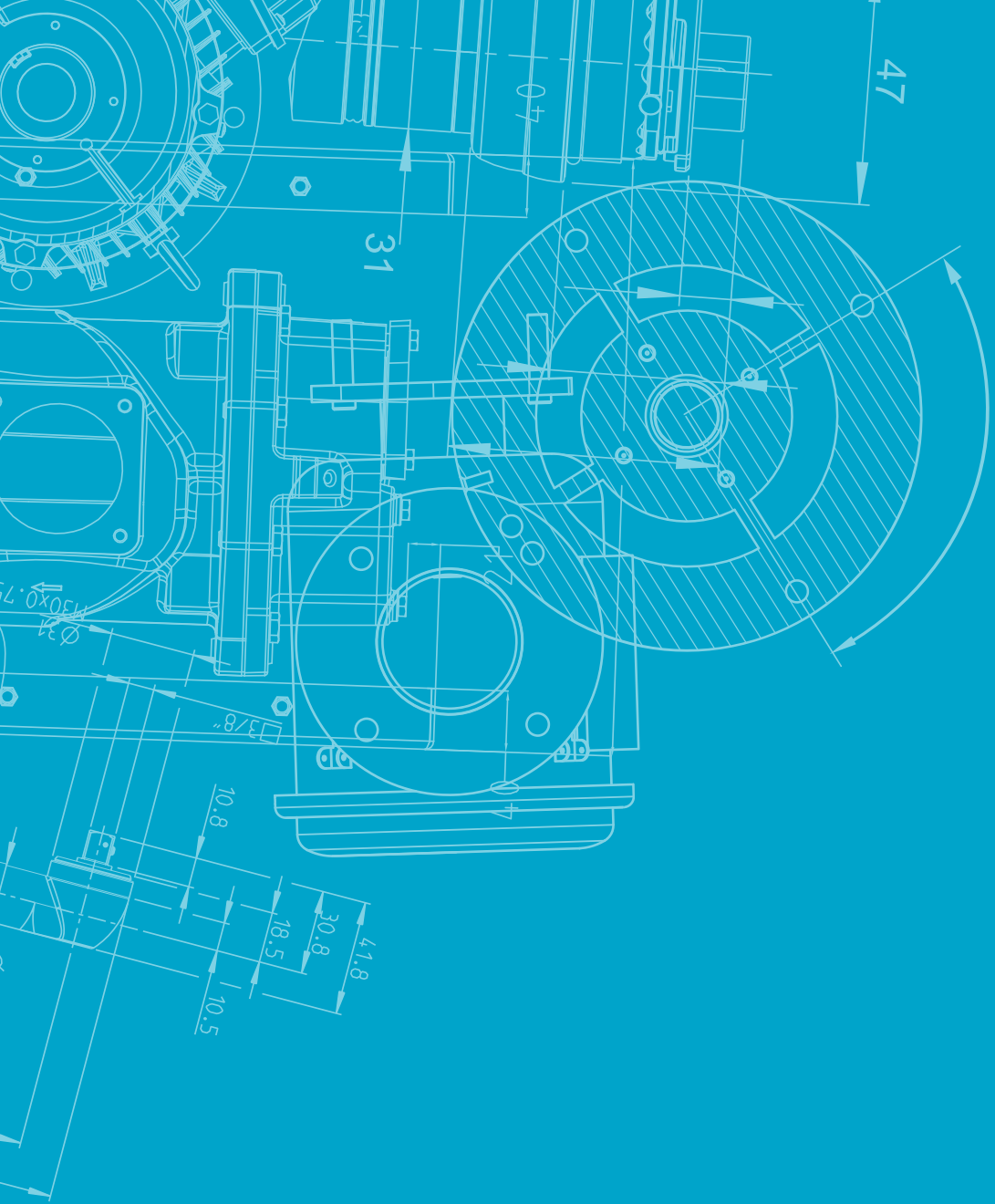

Instruction book

PAC Series Pump

PAC H43C 305 ANZ ITH
DEUTZ TD2.9L4 T3

Atlas Copco

PAC Series Pump

PAC H43C 305 ANZ ITH

Instruction book

Original instructions

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1 Safety precautions for pumps

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 motor 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.
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 arrestor 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 reinstalled before operating the machine.
11. Never operate the unit in surroundings where there is a possibility of taking in flammable or toxic fumes.
12. If the working process produces fumes, dust or vibration hazards, etc., take the necessary steps to eliminate the risk of personnel injury.
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 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.
15. 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.
16. 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.
17. 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.
18. 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.
19. Never operate the pump in excess of its limits as indicated in the technical specifications.

20. Never operate the unit in a humid atmosphere. Excessive moisture causes worsening of the insulation.
21. 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.
22. Whenever an abnormal condition arises, e.g. excessive vibration, noise, odor, etc., stop the engine. Correct the faulty condition before restarting.
23. 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.
24. When operating the pump in Remote or Auto mode, observe all relevant local legislation.
25. If the pump does not prime, do not operate it for more than 2 minutes to avoid overheating the liquid and damaging the seal.
26. 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.
27. 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.
28. 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 - 12 - 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 steamcleaning.
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 is only guaranteed when it used according the specifications in this manual. The limits as indicatedare not be exceeded under any circumstances.

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

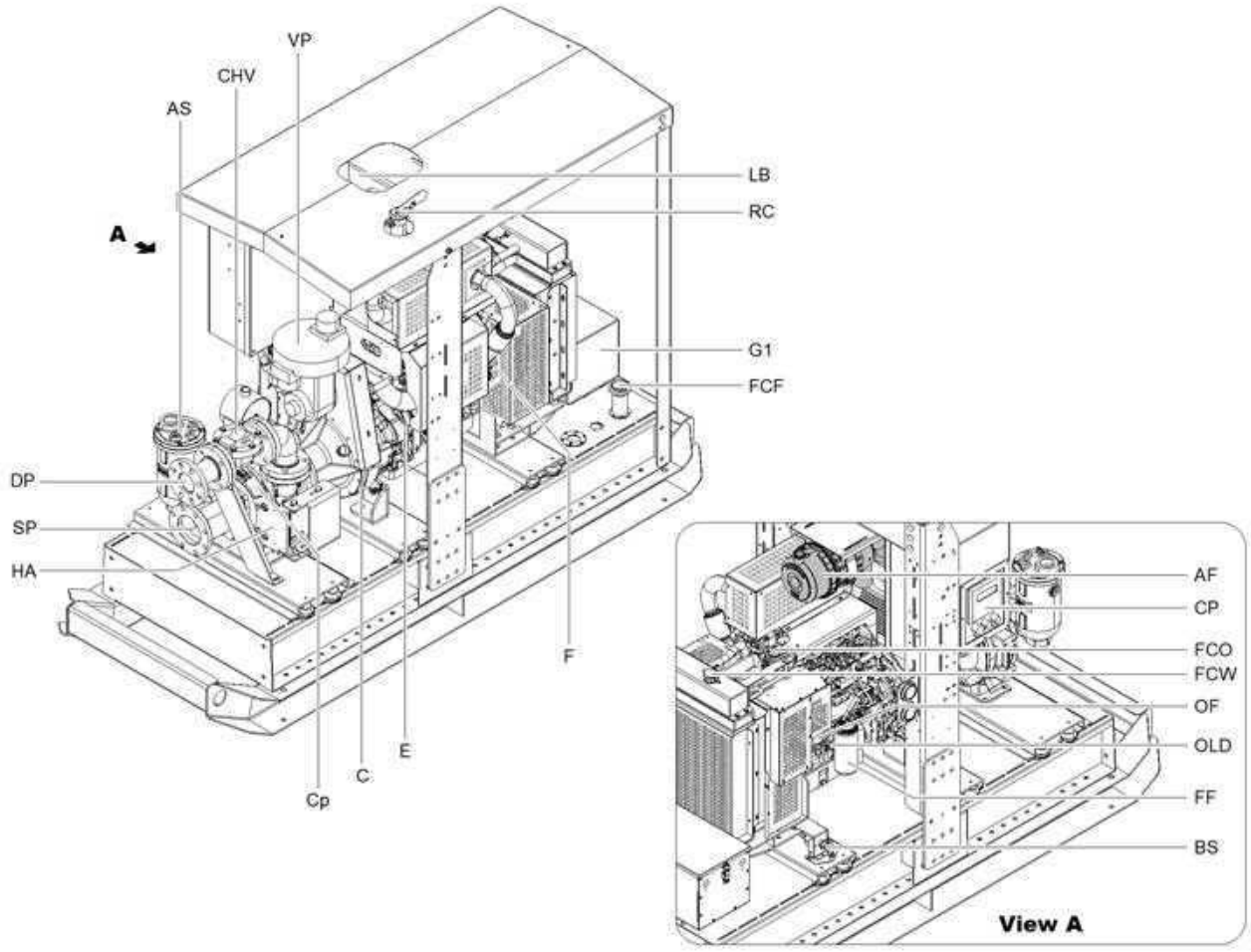
Caustic, slightly inflammable and other explosive substances such as petrol, petroleum, diluted nitrogen, greases, oils, salt water and waste water from toilets as well as sludgy water has a slowerflow capacity than water, should not be transported using the pump.

2 Main parts

2.1 General description

PAC H43C dry-prime centrifugal pumps, are suitable for handling clean water or liquids up to 50°C.

The PAC H43C pumps are driven by a fluid-cooled diesel engine, manufactured by DEUTZ. An overview of the main parts is given in the diagram below.



Reference	Description
AF	Air filter
AS	Air separator
BS	Battery switch
C	Coupling
Cp	Centrifugal pump
CP	Control Panel
CHV	Check valve assembly
DP	Discharge pipe

Reference	Description
E	Engine
F	Fan
FCF	Filler cap fuel
FCO	Filler cap engine oil
FCW	Filler cap coolant
FF	Fuel filter
G1	Battery
HA	Hinge assembly
LB	Lifting beam
OF	Oil filter
OLD	Oil (engine) level dipstick
RC	Rain cap
SP	Suction pipe
VP	Vacuum pump

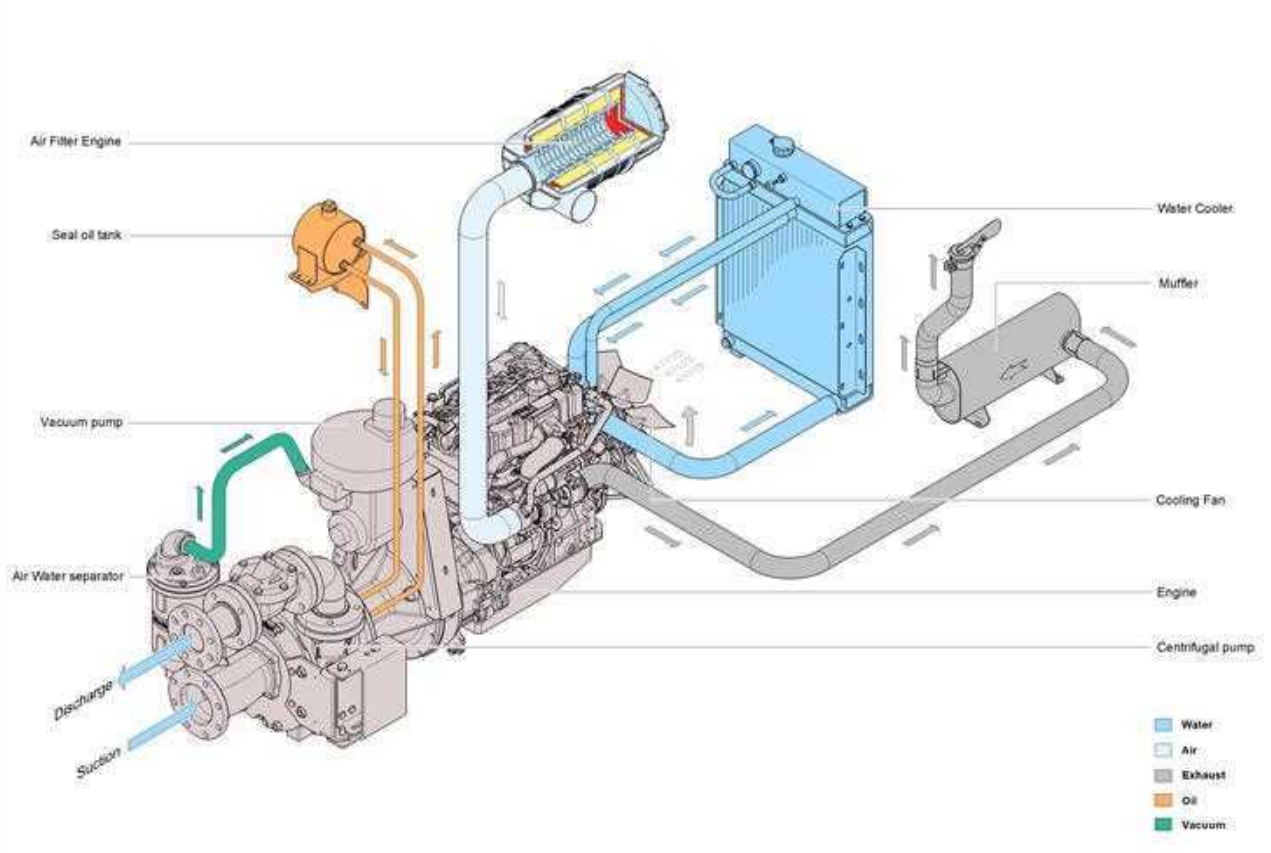
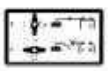


Figure 1: Flow Diagram

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.

Markings	Description
	Indicates the presence of electric shock hazards. Enclosures marked with these symbols should only be opened by trained or instructed people.
	Indicates that these parts can become very hot during operation (e.g. engine, cooler, etc.). Always make sure that these parts are cooled down before touching them.
	Indicates potential Mechanical hazard - Belts
	Indicates potential Mechanical hazard
	Indicates a lifting point of the unit.
	Indicates the battery switch.
	Read the instruction manual before using the lifting eye.
	Read the instruction manual before servicing.
	Indicates the 3-way valve.

2.3 Field of application

The PAC H43C pumps are suitable for handling clean 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:

- PAC H43C - 20 mm

The maximum density is 1.1 kg/dm^3

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

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

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

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

2.4 Mechanical features

The mechanical features described in this chapter are standard features of this pump. For all other mechanical features, see section 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 fluidcooled 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 is protected by roof, the unit can be lifted by using the lifting eye integrated in the bodywork (roof). To be able to lift the PAC H43C 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.

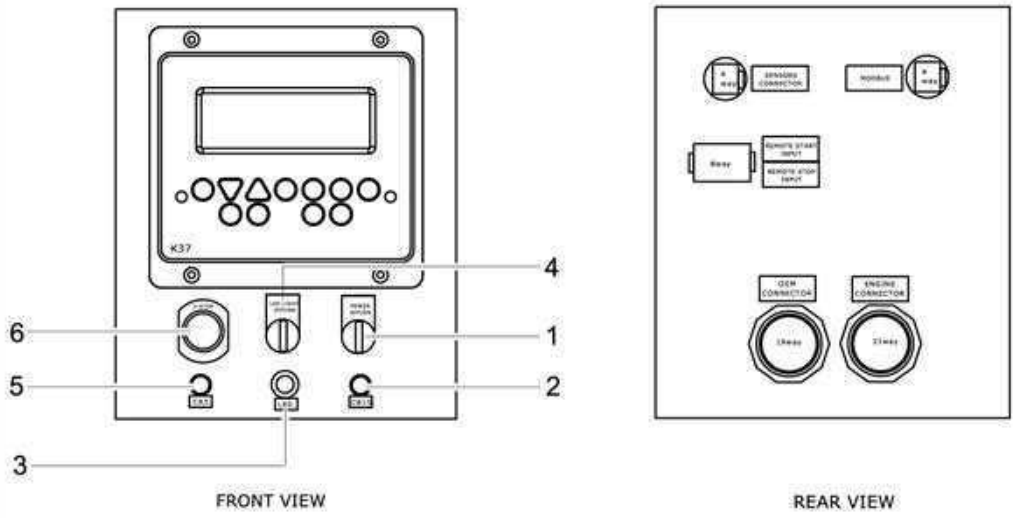
The leaking fluid can be removed via drain holes, secured by drain plugs. Tighten the plugs firmly and check for leakages. When removing the leaking fluid, observe all relevant local legislation.

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 Contoller K37

The pump is fitted with K37 controller. This is located at front side of the machine and communicates via a display section in the front. It carries out the entire necessary task to control and protect the Pump.



Reference	Description
1	Power switch
2	Circuit breaker 3A
3	LED blue lights
4	Work lights switch
5	Circuit breaker 3A
6	Emergency stop

K37 Control Module

Figure 2: DISPLAY MAIN SCREEN

The main screen is divided into Information and ICON zones.

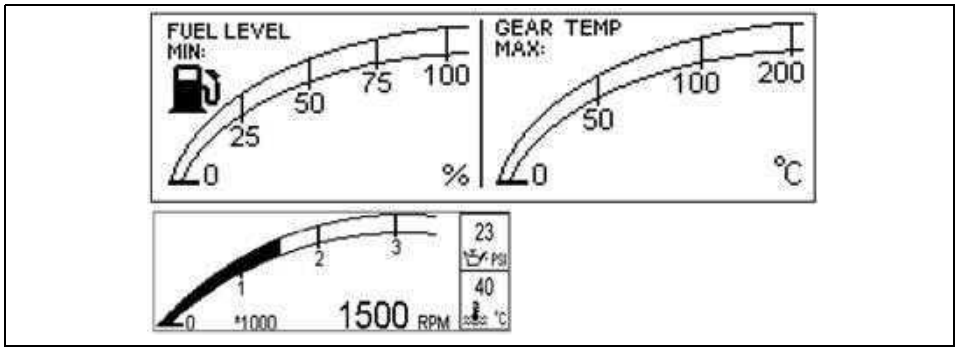


Figure 3: GAUGE SCREENS

Button	Description
	The MENU button allows access to the menu structure. Pressing once on the main screen will enters to the menu. Further presses cycle back through the various menus.

Button	Description
	At the default screen, pressing ENTER will cycle through the engine and pump data and graphical gauge screens. When in the menu structure, pressing this button will enter a sub menu. This button is also used to confirm changes.
	The UP/DOWN button allows for scrolling through menu items and the increasing/decreasing of various values. When the screen is in the main screen, the engine speed is decreased when the throttle is enabled. This is signified on the keypad by the Rabbit/Turtle Symbol.
	
	The AUTO button will place the K37 into Automatic mode. The status line will change from READY to AUTO. If a remote start condition exists, the engine will go in the start sequence.
	The STOP button will stop the engine. Pressing STOP a 2nd time will bypass the cool down timer and stop immediately. It was also cause the controller to return to Manual Mode.
	The START button in manual mode will initiate the engine start sequence. Once the engine has started the protections are in place for the engine and given sensors BUT throttling (if enabled) is done by the user using the UP and DOWN arrows.
	Will shutdown the engine when the 7 Day Timer or Set Stop Timer is active. Pressing HALT again will start the engine again; continuing the current 7 Day Timer or Set Stop Timer running cycle.
	Enters the Set Timer menu.
	Will Display any current ECU warnings that may be present. Pressing this button will also return the default screen.
	Button for Tier 4 emission engines. Pressing this button can cancel or force a diesel particulate regeneration sequence.

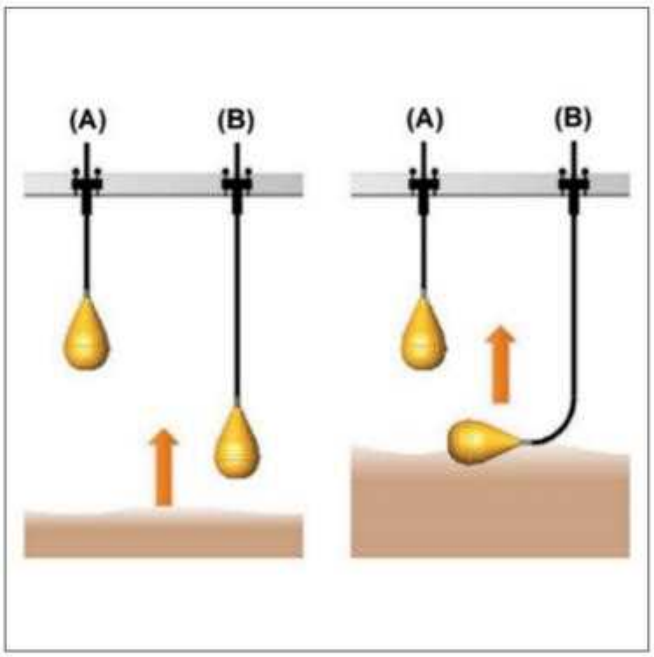
2.6.1 Float switches

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

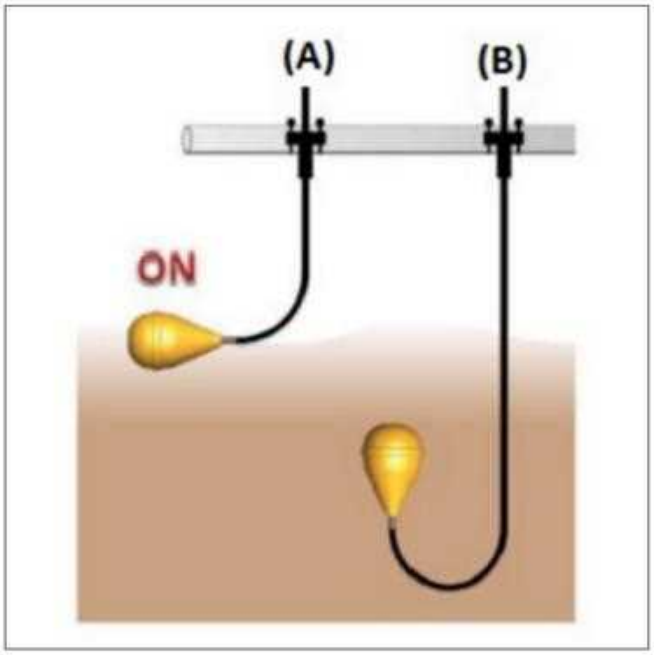
Set the float switches in such a way that frequent starting/stopping is minimized.

Operating procedure:

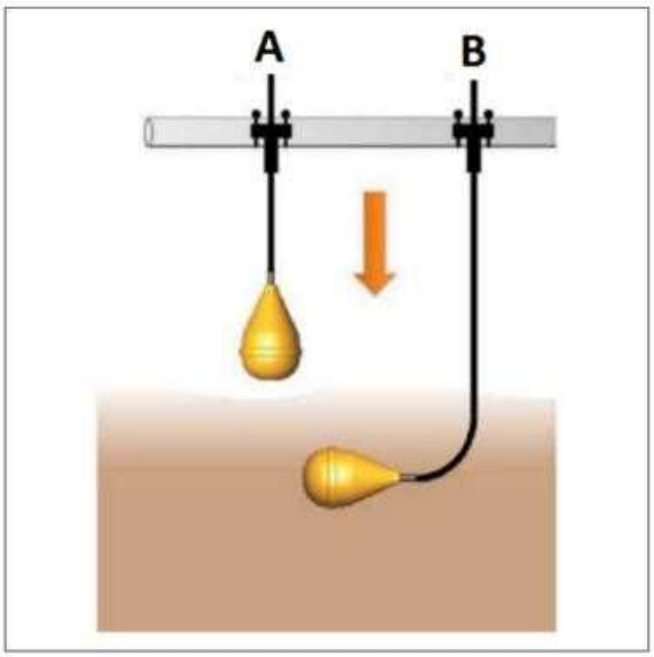
1. Connect the float switches as follows:
   - Connect the Start float to Connector indicated by label “A Start float”.
   - Connect the Stop float to Connector indicated by label “B Stop float”.
2. Put the controller in Auto mode.
3. The pump operates as follows:
   - The tank fills:



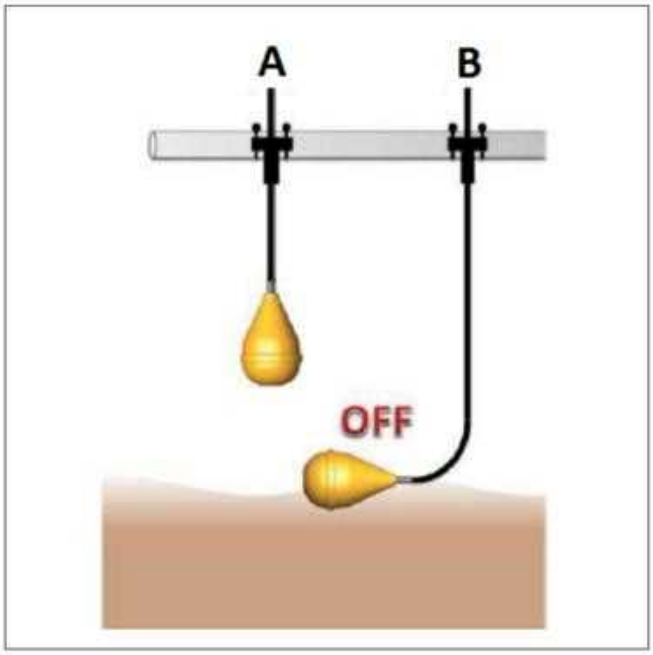
- High level starts the pump:



- The tank drains:



- Low level stops the pump:



2.7 Setting K37

2.7.1 Acknowledge an alarm and faults

General setting is a non password protected area that allows a small subset of parameters to be changed.

Parameter	Function description
Engine run speed	Desired speed of engine at load when in auto and throttle type is GOTO FIXED RPM.
Line fill speed	After the warm up timer has elapsed the engine (when in auto) will throttle to this speed according to the adjustable Line fill time set to fill irrigation lines.
Line fill time	After the warm up timer has elapsed the engine (when in auto) will throttle to Line fill speed according to the adjustable time set to fill irrigation lines.
MaxRPM @ variable	Indicates how high the engine RPM wll throttle to if target value is not being achieved, when throttling with respect to pressure or flow.
MinRPM @ variable	Indicates how low the engine RPM will throttle to if Pump pressure/flow is over target value, when throttling with respect to pressure or flow.

3 Installation and connection

3.1 Lifting

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

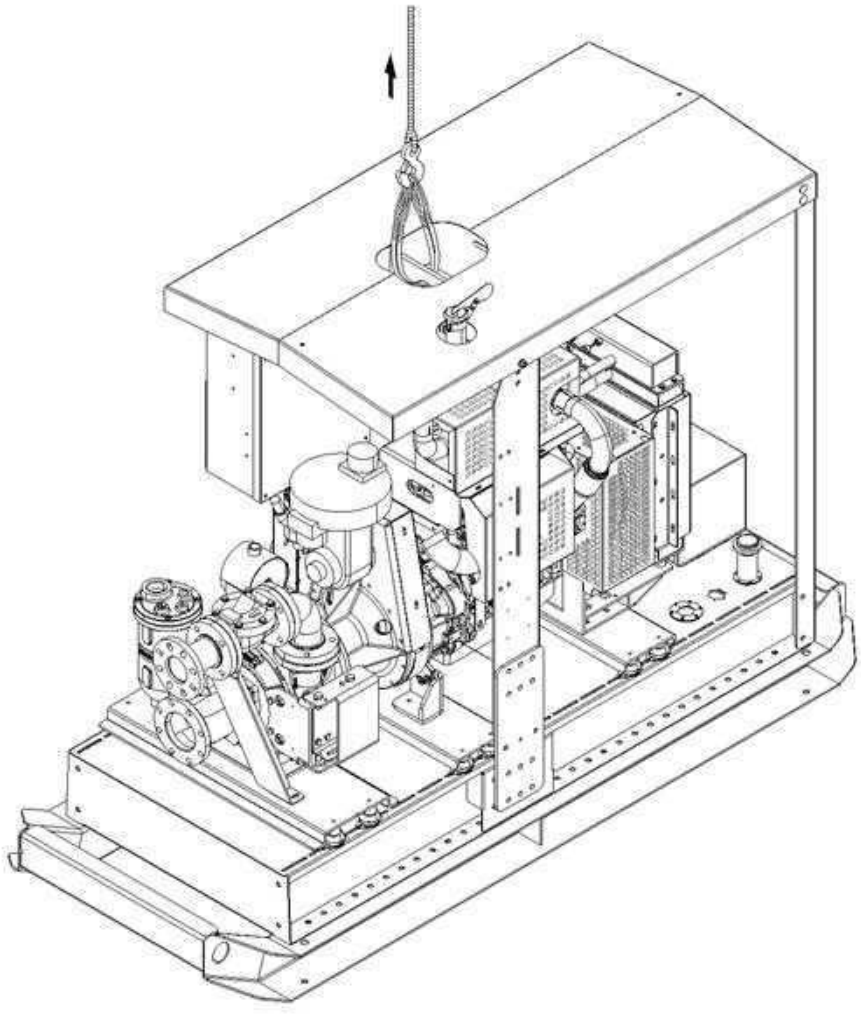
When lifting the unit, the hoist has to be placed in such a way that the pump, which must be placed level, will be lifted vertically.

The machine can be lifted (attention, with the empty tank), at the loading surface, in following way see figure:

Warning: Do not hook the ropes to parts of the engine or pump.

Warning: Never use the guiding rods to lift the unit.

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



- With an appropriate hoist, equipped with scale of an adequate capacity.

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

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

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

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

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.

3.2 Installation

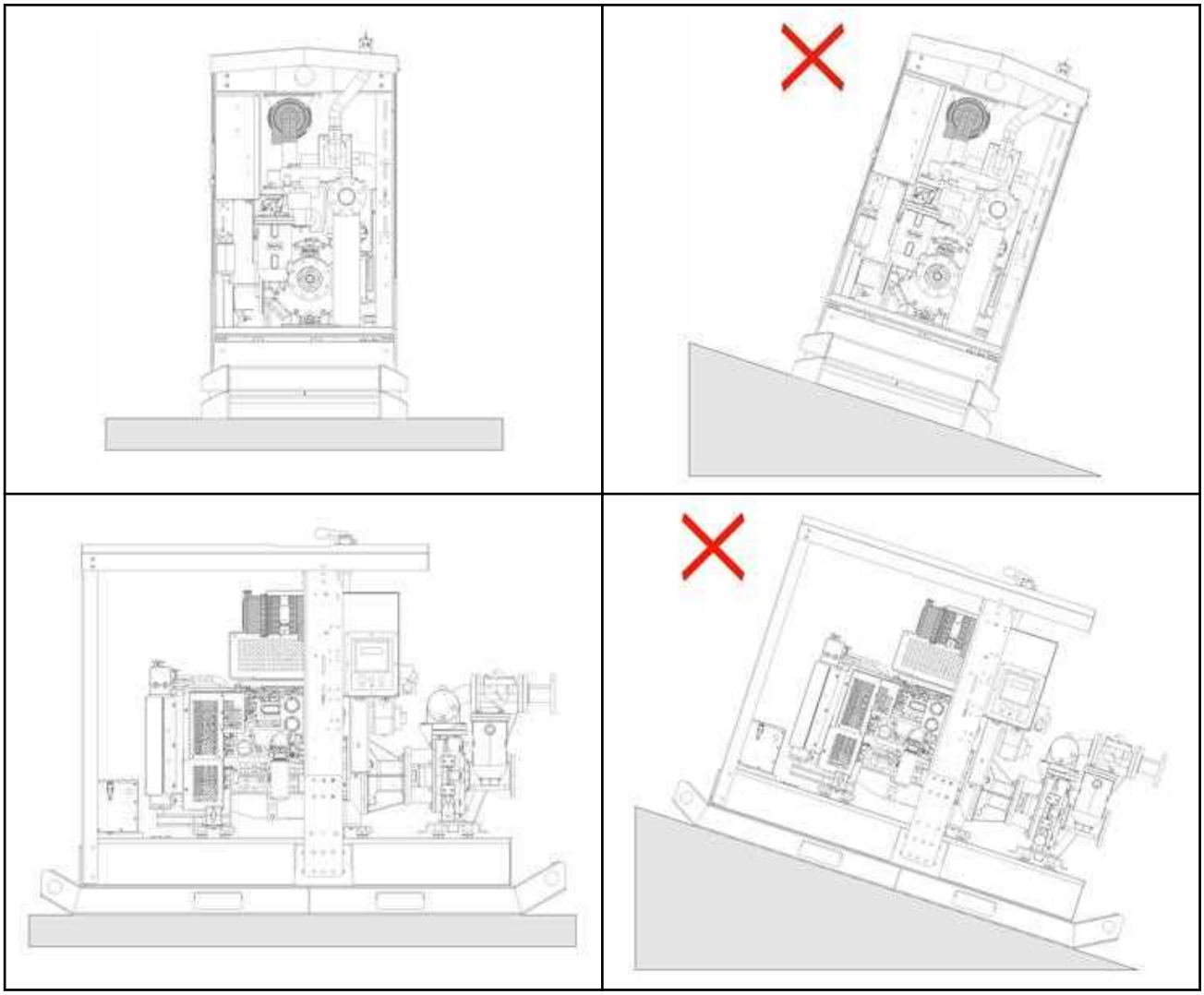
3.2.1 Indoor installation

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.

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



Suction and discharge pipework

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

- Prevent excessive external loads on piping.
- Support the pipelines to prevent distortion of pump components.
- Never draw piping into place by applying force to pump flange connections.
- Clean the hoses or pipes thoroughly before connecting them to the pump.
- In case of using hazardous liquids, ensure that the piping is arranged to allow pump flushing before pump removal.
- In order to minimize friction losses and hydraulic noise in the pipework it is a good practice to choose pipework that is one or two sizes larger than the pump suction and discharge. In the same way, bends in the suction should be avoided as much as possible. Atlas Copco recommends fluid velocities up to 2 m/s (6 ft/sec) on the suction and 3 m/s (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 PAC43C 305 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.

Warning: Never use the pump as a support for piping.

4 Maintenance

4.1 Maintenance schedule

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

Regular service period	Each start up	Every 250 hrs	Every 500 hrs	Months
Pump core				
Check mechanical seal oil level	x			
Replace mechanical seal oil			x	12
Check seal leacks			x	
Replace seal kit				*
Check impeller and wearplate on shut off		x		**
Regrease bearings		x		24
Replace grease bearings			x	24
Replace bearings				***
Check rubber coupling				*

Table 1: Maintenance schedule - PAC43C 305

Note: * - Replace when necessary

Note: ** - Use wear kit when necessary

Note: *** - 5000 hour at BEP

Regular service period	Each startup	Every 250 hrs	Every 500 hrs	Every 1000 hrs	Months
Vacuum pump					
Check oil level	x				
Replace oil			x		6
Check max vacuum		x			
Replace rubber parts kit **				x	24
Check belt tension		x			
Replace belt				x	24

Note: ** - With Membrane vacuum pumps

Regular service period	Every 250 hrs	Every 500 hrs	Every 1000 hrs	Every 3000 hrs	Months
Engine					
Replace oil and oil filter		x	x		12
Replace fuel filter		x	x		12
Replace fuel prefilter			x		12
Replace air filter		x	x		12
Replace coolant liquid				x	12
Replace V belt			x		24
Separator					
Check and clean separator	x				
Replace separator gaskets			x		24
NRV					
Check NRV flap	x				
Replace NRV flap and gasket			x		24

4.2 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

Note: 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.

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

INSPECTION AND CHECKS

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

DISCHARGE OF RESIDUAL WATER OF THE PUMP

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

LUBRIFICATING THE PUMP

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

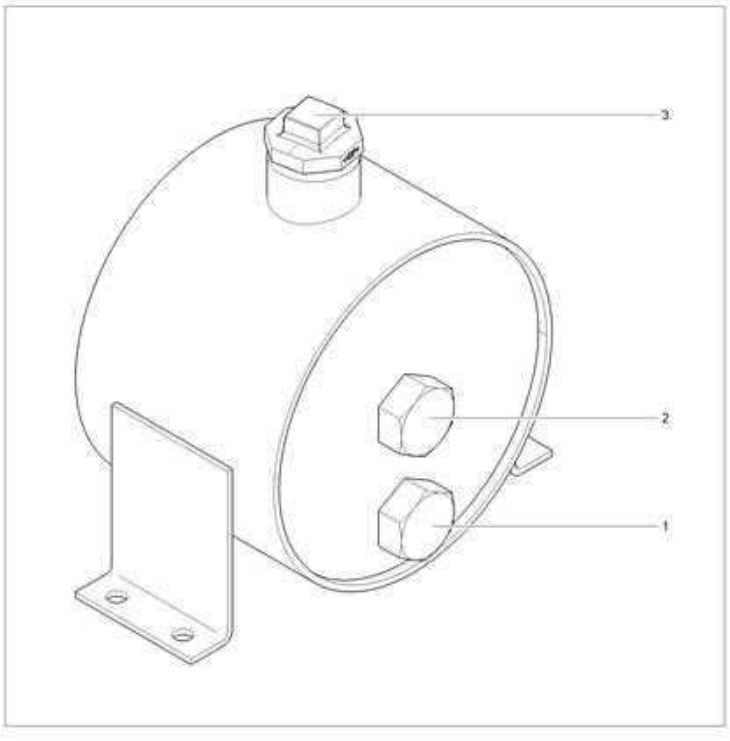
MECHANICAL SEAL CHECK

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 schedule.

Always use PAROIL E.

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



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

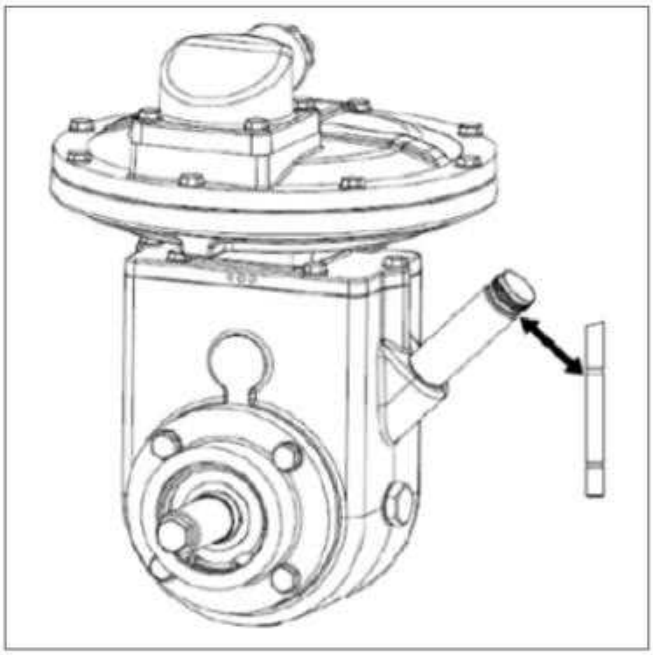
LUBRIFICATING THE DIAPHRAGM VACUUM PUMP

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

Running the vacuum pump with an insufficient amount of oil can damage it.

The vacuum pump is equipped with an oil filler extension to prevent this; 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.



4.3 Adjustments and sevice procedures

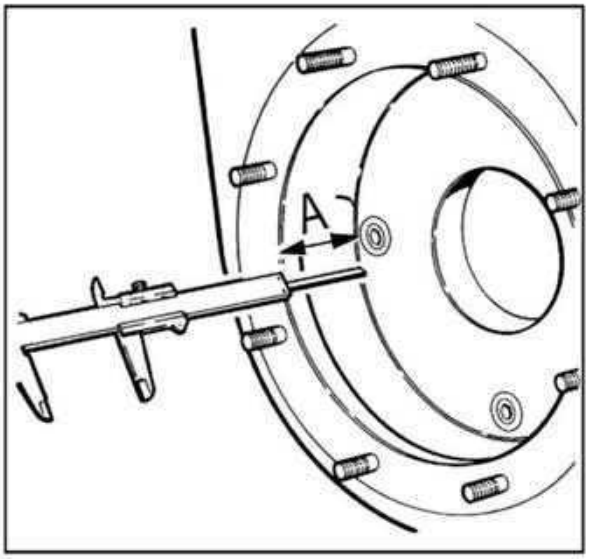
4.3.1 Positioning the impeller with reference to the wear plate(s)

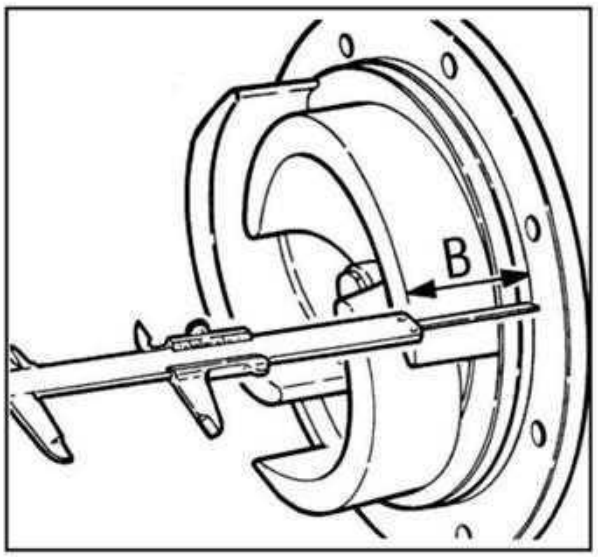
In all models, the distance between the top of the impeller blades and the surface of the wear plate must be between 0.3 - 0.6 mm.

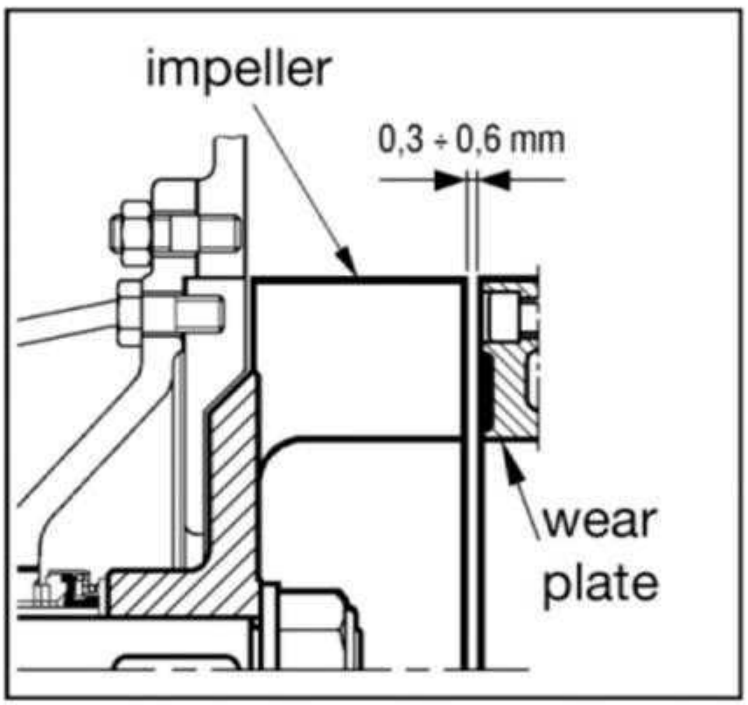
To achieve this, dimensions A and B must be as nearly as possible equal.

To this end, use the shims supplied with spare mechanicals seals. These shims are used to move the impeller further forward if it is too far from the front wear plate or too near the rear wear plate (when foreseen). The shims should be mounted between the seal support ring and the impeller.

Further adjustments can be carried out using casing gaskets and rear wear plate gaskets. The presence of the casing gasket 0.5 mm thick then creates the correct distance.



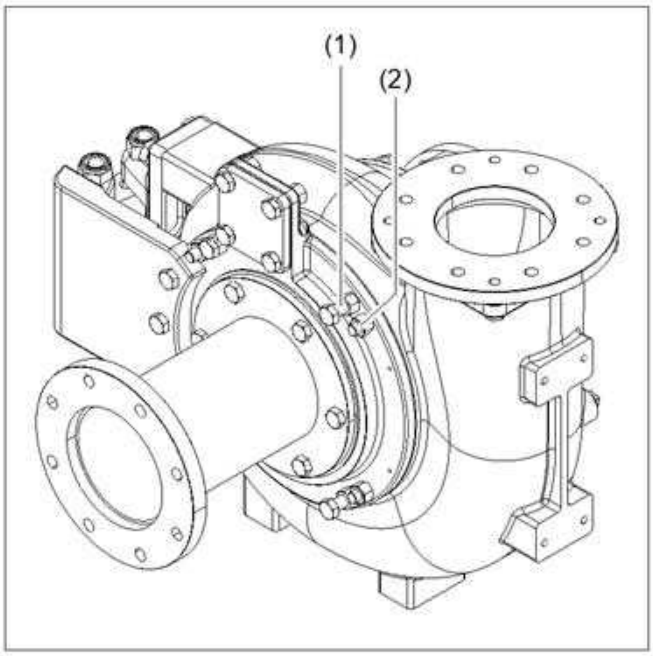




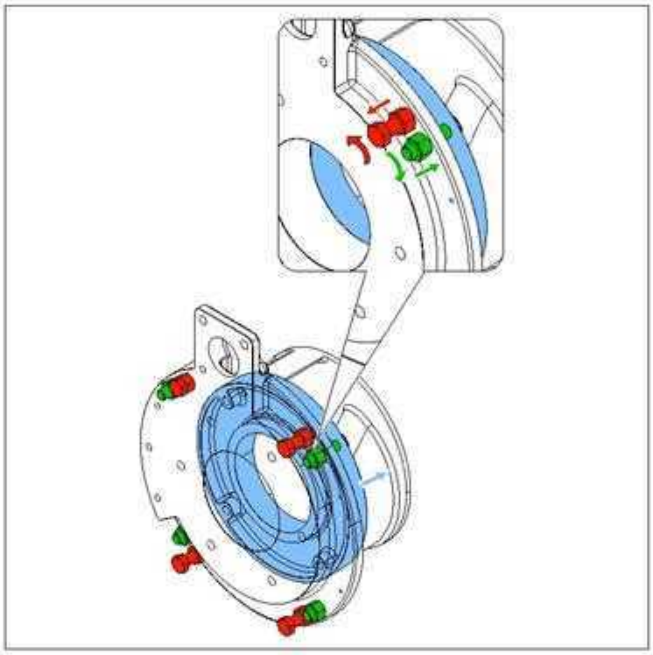
4.3.2 Servicing of impeller

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.

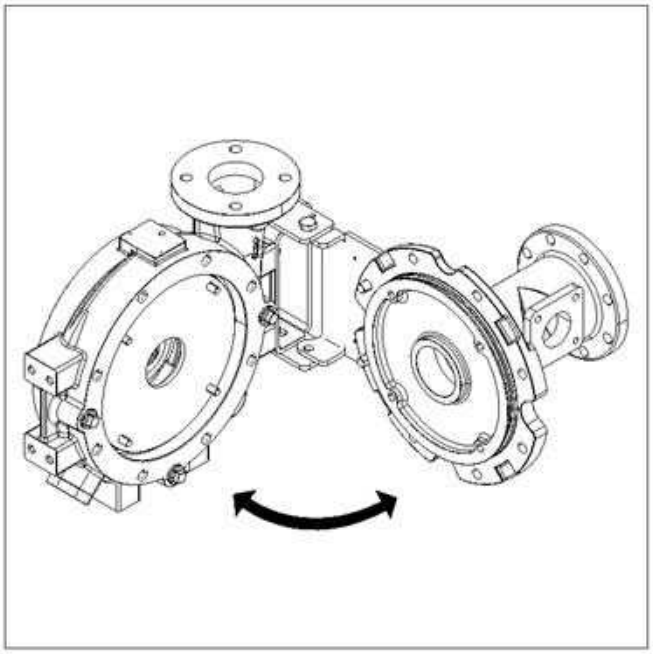


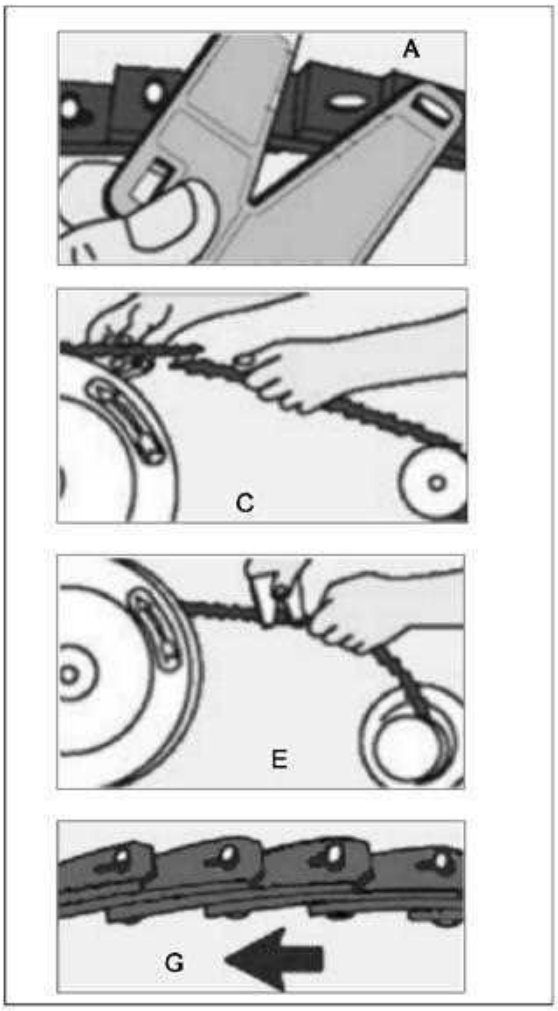
To adjust the wear plate untighten the (1) nuts (x4) and tighten the (2) bolts (4x).

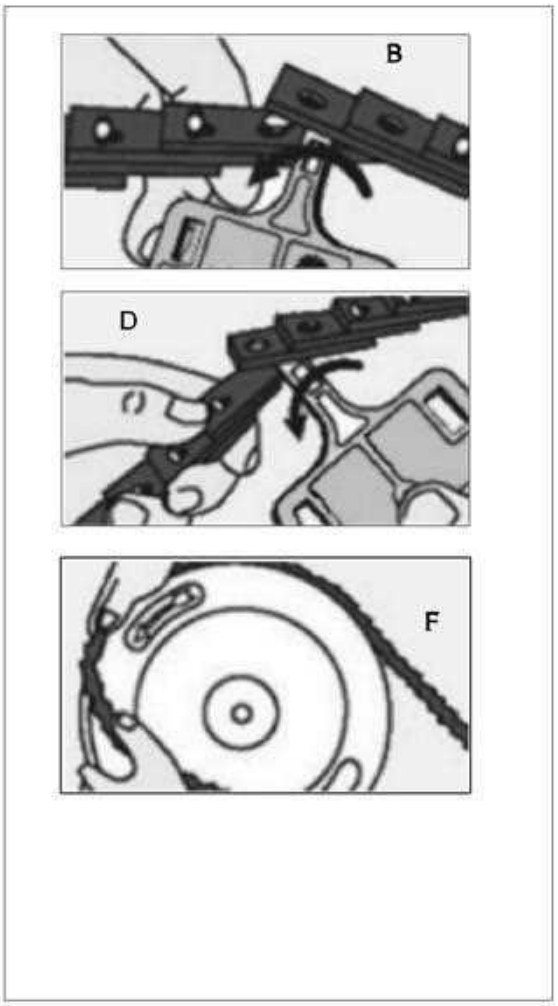


Pump Hinge

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.




A
C
E
G


B
D
F

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.

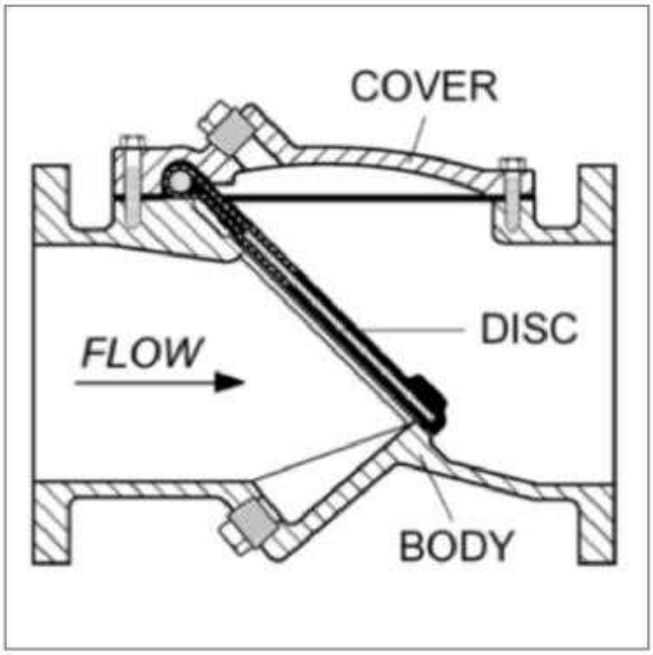
Place the belt on the pulley (shaft side), close the belt in a loop and place it around the pulley on the vacuum pump side, Fig.C.

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.

4.3.3 Inspection check valve - Valmatic



The Check Valve requires no scheduled lubrication or maintenance. For service or inspection, the valve can be serviced without removal from the line. All work on the valve should be performed by a skilled mechanic with proper tools and a power hoist for larger valves. Disassembly may be required to inspect the disc for wear or the valve for deposits.

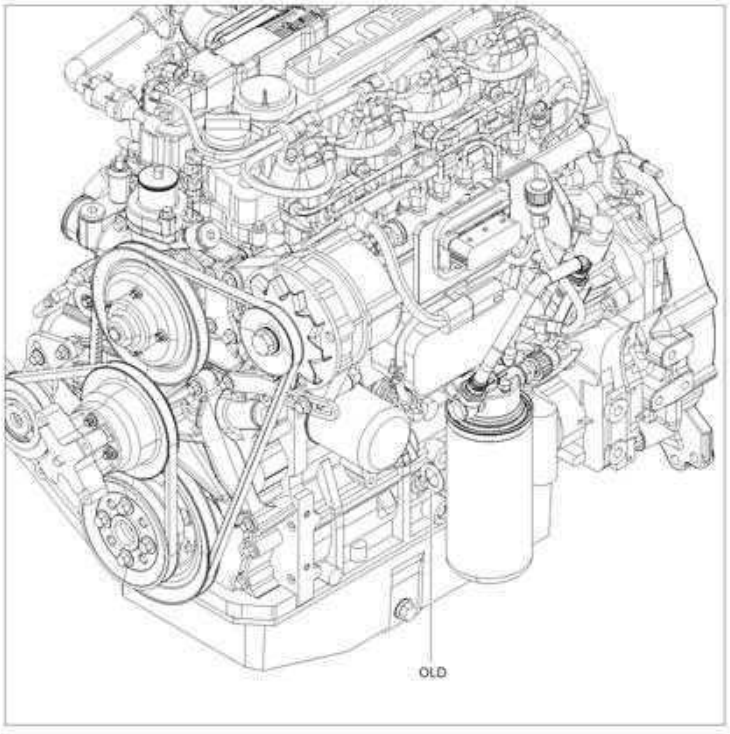
If there are deposits they should be removed and if the rubber disc is damaged it must be replaced.

4.4 Engine maintenance procedures

4.4.1 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 schedule.

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



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

Refer to the Engine Operation Manual for more detailed instructions.

4.4.2 Engine oil and oil filter change

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

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

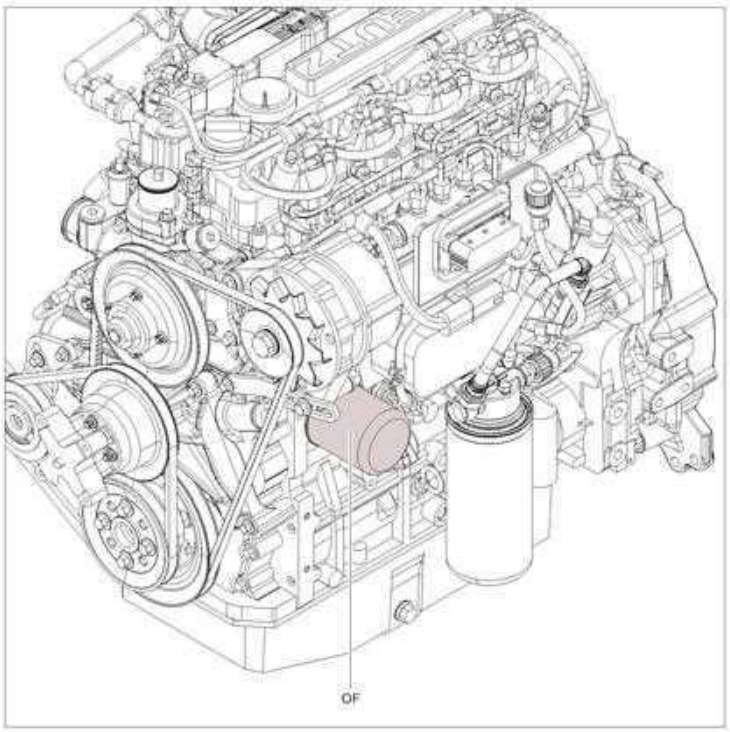


Figure 4: Replacing the oil filter element

Warning: Observe all relevant environmental and safety precautions.

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

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

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

4.4.3 Coolant check

Monitoring coolant condition

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

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

Visual check

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

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

pH measurement

- Check the pH value of the coolant using a pH measuring device.
- The pH-meter can be ordered from Atlas Copco with part number 2913 0029 00.
- Typical value for EG = 8.6.
- If the pH-level is below 7 or above 9.5, the coolant should be replaced.

Glycol concentration measurement

- To optimise the unique engine protection features of the PARCOOL 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.

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

Topping up of coolant

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

Replacing the coolant

Drain

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

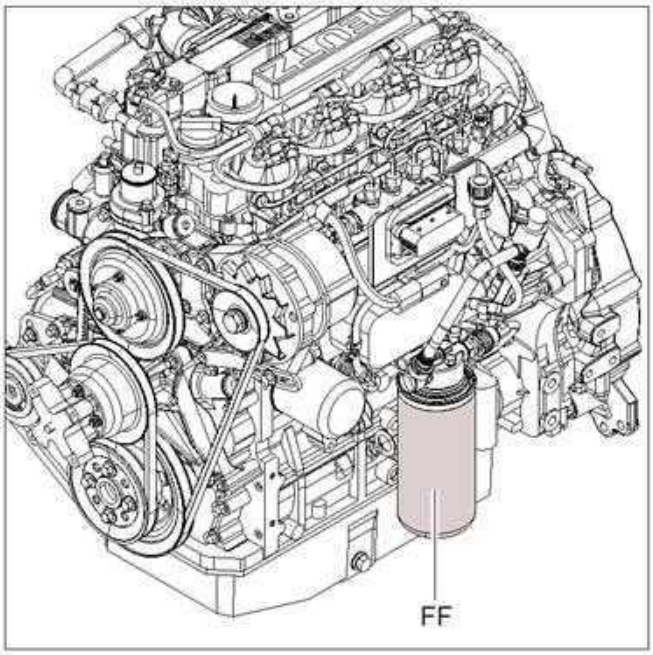
Flush

- Flush twice with clean water. Used coolant must be disposed or recycled in accordance with laws and local regulations.
- From the Atlas Copco Instruction book, determine the amount of PARCOOL 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.

4.4.4 Replacing fuel filter element

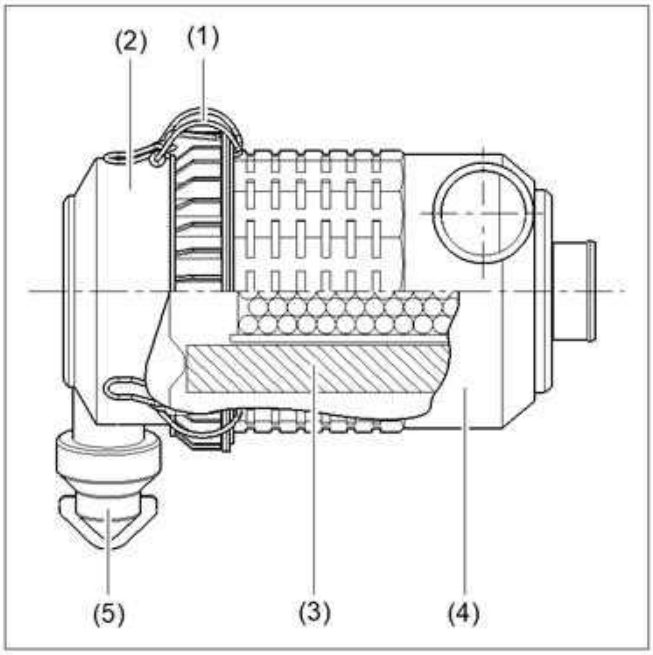


Replacing the filter element:

- 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.

4.4.5 Servicing air filter engine

Main parts



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

Recommendation

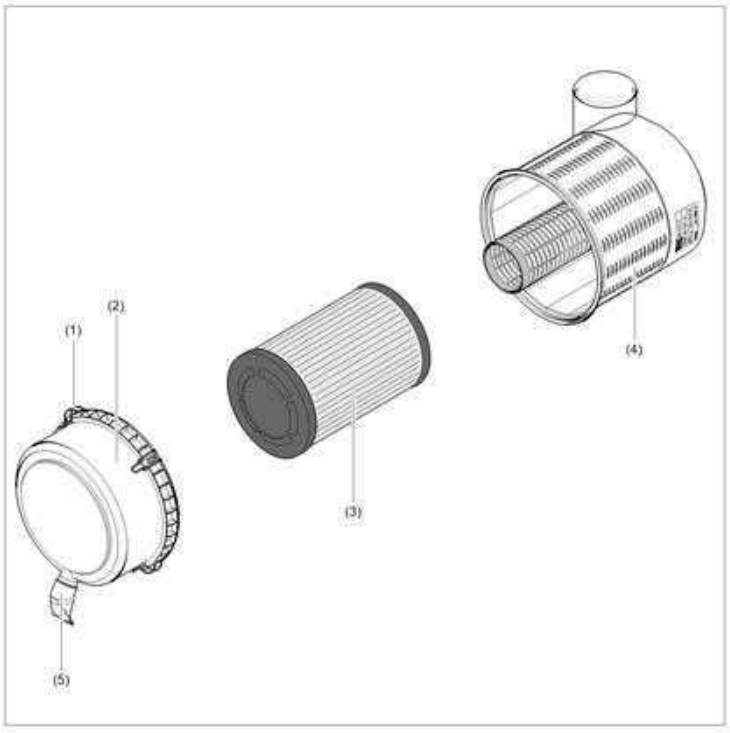
Note: The Atlas Copco air filters are specially designed for the application. The use of non-genuine air filters may lead to severe damage of engine and/or alternator. Never run the unit without air filter element.

- 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.

Cleaning the dust trap

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

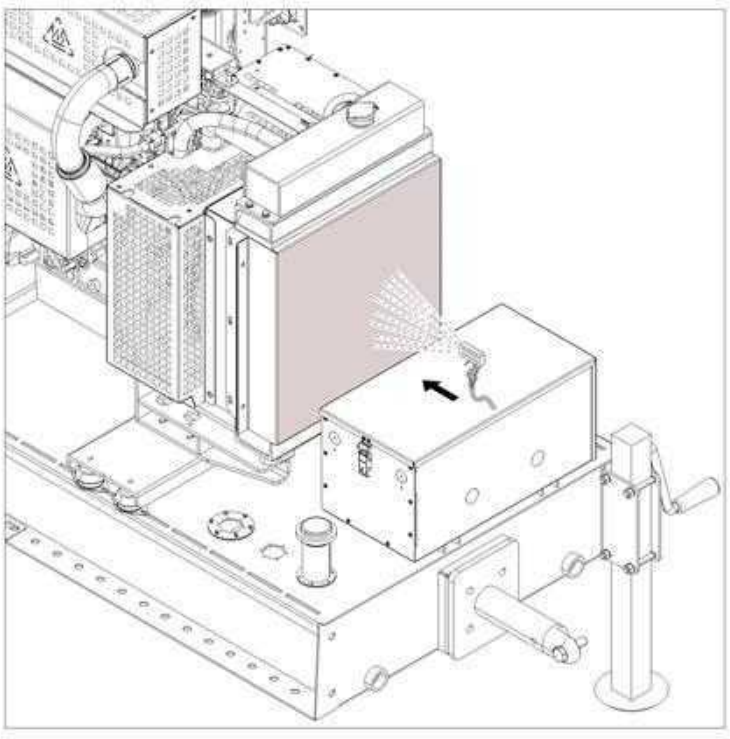
4.4.6 Replacing the filter element



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.

4.4.7 Cleaning cooler



1. 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.

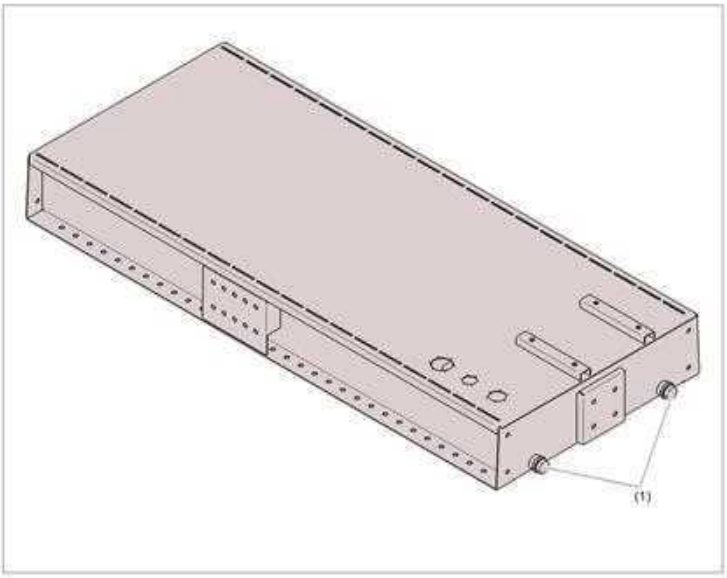
   Warning: Remove any dirt from the coolers with a fibre brush. Never use a wire brush or metal objects.
2. Steam cleaning in combination with a cleansing agent may be applied.

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

   Caution: Make sure to not steam clean the alternator.
3. Close the service door(s).

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

4.4.8 Cleaning the fuel tank



Warning: Observe all relevant environmental and safety precautions.

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

   Warning: Never leave spilled liquids such as fuel, oil, water and cleansing agents in or around the unit.
5. Refill the fuel tank with clean fuel.

4.4.9 Battery care

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

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

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

Electrolyte

Warning: Read the safety instructions carefully.

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

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

Activating a dry-charged battery

1. Take out the battery.
2. Battery and electrolyte must be at equal temperature above 10°C.
3. Remove cover and/or plug from each cell.
4. Fill each cell with electrolyte until the level reaches 10 to 15 mm above the plates, or to the level marked on the battery.
5. Rock the battery a few times so that possible air bubbles can escape; wait 10 minutes and check the level in each cell once more; if required, add electrolyte.
6. Refit plugs and/or cover.
7. Place the battery in the unit.

Recharging a battery

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

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

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

Make-up distilled water

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

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

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

Periodic battery service

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

Battery switch

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

Warning: Never turn the battery switch to OFF during operation.

4.5 Engine consumable specifications

4.5.1 Engine fuel specifications

For fuel specifications, please contact Atlas Copco Customer Center.

4.5.2 Engine oil specifications

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

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

Engine	Type of lubricant
between -10°C and +50°C	PAROIL E
between -25°C and +50°C	PAROIL Extra

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

Specifications PAROIL

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

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

4.5.3 Engine coolant specifications

Warning: 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.

Warning: 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.

5 Checks and troubleshooting

Warning: 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).

5.1 Engine troubleshooting

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

Cause	Remedy
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.

Cause	Remedy
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.

Cause	Remedy
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

5.2 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.

5.2.1 Overview of possible operating problems

Symptom	Possible cause	Corrective action
Pump does not prime	Suction tubes or inlet filter clogged. The vacuum gauge indicates a high value.	Remove the obstruction.
	Suction tube collapse.	Use reinforced suction tube.
	The air that goes into the suction tubes is more than the air that the vacuum pump can extract.	Check for any opening in the suction tubes and seal accordingly.
	Coupling gaskets of suction tubes are leaking.	Replace gaskets.
		Check gaskets of complete pump for leakage and replace accordingly.
		Check non return valve on discharge for proper sealing, cleanness, function and damages.
		Check mechanical seal for leakage and replace accordingly.
		Make sure discharge valve on pump body is closed.
		Make sure ball valve between separator and vacuum pump is open.
		Make sure complete vacuum system (separator, connection tubes, check valves and vacuum pump) is working properly without any defect or leakage.
	The suction lift is too high.	Reduce the suction lift.
	The vacuum pump is broken or doesn't rotate.	Restore or replace the vacuum pump.
	Pump speed is too low.	Only increase speed once you have checked the contract data and pump performance curves.
	Slackening or breakage of the vacuum pump drive belt.	Restore the belt tension and / or replace it if worn or broken.
	Delivery tube or discharge valve is blocked and water cannot be moved away.	Make sure, water can be discharged.
Low or no flow	The pump does not prime	See causes given in Pump does not prime.
	Head required by the system is greater than the rated head of the pump.	Revise system design or select a different pump.
	Excessive flow resistance along suction line.	Revise distribution of elbows, valves, constrictions etc. Where necessary, increase diameter of the pipework.
	Impeller clogged by foreign debris.	Disassemble casing and remove foreign matter.

Symptom	Possible cause	Corrective action
	Suction/delivery pipes/ strainer may be obstructed or clogged.	Locate the obstructed or clogged area and clean.
	Air leaks in suction line.	Check joints are airtight and inspect suction pipe.
	Impeller and / or wear plate may be worn.	Replace them by disassembling the pump.
	Diameter of the suction pipe too small.	Increase size of suction tube.
	Foreign debris trapped in the impeller.	Disassemble the pump casing and remove the foreign debris.
	Pump speed is too low.	Only increase speed once you have checked the contract data and pump performance curves.
	Cavitation on pump related to less flow.	See chapter cavitation.
Excessive power absorption	Rotation speed too high.	Check correct rotation speed.
	Pump operates under conditions that are different from those specified in the contract.	Check operating conditions of pump and compare them to those on the pumps nameplate (e.g. density of liquid).
	Mechanical friction inside the pump between rotating and non-rotating components.	Disassemble pump casing and check for scratches on surfaces.
	Particles in the impeller.	Disassemble pump casing and remove materials. Use suction strainer.
Pump does not provide enough pressure	Viscosity of the liquid is higher than expected.	Contact the pump manufacturer once you have measured the viscosity of the liquid. Viscosity for centrifugal pumps should not exceed 50 cSt. Check for other possible causes: see Low or no flow.
	Impeller worn, worn wear plates, bad adjustment/trimming between impeller and wear plate.	Gap should be between 0.3 - 0.8 mm.
	Pump speed is too low.	Only increase speed once you have checked the contract data and pump performance curves.
	Pump volute worn.	Change pump volute.
Pump vibrates and is noisy	Pump is operating with a flow rate that is too low.	Increase pump speed, check settings of the valves in the system and readings on the pressure and vacuum gauges.
	Pump or pipework is not fixed securely.	Make sure system pipework is correctly fastened.
	Pump cavitates.	Check possible causes: see Pump does not prime and Low or no flow.

Symptom	Possible cause	Corrective action
	Particles in the impeller.	Disassemble pump casing and remove materials. Use suction strainer.

6 Storage of the pump

6.1 Storage

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

6.2 Preparing for operation after storage

Before operating the pump again, remove the wrapping.

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

7 Disposal

7.1 General

When developing products and services, Atlas Copco tries to understand, address and minimize the negative environmental effects that the products and services may have, when being manufactured, distributed, used and disposed.

Recycling and disposal policies are part of the development of all Atals Copco company products. Atlas Copco company standards determine strict requirements.

Material selection, substantial recyclability, disassembly possibilities and separability of materials and assemblies are considered, as well as environmental perils and dangers to health during the recycling and disposal of the unavoidable rates of non-recyclable materials.

Your Atlas Copco pump consists mostly of metallic materials, that can be remelted in steel and melting works and are therefore amost infinitely recyclable.

7.2 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.

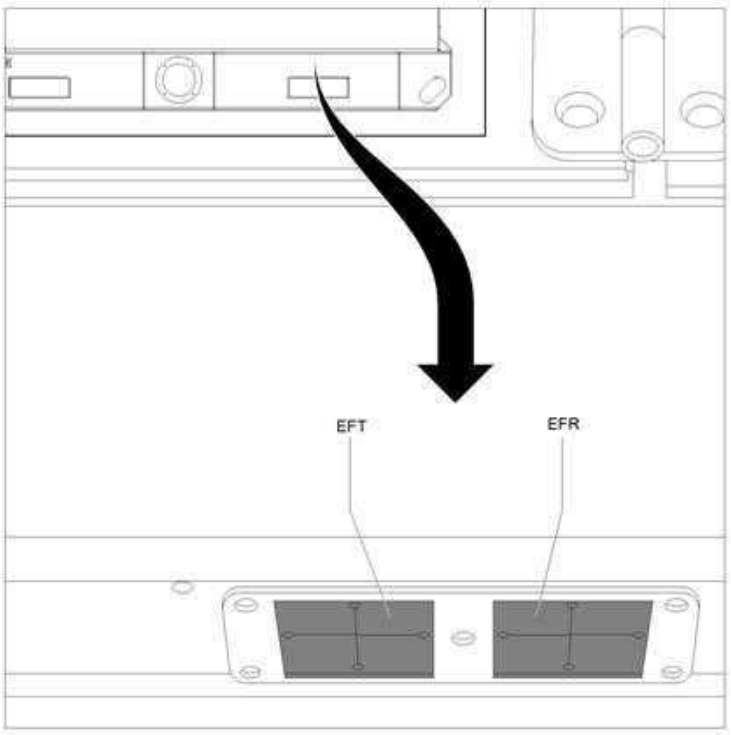
Note: This concept can only succeed with your help. Support us by disposing professionally. By assuring correct disposal of the product you help prevent possible negative consequences for environment and health as a result of inappropriate waste handling. Recycling and re-usage of material helps to preserve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

8 Available option

8.1 External fuel tank connection (with/without quick coupling)

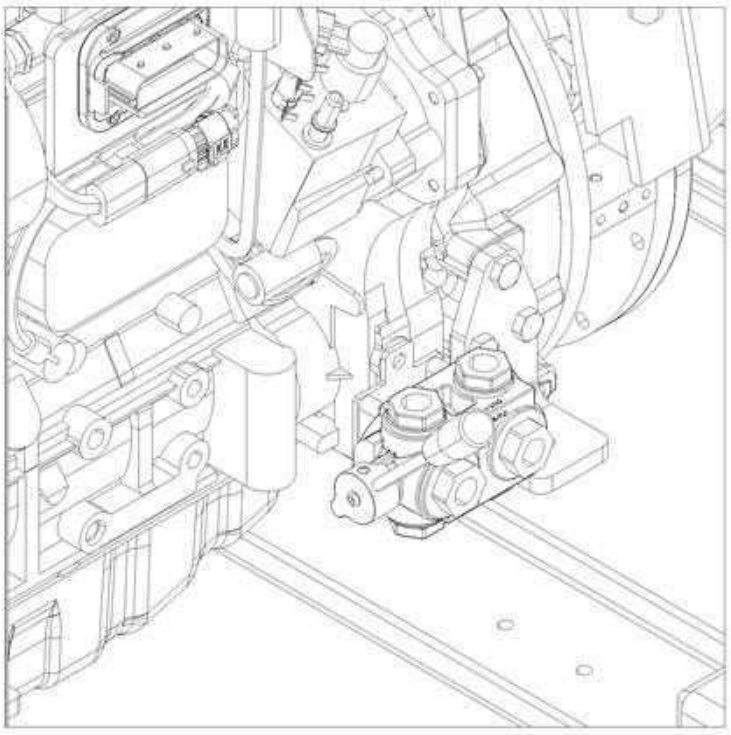
The option external fuel tank connection allows to bypass the internal fuel tank and to connect an external fuel tank to the unit.

View outside

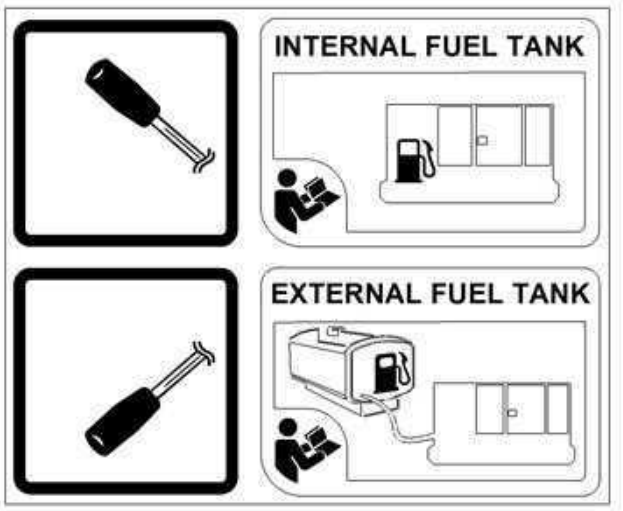


Reference	Description
EFT	External fuel tank feed connection
EFR	External fuel tank return connection

View inside



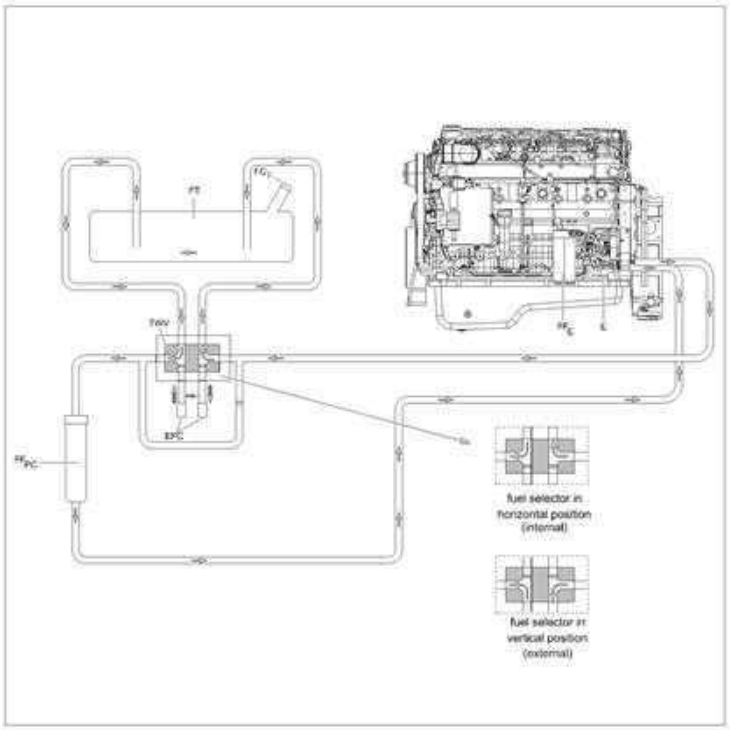
When using this option, make sure to connect the fuel supply line as well as the fuel return line. Connections to fuel lines ought to be air-tight to prevent air from entering the fuel system. Turn the handle of 3-way valve to desired condition.



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.

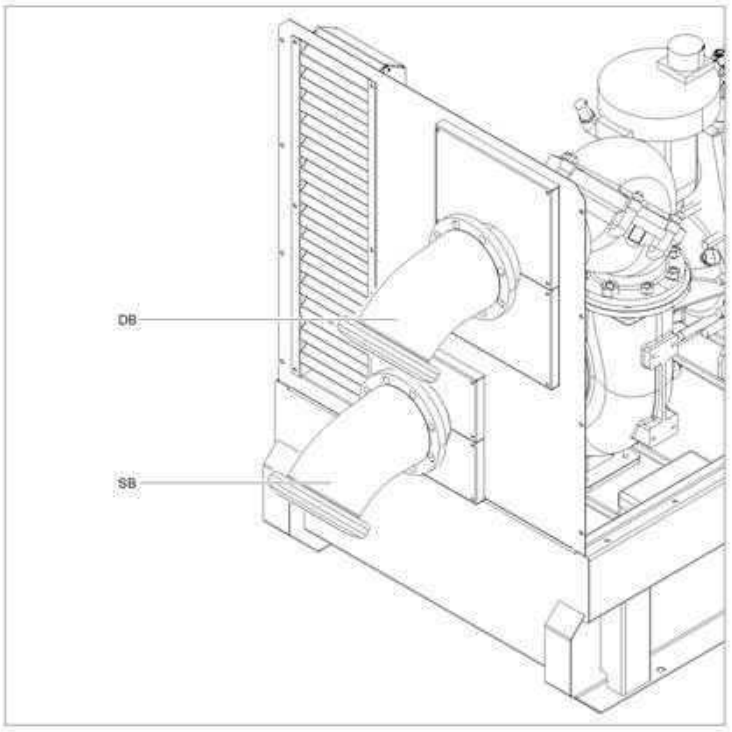
Overview



Reference	Description
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
TWV	3-way valve

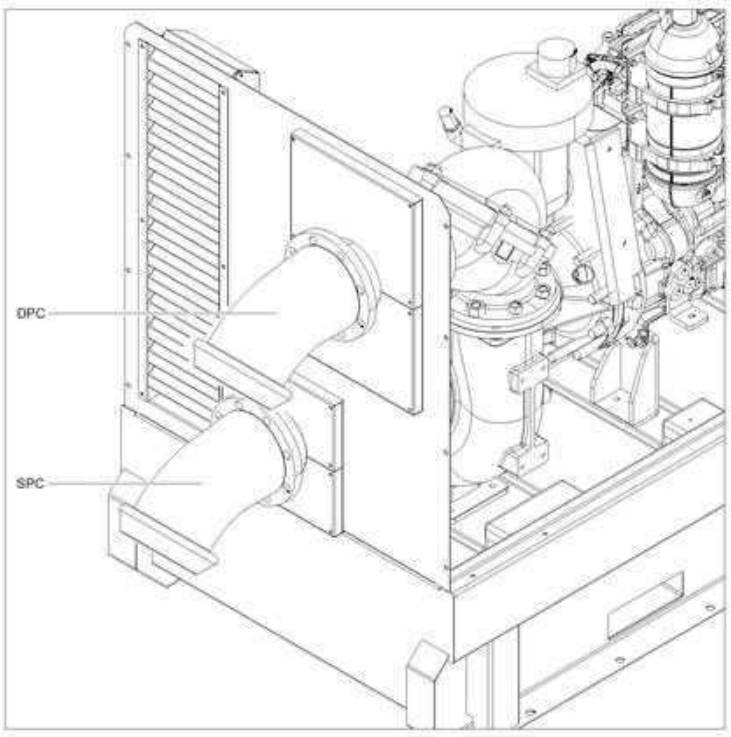
8.2 Suction and discharge pipes

Bauer



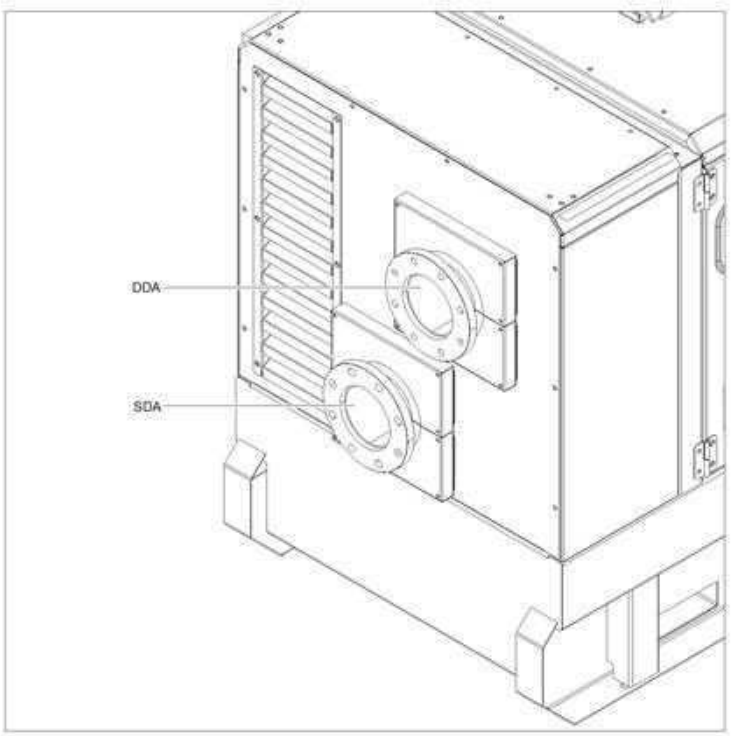
Reference	Description
DB	Discharge Bauer
SB	Suction Bauer

Perrot/Cardan



Reference	Description
DPC	Discharge Perrot/Cardan
SPC	Suction Perrot/Cardan

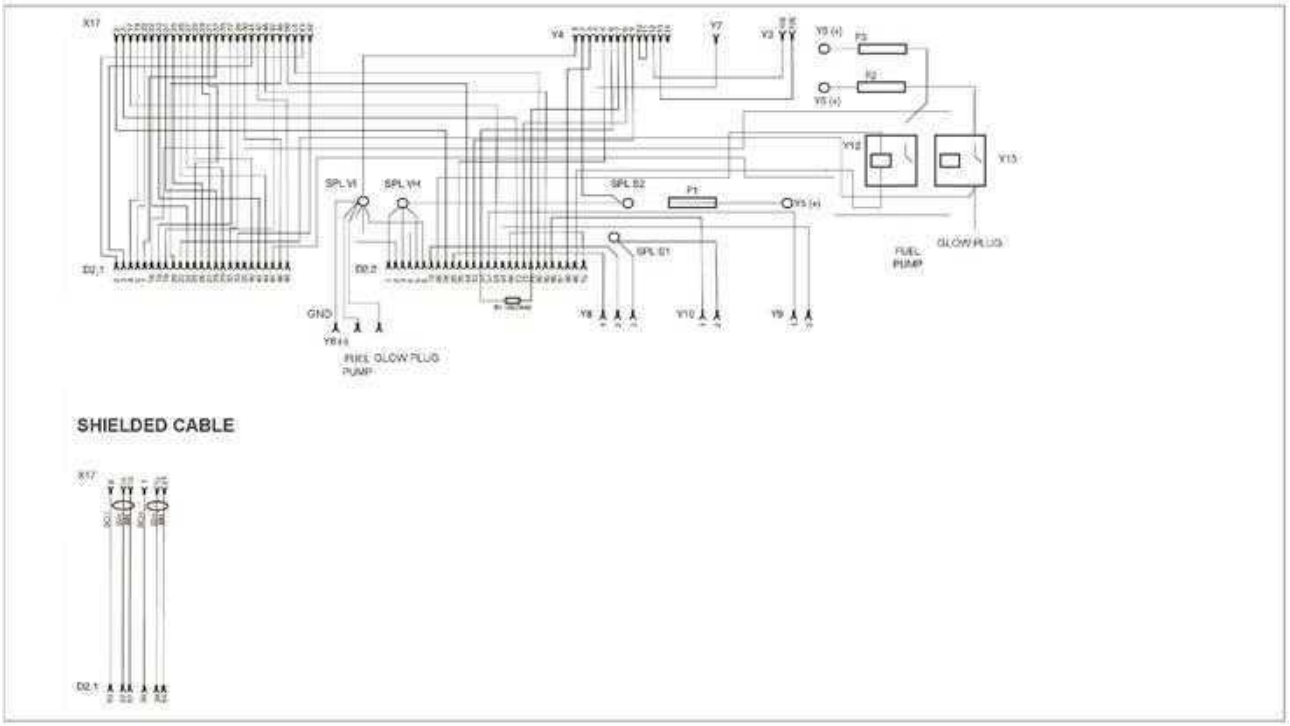
DIN / ASME



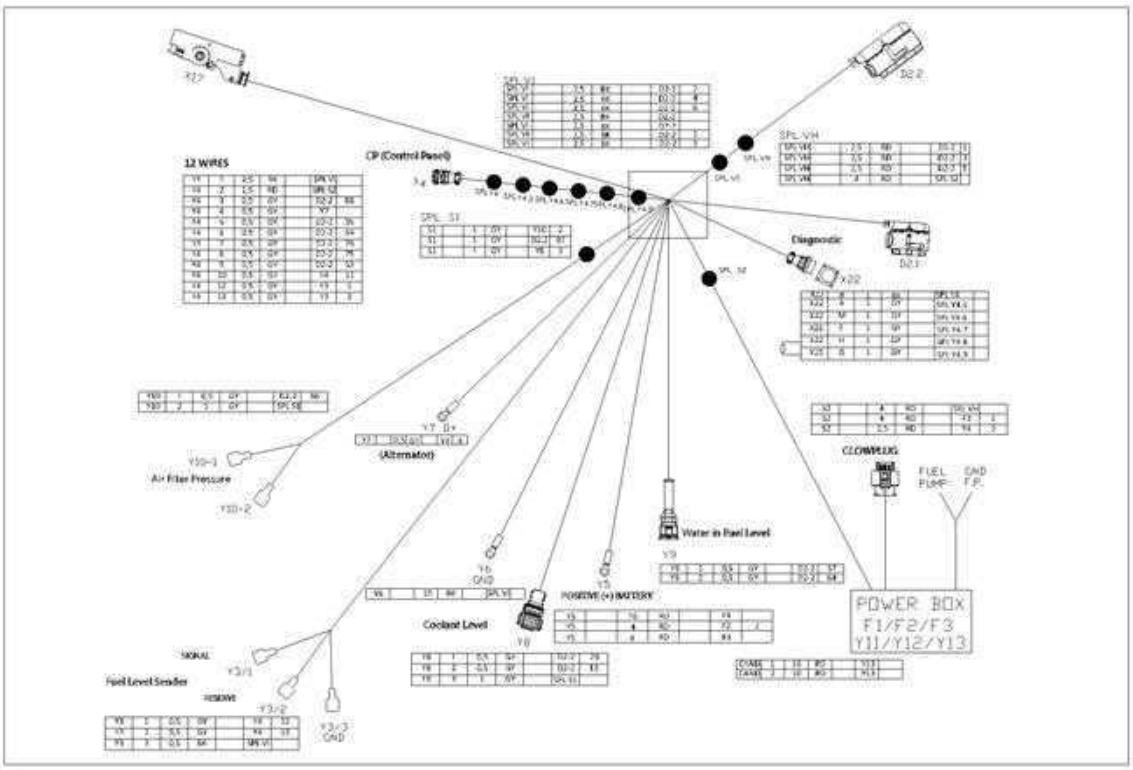
Reference	Description
DDA	Discharge DIN / ASME
SDA	Suction DIN / ASME

9 Circuit diagrams

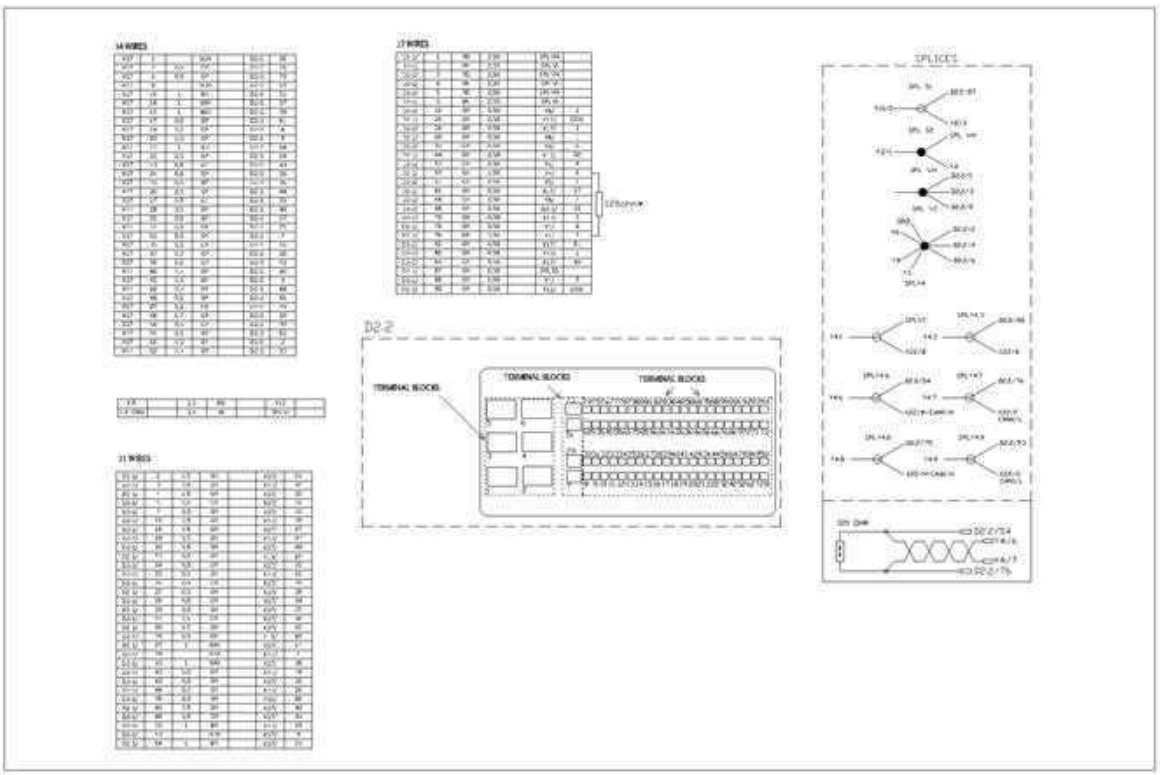
Circuit diagram - DEUTZ TD2.9 L4 T3



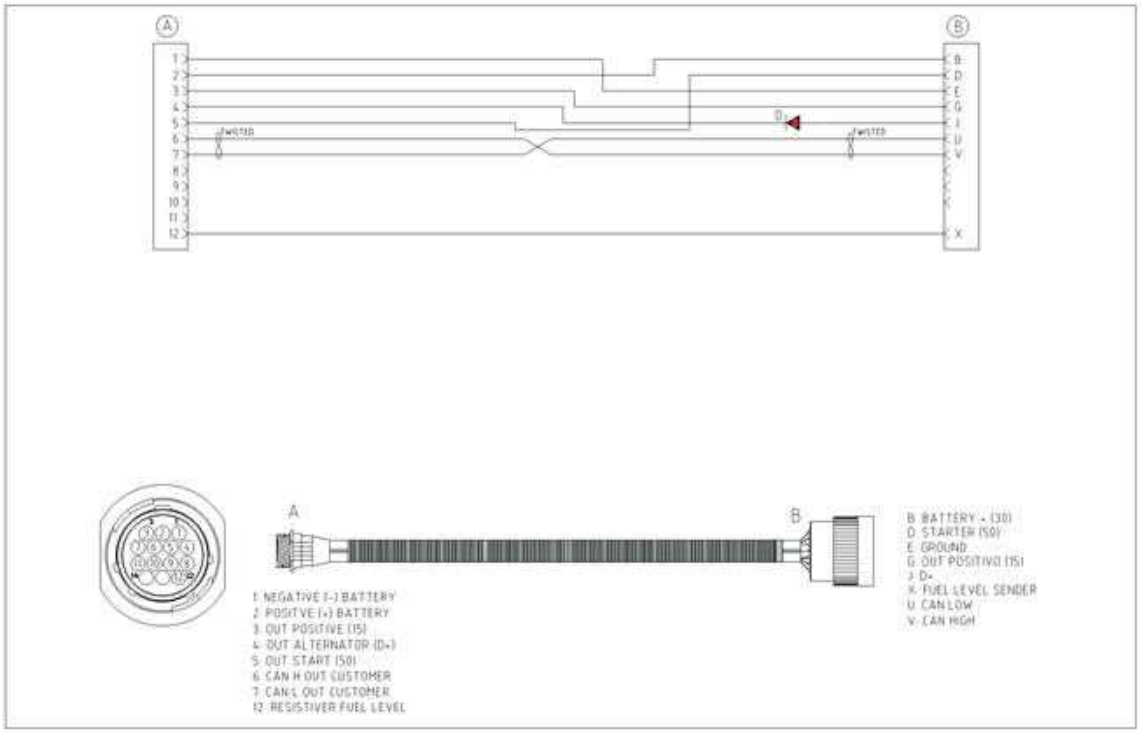
Wiring - Harness - Sheet 1



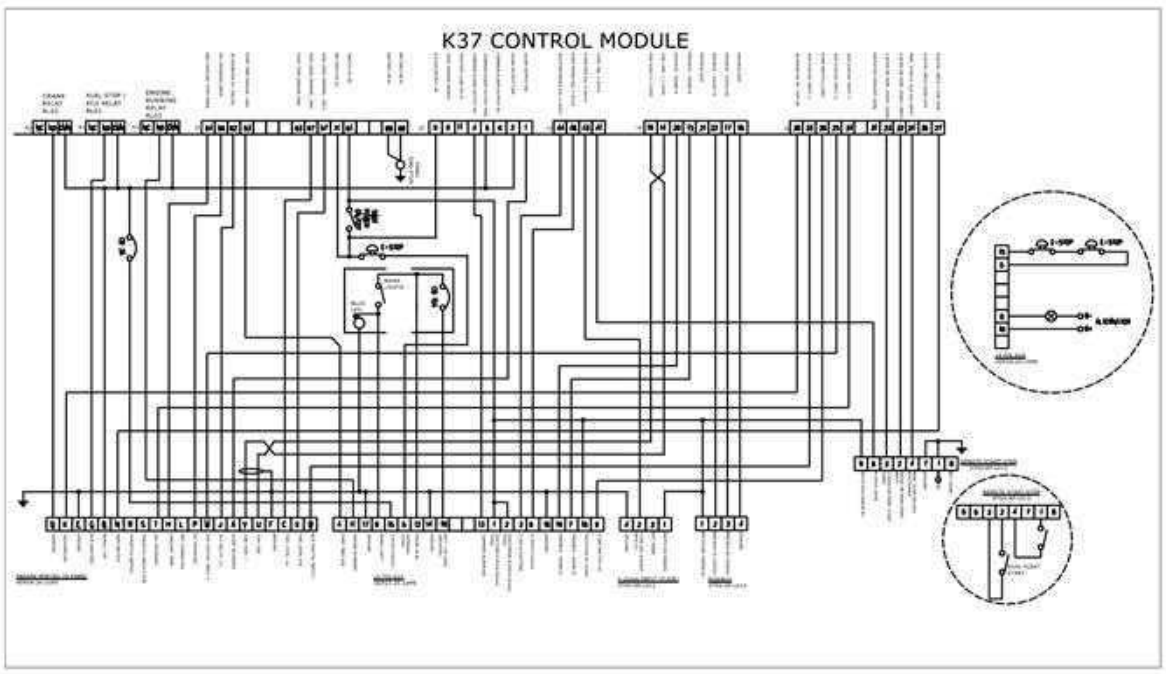
Sheet 2



Wiring - Harness DEUTZ TD2.9 L4 T3 - to Control Panel



Circuit Diagram - K37 Control Module

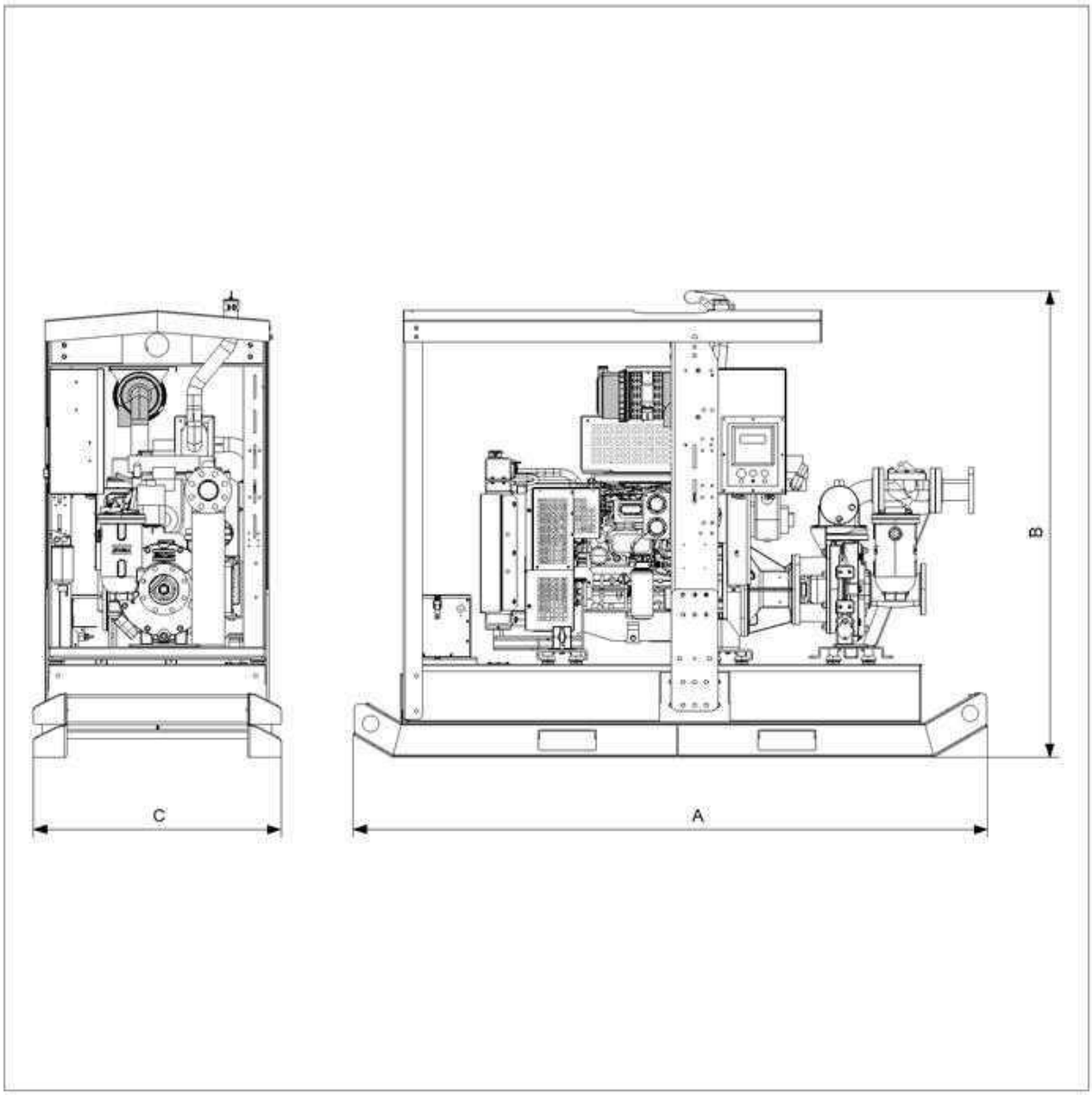


10 Technical specification

10.1 Technical specifications of unit/engine/pump

FEATURES	
Pump model	**Engine model**
	PAC H43C
Product number	8381064376
Suction (mm/in)	100/4"
Discharge (mm/in)	80/3"
Weight (kg)	1940
Fuel tank capacity (l)	420
Solid handlings (mm/in)	20/0.75"
Dimensions A x B x C (mm)	2730 x 2010 x 1070
Engine	
Brand	DEUTZ
Model	TD2.9 L4
Displacement (cm^3)	2900
Cylinders	4
Cooling System	Water cooled
Exhaust emission compliance	Tier 3
Combustion system	Turbo common rail
Engine oil capacity (l)	9
Engine coolant capacity (l)	15
Engine oil	Paroil E
Engine coolant	Parcool Green
Pump Data	
Max speed (rpm)	2600
Flow max (m^3/h)	150
Head max (m)	91
Impeller wear plate gap (mm)	0.5
Vacuum pump oil tank (l)	1.8
Mechanical seal oil tank (l)	1.5
Vacuum pump oil	Paroil E
Mechanical seal oil	ISO VG 32
Non return check	Flap type

10.2 Dimension drawing



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 pump.

Thread size	Torque value (Nm / lbf.ft)
M6	9 (6.64)
M8	23 (16.97)

Thread size	Torque value (Nm / lbf.ft)
M10	46 (34.69)
M12	80 (59.04)
M14	125 (92.25)
M16	205 (151.29)

Table 2: For hexagon screws and nuts with strength grade 8.8

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)

Table 3: For hexagon screws and nuts with strength grade 12.9

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

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

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

11 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) - Material ID

(5) - Engine ID

(6) - Weight (kg)

(7) - Maximum capacity of the pump (m^3/h)

(8) - Maximum head (m)

(9) - Maximum speed (rpm)

(10) - Power (kW)

(11) - Voltage (V)

(12) - Current (A)

(13) - Frequency (Hz)

(14) - Year of Manufacture

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

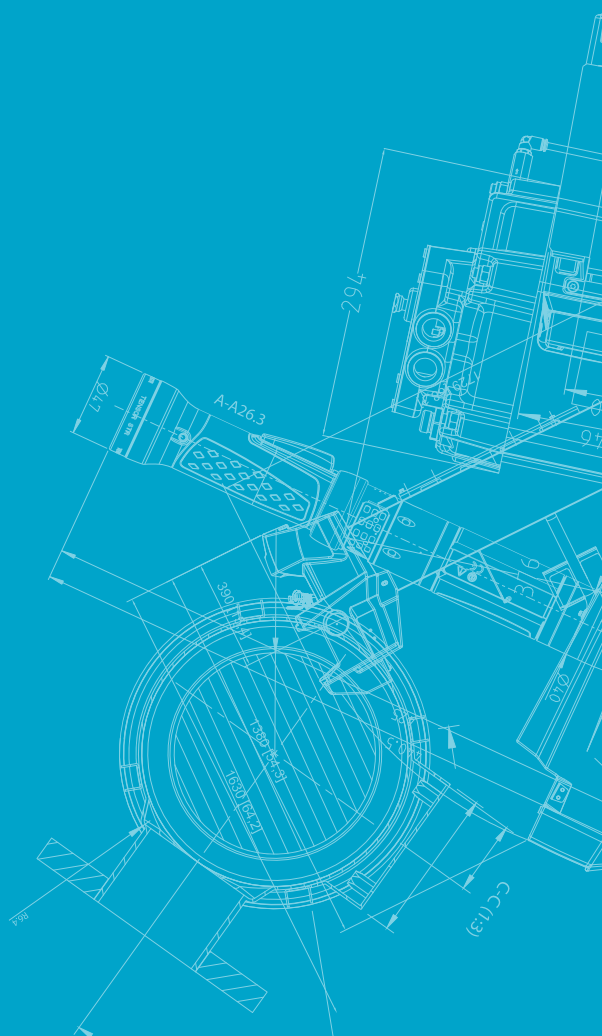
12 Spare parts

12.1 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.



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