The Drive & Control Company

Rexroth
Bosch Group

# Hägglunds PAC/PBC

Drive unit

**Operations and maintenance manual**
**RA15322-WA/05.2018**

The data specified above only serve to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.



Changes in the equipment may occur. We therefore reserve the right to introduce amendments in the manual as we deem necessary without notice or obligations.

This Installation and maintenance manual is valid for drive units manufactured after 01.01.2018. For older drive units please contact your nearest Bosch Rexroth representative.

The cover shows an example configuration. The product supplied may therefore differ from the figure shown.

The original operating instructions were prepared in English (RE15325-WA/02.2016).

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# 1 This documentation

## 1.1 Scope of documentation

This documentation applies to the drive unit Hägglunds PAC/PBC and is intended for machine/system manufacturers, fitters and service engineers.

This documentation contains important information required to transport, install, commission, operate, use, service, dismantle the product safely and professionally.

- Read this documentation completely, before using the Hägglunds PAC/PBC.

## 1.2 Required and additional documentation

Do not start using the product until you have familiarised yourself with the documentation marked with the book symbol 🕮 and followed it.

**Table 1: Necessary and supplementary documentation.**

| | Title | Document no | Document type |
|---|---|---|---|
| 🕮 | Order confirmation | Contains the order-related technical data for your Hägglunds PAC/PBC. | Order confirmation |
| 🕮 | Order documentation | Order specific | E.g. hydraulic and electric diagrams, bill of material, specifications |
| 🕮 | Hydraulic fluid quick reference | RE 15414 | Data sheet |

## 1.3 Display of information

Standardized safety instructions, symbols, terms and abbreviations are used so that you can use this documentation to work quickly and safely with your product. To give you a better understanding they are explained in the sections below.

### 1.3.1 Safety instructions

This documentation includes safety instructions in chapter *2.6: Product-specific safety instructions* and in chapter *3: General instructions on material damage and product damage* and before a sequence of actions or an
instruction for action involving a risk of personal injury or damage to equipment.
The described danger prevention measures must be observed.

Safety instructions are formatted as follows:

**⚠ SIGNAL WORD**

**Type of risk**
Consequences of non-observance
- ▶ Safety precautions
- ▶ <List>

**Warning sign:** Draws your attention to the hazard
- **Signal word:** Indicates the degree of hazard
- **Type of risk!:** Specifies the type and source of the hazard
- **Consequences:** Describes the consequences of non-compliance
- **Precaution:** Specifies how the hazard can be prevented

**Table 2: Risk categories to ANZI Z535.6-2006**

| Warning signs, signal word | Meaning |
|---|---|
| ⚠ DANGER | Indicates a dangerous situation which will result in death or serious physical injury unless averted. |
| ⚠ WARNING | Indicates a dangerous situation which could result in death or serious physical injury unless averted. |
| ⚠ CAUTION | Indicates a dangerous situation which could result in minor to moderate physical injury unless it is averted. |
| ***NOTICE*** | Material damage: the product or its environment could be damaged. |

### 1.3.2 Symbols

The symbols below indicate instructions which are not safety-relevant but help to make the documentation easier to understand.

**Table 3: Key to symbols**

| Symbol | Meaning |
|---|---|
|  | You will be unable to use or operate the product optimally unless this information is observed. |
| ▶<br>▶ | Individual self-contained action (alternatives) |
| **1.**<br>**2.**<br>**3.** | Numbered operating instruction:<br>The numbers indicate the actions follow one another in sequence |
|  | Center of gravity<br>Markings on packaging to indicate where the center of gravitiy are. |

# 2 Safety instructions

## 2.1 About this chapter

This product was made in accordance with the generally accepted rules of the art but there is a risk of personal injury and damage to property unless you follow this chapter and the safety instructions in this documentation.

- Read this documentation carefully through in full before using product.
- Keep this documentation so it is accessible to all users at all times.
- Always give products to third parties with the documentation required.

## 2.2 Intended use

The Hägglunds PAC/PBC is a hydraulic drive unit

In the application the Hägglunds PAC/PBC drive unit is classified as a partly completed machinery. A partly completed machinery is exclusively intended to form an incomplete or a complete machine together with other components or partly completed machineries. The PAC/PBC drive unit may only be commissioned after it has been installed in the machine/system for which it is intended and the safety of the entire system has been established in accordance with the machine directive.

Intended use includes having read and understood the complete documentation, especially the chapter *2: Safety instructions*.

The product is intended for the following use:
• Create  hydraulic flow in a closed loop hydraulic system.

**Special drive units**
Standard drive units are not allowed to be used outside the ambient temperature range of –40 °F to 105 °F, or in areas with potentially explosive atmospheres.

Drive units intended for use in ambient temperature below 20 °F, will be fitted with special optional equipment for preheating the hydraulic system before start.

Drive units intended for use in areas with potentially explosive atmospheres will be fitted with suitable components for use in such areas and manufactured in accordance with valid rules and standards complying with NEC-directives. Observe the technical data, application and operating conditions, and performance limits as specified in the product-specific documentation and in the order confirmation.

## 2.3 Improper use

Any use other than that described as intended use shall be considered as improper and is therefore impermissible.

Bosch Rexroth shall accept no liability whatsoever for damage resulting from improper use. The user shall bear all risks arising from improper use. Similarly, the following foreseeable faulty usages are also considered to be improper:

- Using outside the operating parameters approved in the product-specific data sheet or in the order confirmation (unless customer-specific approval has been granted)
- Use of fluids outside of the standards as specified in *RE15414 Hydraulic fluid quick reference*.
- Modification of factory settings by non-authorized persons
- Use of add/on parts (e.g. mountable filter, control unit, valves) that are not specified by Bosch Rexroth has to be approved by contact at Bosch Rexroth.
- Extension or conversion is not permissible and has to be approved by contact at Bosch Rexroth.
- Using the Drive unit in explosive environments unless the component or machine/ system has been certified as compliant with the NEC directive.
- Using the Drive unit in an aggressive atmosphere without necessary additional measures.

## 2.4 Personnel qualifications

The activities described in this documentation require basic mechanical, electrical and hydraulic knowledge, as well as knowledge of the associated technical terms. For transporting and handling the product, additional knowledge is necessary with regard to working with a lifting device and the corresponding attachment equipment. In order to ensure safe use, these activities may therefore only be carried out by appropriate qualified personnel or an instructed person under the direction and supervision of qualified personnel.

Qualified personnel are those who can recognize possible hazards and institute the appropriate safety measures due to their professional training, knowledge, and experience, as well as their understanding of the relevant regulations pertaining to the work to be done. Qualified personnel must observe the rules relevant to the subject area and have the necessary hydraulic knowledge.

Hydraulic knowledge means, for instance:

- reading and fully understanding hydraulic diagram,
- fully understanding in particular the interrelationships regarding safety devices and having knowledge on the function and assembly of hydraulic components.

Bosch Rexroth offers training support for special fields. For more information about training, please contact your Bosch Rexroth representative.

## 2.5 General safety instructions

- Follow current accident prevention and environmental protection rules.
- Observe the safety rules and regulations of the country in which the product is used.
- Do not use Bosch Rexroth products unless they are in perfect working order.
- Follow all the instructions on the product.
- Before starting up new, rebuild or just worked on installations, all accessories and safety arrangement functions must be controlled/tested.
- Persons who install, operate, remove or maintain Bosch Rexroth products must not consume any alcohol, drugs or pharmaceuticals that may affect their ability to respond.
- Use only Bosch Bosch Rexroth spare parts to avoid the risk of personal injury through using unsuitable parts.
- Comply with the technical data and ambient conditions stated in the product documentation.
- If unsuitable products are fitted or used in safety-critical applications, unintended operating conditions may arise which could cause personal injury and damage to property. So do not use a product for safety-critical applications unless that use is specifically stated and allowed in the product documentation, e.g. in explosion risk areas or in safety-critical controls (operating safety).
- You may only commission the product if it has been determined that the end product (e.g. machinery or a system) into which the Bosch Rexroth products are installed complies with the country-specific provisions, safety regulations and standards of the application.
- Use safety equipment like helmet, protective goggles, safety shoes and hearing protection.
- In emergency situations, use only fire-extinguisher adapted for use both to oil products and electric equipment.

## 2.6 Product-specific safety instructions

The safety instructions below apply to chapters *6: Transport and storage* to *14: Technical data*

**⚠ DANGER**

**Danger from suspended loads!**

Danger to life or risk of injury, damage to equipment!

Improper transportation may cause the Hägglunds drive unit to fall down lead to injuries e.g. crushing or broken bones or damage to the product.

- Make certain that the forklift truck or lifting device has adequate lifting capacity.
- Never stand under or put you hands under suspended loads.
- Ensure your position is stable during transportation.
- Use your personal protective equipment (e.g. safety glasses, safety gloves, suitable working clothes, safety shoes).
- Use suitable lifting device for transport and storage, installation and for removal and repair. Make sure the electric motor is well mounted or anchored when the lifting device is disconnected.
- Observe the prescribed position of the lifting strap.
- Observe the national laws and regulations on work and health protection and transportation.

**Pressurized machine/system!**

Danger to life or risk of injury, serious injuries when working on machines/systems not shutdown! Damage to equipment!

- Do not disconnect any line connections, ports and components when the machine/system is pressurized.
- Always ensure that no energy is accumulated before any measures.
- Ensure that no pressure will enter the hydraulic system in the drive unit via the hydraulic motor e.g. loads on the shaft or winch drum.

## ⚠ WARNING

**Escaping oil mist!**

Risk of explosion, fire, health hazard, environmental pollution!

- Depressurize the machine/system and repair the leak.
- Keep open flames and ignition sources away from the Hägglunds drive unit.

**High voltage!**

Danger to life or personal injury hazard through electrical shock!

- Prior to accessing electrical parts with a voltage higher than 50 volts always disconnect the device from the mains or power unit. Secure the electrical equipment against being switched on again by accident.
- Observe the general deployment regulations and the safety regulations for work on heavy-current equipment.
- The operation, maintenance and/or repair of such equipment is reserved to skilled personnel qualified to work on or with electrical equipment.
- Prior to switching the equipment on always check the protective earth conductor for reliable connection to all electrical equipment according to the connection diagram.
- Exclusively run the component/device - even for short-time measurements or tests - with the protective earth conductor reliably connected to the dedicated connection points.

**Danger due to incorrect mounting and setting of electrical, hydraulic and mechanical functions as well as controls**

Risk of personal injury or property damage.

- Follow instructions for delivered equipment.

**Rotating parts!**

Risk of injury or serious injuries.

- Do not touch rotating parts or in the zone of rotating parts.

**⚠ CAUTION**

**High noise development in operation!**
Danger of hearing damage, deafness!
The noise emission of Hägglunds drive unit depends on speed, operating pressure and installation conditions.
- Always wear hearing protection when in the vicinity of the operating drive unit.

**Hot surfaces on the drive unit!**
Risk of burns!
- Allow the Hägglunds drive unit to cool down sufficiently before touching it.
- Wear heat-resistant protective clothing, e.g. gloves.

**Improper routing of cables and lines!**
Tripping hazard and damage to equipment!
- Lay cables and lines so that they can not be damaged and nobody can trip over them.

**Contact with hydraulic fluid!**
Hazard to health/health impairment e.g. eye injuries, skin damage, toxication during inhalation!
- Avoid contact with hydraulic fluids.
- When working with hydraulic fluids, strictly observe the safety instructions provided by the lubricant manufacturer.
- Use your personal protective equipment (e.g. safety glasses, safety gloves, suitable working clothes, safety shoes).
- If hydraulic fluid should, nevertheless, come into contact with your eyes or bloodstream or is swallowed, consult a doctor immediately.

**Escaping hydraulic fluid due to machine/system leakage!**
Risk of burns and risk of injury due to escaping oil jet!
- Depressurize the machine/system and repair the leak.
- Never attempt to block or seal the leak or oil jet with a cloth.

**Operator error**
Risk of personal injury or damage to the product!
- Check both the general and the custom technical documentation to identify the features of your unique drive unit

## 2.7 Personal protection equipment

Use safety equipment like helmet, protective goggles, safety shoes and hearing protection.

The personal protective equipment is the responsibility of the user of the Hägglunds drive unit. Observe the safety regulations and provisions of your country. All components of the personal protective equipment must be intact.

# 3 General instructions on material damage and product damage

## *NOTE*

**Danger from improper handling!**

Product can be damaged!

- Do not expose the product to an impermissible mechanical load.
- Never use the product as a handle or step.
- Do not place/lay any objects on the product.
- Do not strike the Hägglunds drive unit or any part of it or its accessories.
- Do not strike fittings (e.g. sensors or valves).
- Do not strike sealing surfaces (e.g. service line ports).
- Leave the protective covers on the Hägglunds drive unit until shortly before the lines are connected.
- Do not perform electro-welding on the Hägglunds drive unit.

**Damage to equipment due to improper lubrication!**

Product can be damaged or destroyed!

- Never operate the Hägglunds drive unit with insufficient hydraulic fluid.
- When commissioning a machine/system, make sure that the case interior and the service lines of the Hägglunds motor are filled with hydraulic fluid and remain filled during operation.

**Mixing of hydraulic fluids!**

Product can be damaged!

- Before installation, remove all fluids from the Hägglunds motor to prevent mixing with the hydraulic fluid used in the machine/system.
- Any mixing of hydraulic fluids of different manufacturers or different types of the same manufacturer is not permissible in general.

**Wrong voltage!**

Electrical motor damage!

- All electrical supply levels shall be within the limits that the equipment is constructed for, see Hägglunds PAC/PBC custom documentation and product identification.

## *NOTE*

**Contamination of the hydraulic fluid!**
The cleanliness of the hydraulic fluid has a considerable impact on the cleanliness and service life of the hydraulic system. Contamination of the hydraulic fluid could cause premature wear and malfunctions!

- Make sure that the working environment at the installation site is fully free of dust and foreign substances in order to prevent contaminants, such as welding beads or metal cuttings, from getting into the hydraulic lines and causing product wear or malfunctions. The Hägglunds drive unit must be installed in a clean condition.
- Use only clean connections, hydraulic lines and attachments (e.g. measuring equipment).
- No contaminants may enter the connections when they are plugged.
- Before commissioning, make sure that all hydraulic connections are tight and that all of the connection seals and plugs are installed correctly to ensure that they are leakproof and fluids and contaminants are prevented from penetrating the product.
- Use a suitable filter system to filter hydraulic fluid during filling to minimize solid impurities and water in the hydraulic system.

**Improper cleaning!**
Product can be damaged!

- Plug all openings with the appropriate protective equipment in order to prevent detergents from entering the hydraulic system.
- Never use solvents or aggressive detergents. Use only water and, if necessary, a mild detergent to clean the Hägglunds drive unit.
- Never use a high pressure washing system to clean inside the drive unit
- Do not point the power washer at sensitive components, e.g. shaft seal, electrical connections and components.
- Use lint-free cloths for cleaning.

**Environmental pollution due to incorrect disposal!**
Careless disposal of the Hägglunds drive unit and its fittings, the hydraulic fluid and the packaging material could lead to pollution of the environment!

- Dispose of the Hägglunds drive unit, hydraulic fluid and packaging in accordance with the national regulations in your country.
- Dispose of the hydraulic fluid in accordance with the applicable safety data sheet for the hydraulic fluid.

**Escaping or spilling hydraulic fluid!**
Environmental pollution and contamination of the ground water!

- Use an oil binding agent if hydraulic fluid is spilled.
- Observe the information in the safety data sheet for the hydraulic fluid and the specifications provided by the system manufacturer.

The warranty applies only to the delivered configuration.
The entitlement to warranty cover will be rendered void if the product is incorrectly installed, commissioned or operated, or if it is used or handled improperly.

# 4 Delivery contents

Included in the delivery contents are:
• Hägglunds PAC/PBC as per order confirmation

# 5 About this product

## 5.1 Product description

The intention with the drive unit is to provide the hydraulic motor(s) with the required flow of oil and pressure at the right time. All included parts are assembled in a compact cabinet. The drive unit has one or more pumps driven by one or more electric motors. The main pump is an axial piston pump with variable displacement for closed loop systems. The electric motor is totally enclosed (TEFC).

The standard control system to the drive unit is the Hägglunds Spider, a small, compact and configurable control system. It can health monitor the drive unit and can control up to four pumps with a high variation of pre-programmed functions.

The drive unit is a very flexible product with a wide option range. This makes it possible to select a standard drive unit to fulfil the features needed in many different applications.

This installation and maintenance manual is intended to cover all standard options. It may not cover all details on customized drive units and other control systems than Hägglunds Spider, that differs from the standard Hägglunds PAC/PBC concept.

## 5.2 Product identification

**1** Model number
**2** Weight
**3** Serial number
**4** Tank volume
**5** Flow capacity
**6** Max pressure
**7** Manufacturer
**8** Date of manufacture
**9** Job/order number
**10** Electric motor power
**11** Electric motor voltage
**12** Electric motor frequency
**13** Electric motor rpm

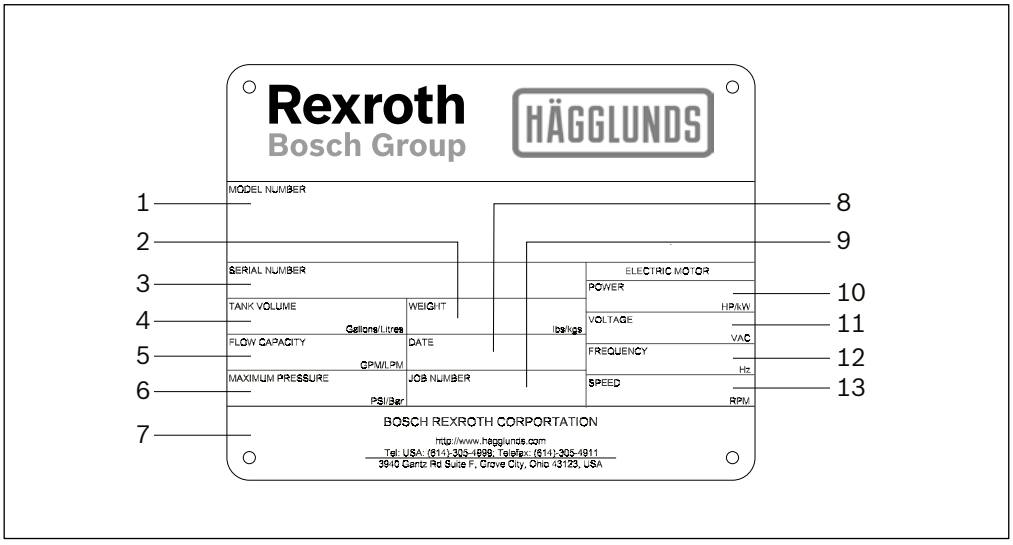


**Fig. 1: Product identification**

## 5.3 Main components

**Notice!** Changes from the picture and the components may occur.

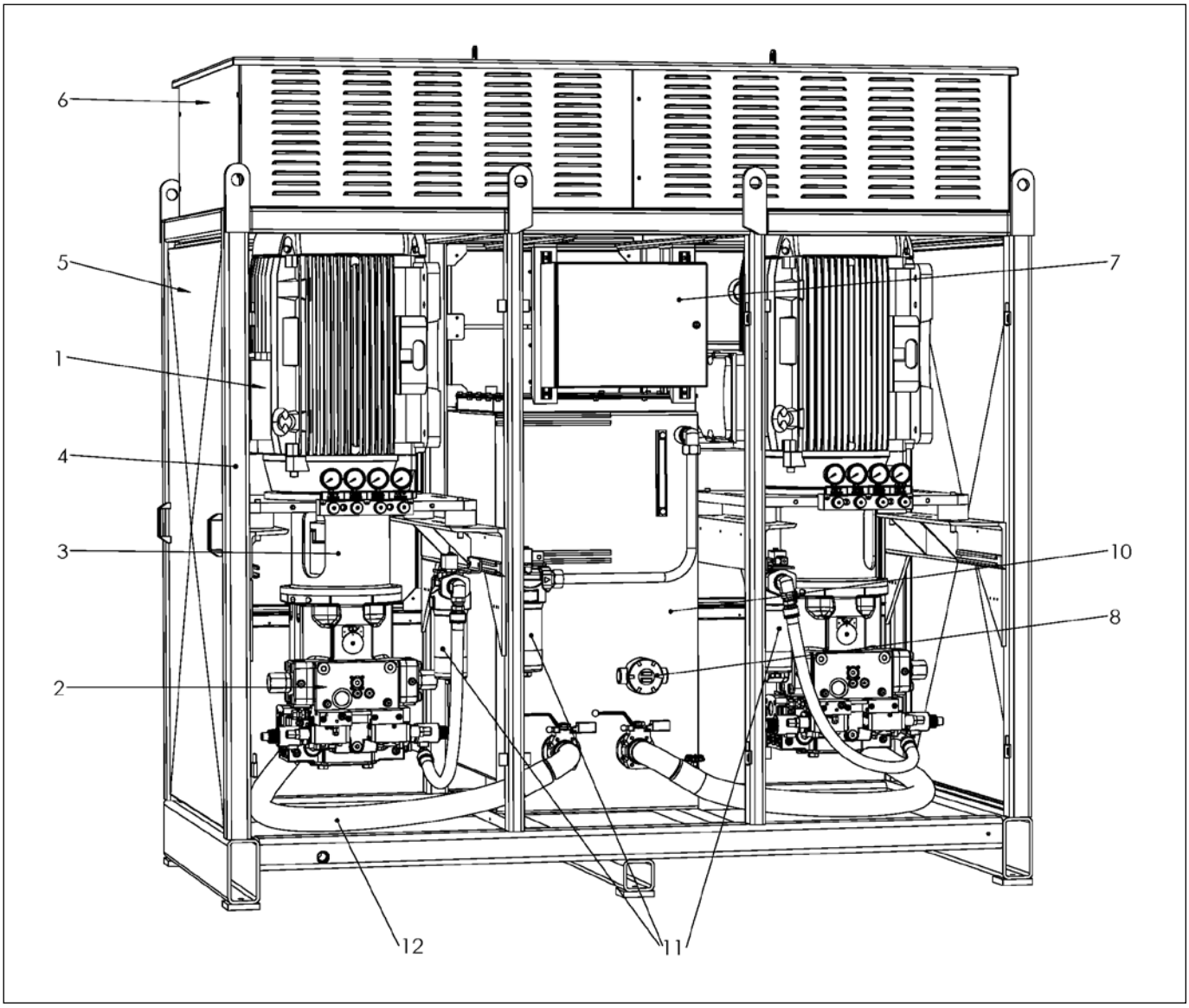


**Fig. 2: Main components PAC S, M, L, and XL**

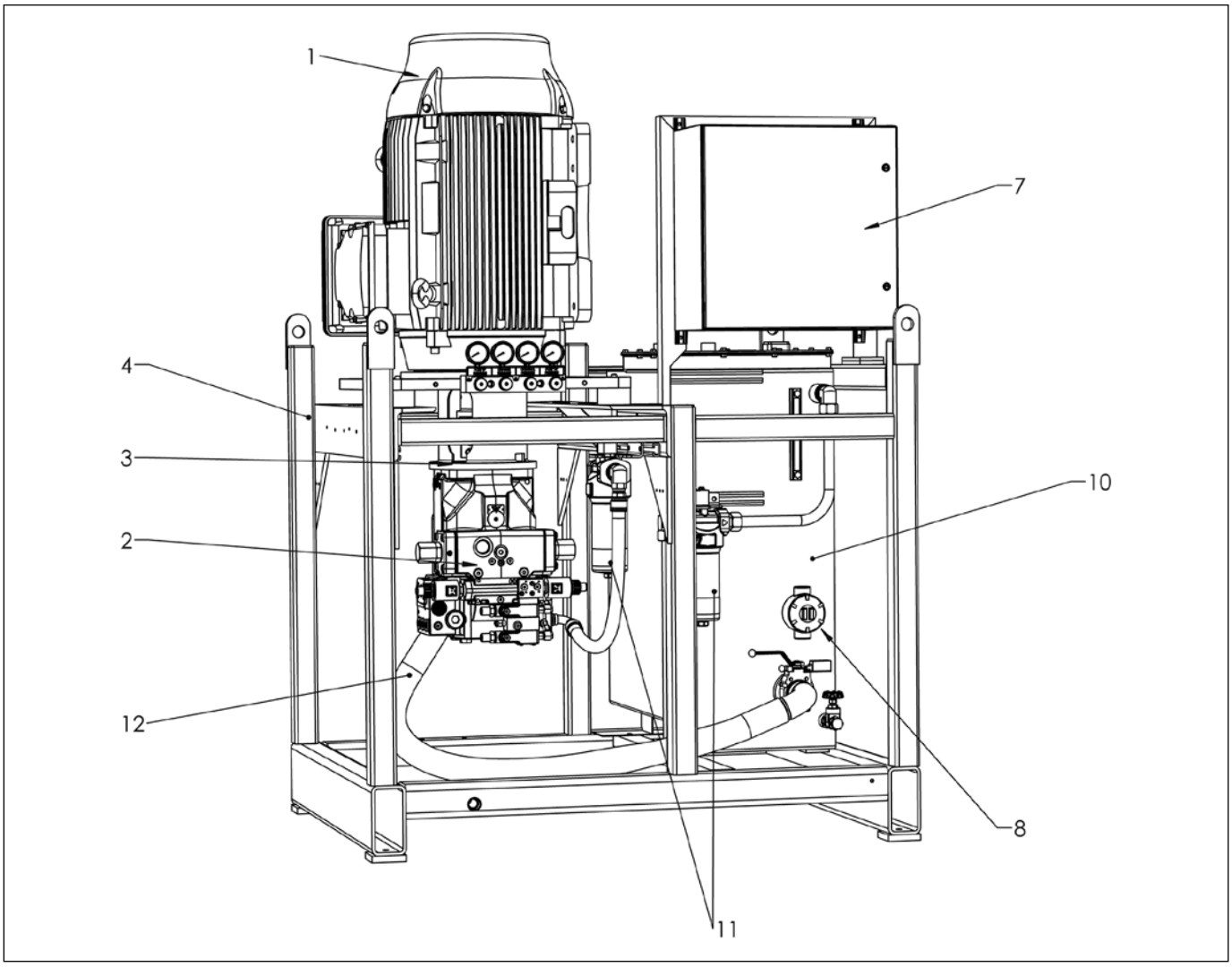


**Fig. 3: Main components PBC S, M, L, and XL**

| Main components | | |
|---|---|---|
| **Item** | **Description** | **See also figure** |
| 1 | Electrical motor | – |
| 2 | Hydraulic pump | – |
| 3 | Shaft coupling/bellhousing | – |
| 4 | Frame | – |
| 5 | Panels (PAC only) | – |
| 6 | Top cover (PAC only) | – |
| 7 | Control system, Hägglunds spider | – |
| 8 | Oil heater (optional) | – |
| 9 | Oil cooler (not shown) | – |
| 10 | Oil tank | Fig. 4 |
| 11 | Filter | – |
| 12 | Hoses, internal | All |

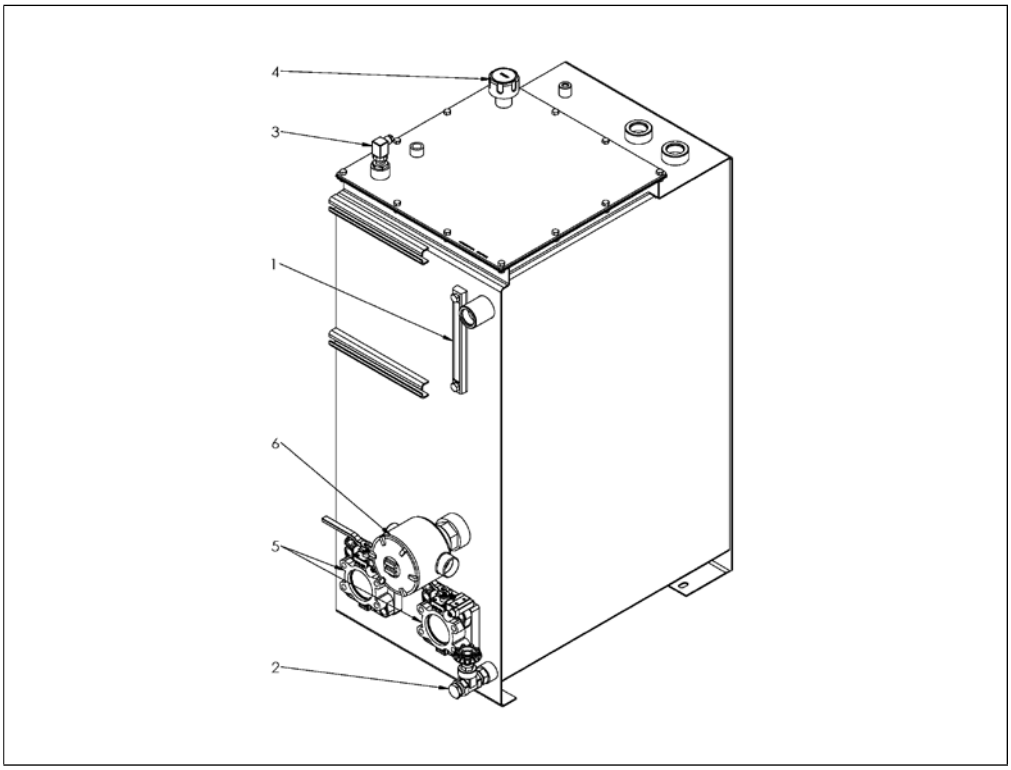


**Fig. 4: Detailed view, tank PAC/PBC S, M, L, and XL**

| Item | Description |
|---|---|
| 1 | Oil-level gauge |
| 2 | Oil-drain valve |
| 3 | Level and temperature sensor |
| 4 | Air filter breather |
| 5 | Suction ports / valves |
| 6 | Oil heater |

## 5.4 Hydraulic fluids

The Hägglunds hydraulic system is primarily designed for operation with hydraulic fluids according to ISO 11158 HM.

Fluids by the standards given in *Table 4: Suggested fluid types* are suggested. Before the start of project planning, see data sheet RE 15414, Hydraulic fluid quick reference, for detailed information on hydraulic fluids and specific additional demands

**Table 4: Suggested fluid types**

| SO 11158 | ISO 15380 | ISO 12922 |
|---|---|---|
| HM | HEES | HFB |
| HV | HEPG | HFC |
| | HEPR | HFDU |

**Details regarding the selection of hydraulic fluid**

The hydraulic fluid should be selected such that the operating viscosity in the temperature range, as measured in the motor housing, is within optimum operation range, see *Fig. 5: Selection diagram for viscosity ranges with straight fluids, i.e. viscosity index 100*. General recommendation is to have a system temperature of 122 °F, see dotted line in *Fig. 5: Selection diagram for viscosity ranges with straight fluids, i.e. viscosity index 100*. A VG 68 fluid will render just above 40 cSt at this point.

- Optimum viscosity range is 40 to 150 cSt.
- Running above 150 cSt or below 40 cSt results in reduced efficiency.
- Running above 400 cSt results in substantial efficiency loss.
- For pumps, the maximum start-up viscosity is 1000 cSt.
- For motors, starting at above 10000 cSt imparts unnecessary strain on parts.
- Running below 30cSt may impact the service life.
- Running below 20 cSt may render instant seizure.

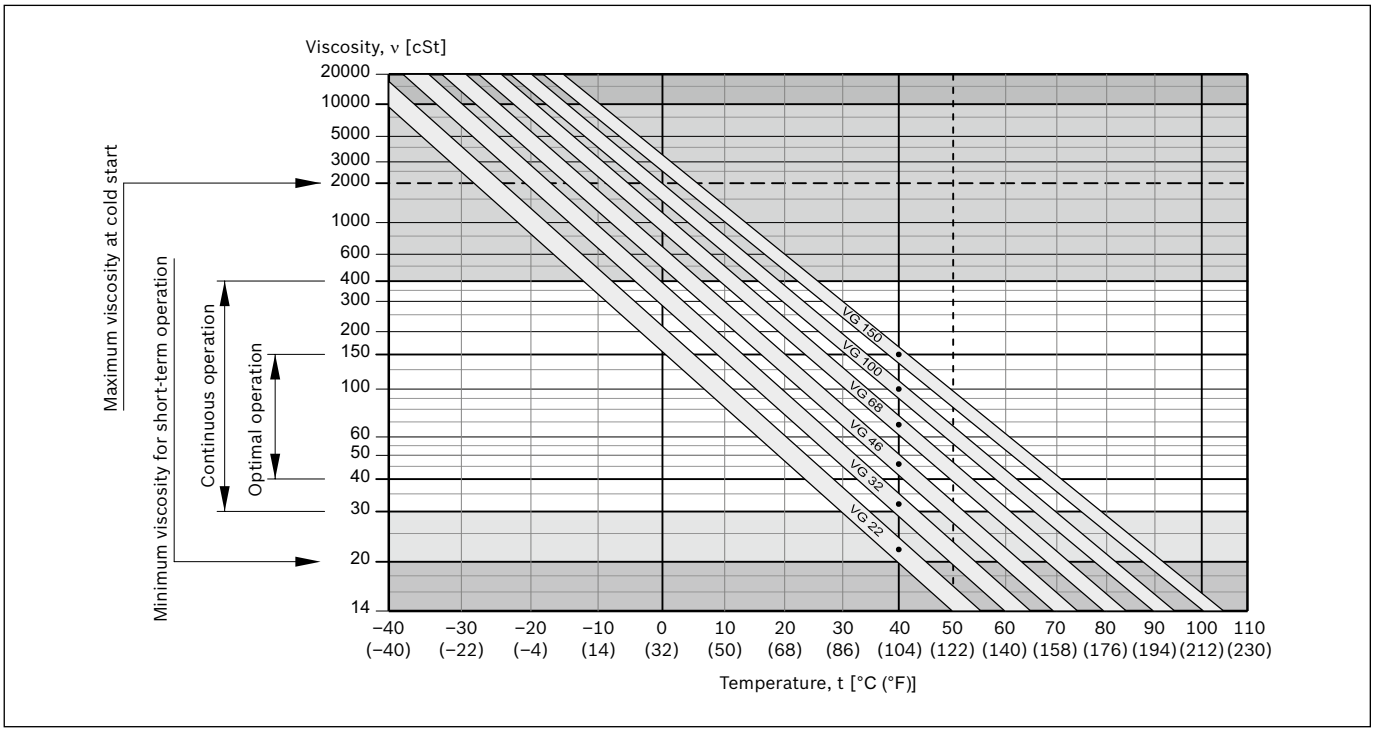


**Fig. 5: Selection diagram for viscosity ranges with straight fluids, i.e. viscosity index 100**

## 5.5 Requirements for hydraulic fluid cleanliness

The drive units are equipped with filters on the drain line and return line. In order to obtain stated service life it is important to follow recommendations concerning cleanliness levels and maintenance.

**Cleanliness level recommendations**

- The system must be flushed before start up (see section *8.3 Flushing before start up*).
- When filling the tank with hydraulic fluid it is important to fill through the special oil filler connection (see *8.2: Filling up the system with hydraulic fluid*).
- For industrial applications the contamination level should not exceed NAS 16389 Class 9 (ISO 4406:1999 18/16/13).
- Have a water content of <200 ppm (0,02%).
- Always use filter elements recommended and supplied by Bosch Rexroth.
- The hydraulic fluid should be analyzed according to the special maintenance intervals for your specific drive unit or the maximum intervals on the maintenance chart (see *Table 15: Maintenance chart*). Be particularly vigilant when removing equipment for repairs or maintenance, dirt must not be allowed to enter the system, clean prior to opening and plug open connections.

| ***NOTICE*** |
| --- |
| **Dirt in oil**<br>Damage on equipment<br>▶ Do not re-use hydraulic fluid which has leaked out. |

## 5.6 Cooling water

The cooling water must be filtered to 44 µm.

**It is important to:**

- Maintain the water filter (if any) in a correct way to get the required flow of water through the Water-oil cooler.
- Check the temperature in the hydraulic system, according to the special maintenance intervals for your specific drive unit.
- Clean the cooling system if the temperature in the hydraulic system is above the specified limits on account of too low cooling capacity.
- Clean and empty the cooling system (water side) before periods of rest (especially if the cooling water is not totally clean).

| ***NOTICE*** |
| --- |
| **Cooling capacity too low**<br>The service life of hydraulic motor, the main components in drive unit and the hydraulic fluid will be reduced.<br>▶ Have the required flow, pressure and temperature of the cooling water (see Hägglunds PAC/PBC order specific documentation). |

## 5.7 Drive unit monitoring

If the monitoring function is not included in a control system supplied with the drive unit, the following function **must** be fulfilled in the system.

The monitoring of the drive unit switches and sensors are grouped in two levels according to the logic diagram.

The warning indication is to give an indication about a problem in the drive unit but does not need an immediate action. The alarm indicates a need for stopping the pump. The stop sequence is to first stop the hydraulic motor by setting the pump swash angle to zero without ramp and after a short delay to allow the hydraulic drive to stop, switch off the electric motor.

The low (charge) pressure indicator must be interlocked during stop and startup of the electric motor to avoid alarm and give the pump time to build up the charge pressure after start.

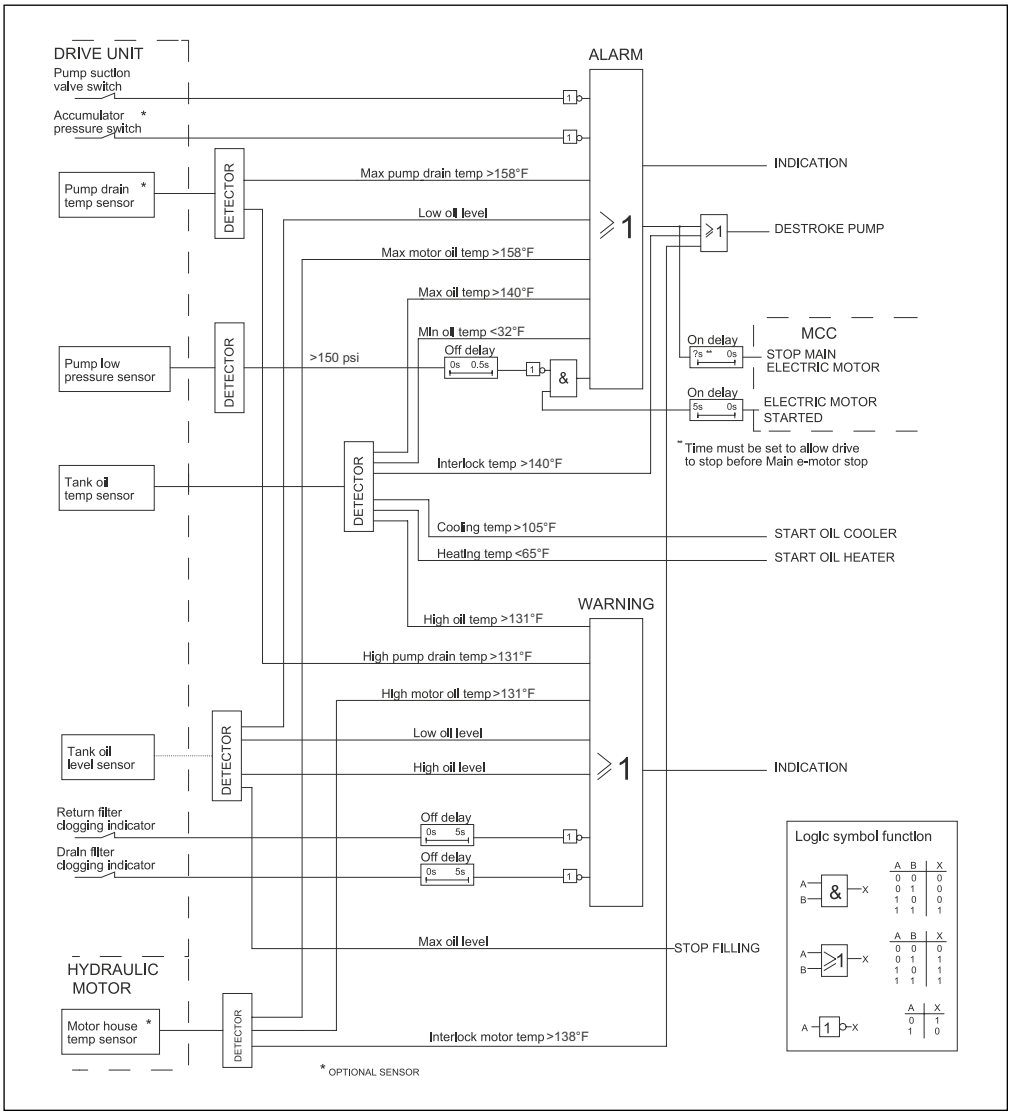


**Fig. 6: Monitoring logic diagram**

# 6 Transport and storage

## 6.1 Storage of the packed drive unit

At delivery the drive unit is protected by a plastic hood with a label showing the center of gravity. Do not remove the plastic hood until installation!

At delivery, the hydraulic components are protected internally with desiccant bags to absorb moisture. This provides sufficient corrosion protection for indoor storage in air conditioned premises for about 12 months.

The drive unit and belonging parts (including parts delivered separately) should be stored indoors, in dry, vibration free and dust free conditions. It should not be stored for more than three months in non-air conditioned premises. The drive unit must be placed where not exposed to strong sunlight or severe cooling to avoid condensation.

If storage time exceed limits, the drive unit must be operated so that the hydraulic system is lubricated with new fluid (see *9.8: Drive unit out of service*).

## 6.2 Lifting the packed drive unit

The packed drive unit is among other things marked with center of gravity and weight. Normally the drive unit package is designed for forklift truck handling.

**⚠ WARNING**

**Packed unit can tip**

Danger to life or risk of injury, damage to equipment

- Center of gravity is high, see label on the crate.
- Avoid rapid acceleration, deceleration and turns while moving the goods.
- Position the forks according to the instructions in *: If storage time exceed limits, the drive unit must be operated so that the hydraulic system is lubricated with new fluid (see 9.8: Drive unit out of service)., section Lifting with fork lift*

**Lifting with fork lift**

The lifting of drive units can is done by lifting from the long side.

The absolute minimum required fork length, see *Table 5: Minimum fork length*

The minimum distance between the forks is 31.5 in – 43.25 in depending of the drive unit size.

Position forks about the centre of gravity at lifting from long side. At lifting from short side the lifting shall be done from the side closest to the center of gravity.

**Parts that are delivered separately**

- The package is always marked with the weight.
- Packages are only designed for forklift truck handling.

**Table 5: Minimum fork length**

| Cabinet size | Fork length PAC/PBC in |
|---|---|
| PAC/PBC S2 | 48 |
| PAC/PBC S3 | 48 |
| PAC/PBC M2 | 65 |
| PAC/PBC M3 | 65 |
| PAC/PBC L3 | 72 |
| PAC/PBC XL3 | 84 |

# 7 Installation

## 7.1 Installation directives

If the drive unit is to work properly it must be installed in accordance with these instructions. The conditions the unit will operate in must be taken into consideration. Improper installation, not following the instructions in this manual and in the attached technical documentation, may affect the function and/or the service life of the drive unit. It is important that the safety precautions in this manual always are followed.

Position the drive unit:
- on a firm level foundation to avoid vibrations.
- to ease maintenance and service (see *7.3: Positioning the drive unit*).
- protected from weather, airborne sprays, heavy contaminations and radiated heat.
- to ensure free ventilation for cooling purposes for the electric motor and the air-oil cooler.
- to minimize pipe runs.

Clamp each pipe in the pipe run separately and attach it to a firm foundation to avoid vibration. The hydraulic connections from the drive unit must always be fitted to the piping with hoses. If air-oil cooler is mounted at a location other than on the drive unit, it must be considered that the cooler will start without notice and has sharp edges.

## 7.2 Lifting methods

**Lifting with fork lift**

See *6.2: Lifting the packed drive unit section lifting with fork lift*.

Lifting with ropes/chains

Lift the drive unit without top cover, maximum lifting angle 90°.

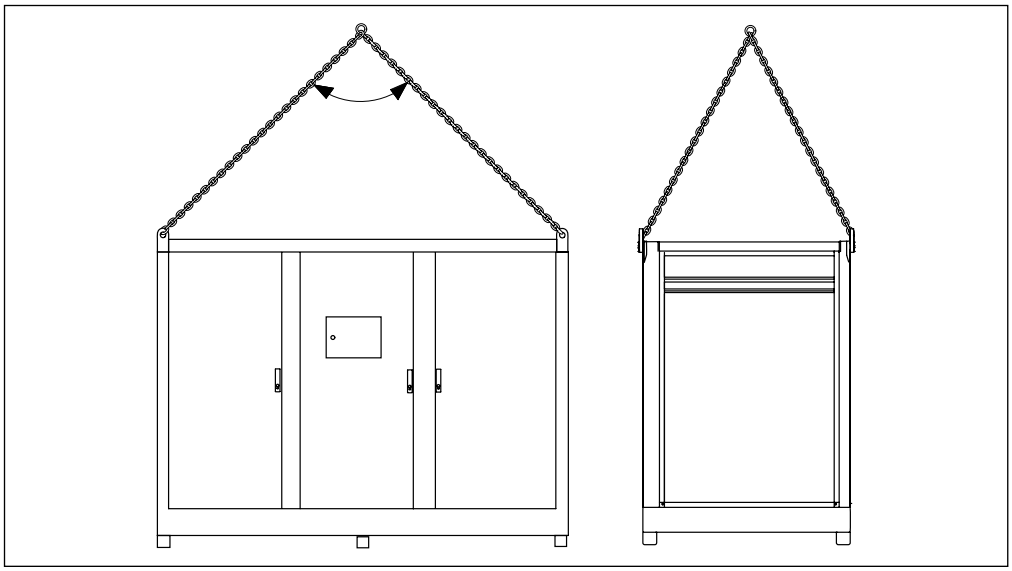

**Fig. 7: Lifting the PAC/PBC S, M, L, AND XL**

**⚠ DANGER**

**Danger while transporting or lifting Hägglunds drive unit due to heavy weight!**
Danger to life, risk of injury or serious injuries and risk of damage to equipment

- Do not stand under hanging load.
- Use only lifting equipment adapted to the weight of the drive unit (check rating plate inside the cabinet).
- Centre of gravity is high, see label on plastic cover of cabinet.
- Do not lift the drive unit with hydraulic fluid in the tank, or with the front bar disassembled.
- Do not lift the drive unit with main electric motors installed unless the motors are pre-assembled at delivery.
- Always use a minimum of four lifting points when lifting the drive unit.

## 7.3 Positioning the drive unit

The following minimum space must be left around the drive unit, to ensure free ventilation and provide sufficient working space for easier maintenance. Heavier maintenance e.g. change of motor/pump will demand more working space. The drive units may not be installed side by side without facing side walls removed. It is important that all pipes (both for water and hydraulics) are mounted to give sufficient working space for maintenance.

**⚠ WARNING**

**Unstable movement or turning over of the drive unit at installation of drive units in outdoor environment with heavy wind, at inclined surfaces or in areas with risk for earthquakes.**
Risk of injury or serious injuries

- The drive unit has to be fixed to the ground with fixing screws or similar.

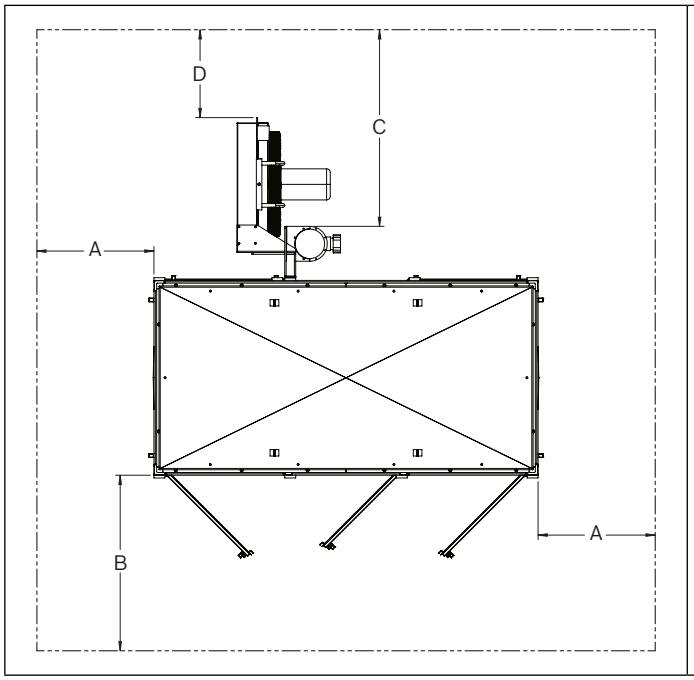


**Fig. 8: Recommended minimum space around drive unit, PAC**

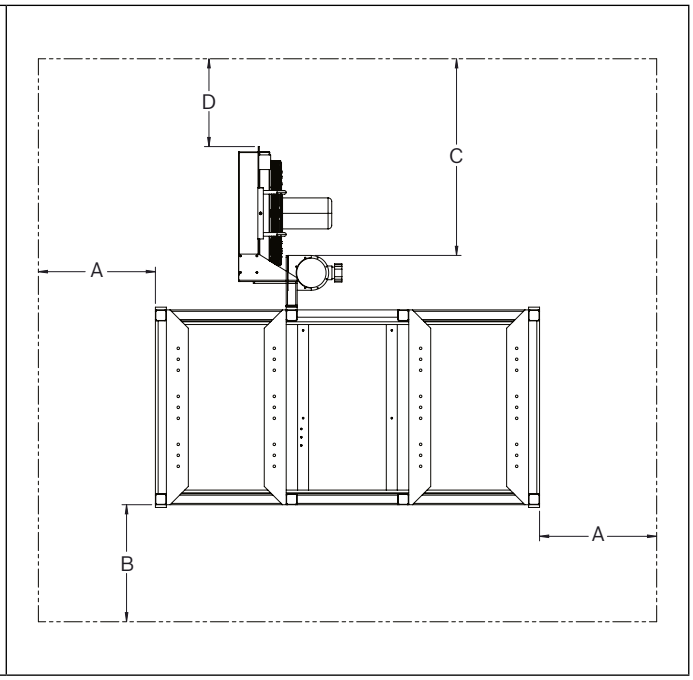


**Fig. 9: Recommended minimum space around drive unit, PBC**

**Table 6: Recommended space around PAC/PBC**

| Minimum space | PAC (in.) | PBC (in.) |
|---|---|---|
| A | 32 | 32 |
| B | 48 | 32 |
| C | 32 | 32 |
| D | 24 | 24 |

**Side by side positioning**

When drive units are installed side by side, side panels must be removed to make it possible to perform service on the drive unit. Distance between units should be 5 mm to allow assembly of sealing strip. Use sealing strip from Bosch Rexroth!

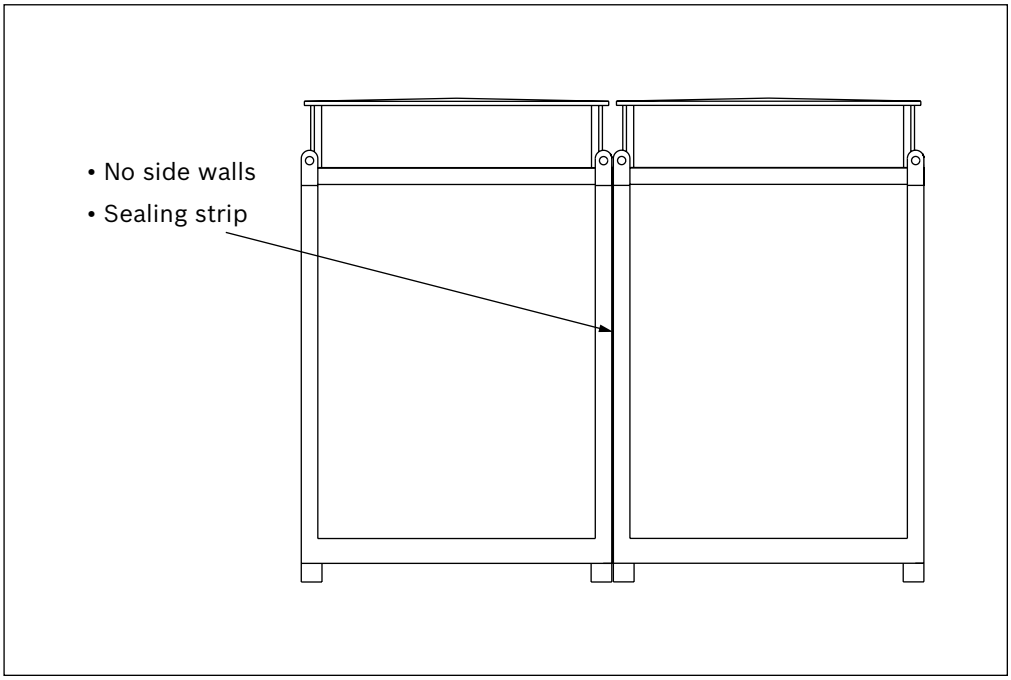


**Fig. 10: Drive unit installation side by side**

## 7.4 Mounting of the cabinet feet

**⚠ CAUTION**

**Unplanned drop of the unit**
Risk of crushing hands.
- Follow the safety precautions in *7.2: Lifting methods*
- Use support to prevent drop.

The cabinet feet (option) minimizes the vibrations and makes it easy to level the drive unit. They are delivered separately within the cabinet and have to be mounted according to the following instructions:

1. Mount the cabinet feet before filling hydraulic fluid in the tank.
2. Mount the cabinet feet before the electric motor(s), if they are delivered separately or supplied by the customer.
3. Lift the drive unit according to *7.2: Lifting methods*. Notice especially the safety precautions.
4. Mount the cabinet feet according to *Fig. 11: Adjusting cabinet feet* and *Table 7: Adjusting cabinet feet.* Level the drive unit by the adjusting screws.

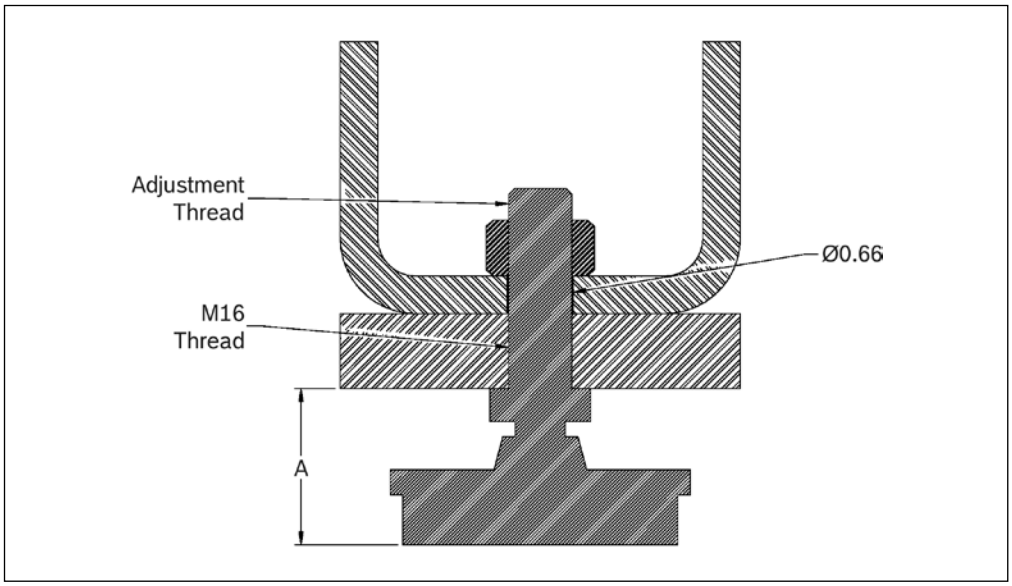


**Fig. 11: Adjusting cabinet feet**

**Table 7: Adjusting cabinet feet**

| Cabinet size | Adj. height A | Adj. screw head size |
|---|---|---|
| | in | mm |
| PAC/PBCS2 | 1.56–2.56 | 22 |
| PAC/PBCS3 | | |
| PAC/PBCM2 | | |
| PAC/PBCM3 | | |
| PAC/PBCL3 | | |
| PAC/PBCXL3 | | |

## 7.5 Mounting of main electric motor

In many cases the electric motor(s) are delivered separately. The following instructions are applicable for these cases only.

**⚠ WARNING**

**Unsecured motor can fall**

Risk to life or serious injury or material damage.

- Do not stand under hanging load.
- Use all lifting ears when the electric motor is hanging free.
- Earbolts must be screwed in right up to their supporting surface and tightly fastened
- Use only lifting equipment adapted to the weight on the rating plate.
- No hands between electric motor and bellhousing during assembly.
- If necessary, use suitable, sufficiently-sized transport equipment such as lifting straps (EN1492-1)

1. **Unpack the electric motor**
   Unpack the electric motor. Check the electric motor for external damage and that all rating plate data are the same as in the attached technical documentation.

2. **Check the shaft coupling**
   Check that the axial shaft coupling for external damage and that the locking screw is tightened.

3. **Lift the electric motor**
   Two separate lifting equipments are needed to lift the electric motor.

   – Lift the electric motor horizontally with both lifting equipments.
     Do not use the motor shaft as lifting point!
   – When at a reasonable height, lower one of the lifting equipment until the motor is hanging vertically.
   – If needed, lower the motor to a stable frame or similar resting on the electric motor flange.
   – If needed reconnect one lifting equipment for vertical lifting of the electric motor. The straps must be separated to avoid force from the straps to the fan cover (Fig. 12). Never let the electric motor stand on the shaft coupling!

Dismount the front beam of the PAC/PBC to simplify the assembly of the electric motor!

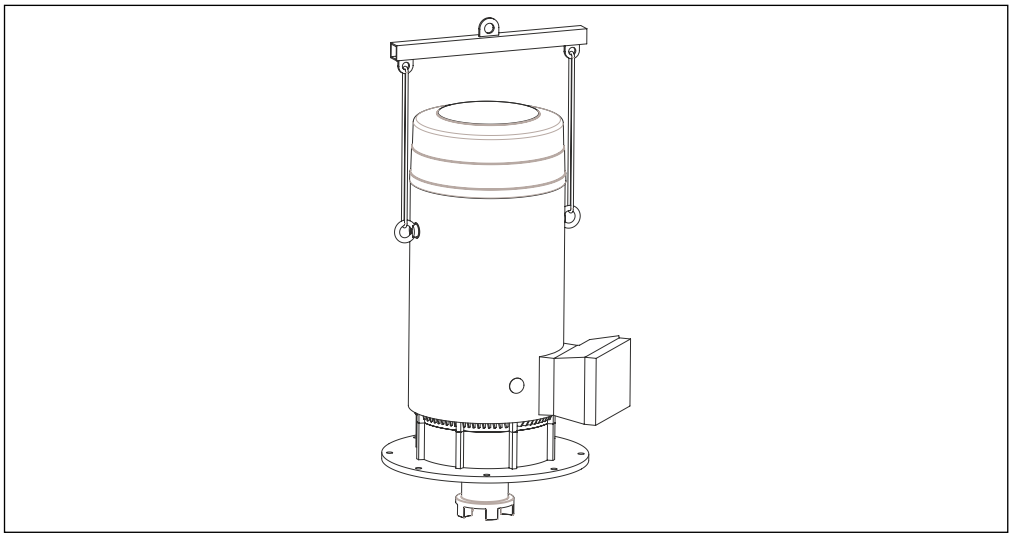

**Fig. 12: Lifting electrical motor vertically**

4. **Mount the electric motor in the drive unit**
   Lift the electric motor in to the drive unit. It is important that the electric motor is hanging vertically. Fit the shaft coupling through inspection hole (*Fig. 13: Mounting of electrical motor*) into the ring gear coupling without causing any damage. The connection box on the electric motor must be positioned as shown on the order specific dimension drawing. Lower the motor to a position approximately 0.25 in above the bellhousing. Place screws in the holes and tighten by hand. Lower the motor to the bellhousing.

5. **Tighten screws to the bellhousing**
   Inspect that there is an axial clearance (*Fig. 13: Mounting of electrical motor*) through the inspection hole in the bellhousing. Tighten the attached screws to the bellhousing with torque according to *Table 8: Tightening torques of bellhousing.*

6. **Mount unit top cover**
   Assemble top cover according to *7.6: Mounting of top cover* and mount on the PAC/PBC.

**Table 8: Tightening torques of bellhousing**

| Bolt Size | 1/2-13 | 5/8-11 | 3/4-10 |
|---|---|---|---|
| Tightening torque (ft lbs) | 94 | 187 | 323 |

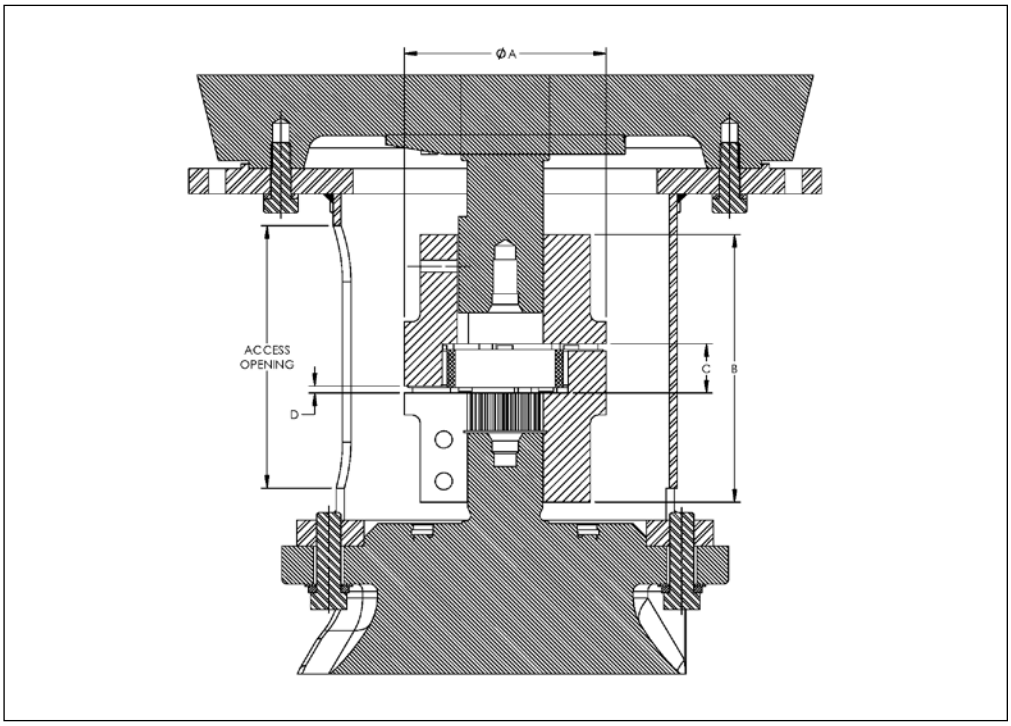


**Fig. 13: Mounting of electrical motor**

### Shaft coupling

For information about coupling type, see order specific PAC/PBC documentation

**Table 9: Axial shaft coupling clearance**

| | | | | | Keyed Coupling | | Spline Coupling | |
|---|---|---|---|---|---|---|---|---|
| **Coupling Type** | **A** | **B** | **C** | **D** | **Screw Size** | **Torque (ft lbs)** | **Screw Size** | **Torque (ft lbs)** |
| 38/45 | 3.160 | 4.500 | 0.981 | 0.156 | 5/16-18 | 14 | 3/8-16 | 49 |
| 42/55 | 3.740 | 5.000 | 1.031 | 0.156 | 3/8-16 | 23 | 7/16-14 | 76 |
| 55/70 | 4.130 | 6.300 | 1.173 | 0.156 | 1/2-13 | 50 | 7/16-14 | 76 |
| 75/90 | 6.300 | 8.270 | 1.534 | 0.219 | 1/2-13 | 50 | 5/8-11 | 230 |
| 90/100 | 7.880 | 9.650 | 1.746 | 0.266 | 3/4-10 | 167 | 5/8-11 | 230 |

## 7.6 Mounting of top cover

If the drive unit is placed outdoors, the top cover should be sealed with sealing strip. Do not glue the top cover! The air intake shall be turned away if possible, from dusty environment.

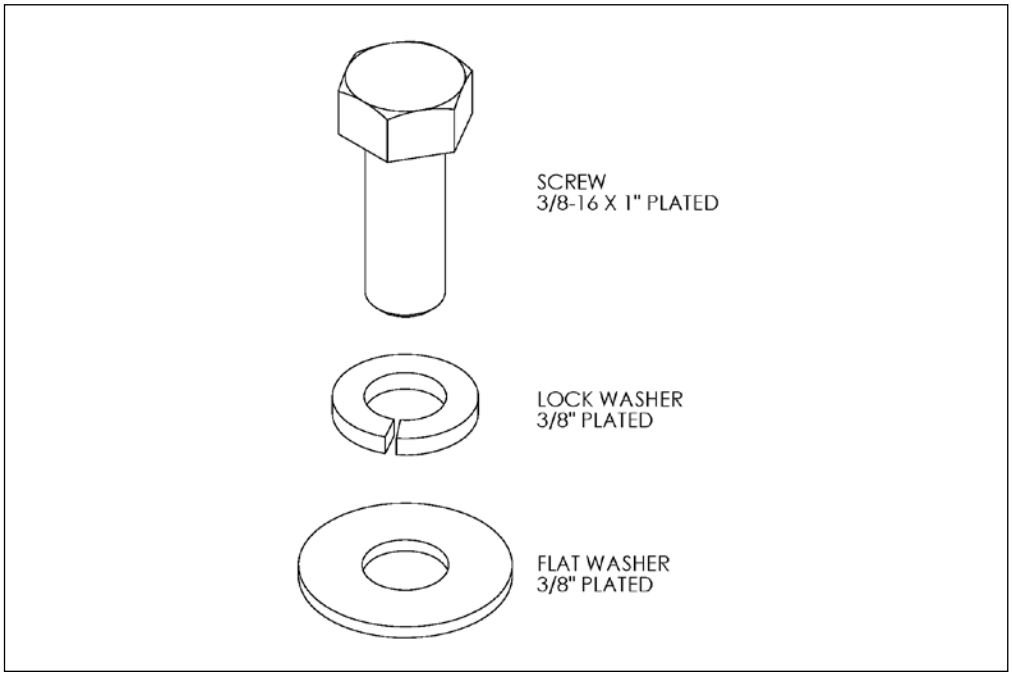


**Fig. 14: Parts for assembling of top cover**

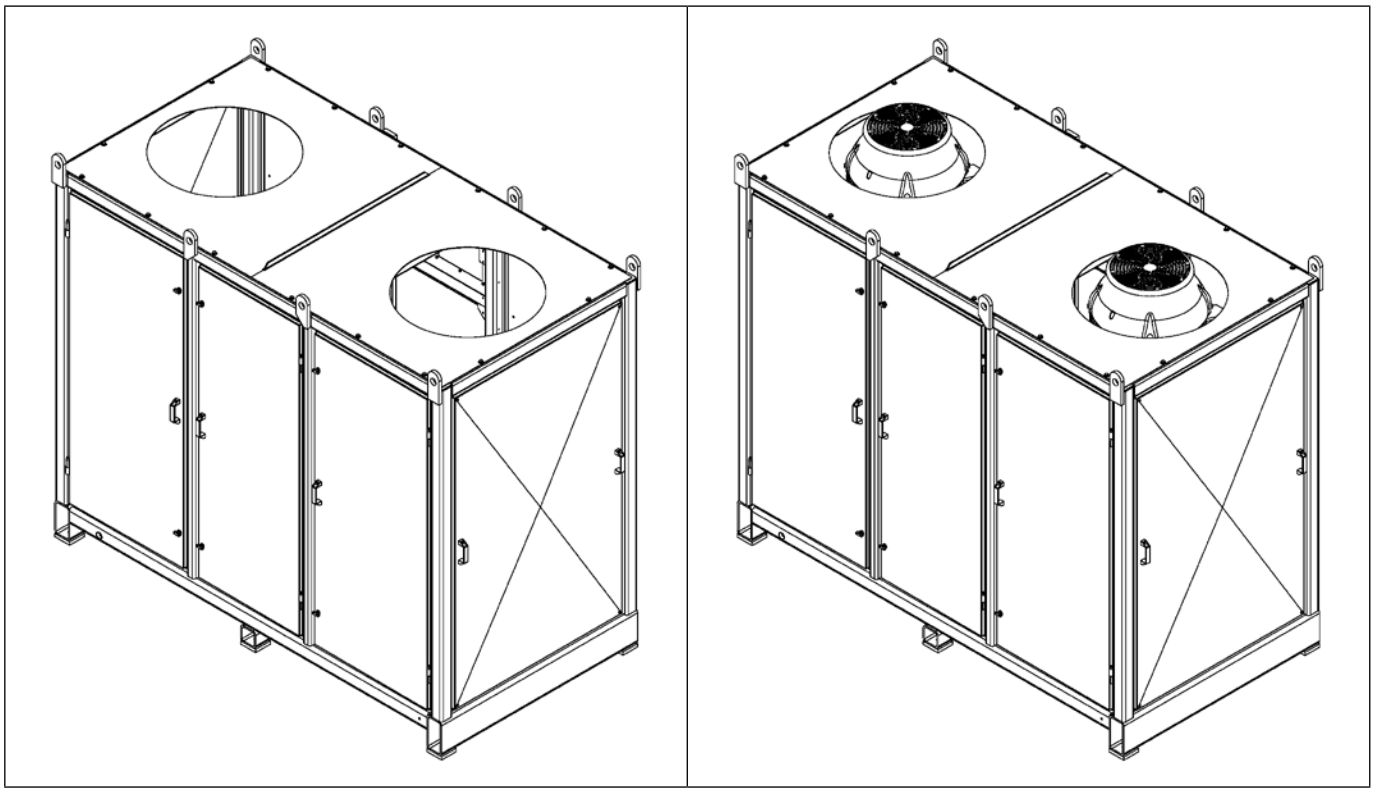

**Fig. 15: Panels**

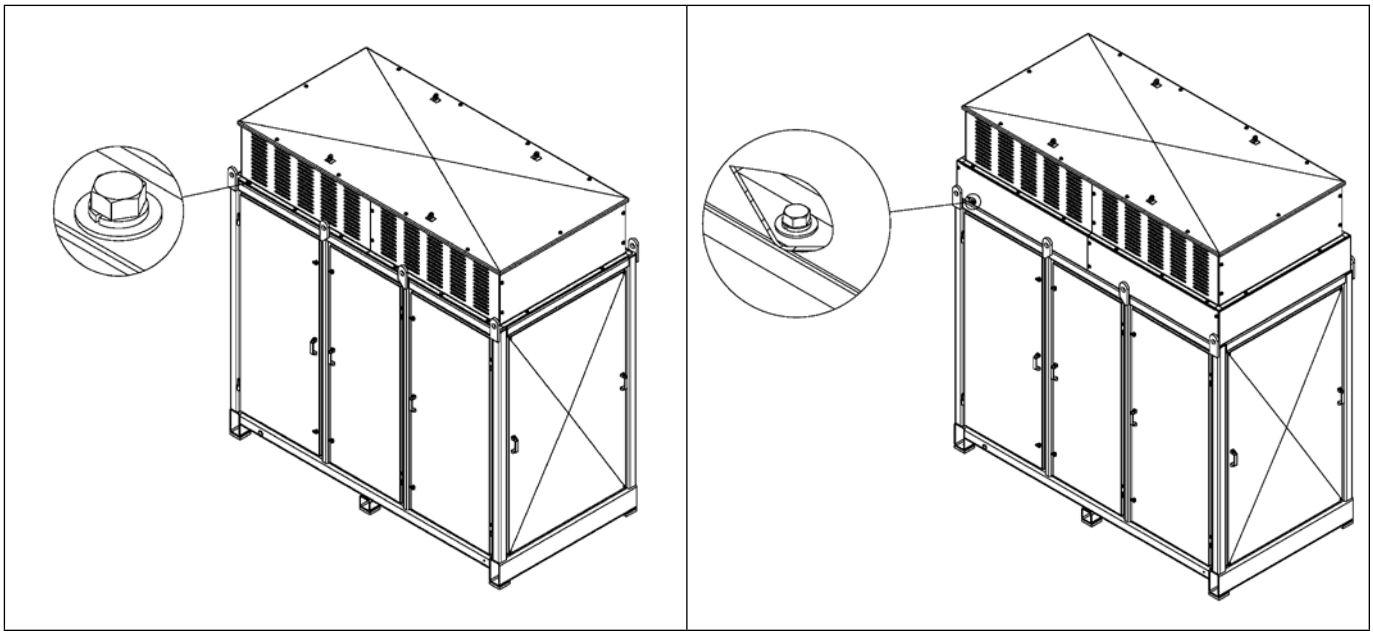

**Fig. 16: Air outlet (only for top cover > 1000 mm)**

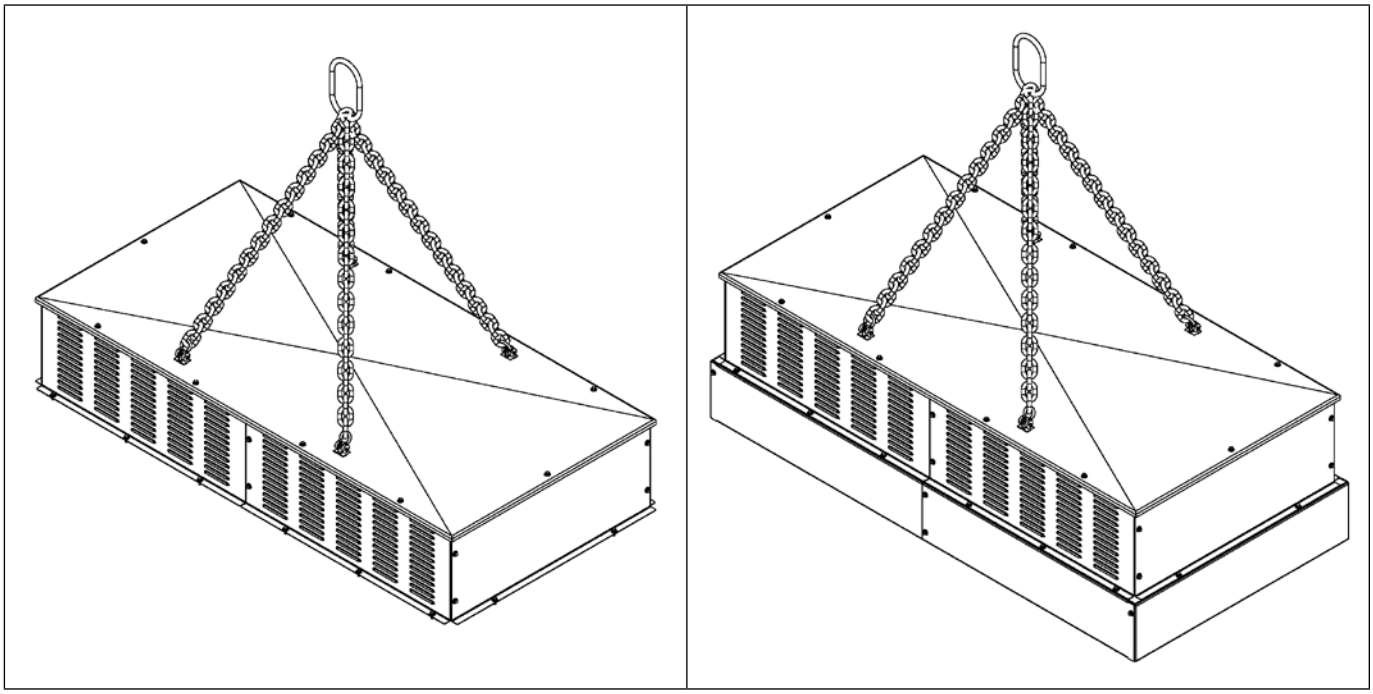

**Fig. 17: Lifting top cover (when built on floor)**

If the top cover is assembled on the floor, screws must be loose to allow the top cover construction to align with the frame after positioning. Tighten all screws properly when all is in position.

## 7.7 Hydraulic connections

During mounting of the hydraulic connections the following points must be followed.

- Do not remove coupling protections until final assembly.
- Mount all external pipes to give sufficient working space to allow maintenance of the drive unit.
- Always use hoses to connect with piping.
- All measures in the hydraulic system must be performed by professional service personnel with knowledge of risks involved. Be especially accurate when connecting the A- and B- connections (high pressure).

**⚠ DANGER**

**Pressurized oil leakage**

Danger to life or risk of injury.

▶ Do not open any connections if the hydraulic system is pressurized.

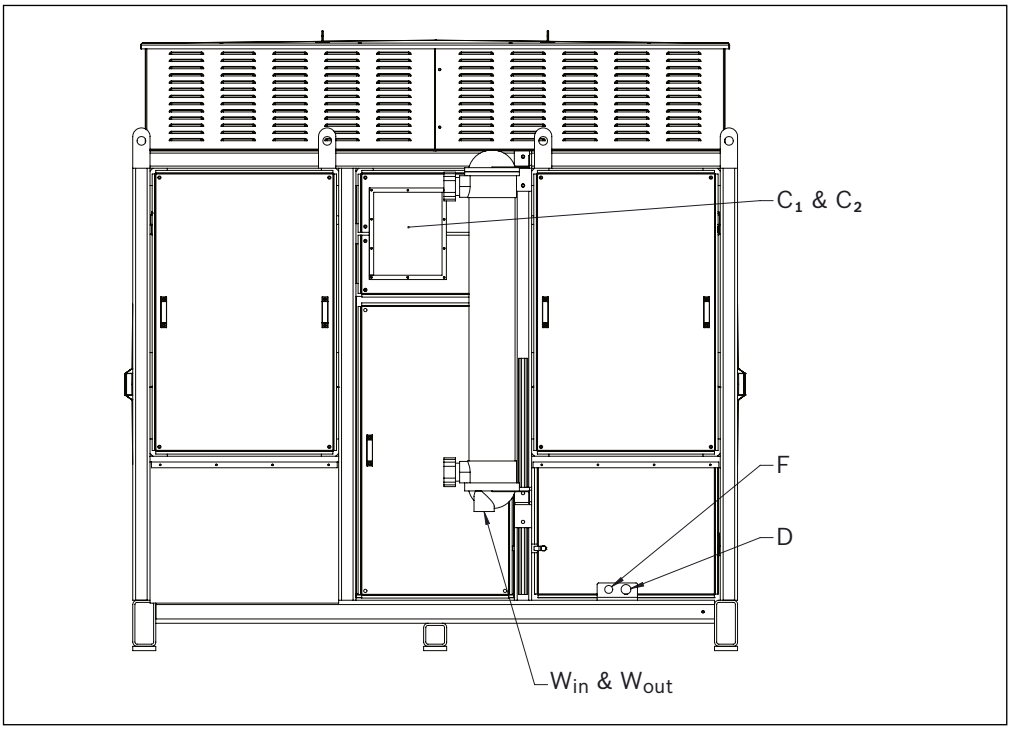


**Fig. 18: Connections PAC**

**Table 10: Connections PAC**

| | Function |
|---|---|
| $C_1$<br>$C_2$ | Oil OUT to cooler<br>Oil IN from cooler |
| F | Oil OUT flushing motor(s) |
| D | Drain from hydraulic motor(s) |
| $W_{in}$<br>$W_{out}$ | Water in oil cooler<br>Water out oil cooler |

**Table 11: Dimensions pump connections**

| Pump type | Dimensions main connection A&B | Thread | Depth of threaded holes | Thickness std flange connections | Torque*) |
|---|---|---|---|---|---|
| | | | in | in | ft lbs +10% -0 |
| SP40 | 3/4" SAE | 3/8-16" UNC | 0.8 | 0.7 | 44 |
| SP71 | 1" SAE | 7/16" UNC | 0.6 | 0.9 | 68 |
| SP125 | 1 1/4" SAE | 1/2" UNC | 1.0 | 1.0 | 111 |
| SP180 | 1 1/4" SAE | 1/2" UNC | 1.0 | 1.0 | 111 |
| SP250 | 1 1/2" SAE J5118C flange code 62-6000psi | 5/8-11 UNC | 1.1 | 1.1 | 218 |
| SP355 | | | | | |
| SP500 | 2" SAE J5118C flange code 62-6000psi | 3/4-10 UNC | 1.6 | 1.5 | 332 |
| SP750 | | | | | |
| HD6-HD7 | 1 1/2" SAE J5118C flange code 62-6000psi | 5/8-11 UNC | 1.3 | 1.1 | 218 |
| HD11-HD14 | | | | | |
| HD24-HD30 | 2" SAE J5118C flange code 62-6000psi | 3/4-10 UNC | 1.5 | 1.5 | 332 |

*) Torque acc. to SAE J518-2 with class 10.9 or grade 8 screws.

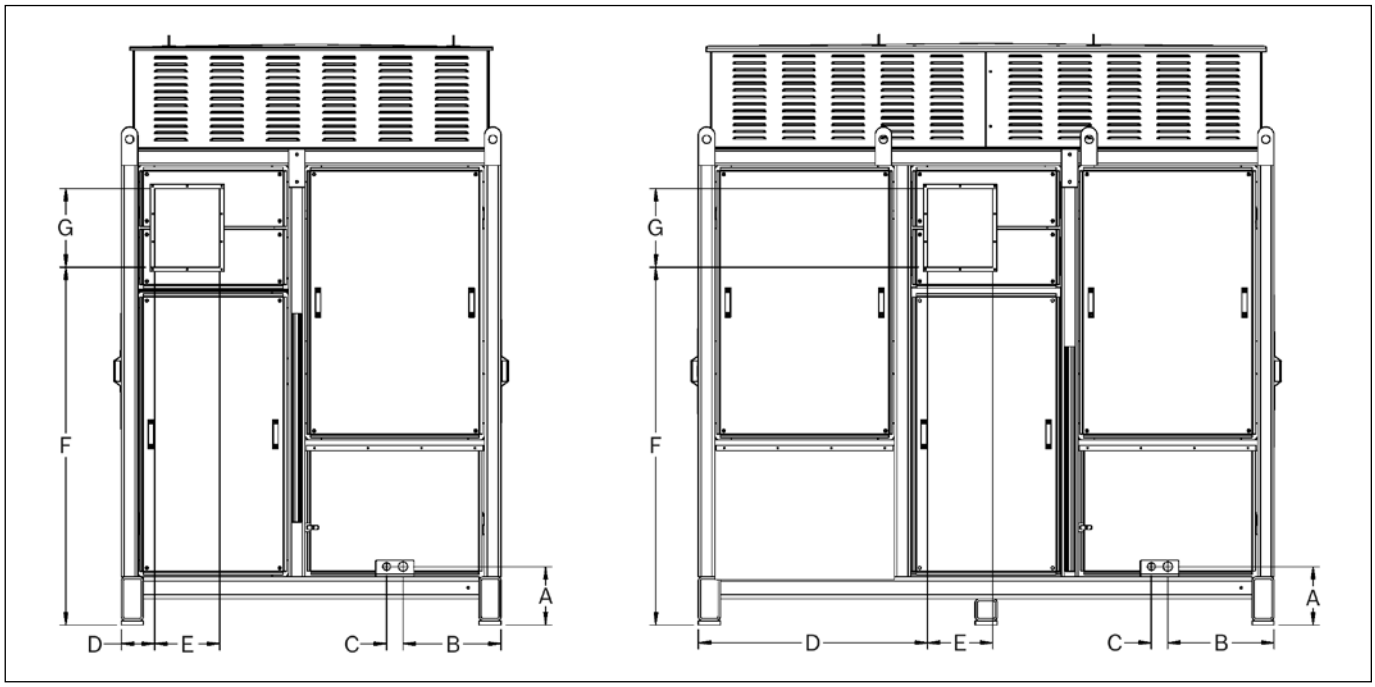


**Fig. 19: Dimensions external connections points example PAC Small, Medium, Large and X Large**

**Table 12: Dimensions external connections points PAC Small, Medium, Large and X Large**

| Cabinet Size | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| PAC/PBC S2 | 8.625 | 13.75 | 3 | 6.063 | 11.875 | 59.188 | 14.375 |
| PAC/PBC S3 | 8.625 | 13.75 | 3 | 33.563 | 11.875 | 59.188 | 14.375 |
| PAC/PBC M2 | 10.625 | 17.875 | 3 | 6.063 | 11.875 | 65.188 | 14.375 |
| PAC/PBC M3 | 10.625 | 19.375 | 3 | 41.813 | 11.875 | 65.188 | 14.375 |
| PAC/PBC L3 | 10.625 | 20.125 | 3 | 45.313 | 11.875 | 77.188 | 14.375 |
| PAC/PBC XL3 | 10.625 | 23 | 3 | 61.563 | 20.875 | 78.156 | 15.188 |

## 7.8 Pipe work, internal

**General**

The drive unit should be placed as close to the hydraulic motor as possible, taking other circumstances (e.g. space, environmental conditions ) into consideration. The main connections of the main pump and the hydraulic motor must always be fitted to the piping with hoses. We recommend to use shut off valves for the main lines A and B. The protections on all ports must be kept on until final assembly to avoid dirt in the system.

**Storage of included components**

The included components shall be stored according to *6.1: Storage of the packed drive unit*.

**Handling of fittings**

**General**

Inspect the sealing surfaces on the couplings visually before mounting. It must be free from any damages. Handle the couplings with care. Check that the sealing (if any) is in its right position, free from cracks and that it is saturated with oil . The dirt protections on the fittings must be kept on until final assembly.

**Flange fittings**

The flange screws must be tightened crosswise.

**JIC type, tube fittings, 37° flare (SAE J514, ISO8434-2)**

- Tighten the fitting nut with wrench until it stops. Tighten additional 1/4 turn to 1/2 turn.
- Use correct size of tool, to avoid fitting to be damaged and difficult to remove.

**Cleaning**

The pipes and hoses should be pre cleaned, inspected and sealed by the supplier. If the pipes are field bent and installed the overall system must be carefully oil flushed to reach the required cleanliness level.

**Mounting of hoses**

Ensure that hoses not are stressed or twisted on installation, to avoid premature failure. Bend radius should conform to manufacturers recommendations.

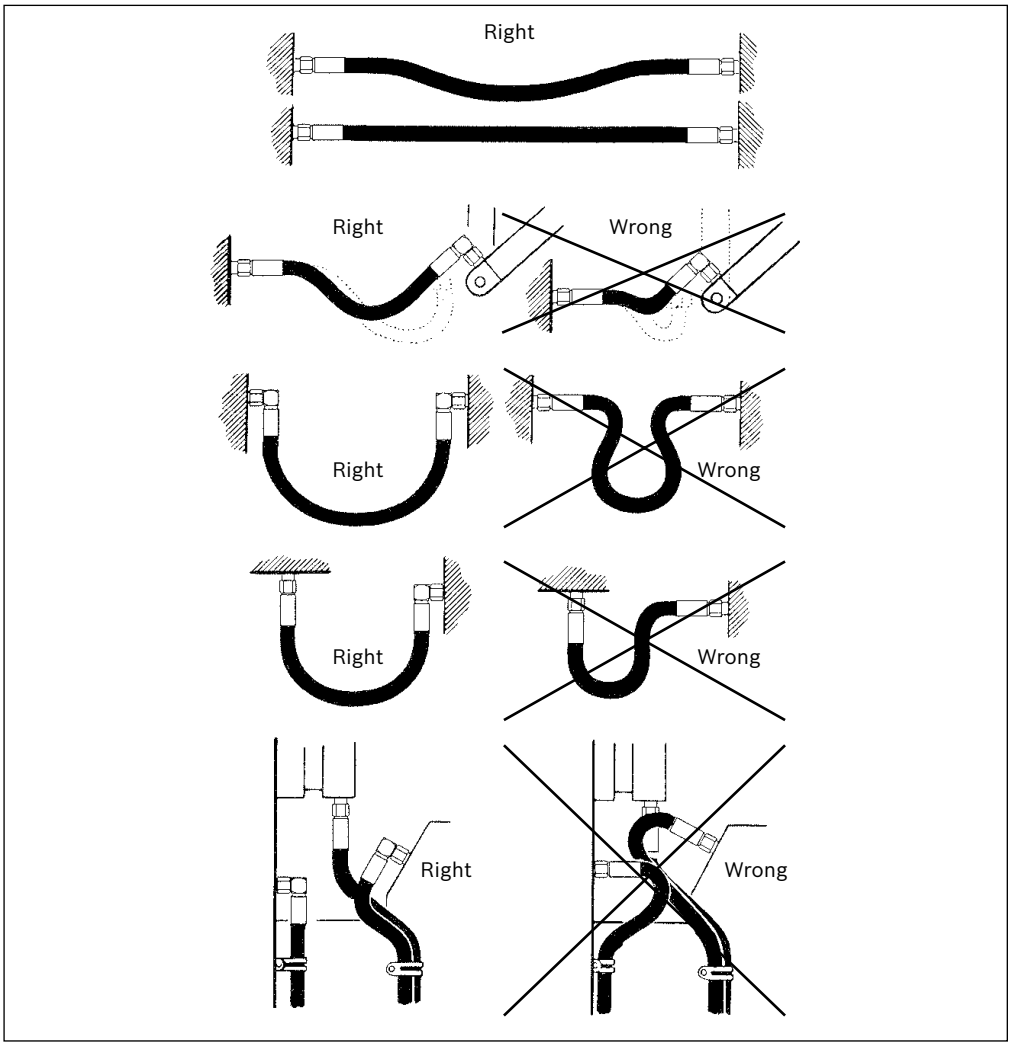


**Fig. 20: Mounting of hoses**

## 7.9 Electric connections

### 7.9.1 Safety precautions

Installation of electrical equipment must in most countries be installed by licensed electricians (ref. to domestic laws).

- All electric equipment has to be installed and used by qualified personnel who are familiar with relevant safety requirements.
- Safety equipment necessary for the prevention of accidents at the mounting and operating site shall be provided in accordance with the regulations prevailing in the local country.
- Grounding shall be carried out according to local regulations before the electric equipment is connected to the main voltage. Grounding point on the back side of the frame.
- All electrical supply levels must be within the limits that the equipment is constructed for, see order specific Hägglunds PAC/PBC documentation and rating plate.

### 7.9.2 Control system box and additional box

Connect the cables to the terminals inside the control system box. For some features, there is an additional junction box next to the control system box. All external electrical connections must be connected according to the electrical drawings in the Hägglunds PAC/PBC order specific documentation.

### 7.9.3 Air-oil cooler

The main voltage and connection are marked on the electric motor marking plate. Y or D Connection is done depending on supply voltage in accordance to *Fig. 23: D and Y connections* from MCC (Motor Control Center). The start and stop signal to control the MCC shall be connected according to the order specific documentation. Check direction of rotation, see air stream arrow in *Fig. 21: Air-oil cooler*

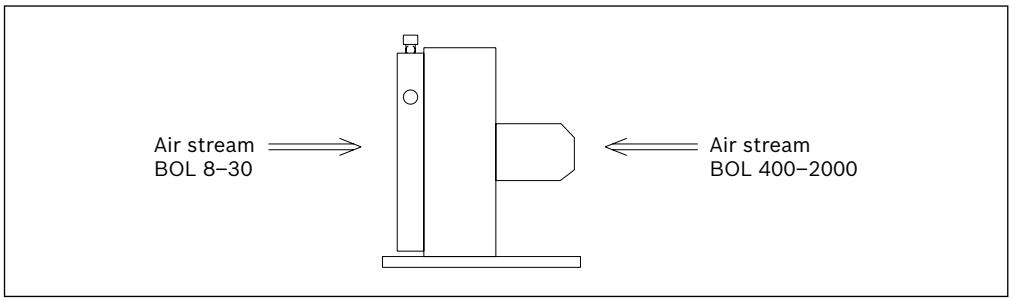


**Fig. 21: Air-oil cooler**

### 7.9.4 Water-oil plate cooler

Connect the water-oil cooler to the pre-assembled cable connector on the backside of the drive unit.

### 7.9.5 Water-oil tube cooler

Cable is pre-assembled to the water valve for the cooler.

### 7.9.6 Oil heater

Connect the cables on the screw terminals inside the terminal box as shown in *Fig. 22: Connections terminal box, oil heater*. For power and voltage see attached Hägglunds PAC/PBC order-specific documentation and rating on the oil heater.
The start and stop signal to control the heater shall be connected according to the Hägglunds PAC/PBC order-specific documentation.

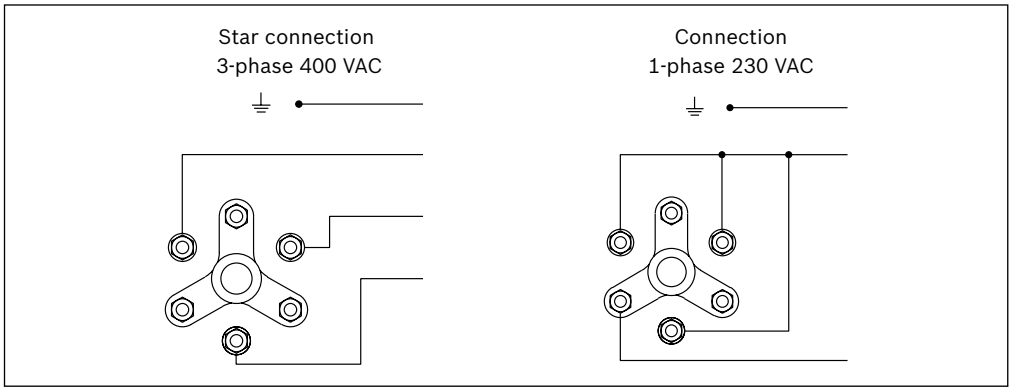


**Fig. 22: Connections terminal box, oil heater**

### 7.9.7 Electric motor

The main voltage and connection are marked on the electric motor marking plate, Y or D Connection is done depending on supply voltage in accordance to *Fig. 23: D and Y connections* from MCC (Motor Control Center). Electric motor must be separately grounded.

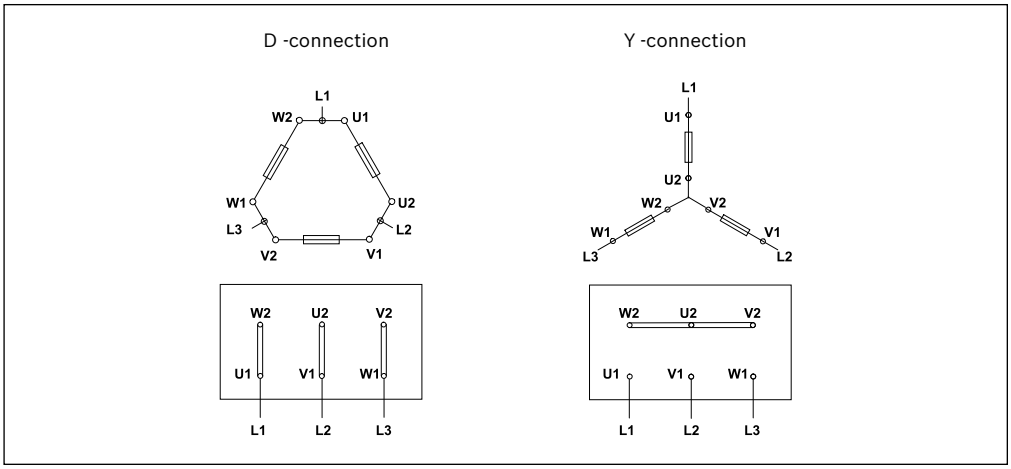


**Fig. 23: D and Y connections**

**Table 13: Standard voltage**

| Standard voltage D | Standard voltage Y |
|---|---|
| 380 V /50Hz | 660 V /50Hz |
| 400 V /50Hz | 690 V /50Hz |
| 415 V /50Hz | |
| 440 V /60Hz | |
| 460 V /60Hz | |
| 480 V /60Hz | |

# 8 Commissioning

## 8.1 Before commissioning

**General**

- Read and understand this complete manual and the other attached technical documentation.
- Visually check the whole system for: signs of damage, incorrect circuitry, security of foundations.
- Check that the coupling between the electric motor and pump is properly mounted.
- The accumulator has to be filled with dry nitrogen to a pressure level in accordance with the attached order specific Hägglunds PAC/PBC documentation (the accumulator is normally precharged to approximately 130 psi at delivery). For filling point see *Fig. 2: Main components PAC S, M, L, and XL and Fig. 3: Main components PBC S, M, L, and XL*.

| ***NOTICE*** |
| --- |
| **The system will not fullfil the functionality**<br>Damage to the customer equipment<br>▶ The accumulator must be charged with dry nitrogen from a bottle equipped with a pressure reducing valve. |

**Cleanliness**

- The external hydraulic system must be thoroughly cleaned on the inside.

**Pipe work**

- The couplings has to be securely tightened.
- The pipe work must be properly cleaned.
- The pipe work has to be mounted free of stress.
- The lines has to be in accordance with installation drawing/piping plan.

**Electrical**

- Check that electric motor(s), control system and other electrical components are connected to the correct voltages.
- Check the function of electrical components and monitoring system manually. Instruments that cannot be actuated can be checked for correct wiring and possibly operated manually. Level switch and indication should be checked when filling up the tank.
- Check interlock of electric motor.
- Check the stop sequence of the system at alarm.

## 8.2 Filling up the system with hydraulic fluid

**Before filling**

- Check that the correct type and quality of hydraulic fluid is used. Do not mix different types of hydraulic fluid without first checking with manufacturers.
- Check that the barrel with hydraulic fluid and tank/hoses not are contaminated with water or other substances.

**Filling**

Use a fluid filling pump unit with a filter rating of β10 ≥ 75.

Cleanliness in barrels with new oil is not clean enough for the system and has to be filtered before filling up in to the system to avoid problems.

## NOTICE

**Dirty oil in the system!**

Damage on the equipment!

- Only use the specific filling point in the drive unit to fill up the hydraulic system, see *Fig. 2: Main components PAC S, M, L, and XL and Fig. 3: Main components PBC S, M, L, and XL*

Always pump the fluid in through the special quick connection. The quick connection is a completely rust-proof quick release coupling, The fluid filled into the system will be filtered through the drain filter.

The tank must be filled with oil to the nominal level before starting for the first time, according to *Table 14: Oil volume in tank*. Check the function of the level sensor and indication on the level gauge during filling up of the tank.

**Table 14: Oil volume in tank**

| Reservoir Size | Recommended Fill (gallons) | Sight Glass Maximum (gallons) | Max Oil Volume (gallons) |
|---|---|---|---|
| 200 | 52 | 56 | 61 |
| 400 | 103 | 108 | 116 |
| 600 | 155 | 162 | 173 |
| 800 | 217 | 228 | 243 |
| 1000 | 265 | 276 | 291 |
| 1200 | 324 | 336 | 357 |
| 1600 | 445 | 460 | 485 |

NOTE: Recommended oil fill is based on oil level being 2" down from top of sight glass.

## ⚠ WARNING

**Leakage of hydraulic oil**

Risk of personal injury

- Check the caution sign on the hydraulic fluid container and the warnings in section *5.4: Hydraulic fluids*.
- Avoid long contact with the skin and the hydraulic fluid.
- Remove any spilled oil from the floor, great risk to slip and fall.

## 8.3 Flushing before start up

A pressure filter and check valve has to be connected to the main line at the drive unit. This filter is connected on the return side of the drive pump. Recommended filtration degree β10 ≥ 75. The size of the flushing filter should be matched to the installed pump, so that the pressure drop across the filter is not excessive and that the max pressure/flow ratings for the filter is not exceeded.

The main lines should be connected together at the motor side enabling the entire system to be flushed, see *Fig. 24: Hydraulic circuit flushing*. If the system not is fitted with a flushing line to the hydraulic motor, the drain line from the motor has to be plugged. If the system is fitted with a flushing line to the hydraulic motor, the flushing line shall be connected to the drain line of the motor to enable cleaning of the flushing line.

**⚠ CAUTION**

**Wrong direction of rotation of the pump**

Pump will be damaged. System contaminated

- Make sure that the pump has the correct direction of rotation. The correct direction of rotation is marked with a sign placed under the electric motor.

**Rotating parts!**

Risk of injury.

- Do not touch rotating parts inside the inspection hole or in the zone of rotating parts.

The maximum flow from the drive unit should be flushed through the main circuit for at least 2 hours on small installations and considerably longer time on large installations. Use extreme caution to ensure pump is stroked in sync with free flow direction of check valve. Use a check valve sized for the oil flow.

When using the main pump the maximum pressure should be reduced. After cleaning and flushing of the system, particle content has to be verified with oil sample test, inline cleanliness measurement or corresponding. High cleanliness is important for long lifetime of the hydraulic system.

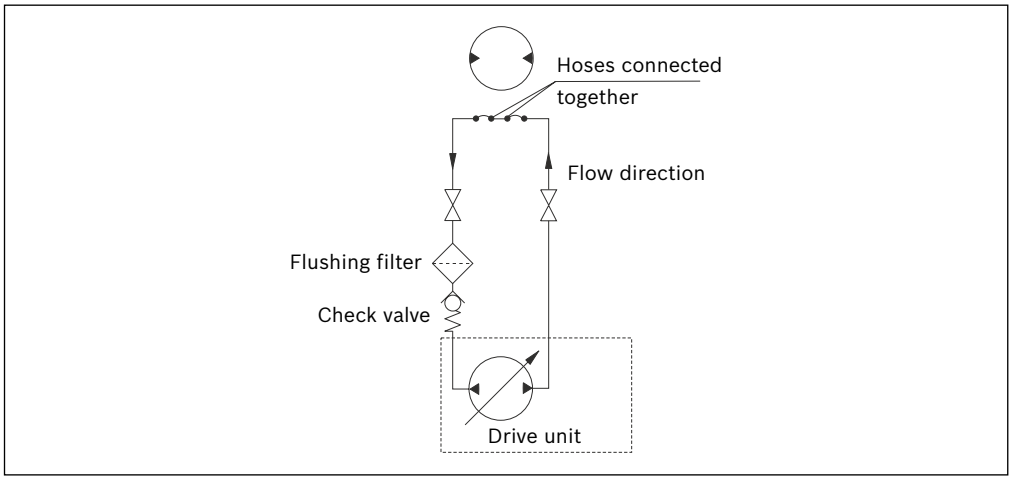


**Fig. 24: Hydraulic circuit flushing**

## 8.4 Initial start up procedure

**Important**

- Follow section *2: Safety instructions*.
- Make sure the driven system and driven machine is ready to run.
- Warn all personnel in the area that the system will be started.
- Never operate the drive unit with defective instruments or control elements.
- Keep inflammable materials away from the drive unit.
- During start-up period, the hydraulic system will be cleaned from built-in dirt particles, therefore keep an eye on the filter indicator during the entire start up procedure.

**STEP 1**

**Immediately before starting**

- Check that the prescribed steps in section *8.1: Before commissioning* have been carried out.
- Check fluid level in the tank and refill to the nominal level, see *8.2: Filling up the system with hydraulic fluid*
- Check if any components need filling with clean hydraulic fluid, i.e. motor case.
- Check safety equipment.
- Make sure that all valves on the suction, pressure and inlet side of the pump, as well as any valves on drain lines, are open.
- Check that cooling water is connected and turned on if a water-oil cooler is used.
- For adjustments and settings on the control system (if any) see special instruction in attached order specific Hägglunds PAC/PBC documentation.

**STEP 2**

**Start with unloaded pump at short intervals**

Starting of the drive unit shall be carried out with a completely unloaded pump in short intervals. Five (5) second max until proper charge pressure is reached.

- When the hydraulic fluid is cold some restarts may be needed to raise the charge pressure.
- Check the charge pressure level and confirm with data and settings on attached order specific Hägglunds PAC/PBC documentation.
- If OK, the pump may be allowed to come on stroke and introduce flow into the unloaded hydraulic system. Check that the charge pressure is still OK.

**STEP 3**

**Unloaded pump at longer intervals**

- Run for a period at no load condition until system is stable and control is established.
- Check fluid level in the tank.
- Filling up the system with fluid may be needed as parts of the system have been filled up.
- Check for unusual noises or vibrations.
- Check that the specified pressure levels for charge pressure and control pressure (control pressure, only on the SP pump) at the drive unit are maintained in accordance with the values stated on the hydraulic diagram in the order specific Hägglunds PAC/PBC documentation. These pressure levels are preset at the factory and normally not needed to readjust.
- Check for leakage points.

- Stop the electric motor and correct if any faults discovered on the points above.
- Check all connections, screws etc. and tighten if necessary.
- Restart when finished.

**STEP 4**

**Loaded hydraulic system**

- The hydraulic system can be loaded when the hydraulic system functions works satisfactorily in unloaded running condition.
- Gradually increase load until satisfactory operation is obtained.
- It may be necessary at this point to make adjustments to flow, ramp rates, etc.
- Cycle the system until normal operating temperature is reached.
- If system will run with speed feedback, check and adjust feedback regulator parameters.

**STEP 5**

**Check:**

- Unusual noises or vibrations.
- Function of the safety equipment.
- Temp in tank and closed loop. Check also that the cooler control is stable. If not, investigate water supply, controls, air-oil cooler, etc.
- Leakage points.
- Pump compensator pressure control and pressure switches (optional). At delivery, these pressure levels are set according to the order specific hydraulic diagram and normally no readjustment will be necessary. Pump compensator pressure can be checked by closing the valve on the high pressure leg and stroke the pump until the pressure is indicated on the control system display or on an optional gauge.

**STEP 6**

**After test**

- Correct any faults discovered at the points above.
- Check the filter indicator. It might be necessary to change filter elements due to particles from the piping. When changing filter elements carefully follow the instructions in *9.3: Filter change* to avoid dirt into the system. If there still is dirt in the system, additional flushing is necessary in order to prevent premature failure of system components.
- Check all connections, screws etc. and tighten if necessary.

## 8.5 Pump settings and adjustments

### 8.5.1 Variable displacement SP pump

Charge pressure level, control pressure level, high pressure relief valves and pressure compensator are set from factory and there is normally no need for readjustment. Check always the pressure levels in the attached Hägglunds PAC/PBC custom documentation.

Setting of pressures on the pump(s) must be performed by skilled service personnel familiar with the functions and risks involved with the pump. The pressures shall be set during operation of electric motor and with the system at operating temperature. Note that pressures can change with different viscosities.

**1. Charge pressure adjustment**

To adjust the charge pressure the pump shall be in neutral position (zero displacement). Release the lock nut, and adjust the charge pressure to the necessary level by turning the setting screw. The charge pressure shall normally be set to 220 psi. On application with high shock loads, type shredders the charge pressure shall preferably be set to 290 psi. The charge pressure shall be measured at port MK4.

**2. Control pressure adjustment**

The control pressure to be measured at port E2. The control pressure shall be adjusted to: 435 psi[1)] + ($p_n$ –$p_s$) with the pump in neutral/zero stroke position.

Special for pump size **SP355**, adjust the pressure to:
508 psi[1)] + ($p_n$ –$p_s$) with the pump in neutral/zero stroke position. ($p_n$ - $p_s$) = should be about 73-175 psi, depending on the pump size and electric motor speed. Release the lock nut and adjust the control pressure to the necessary level by turning the setting screw. To get the value $p_n$ measure the pressure in ME3-port with the pump in neutral. To get the value $p_s$ measure the pressure in ME3-port with the pump swivelled out to >50 % stroke (Secure that the flushing valve has moved).After adjustment tighten the setting screw by means of the lock nut.

Note 1) This pressure has to be 2 x charge pressure + 73 psi (SP355)

**3. High pressure relief valves setting A and B side**
For setting levels see the documentation for the specific Drive Unit.
The high pressure relief valve setting should be 580 psi > compensator pressures setting.

To adjust the high pressure relief valves A/B-ports have to be blocked and the compensator pressure level has to be adjusted down to minimum.
Swivel the pump to ~50 % stroke in A-side and adjust the compensator pressure up to the requested high pressure level (high pressure relief valves setting).

Adjust the high pressure relief valve A-side down to the same level as to the recently set compensator level. Read the working pressure in MAB-port
After that do the corresponding procedure on B-side.

---

**Notice!** The high pressure relief valves must be adjusted before the compensator pressure adjustment.

---

**4. Pressure compensator setting**
Release the lock nut and adjust the setting screw. The pressure compensator shall be adjusted with blocked main-port or blocked actuator. Stroke the pump to about 50% of max flow. Set the compensator pressure to a value according to the Hägglunds PAC/ PBC custom documentation. Measure the pressure at port MAB.

**5. Manual control of flow on SP pump**
The SP pump flow can be controlled manually with a button on each side of the pump controller. The manual control must be handled with high precaution as this will override all interlock of the drive.

**⚠ CAUTION**

**Manual control of pump**
Risk of personal injury or damage of equipment
- Use with high precaution

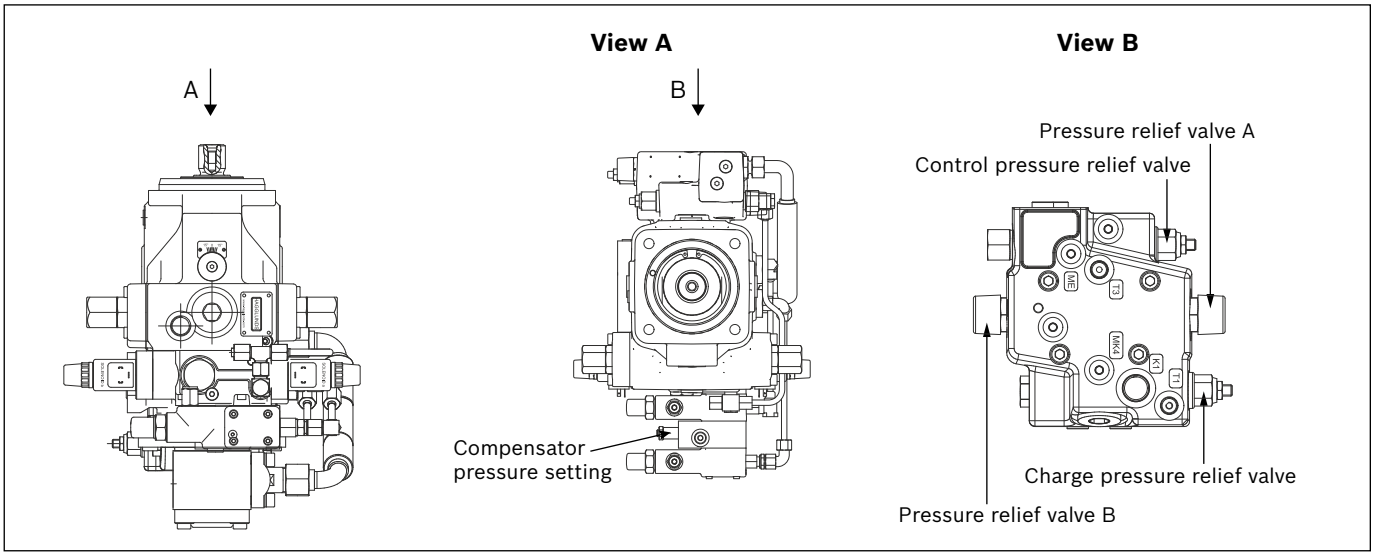


**Fig. 25: Pump SP40-SP71**

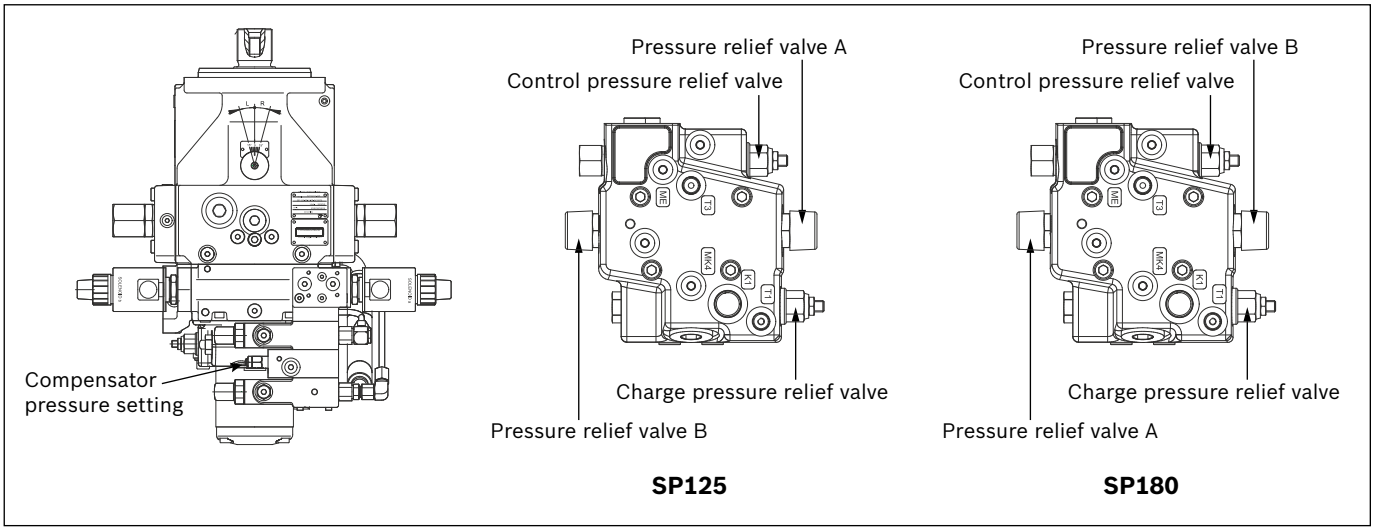


**Fig. 26: Pump SP125-SP180**

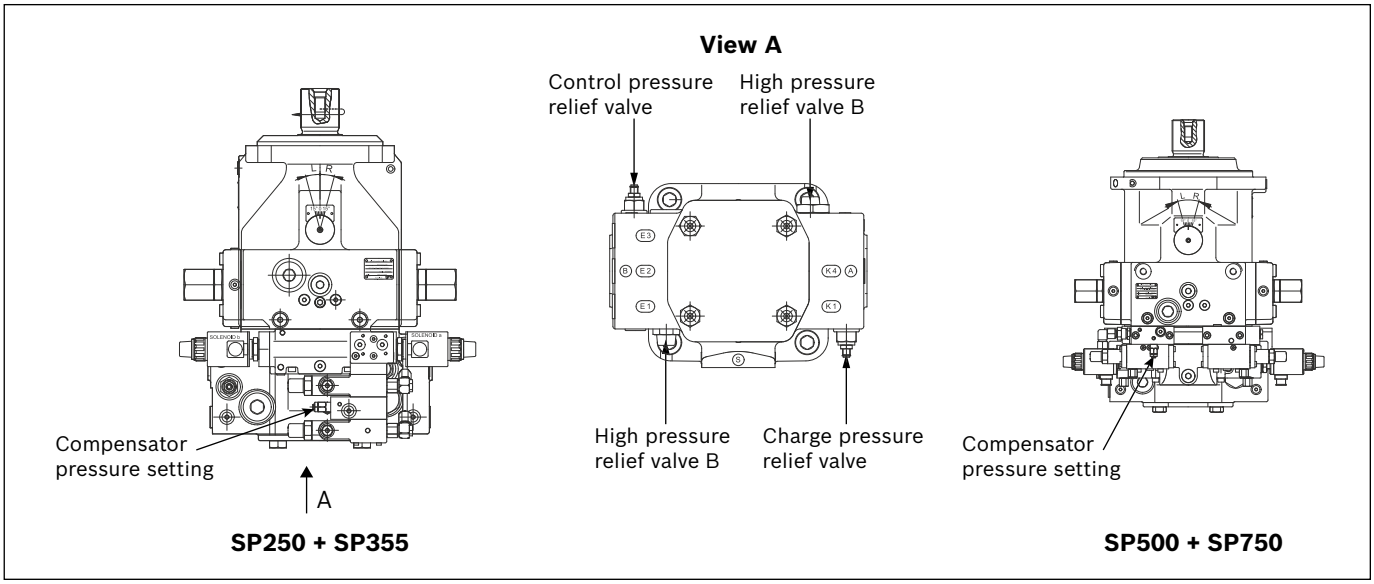


**Fig. 27: Pump SP250-SP750**

### 8.5.2 Axial piston HD pump

**General**

Charge pressure and pump compensator pressure level are set from factory and consequently there is normally no need for readjustment. Check always the pressure levels in the attached Hägglunds PAC/PBC custom documentation.
Setting of pressures on the pump(s) must be performed by professional skilled service personnel familiar with the functions and risks involved with the pump.
The pressures shall be set *during operation* and with the system at operating temperature. Note that pressures can change with different viscosities.

**Charge pressure adjustment**

1. Remove acorn nut, loosen lock nut and adjust pressure with an allen key, size 5/32“. Clockwise adjustment will increase the pressure. Charge pressure, see Hägglunds PAC/PBC custom documentation. If other charge pressures are to be set, contact Bosch Rexroth representative for consultation.

When charge pressure is set, tighten lock nut and return acorn nut. Note in the logbook or technical documentation.

**If the main pressure levels are to be increased**

1. Make sure that the piping and machine structure can take higher pressure/higher torque delivered from the hydraulic motor.
2. Compensator pressure adjustment. Activate or move the input signal to the control valve on the pump so that pressure increases in the high pressure closed circuit to the pressure limiter setting. The pressure limiter setting is reached when the pressure stops increasing and remains steady at a given pressure level (as shown on the gauges).The pressure limiter setting for both A- and B-side is set on the compensator valve.
   Remove acorn nut, loosen lock nut and adjust pressures with an allen key, size 5/32“, until the desired pressure level is established. Clockwise rotation of the adjustment screw will increase the pressure.
3. When main pressures are set, tighten lock nut and return acorn nut. Note the new pressure level in logbook or technical documentation.

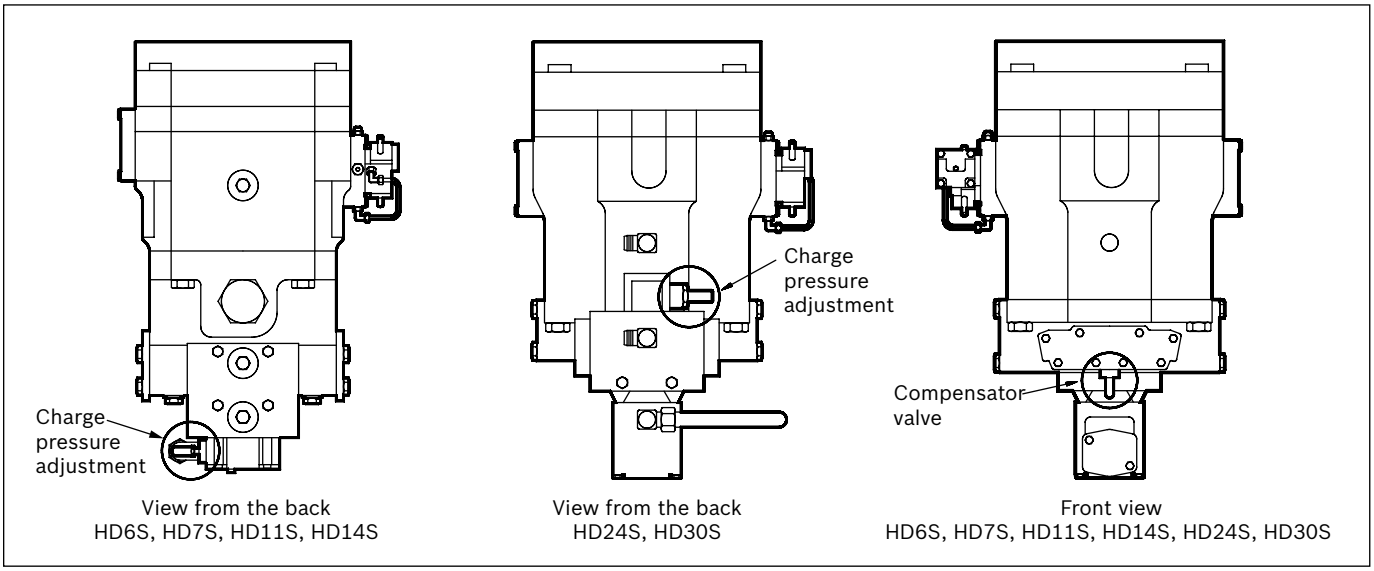


**Fig. 28: HD pump**

# 9 Maintenance and repair

## 9.1 Maintenance log

We recommend that a maintenance log is kept to record service/maintenance/repair, addition and alteration of the equipment. Each note, observation or comment should be dated.

## 9.2 Preventive maintenance

**Common**

The maintenance of hydraulic systems is designed to prevent failure of the system and to keep the system running efficiently to specification. The specific procedures will depend on the nature of the equipment, the environment it is working in and the duty cycle, bearing in mind the consequences of a breakdown. To optimize the maintenance intervals economically a Life Cycle Cost (LCC) analysis is recommended.

The panels covering the drive unit can be dismounted to simplify the access to the components inside the unit. The bolts holding the panels can be opened with a 3/4" tool.

**⚠ CAUTION**

**Drop of panels**

Risk of injury.

- If weight exceeds 50 lbs, utilize two persons when lifting.

**Daily checks, first week after commissioning**

- ☐ Fluid leaks
- ☐ Fluid level in the tank
- ☐ Operating temperature
- ☐ System pressure
- ☐ Charge and control pressure
- ☐ System performance and general condition
- ☐ Unusual noises
- ☐ Contamination indicators on the filters

**Pre-start checks (even daily)**

☐ Fluid leaks
☐ Fluid level in the tank
☐ The suction valve is open
☐ Contamination indicator on the filters

**Frequent checks (weekly to monthly)**

☐ Unusual vibrations or noises
☐ Fluid leaks
☐ Fluid level in the tank
☐ The unit is clean
☐ The air flow paths not are blocked (electric motor, air cooler, hood louvers, etc.)
☐ Pressure levels normal – stable
☐ Actuator speeds normal – stable
☐ Operating temperature
☐ The drive is running smoothly
☐ Contamination indicators on the filters
☐ Check and clean the oil pan
☐ Accumulator pre-charge (if equipped)
☐ Case drain flow (if equpped)
☐ Pump coupling insert

**Scheduled maintenance**

Planned maintenance at specific time intervals, including the following checks and actions:

☐ All points under frequent checks
☐ Check all pressure levels
☐ Check for stable temperature levels around the system
☐ Drain water and sludge from the tank at the drain tap
☐ Check the electric motor
☐ Check the function of monitoring equipment/switches, etc.
☐ Cleaning
☐ Take oil samples
☐ Grease electric motors
☐ Check anit-corrosion emitter

| ***NOTICE*** |
| --- |
| **High pressure washing**<br>Damage on equipment<br>▶ Never use a high pressure washing system to clean inside the drive unit |

☐ Check the cables
☐ Check drain line flows and drain line oil condition
☐ Check the hoses, couplings and pump(s), with respect to cracks, leakages and condition
☐ Check the shaft coupling through the inspection hole.

**⚠ CAUTION**

**Rotating parts!**

Risk of injury.

- Do not touch rotating parts inside the inspection hole or in the zone of rotating parts.

- ☐ Check the cooling water flow
- ☐ Check that the insulation inside the cabinet (especially for the roof) is fixed
- ☐ Check that the doors and cover of the drive unit not are damaged

**Table 15: Maintenance chart**

| Absolute max. intervals for major inspection and replacement | Accumulator | Air inlet | Oil filters | Air breather on tank | Hydraulic fluid |
|---|---|---|---|---|---|
| After the first 100 working hours | - | - | R* | - | - |
| After 3 months or 500 working hours | - | - | R* | - | - |
| Once every 3 months | I** | - | - | - | - |
| Once every 6 months | I | I | - | - | I |
| Once every 12 months | - | - | R* | R | - |

I = Inspection
R = Replacement
* If the contamination indicator is tripped out, the filter must be changed immediately and the oil examined.
** For shock load applications, i.e. shredders, crushers etc.

## 9.3 Filter change

**⚠ WARNING**

**High temperature oil**

Risk of injury

- Avoid opening the filter with oil flow

**Weight of filter bowl**

Risk of injury

- Be careful when dismounting the bowl

**Single filter**

1. Stop the operation and electric motor.
2. Loosen the drain plug under the filter bowl to empty from hydraulic fluid. When empty – tighten the drain plug.
3. Unscrew the bowl from the filter housing counter clockwise and remove the bowl.
4. Change filter cartridge. It is very important during the mounting not to expose the cartridge to any dirt i.e. keep it in the plastic cover as long as possible.
5. Check the O-ring and the backup ring for damage. Change parts if necessary.
6. Wet the sealing surfaces and thread of the filter head and bowl as well as the o-ring on the bowl and element with clean operating fluid.
7. Apply silver grade anti-seize per MIL-PRF-907E to threads. Screw filter bowl fully (metal to metal contact) and then unscrew by one-quarter turn.

When removing a filter element take some time to inspect the bowl interior and look for unusual contamination within the element pleats. Contact your Bosch Rexroth representative for advice.

When removing a filter element take some time to inspect and look for unusual contamination within the pleats. Contact your Bosch Rexroth representative for advice.

**Duplex filter**

1. Engage the switching lever and turn the lever to the other direction to change flow direction in the filter housing, see *Fig. 29: Duplex filter change*.
2. Loosen the drain plug under the filter bowl to empty from hydraulic fluid. When empty - tighten the drain plug.
3. Unscrew the bowl from the filter housing counter clockwise and remove the bowl.
4. Change filter cartridge.
   It is very important during the mounting not to expose the cartridge to any dirt i.e. keep it in the plastic cover as long as possible.
5. Check the O-ring and the backup ring for damage. Change parts if necessary.
6. Wet the sealing surfaces and thread of the filter head and bowl as well as the o-ring on the bowl and element with clean operating fluid.
7. Apply silver grade anti-seize per MIL-PRF-907E to threads. Screw filter bowl fully (metal to metal contact) and then unscrew by one-quarter turn.

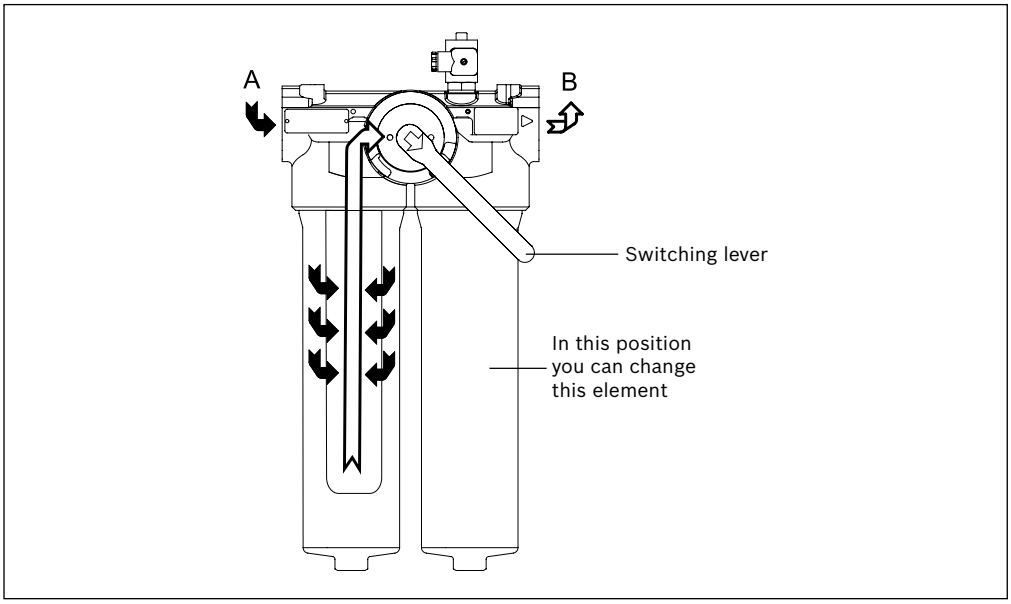


**Fig. 29: Duplex filter change**

## 9.4 Inspection of hydraulic fluid

**⚠ CAUTION**

**Hot hydraulic fluid.**
Risk of injury
- Use personal safety equipment

| NOTICE |
| --- |
| **Danger associated to Hydraulic fluid.**<br>Risk of environmental damage<br>▶ Store up used hydraulic fluid and contaminated filter elements for proper waste disposal. |

Different hydraulic fluids are affected differently - consult the manufacturer.

**Oil analysis**
The purpose to take an oil sample is to check the condition of the oil.

With scheduled oil analysis, wear products can be identified and corrective action can be taken before failure occurs. Oil analysis can indicate when an oil change is required, point out shortcomings in maintenance and keep repair cost to a minimum. Using oil analysis can create a “window of opportunity”, allowing the user to schedule, overhaul, maintenance or repairs, thus saving money on equipment repairs and downtime.

The most used method is to take samples in a special bottle and send it to a fluid laboratory for a analysis to get a report, following a specific international standard. The analysis should cover viscosity, oxidation, water content, particle counting possibly including element analysis of particles.

Another method is to install an inline particle counter direct in your hydraulic system which give you the contamination level according to international standards. The disadvantage with this method is that you only get the contamination level in the oil.

**General**
The intention is to verify the condition of the oil during operation. The motors should be running at normal operation while the sample is taken.

The cleanliness is extremely important during sampling.

Always use bottles adapted to oil samples, they can be ordered from any fluid analysis laboratory. Never try to clean your own bottle if you want a true value of the result. The sample should be taken by using a mini-mess hose connected to a mini-mess coupling. Always clean the connections carefully before you connect the mini-mess hose to the coupling.

Check and be aware of the pressure you may have on the connection before you connect. Be careful when connecting the mini-mess hose because the oil beam can be dangerous and should never point against any person or other sensitive object.

**Bottle samples**
The sample shall be taken at the mini-mess coupling on the low pressure side of the motor in the main loop. Never take the sample out of the tank using the ball valves.

Clean the coupling and the hose carefully. Connect the mini-mess hose to the coupling but be careful and be aware of the direction of the oil stream. Let a minimum 2 liters (0.53 gallon US) of oil flush into a bucket before you fill the bottle. Remove the cap of the bottle as late as possible and avoid any contamination to be in touch with the cap, bottle or mini-mess hose when the sample is taken.

To get a reliable result the system must run without moving any valves and the mini-mess hose should not touch the bottle. Only ¾ of the bottle shall be filled because the laboratory has to shake the sample to get a mixed fluid when they analyze it. Minimum 100 ml are needed for a good analysis. When the bottle is filled, close the cap as soon as possible to prevent contamination from the air to enter the bottle and give wrong result.

**Inline measure**

The measure can be taken at the mini-mess coupling on the pump low pressure side of the main loop system (MB or MA port depending on the main flow direction). Return flow can be connected to the mini-mess coupling on the pump R(L) port. Clean the couplings and the hoses carefully before connection.  Connect the hoses according to the particle counter manual. To get a true value of the contamination, readings have to be stable for 10 min.

## 9.5 Air filter breather change

1. Clean the area around the air filter breather. See *Fig. 4: Detailed view, tank PAC/PBC S, M, L, and XL*.
2. Remove the existing filter and dispose according to environmental regulations.
3. Mount a new filter and make sure no foreign material has entered the oil tank.

## 9.6 Electric motor (WEG)

### 9.6.1 Lubrication

Lubricate electrical motors according to *Table 16: Lubrication intervals WEG***.**

1. Clean the grease nipples.
2. Use PolyRex®EM grease.
3. Grease the electrical motor, use a grease gun.

**Grease**

When regreasing, use only special ball bearing grease with the following properties:

- Good quality lithium base or lithium complex grease
- Base oil viscosity 100-140 cSt at 40 °C (476-667 SSU at 104 °F).
- Consistency NLGI grade 2 or 3
- Temperature range -22°F ... +248 °F, continuously

Grease with the right properties are available from all the major lubricant manufacturers. If the type of grease is changed and compatibility is uncertain, lubricate several times at short intervals in order to displace the old grease.

---

Specified lubrication intervals are valid for 158 °F bearing temperature. For each 59 °F of temperature rise, the lubrication period is reduced by half. In case of other

conditions, consult the electrical motor manual or the lubrication data plate on the electric motor for selection of type of grease and lubrication intervals.

**⚠ CAUTION**

**Grease splash**
Risk of injury
- Check the warning label on the grease cartridge

**Table 16: Lubrication intervals WEG**

| Electric Motor Frame Size | Drive End | | | Non Drive End | | |
|---|---|---|---|---|---|---|
| | Lubrication Interval in duty hours | | Grease Amount | Lubrication Interval in duty hours | | Grease Amount |
| | 50 Hz | 60 Hz | oz | 50 Hz | 60 Hz | oz |
| 254TC | 10000 | | 0.46 | 10000 | | 0.32 |
| 256TC | | | | | | |
| 284TSC | | | 0.63 | | | 0.39 |
| 286TSC | | | | | | |
| 324TSC | | | 0.74 | | | 0.46 |
| 326TSC | | | | | | |
| 364TSC | 2250 | 4850 | 0.95 | 2250 | 4850 | 0.95 |
| 365TSC | | | | | | |
| 405TSC | | | | | | |
| 444TSC | 4250 | | 1.2 | 4250 | | 1.2 |
| 445TSC | | | | | | |
| 447TSC | | | | | | |
| 449TSC | | | | | | |

### 9.6.2 Air inlet

Check that the air inlets on the cabinet top cover and on the electric motor not are clogged by dirt and that air can pass easily.

### 9.6.3 Draining

The condensate drain holes must be opened at regular intervals, depending on climatic conditions.

***NOTICE***

**Reduction of the degree of protection**
Material damage to the motor
- After the condensation has been drained, all of the drain holes must be closed again

## 9.7 Cooler

### 9.7.1 Cleaning

The cooler has to be cleaned when the temperature in the hydraulic system is above specified limits due to low cooling capacity.

Before cleaning:

- Stop the drive unit.
- Switch off the electric power.

| ***NOTICE*** |
| --- |
| **Improper handling**<br>Environmental risk<br>▶ Follow the safety precautions on the container of the cleaning agent used<br>▶ Cleaning agent and waste water from rinsing should not be disposed in nature |

**Air oil cooler**

Cleaning of air fins

- The easiest way to clean the cooler matrix is using compressed air or rinsing with water.
- Fouling can be removed by using a degreasing agent and a high-pressure washing system. When using a high pressure washing system point the jet carefully parallel to the cooler matrix.

**Water-oil cooler, tube type**

The cleaning procedure shall be carried out without removing the tube stack from the body.

- Drain the water from the cooler using the provided drain port.

Oil chamber

- Flood the oil chamber with a commercial solvent and let soak for 30 minutes.
- Backflow with solvent or oil.
- Remove all chemicals from shell side before placing into service.

Cooling tubes

- Use a 50/50 solution of inhibited muriatic acid and water.
- Remove all chemicals from tube side before placing into service.

## 9.8 Drive unit out of service

**Periods out of service**

Clean and empty the cooling system (water side) before periods of rest (especially if the cooling water is not totally clean). If the drive unit is to be out of service for more than three months, the hydraulic system must be protected internally against rust. The period must be shorter if the equipment is placed in a humid or aggressive environment.

Execution:
Use hydraulic fluid with rust preventing additives according to ASTM D665 class A or hydraulic fluid similar to Cortec M-529, 5% by volume. This additive gives protection against rust maximum one year.

For storage more than one year the equipment must be run once a year to maintain a protective film on the internal surfaces of components and oil lines to protect against corrosion.

The hydraulic pump and electric motor should be rotated monthly.

For long-term storage, contact Bosch Rexroth.

If any parts of the system are disconnected, note that open fittings must be protected with plugs or covers to prevent from dirt particles.

**Re-commissioning**

Before the plant is re-started after a long stop period, a check must be done to verify the system function.
Measures to be done:
- Remove preservative fluid and any signs of contamination.
- Follow the procedure in *8.4: Initial start up procedure*.

## 9.9 Repair

Bosch Rexroth offers a comprehensive range of services for the repair of Hägglunds products.
Repairs on the Hägglunds products may only be performed by service centers certified by Bosch Rexroth.

- Use exclusively original spare parts from Bosch Rexroth to repair the Hägglunds product, otherwise the functional reliability of the product can not be assured and you lose your warranty entitlement.

In the event of questions regarding repairs, contact your responsible Bosch Rexroth service partner or the service department of the manufacture‘s plant for the Hägglunds product, see *chapter 9.10: Spare parts*

## 9.10 Spare parts

Address all questions regarding spare parts to your responsible Bosch Rexroth Service partner or the service department of the manufacturer‘s plant for the Hägglunds products. Details can be found on the name plate of the Hägglunds product.

**⚠ CAUTION**

**Use of unsuitable spare parts!**

Spare parts that do not meet the technical requirements specified by Bosch Rexroth may cause personal injury or property damage!

- Use exclusively original spare parts from Bosch Rexroth to repair the Hägglunds product, otherwise the functional reliability of the Hägglunds product can not be assured and you lose your warranty entitlement.

# 10 Removal and replacement

## 10.1 Common

Before removing any hydraulic/electric components, disconnect the drive unit. Make sure that the electric motor power is disconnected and locked and that no energy is accumulated in the system. Follow instructions in chapter *2: Safety instructions*

**Before disassembly:**

- Clean all assemblies and components.
- Take all precautions necessary to prevent dirt entering the system.
- Disassembly shall only be done by professional service personnel.

**Disassembly:**

- Label the parts
- Protect easily damaged parts and machined surfaces.
- Inspect all parts during disassembly for wear or damage.
- If hydraulic fluid will be drained and reused, make sure that drain containers are clean and covered when not in use.
- Clean all metal parts with a suitable solvent and set aside on a clean and lintfree cloth to drain.

**Reassembly:**

- Replace all seals, gaskets and o-rings with new items of the correct size and lubricate with system hydraulic fluid before assembly.
- Refill hydraulic fluid according to section *8.2: Filling up the system with hydraulic fluid*

# 11 Disposal

**⚠ WARNING**

**Danger when dismantling, components may contain accumulated energy**

Risk of injury

- Check that the drive unit is completely disconnected.
- Check pressure in the accumulator (if applicable).
- Take the fire hazard into consideration during dismantling.

## 11.1 Environmental protection

Careless disposal of the Hägglunds PAC/PBC, the hydraulic fluid and the packaging material could lead to pollution of the environment.

Observe the following points when disposing of the Hägglunds PAC/PBC:

1. Completely empty tank and system.
2. Dispose the hydraulic fluid according to the national regulations of your country. Also observe the applicable safety data sheet for the hydraulic fluid.
3. Remove the PAC/PBC into its individual parts and properly recycle these parts separate according to material type. Dispose material in accordance with the national regulations in your country. The main materials for respective component is to be found in the data sheet RE 15325 Hägglunds PAC/PBC .

# 12 Extension and conversion

Do not modify Hägglunds products. Please contact your Bosch Rexroth representative for extension or conversion.

# 13 Troubleshooting

| Causes of Trouble and Its Effect in the Hydraulic Installation | | | | | |
|---|---|---|---|---|---|
| **Source of trouble, effects** | **Mechanical Drive** | **Suction Line** | **Pump** | **Pressure Line** | **Return Line** |
| **Excessive noises** | 1. Coupling misaligned<br>2. Coupling loose<br>3. Coupling defective<br>4. Loose mounting of pump and/or motor<br>5. Pump or electric motor defective<br>6. Direction of rotation wrong<br>7. Torque arm anchor point loose or defective | Suction line resistance is excessive:<br>1. Tap or cock in the suction line is closed or only partially open<br>2. Suction line blocked, crushed, damaged, or leaking<br>3. Fluid level too low | 1. Maximum pump pressure exceeded<br>2. Boost pump defective<br>3. Shaft seals, or seals on suction side are defective<br>4. Pump defective<br>5. Pressure and return lines connected incorrectly<br>6. Control system oscillating | 1. Installation not bled completely | 1. Return filter blocked<br>2. Hose connection loose<br>3. Hoses crushed or damaged |
| **Insufficient power and torque at the hydraulic motor (pressure too low)** | 1. Electric motor coupling defective<br>2. Direction of rotation wrong<br>3. Motor defective<br>4. Key sheared at pump or motor | | 1. Pump set up incorrectly<br>2 .Internal leakages due to wear<br>3. Pump defective<br>4. Unsuitable type | 1. Leakages<br>2. Excessive line resistance<br>3. Pressure filter blocked<br>4. High-pressure ball valve closed<br>5. Line connected incorrectly | 1. Excessive line resistance<br>2. Filter blocked<br>3. Line connected incorrectly |
| **Jerky motor movements (variations in pressure and/or flow)** | 1. Coupling misaligned<br>2. Coupling loose<br>3. Coupling defective<br>4. Loose mounting on pump and/or motor<br>5. Pump or motor defective<br>6. Varying load and/or control input | Suction resistance is excessive:<br>1. Valve in the suction line is partially open<br>2. Suction line blocked or leaking<br>3. Fluid level too low | 1. Pump defective<br>2. Erratic load conditions react on the pump control system<br>3. Pump sticking / contaminated pilot valve<br>4. Pump control / PID loop set up incorrectly<br>5. Accumulator not pre-charged | 1. Installation not bled completely<br>2. Lines connected incorrectly | 1. Excessive line resistance<br>2. Filter blocked<br>3. Lines connected incorrectly |
| **Foaming of the hydraulic fluid** | 1. Oil service life | 1. Suction line loose / leaks<br>2. Fluid level too low | 1. Shaft seals on the suction side are defective | | 1. Return line terminates above the fluid level. |
| **Power Take-off either does not turn at all or too slowly (no delivery flow or insufficient delivery flow)** | 1. Coupling misaligned<br>2. Coupling loose<br>3. Coupling defective<br>4. Loose mounting on pump and/or motor<br>5. Pump or motor defective | Suction resistance is excessive:<br>1. Valve in the suction line is part open<br>2. Suction line blocked or leaking<br>3. Fluid level too low | 1. Internal leakage due to wear<br>2. Pump defective<br>3. Inlet and return lines wrongly connected<br>4. Pump set up incorrectly | 1. Leakages<br>2. High-pressure ball valve closed<br>3. Lines connected incorrectly | 1. Filter blocked<br>2. Lines connected incorrectly |

| Causes of Trouble and Its Effect in the Hydraulic Installation | | | | | |
|---|---|---|---|---|---|
| **Pressure Valves** | **Flow Control Valves** | **Directional Control Valves** | **Fluid** | **Output Drive (motor, cylinder)** | **Others** |
| 1. Valve chatter due to dirt on valve seal<br>2. Oil | 1. The valve oscillates and excites other control elements into oscillation<br>2. Control system oscillating | 1. Valve chatters due to defective solenoid or the voltage is too low<br>2. Valve defective due to dirt or wear<br>3. Flow through valve is excessive<br>4. Pilot pressure variations<br>5. Check the electrical controls | 1. Cavitation problems due to low fluid level or viscosity too high (fluid temperature is too low)<br>2. Fluid is contaminated and dirty leading to damage and blockage of equipment<br>3. Fluid foams<br>4. Entrained air in the hydraulic fluid | 1. Wear of running surfaces<br>2. Control system oscillating<br>3. Hydraulic motor defective | |
| 1. Pump compensator and/or cross-over valves set too low<br>2. Internal leakage due to wear<br>3. Dirty or damaged valve seat<br>4. Broken spring | 1. Servo / control pressure too low<br>2. Incorrect driver setting<br>3. Valve defective<br>4. Defective pump coil | 1. Spool jams | 1. Viscosity too low, causing excessive leakage<br>2. Viscosity too high causing excessive flow resistance<br>3. Fluid foams<br>4. Suction line heat tracing defective (if equipped) | 1. Internal Leakage<br>2. Wear or running surfaces<br>3. Excessive internal friction causing low efficiency | 1. There is a defect in the open (or closed) loop control circuit<br>2. Display instruments are defective |
| 1. Valve chatter due to dirt on valve seat or valve worn<br>2. Insufficient damping<br>3. Excessive wire length of undamped remote control line<br>4. Defective remote-control valve or joystick | 1. Valve dirty<br>2. Pressure losses excessive | 1. Valve chatters due to defective solenoid or the voltage is too low<br>2. Valve defective due to dirt or wear<br>3. Flow through valve is excessive<br>4. Pilot pressure variations<br>5. Adjustable damping on valves, has not been set<br>6. Check the electrical controls | 1. Hydraulic fluid dirty<br>2. Hydraulic fluid foams | 1. Stick-slip effect due to friction<br>2. Operation below minimum recommended motor speed<br>3. Speed feedback issue | 1. EMI interference<br>2. Stray voltage |
| | | | 1. Unsuitable fluid for the duty | | |
| 1. Operating pressure set too low<br>2. Internal Leakage due to wear<br>3. Dirty or damaged valve seat<br>4. Broken spring | 1. Flow rate set too low / volume stop<br>2. Valve blocked due to dirt | 1. Wrong switched position<br>2. Solenoid defective<br>3. Internal leakage due to wear<br>4. Spool jams or sticks | 1. Viscosity too low, causing excessive leakage / wear<br>2. Viscosity too high, causing excessive flow<br>3. Fluid foams | 1. Internal leakage<br>2. Wear of running surfaces<br>3. Excessive internal friction, causing low efficiency | 1. Conditions for starting not fulfilled<br>2. Electrical lines open circuit<br>3. Signalling elements, such as pressure or limit switches, are defective, wrongly set, or not connected<br>4. Control signal / DCS setup issue |

| Causes of Trouble and Its Effect in the Hydraulic Installation | | | | | |
|---|---|---|---|---|---|
| **Source of trouble, effects** | **Mechanical Drive** | **Suction Line** | **Pump** | **Pressure Line** | **Return Line** |
| **Excessive operating temperature** | | | 1. Reduction in efficiency due to wear<br>2. The pump control system is defective<br>3. Rotational speed and/or delivery excessive<br>4. Boost pump defective<br>5. Neutral bypass defective | 1. Pressure filter blocked<br>2. High-pressure ball valve closed | 1. Return filter blocked |
| **Line shocks when switching takes place** | 1. Excessive material / feed rate<br>2. Excessive load vibration | | 1. Pump set up incorrectly<br>2. Accumulator not pre-charged | 1. Line mounts are missing or loose<br>2. Poor installation<br>3. Installation not bled | 1. Lines loose |
| **The pump switches on and off too often** | 1. Electric motor start circuit issue | 1. Air in systems | 1. Pump defective | | |

| Causes of Trouble and Its Effect in the Hydraulic Installation | | | | | |
|---|---|---|---|---|---|
| **Pressure Valves** | **Flow Control Valves** | **Directional Control Valves** | **Fluid** | **Output Drive (motor, cylinder)** | **Others** |
| | 1. Valve defective<br>2. Shuttle / flushing valve sticking / contaminated | 1. Leakage losses too high<br>2. Spool sticking | 1. Viscosity too low, causing excessive leakage / wear<br>2. Viscosity too high, causing excessive flow resistance<br>3. Fluid foams | 1. Losses in efficiency due to wear<br>2. Internal friction too high (poor level of efficiency)<br>3. Internal leakage losses | 1. Actual cooling temperature higher than design specification<br>2. Insufficient hydraulic fluid<br>3. Coolant valve failed<br>4. Thermostat set too high<br>5. Fan not switched on / incorrect rotation<br>6. Ambient too high.<br>7. Deposits in radiator |
| 1. Valve switches too quickly<br>2. Restrictors or orifices are damaged or missing | 1. Sticking / binding control valve spool on pump | 1. Switching time set too short (ramp time) | | 1. Excessive masses or forces<br>2. No damping | |
| 1. Sequence valve or shut-off valve has wrong setting | | | | | 1. Pressure switch differential set too low<br>2. Pressure switch set incorrectly<br>3. Charge pressure switch set up incorrectly or defective<br>4. Drive control loop / DCS setup issue<br>5. Motor starter / MCC issue<br>6. Incorrect / loose wiring |

# 14 Technical data

## 14.1 Weights

### Total weight of the drive unit

The total weight of the drive unit, is marked on the product identification located on the cabinet frame, see *Fig. 2: Main components PAC S, M, L, and XL and Fig. 3: Main components PBC S, M, L, and XL*.

**Table 17: Weight electric motor**

| WEG | Weight |
|---|---|
| hp | lb. |
| 15 | 251 |
| 20 | 291 |
| 25 | 388 |
| 30 | 437 |
| 40 | 492 |
| 50 | 536 |
| 60 | 869 |
| 75 | 1118 |
| 100 | 1140 |
| 125 | 1590 |
| 150 | 1675 |
| 200 | 2094 |
| 250 | 2094 |
| 300 | 2381 |
| 350 | 2674 |
| 450 | 3395 |
| 500 | 3461 |
| 550 | 4334 |
| 600 | 4334 |
| 650 | 4394 |
| 700 | 4583 |
| 750 | 4951 |

**Table 18: Weight pump**

| Pump | Weight | Attachment kit | Weight | Pump | Weight |
|---|---|---|---|---|---|
| | lb. | | lb. | | lb. |
| SP40 | 163 | SP40 + SP40 | 9 | | |
| SP71 | 216 | SP71 + SP71 | 11 | HD6S | 335 |
| SP125 | 331 | SP125 + SP125 | 22 | HD7S | 335 |
| SP180 | 348 | SP180 + SP180 | 22 | HD11S | 485 |
| SP250 | 589 | SP250 + SP250 | 55 | HD14S | 485 |
| SP355 | 611 | SP355 + SP355 | 64 | HD24S | 754 |
| SP500 | 869 | SP500 + SP500 | 73 | HD30S | 787 |
| SP750 | 1191 | | | | |

**Table 19: Weight air cooler**

| Air cooler type | Weight |
|---|---|
| | lb. |
| BOL-16 | 55 |
| BOL-30 | 125 |
| BOL-725 | 170 |
| BOL-950 | 300 |
| BOL-1200 | 430 |
| BOL-1600 | 515 |
| BOL-2000 | 582 |

**Table 20: Weight tube cooler**

| Cooler type | Weight |
|---|---|
| | lb. |
| B-700 | 30 |
| B-1000 | 65 |
| B-1200 | 160 |
| B-1600 | 400 |

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