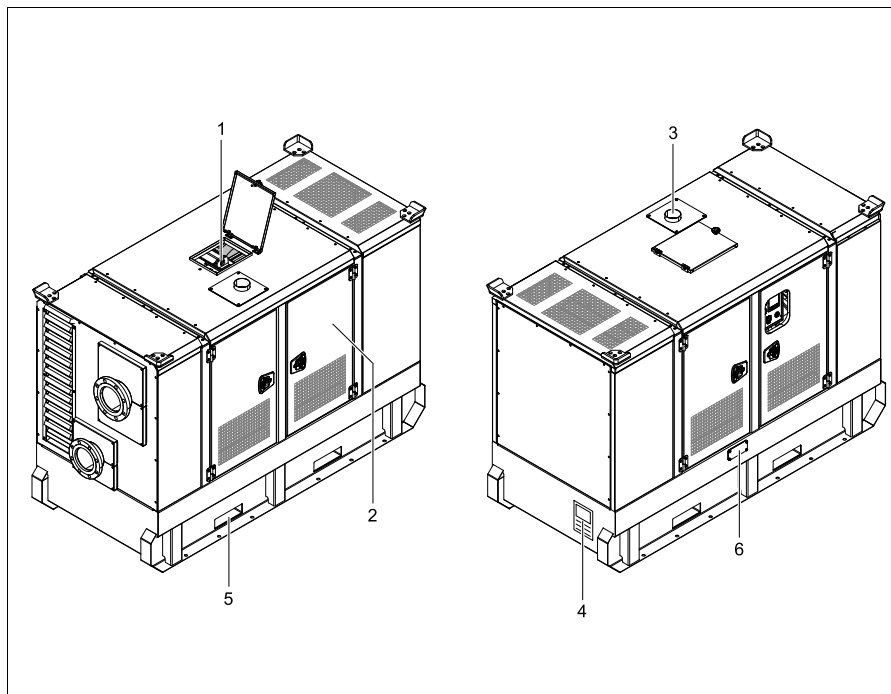
Do not use the pump to transport water for human consumption, for water pumping or for installation in an explosive atmosphere.

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 pump.

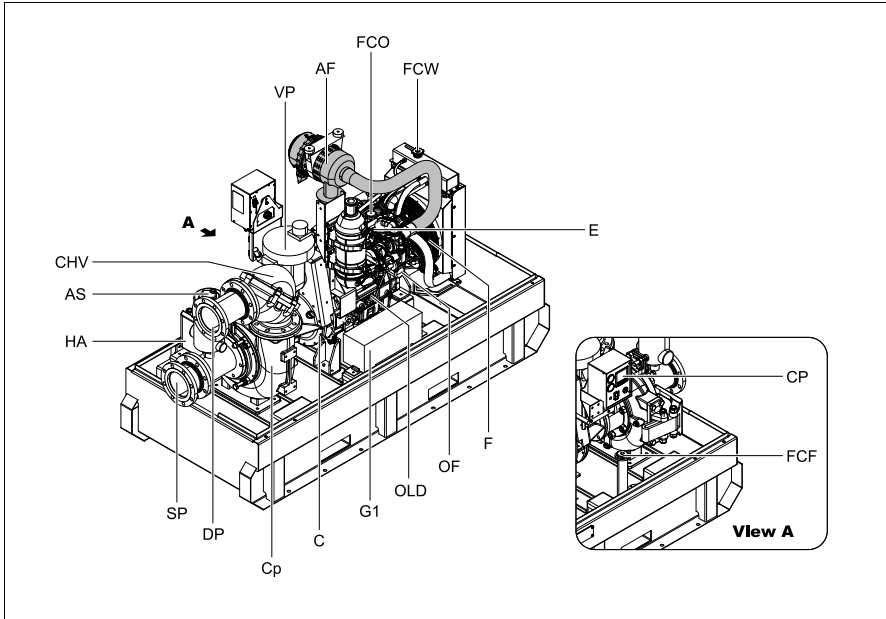
2 Main parts

2.1 General description

The PAS 100-150 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 pumps are driven by a fluid-cooled diesel engine, manufactured by DEUTZ. An overview of the main parts is given in the diagram below.

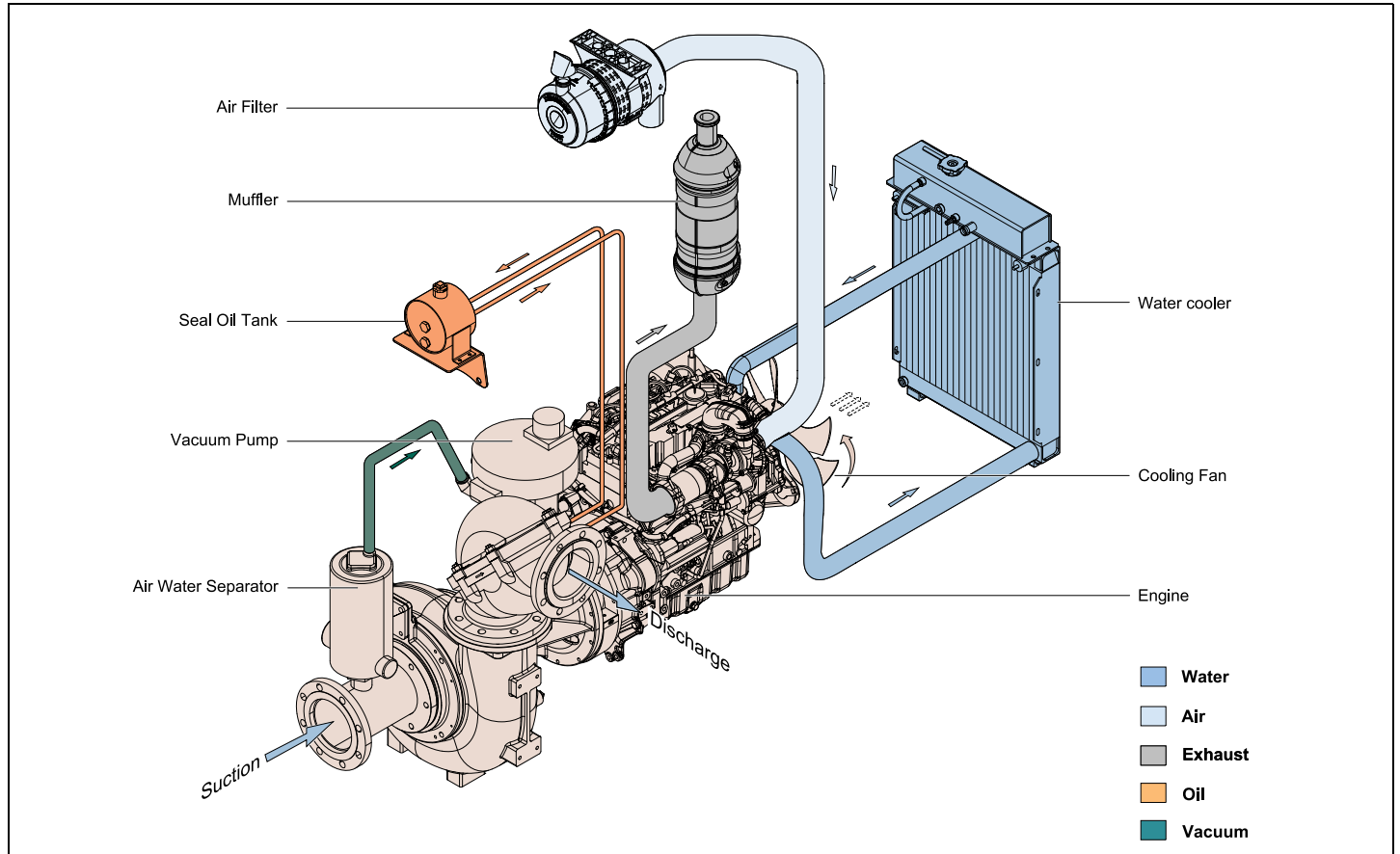


- 1 Lifting beam
- 2 Side doors
- 3 Engine exhaust
- 4 Data plate
- 5 Hole for forklift
- 6 Drain hole



- AF Air filter
- AS Air separator
- C Coupling
- Cp Centrifugal pump
- CP Control Panel
- CHV Check valve assembly
- DP Discharge pipe
- E Engine
- F Fan
- FCO Filler cap engine oil
- FCF Filler cap fuel
- FCW Filler cap coolant
- G1 Battery
- HA Hinge assembly
- OF Oil filter
- OLD Engine oil level dipstick
- SP Suction pipe
- VP Vacuum pump

Flow Diagram



2.2 Markings

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.



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 that these points may not be used for lifting. Always use the lifting rod in the roof of the unit to lift it.



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 using the lifting eye.



Indicates the 3-way valve.

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/dm³

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 NPSH_r 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.



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 “Overview of the mechanical options”.

2.4.1 Pump

The P 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 pump is assembled to and driven by a fluid-cooled diesel engine.

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

2.4.5 Bodywork

The pump, the engine, the cooling system, etc. are enclosed in a sound-insulated bodywork that can be opened by means of side doors (and service plates).

The unit can be lifted by using the lifting eye integrated in the bodywork (roof). To be able to lift the PAS 100-150 by means of a forklift, rectangular slots are provided in the frame.

2.4.6 Control panel

The control panel grouping the controller, hour meter, fuel level gauge, ON/OFF switch etc., is placed at the rear end.

2.4.7 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.

2.4.8 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.

2.4.9 Spillage free skid

A Spillage free skid with forklift slots allows the customer to transport the pump easily with a forklift. It avoids accidental spilling of engine fluids and thus helps to protect the environment.

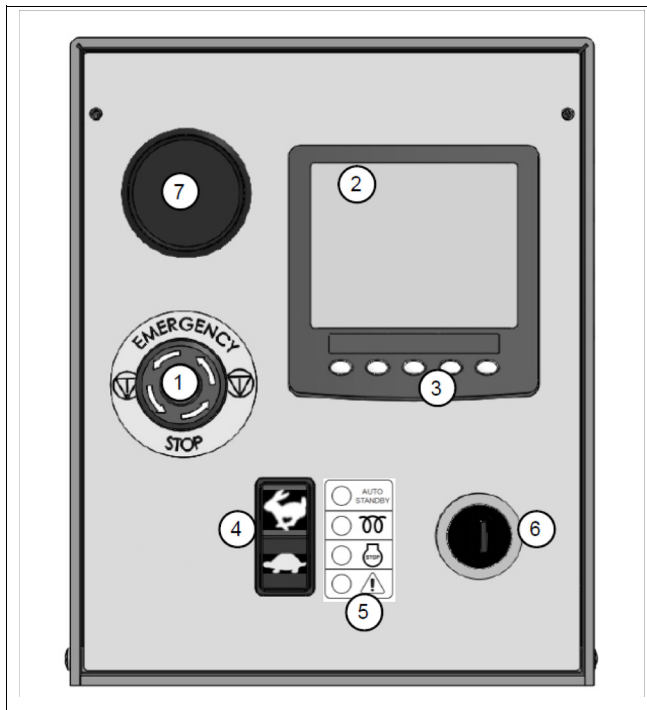
The leaking fluid can be removed via drain holes, secured by drain plugs. Tighten the plugs firmly and check for leakages. When removing the leaking fluid, observe all relevant local legislation.

2.5 Electrical features

The electrical features described in this chapter are standard provided on this pump. For all other electrical features, see section Overview of the electrical options.

2.6 Control panel





The control panel controls and automatically starts/stops governed diesel engine.












Ref	Description
1	Emergency stop button Pull the Emergency Stop button "OUT" to allow engine operation. Push the Emergency Stop button to shutdown the engine
2	LCD LCD displays SAE J1939 parameters and diagnostics. Configuration via display: transducer start-stop, transducer alarms, engine run speed, automatic start/stop mode.
3	Tactile function buttons
4	Rabbit/turtle. Pressing and realising the rabbit icon increases the speed requested by 25 RPM. Pressing and holding the rabbit icon causes the speed to accelerate to full speed in a few seconds. In the same way, pressing the turtle icon decreases the speed.
5	Led indication AUTO - PREHEAT - STOP (SHUTDOWN) - WARNING
6	Ignition key switch position. AUTO START (WHEN EQUIPPED with Floats/transducer). OFF - RUN - START.
7	Vacuum gauge (only PAS 100 - 150 HF)

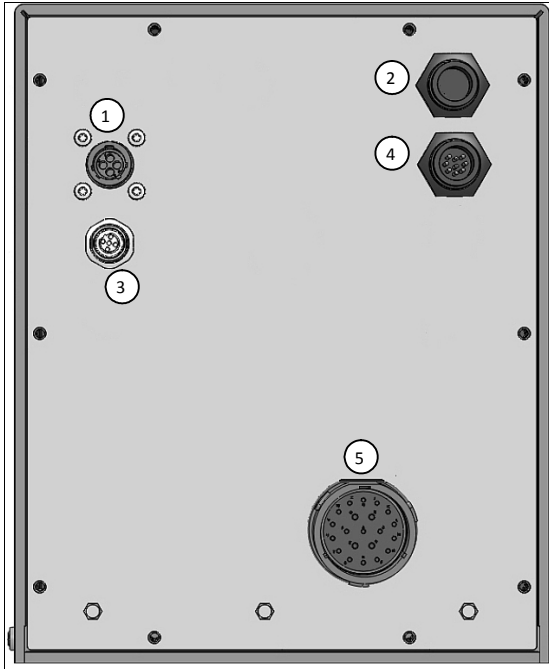
LED INDICATION

MODEL PW750

	<p>AUTO STANDBY LED (Green) An illuminated AUTO STANDBY LED indicates the keyswitch is in the "auto start" position and the system is ready to start.</p>
	<p>PREHEAT LED (Amber) An illuminated PREHEAT LED indicates the keyswitch is in the "auto start" position and the system is ready to start. When the LED extinguishes, the preheat period is complete and the engine may be cranked.</p>
	<p>ENGINE STOP LED (Red) An illuminated ENGINE STOP LED indicates the ECU has stopped the engine due a fault. ECU programming determines the responses to warning and failures.</p>
	<p>WARNING LED (Amber) An illuminated WARNING LED indicates a warning reported by the ECU.</p>

MODEL PW1000

		AUTO STANDBY	Legacy PW750
			Legacy PW750
			Legacy PW750
			Legacy PW750
		DEF	Indicator (Diesel Exhaust Fluid)



Ref	Description
1	Float switch connector with cap. The control Panel uses a four position circular plastic connector for the two floats inputs switch. The control panel is equipped with a harness interface auxiliary interface I/O. Pin 1: High Float (colour cable GREY). Pin 2: Low Float (colour cable TANGERINE). Pin 3: High Float (colour cable Black). Pin 4: Low Float (colour cable Black)
2	Connection to vacuum gauge
3	Transducer connector The Control Panel uses industry standard M12 connection for 4÷20 mA transducer input.
4	Out Auxiliary
5	Deutsch 21 pin engine harness connector Connection to the engine is provided by a Deutsch/TE 21 pin connector

2.6.1 Display interface

Five buttons access a context dependent button bar when any button from 1 to 4 is pressed. The graphical menu structure uses easily understood icons to indicate the button's current function. After 5 seconds of inactivity the button bar disappears.



Button 1: Analog Gauge (pages)

Button 2: Digital Gauge (pages)

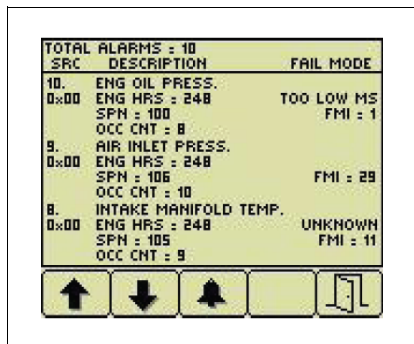
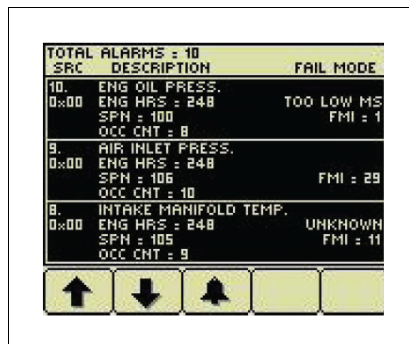
Button 3: Single Analog gauge

Button 4: Active Alarm (page)

Button 5: Configures the parameters displayed by gauge pages.



ACTIVE ALARM



Example Alarms message.

After identification, the exit button becomes active.

Standard J1939 abbreviations are used for alarms.

SNP: Suspect Parameter Number.

FMI: Failure Mode Indicator

ALARM LIST






The Alarm List is accessed by pressing any button while an alarm popup is displayed or by pressing any of the first 4 buttons to show the button bar and then button 4

Alarms not yet acknowledged are shown in grey on black while acknowledged alarms are shown in black on grey. The list also indicates when the alarm occurred if engine hours are available. The most recent alarm is displayed at the top of the list.

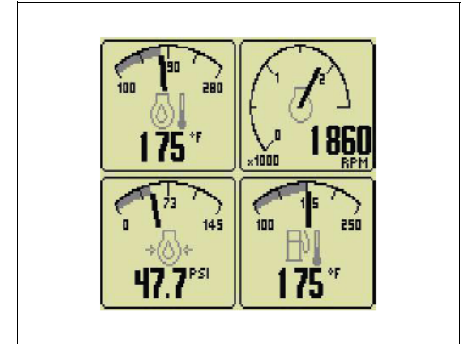
The list can be scrolled using buttons 1 and 2 and alarms acknowledged by pressing button 3. The Alarm List can be closed by pressing Button 5 once the alarms are acknowledged.

An alarm indicator is displayed near the upper right corner of the display as long as alarms are active. The indicator and alarm messages in the list are automatically removed when the alarm is no longer received for a few seconds.

Only active faults are displayed in the alarm list. Once a fault is corrected it is automatically removed from the list. To view previously active faults use the engine diagnostic tool.

	1
	2
	3
	4
	5

ANALOG GAUGE PAGES

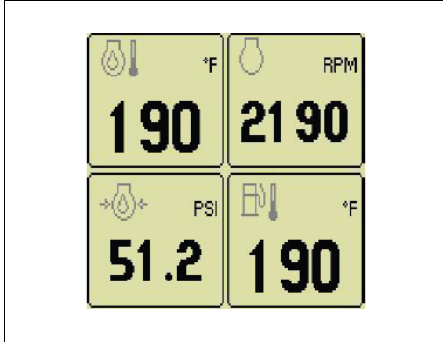


Analog Gauge Pages give four independent pages of analog gauges (16 total).

To enable Analog Gauge Pages, push any of the first four buttons to show the top level button bar and then push button 1. The gauges may be configured by the user to create a specific view.

The same gauges are the same for "Analog" and "Digital Gauge Pages". Adjustments in either Analog Gauge Pages or Digital Gauge Pages affect the same gauge in the other mode.

DIGITAL GAUGE PAGES



Digital Gauge Pages display the same data as the Analog Gauge Pages but in digital only format. To enable "Digital Gauge Pages", press any of the first 4 buttons to show the top level button bar and then press button 2.

Alternate pages are selected by repeated pressing of button 2.

SIGLE ANALOG GAUGE



Single Analog Gauge uses the entire display for a single analogue gauge. This way is enabled by pressing any of the first 4 buttons to show the top level button bar and then press button 3, after the gauge displayed is selectable by repeatedly pressing button 3

CONFIGURATION

To adapt the control panel to the requirements of a particular application, a large number of parameters are configurable.





The "Configuration" Menu allows the user to set various operating parameters such as US or metric units, scale limits for tachometer and service timers. The configuration menu is entered by pressing and holding button 5 (the right hand button) in any mode for at least 3 seconds. If PIN (Personal Identification Number or 'password') entry is enabled the correct PIN must be entered to access the configuration menu.

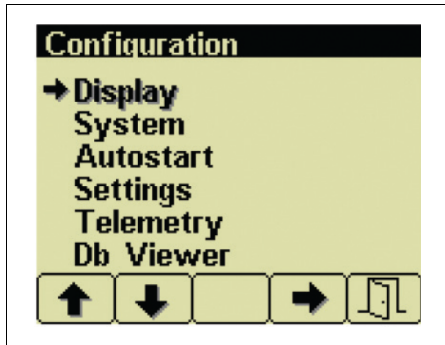
The top level configuration menu is displayed as shown.

Buttons 1 and 2 allow you to choose from "Display", "System", "Auto start",

"Settings", "Telemetry" or "Db Viewer". Pressing button 4 selects the chosen menu item indicated by bold text and the selection arrow.

Each item is described in detail on the following pages. Settings are automatically stored when exiting the current menu even when power is removed

	1
	2
	4
	5

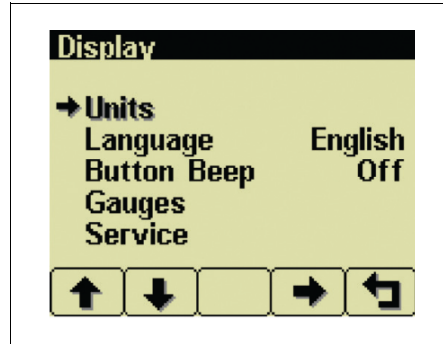


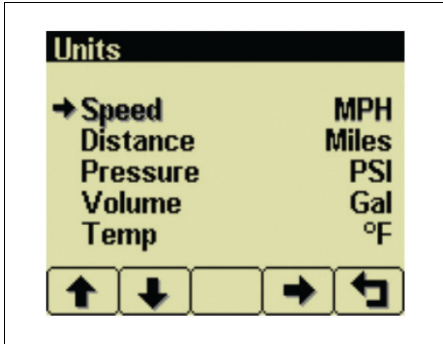
The Configuration menu and its six choices. Pressing Button 4 selects the highlighted menu item. Button 5 exits the configuration mode.

DISPLAY

The Display Menu allows the user to configure items affecting how information is displayed.

This menu allows the user to set the units used for speed, distance, pressure, volume and temperature independently. Button 4 cycles through the available values for the selected item.





Speed MPH (miles per hour)

km/h (kilometers per hour)

Knts (knots)

Distance Miles

km (kilometers)

NM (nautical miles)

Pressure PSI (pounds per square inch)

bar (barometric units)

kPa (kilopascals)

Volume Gal (US gallons)

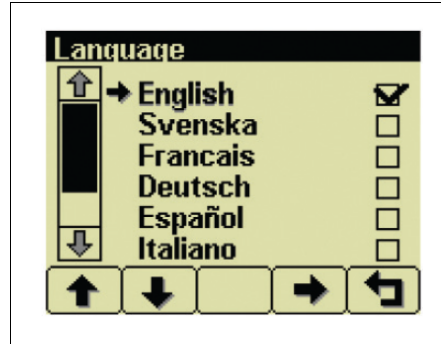
IGal (Imperial gallons)

Liters

Temperature F (Fahrenheit)

°C (Celsius).



LANGUAGE MENU



This menu allows the user to choose between English, Swedish, French, German, Spanish, Italian, Dutch and Portuguese.

The currently selected value is indicated by the check mark.

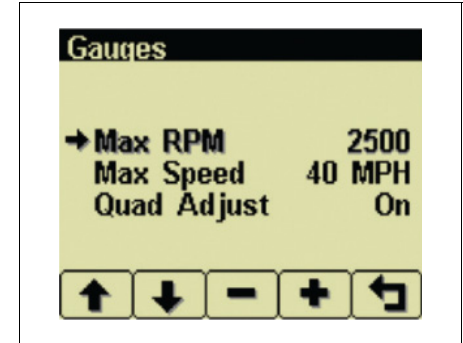
Button 4 selects the highlighted value.

	check mark
	4

BUTTON BEEP

The soft buttons emit an audible beep when this item is On. Button beep is disabled by setting this item to Off. The audible beep still sounds when an alarm occurs. Button 4 cycles between On and Off.



GAUGE



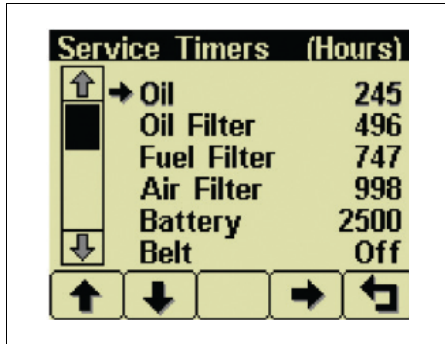
This menu allows the user to configure aspects of the gauges displayed.

Button 3 selects the previous value while

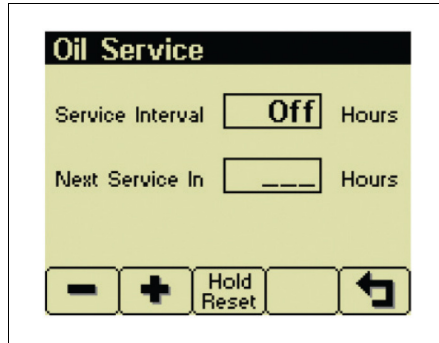
Button 4 selects the next value of the highlighted item.

	3
	4

SERVICE





Sets the sixteen (16) service intervals in hours and resets the service timer. Setting the service interval to 0 disables the timer and the word Off is displayed.

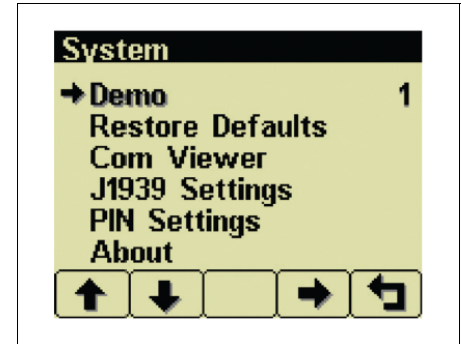


Pressing Button 4 allows adjusting the selected service timer.


Button 1 decreases the service interval time, while Button 2 increases the service interval time in 10 hour increments.

	1
	2

SYSTEM



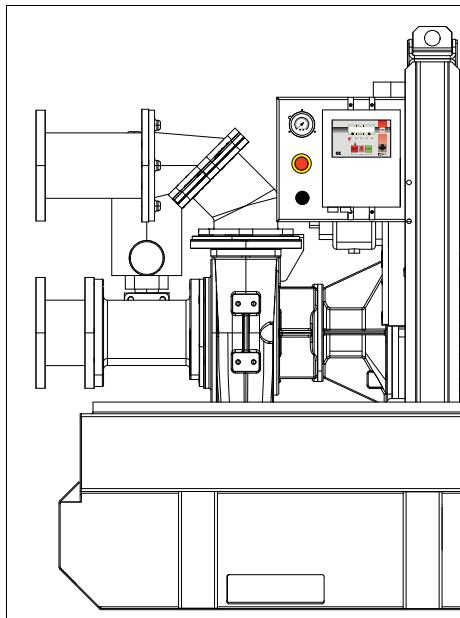
The System Menu allows the user to configure items affecting how the system functions. Button 4 cycles through the available values for the selected item.

	4
---	---

2.6.2 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.

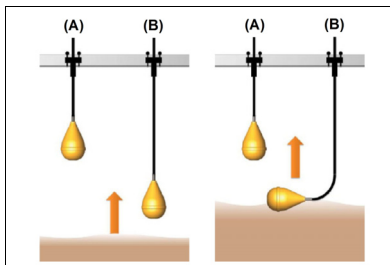
Set the float switches in such a way that frequent starting/stopping is minimized.



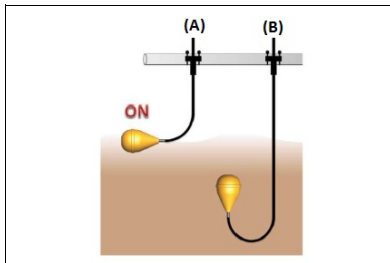
Operating procedure:

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:

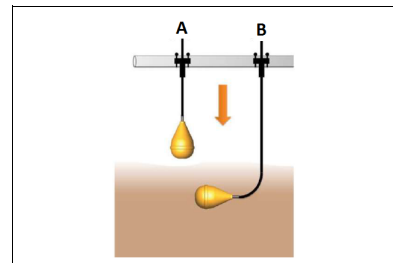
- The tank fills:



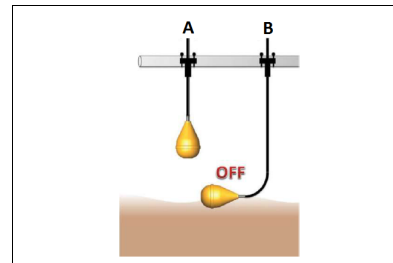
- High level starts the pump:



- The tank drains:



- Low level stops the pump:



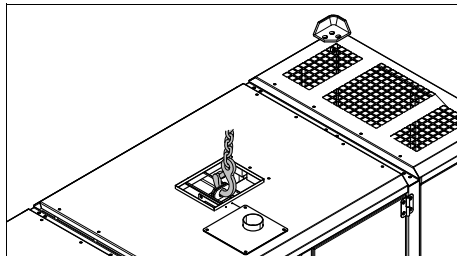
3 Installation and connection

3.1 Lifting

The lifting eye, to lift the unit by means of a hoist, is integrated in the bodywork and easily accessible from the outside. The recesses in the roof have guiding rods at both sides.

Before lifting the unit, check its dimensions and weight, which can be found on the **Data plate**.

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.



Never use the guiding rods to lift the unit.

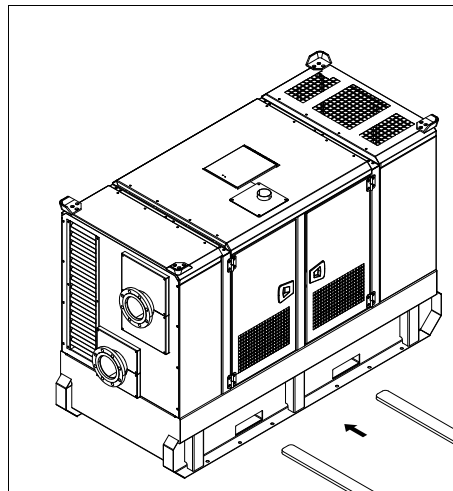


Lifting acceleration and deceleration must be kept within safe limits (max 2g).

Helicopter lifting is not allowed.

– Check that the inner earthing system is in

To be able to lift the unit by means of a forklift, rectangular slots are provided at the bottom of the frame.



compliance with the local legislation.

3.2 Installation

3.2.1 Indoor installation

If the pump is operated indoors, 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.

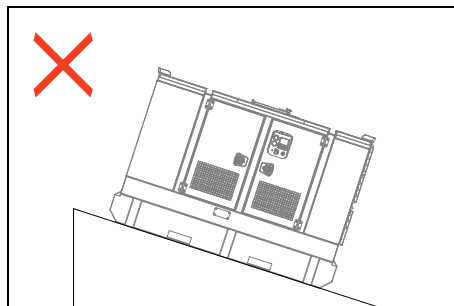
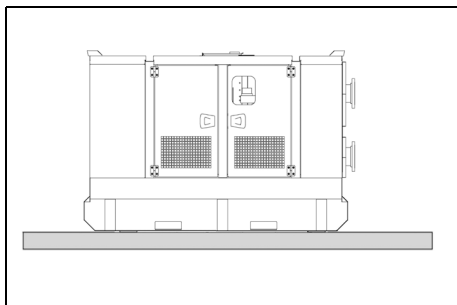
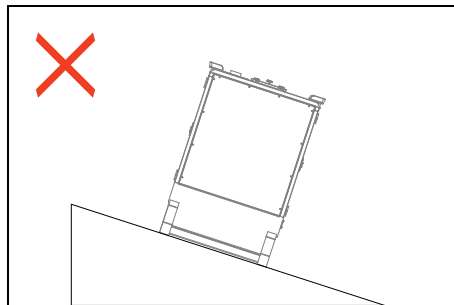
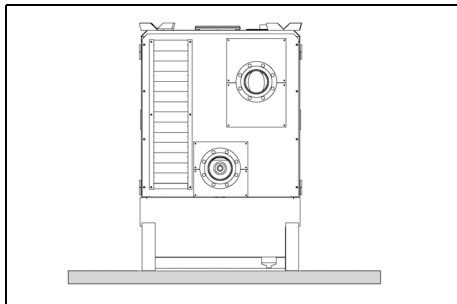


For more information about indoor installation, consult your local Atlas Copco dealer.

3.2.2 Outdoor installation

- Place the pump on a horizontal, even and solid floor. The pump can operate in a slant position not exceeding 15% (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).

- 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.



3.2.3 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 (9ft/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.
 - Never throttle on pump suction side and never place a valve directly on the pump inlet bore.
 - Take suction lift into account in the $NPSH_{available}$, which must be higher 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.

- The discharge pipe must be positioned to avoid parts sticking out, which can be dangerous.



Never use the pump as a support for piping.

4 Operating instructions



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



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

4.1 Starting

Before operating the pump, check that the electrical and mechanical parts of the system have been correctly installed.

Check the oil level of the engine. Check the level of fuel. In addition to this manual refer to engine manual and control panel manual.

PRIMING



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

If the pump does not prime.

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

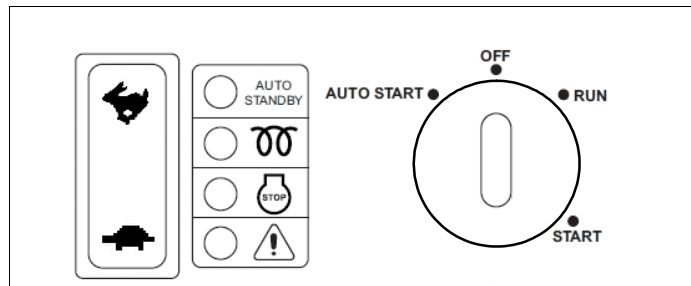
Never change the accelerator limit stop: at speeds higher than that for which the engine is set, the pump would absorb more power than the engine can supply.

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.

MANUAL CONTROL PANEL OPERATION



Turning the control system key to the "RUN" position, all LEDs illuminate once and a start-up screen is displayed while a self test is performed. If the display beeps for longer than 1 second, it indicates a self test fault.

Users can attempt to rectify the fault by restoring factory defaults (pass on Configuration Menu for details). Contact your local Atlas Copco dealer for assistance if the fault persists.

After the start-up screen is cleared, the display shows readings on its virtual gauges. Initially the analog gauges are displayed but the display uses the last displayed screen on subsequent startups (pass on Preferred Screen Store for details).

If the ECU is preheating when the key switch is turned to the run position, the Preheat LED is illuminated. Preheat time varies with atmospheric and engine conditions. After waiting for the Preheat LED to extinguish, the engine is cranked by turning and holding the key switch in the "START" position until the engine starts.

AUTOMATIC START/STOP CONTROL PANEL OPERATION

Turning the control system key to the "AUTO START" position causes all LEDs to illuminate at once, the "Auto Standby" indicator is illuminated and the start-up screen is displayed while a self test is performed. After the start-up screen is cleared, the display shows the transducer reading and switch status on the Transducer/Switch gauge. All other CANbus values will show ----- since the ECU is not energized at this time. After one minute the display is powered down to reduce battery drain. The automatic start/stop system is still functioning as indicated by the "AUTO STANDBY" LED.

Once the configured automatic start condition exists, the display powers up, the panel starts the engine and follows the throttle control profile configured. The flexible throttle profile includes various speeds and times for a variety of scenarios.

When the configured stop conditions exist, the panel reduces the engine speed per the throttle profile and stops the engine. If the configured start conditions exist before the shutdown process is complete the engine will return to the previous speed until the stop condition exists.



Automatic Start/Stop Warning.

When the key is turned to the auto start position and a start condition exists, the panel will start immediately! Always configure parameters by turning the key to run. Do not configure the panel in the auto start position! Always use lock out/tag out procedures when servicing auto start equipment!

5 Maintenance

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.

MAINTENANCE SCHEDULE - PAS 100 - 150 HF

Regular service period		Daily	Every 500 hrs	Every 1000 hrs	Every 3000 hrs	Annually	Every 2 years
Engine							
Engine oil	Check oil level (if necessary top up)	x					
	Replace		x			x	
Oil filter. Replace (every time the lubricating oil is changed)	Replace		x			x	
Air filter	Check air intake vacuum indicator	x					
	Replace		x				
Emptying of the water tank in the fuel prefilter	Check	x					
Fuel prefilter	Replace			x		x	

Regular service period		Daily	Every 500 hrs	Every 1000 hrs	Every 3000 hrs	Annually	Every 2 years
Fuel filter	Replace		x			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			x	
	Replace			x			
Radiator	Clean		x				

Regular service period		Daily	Every 500 hrs	Every 1000 hrs	Every 3000 hrs	Annually	Every 2 years
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			x	
	Check terminals of battery		x			x	
Torque on critical bolt connections	check			x		x	
Hoses and clamps	Inspect (if necessary replace)		x			x	
Rubber flexibles	Inspect (if necessary replace)			x		x	

Regular service period		Daily	Every 500 hrs	Every 1000 hrs	Every 3000 hrs	Annually	Every 2 years
Pump							
Vacuum pump oil	Check oil level (if necessary top up)	x					
	Replace		x			x	
Vacuum pump diaphragm and valves	Inspect (if necessary replace)		x				
	Replace			x			
Vacuum pump belt	Inspect (if necessary tension or replace)		x				
	Replace			x			
Mechanical seal oil	Check oil level (if necessary top up)	x					
	Replace		x			x	
Mechanical seal and V-Ring	Check		x				
Impeller	Inspect and adjust (if necessary replace)		x				
Wear plates	Inspect (if necessary replace)		x				

Regular service period		Daily	Every 500 hrs	Every 1000 hrs	Every 3000 hrs	Annually	Every 2 years
Check valve	Inspect (if necessary replace)		x				
Separator	Inspect function of floater and valve		x			x	
	Clean components		x			x	
Rubber couplings	Inspect (if necessary replace)				x		
Pump shaft bearings	Replace				x		

5.1 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 the water that is inside the pump using the drain valve at the bottom of the volute.
- When the pump has to be lifted out of the unit for maintenance activities:
 - Drain the water
 - Disconnect the pipes
 - Use the lifting point (1) on top of the pump
 - Make sure to use suitable slings



before carrying out maintenance on the unit, it is essential:

- 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.



residual liquid may be found in the pump casing, head and suction line. Take the necessary precautions if the liquid is hazardous (flammable, 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

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.

LUBRICATING THE PUMP

Every month check the oil level using indicators (min. oil level, max. oil level) and if necessary to up through the cap (Ref. n°3).

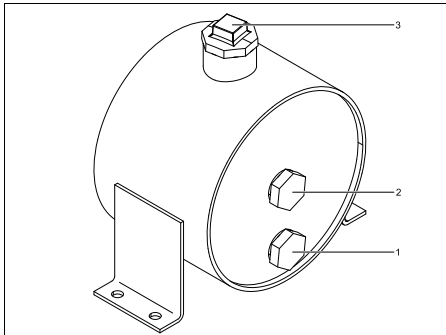
MECHANICAL SEAL CHECK

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 schedules".

Always use PAROIL E.

Remove the oil filler cap and top up the oil level, until the oil level monitor shows it is full.



Ref	Description
1	Oil level viewing plug (min)
2	Oil level viewing plug (max)
3	Oil filling plug

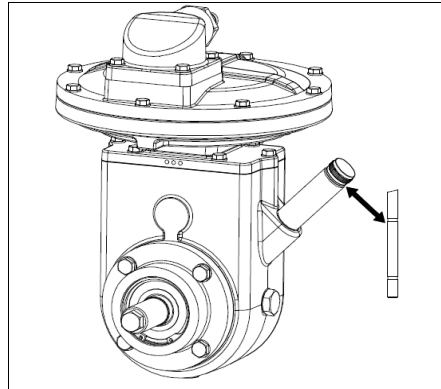
LUBRICATING THE DIAPHRAGM VACUUM PUMP

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; as described in the above mentioned figures, the level must be between the minimum and maximum levels (the optimal level is halfway).

Oil prescribed for top-up: Vacuum pump oil viscosity grade 460.



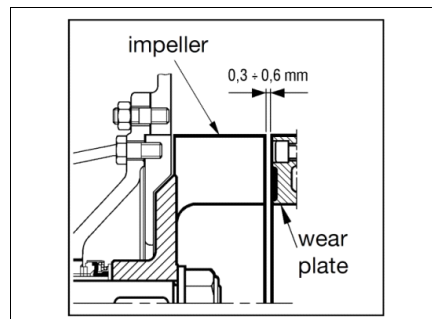
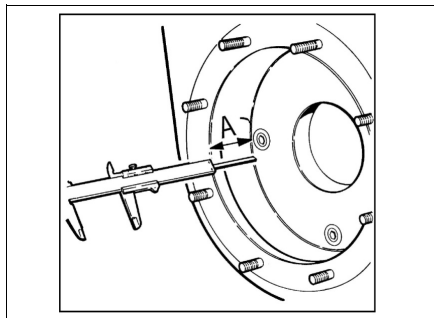
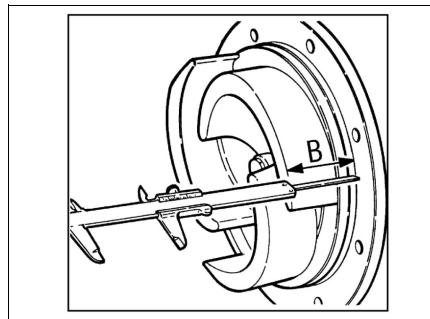
5.2 Adjustments and service procedures

5.2.1 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, dimensions A and B must be as nearly as possible equal.

To this end, use the shims supplied with spare mechanical 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.

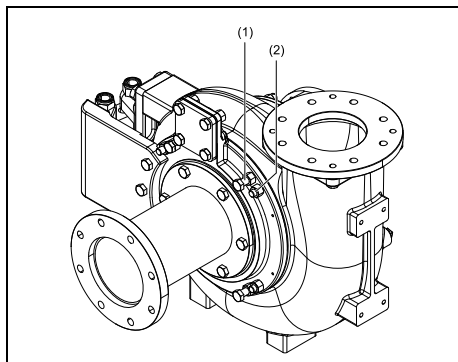


5.2.2 Servicing of impeller

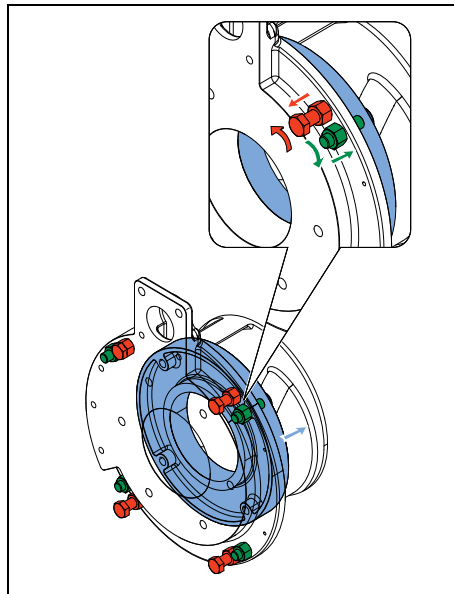
Servicing of impeller

Wear Plate Adjustment

Atlas Copco Pump volute allow you to adjust the clearance between the wear plate and the impeller to have a long life of impeller and thus a better efficiency.



To adjust the wear plate untighten the (1) nuts (x4) and tighten the (2) bolts (4x).

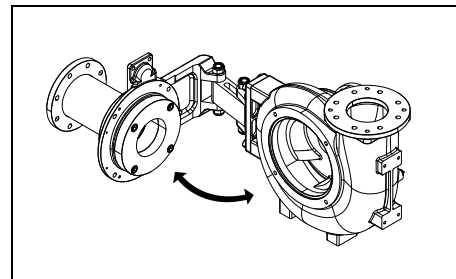


The tightening and untightening of the bolts is dependent of the pitch of the bolts and nuts.

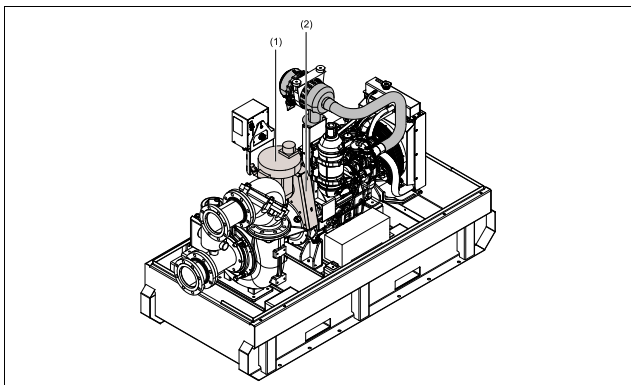
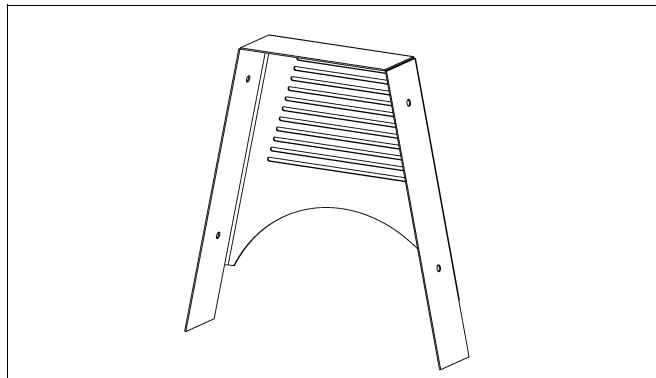
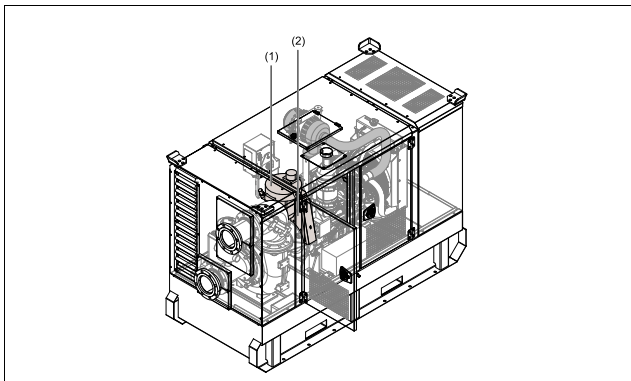
For further assistance contact Atlas Copco Varisco s.r.l.

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.



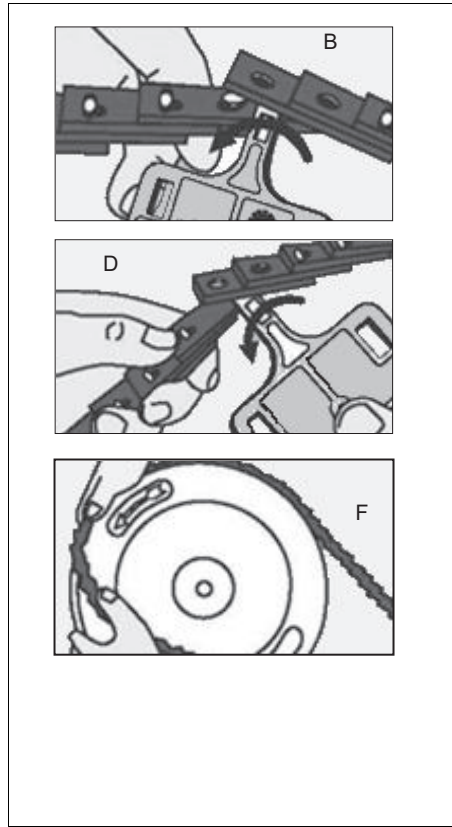
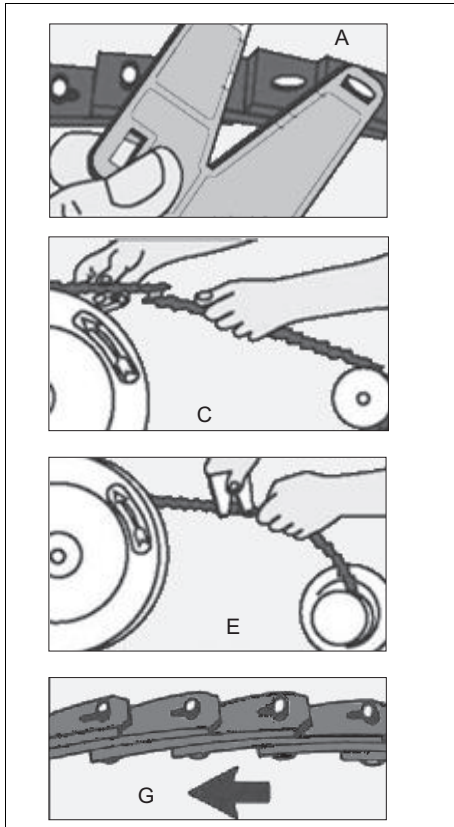
5.2.3 Replacement belt



The vacuum pump and shaft 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.

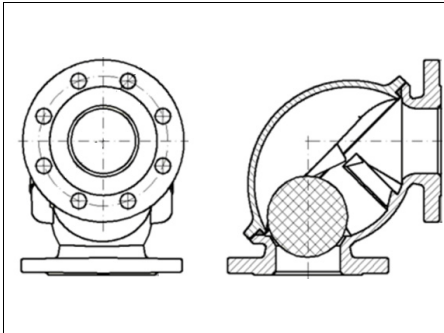
Place the belt on the pulley (shaft side), close the belt in a loop and place it around the pulley on the vacuum pump side, Fig.C.

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.

5.2.4 Inspection ball valve (only 100 - 150 HF)



It's strongly recommended to check the ball valve function and cleanness before usage of the pump. Small debris can accumulate in the ball valve housing.

Open the valve cover to check the status of the ball and if necessary clean and remove any solid bodies from the valve housing.

Replace the ball if marks or scratches emerge on the ball surface.

5.3 Engine maintenance procedures

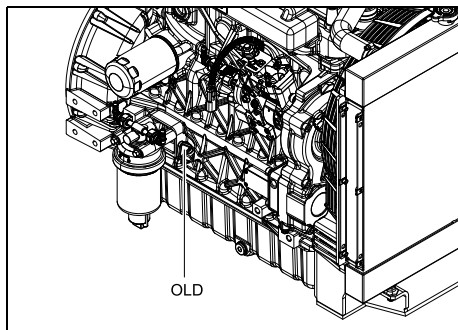
Refer to the Engine Operation Manual for a full maintenance schedule.

5.3.1 Engine oil level check

Consult the Engine Operation Manual for the oil specifications, viscosity recommendations and oil change intervals. For the intervals, see also section **Maintenance schedules**.



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.

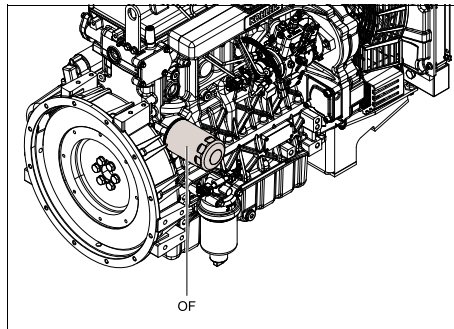
Refer to the Engine Operation Manual for more detailed instructions.

5.3.2 Engine oil and oil filter change

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



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



Replacing the oil filter element



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.



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.

5.3.3 Coolant check

5.3.3.1 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.



**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 EG 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.



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

5.3.3.2 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 EG.
- Topping up the coolant with water only, changes the concentration of additives and is therefore not allowed.

5.3.3.3 Replacing the coolant

Drain

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

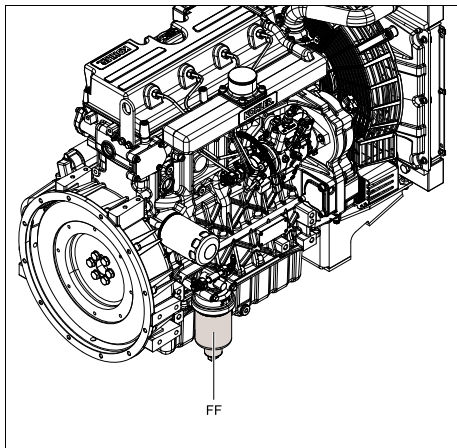
Flush

- 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 EG 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.

5.3.4 Replacing fuel filter element

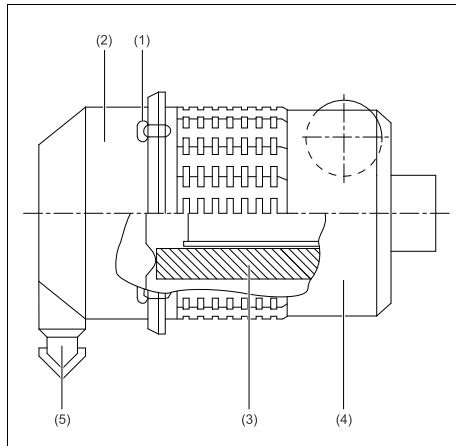


Replacing the filter element:

- 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.

5.3.5 Servicing air filter engine

5.3.5.4 Main parts



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

5.3.5.5 Recommendation



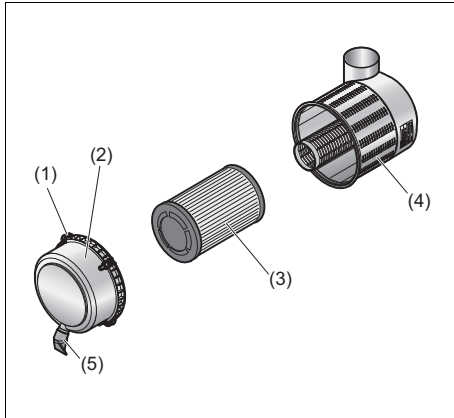
The Atlas Copco air filters are specially designed for the application. The use of non-genuine air filters may lead to severe damage of engine and/or alternator. Never run the unit without air filter element.

- 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 9307 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.

5.3.5.6 Cleaning the dust trap

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

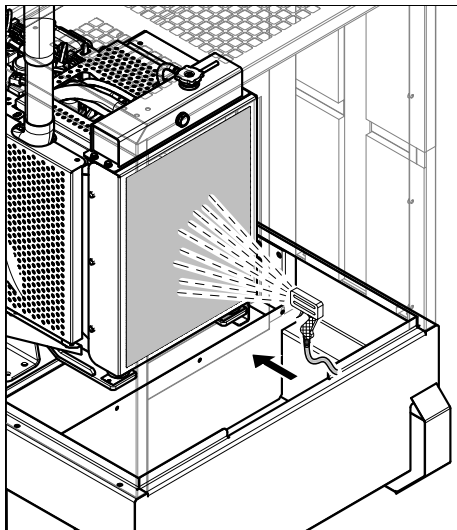
5.3.6 Replacing the filter element



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.

5.3.7 Cleaning cooler



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



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

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



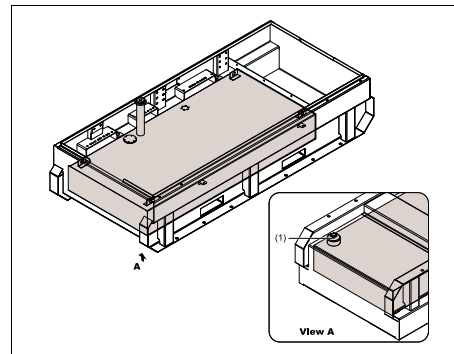
To avoid damaging the coolers, angle between jet and coolers should be approx. 90°. Protect the electrical and controlling equipment, air filters, etc. against penetration of moisture. Make sure to not steam clean the alternator.

- Close the service door(s).



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

5.3.8 Cleaning the fuel tank



Observe all relevant environmental and safety precautions.

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



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

- Refill the fuel tank with clean fuel.

5.3.9 Battery care



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.

5.3.9.7 Electrolyte



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.

5.3.9.8 Activating a dry-charged battery

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

- 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.
- Refit plugs and/or cover.
- Place the battery in the unit.

5.3.9.9 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.



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.

5.3.9.10 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.

5.3.9.11 Periodic battery service

- Keep the battery clean and dry.
- 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.
- Record the quantity of distilled water added.
- Keep the terminals and clamps tight, clean, and lightly covered with petroleum jelly.
- Carry out periodic condition tests. Test intervals of 1 to 3 months, depending on climate and operating conditions, are recommended.
- 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 sound-insulated bodywork. It allows to open or to close the electrical connection between the battery and the engine circuits.



Never turn the battery switch to OFF during operation.

5.4 Engine consumable specifications

5.4.1 Engine fuel specifications

For fuel specifications, please contact your Atlas Copco Customer Center.

5.4.2 Engine oil specifications



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 -10°C and +50°C	PAROIL E
between -25°C and +50°C	PAROIL Extra



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. Extensive laboratory and field endurance tests on Atlas Copco equipment have proven PAROIL to match all lubrication demands in varied conditions. It meets stringent quality control specifications to ensure your equipment will run smoothly and reliably.

The quality lubricant additives in PAROIL allow for extended oil change intervals without any loss in performance or longevity.

PAROIL provides wear protection under extreme conditions. Powerful oxidation resistance, high chemical stability and rust-inhibiting additives help reduce corrosion, even within engines left idle for extended periods.

PAROIL contains high quality anti-oxidants to control deposits, sludge and contaminants that tend to build up under very high temperatures.

PAROIL's detergent additives keep sludge forming particles in a fine suspension instead of allowing them to clog your filter and accumulate in the valve/rocker cover area.

PAROIL releases excess heat efficiently, whilst maintaining excellent bore-polish protection to limit oil consumption.

PAROIL has an excellent Total Base Number (TBN) retention and more alkalinity to control acid formation.

PAROIL prevents Soot build-up.

PAROIL is optimized for the latest low emission EURO -3 & -2, EPA TIER II & III engines running on low sulphur diesel for lower oil and fuel consumption.

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 -25°C (-13°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

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

5.4.3 Engine coolant specifications



Never remove the cooling system filler cap while coolant is hot.

The system may be under pressure. Remove the cap slowly and only when coolant is at ambient temperature. A sudden release of pressure from a heated cooling system can result in personal injury from the splash of hot coolant.

It is strongly recommended to use Atlas Copco branded coolant.

The use of the correct coolant is important for good heat transfer and protection of liquid-cooled engines. Coolants used in these engines must be mixtures of good quality water (distilled or de-ionised), special coolant additives and if necessary freeze protection. Coolant that is not to manufacturer's specification will result in mechanical damage of the engine.

The freezing point of the coolant must be lower than the freezing point that can occur in the area. The difference must be at least 5°C. If the coolant freezes, it may crack the cylinder block, radiator or coolant pump.

Consult the engine's operation manual and follow the manufacturer's directions.



Never mix different coolants and mix the coolant components outside the cooling system.

Specifications PARCOOL EG

PARCOOL EG is the only coolant that has been tested and approved by all engine manufacturers currently in use in Atlas Copco compressors, generators and pumps.

Atlas Copco's PARCOOL EG extended life coolant is the new range of organic coolants purpose designed to meet the needs of modern engines. PARCOOL EG can help prevent leaks caused by corrosion. PARCOOL EG is also fully compatible with all sealants and gasket types developed to join different materials used within an engine.

PARCOOL EG is a ready to use Ethylene Glycol based coolant, premixed in an optimum 50/50 dilution ratio, for antifreeze protection guaranteed to -40°C.

Because PARCOOL EG inhibits corrosion, deposit formation is minimized. This effectively eliminates the problem of restricted flow through the engine coolant ducts and the radiator, minimizing the risk for engine overheating and possible failure.

It reduces water pump seal wear and has excellent stability when subjected to sustained high operating temperatures.

PARCOOL EG is free of nitride and amines to protect your health and the environment. Longer service life reduces the amount of coolant produced and needing disposal to minimise environmental impact.

	Litre	US gal	Imp gal	cu.ft	Order number
can	5	1.3	1.1	0.175	1604 5308 00
can	20	5.3	4.4	0.7	1604 5307 01
barrel	210	55.2	46	7.35	1604 5306 00

To ensure protection against corrosion, cavitation and formation of deposits, the concentration of the additives in the coolant must be kept between certain limits, as stated by the manufacturer's guidelines. Topping up the coolant with water only, changes the concentration and is therefore not allowed.

Liquid-cooled engines are factory-filled with this type of coolant mixture.

6 Checks and trouble shooting



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).

6.1 Engine troubleshooting

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

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.
- 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.
- 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

6.2 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.

6.2.1 Overview of possible operating problems

<i>Symptom</i>	<i>Possible cause</i>	<i>Corrective action</i>
<i>Pump does not prime</i>	1. Suction tubes or inlet filter clogged. The vacuum gauge indicates a high value.	Remove the obstruction.
	2. Suction tube collapse.	Use reinforced suction tube.
	3. 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.
	4. 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.
		Make sure complete vacuum system (separator, connection tubes, check valves and vacuum pump) is working properly without any defect or leakage.
	5. The suction lift is too high.	Reduce the suction lift.
	6. The vacuum pump is broken or doesn't rotate.	Restore or replace the vacuum pump.
	7. Pump speed is too low.	Only increase speed once you have checked the contract data and pump performance curves.
8. Slackening or breakage of the vacuum pump drive belt.	Restore the belt tension and / or replace it if worn or broken.	
9. Delivery tube or discharge valve is blocked and water cannot be moved away.	Make sure, water can be discharged.	

<i>Low or no flow</i>	1. The pump does not prime,	See causes given in Pump does not prime .
	2. Head required by the system is greater than the rated head of the pump.	Revise system design or select a different pump.
	3. Excessive flow resistance along suction line.	Revise distribution of elbows, valves, constrictions etc. Where necessary, increase diameter of the pipework.
	4. Impeller clogged by foreign debris.	Disassemble casing and remove foreign matter.
	5. Suction/delivery pipes/ strainer may be obstructed or clogged.	Locate the obstructed or clogged area and clean.
	6. Air leaks in suction line.	Check joints are airtight and inspect suction pipe.
	7. Impeller and / or wear plate may be worn.	Replace them by disassembling the pump.
	8. Diameter of the suction pipe too small.	Increase size of suction tube.
	9. Foreign debris trapped in the impeller.	Disassemble the pump casing and remove the foreign debris.
	10. Pump speed is too low.	Only increase speed once you have checked the contract data and pump performance curves.
	11. Cavitation on pump related to less flow.	See chapter cavitation.
<i>Excessive power absorption</i>	1. Rotation speed too high.	Check correct rotation speed.
	2. 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).
	3. Mechanical friction inside the pump between rotating and non-rotating components.	Disassemble pump casing and check for scratches on surfaces.
	4. Particles in the impeller.	Disassemble pump casing and remove materials. Use suction strainer.

<i>Pump does not provide enough pressure</i>	1. 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 .
	2. Impeller worn, worn wear plates, bad adjustment/trimming between impeller and wear plate.	Gap should be between 0.3 - 0.8 mm.
	3. Pump speed is too low.	Only increase speed once you have checked the contract data and pump performance curves.
	4. Pump volute worn.	Change pump volute.
<i>Pump vibrates and is noisy</i>	1. 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.
	2. Pump or pipework is not fixed securely.	Make sure system pipework is correctly fastened.
	3. Pump cavitates.	Check possible causes: see Pump does not prime and Low or no flow .
	4. Particles in the impeller.	Disassemble pump casing and remove materials. Use suction strainer.

7 Storage of the pump

7.1 Storage

- Store the pump in a dry, frost-free room which is well ventilated.
- Run the engine regularly, e.g. once a week, until it is warmed up. If this is impossible, extra precautions must be taken:
 - Consult 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.

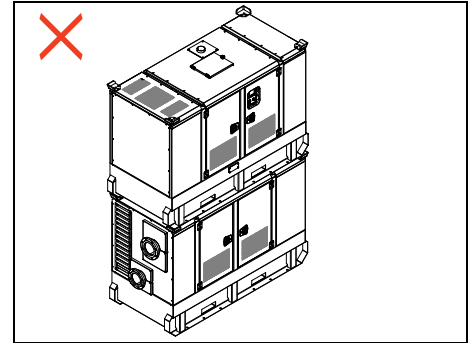
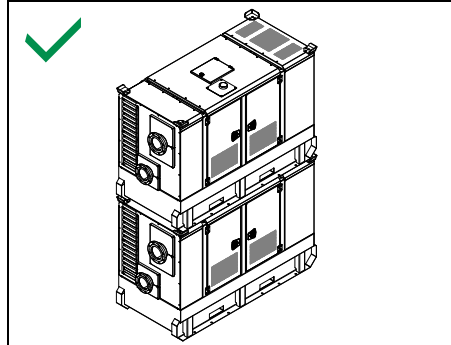
7.2 Stacking

- Pumps are designed to be stackable for the purpose of storage and storage only.
- Do not stack the pumps and use for pumping application.
- While stacking, the pump side of the machines should be on the same side.
- Do not stack more than one pump.

- Stacking to be done with similar size pump.
- While stacking care must be taken to place the pump in the correct position and not dropped.



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



7.3 Preparing for operation after storage

Before operating the pump again, remove the wrapping.

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

8 Disposal

8.1 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 Atlas 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 mostly of metallic materials, that can be remelted in steel and melting works and are therefore almost infinitely recyclable.

8.2 Disposal of materials

- 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 of in an approved waste disposal unit.
- The battery must be kept separate and disposed of through an authorized collection centre in accordance with the law.



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.

9 Options

9.1 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

- Check the towbar, the brake system and the towing eye of the 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 tyres are in good condition and inflated correctly.
- Connect the signalization cable, check all lights and connect the pneumatic brake couplers (if applicable).
- Attach the safety break-away cable or safety chain to the towing vehicle (if applicable).
- Remove wheel chocks, if applied, and disengage the parking brake (if applicable).

When using this option

- Make sure that the towing equipment of the vehicle matches the towing eye before towing the unit.

- Never move the pump while piping is connected to the unit.
- Always apply the hand brake when parking.
- Leave enough space for operation, inspection and maintenance (at least 1 meter at each side).
- Wheel chocks allow to park the unit on sloping ground. Place wheel chocks in front of or behind the wheels to immobilize the unit.
- Place the unit on level ground and apply the parking brake before disconnecting the unit from the towing vehicle.
- The unit must be transported in horizontal position and stowed safely.

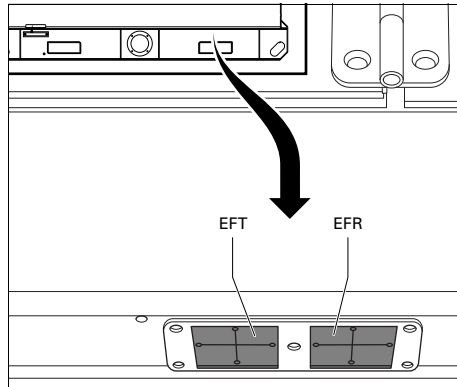
To maintain the undercarriage

- Check the tightness of the towbar bolts, the axle bolts and the wheel nuts at regular intervals.
- 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.
- Check the brake system and condition of the vibration dampers on regular basis.
- Re-pack the wheel hub bearings using grease as per requirements.
- Wheel chocks allow to park the unit on sloping ground. Place wheel chocks in front of or behind the wheels to immobilize the unit.

9.2 External fuel tank connection (with/without quick couplings)

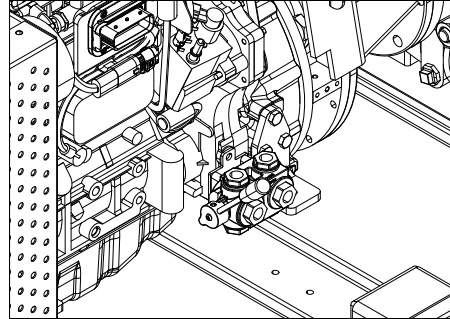
The option external fuel tank connection allows to bypass the internal fuel tank and to connect an external fuel tank to the unit.

View outside

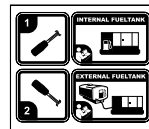


EFT | External fuel tank feed connection
EFR | External fuel tank return connection

View inside



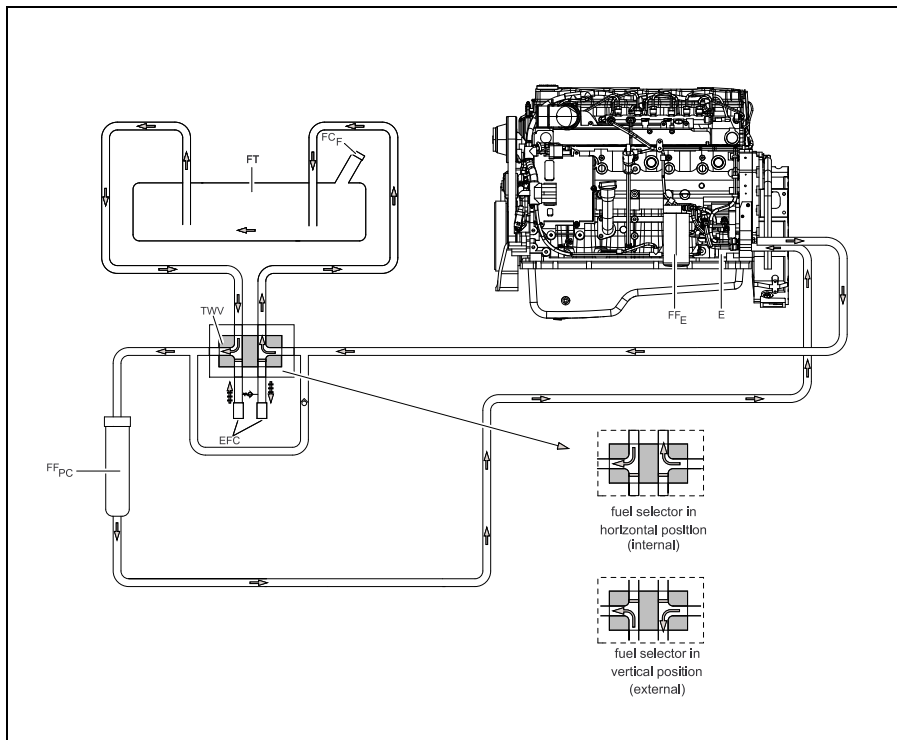
When using this option, make sure to connect the fuel supply line as well as the fuel return line. Connections to fuel lines ought to be air-tight to prevent air from entering the fuel system. Turn the handle of 3-way valve to desired condition.



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.

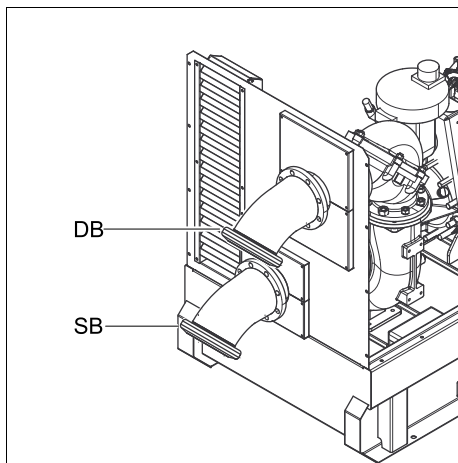
Overview



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

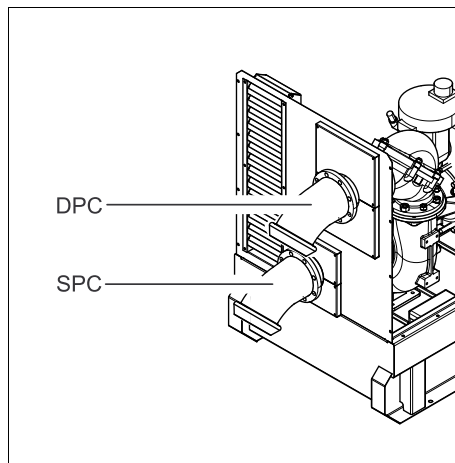
9.3 Suction and discharge pipes

Bauer



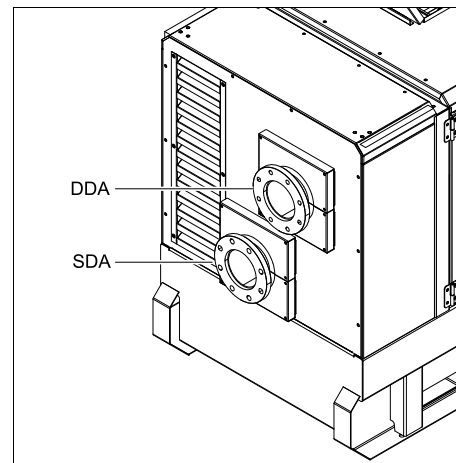
DB | Discharge Bauer
SB | Suction Bauer

Perrot/Cardan



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

DIN / ASME

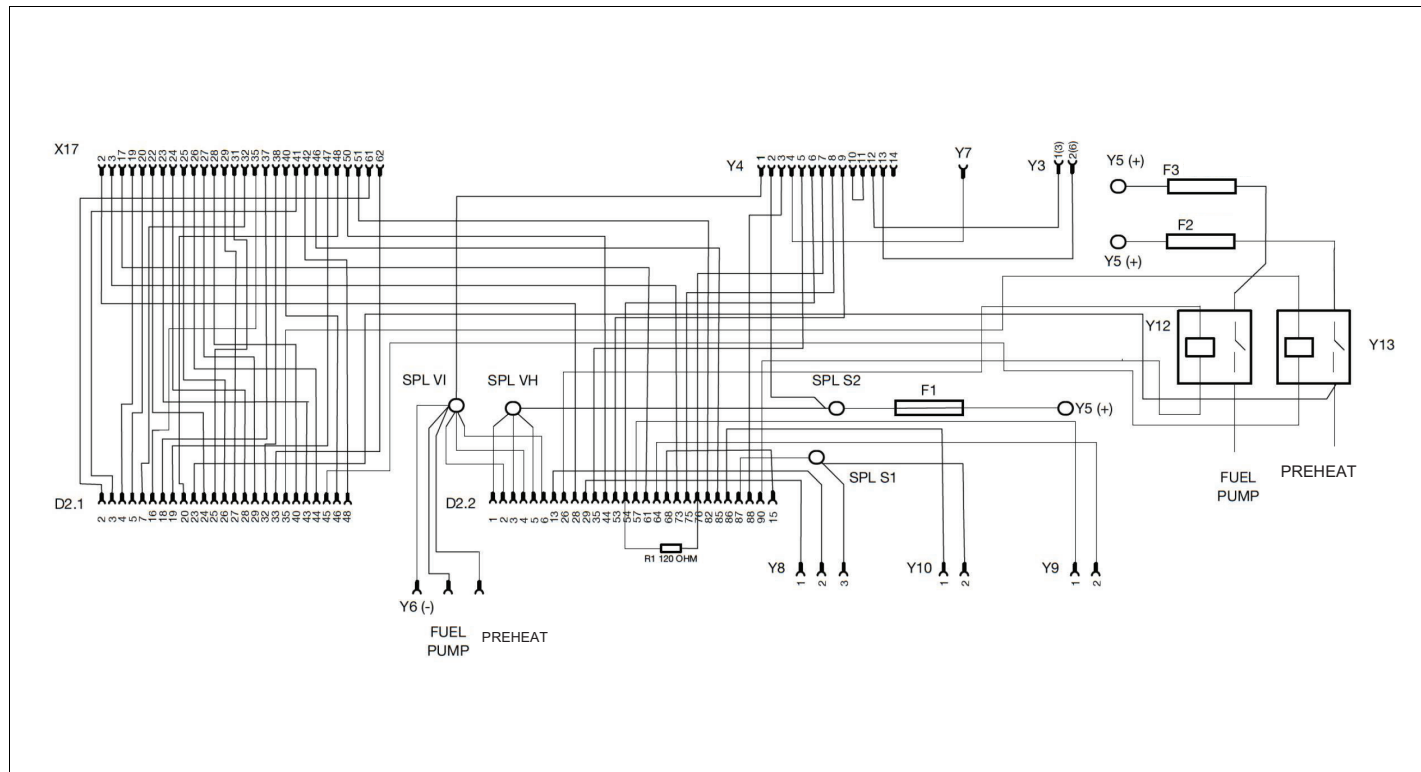


DDA | Discharge DIN / ASME
SDA | Suction DIN / ASME

9.4 Circuit diagrams

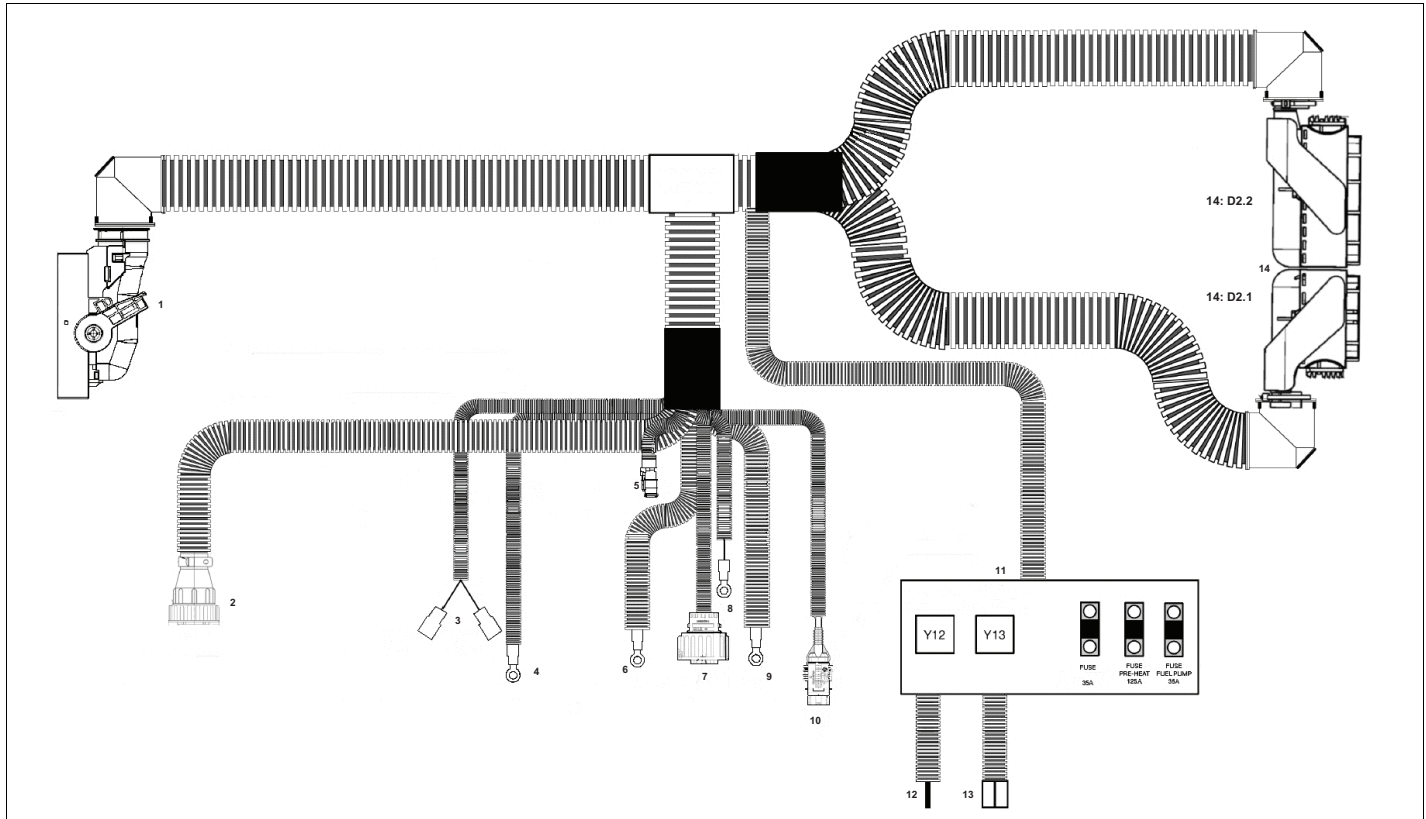
The applicable circuit diagram for the PAS 100-150 units.

Circuit diagrams - PAS 100-150 HF



Item	Description
X17 (1)	INTERFACE CONNECTOR ENGINE
Y4 (2)	INTERFACE CONNECTOR CONTROL PANEL
Y10 (3)	WARNING AIR FILTER
Y7 (4)	D+ (ALTERNATOR)
Y3 (5)	FUEL LEVEL GAUGE (1.SIGNAL - 2.RESERVE WARNING)
Y6 (6)	GROUND
Y8 (7)	COOLANT LEVEL SENSOR
Y5 (9)	+ SUPPLY
Y9 (10)	FUEL PRE-FILTER / WATER IN FUEL
OUTPUT Y12 (12)	RELAY FUEL PUMP, 12V, 1C, 40A
OUTPUT Y13 (13)	RELAY PRE-HEAT, 12V, 1C, 180A
D2.1 - D2.2 (14)	ECU CONNECTOR
F1	30A
F2	125A
F3	30A

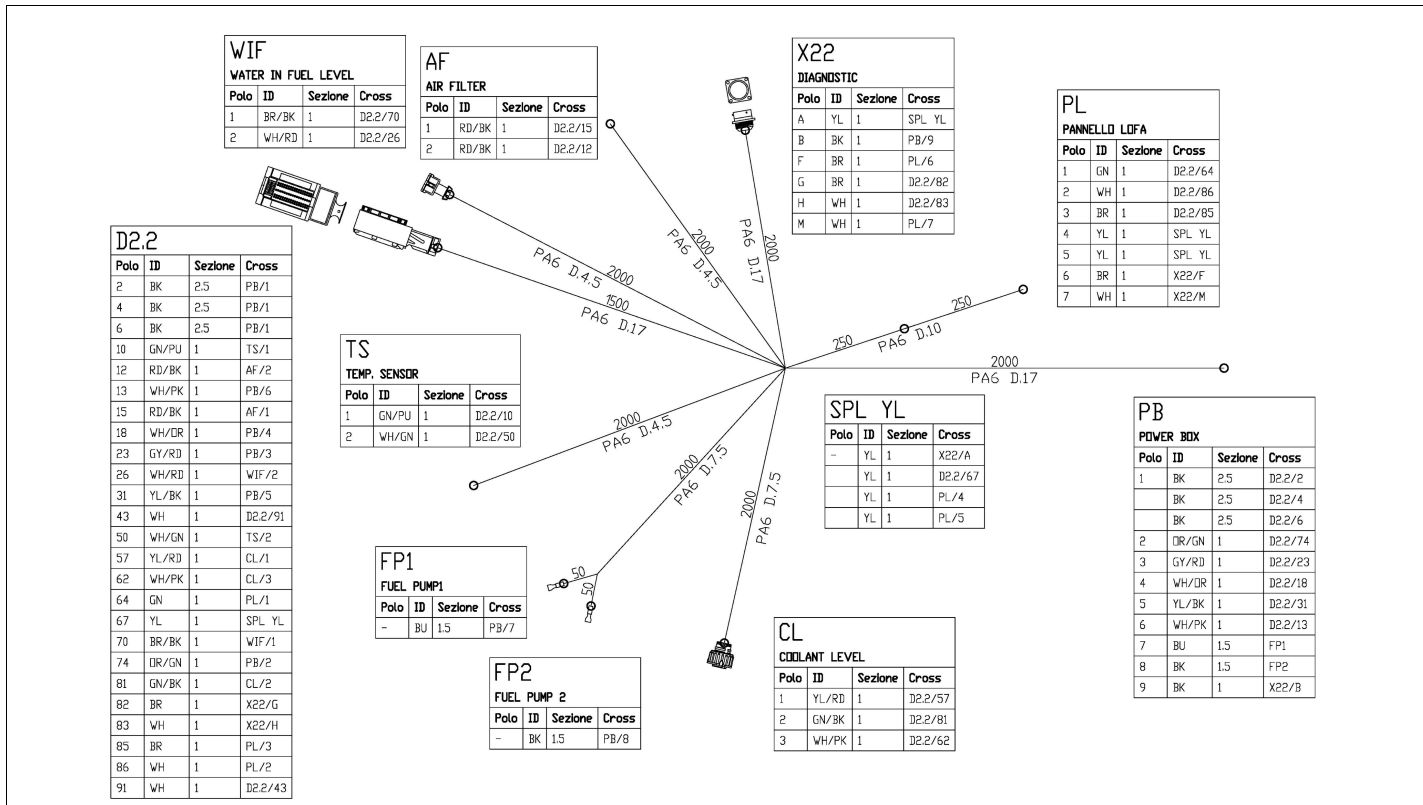
9.5 Wiring - Harness - PAS 100-150 HF



Item	Description
1	INTERFACE CONNECTOR ENGINE
2	INTERFACE CONNECTOR CONTROL PANEL
3	WARNING AIR FILTER
4	D+ (ALTERNATOR)
5	FUEL LEVEL GAUGE (1.SIGNAL - 2.RESERVE WARNING)
6	GROUND
7	COOLANT LEVEL SENSOR
8	FEEDBACK PREHEAT
9	+ SUPPLY
10	FUEL PRE-FILTER / WATER IN FUEL
11	PANEL FUSES / RELAYS
12	FUEL PUMP
13	PRE -HEAT
14	ECU CONNECTOR

Connectors

Sheet - 1



X23			
Polo	ID	Sezione	Cross
1	PK	1	PB/1
2	BK	1	PB/2
3	GN/WH	1	PB/3
4	BK/WH	1	PB/4
5	PK/YL	1	PB/5
6	PU/BK	1	PB/6
7	WH/PK	1	PB/7
8	YL/BK	1	PB/8
9	WH/DR	1	PB/9
10	DR/BU	1	PB/10
11	PK/DR	1	PB/11
12	GY/BR	1	PB/12



PB			
Polo	ID	Sezione	Cross
1	PK	1	X23/1
2	BK	1	X23/2
3	GN/WH	1	X23/3
4	BK/WH	1	X23/4
5	PK/YL	1	X23/5
6	PU/BK	1	X23/6
7	WH/PK	1	X23/7
8	YL/BK	1	X23/8
9	WH/DR	1	X23/9
10	DR/BU	1	X23/10
11	PK/DR	1	X23/11
12	GY/BR	1	X23/12

X43			
Polo	ID	Sezione	Cross
1	GY/RD	1	PB/1
2	BR/YL	1	PB/2
3	PK/YL	1	PB/3
6	DR/PU	1	PB/6
7	BK/YL	1	PB/12
8	RD/DR	1	PB/5
9	GY/RD	1	PB/9
10	PU/BK	1	PB/8
11	GN/WH	1	PB/7
12	GN/BR	1	PB/10
13	BU/DR	1	PB/11
14	PU/YL	1	PB/14
15	BK/GN	1	PB/15
16	DR/BK	1	SPL DR/BK
17	GY/YL	1	PB/13
18	YL/GN	1	PB/16
19	GY/BU	1	PB/19
20	YL/GN	1	PB/18
21	GY/BU	1	PB/4



SPL DR/BK			
Polo	ID	Sezione	Cross
-	DR/BK	1	X43/16
-	DR/BK	1	PB/20

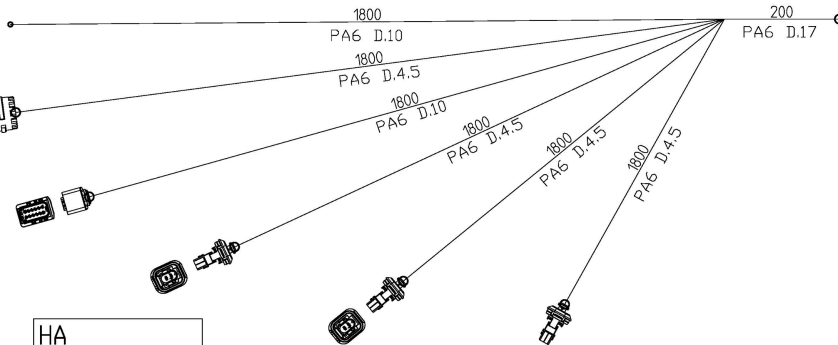
PB			
Polo	ID	Sezione	Cross
1	GY/RD	1	X43/1
2	BR/YL	1	X43/2
3	PK/YL	1	X43/3
4	GY/BU	1	X43/21
5	RD/DR	1	X43/8
6	DR/PU	1	X43/6
7	GN/WH	1	X43/11
8	PU/BK	1	X43/10
9	GY/RD	1	X43/9
10	GN/BR	1	X43/12
11	BU/DR	1	X43/13
12	BK/YL	1	X43/7
13	GY/YL	1	X43/17
14	PU/YL	1	X43/14
15	BK/GN	1	X43/15
16	YL/GN	1	X43/18
17	DR/BK	1	SPL DR/BK
18	YL/GN	1	X43/20
19	GY/BU	1	X43/19
20	DR/BK	1	SPL DR/BK

X46.1			
Polo	ID	Sezione	Cross
1	PU	1.5	PB/1
2	BK	1.5	PB/2



PB			
Polo	ID	Sezione	Cross
1	PU	1.5	X46.1/1
2	BK	1.5	X46.1/2

B90			
Polo	ID	Sezione	Cross
1	GN	1	PB/1
2	GY/BU	1	PB/3
3	YL/GN	1	PB/4
4	BK	1	PB/2



PB			
Polo	ID	Sezione	Cross
1	GN	1	B90/1
2	BK	1	B90/4
3	GY/BU	1	B90/2
4	YL/GN	1	B90/3
5	BK/YL	1	Y31/1
6	DR	1	Y31/4
7	DR	1	N3/5
8	YL	1	N3/6
9	GY/RD	1	N3/2
10	BR/YL	1	N3/3
11	PK/YL	1	N3/4
12	PU/YL	1	N3/8
13	DR/BK	1	N3/9
14	BK/GN	1	N3/10
15	GY/RD	1	N3/11
16	DR/PU	1	N3/12
17	DR	1	HA/1
18	BR	1	HA/2
19	DR	1	HB/1
20	BR	1	HB/2
21	DR	1	HC/1
22	BR	1	HC/2

Y31			
Polo	ID	Sezione	Cross
1	BK/YL	1	PB/5
4	DR	1	PB/6

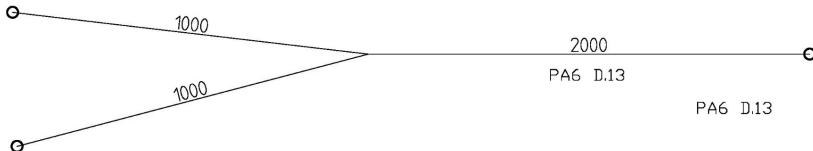
N3			
Polo	ID	Sezione	Cross
2	GY/RD	1	PB/9
3	BR/YL	1	PB/10
4	PK/YL	1	PB/11
5	DR	1	PB/7
6	YL	1	PB/8
8	PU/YL	1	PB/12
9	DR/BK	1	PB/13
10	BK/GN	1	PB/14
11	GY/RD	1	PB/15
12	DR/PU	1	PB/16

HA HEATER A			
Polo	ID	Sezione	Cross
1	DR	1	PB/17
2	BR	1	PB/18

HB HEATER B			
Polo	ID	Sezione	Cross
1	DR	1	PB/19
2	BR	1	PB/20

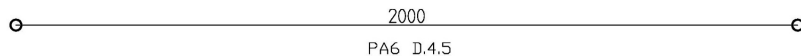
HC HEATER C			
Polo	ID	Sezione	Cross
1	DR	1	PB/21
2	BR	1	PB/22

RD10			
Polo	ID	Sezione	Cross
1	RD	10	PB/2



PB			
Polo	ID	Sezione	Cross
1	BK	1	BK10/1
2	RD	10	RD10/1

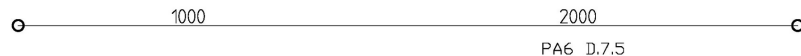
BK10			
Polo	ID	Sezione	Cross
1	BK	1	PB/1



D+			
Polo	ID	Sezione	Cross
1	DR	1	PB/1

PB			
Polo	ID	Sezione	Cross
1	DR	1	D+/1

HP
HEATER PLUG



PB

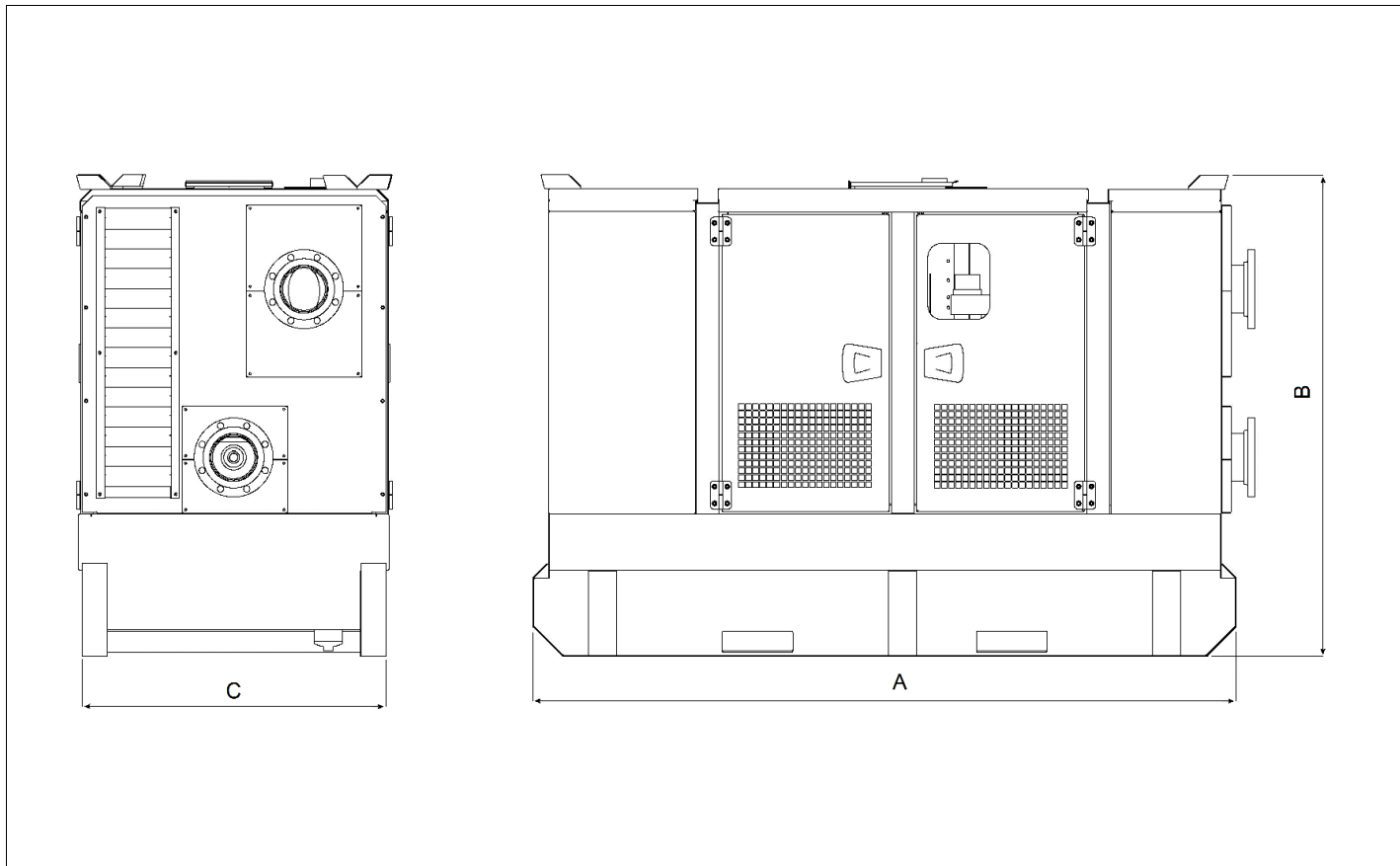
10 Technical specifications

10.1 Technical specifications of unit/engine/pump

FEATURES		
Pump model	Engine model	
	PAS 100 HF	PAS 150 HF
Connection (mm/in)	100/4"	150/6"
Weight (kg)	-	-
Fuel tank capacity (l)	355	355
Solids handling (mm)	76	76
Dimensions A B C (mm)	-	-
Engine		
Brand	DEUTZ D2.9L4	DEUTZ TD2.9L4
Displacement (cm ³)	2900	2900
Cylinders	4	4
Cooling System	Water cooled	Water cooled
Exhaust emission compliance	Tier 4 Final	Tier 4 Final
Lubrication oil capacity (l)	8.9	8.9
Coolant capacity (l)	10	10
Adblue tank capacity (l)	NA	NA
Combustion system	Normally aspirated	Turbo common rail
Pump Data		
Max speed (rpm)	2200	2200
Flow max (m ³ /h)	280	520
Head max (m)	51	51
Diaphragm vacuum pump (m ³ /h)	50	50

FEATURES		
	PAS 100 HF	PAS 150 HF
Vacuum pump oil tank (l)	1.8	1.8
Mechanical seal oil tank (l)	1.5	1.5
Non return check valve	Ball type	Ball type

10.2 Dimension Drawing - PAS 100-150 HF



10.3 Torque values

10.3.1 General torque values

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

For hexagon screws and nuts with strength grade 8.8

Thread size	Torque value (Nm / lbf.ft)
M6	9 (6.64)
M8	23 (16.97)
M10	46 (34.69)
M12	80 (59.04)
M14	125 (92.25)
M16	205 (151.29)

For hexagon screws and nuts with strength grade 12.9

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



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

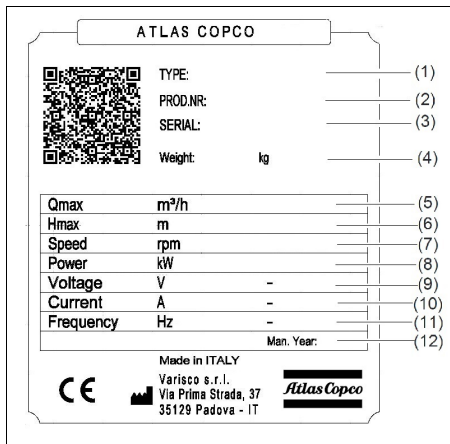
10.3.2 Critical torque values

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



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

10.4 Data plate

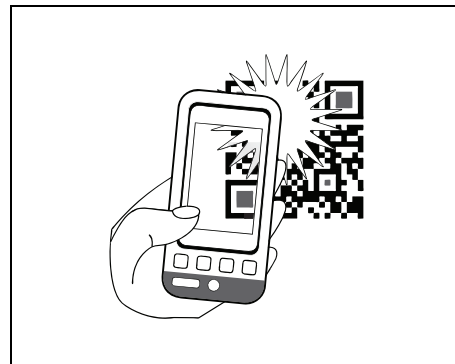


Every electrically driven pump is equipped with an identification plate which gives the following information:

- 1 Type of unit
- 2 Product Number
- 3 Serial Number
- 4 Weight (kg)
- 5 Max capacity of the pump (m³/h)
- 6 Max head (m)
- 7 Max speed (rpm)
- 8 Power (kW)
- 9 Voltage (V)
- 10 Current (A)
- 11 Frequency (Hz)
- 12 Year of Manufacture

The values indicated on the nameplate refer to testing with water at 20°C and with a density 1000 kg/m³.

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 smartphone or tablet will lead you to a website with additional information about your pump.



Some parts of this website may be password protected.

11 Spare parts

11.1 Ordering spare parts

For spare parts see parts list.

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

- Pump type.
- Pump serial number
- Quantity required.
- Part number.
- Part description.

Following documents are provided with this unit:

- Test Certificate
- EC Declaration of Conformity:

Atlas Copco

EC DECLARATION OF CONFORMITY

1 We, Varisco S.p.A., declare under our sole responsibility, that the product

2 Machine name : **ENGINE DRIVEN PUMP**

3 Commercial name :

4 Serial number :

5 Which falls under the provisions of the article 12.2 of the EC Directive 2006/42/EC on the approximation of the laws of the Member States relating to machinery, is in conformity with the relevant Essential Health and Safety Requirements of this directive.

The machinery complies also with the requirements of the following directives and their amendments as indicated.

Directive on the approximation of laws of the Member States relating to	Harmonized and/or Technical Standards used	Att' mnt
6 Machinery safety	2006/42/EC EN ISO 12100-1 EN ISO 12100-2 EN 1012-1 EN ISO 9906	
7 Electromagnetic compatibility	2004/108/EC EN 61000-6-2 EN 61000-6-4	
8 Outdoor noise emission	2000/14/EC ISO 3744	x

9 The harmonized and the technical standards used are identified in the attachments hereafter

10 GRUPOSI Elettrogenesi Europa, S.A. is authorized to compile the technical file

11	Conformity of the specification to the Directives	Conformity of the product to the specification and by implication to the directives
12 Issued by	Engineering manager	Manufacturing
13 Name	Antonio Tilomanlio	Wim Moors
14 Signature		

15 Place , Date Padova, Italy

VARISCO S.p.A. A company within the Atlas Copco Group

Form 3061 6/06/07 Postal address Phone: +39 049 8294111 L.V.A. 0020908282
 ed. 03.2015 09.21 Tasca Strada, 9 - Z.I. Nord Fax: +39 049 8070762
 35128 PADOVA Italy For info, please contact your local Atlas Copco representative
 Italy www.atlas-copco.com

p. 1/10

- Outdoor Noise Emission Directive 2000/14/EC:

Atlas Copco

Outdoor Noise Emission Directive 2000/14/EC

1. Conformity assessment procedure followed : Full Quality Assurance

2. Name and address of the notified body :

3. Measured sound power level :

4. Guaranteed sound power level :

VARISCO S.p.A. A company within the Atlas Copco Group

Form 30106/0007 Postal address Phone: +39 049 8284111 I.V.A. 02005980282
ed. 00_2014.07.04 Terza Strada, 9 - Z.I. Nord Fax: +39 049 8076762
35128 PADOVA
Italy
www.atlas-copco.com

For info, please contact your local Atlas Copco representative

p.2/10

