Installation and Maintenance Manual

Power Unit PEC

EN326-6h 2005
Preface

Hägglunds Drives is one of the world’s leading manufacturers of large hydraulic Drive Systems. A leading position, made possible by unbeatable service spirit and of continuing development of both products and markets all over the world. Our drives are to be found in most industrial and marine segments, where there are extremely high demands for efficiency and reliability. Our main office and production plant is in Mellansel, Sweden and we have our own sales- and representation offices in some 40 different countries.

Our high quality Drive Systems, are based upon our unique hydraulic piston motors, developed through a wealth of experience accumulated over 30 years in marine and industrial areas. Today this ongoing development work has resulted in the powerful Power Unit, PEC. New, as well as established technical solutions, contribute to the creation of this product. The most desirable features and operating reliability have been designed in this Power Unit, PEC.

This manual provides necessary information for installation and maintenance of the Power Unit. In order to find particular information, just search for the wanted section as listed in the table of contents. However, 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.

Before starting the installation/maintenance, the manual must be read and understood in all respects. All involved personnel shall be in agreement with the Safety precautions which is described in section 1.1.

This Installation and Maintenance Manual is valid for Power Units manufactured after 97-07-01. For older Power Units please contact your nearest Hägglunds Drives representative.
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1. GENERAL

1.1 Safety precautions
It is of high importance that the Safety precautions are always followed, if you are unsure about something, please don’t hesitate to contact your nearest HD-office for advice.

Special Power Units
Standard Power Units are not allowed to be used beside an ambient temperature of 0°C to 50°C, or in areas with potentially explosive atmospheres.

For lower ambient temperature than 0°C and in areas with potentially explosive atmospheres, special Power Units have to be used.

Power Units intended for use in ambient temperature below 0°C, will be fitted with special optional equipment for preheating the hydraulic system before starting up.

Power 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 ATEX-directives or corresponding. Power Units intended for use in such areas will be marked in a way that shows in which type of areas it can be used.

Warning signs
In this manual you will find the following signs which indicate a potential hazard, which can or will cause personal injury or substantial property damage. Depending on the probability of the hazard, and how serious the injury or property damage could be, there are three levels of classification.

![DANGER](image)

**DANGER** is used to indicate the presence of a hazard which will cause severe personal injury, death, or substantial property damage if the warning is ignored.

![WARNING](image)

**WARNING** is used to indicate the presence of a hazard which can cause severe personal injury, death, or substantial property damage if the warning is ignored.

![CAUTION](image)

**CAUTION** is used to indicate the presence of a hazard which will or can cause minor personal injury or property damage if the warning is ignored.

General
Ensure no admittance to the equipment by unauthorized persons. Only perform measures on the Power Unit when you are completely familiar with the function of the Power Unit (including the control system) as well as the complete drive.
Service and repair of the electrical, hydraulic and the mechanical functions, as well as controls and settings require professional service personnel knowledgeable of risks involved.
Safety equipment necessary for the prevention of accidents at the mounting and maintenance shall be provided in accordance with the regulations prevailing in the local country.
Before any measures
- Use the Order code and other attached technical documentation to identify the features of your unique Power Unit and system.
- Read the attached technical documentation (this manual included) and make yourself familiar with the Power Unit (control system included) as well as the complete drive.
- Use safety equipment like helmet, protective goggles, safety shoes and hearing protection.

**Always** ensure that **no energy is accumulated** before any measures.
- Ensure that all electric power is cut and locked out.
- Ensure that there is no enclosed pressure in the hydraulic system (housing load).
- Ensure that no pressure will enter the hydraulic system in the power unit via the hydraulic motor, eg loads on the shaft or winch drum.
- If the hydraulic system is used for lift devices, these should be secured, or in the rest position (hanging load).
- Ensure that all accumulators are discharged.

Electricity supply
Safety equipment necessary for the prevention of accidents shall be provided in accordance with the regulations prevailing in the local country. All electrical supply levels shall be within the limits that the equipment is constructed for, see technical documentation and maximum rating plates.

Mounting
Carefully follow the instructions and be aware of the high weights and forces during lifting. Incorrect mounting and setting of electrical, hydraulic and the mechanical functions, as well as controls can cause personal injury or property damage.

Before starting up
Before starting up new, rebuild or just worked on, applications. All accessories and safety arrangement functions, should be controlled/tested.

Maintenance and service
Notice the special maintenance intervals for your specific Power Unit or the maximum intervals on the maintenance chart (section 5.2) and keep a maintenance log. Regular and correct maintenance and service are necessary conditions for reliable and safe operation. Use only spare parts recommended and supplied by the Hägglunds Drives organization.

Hydraulic fluid
Notice that most hydraulic fluids can cause personal injury and major damage on the environment, check the caution sign on the container or consult the supplier. Used hydraulic fluid can contain noxious contaminations. We recommend using the sevice of professional oil company for supply and disposal of fluids used. Never dump hydraulic fluid into drainages or water courses.

Bellhousing
Note that there are rotating parts inside the bellhousing during operation. Be careful during inspection through the inspection hole. Put back the plug.

Hot surfaces
Hot surfaces locally temperatures above 70°C (158°F) can be experienced.

Emergency situations
Emergency shutdown: It must be possible to cut the electric power at emergency situations. Fire-extinguisher: Use only fire-extinguisher adapted for use both to oil products and electric equipment.
1.2 Operating principle

Main components

1. Hydraulic pump
2. Electric motor
3. Control system, Spider (option)
4. Water-oil cooler (option)
5. Oil filter (drain)
6. Oil filter (return)
7. Air breather filter
8. Water valve (option)
9. Junction box
10. Suction line indicator
11. Level switch
12. Temperature switch
13. Oil heater (option)
14. Accumulator (option)
15. Level indicator
16. Drain cock oil tank
17. Drain plug oil pan
18. Charge pressure gauge
19. Working pressure gauge

Note: Changes from the picture and main components tables above may occur.

Function

The intention with the Power Unit is to provide the hydraulic motor(s) (or other hydraulic systems) with the required flow of oil and pressure at the right time. All included parts are assembled in one (or more) compact cabinet(s). The Power 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. Three different control systems are available.

Control systems available

Spider: A small, compact and configurable control system. It can health monitor the Power Unit and can control one or two pumps with three pre-programmed functions:
- Basic, for most of our drives can be configured for speed feedback control and power limitation.
- Shredder, for shredder applications.
- Syncro, for friction and synchronized drives.

DCA: Based on electronic control cards, with different cards for different pump types and functions.

MCA: For special control functions, normally based on PLC and control cards.

It is also possible to control the Power Unit from external control systems provided by the customer.

The Power Unit is a very flexible product with a wide option range. This makes it possible to select a standard Power Unit to fulfill 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 special Power Units that differs from the standard Power Unit concept.

CAUTION

It is of great importance to check the other attached technical documentation to identify the features of your unique Power Unit.
2. TECHNICAL DATA

2.1 Choice of hydraulic fluid

The Power Unit is primarily designed to operate on conventional petroleum based hydraulic fluids. The hydraulic fluid can be chosen in consultation with an oil supplier. The hydraulic fluid has to fulfill the following requirements:

- Fulfill FZG 90 test stage 11 described in IP 334 (DIN 51354).
- Contain inhibitors to prevent oxidation, corrosion and foaming.
- Have a viscosity within the prescribed interval for both Power Unit (see below) and Hydraulic motor at operating temp (measured in the motor loop).
- Have a water content of <0.1% and in industrial applications with high demands for service life, <0.05%.

For other hydraulic fluids please contact your Hägglunds Drives representative when:

- You may need other seals within the pump and other components.
- The service life, max. pressure and max speed for the pumps may be reduced.
- Some fluids are just impossible to use.

### RECOMMENDED VISCOSITY

at operating temperature

40-150 cSt (187-720 SSU)

At cold start the maximum permissible viscosity is 1600 cSt (7400 SSU) run with low pressure and low flow.

<table>
<thead>
<tr>
<th>Viscosity limits</th>
<th>Viscosity index VI</th>
<th>Recommended</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity ν</td>
<td>For operation with large temp. difference</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Min. Cont.</td>
<td></td>
<td>40 cSt/187 SSU</td>
<td></td>
</tr>
<tr>
<td>Min. int.</td>
<td></td>
<td>20 cSt/98 SSU</td>
<td></td>
</tr>
<tr>
<td>Max. cont.</td>
<td></td>
<td>150 cSt/720 SSU</td>
<td></td>
</tr>
<tr>
<td>Max. cold start</td>
<td></td>
<td>1600 cSt/7400 SSU</td>
<td></td>
</tr>
</tbody>
</table>

- Check caution sign on container or consult the supplier.
- Avoid contact of long duration with the skin.
- Use services of a professional oil supplier for disposal of used fluids, and filter elements.
- Never dump hydraulic fluid into drainages or water courses.
- Avoid contamination of hydraulic fluids on floors, it involves a great risk to slip and fall.
2.2 Requirements for hydraulic fluid cleanliness

The Power Units are equipped with filters on the drain- & return-line(s). 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 "Flushing before start up".
- When filling the tank with hydraulic fluid it is important to fill through the special oil filler connection, see section "Filling up the system with hydraulic fluid"
- The solid contamination level in the system should not exceed ISO/DIS 4406, 19/16/13 (NAS 1638, class 7).
- The water content shall be < 0,1% and in industrial applications with high demands for service life, <0,05%.
- Always use filter elements recommended and supplied by the Hägglunds Drives organization.
- The hydraulic fluid should be analyzed according to the special maintenance intervals for your specific Power Unit or the maximum intervals on the maintenance chart (section "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.

Do not re-use hydraulic fluid which has leaked out.

2.3 Cooling water

The cooling system is primarily designed to operate on clean fresh water. When there are particles in the water, larger than 0,5 mm (0,02 in), a water filter has to be used. It is important to:
- Maintain the water filter (if any) in a correct way, this is to get the required flow of water through the water oil cooler.
- Have the required flow, pressure and temperature of the cooling water (see attached technical documentation).
- Check the temperature in the hydraulic system, according to the special maintenance intervals for your specific Power Unit or the maximum intervals on the maintenance chart.
- 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).

If cooling capacity is too low, the service life of Hydraulic motor, the main components in Power Unit and the hydraulic fluid will be reduced.
2.4 Power Unit monitoring

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

![Diagram of Power Unit Monitoring and External Functions]

The monitoring of the Power Unit switches are grouped in two levels according to the logic diagram.

The warning indication is to give an indication about a problem in the Power 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 without ramp, by setting the pump swashangle to zero. And after a short delay stop the electric motor.

The low charge pressure switch 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.
2.5 Miscellaneous components

Location of internal scales on the Temperature Switch

<table>
<thead>
<tr>
<th>Standard location of internal scales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Stop Power Unit</td>
</tr>
<tr>
<td>Pilot light on</td>
</tr>
<tr>
<td>Cooler on</td>
</tr>
<tr>
<td>Oilheater on</td>
</tr>
<tr>
<td>Stop Power Unit</td>
</tr>
<tr>
<td>Start of warm flushing</td>
</tr>
</tbody>
</table>

Note 1: Temperature setting according to current documentation for PEC unit. See documentation.

Temperature Sensor Device
(Alternative temperature measuring device)

Temperature levels to be set in the Spider II or other control system. Setting levels according to Temperature Switch and PEC documentation.

Accumulator precharge pressure
At the top of the accumulator there is a gas valve connected to the bladder. Use the charging set to check the precharge pressure.

NOTICE!
The accumulator must be charged with dry nitrogen from a bottle equipped with a pressure reducing valve.

Manual override on water valve
It is possible to open the water valve manually with a screw (counter clockwise), located according to picture beside.

Level switch

<table>
<thead>
<tr>
<th>Levels on level switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
</tr>
<tr>
<td>Low</td>
</tr>
<tr>
<td>Min</td>
</tr>
</tbody>
</table>

Inspection cover on tank
Replace the gasket when opening the inspection cover.

Isolation valve on pressure gauges
Release isolation valves for pressure gauges when they are not used. If gauges are pressurized continuously they may be damaged.
3. HANDLING OF THE PACKED POWER UNIT

3.1 Storage of the packed Power Unit

At delivery, the hydraulic components are protected internally by an oil film (containing rust preventing additives). This provides sufficient protection for indoor storage in air conditioned premises for about 12 months.

The Power Unit and belonging parts 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.

If storage time exceed limits, the Power Unit must be operated so that the hydraulic system is lubricated with new fluid. (see section "Power Unit out of service")

The power unit must be placed where not exposed to strong sunlight or severe cooling to avoid condensation.

3.2 Lifting the packed Power Unit

The packed Power Unit is among other things branded with centre of gravity and weight. Normally the Power Unit package is designed for forklift truck handling.

- Centre of gravity is high, see label on the goods.
- Avoid rapid acceleration, deceleration and turns while moving the goods.
- Position the forks according to the instructions below.

Lifting with fork lift
- The absolute minimum required fork length is 1300 mm (51.2 in).
- The minimum distance between the forks is 800 mm (31.5 in) for a 2-door Power Unit and 1100 mm (43.3 in) for a 3-door Power Unit.
- Position forks about the centre of gravity.

Parts that are delivered separately
The package is always branded with the weight.
- Packages on loading stools are only designed for forklift truck handling.
- Some other packages may be lifted with a lifting crane, always check the label on the package.

- Do not stand under hanging load.
- Use only lifting equipment adapted to the weight on the label of the package.
4. INSTALLATION

4.1 Installation directions

If the Power 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 Power Unit. It is important that the safety precautions in this manual are always followed.

Never place the Power Unit directly against a wall or similar obstruction, satisfactory air circulation will then be impossible. Contact your Hägglunds Drives representative.

Position the Power Unit
- On a firm level foundation. (to avoid vibrations).
- To ease maintenance and service. (see section "Positioning the Power Unit").
- Protected from weather, airborne sprays, heavy contaminations and radiated heat.
- To ensure free ventilation of 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 main connections from the Power Unit must always be fitted to the piping with hoses. If Air-oil cooler is mounted at a location other than on the Power Unit, it must be considered that the cooler will start without notice and has sharp edges.

When Units are installed side by side, side walls must be removed. To make it possible to perform service on the Power Unit.
4.2 Lifting methods and weights

The total weight of the Power Unit, is stamped on the rating plate located on the Junction box door inside the cabinet.

Lifting with ropes/chains
Lift the Power Unit with no top cover on, max. lifting angle 90°.

Lifting with fork lift
- The absolute minimum required fork length is 1300 mm (51,2 in).
- The minimum distance between the forks is 800 mm (31,5 in) for a 2-door Power Unit and 1100 mm (43,3 in) for a 3-door Power Unit.
- Position forks about the centre of gravity.

- Do not stand under hanging load.
- Use only lifting equipment adapted to the weight of the Power Unit (check rating plate inside the cabinet).
- Centre of gravity is high, see label on cabinet.
- Do not lift the Power Unit with Hydraulic fluid in the tank, or with the front bar disassembled.

### Electric motor ABB

<table>
<thead>
<tr>
<th>Power kW</th>
<th>Weight* kg (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.5</td>
<td>138 (304)</td>
</tr>
<tr>
<td>22</td>
<td>155 (341)</td>
</tr>
<tr>
<td>30</td>
<td>195 (429)</td>
</tr>
<tr>
<td>37</td>
<td>235 (517)</td>
</tr>
<tr>
<td>45</td>
<td>250 (550)</td>
</tr>
<tr>
<td>55</td>
<td>300 (660)</td>
</tr>
<tr>
<td>75</td>
<td>450 (990)</td>
</tr>
<tr>
<td>90</td>
<td>490 (1078)</td>
</tr>
<tr>
<td>110</td>
<td>675 (1485)</td>
</tr>
<tr>
<td>132</td>
<td>730 (1606)</td>
</tr>
<tr>
<td>160</td>
<td>850 (1870)</td>
</tr>
<tr>
<td>200</td>
<td>970 (2134)</td>
</tr>
<tr>
<td>250</td>
<td>1350 (2970)</td>
</tr>
<tr>
<td>315</td>
<td>1550 (3410)</td>
</tr>
<tr>
<td>355</td>
<td>1550 (3410)</td>
</tr>
<tr>
<td>400</td>
<td>1900 (4180)</td>
</tr>
<tr>
<td>500</td>
<td>2400 (5280)</td>
</tr>
</tbody>
</table>

*This is the weight for a standard el-motor, more accurate weight for a specific motor can be found on the rating plate.

### Pumps

<table>
<thead>
<tr>
<th>Hägglunds Drives</th>
<th>Weight kg (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP40</td>
<td>77 (170)</td>
</tr>
<tr>
<td>SP71</td>
<td>94 (207)</td>
</tr>
<tr>
<td>SP125</td>
<td>135 (298)</td>
</tr>
<tr>
<td>SP180</td>
<td>150 (330)</td>
</tr>
<tr>
<td>SP250</td>
<td>250 (550)</td>
</tr>
<tr>
<td>SP355</td>
<td>270 (594)</td>
</tr>
<tr>
<td>SP500</td>
<td>385 (847)</td>
</tr>
<tr>
<td>SP750</td>
<td>540 (1188)</td>
</tr>
</tbody>
</table>

### Dension

<table>
<thead>
<tr>
<th>Weight kg (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P6</td>
</tr>
<tr>
<td>P7</td>
</tr>
<tr>
<td>P11</td>
</tr>
<tr>
<td>P14</td>
</tr>
<tr>
<td>P24</td>
</tr>
<tr>
<td>P30</td>
</tr>
</tbody>
</table>

### Sauer

<table>
<thead>
<tr>
<th>Weight kg (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>90R 42</td>
</tr>
<tr>
<td>90R 55</td>
</tr>
<tr>
<td>90R 75</td>
</tr>
<tr>
<td>90R 100</td>
</tr>
<tr>
<td>90R 130</td>
</tr>
<tr>
<td>90R 180</td>
</tr>
</tbody>
</table>

### Air-Oil Cooler

<table>
<thead>
<tr>
<th>Size</th>
<th>Weight kg (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBI 23-4</td>
<td>36 (79)</td>
</tr>
<tr>
<td>TBI 33-4</td>
<td>52 (115)</td>
</tr>
<tr>
<td>TBI 56-6</td>
<td>75 (165)</td>
</tr>
<tr>
<td>TBI 76-6</td>
<td>140 (308)</td>
</tr>
<tr>
<td>TBI 110-6</td>
<td>170 (374)</td>
</tr>
</tbody>
</table>
4.3 Positioning the Power Unit

The following minimum space must be left around the Power 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 Power 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.

At installation of Power Units in outdoor environment with heavy wind, at inclined surfaces or in areas with risk for earthquakes, special measures have to be done.

At such conditions its risk for unstable movement or turning over of the Power Unit.

The Power Unit has to be fixed to the ground by means of fixing screws or similar.

<table>
<thead>
<tr>
<th>Cabinet size</th>
<th>Power Unit</th>
<th>Minimum Space mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>1</td>
<td>PEC 102/202</td>
<td>700</td>
</tr>
<tr>
<td>2</td>
<td>PEC 103/203</td>
<td>700</td>
</tr>
<tr>
<td>3</td>
<td>PEC 302/402/602</td>
<td>700</td>
</tr>
<tr>
<td>4</td>
<td>PEC 303/403/603</td>
<td>700</td>
</tr>
<tr>
<td>5</td>
<td>PEC 803/1003</td>
<td>700</td>
</tr>
<tr>
<td>6</td>
<td>PEC 702</td>
<td>700</td>
</tr>
<tr>
<td>7</td>
<td>PEC 1203</td>
<td>700</td>
</tr>
</tbody>
</table>

4.4 Mounting of the cabinet feet

The cabinet feet (option) minimizes the vibrations and makes it easy to level the Power 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 Power Unit according to section “Lifting methods and weight”. Notice especially the safety precautions.
4. Mount the cabinet feet according to the drawing below.
5. Level the Power Unit by the adjusting screws.

Be careful while mounting the cabinet feet. Follow the safety precautions in section “Lifting methods and weights”
4.5 Mounting of electric motor

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

1. Remove the roof from the Power Unit
   Untighten the screws that keep the roof on the top cover. Mount lifting eye bolts in their holes on the corners of the roof, and lift the roof away. If range of lift is insufficient, front panel and front beam of the Power Unit can be removed.

2. Remove the sound baffle
   Lift away the sound baffle and put it on a place where it may not be damaged. When putting back, the insulation material must be turned upwards.

3. Unpack the electric motor(s)
   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.

4. Check the shaft coupling(s)
   Check that the axial shaft coupling clearance is in conformance with the table and picture beside and that the locking screw is tightened.

5. Lift the electric motor
   First use the top mounted lifting ear and lift to position the electric motor vertically. Then lift with all lifting ears. Never let the electric motor stand on the shaft coupling.

Two separate lifting equipment could be needed to lift the electric motor.

6. Mount the electric motor in the Power Unit
   Lift the electric motor in to the Power Unit. It is important that it is hanging perpendicular. Fit the shaft coupling through inspection hole, (figure above) into the nylon star coupling without causing any damage on it. The connection box on the electric motor must be positioned as on the picture in section “Operating principle”. Lower motor to a position approximately 5 mm (0,2 in) above bellhousing. Place greased bolts in the holes, tighten by hand.

7. Tighten bolts to the bellhousing
   Inspect that there is an axial clearance (table above) through the inspection hole in the bellhousing, then tighten the attached bolts to the bellhousing.

8. Assemble unit roof and sound baffle
   Assemble in reverse order acc. to point 1 and 2. When the top of the electric motor is below the sound baffle, a piece of thin sheet aluminium must be formed to a cylinder or a hexagon and be riveted to the fan cover, to allow the electric motor to suck in cooling air from the area above the sound baffle (where the cooling air inlet is located). The hole in the sound baffle must be located straight above the electric motor and be slightly smaller than the cross section of the fan cover.

For connection of the electric motor see section “Electric connections”.

- Do not stand under hanging load.
- Use all lifting ears when the electric motor is hanging free.
- Use only lifting equipment adapted to the weight on the rating plate.
- No hands between Electric motor and Bellhousing during assembly.
### 4.6 Mounting of top cover

If the Power Unit is placed outdoors, the Top cover should be sealed with sealing strip. Don’t glue the Top cover! The air intake shall be turned away if possible, from dusty environment.

### 4.7 Mounting of air-oil cooler

Normally the air-oil cooler is delivered separately to be mounted on the Power Unit. The following instructions are appliable for these cases only. (changes may occur from the drawing/technical doc.)

- Mount brackets with attached screws (in the drilled holes) on the Power Unit according to the installation drawing in attached technical documentation.
- Lift up air-oil cooler. Never lift with the electric motor.
- Mount the air-oil cooler on the brackets with the attached screws.
- Check that all screws are properly tightened. Note that if an air-oil cooler becomes loose it can cause severe personal injury.
- Connect the attached hydraulic hoses. N.B. Oil in at the Power Unit shall be connected to Oil out at the air-oil cooler and vice versa. The coupling protections must be kept on until final assembly to avoid exposure of dirt.
- For electric connections, couplings and hoses, see respective section.

#### Cabinet size

<table>
<thead>
<tr>
<th>Cabinet size</th>
<th>Power Unit</th>
<th>Dimensions mm (in)</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PEC 102/202</td>
<td>A: 500 (19.69)</td>
<td>C1 &amp; C2*</td>
</tr>
<tr>
<td>2</td>
<td>PEC 103*203</td>
<td>B: 600 (23.63)</td>
<td>BSP 1&quot; female</td>
</tr>
<tr>
<td>3</td>
<td>PEC 302/402/602</td>
<td>D: 700 (27.56)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>PEC 303/403/603</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>PEC 803/1003</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>PEC 702</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>PEC 1203</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Always check the technical documentation

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![Diagram](image)

**Note illustration F-F:**

- dim. 42 is 50 (1.97) for cab size 6 & 7.

**CAUTION**

Particles may go together with the outgoing air flow.
4.8 Hydraulic connections

During mounting of the hydraulic connections the following points must be kept in mind:
- The coupling protections must be kept on until final assembly.
- It is important that all pipes are mounted to give sufficient working space for maintenance of the Power Unit.
- Always use hoses to connect pump with piping.

<table>
<thead>
<tr>
<th>Pump</th>
<th>Size</th>
<th>Dim. main conn.* A&amp;B</th>
<th>Dim. thread holes**</th>
<th>Thickness std flange conn. mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP250</td>
<td>1 1/2&quot;</td>
<td>5/8-11 UNC</td>
<td>29 (1,14)</td>
<td>30 (1,18)</td>
</tr>
<tr>
<td>SP355</td>
<td>2&quot;</td>
<td>3/4 - 10 UNC</td>
<td>35 (1,68)</td>
<td>37 (1,46)</td>
</tr>
<tr>
<td>SP500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP750</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denison</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P6/P7</td>
<td>1 1/2&quot;</td>
<td>5/8-11 UNC</td>
<td>27 (1,06)</td>
<td>30 (1,18)</td>
</tr>
<tr>
<td>P11/P14</td>
<td>2&quot;</td>
<td>3/4-10 UNC</td>
<td>37 (1,46)</td>
<td></td>
</tr>
<tr>
<td>P24/P30</td>
<td>2&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sauer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90R042</td>
<td>3/4&quot;</td>
<td>3/8-16 UNC</td>
<td>20 (0,79)</td>
<td>19 (0,75)</td>
</tr>
<tr>
<td>90R055</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90R075</td>
<td>1&quot;</td>
<td>7/16-14 UNC</td>
<td>21 (0,83)</td>
<td>24 (0,94)</td>
</tr>
<tr>
<td>90R100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90R130</td>
<td>1 1/4&quot;</td>
<td>1/2-13 UNC</td>
<td>23 (0,91)</td>
<td>27 (1,06)</td>
</tr>
<tr>
<td>90R180</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* SAE-flange J518, code 62, 414 bar (6000 psi) 90° connections have to be used, except for the lower pump in a tandem mount that needs a straight connection.
** 4 screws needed/connection, preferably with cap head bolts.

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** 4 screws needed/connection, preferably with cap head bolts.

All measurements in the hydraulic system must be performed by professional service personnel knowledgeable of risks involved. Be especially accurate when connecting the A- and B- connections (high pressure).

Note that there must be an opening in the lower edge of the rubber cloth. The opening area must be the same as the air inlet area. Do not make any holes in the rubber cloth.
4.9 Electric connections

Safety precautions

- All electric equipment is intended 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.
- Earthing shall be carried out according to local regulations before the electric equipment is connected to the main voltage.
- All electrical supply levels must be within the limits that the equipment is constructed for, see technical documentation and maximum rating plate.

Junction box

Connect the cables on the screw terminals inside the junction box according to the electrical drawing in the attached technical documentation. Inlets for electrical cables, see picture in section 4.8.

Air-oil cooler

The voltage and connection are stamped on the rating plate. Connect the electric motor to the electrical supply. Check direction of rotation, see air stream arrow in figure beside.

Oil heater

Connect the cables on the screw terminals inside the terminal box as shown on pictures below. For power and voltage see attached technical documentation and rating on the oil heater.

Star connection
3-phase 400 VAC

Connection
1-phase 230 VAC

El-motor

Major voltage connection according to stamping on the rating plate.
4.10 Water connections

Cooling water must fulfill required flow, pressure, temperature and cleanliness level (see attached technical documentation and section “Cooling water”). Otherwise the reliability of the entire drive will be reduced. It is important that all piping on the Unit is performed so that sufficient working space for maintenance is obtained. The water-pipes and the cooler may need to be insulated to prevent condensing water and freezing in winter condition.

4.11 Pipework

General

The Power Unit should be placed as close to the hydraulic motor as possible, taking other circumstances (such as space, environmental conditions et cetera) into consideration.

The main connections of the drive pump and the hydraulic motor must always be fitted to the piping with hoses. We recommend there be shut off valves on the main lines A & B. The protections on all parts must be kept on until final assembly.

Do not work on the pipework if the hydraulic system is pressurized. Use necessary safety equipment during installation of the pipe work. Usual safety requirements for each measure must be followed.

Storage of included components
The included components shall be stored according to section “Storage of the packed Power Unit”. Notice that the packing must not be removed during storage.
Handling of fittings

General:
Inspect the sealing surfaces on the couplings visually before mounting. It must be free from any damages such as scores and cracks. Handle the couplings with care. If you drop the coupling or it has nicks on it inspect it visually. Check that the sealing (if any) is in its right position, free from cracks and that it is saturated with oil.

The protections and packings on the fittings must be kept on until final assembly.

Flange fittings:
The screws must be tightened crosswise.

Jic-fittings (SAE J514, ISO 8434):
Moment of tightening; by hand +1/4 - 1/2 turn.
Do not overtighten the fittings.
Use correct size tools, fittings can be damaged and difficult to remove.
Notice that all fittings may expand because of heat and vibrations and must be retightened.

Welded fittings:
Contact your Hägglunds Drives representative.

Mounting of hoses
Ensure that hoses are not stressed or twisted on installation, so as to prevent premature failure.
Bend radius should conform to manufacturers recommendations.

Clamps
The normal distance between clamps:
D ≤ 25 mm (1 in) 1500 - 2000 mm (59 - 79 in).
D ≥ 25 mm (1 in) 2000 - 2500 mm (79 - 98 in).
The pipes must be clamped immediately before and after a bend and immediately before transition to a hose.

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 oil flushed to reach the required cleanliness level.

Pressure tests
Pressure tests should always take place before flushing in order to release contaminations by stresses introduced by the pressure. The main lines must be pressure and leakage tested to a static pressure of 1,5 x max. expected system pressure (not above bursting pressure). The hydraulic motor and Power Unit must be disconnected or protected by closed valves during the pressure tests. The tests on the main lines are appr. carried out by using a hydraulic hand pump.
4.12 Flushing before start up

A pressure filter and checkvalve has to be connected to the main line at the Power Unit. This filter is connected on the return side of the drive pump.

Rec. filtration degree $\beta_{10} = 75$ or better.

The size of the flushing filter should be matched to that of the pump concerned, 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 enabling the entire system to be flushed, see figure beside.

The maximum flow from the Power Unit should be flushed through the main circuit for at least 2 hours on small installations and considerably longer on large ones.

Use extreme caution to ensure pump is stroked in sync with free flow direction of check valve.

4.13 Commissioning

4.13.1 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, is the degree of filtration for the filter according to the data in the technical documentation.
- Check that the coupling between the electric motor and pump is properly mounted.
- Check that the precharge pressure in the accumulator (option) is in accordance with the attached technical documentation and/or check the precharge pressure on the label close to the accumulator. How to check precharge pressure, see page 10.

Cleanliness
- The hydraulic system must be flushed and thoroughly cleaned on the inside.
- If the slightest doubts are entertained, the cleanliness should be checked before filling with oil.

Pipe work
- Are the couplings properly tightened?
- Is the pipe work properly cleaned?
- Is the pipe work mounted free of stress?
- Are the lines in accordance with installation drawing/piping plan?

Electric
- Check that electric motor(s), control system and other electrical components are con-nec-ted 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.

4.13.2 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 are not contaminated with water or other substances.
- For handling of couplings and hoses see section “Pipe work“
- Plug the drain connection D (motor) to prevent non filtered fluid being flushed into the hydraulic motor case, when filling the system the first time.
Filling up the system with hydraulic fluid

Filling

Use an fluid filling pump unit which has a filter with a filter rating of 10 microns or better.

**New fluid is normally not filtered and will introduce dirt into the system, the fluid must therefor always be filled through a filter. Never pour hydraulic fluid into the tank through the air breather filter.**

Always pump the fluid in through the special quick connection which is marked appropriately. The quick connection is a completely rust-proof quick release coupling, see figure below. The fluid filled into the system will be filtered through the drain filter for better results.

The tank must be filled with oil to 20 mm (0,79 in) below the maximum level on the visual level gauge on tank before starting for the first time.

Check the function of the level -switch and -indication during filling up of the tank.

<table>
<thead>
<tr>
<th>Power Unit</th>
<th>PEC 102/103</th>
<th>PEC 202/203</th>
<th>PEC 302/303</th>
<th>PEC 402/403</th>
<th>PEC 602/603</th>
<th>PEC 803</th>
<th>PEC 1003</th>
<th>PEC 702</th>
<th>PEC 1203</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max (visual level gauge on tank)</td>
<td>171 (45,1)</td>
<td>236 (62,3)</td>
<td>308 (81,3)</td>
<td>396 (104,5)</td>
<td>517 (136,5)</td>
<td>857 (226,2)</td>
<td>994 (262,4)</td>
<td>715 (188,9)</td>
<td>1240 (327,6)</td>
</tr>
<tr>
<td>Between levels, max - warning</td>
<td>27 (7,1)</td>
<td>32 (8,4)</td>
<td>36 (9,5)</td>
<td>47 (12,4)</td>
<td>49 (12,9)</td>
<td>82 (21,6)</td>
<td>89 (23,5)</td>
<td>65 (17,2)</td>
<td>102 (27,0)</td>
</tr>
</tbody>
</table>

Filling up the system with hydraulic fluid after the fluid filling open up the drain line and reconnect the drain line from the hydraulic motor.

- **WARNING**
  - Check the caution sign on the hydraulic fluid container and the warnings in section “Choice of hydraulic fluid”.
  - Avoid long contact with the skin and the hydraulic fluid.
  - Remove any spilled oil from the floor, great risk to slip and fall.
4.13.3 Initial start up procedure

Note!
- Make sure the driven system and driven machine is ready to run, warn all personnel in the area that start up is imminent.
- Follow “Safety precautions” section 1.1.
- Never operate the Power Unit with defective instruments or control elements.
- Keep inflammable materials away from the Power 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 starting up procedure.

On cold start up, the filters may indicate bypass. After a few minutes of operating, press down the visual indicator to reset. If the indicators will not reset after system has reached operation temperature, filter element must be changed.

STEP 1
Immediately before starting
- Check fluid level in the tank and refill to about 20 mm (0,79 in) below max level at visual level gauge on tank (see “filling up the system with hydraulic fluid”).
- Check if any components need filling with clean hydraulic fluid, i.e. pump case or motor case.
- Check safety equipment.
- Check that the prescribed steps in section “Before starting up” have been carried out.
- 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 technical documentation.

STEP 2
Start with unloaded pump at short intervals
Starting of the power unit shall be carried out with a completely unloaded pump in short intervals.

Make sure immediately that the pump has the correct direction of rotation, otherwise the pump will be damaged. The correct direction of rotation is evident from a sign placed under the electric motor, see figure below.

- When the hydraulic fluid is cold some restarts may be needed to raise the charge pressure.
- Check the charge pressure confirm with data and settings on attached technical 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.
Initial start up procedure

STEP 3
Unloaded pump at longer intervals
Run for a period at no load condition until system is stable and control is established.

Topping up may be needed due to parts of the system having been filled with fluid.
- Check for unusual noises or vibrations.
- Check that the specified pressure levels for charge pressure and pilot* pressure at the Power Unit are maintained in accordance with the values stated on the hydraulic diagram in the attached technical documentation. These pressure levels are preset at the factory and there is normally no need to readjust. *only on the Hägglunds Drives pump
- Check for leakage points.

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

STEP 4
Loaded hydraulic system
The hydraulic system can be loaded when the hydraulic system functions satisfactorily in unloaded running condition.
- Gradually increase load pressure 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.

STEP 5
Checking
- Check for unusual noises or vibrations.
- Check the function of the safety equipments.
- Check temp in tank and closed loop. Check also that the cooler control is stable. If not, investigate water supply, controls, air blast cooler, etc.
- Check for leakage points.
- Check that the pump compensator pressure control and pressure switches (optional) are set at levels appropriate to the drive. Upon delivery, these pressure levels are set at the levels specified by the customer and normally no readjustment will be necessary. The values are stated in the technical documentation, data and settings. Pressure can easily be checked by closing a ball valve on the high pressure leg and stroking the pump until the pressure is showing on the gauge.
- The working pressure must be checked to ensure that they correspond to the contracted values.

STEP 6
Stop the electric motor
- Correct any faults discovered at the points above.
- Check the filter indicator. It is not unusual to change elements on commissioning as the system is cleaning the dirt particles out. When changing filter elements carefully follow the instructions in section “Filter change” to prevent introduction of dirt into the system.
  If there is still 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 it is necessary.
- Tidy up inside and around the Power Unit. Remove waste fluid, pieces of cable among other things. Keep the inside of the Power Unit neat and clean.
4.14 Pump settings and adjustments
4.14.1 Hägglunds Drives, SP-pump

Charge pressure level, control pressure level, high pressure relief valves and pressure compensator are set before the delivery of Power Units from the factory and there is normally no need for readjustment. Check always the pressure levels in the documentation. **Setting of pressures on the pump(s) must be performed by skilled service personnel familiar with functions and risks involved with the pump.** The pressures shall be set during operation and with system at operating temperature. Note that pressures will change with different viscosities.

1. **Charge pressure adjustment:** Stroke out the pump to more than 50 % and increase the high pressure up to Php > 100 bar by loading an actuator. Release the luck nut width size 19 and adjust the charge pressure to the necessary level by turning the setting screw (internal hexagon size 6). The charge pressure shall be set at 15 bar/218 psi as standard. Pressure to be measured at port MK4-port. After adjustment tighten the setting screw by means of the luck nut size 19.

2. **Control pressure adjustment:** The control pressure to be measured at port E2. The control pressure shall be adjusted to 30 bar/436 psi + (p₁ - p₂) with the pump in neutral (zero stroke position).

   Release the luck nut width size 19 and adjust the control pressure to the necessary level by turning the setting screw (internal hexagon size 6). To get the value p₁ measure the pressure in ME3-port with the pump in neutral. To get the value p₂ measure the pressure in ME3-port with the pump swiveled out to >50 % stroke (Secure that the flushing valve has moved). (p₁ - p₂) should be about 5-12 bar, depending on the pump size. After adjustment tighten the setting screw by means of the luck nut size 19

3. **High pressure relief valves setting A and B side:** Set the compensator pressure (See item 4.) to a value corresponding to the high pressure relief valve setting. The reason for that is to be able to reach enough high pressure at the pressure relief valve setting. Release the luck nut (width size 24) and adjust the setting screw (internal hexagon size 6). With loaded pump (blocked or partly blocked main port or actuator) increase the high pressure relief valve setting until the pump starts to swivel out. Setting value according to documentation, maximum 390 bar. With completely blocked port the swivel angle shall be below 3°. Measure the pressure at port MA resp. MB. The setting value shall be 40 bar above the compensator pressure setting.

   **N.B. The high pressure relief valves must be adjusted before the compensator pressure adjustment.**

4. **Pressure compensator setting:** Release the luck nut (width size 17) and adjust the setting screw (internal hexagon size 5). The pressure compensator shall be adjusted with blocked main-port or blocked actuator. Set the compensator pressure to a value according to the documentation, maximum 350 bar. Measure the pressure at port MA resp. MB
4.14.2 Denison pump

P6S, P7S, P11S & P14S  P24S & P30S

Charge pressure and Pump compensator pressure level are set before the Power Units leave the factory and consequently there is normally no need for readjustment. Check always the pressure levels in technical documentation. Setting of pressures on the pump(s) must be performed by professional 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.

1. **Charge pressure adjustment**: Remove acorn nut, loosen lock nut and adjust pressure with an allen key, size 5/32". Clockwise adjustment will increase the pressure. The charge pressure (on the charge pressure gauge) shall be within the following limits: 15 bar/218 psi (for P6S/ P7S & P11S/P14S & P24S) and 15 bar/261 psi (for P30S).

If other charge pressures are to be set, contact Hägglunds Drives representative for consultation.

2. **When charge pressure is set**: Tighten lock nut and return acorn nut. Note in the logbook or technical documentation.

1. **If the main pressure levels are to be increased**: 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 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.

---

**WARNING**

Working in high pressure areas could be dangerous in case of unforeseen failures.
### 4.14.3 Sauer pump

Charge pressure and Pump compensator levels are set before the Power Units leave factory and consequently there is normally no need for readjustment. Check always the pressure levels in technical documentation. **Setting of charge pressures on the pump(s) must be performed by professional 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.

1. **Block the main line and onstroke the pump to max.**

2. **Charge pressure adjustment:** Loosen lock nut and adjust pressure with an allen key, size 3/16". Clockwise adjustment will increase the pressure. The charge pressure (on the charge pressure gauge) shall within the following limits: 15bar/218psi (for 90R042, 90R055, 90R075, 90R100, 90R130 and 90R180).

   If other charge pressures are to be set, contact Hägglunds Drives representative for consultation.

3. **When charge pressure is set:** Tighten lock nut. Note in the logbook or technical documentation.

1. **If the main pressure levels are to be increased:** Make sure that the piping and machine structure can take higher pressure/higher torque delivered from the hydraulic motor.

2. **Block the main line and onstroke the pump to max.**

3. **Compensator pressure adjustment:** Activate or move the input signal to the control 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 A-side is set on the multi function valve at the same side of pump as A-port and vice versa.

Remove the plastic plug, loosen lock nut (width across flats 19 mm for 90R042, 90R055, 90R075 & 90R100 and 24 mm for 90R130 & 90R180) and adjust pressure with an allen key (size 5 mm for 90R042, 90R055, 90R075 & 90R100 and 8 mm for 90R130 & 90R180) until the desired pressure level is established (approximate 93 bar/1348 psi/turn)

Clockwise rotation of the pressure adjustment screw will increase the pressure setting.

4. **When main pressures are set:** Tighten lock nut (to 16 Nm/12 lbf-ft) and return the plastic plug. Note the new pressure level in logbook or technical documentation.
5. PREVENTIVE MAINTENANCE

5.1 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.

5.2 Maintenance chart

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. Follow the “Safety precautions” during the check-ups.

Daily checks, first week after commissioning
- Fluid leaks
- Fluid level in the tank
- Operating temperature
- System pressure
- System performance and general condition
- Unusual noises
- Contamination indicators on the filters

Frequent checks
- Unusual vibrations
- Unusual noises
- Fluid leaks
- Fluid level in the tank
- Is the unit relatively clean? air flow paths unrestricted?
- Pressure levels normal - stable?
- Actuator speeds normal - stable?
- Operating temperature
- Is the drive running smoothly?
- Cont. indicators on the filters

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
- Clean areas where dirt is building up.

N.B. Never use a high pressure washing system to clean inside the Power Unit

Pre-start checks (even daily)
- Fluid leaks
- Fluid level in the tank
- Is the suction valve open?
- Contamination indicator on the filters

Frequent checks
- 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. Warning, rotating parts inside the inspection hole
- Check the flow of cooling water
- Check that the insulation inside the cabinet (especially on roof) is fixed
- Check that the doors and cover of the Power Unit are not damaged

N.B. Never use a high pressure washing system to clean inside the Power Unit

<table>
<thead>
<tr>
<th>Absolute max. intervals for major inspection and replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accumulator</td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td>After the first 100 working hours</td>
</tr>
<tr>
<td>After 3 months or 500 working hours</td>
</tr>
<tr>
<td>Once every 3 months</td>
</tr>
<tr>
<td>Once every 6 months</td>
</tr>
<tr>
<td>Once every 12 months</td>
</tr>
</tbody>
</table>

*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, shredders, crushers i.e.
5.3 Filter change

Single filter
1. Stop the operation and electric motor
2. Remove the filter bowl and change filter cartridge.

It is very important during the mounting not to expose the new cartridge to any dirt i.e. keep it in the plastic cover as long as possible.

Check the O-ring and the backup ring for damage, change parts if necessary.
3. Mount the filter bowl. Tighten by hand to stop and back off 1/8:th of a turn.

Note!
When removing a filter element take some time to inspect and look for unusual contamination within the pleats. Contact your Hägglunds Drives’ office for advice.

Duplex filter
1. Press in the pressure equalizing lever on the underside of the switching lever and hold it, see figure below.
2. Withdraw the catch knob, turn over and engage the switching lever on the other side.
3. Loosen the vent screw, only on the side where the filter is to be changed, (see picture below) 2-3 turn (maximum back out the safety stop).
4. Remove the filter bowl and 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.

Check the O-ring and the backup ring for damage. Change parts if necessary.
5. Mount the filter bowl. Tighten by hand to stop and back off 1/8:th of a turn.
6. Refill the filter by pressing the equalising lever and hold it there until the vent screw bore is bubble free.
7. Tighten the vent screw. Check the filter for leaks by pressing in the equalizing lever once again.

5.4 Inspection of hydraulic fluid

We recommend that the hydraulic fluid is analyzed once every 6 months. The analysis should cover viscosity, oxidation, water content, additives and fouling. In the vast majority of cases, your oil supplier will undertake to perform an analyses that will reveal the condition of the hydraulic fluid and can recommend suitable actions. If the analysis reveals that the properties of the hydraulic fluid is not fulfilling the requirements in section “Requirements for hydraulic fluid cleanliness” it should no longer be used, but be changed or cleaned immediately. Refill fluid according to section “Filling up the system with hydraulic fluid”.

Different hydraulic fluids are affected differently - consult the manufacturer.

CAUTION
- Dangers associated to Hydraulic fluid.
- Store up used hydraulic fluid and contaminated filter elements for destruction.
- The fluid may be hot if the cooling is insufficient.
5.5 Lubrication of electric motor (valid for ABB-motors)

Lubricate electrical motors larger than 30 kW.
1. Clean the grease nipples.
2. 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 -30°C - +120°C, continuously (-22°F - +248°F).

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.

<table>
<thead>
<tr>
<th>Frame size</th>
<th>El-motor Rated Power (kW)</th>
<th>Lubrication intervals in duty hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>225</td>
<td>37</td>
<td>3200</td>
</tr>
<tr>
<td>250</td>
<td>55</td>
<td>3000</td>
</tr>
<tr>
<td>280</td>
<td>75</td>
<td>3000</td>
</tr>
<tr>
<td>315</td>
<td>110</td>
<td>2700</td>
</tr>
<tr>
<td>355</td>
<td>132</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td>250</td>
<td></td>
</tr>
</tbody>
</table>

5.6 Air filter change
1. Clean around the area where the air filter is located.
2. Unscrew the cap and change the filter.
3. Mount the cap and make sure that no foreign material has entered the oil tank.
5.7 Cleaning of Water-Oil cooler

- Back-flushing with water will remove most soft deposit.

- If fouling appears in the form of hard deposits, circulate a weak acid through the cooler in reverse direction to the normal waterflow. Use 5% phosphoric acid or, for frequent cleaning, 5% oxalic acid or similar weak organic acid. Afterwards rinse with a large quantity of water to flush all acid from the cooler before starting up the system again.

Never wait until the cooler is completely clogged before cleaning.

5.8 Cleaning of Air-Oil cooler

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

Cleaning the inside of oil cooling pipes
Connect the cooler to a closed circuit and flush the inside with perchloroethylene. After cleaning the radiator should be flushed with fluid before reconnecting to the hydraulic system.

Follow the safety precautions on the container of the cleaning agent used. Disconnect the Power Unit before disconnecting the water-oil/Air-oil cooler. Make sure that electric power is cut off before cleaning! Cleaning agent and waste water from rinsing should not be desposed in nature.

5.9 Power Unit out of service

Periods out of commissioning
Clean and empty the cooling system (water side) before periods of rest (especially if the cooling water is not totally clean). If the Power Unit is to be out of service for more than three months, the hydraulic system must be protected internally against rust. This can be done in the following manner:
Use hydraulic fluid with rust preventing additives according to ASTM D665 class A or hydraulic fluid similar to Shell corr. hydraul, 2% VSI-improver. This additive gives protection against rust for up to about a year. After this, the equipment should be run at intervals so as to maintain a protective film on the internal surfaces of components and oil lines, thus providing protection against corrosion. If any parts of the system are disconnected, note that open fittings must be protected by plugs or covers to prevent ingress of any dirt particles.

Re-commissioning
Before the plant is re-started after a long idle period, a check should be made as to whether the instructions supplied for the original commissioning still apply. Moreover, the following measures should be observed.
-Remove preservative solution and any signs of contamination.
-Follow the procedure in section "Initial start up procedure"
6. CORRECTIVE MAINTENANCE

6.1 Common
Before removing any hydraulic/electric components, disconnect the Power Unit. Ensure that no energy is accumulated in the system and the electric motor currentless. Be watchful on the section "Safety precautions".

Before disassembly:
- Trouble-shoot the Power Unit and perform appropriate tests.
- Clean all assemblies and components, take all precautions necessary to prevent dirt entering the system.
- Disassembly may only be done by professional service personnel.

Disassembly:
- Label all parts, and protect precision or machined surfaces.
- Inspect all parts during disassembly for wear or damage.
- If hydraulic fluid is to be drained and reused, make sure that drain containers are clean and covered when not in use.
- Clean all metal parts using a suitable solvent prior to reassembly, set aside on a clean and lintfree cloth to drain.

Reassembly:
- Lubricate with system hydraulic fluid
- Replace all seals, gaskets and o-rings with new items of the correct size.
- Ensure complete sealing at pipe connections
- Refill hydraulic fluid according to section "Filling up the system with hydraulic fluid".

6.2 Change of electric motor/pump unit.
The most common method to change the pump is to lift the complete electric motor/pump unit and then remove the pump.
The electric motor and pump are assembled into a unit and mounted on the motor support plate attached to the frame via antivibration elements.

1. Remove roof and sound baffle: See section "Mounting of electric motor" item 1 and 2.
2. Release the motor support plate: Release the motor support plate from the frame.
3. Adapt lifting equipment: Adapt lifting equipment in the four holes in the corners of the motor support plate.
4. Lift the el-motor/pump unit: Be careful and take the weight and centre of gravity into consideration. Never let the electric motor/pump stand on the charge pump.
5. Assemble: Assemble in reverse order according to point 4 to 1.

WARNING
- Always use all four lifting points when lifting the electric motor/pump unit.
- Never use the lifting ears on the electric motor to lift the complete electric motor/pump unit.
- Use only lifting equipment adapted to the weight (for weights see section “Lifting methods and weights”)
- Do not stand under hanging load
- Take centre of gravitation into consideration during lifting
### 6.3 Fault finding

<table>
<thead>
<tr>
<th>Fault</th>
<th>Probable cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Unit does not start</td>
<td>Main voltage to electric motor lacking.</td>
<td>Look for the cause in the electric power network.</td>
</tr>
<tr>
<td></td>
<td>Control voltage lacking.</td>
<td>Look for the cause in the electric power supply network. Examine the control system in the power unit. If the control system has tripped, determine the reason.</td>
</tr>
<tr>
<td>Power Unit fails to deliver oil flow.</td>
<td>No servo pressure.</td>
<td>No control current to electro hydraulic stroker control. Examine the control function or electronic control card.</td>
</tr>
<tr>
<td></td>
<td>Coupling pump/el-motor defect.</td>
<td>Check through the inspection hole in the bellhousing.</td>
</tr>
<tr>
<td></td>
<td>Wrong direction of rotation hydraulic pump.</td>
<td>Check direction of rotation.</td>
</tr>
<tr>
<td></td>
<td>Load is to big.</td>
<td>Check that load pressure is not to high so that pressure override reduces pump delivery.</td>
</tr>
<tr>
<td>Unwanted noise</td>
<td>Suction line not open.</td>
<td>Open suction line cock.</td>
</tr>
<tr>
<td></td>
<td>Charge pressure too low or non-existent.</td>
<td>Check that charge pressure is correct.</td>
</tr>
<tr>
<td></td>
<td>Air leaks.</td>
<td>Examine the suction line to the charge pump for air leaks. Test by pouring oil over pipe joints while listening to changes in noise in the pump.</td>
</tr>
<tr>
<td></td>
<td>Pump caviating.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Air filter in tank clogged.</td>
<td>Change filter.</td>
</tr>
<tr>
<td></td>
<td>Worn elastomer element in the shaft coupling.</td>
<td>Change elastomer element.</td>
</tr>
<tr>
<td></td>
<td>Wrong direction of rotation.</td>
<td>Reverse direction of rotation.</td>
</tr>
</tbody>
</table>
Fault finding

<table>
<thead>
<tr>
<th>Fault</th>
<th>Probable cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>No pressure in system</td>
<td>Power unit fails to deliver oil.</td>
<td>Perform previously described actions.</td>
</tr>
<tr>
<td></td>
<td>High pressure pilot control is not closed.</td>
<td>Clean and repair high pressure pilot control.</td>
</tr>
<tr>
<td></td>
<td>Additional valves on the pump.</td>
<td>Check additional valves on the pump.</td>
</tr>
<tr>
<td>Excessive wear.</td>
<td>Viscosity too low.</td>
<td>Compare with our oil recommendations.</td>
</tr>
<tr>
<td></td>
<td>Change filters and change if necessary.</td>
<td>Check the oil temperature, and the cooling circuit.</td>
</tr>
<tr>
<td>Abrasive material circulation throught pump with the hydraulic fluid.</td>
<td>Change filters and change if necessary.</td>
<td>Check that changing is performed at prescribed intervals.</td>
</tr>
<tr>
<td>Air in the hydraulic system.</td>
<td>Locate and remedy the air system leak</td>
<td>Purge air from system.</td>
</tr>
<tr>
<td>Pump caviating.</td>
<td>Inspection of hydraulic fluid, change oil.</td>
<td></td>
</tr>
<tr>
<td>Content of water in hydraulic fluid too high.</td>
<td>system</td>
<td></td>
</tr>
<tr>
<td>High oil temperature.</td>
<td>Poor cooling capacity.</td>
<td>Check flow of cooling water, cooler, water valve and water filter or air cooler (option).</td>
</tr>
<tr>
<td>Internal leakage in pump.</td>
<td>Change or repair pump.</td>
<td></td>
</tr>
<tr>
<td>Too small an amount of replacement oil in hydraulic system.</td>
<td>Check that charge pump delivers sufficient flushing oil.</td>
<td></td>
</tr>
<tr>
<td>High oil temp. in closed circuit.</td>
<td>No oil exchange out of closed loop.</td>
<td>Check charge pressure + shuttle valve setting.</td>
</tr>
</tbody>
</table>

7. SCRAPPING

When the complete Power Unit or a single component is worn out, it should be scrapped as soon as possible. Used hydraulic fluid, material exposed to hydraulic fluid and grease may cause damage on the environment and should be delivered for destruction according to prevailing local regulations.

The main materials for respective component is to be found in the “Engineering manual Power Unit”.

![WARNING]

- Check that the Power Unit is completely disconnected.
- The components may contain accumulated energy.
- Take the fire hazard into consideration during dismantling.
- The accumulator must be empty.

8. DECLARATION OF CONFORMITY

The Declaration of Conformity, is available on request for deliveries from Hägglunds Drives AB.