

Hägglunds DOb

Drive unit

**Installation and maintenance
manual**
RE 15327-WA/05.2017

Supersedes
12.2016
English



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.

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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.

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

The original operating instructions were prepared in English.

Contents

1	This documentation	5
1.1	Scope of documentation	5
1.2	Required and additional documentation	5
1.3	Display of information	5
2	Safety instructions	7
2.1	About this chapter	7
2.2	Intended use	7
2.3	Improper use	7
2.4	Personnel qualifications	8
2.5	General safety instructions	9
2.6	Product-specific safety instructions	10
2.7	Personal protection equipment	12
3	General instructions on material damage and product damage	13
4	Delivery contents	15
5	About this product	15
5.1	Product description	15
5.2	Product identification	15
5.3	Main components	16
5.4	Hydraulic fluids	17
5.5	Requirements for hydraulic fluid cleanliness	18
5.6	Control cabinet function	19
5.7	Control cabinet interface	20
6	Transport and storage	21
6.1	Storage of the packed drive unit	21
6.2	Lifting the packed drive unit	22
7	Installation	23
7.1	Installation directives	23
7.2	Lifting methods	23
7.3	Positioning the drive unit	24
7.4	Hydraulic connections	26
7.5	Pipe work, internal	28
7.6	Electric connections	30
8	Commissioning	33
8.1	Before commissioning	33
8.2	Filling up the system with hydraulic fluid	33
8.3	Flushing before start up	36
8.4	Initial start up procedure	37
8.5	Pressure settings and adjustments	39
8.6	Temperature settings for cooling	39

9	VFD (Variable frequency drive)	40
9.1	PC based commissioning of VFD	40
9.2	Front panel based commissioning of VFD	45
9.3	Functions and Parameters	48
10	Maintenance and repair	62
10.1	Maintenance log	62
10.2	Preventive maintenance	62
10.3	Filter change	64
10.4	Inspection of hydraulic fluid	64
10.5	Electric motor	66
10.6	Cooler	68
10.7	Drive unit out of service	68
10.8	Repair	69
10.9	Spare parts	69
11	Removal and replacement	70
11.1	Common	70
12	Disposal	71
12.1	Environmental protection	71
13	Extension and conversion	71
14	Troubleshooting	72
15	Technical data	76
15.1	Weights	76
16	Declaration of Incorporation	77

1 This documentation

1.1 Scope of documentation

This documentation applies to the drive unit Hägglunds DOb and is intended for machine/system manufactures, 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 DOb.

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 DOb.	Order confirmation
	Order documentation	Order specific	E.g. hydraulic and electric diagrams, bill of material, specifications
	Hydraulic fluid quick reference	RE 15414	Data sheet
	Float switch, Type ABZMS-41	RE 50222-B	Operation manual

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

- **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.
►	Individual self-contained action (alternatives)
•	
1. 2. 3.	Numbered operating instruction: The numbers indicate the actions follow one another in sequence
	Center of gravity Markings on packaging to indicate where the center of gravity 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 DOb is a hydraulic power unit

In the application the Hägglunds DOb drive unit is classified as a partly completed machinery in the sense of the EU machine directive 2006/42/EC. A partly completed machinery is exclusively intended to form an incomplete or a complete machine together with other components or partly completed machineries. The DOb 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 open loop hydraulic system.

Standard drive units are not allowed to be used outside an ambient temperature of 0 °C to 40 °C (32 °F to 104 °F) or in areas with potentially explosive atmospheres.

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 ATEX 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, electric and automation 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.

Electric knowledge means, for instance:

- Reading and fully understanding of electrical diagrams
- Certification for work with electrical equipment

Automation knowledge means, for instance:

- Reading and fully understanding of logic diagrams
- Knowledge of programmable equipment (PLC, VFD etc)



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 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.
- Follow the general installation and safety regulations when working on power installations
- Do not remove or plug in connectors when the unit is powered

2.6 Product-specific safety instructions

The safety instructions below apply to chapters 6: *Transport and storage* to 15: *Technical data*

DANGER

Danger from suspended loads!

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

Improper transportation may cause the Hågglunds 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 your 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. 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.
- ▶ Always wait 5 minutes after switching off power to allow live capacitors to discharge before accessing an electric component. Measure the electrical voltage of live parts before beginning to work to make sure that the equipment is safe to touch.
- ▶ Never touch electrical connection points of the components while power is turned on.

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

No brake

Risk of personal injury or damage to the product!

- ▶ Take care of at power failure or when system is switched off, the system has no load holding function!

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 Häggglunds 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 cover on the Häggglunds drive unit until shortly before the lines are connected.
- ▶ The protections on all parts must be kept on until final assembly to avoid dirt in the system
- ▶ Do not perform electro-welding on the Häggglunds drive unit.

Damage to equipment due to improper lubrication!

Product can be damaged or destroyed!

- ▶ Never operate the Häggglunds drive unit with insufficient hydraulic fluid.
- ▶ When commissioning a machine/system, make sure that the case interior and the service lines of the Häggglunds 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 Häggglunds 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 Häggglunds DOb 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 Hågglunds 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 Hågglunds 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 Hågglunds drive unit and its fittings, the hydraulic fluid and the packaging material could lead to pollution of the environment!

- ▶ Dispose of the Hågglunds 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 DOb as per order confirmation

5 About this product

5.1 Product description

The DOb unit provides a hydraulic motor with required hydraulic oil flow and power together with system control functionality and is assembled in a compact cabinet. The DOb unit has an open loop hydraulic system and gives possibility to get control functionality of torque (pressure) or speed of the hydraulic motor shaft. The unit has a fixed hydraulic pump and a speed controlled electrical motor to drive the pump. DOb is equipped with an air cooler for the hydraulic oil, the fan of the cooler is speed controlled to minimize the sound level.

The unit has a maximum power of 7.5 kW, maximum flow of 30 lpm and maximum working pressure of 315 bar. (The max flow and max pressure cannot be achieved simultaneous)

The control cabinet contains two VFD units (Variable Frequency Drive) for speed control of main pump and cooler electric motors, health monitoring of the drive unit system and system status indication. The flow from the unit can be controlled locally from the cabinet front or via remote connections to terminals inside the cabinet. This installation and maintenance manual is intended to cover default setup of the system.

5.2 Product identification

- 1 Type code
- 2 Serial number
- 3 Weight
- 4 Manufacturer
- 5 Max pressure

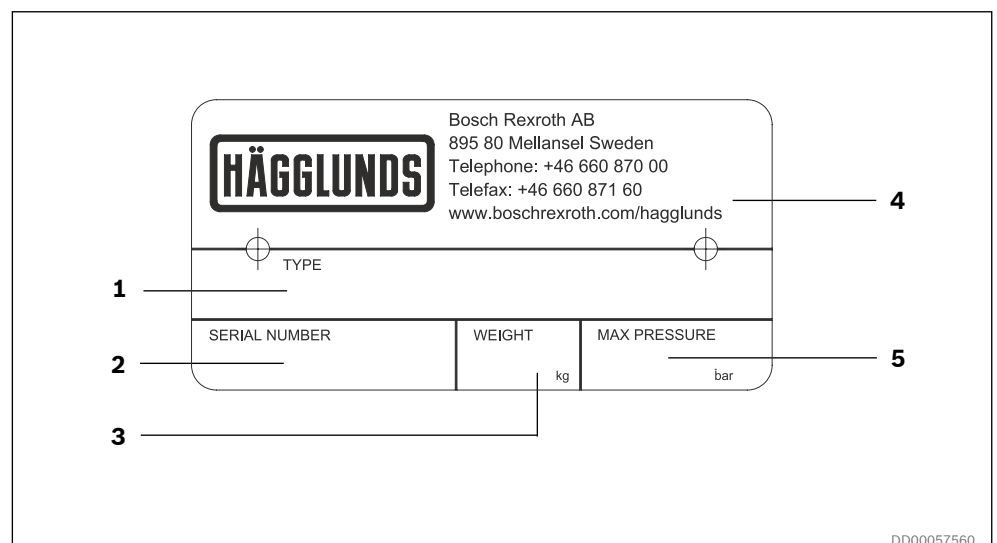


Fig. 1: Product identification

5.3 Main components

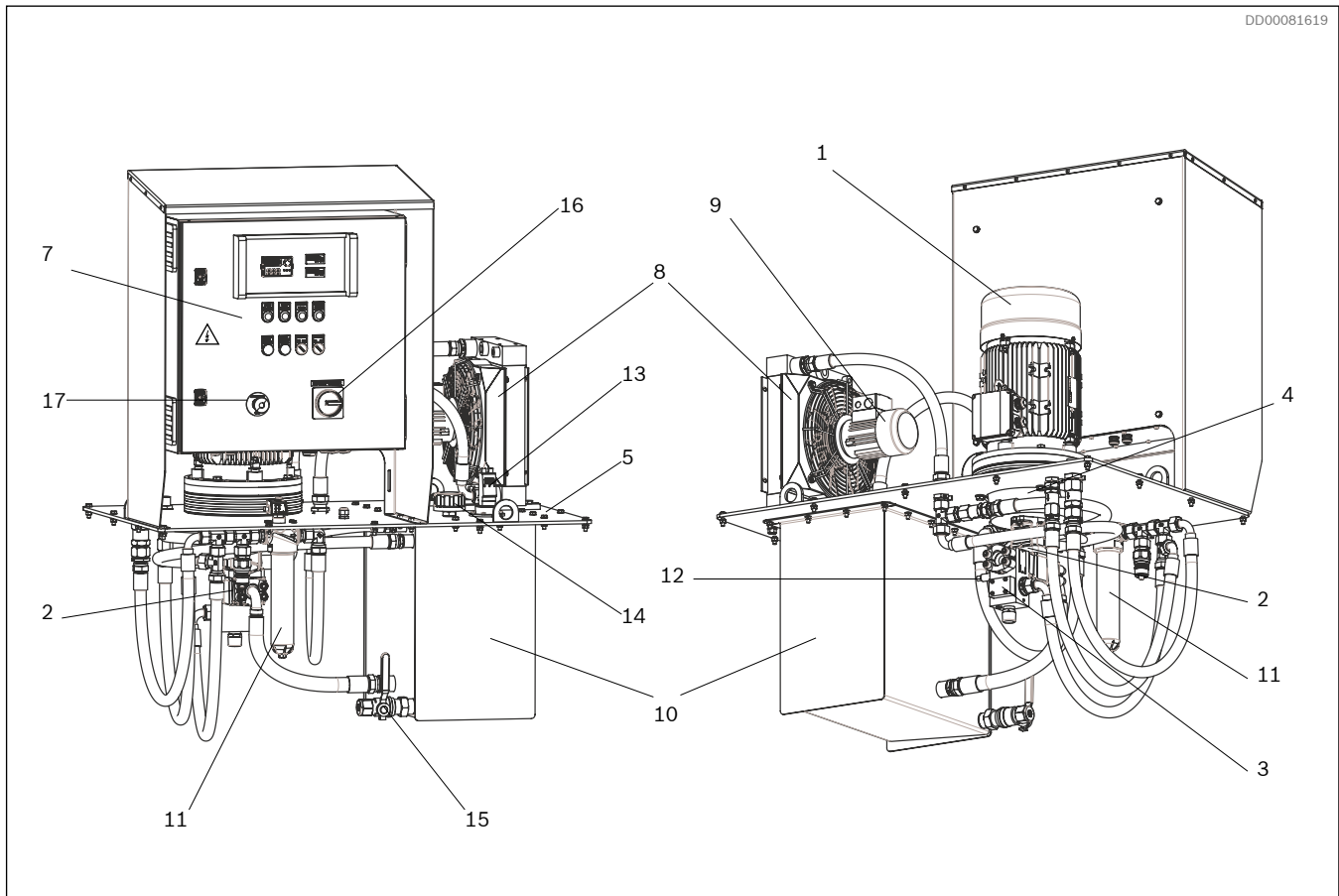


Fig. 2: Main components DOB

Main components		
Item	Description	See also figure
1	Main electrical motor	
2	Hydraulic pump	
3	Pump safety block	Fig. 22
4	Shaft coupling/bellhousing	-
5	Frame (not shown)	-
6	Panels (not shown)	-
7	Control cabinet	Fig. 5
8	Air oil cooler	
9	Cooler fan motor	
10	Oil tank	Fig. 19
11	Filter	
12	Pressure sensor	
13	Oil level/temperature sensor	Fig. 19
14	Air breather	Fig. 19
15	Oil-drain valve	Fig. 19
16	Main power switch	Fig. 5
17	Emergency stop actuator	Fig. 5

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. 3: Selection diagram for viscosity ranges with straight fluids, i.e. viscosity index 100*. General recommendation is to have a system temperature of 50°C, see dotted line in *Fig. 3: 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 1600 cSt.
- Running below 30cSt may impact the system service life.
- Running below 20 cSt may render instant system seizure.

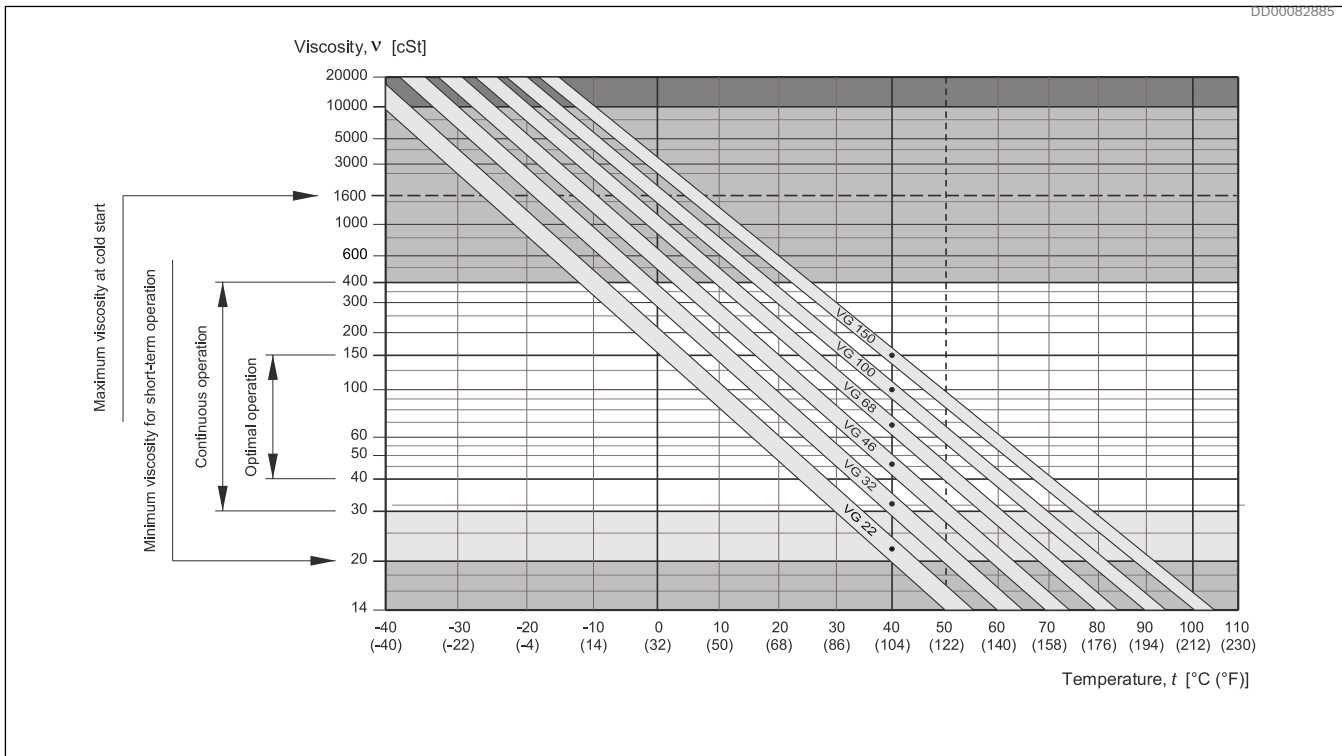


Fig. 3: Selection diagram for viscosity ranges with straight fluids, i.e. viscosity index 100

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 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 analysed according to the special maintenance intervals for your specific drive unit or the maximum intervals on the maintenance chart (see Table 11: *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

Damage on equipment

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

5.6 Control cabinet function

The control cabinet main components are two VFD's.

The first VFD controls the speed of the electrical motor driving the hydraulic pump. This VFD also contains a configurable function for start/stop logic, speed or torque (pressure) control and start cooling command. Speed/torque control can be activated with a switch on the front panel.

Start/stop of the hydraulic flow is via front panel buttons in local drive mode or via a dry contact connected to terminals for start/stop in remote mode.

The command for setting of speed or pressure is via a front panel potentiometer in local mode and via terminals for a 4-20mA signal in remote mode. Selection of local or remote mode is done with a front panel switch.

Indicators of speed and pressure are available on the front panel.

The second VFD controls the speed of the electrical motor driving the air-oil cooler fan. The speed of the fan is controlled by the oil temperature in the hydraulic tank. Minimum oil level and maximum oil temp in the tank are monitored with indication on the front panel and will stop the drive at critical level. Clogged return oil filter will be indicated on the front panel

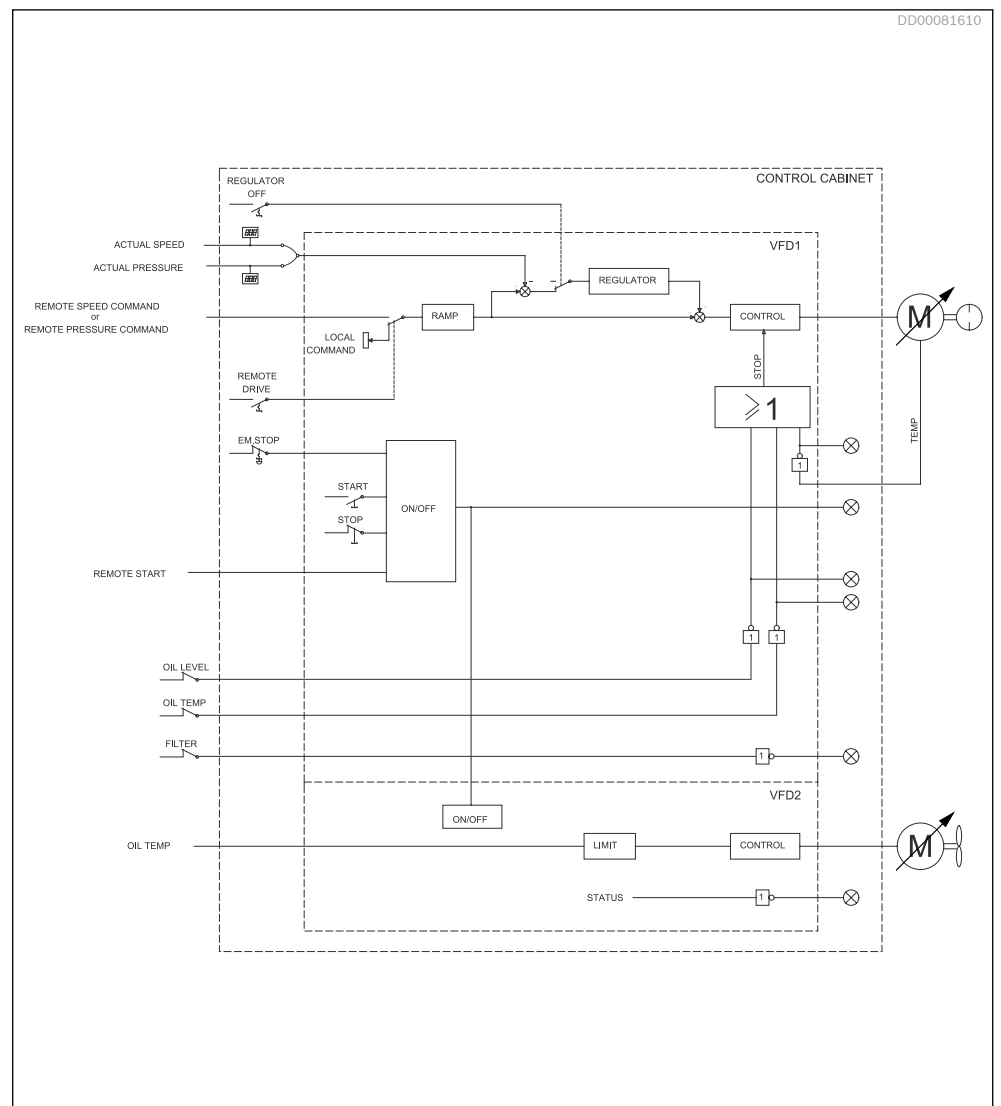


Fig. 4: Monitoring logic diagram

5.7 Control cabinet interface

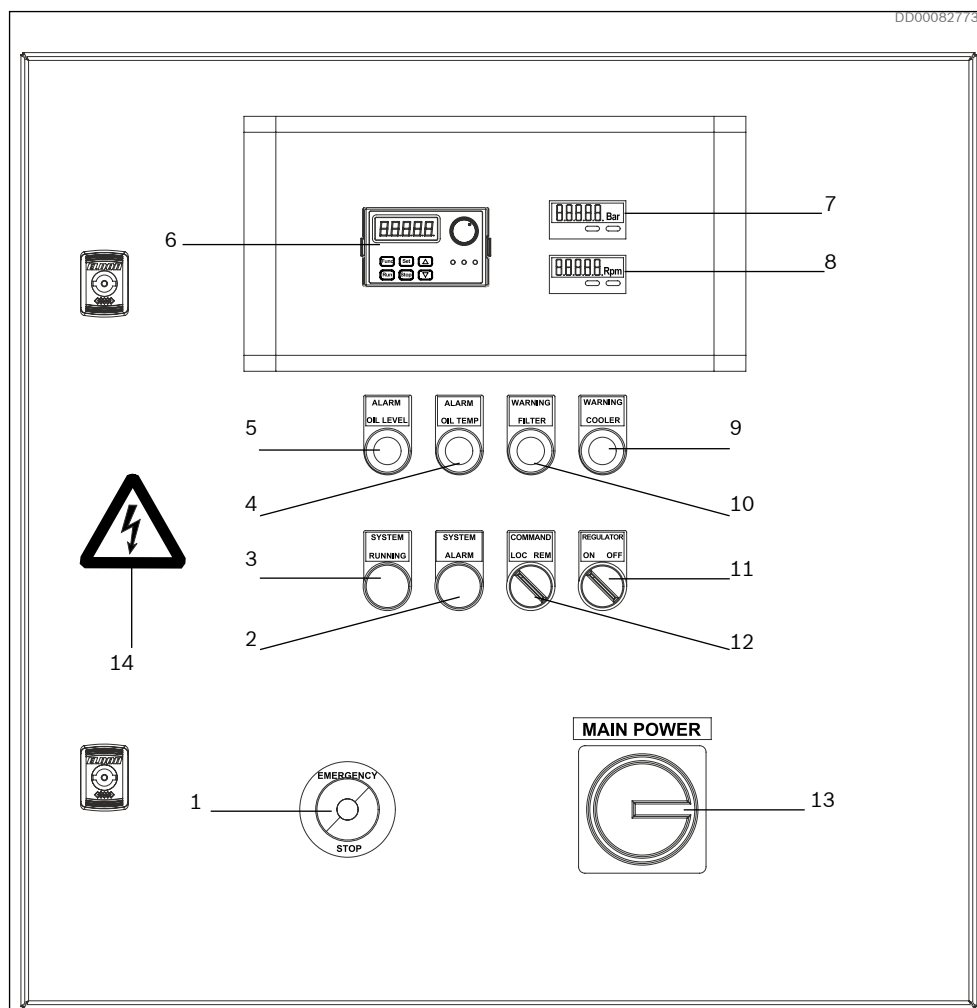


Fig. 5: Front control cabinet

Pos.	Description
1	Emergency stop
2	System alarm
3	System running
4	Alarm oil temperature
5	Alarm oil level
6	Control panel frequency converter
7	Actual pressure
8	Actual speed
9	Warning cooler
10	Warning filter
11	Regulator on/off
12	Command local/remote
13	Main power switch
14	Warning sign electricity

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!

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 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 10.7: *Drive unit out of service*).

6.2 Lifting the packed drive unit

The packed drive unit is marked with centre 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

- ▶ Centre 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 6.2: *Lifting the packed drive unit, section Lifting with fork lift*

Lifting with fork lift

The lifting of drive unit must be done from long side of the drive unit.

See Fig. 6 for maximum total width of the forks.

Position forks about the centre of gravity at lifting.

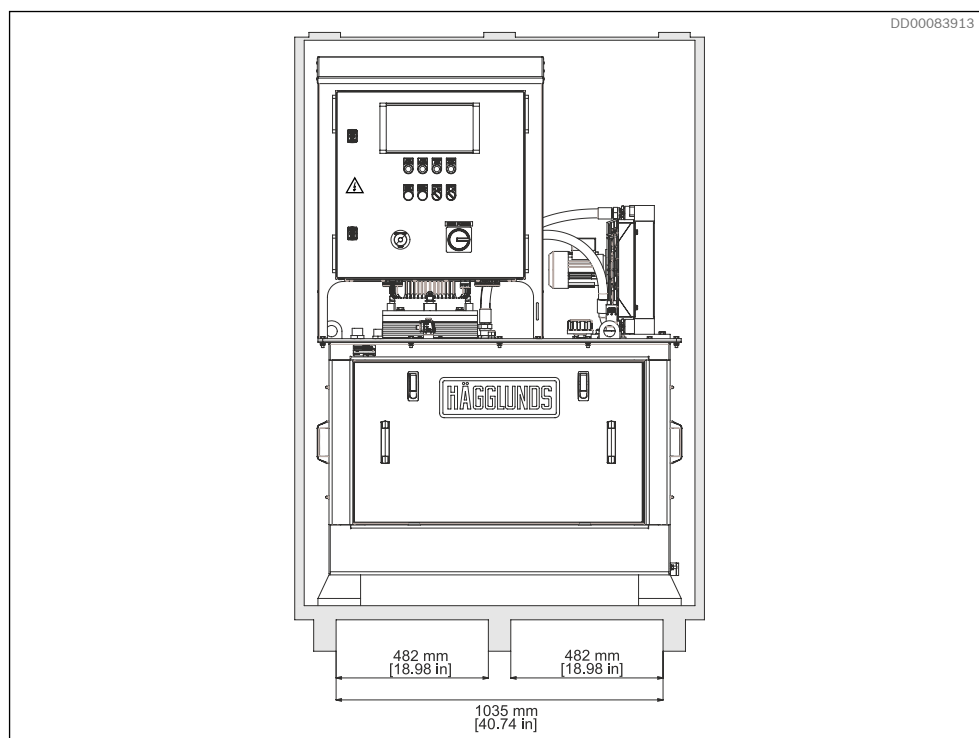


Fig. 6: Maximum width of forks lifting packed drive unit

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.

7.2 Lifting methods

Lifting with fork lift

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

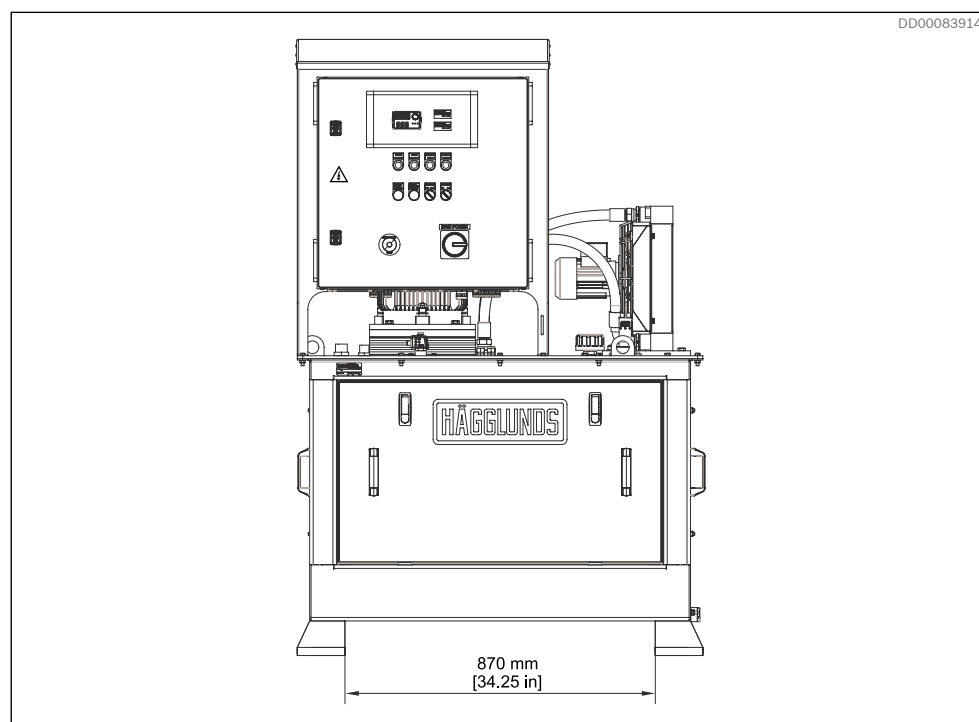


Fig. 7: Maximum width of forks lifting drive unit

Lifting with ropes/chains

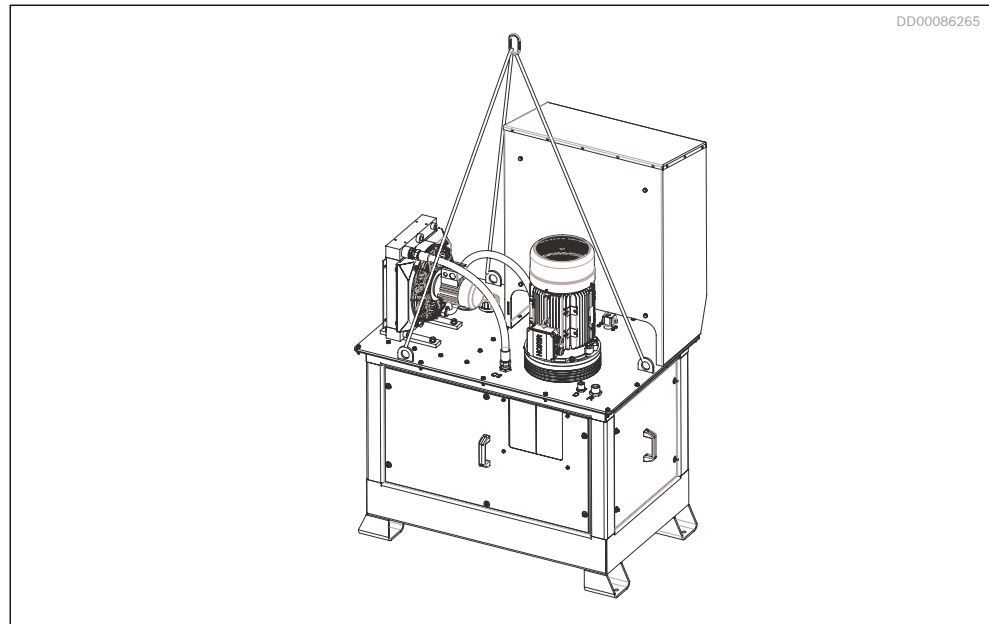


Fig. 8: Lifting the DOB

! DANGER

Danger while transporting or lifting Hågglunds 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,
- ▶ Always use all three 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.

It is important that all pipes 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.

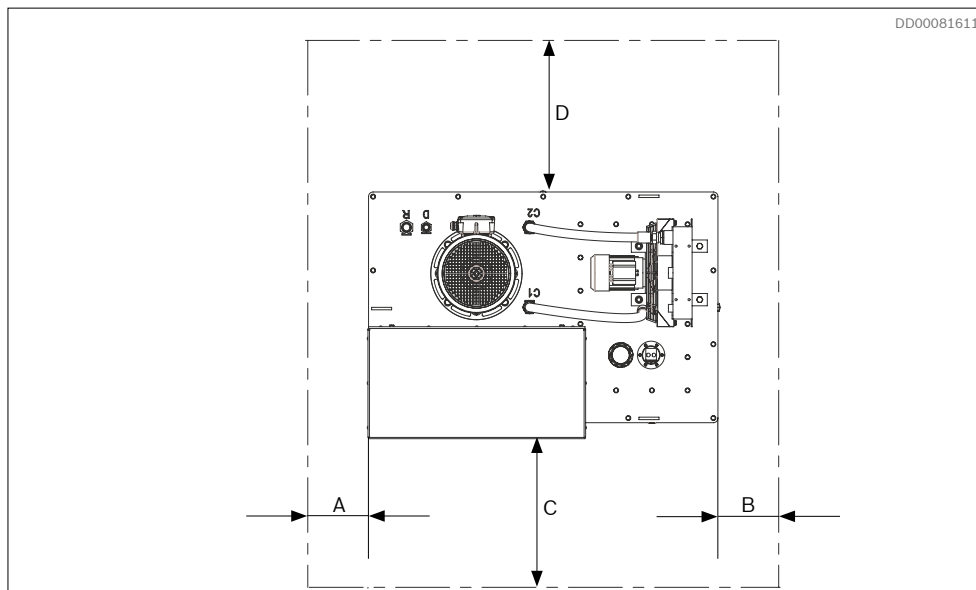


Fig. 9: Recommended space around DOB

Table 5: Recommended space around DOB

Minimum space	mm	in
A	min. 200	7.87
B	min. 200	7.87
C	min. 600	15.75
D	min. 600	15.75

Anchoring

If the unit is mounted on an inclined plane or if it is exposed to external influences such as wind or vibration, the unit should be mounted to the ground with bolts through the supporting base of the frame according to Fig. 10. Max inclination of drive unit is 14°.

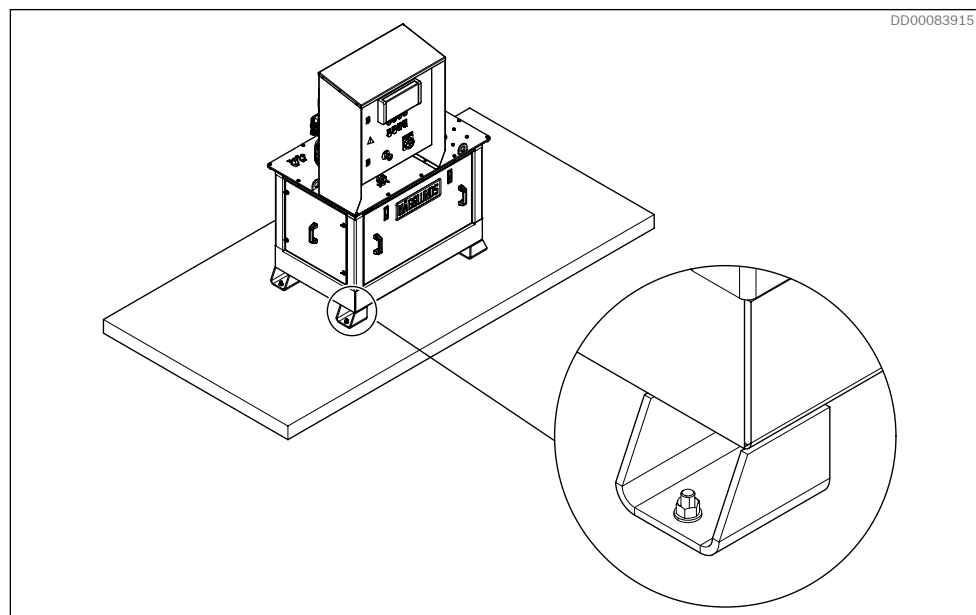


Fig. 10: Anchoring DOB

7.4 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 connection (high pressure).

DANGER

Pressurized oil leakage

Danger to life or risk of injury.

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

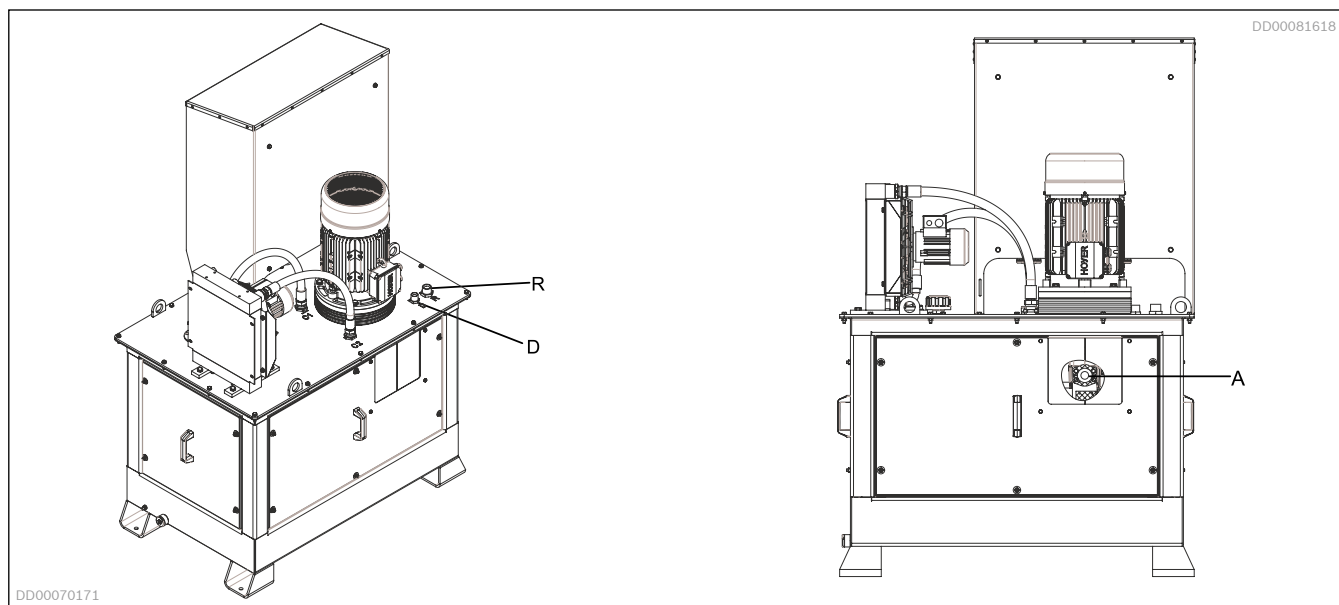


Fig. 11: Hydraulic connections at the drive unit

Table 6: Hydraulic connections

A	"1" SAE J518C Flange	A-Port pump
D	3/4" G Male	Drain from hydraulic motor
R	1" G Male	Return from hydraulic motor

Table 7: Dimensions pump connections

Pump type	Dimensions main connection A&B	Thread	Depth of threaded holes		Thickness std flange connections		Torque*)
			mm	in	mm	in	Nm +10% -0
A10FZO 008	1" SAE	M12 x 1.75	17	0.6	22.4	0.9	92
A10FZO 010							

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

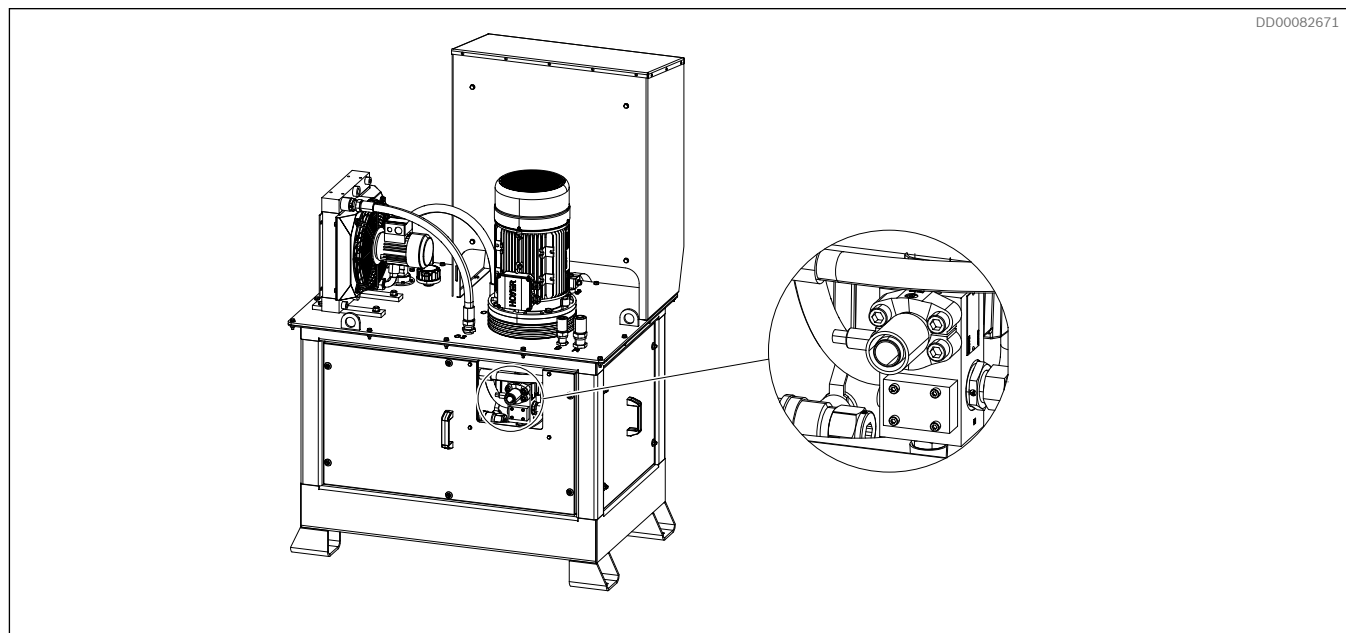


Fig. 12: High pressure connection

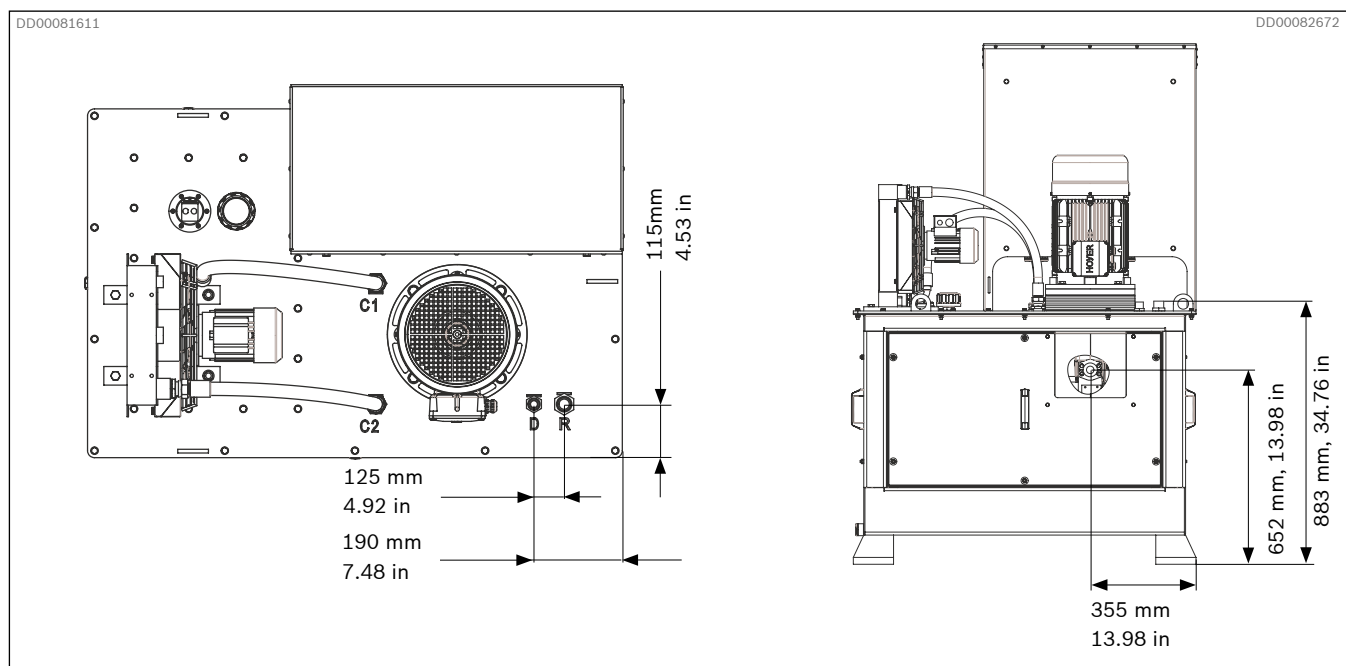


Fig. 13: Dimensions external connections points

7.5 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 parts 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.

Ermeto type, tube fittings, 24° cone, soft seal (DIN 3861, ISO 8434-4)

- Tighten the fitting nut with wrench until it stops. Tighten additional 1/6 turn to 1/4 turn.
- Use correct size of tool, to avoid fitting to be damaged and difficult to remove.

BSPP (G) fittings

1. For dimension 1" and larger, if necessary, spray nut abutment with a volatile oil like WD-40. This is done so that the nut should run as smoothly as possible and to prevent twisting of the hose when the nut is tightened.
2. Screw on the nut with your fingers. Wiggle a little on the hose during the install to check that the cone on the hose fitting has the right position in the cone on the mating fitting and that the sealing surfaces have been met.
3. Tighten the nut with the intended spanner. Recommended torque available from the table below.

Thread	Tightening torque (Nm)	Tightening torque (ibf ft)
G 3/4-14	90-135	65-100
G 1-11	120-160	90-120

If a torque wrench is not available, a rule of thumb is that the nut should be tighten additional 1/4 to 1/2 turn after the nut has been tightened so that the hose can not be turned.

4. Check that the hose doesn't get twisted when the nut is tightened.

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.

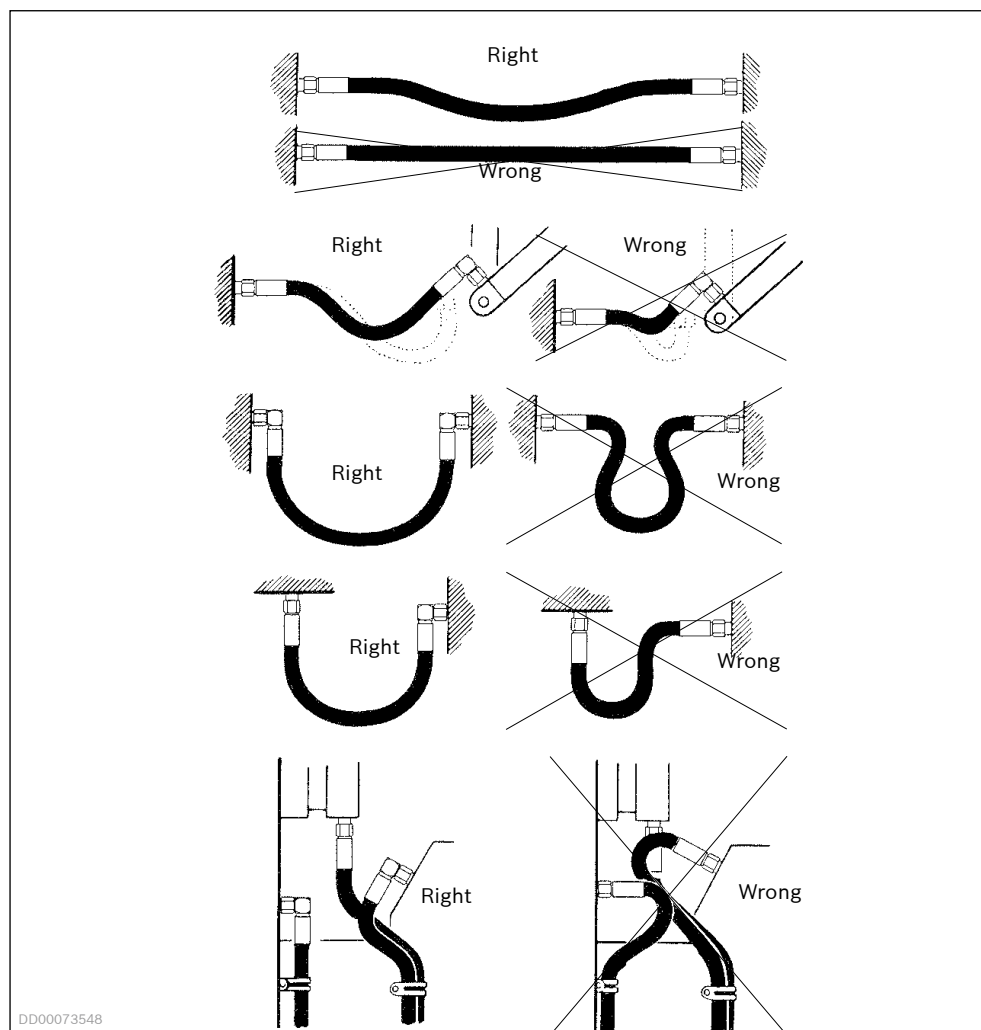


Fig. 14: Mounting of hoses

7.6 Electric connections

7.6.1 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 side of the frame.
- All electrical supply levels must be within the limits that the equipment is constructed for, see order specific Hägglunds DOB documentation and rating plate.

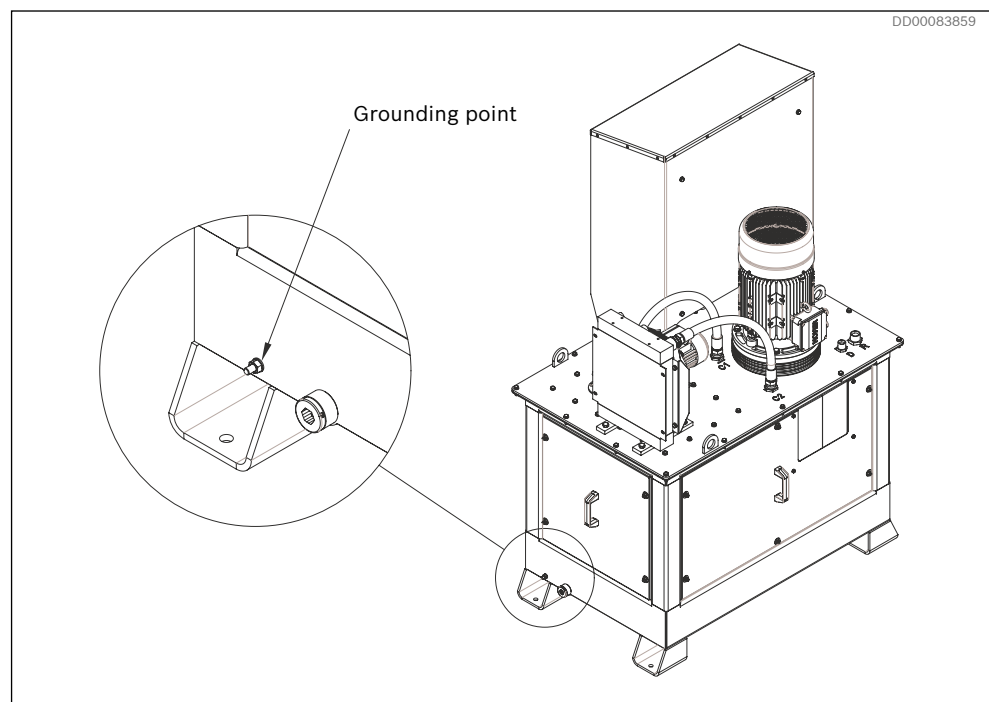


Fig. 15: Grounding point

7.6.2 Electrical connection

Connect the cables to the terminals inside the control cabinet

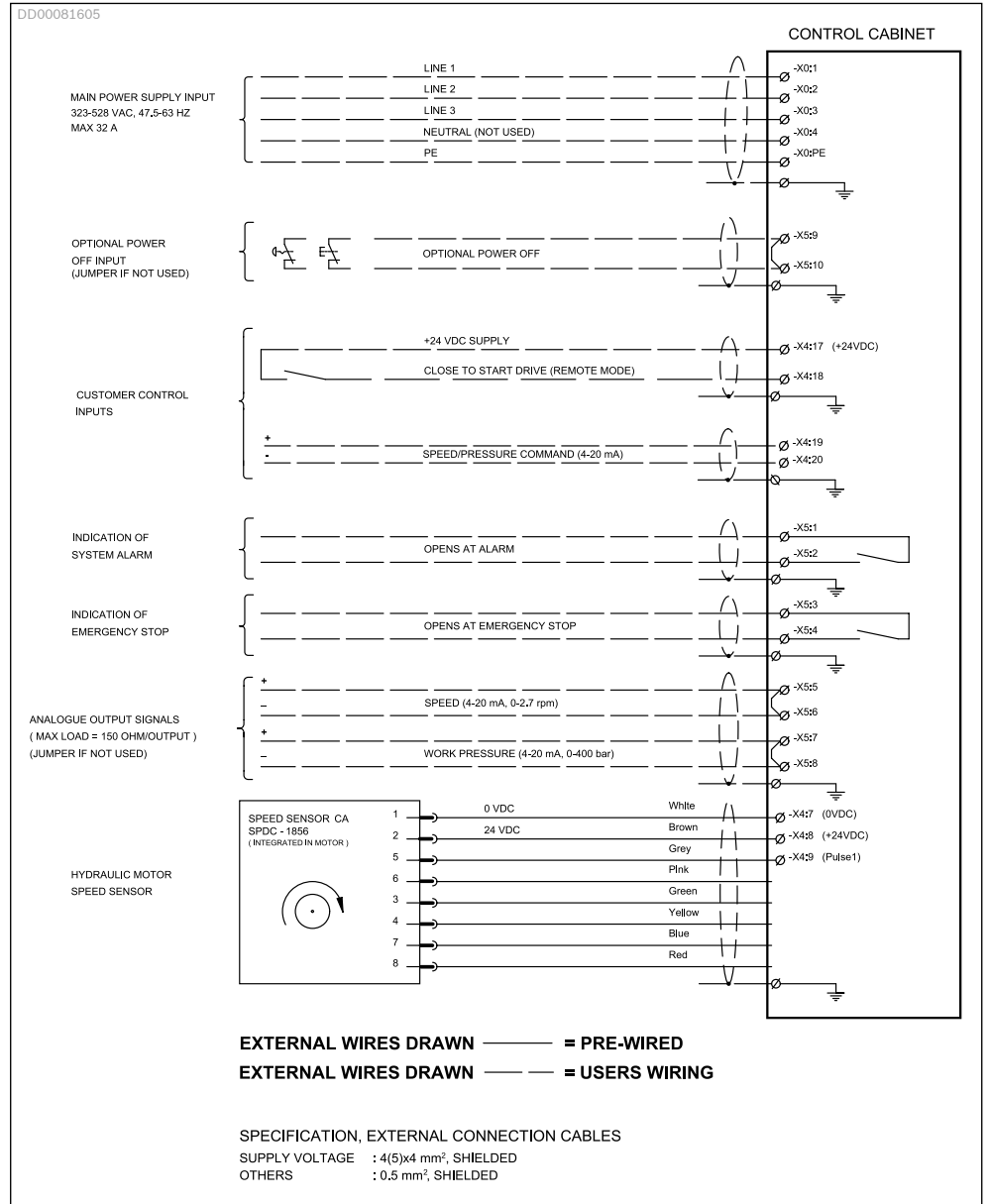


Fig. 16: External connections

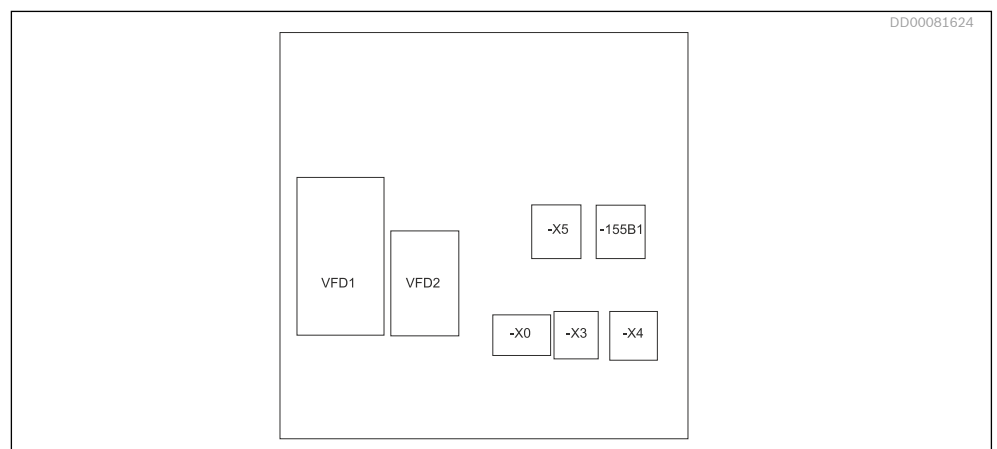


Fig. 17: Simplified terminals view inside cabinet

Table 8: Terminals, control cabinet

Block	Number	Type	Function	
-X0	1	Mains power supply	L1	
	2		L2	
	3		L3	
	4		Neutral (not used)	
	PE		Protective earth	
-X3	1	Temp/Level sensor digital signals	+24 VDC	
	2		High temperature	
	3		0 VDC	
	4		Low level	
	5	Filter switch	+24 VDC	
	6		Not used	
	7		0 VDC	
	8		Filter clogged	
-X4	1	Main motor thermistor	A-side	
	2		B-side	
	3	Temp/Level sensor analog signals	+24 VDC	
	4		Temperature	
	5		0 VDC	
	6		Level (not used)	
	7	Speed sensor	0 VDC	
	8		+24 VDC	
	9		Pulse train	
	10		Not used	
	11	Pressure sensor	+24 VDC	
	12		+4-20 mA	
	13]] Jumpers for pressure feedback]] Jumpers for speed feedback	Pressure signal
	14			0 VDC
	15			Speed signal
	16			Signal input to regulator
	17	Remote drive start	+24 VDC	
	18		Start input	
	19	Remote speed / pressure setpoint	+4-20 mA	
	20		4-20 mA return	
-X5	1	Sum alarm indication	Dry contact A	
	2		Dry contact B	
	3	Emergency stop indication	Dry contact A	
	4		Dry contact B	
	5	Pressure signal ¹⁾ (JUMPER IF NOT USED)	+4-20 mA out (0-400 bar)	
	6		4-20 mA return	
	7	Speed signal ¹⁾ (JUMPER IF NOT USED)	+4-20 mA out (0-2.7 rpm)	
	8		4-20 mA return	
	9	Power off input (JUMPER IF NOT USED)	+24 V	
	10		Out	

¹⁾ Signal must be isolated in external system

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.

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 cabinet is 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.
- Check grounding of frame (grounding point on side of frame, see *Fig. 15*)
- Check emergency stop function

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 $\beta_{10} \geq 75$.



Cleanliness in barrels with new oil is not clean enough for the system and has to be filtrated 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. 18: Oil filling*

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. See *Fig. 18: Oil filling*.

The tank must be filled with oil to nominal level before starting for the first time, according to *Table 9: Volumes for threshold levels*.

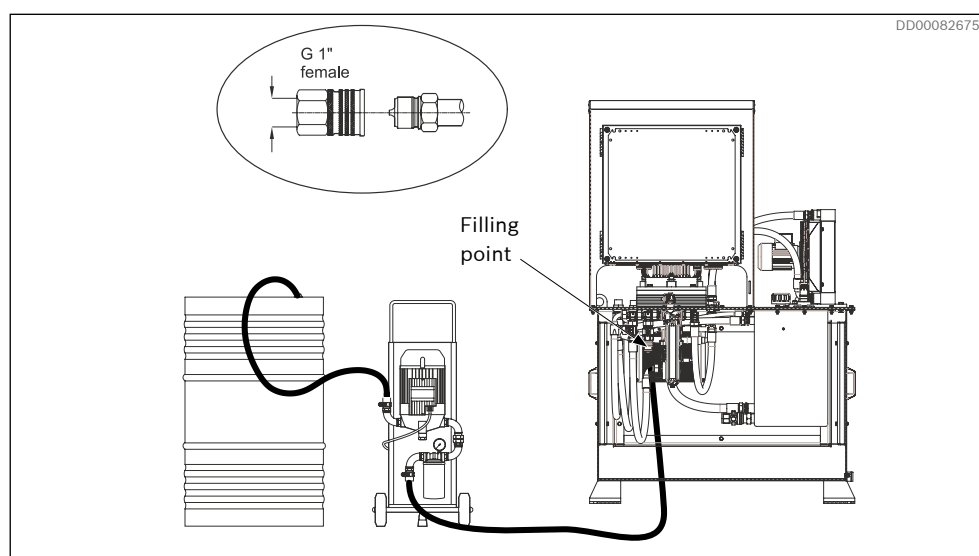


Fig. 18: Oil filling

How to check oil volume during filling

- Make sure that the power to the control unit is turned on (main power switch in on position). This will also power on the level and temperature sensor.
- Make sure that the display on the level and temperature sensor is showing the oil level. Use the ▶ key to change between showing the oil temperature or the oil level in the measured value display mode. For more info regarding operation of the level and temperature sensor, see chapter 4, operation, in operation manual RE50222-B. See item 13 in *Fig. 2: Main components DOb*, for position of the level and temperature sensor on the drive unit.
- During the initial filling, the level and temperature sensor will not show changes in the level until minimum measured value is reached (49 % / 29 liters / 8 gallons).
- Until the alarm (stop) level is reached, LED 1 will be yellow. When the alarm (stop) level is reached, LED 1 will switch off. See *Table 9: Volumes for threshold levels*, for corresponding values.
- Fill the tank until the oil level reaches the nominal value. See *Table 9: Volumes for threshold levels* for corresponding values.

Table 9: Volumes for threshold levels

Max level (measure max)					Nominal level					Alarm (stop) level				
Volume			Distance from top		Volume			Distance from top		Volume			Distance from top	
%	L	gal	mm	inch	%	L	gal	mm	inch	%	L	gal	mm	inch
121	72	19	25	0.98	100	60	16	108	4.25	70	42	11	168	6.61

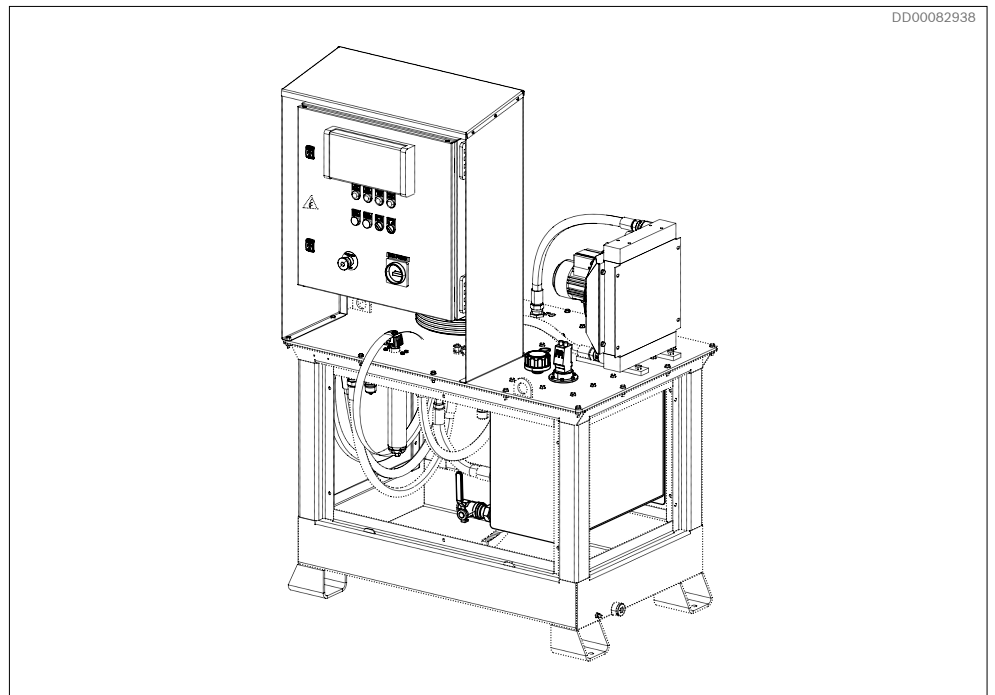


Fig. 19: Tank with level sensor

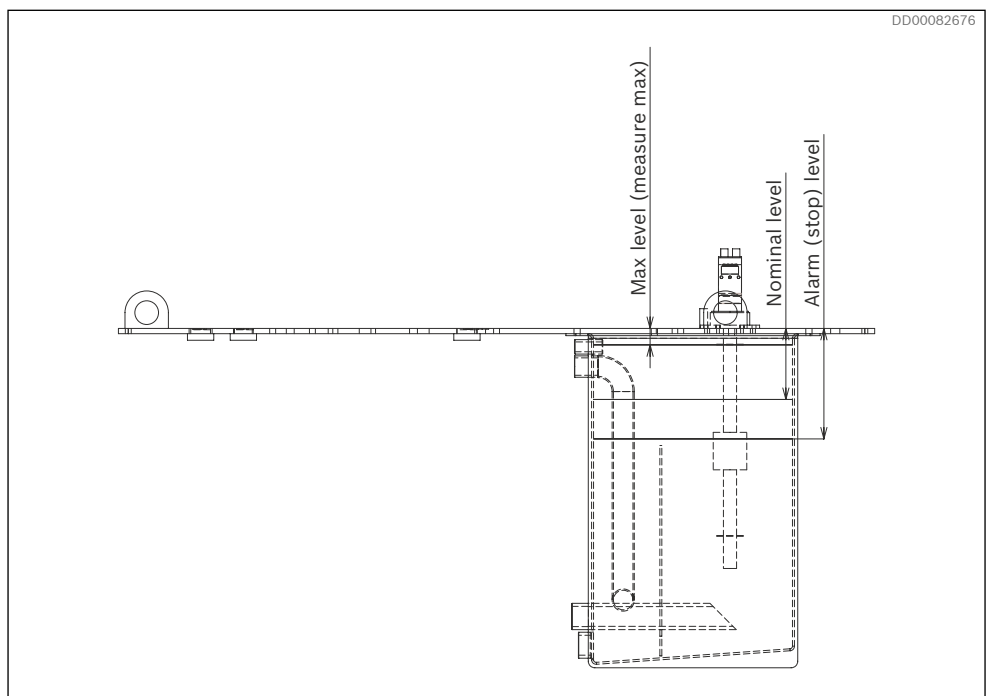


Fig. 20: Point of measure

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 $\beta_{10} \geq 75$.

The size of the flushing filter should be matched to the installed pump, so that the pressure drop across the filter not is excessive and that the max. pressure/flow ratings for the filter not is exceeded.

The main lines should be connected together at the motor side enabling the entire system to be flushed, see *Fig. 21: 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

Rotating parts!

Risk of injury.

- ▶ Do not touch 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 that the oil flow direction from the pump is the same as the 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.

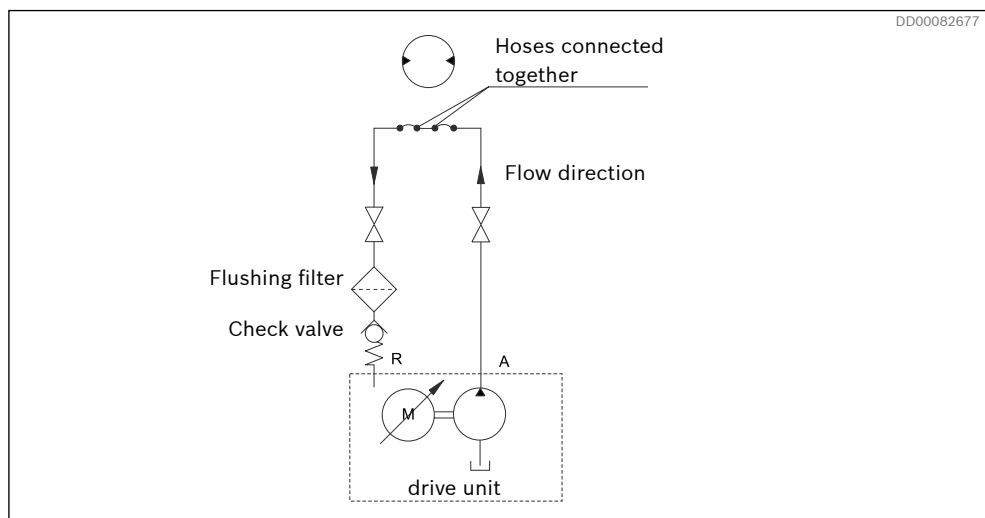


Fig. 21: Hydraulic circuit flushing

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 in the pressure, return and drainage lines are open.
- Set front panel regulator switch off. (see Fig. 5, switch pos 11)
- Set front panel switch to local. (see Fig. 5, switch pos 12)
- Turn front panel potentiometer to minimum position (counter clockwise)
- For adjustments and settings for the control system see special instruction 9: *VFD (Variable frequency drive)* page 40.

STEP 2

Start without external load at low speed

Start the unit in local mode and set minimum speed of the electric motor. The machine should have no load, which gives as low pressure as possible in the system.

CAUTION

Rotating parts!

Risk of injury.

- ▶ Do not touch rotating parts

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 has been filled up.
- Check for unusual noises or vibrations.
- 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 safety equipment.
- Temp in tank and hydraulic loop. Check also that the cooler control is stable.
- Leakage points.

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 10.3: *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 Pressure settings and adjustments

High pressure relief valves setting

The maximum pressure setting is adjusted from factory (315 bar, 4569 psi), but can be changed by the pump safety block, see *Fig. 22: Pump safety block*

Remove plastic cap, release the lock nut and adjust the setting screw, Clockwise increase maximum pressure level, counter clockwise decrease maximum pressure settings. Tighten the lock nut after adjustment.

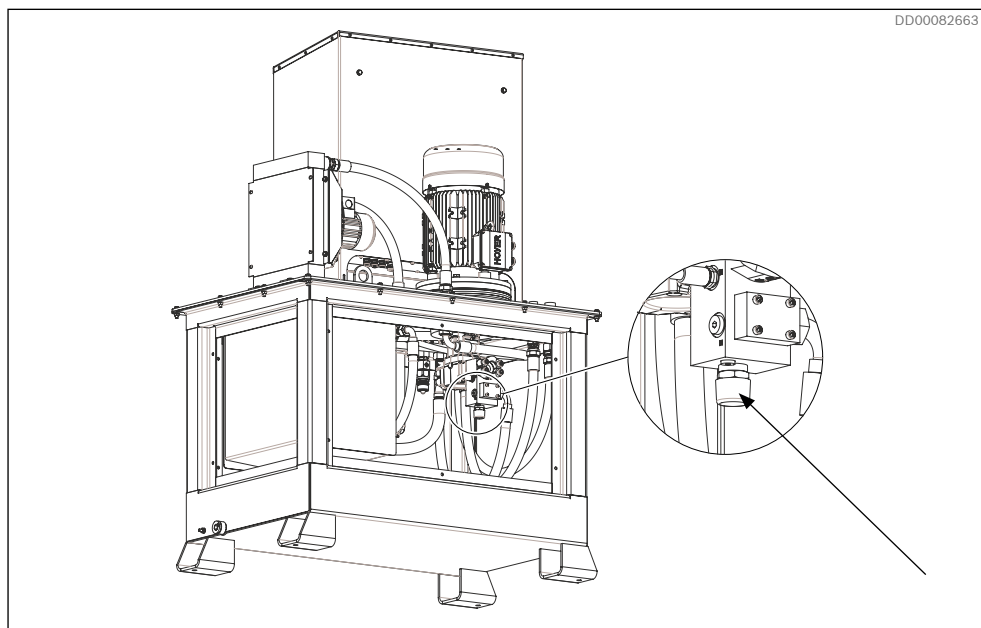


Fig. 22: Pump safety block

8.6 Temperature settings for cooling

The speed of the cooler fan is controlled by a VFD in the control cabinet via analog output 2 (temperature) on the level/temperature sensor. As default the cooling fan will start when the temperature in the oil tank is 40 °C [104 °F] and at 50 °C [122 °F] the maximum speed of the cooling fan will be reached. Depending on the application and oil type in the system, a change of the default values can be needed. Contact your Bosch Rexroth representative for advice.

How to change the values for when the cooling fan will start and when the maximum speed will be reached:

1. Cooling fan start - change A2.Lo value. For more info, see operation manual RE50222-B, chapter 4.8.2 (Analog output x: Assignment of the lower limit).
2. When maximum speed of the cooling fan will be reached - change the A2.Hi value. For more info, see operation manual RE50222-B, chapter 4.8.1 (Analog output x: Assignment of the upper limit).

The alarm (stop) level for the oil temperature in the tank is set to 63 °C [145 °F] and should normally not be changed. Contact your Bosch Rexroth representative if you need to change this value.

9 VFD (Variable frequency drive)

The VFD's in the Control Cabinet are preconfigured at delivery acc. to chapter 9.3.1 and 9.3.2 to fit the basic functionality for the drive unit. All parameters are possible to change and the used parameter functions are described in the remaining part of chapter 9.3 which is selected parts of the Operating Instructions for EFC3610, R912005854

9.1 PC based commissioning of VFD

Start-up and data back-up with PC

The frequency converter can be started up and operated remotely with the free PC software ConverterWorks. The supporting package is available for download from the webpage www.boschrexroth.com/efcx610 (product catalogue EFC 3610 section).

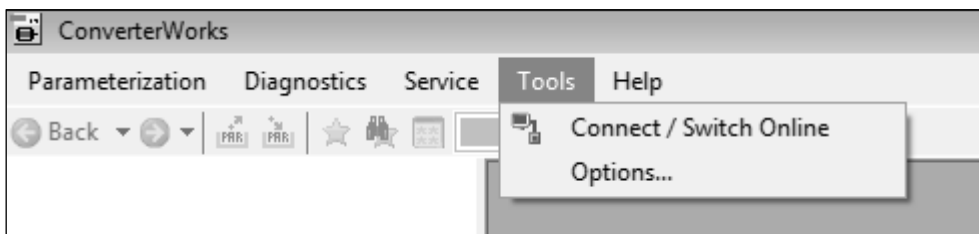
The software makes it easy to specify and adjust the parameters. Parameters can be saved and stored to ensure reliable archiving.

Minimum system requirements for using the software on a PC

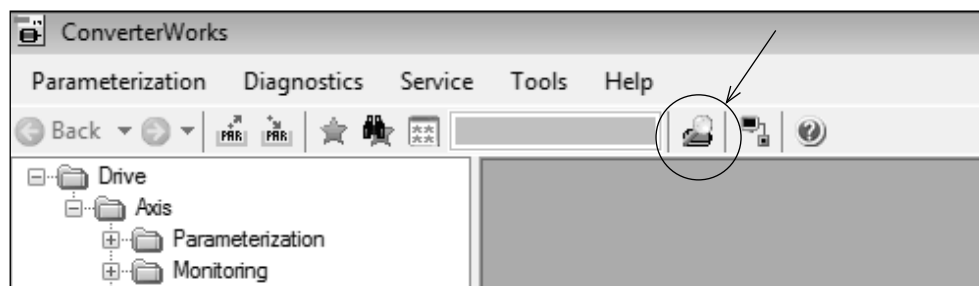
- Processor: Intel Pentium or higher capacity
- Operating system: Windows 7 or Windows XP
- Display resolution: 1024 x 768
- 1 GB free hard disk space

The connection to the PC is via a standard USB Mini-B interface. The required driver for the USB port is included in the supporting package.

9.1.1 How to start transmission



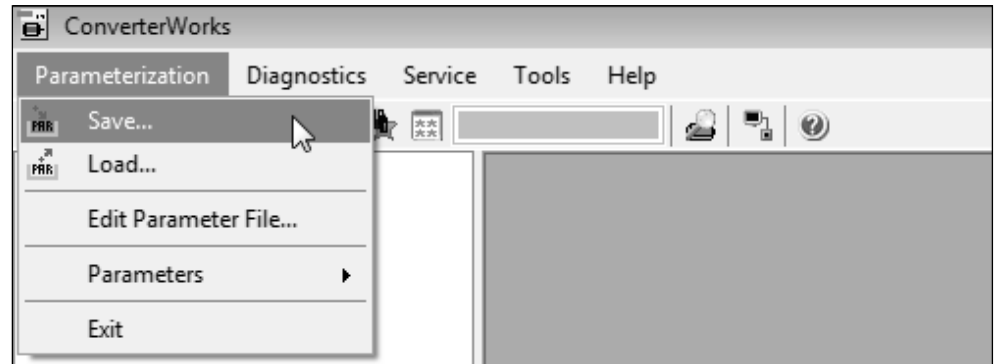
When the device is connected properly with the PC, the grey color PC to converter connector symbol will be coloured .



9.1.2 How to save the available parameters

In order to save parameters, the device must be online.

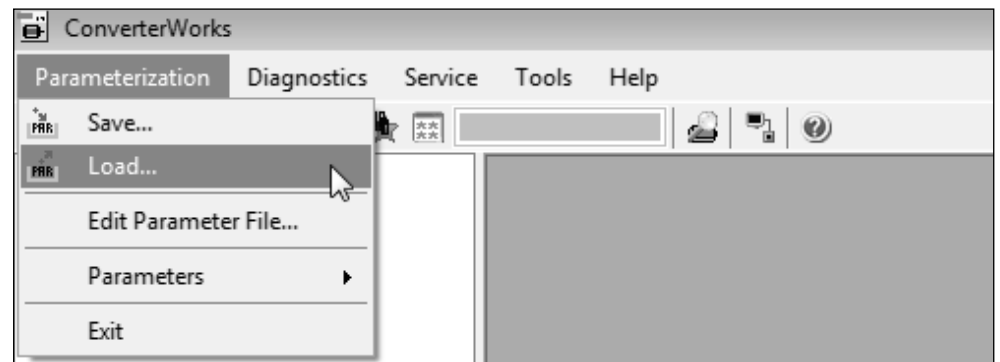
- Click on *Parameterization* → *Save*.
- Choose a file name and a destination.
- To save all available parameters, switch the parameter selection to *all parameters*.
- Click on *save*.



9.1.3 How to load a new parameter file using ConverterWorks software

In order to load a parameter file, the device must be online.

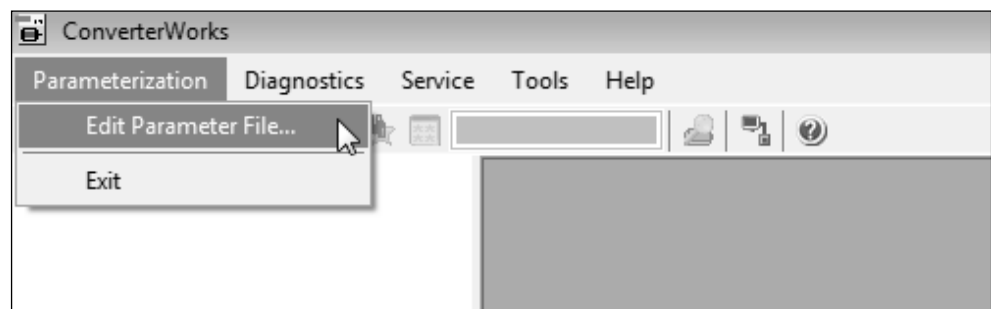
- Click on *Parameterization* → *Load*.
- Choose a parameter file.
- Click on *Load*.



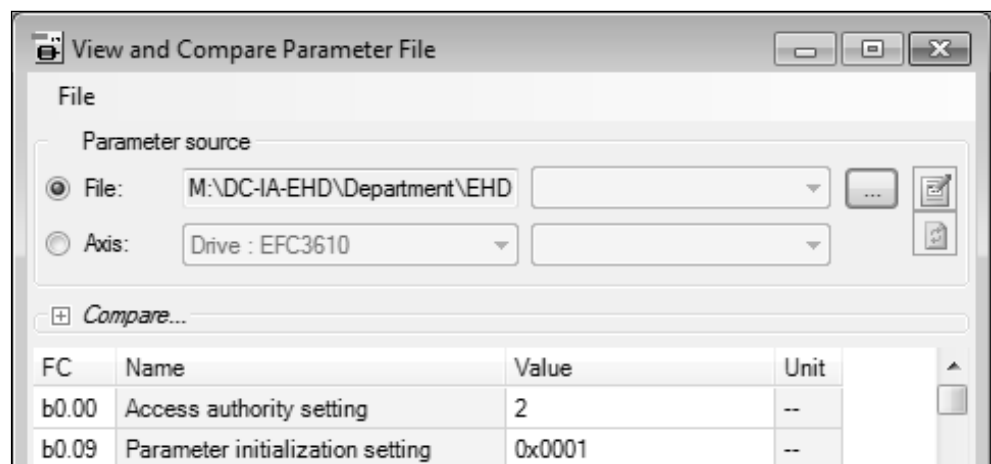
9.1.4 How to change parameter value using ConverterWorks software

In order to change the value of a parameter,

- Click *Parameterization* → *Edit parameter File*.
- Load a parameter file or choose Axis as parameter source (Parameters loaded from the connected circuit).
- Double click on the parameter value.
- Change the parameter value.
- Press enter to save the parameter value.
- Close the parameter box



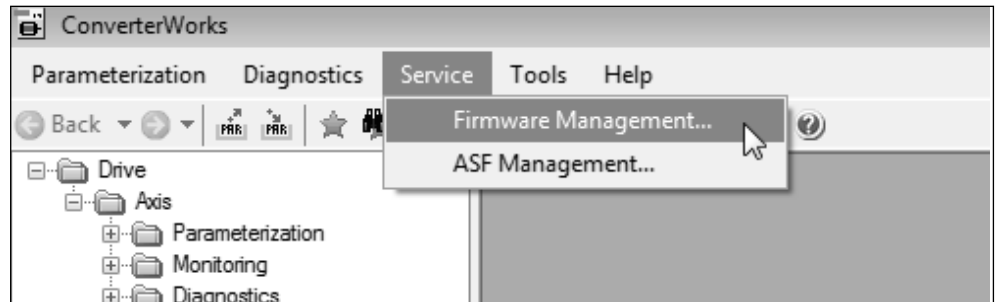
It is possible to compare two parameter files with the option *Compare*



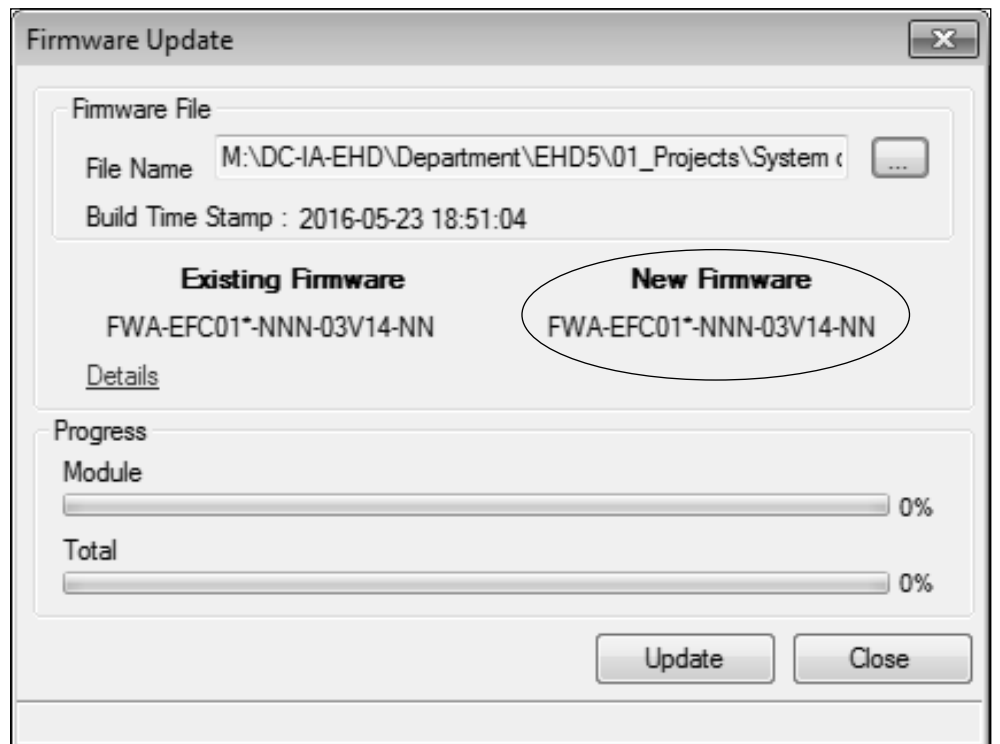
9.1.5 How to update Firmware

To perform Firmware update, the device must be online

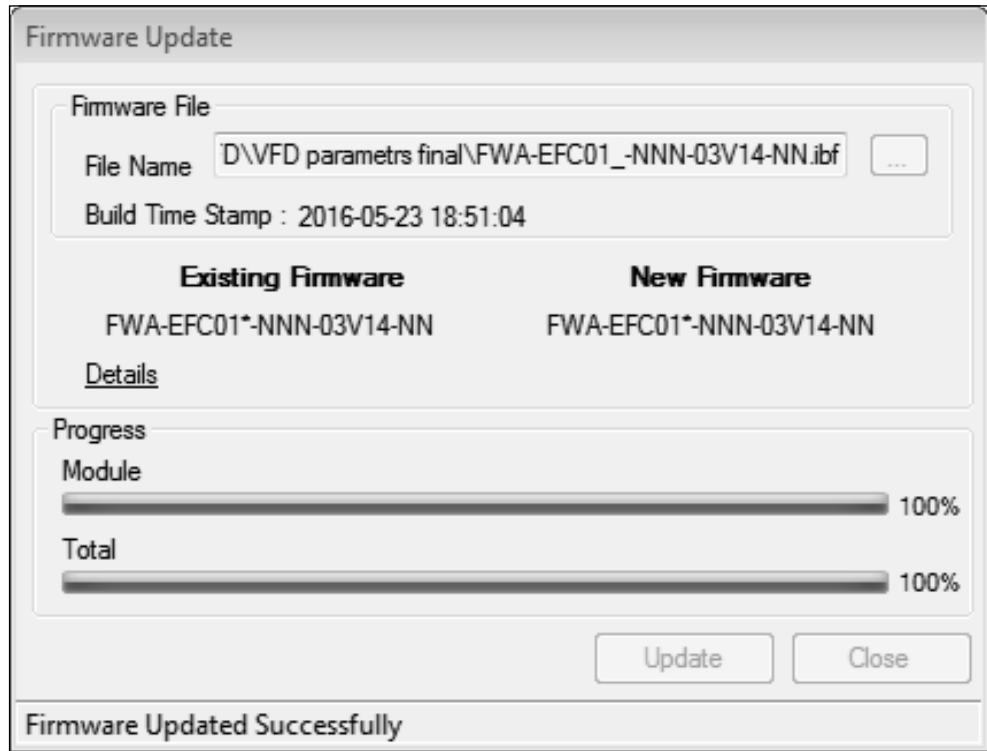
- From the *Service* menu, select *Firmware management*.



- In the new window the existing Firmware in the connected device is shown. (It is also possible to check the existing firmware version with parameter [d0.99]).
- Select a new Firmware file for update of the device.
- The existing Firmware on the device is stopped. After loading the new file, the internal name of the new firmware is shown at the right side of the window. Select *Update* to perform the update.



- If the parameter settings of the old version not are compatible with the new Firmware version – there will be a warning '*Firmware Update is not compatible since existing Firmware version is older than 03Vxx (new version). If updated all the parameters will be set to default values*'.
- Confirm with *Ok*. All configured parameters must be updated.



- The module loading message appears three times. The device will boot automatically, after the update has been finished. *'Firmware updated successfully'* is displayed and the update window can be closed.
- The device has to be rebooted after update.

9.2 Front panel based commissioning of VFD

The front panel consists of two areas, LED display and Control buttons. The display shows the operating modes and settings of the frequency converter. The buttons allow to manually program and control the converter.

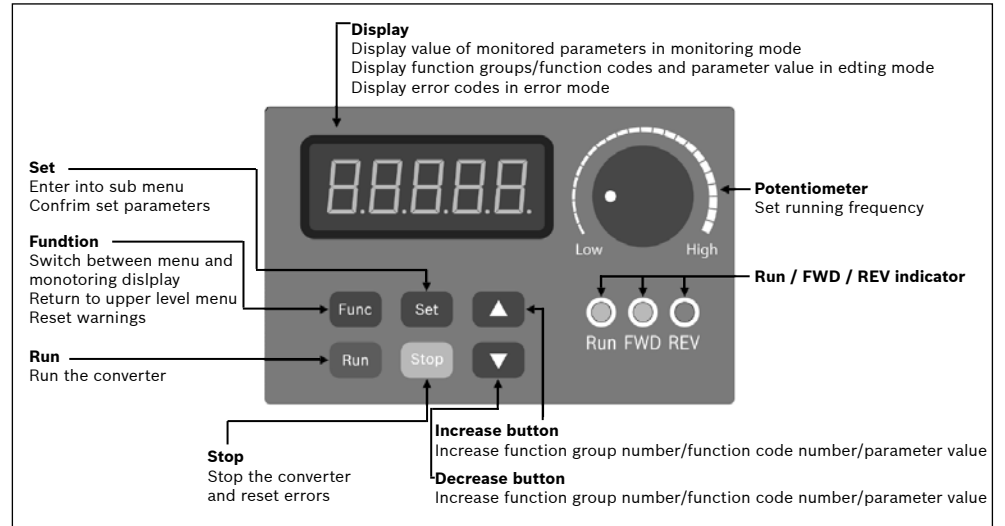


Fig. 23: LED front panel

Table 10: LED indicator status

Mode	Run	FWD	REV	Power
Power off	Off	Off	Off	Off
Ready	Off	Green/ Off	Off/ Green	Red
Run(FWD)	Green	Green	Off	Red
Run(REV)	Green	Off	Green	Red
Run pending				
DC braking at start	Blinks (Short green long dark)	Green/Off	Off/ Green	Red
Direction change dead time				
Deceleration stop phase	Blinks (Short dark long green)	Green/Off	Off/ Green	Red
DC braking at stop				
Warning with FWD	Green	Green	Off	Blinks in Red (Short dark long red)
Warning with REV	Green	Off	Green	Blinks in Red (Short dark long red)
Warning at stop	Off	Green/Off	Off/ Green	Blinks in Red (Short dark long red)
Error	Off	Green/Off	Off/ Green	Blinks in Red (Short red long dark)

9.2.1 Parameter access with Front panel

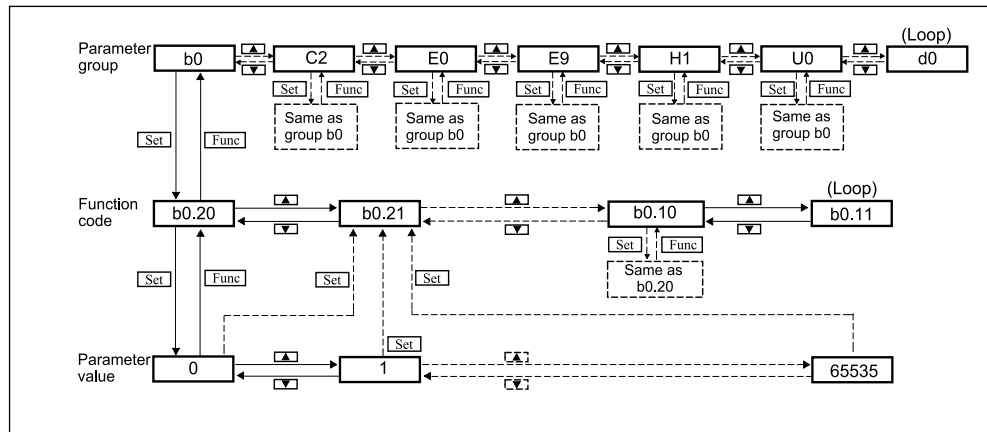


Fig. 24: Operating Mode

The parameters are arranged in parameter groups. A fast access to the parameter groups are possible with button combinations. Each parameter group consist of different Function codes (e.g. b0.20, b0.21) with a parameter value (assigned according to the application needs). Below steps will explain how to change a particular function code parameter value using front panel.

- Step 1: Pressing <Func> once, the display parameter will be displayed.
- Step 2: Pressing <Func> once again, the parameter groups (e.g: b0) will be displayed. Pressing <▲> or <▼> allow us to select different parameter groups like b0, C2, E0, E9, H1, U0 and d0 etc.
- Step 3: Pressing <Set> after Step 2, the function codes will be displayed. Pressing <▲> or <▼> allow us to choose different function codes (like b0.20, b0.21, b0.10 etc.)
- Step 4: To display the parameter value in a function code, press <Set> once. Change the necessary parameter value by pressing <▲> or <▼>. The new parameter value can be saved by pressing <Set>. It is possible to go back to previous step, by pressing <Func> button.

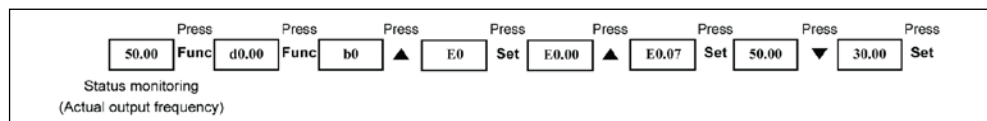


Fig. 25: Operating Example

9.2.2 Fast Access to Parameters Code (Function Codes) with Button Combinations

The front panel provides a fast access to parameters within a parameter group with the button combinations <Func> + <▲> or <Func> + <▼>. This function is only valid for the tens digit of the function code index '□□.x□'

The front panel provides a fast access to parameters within a parameter group with the button combinations <Func> + <▲> or <Func> + <▼>. This function is only valid for the tens digit of the function code index

- Pressing <Func> + <▲> once: '□□.x□' is changed to '□□.x+1□'
- Pressing <Func> + <▼> once: '□□.x□' is changed to '□□.x-1□'

Example: The frequency converter is now displaying 'E0.07' after setting with <Func>, <Set>, <▲> and <▼> buttons. If 'E0.17' needs to be displayed based on 'E0.07', <▲> button has to be pressed for 10 times. But, with button combination function, it is only necessary to press '<Func> + <▲>' buttons once

Note:

→ The parameter fast access function is only available when [b0.00] = 0, 1, or 2.

→ If the index of parameters is not continuous in a specific parameter group, the adjacent parameter will be accessed. For example, the display of 'E0.01' should be changed to 'E0.11' with '<Func> + <▲>' button function. However, parameter E0.11 is unavailable in group E. While the adjacent parameter is E0.15. In this case, 'E0.15' is accessed and displayed.

9.2.3 Digit Shifting Function for Modification of Parameter Values

The front panel provides the digit shifting function for modification of parameter values. To activate this function, press <Func> + <▲> or <Func> + <▼> once when the frequency converter is displaying a certain parameter value. After this action, the unit digit of the value blinks.

To select the digit for modification, press the following button combinations.

- Pressing <Func> + <▲> once: the blinking digit is shifted one digit leftwards.
- Pressing <Func> + <▼> once: the blinking digit is shifted one digit rightwards.
- Example: [E0.07] = 35.40. The frequency is now displaying '35.40'. If the value '35.40' needs to modify to 15.40, execute the following steps.
- Step 1: Pressing <Func> + <▲> or <Func> + <▼> once to activate the digit function. '35.40' is displayed with the unit digit '5' blinking.
- Step 2: Pressing <Func> + <▲> again to shift the blinking digit leftwards. '35.40' is displayed with tens digit '3' blinking.
- Step 3: Pressing <▼> twice to change the tens digit '3' to be '1'. '15.40' is displayed with tens digit '1' blinking.
- Step 4: Pressing <Set> to save the modified parameter value '15.40'. The display returns back to an upper menu level to show the next parameter with 'E0.08' displayed.

The digit shifting function is only available for parameters with values and unavailable for parameter with options.

9.3 Functions and Parameters

9.3.1 Functions and Parameters used in VFD for main pump electric motor

Parameter	Value	Name	Comment
C0:Power control parameters			
C0.01	0	Duty cycle	Normal duty
C1:Motor and system parameters			
C1.05	7,5	Motor rated power	
C1.06	400	Motor rated voltage	
C1.07	15	Motor rated current	
C1.08	50	Motor rated frequency	
C1.09	1460	Motor rated speed	
C1.10	0,82	Motor rated power factor	
C1.69	0	Motor thermal protection setting	Inactive. Since PTC in use
C1.75	20	Low speed derating frequency	$f=n/30$ n =speed (rpm), f =frequency (Hz) $n=600$ rpm
C2: V/F control parameters			
C2.07	100	Slip compensation factor	1-100% full slip compensation
E0: Set point and control parameters			
E0.00	0	First frequency setting source	0- Potentiometer
E0.02	3	Second frequency setting source	3-AI 2 analog input
E0.08	120	Maximum output frequency	Allowed maximum output frequency. $f=n/30$ $n=3600$ rpm (Max. speed of pump)
E0.09	100	Output frequency high limit	According to application. $f=n/30$ $n=3000$ rpm
E0.10	5	Output frequency low limit	According to application. $f=n/30$ $n=150$ rpm
E0.15	1	Low speed running mode	1- running with low frequency limit when output frequency lower than Output frequency low limit (E0.10)
E0.17	1	Direction control	1: Forward only
E0.26	6	Acceleration time	Ramp rise time
E0.27	6	Deceleration time	Ramp fall time

Parameter	Value	Name	Comment
E1: Input terminal parameters			
E1.00	30	X1 input(Digital)	30: Second frequency setting source activation (potentiometer → analog in)
E1.01	33	X2 input (Digital)	Fault signal N.C contact input • Max oil temperature error or • Min oil level error or • High main motor temperature
E1.02	35	X3 input (Digital)	Forward runniing
E1.03	41	X4 input (Digital)	PID deactivation
E1.04	31	X5 input (Digital)	Second run command source activation
E1.35	1	AI 1 input	1: 4-20 mA setting range Actual Speed or pressure for feedback
E1.40	1	AI 2 input	1: 4-20 mA setting range Set speed in remote mode
E1.61	2	Broken wire protection	2: Broken wire detection for analog inputs
E1.73	100	Input curve 1 maximum frequency	Setting range is 0...E0.09 Hz
E2: Output terminal parameters			
E2.01	1	DO1 output setting	Indication of converter running(Start signal for cooler drive)
E4: PID control parameters			
E4.00	4	PID reference channel	AI 2 analog input
E4.01	0	PID feedback channel	AI 1 input
U1:Panel parameters			
U1.00	1	Run monitoring display	Actual speed
U1.10	3	Stop monitoring display	Setting speed

9.3.2 Functions and Parameters used in VFD for cooler fan electric motor

Parameter	Value	Name	Comment
C1: Motor and system parameters			
C1.05	0,4	Motor rated power	
C1.06	400	Motor rated voltage	
C1.07	1,9	Motor rated current	
C1.08	50	Motor rated frequency	
C1.09	1380	Motor rated speed	
C1.10	0,73	Motor rated power factor	
C2: V/F control parameters			
C2.00	1	V/f curve mode	1: Square (Due to variable torque load of fan)
C2.07	100	Slip compensation factor	1-100% full slip compensation
E0: Set point and control parameters			
E0.00	2	First frequency setting source	2:Set AI 1 analog input as first frequency setting source(E1.35)
E0.01	1	First run command source	Multifunction digital input
E0.08	60	Maximum output frequency	Allowed maximum output frequency of the frequency converter.
E0.09	54,67	Output frequency high limit	According to application. $f=n/30 \rightarrow n=\text{speed in rpm, } n=1640 \text{ rpm}$
E0.26	1,0	Acceleration time	Ramp rise time
E0.27	1,0	Deceleration time	Ramp fall time
E0.50	1	Stop mode	1: Freewheeling stop
E1: Input terminal parameters			
E1.00	35	X1 input	35:Forward running (Start signal from pump drive)
E1.35	1	AI 1 input mode	1: 4-20 mA (Frequency setting signal from temperature sensor)
E1.61	2	Broken wire protection	2:Error
E1.73	54,67	Input curve 1 maximum frequency	Setting range is 0...E0.09 Hz
U1: Panel parameters			
U1.00	1	Run monitoring display	Actual speed
U1.10	3	Stop monitoring display	Setting speed

Terminology and abbreviation used in parameter list is given below.

- Code: Function / parameter code, written in bx.xx, Cx.xx, Ex.xx, Hx.xx, Ux.xx, dx.xx format.
- Name: Parameter name
- Default: Factory default
- Min.: Minimum setting step
- Attri: Parameter attribute
- – Run: Parameter setting can be modified when the converter is in run or stop status.
 - Stop: Parameter setting can only be modified when the converter is in stop status.
 - Read: Parameter setting is read-only and cannot be modified.
- DOM: Depends on model
- [bx.xx], [Cx.xx], [Ex.xx], [Hx.xx], [Ux.xx], [dx.xx]: Function / parameter values
- Value: The value we chosen for the frequency controller

9.3.3 System Parameters

9.3.3.1 b0: Basic system parameters

This function is used to set parameters or read parameter settings fast. Five access modes are available with parameter b0.00.

Code	Name	Setting range	Min.	Attri.
b0.00	Access authority setting	0.....4	-	Run

- 0: Basic parameters
ONLY parameters in group b0, d0, C0, E0, U0, U1 are visible.
- 1: Standard parameters
Parameters in group C1, C2, C3, E5, E8 are ADDITIONALLY visible.
- 2: Advanced parameters
Parameters in group E1, E2, E3, E4, E9, H0, H1, H8, and H9 are ADDITIONALLY visible.
- 3: Start-up parameters
Parameters in group b0, d0 and Monitoring Parameters are always visible.
- 4: Modified parameters
This option provides the possibility for users to view or modify the parameter settings which have been modified and different than default settings.

9.3.4 Group C: Power Parameters

The Group C: Power Parameters is divided in:

C0: Power Control parameters

C1: Motor and system parameters

C2: V/F control parameters

C3: Vector control parameters.

9.3.4.1 C0: Power Control parameters

Code	Name	Setting range	Default	Min	Attri.
C0.01	Normal/ Heavy Duty setting	0: Normal Duty 1: Heavy Duty	1	-	Stop

This function is used for switching the duty mode of a frequency converter according to the load type of the actual application.

- 0: ND (Normal duty)

Code	Name	Setting range	Default	Min.	Attri.
C1.75	Low speed derating frequency	0.10...300,00	25.00	0.01	Run

Change the duty mode to 'Normal duty' by modifying the parameter setting from '1' to '0' according to the actual application.

- 1: HD (Heavy duty). This mode is set by default.

9.3.4.2 C1: Motor and system parameters.

Nameplate parameters configuration

Most of the motor data are available on the motor nameplate, based on which the following parameters of the frequency converter need to be set accordingly.

Code	Name	Setting range	Default	Min.	Attri.
C1.05	Motor rated power	0.1...1,000.0 kW	DOM	0.1	Stop
C1.06	Motor rated voltage	0...480 V	DOM	1	Stop
C1.07	Motor rated current	0.01...655.00 A	DOM	0.01	Stop
C1.08	Motor rated frequency	5.00...400.00 Hz	50.00	0.01	Stop
C1.09	Motor rated speed	1...30,000	DOM	1	Stop
C1.10	Motor rated power factor	0.00...0.99	0.00	0.00	Stop

Motor thermal protection without temperature sensor

This function is to realize the motor thermal protection based on the thermal model of motor. Since PTC is in use, Motor thermal protection without temperature sensor is inactive ([C1.69]=0).

Motor derating frequency at low speed

This function is used to reduce the overload and thermal risks as motors have low cooling performance at low speed, compared to at rated speed.

- Low speed derating frequency

Code	Name	Setting range	Default	Min.	Attri.
C1.69	Motor thermal protection setting	0: Inactive 1: Active	1	-	Stop

When the output frequency is higher than [C1.75] 'Low speed derating frequency', the allowed continuous current is [C1.07] 'Motor rated current'.

- When the output frequency is lower than [C1.75], the allowed continuous current is reduced to [C1.76] ('C1.76'=Zero speed load).

9.3.4.3 C2: V/F control parameters

V/f control is a control strategy where the ratio between Voltage (V) and frequency (f) is maintained constant to keep the maximum torque output of the motor constant while controlling the speed as per our requirement.

V/f curve selection

Code	Name	Setting range	Default	Min	Attri.
C2.00	V/f curve mode	0: Linear 1: Square 2: User-defined	0	-	Stop

- 0: Linear
- This mode refers to linear voltage / frequency control, which is used for normal Constant torque loads. The default mode is Linear. The frequency converter for controlling the main pump electric motor used this control mode.
- 1: Square
- This mode refers to square voltage / frequency control, which is used for variable torque loads of fans, pumps, etc. The frequency converter for controlling the cooler fan of electric motor used this control mode.

Slip compensation factor configuration

Slip is defined as the relative difference between synchronous speed (speed of the rotating magnetic field) and rated speed (rotor speed).

Slip compensation factor is used to compensate Motor rated slip frequency (C1.12, default set automatically according to basic motor parameters) to the actual applications in V/f control.

Code	Name	Setting range	Default	Min	Attri.
C2.07	Slip compensation factor	0...200 %	0	1	Run

- 0 %: No slip compensation
- The slip compensation function is deactivated.
- 1...100 %: Full slip compensation
- Example: [C1.12] = 2.50 Hz, [C2.07] = 100 %
- The actual slip compensation is 2.50 Hz x 100 % = 2.50 Hz.
- 101...200 %: Over slip compensation
- Example: [C1.12] = 2.50 Hz, [C2.07] = 200 %
- The actual slip compensation is 2.50 Hz x 200 % = 5.00 Hz.

9.3.5 Group E: Function Control Parameters

9.3.5.1 1 E0: Set point and control parameters

Select the Frequency Setting Source

Different frequency setting sources can be selected by setting parameter E0.00 'First frequency setting source' or E0.02 'Second frequency setting source'.

Code	Name	Setting range	Default	Min	Attri.
E0.00	First frequency setting source	0...99	0	-	Stop
E0.02	Second frequency setting source	0...99	2	-	Stop

- 0: Panel potentiometer
The speed frequency is set by the potentiometer on the operating panel.
- 1: Panel button setting
- The setting frequency is set by parameter E0.07 'Digital setting frequency'.
Pressing <▼> and <▲> buttons on the operating panel will decrease and increase the output frequency respectively when the frequency converter is running.
- 2: AI1 analog input
The setting frequency is set by AI1 input.
- 3: AI2 analog input
The setting frequency is set by AI2 input.
- 11: Digital input Up / Down command
The setting frequency is set by command of Up / Down / Reset via digital inputs.
- 20: Communication
The setting frequency is set by engineering software, PLC or other external device via Modbus protocol.
- 21: Multi-speed settings
The setting frequency is set by multi-speed settings.
- 99: Inactive
The frequency converter for controlling the main pump electric motor uses potentiometer as first frequency setting source and AI2 input (PID control reference) as second frequency setting source. The frequency converter for controlling the cooler uses AI1 analog input (Frequency setting signal from temperature sensor) as first frequency setting source.

First run command source configuration

Code	Name	Setting range	Default	Min	Attri.
E0.01	First run command source	0...2	0	-	Stop

- 0: Operating panel
Control the frequency converter for run and stop with <Run>, <Stop> buttons on the operating panel.
Control the running direction by setting parameters U0.00 'Direction control by panel' and E0.17 'Direction control'.
- 1: Multi-function digital input
Control the frequency converter for run, stop and running direction by setting digital inputs.
- 2: Communication
Control the frequency converter for run, stop and running direction with Modbus communication protocol.

Since the frequency converter for controlling the cooler's run, stop and running direction is controlled by the signals from the pump drive, the First run command source (E0.01=1) is set as Multifunction digital input.

Direct output frequency limitation

Code	Name	Setting range	Default	Min	Attri.
E0.08	Maximum output frequency	50.00...400.00 Hz	50.00	0.01	Stop
E0.09	Output frequency high limit	[E0.10]...[E0.08] Hz	50.00	0.01	Run
E0.10	Output frequency low limit	0.00...[E0.09] Hz	0.00	0.01	Run

- Maximum output frequency
- The allowed maximum output frequency of the frequency converter.
- Output frequency high limit
The allowed maximum output frequency according to the requirements in actual applications.
- Output frequency low limit
the allowed minimum output frequency according to the requirements in actual applications.

The frequency is calculated as $f=n/30$

n: The speed of motor in rpm

f: frequency in Hz

Behavior at low speed running

Code	Name	Setting range	Default	Min	Attri.
E0.15	Low speed running setting	0: Running at 0.00 Hz 1: running with low limit frequency	0	-	Stop

For main pump electric motor the running frequency cannot be too low and hence the frequency converter runs at 'Output frequency low limit' when the output frequency is lower than [E0.10].

Direction Control

Code	Name	Setting range	Default	Min	Attri.
E0.17	Direction control	0...3	0	-	Stop

The actual direction is controlled by the configuration of parameter [E0.17] 'Direction control'.

- 0: Forward / Reverse
- 1: Forward only
- 2: Reverse only
- 3: Swap default direction

Acceleration/ Deceleration time configuration

Code	Name	Setting range	Default	Min	Attri.
E0.26	Acceleration time	0.1...6,000.0 s	0.1	DOM	Run
E0.27	Deceleration time	0.1...6,000.0 s	0.1	DOM	Run

Acceleration / deceleration time setting is the time for frequency increase from 0.00 Hz to [E0.08] 'Maximum output frequency' / the time for frequency decrease from [E0.08] to 0.00 Hz respectively.

Stop mode setting

Code	Name	Setting range	Default	Min	Attri.
E0.50	Stop mode	0...2	0	-	Stop

0: Decelerating stop

The motor decelerates to stop according to the defined deceleration time.

1: Freewheeling stop

Once the stopping command is activated, the converter stops output and the motor mechanically freewheels to stop.

2: Freewheeling with stop command, decelerating with direction change

- When stopping command is active, the motor freewheels to stop as [E0.50] = 1.
- When direction command is changed during running, the motor decelerates to stop according to the defined deceleration time as [E0.50] = 0.

9.3.5.2 E1: Input terminal parameter

E1: Input terminal parameter

5 multi-function digital inputs (X1, X2, X3, X4 and X5) are available. Frequency controller for pump drive used the digital inputs X1(E1.00=30), X2(E1.01=33), X3 (E1.02=31), X4 (E1.03=41) and Frequency controller for cooler used X1(E1.00=35) digital input.

Code	Name	Setting range	Default	Min	Attri.
E1.00	X1 Input	0...46	35	-	Stop
E1.01	X2 Input		36	-	Stop
E1.02	X3 Input		0	-	Stop
E1.03	X4 Input		0	-	Stop
E1.04	X5 Input		0	-	Stop

- 0: Inactive
- 30: Second frequency setting source activation
 - : For the frequency converter for main pump electric motor, the second frequency setting source is set to AI2 analog input by setting parameter E0.02.
 - : When X1 input is active, the actual setting frequency is set by the second frequency setting source (AI2 analog input).
- 31: Second run command source activation.
 - : Used for switching to the second run command source. X5 enables remote drive start.
- 33: Error signal N.C. contact input.
 - If the defined input is open, the external error signal is active and the system stopped.
 - If the defined input is high, there is no external error and the system can run.

This setting is used as fault signal N.C contact input for Max oil temperature, Min oil level and Max main electric motor temperature.

- 35: Forward running (FWD)
 - : For the main pump drive, X3 starts the forward running
 - : For the cooler drive, the signal from the main pump drive to X1 starts the cooler.
- 36: Reverse running (REV)
- 41: PID deactivation via X4.

Analog Input Configuration

Code	Name	Setting range	Default	Min	Attri.
E1.35	AI1 input mode	0: 0...20 mA 1: 4...20 mA 2: 0...10 V 3: 0...5 V	2	-	Run
E1.40	AI2 input mode	4: 2...10 V	1	-	Run

This function will detect if the cable to an Analog input is disconnected or broken for AI1 or AI2

- 1: Warning

If a broken wire is detected, the frequency converter will continue running with warning (Warning code: Aib-).

- 2: Error

If a broken wire is detected, the frequency converter will stop with error indication (Error code: AibE).

Analog input curve maximum frequency

Code	Name	Setting range	Default	Min	Attri.
E1.73	Input curve 1 maximum frequency	0.00... [E0.09] Hz	50.00	0.01	Run

Scaling of analog input. Adjustable in the range 0.00... [E0.09] Hz.

9.3.5.3 E2: Output terminal parameters

Digital Output Configuration

Code	Name	Setting range	Default	Min	Attri.
E2.01	DO1 output setting	0...99	0	-	Stop

- 1: Converter running

The output is active when the frequency converter is running and has frequency output including 0.00 Hz. Used as start signal for cooler drive from the main pump drive

9.3.5.4 E4: PID control parameters (Optional)

In PID control, a negative feedback system is formed with proportional, integral and derivative operations based on the differences between reference values and their feedback.

Take the following steps to configure the PID reference:

Step1: Select the PID reference channel

Code	Name	Setting range	Default	Min	Attri.
E4.00	PID reference channel	0...9	0	-	Stop

- [E4.00] = 0: Inactive
The PID control function is inactive.
- [E4.00] = 1: Panel potentiometer
The reference value is set by adjusting the potentiometer on the operating panel.
- [E4.00] = 2: Panel button
The reference value is set by E0.07 'Digital setting frequency', which can be decreased or increased by pressing the <▼> or <▲> buttons on the operating panel respectively when the frequency converter is running.
- [E4.00] = 3: AI1 analog input
The reference value is set by AI1 analog input.
- [E4.00] = 4: AI2 analog input
The reference value is set by AI2 analog input.
- [E4.00] = 5: X5 pulse input
The reference value is set by pulse signal via X5 input.
- [E4.00] = 7: Communication
The reference value is set by engineering software, PLC or other external devices via Modbus or other communication.
- [E4.00] = 8: Analog reference E4.03
The reference value is set by parameter E4.03.
- [E4.00] = 9: Speed reference E4.04
The reference value is set by parameter E4.04.

Frequency converter for pump drive uses AI 2 analog input (E4.00=4) as the PID reference channel.

Step 2: Select the PID feedback channel

Code	Name	Setting range	Default	Min	Attri.
E4.01	PID feedback channel	0...99	0	-	Stop

- 0: AI1 analog input
Feedback value is set by AI1 analog input.
- 1: AI2 analog input
Feedback value is set by AI2 analog input.
- 2: X5 pulse input
Feedback value is set by X5 pulse input.
- 3: EAI analog input
Feedback value is set by EAI analog input.
- 99: Inactive

Frequency converter for pump drive uses AI 1 analog input (E4.01=0) as the PID feedback channel.

9.3.6 U1: Panel parameters

Code	Name	Setting range	Default	Min	Attri.
U1.00	Run monitoring display	0...99	0	-	Run
U1.10	Stop monitoring display		2	-	Run

- 0: Output frequency
- 1: Actual speed
- 2: Setting frequency
- 3: Setting speed
- 4: User-defined setting speed
- 5: User-defined actual speed
- 10: Output voltage
- 11: Output current
- 12: Output power
- 13: DC-bus voltage
- 16: Output torque
- 17: Setting torque
- 20: Power module temperature
- 21: Actual carrier frequency
- 23: Power stage running time
- 30: AI1 input
- 31: AI2 input
- 33: I/O card EAI input
- 35: AO1 output
- 37: I/O card EAO output
- 40: Digital input 1
- 43: I/O card digital input
- 45: DO1 output
- 47: I/O card EDO output

50: Pulse input frequency
 55: Pulse output frequency
 60: Relay output
 62: I/O card relay output
 63: Relay card output
 70: PID reference engineering value
 71: PID feedback engineering value
 80: ASF Display00
 81: ASF Display01
 98: High resolution output current
 99: Firmware version

9.3.7 Warning code

The warning codes displayed on the front panel of the Frequency controller is listed below.

Code	Description
P.oFF	Displayed only at power down/drop in stop state
S.Err	Parameter change blocked
C-dr	Communication disconnection
PrSE	Parameter setting contradiction
noCP	No modified parameter
AibE	Analog input broken wire protection

❖ C-dr

If the interval between the current and next communication commands exceeds the time defined in 'Communication error detection time' [E8.01], the frequency converter will reports a communication error code(C-dr) and act as defined in [E8.02] 'Communication error protection mode'

❖ AibE

This function can detect the input missing possibly due to the Analog input cable disconnection. Solution is to check wiring of AI1, AI2 and EAI

Once the broken wire is detected, the frequency converter can stop with error indication (Error code: AibE).

10 Maintenance and repair

10.1 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.

10.2 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 optimise the maintenance intervals economically a Life Cycle Cost (LCC) analysis is recommended.

Follow the *2: Safety instructions* during the checks.

The panels covering the drive unit can be dismantled to simplify the access to the components inside the unit.

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

Pre-start checks (even daily)

- Fluid leaks
- Fluid level in the tank
- Contamination indicator on the filters

Frequent checks

- Unusual vibrations or noises
- Fluid leaks
- Fluid level in the tank
- The unit is clean
- The air flow paths not are blocked
- Pressure levels normal - stable
- Operating temperature
- The drive is running smoothly
- Contamination indicators on the filters
- Check and clean the oil pan

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.

NOTICE**High pressure washing**

Damage on equipment

- ▶ 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.
- Check the air filter in the control unit

CAUTION**Rotating parts!**

Risk of injury.

- ▶ Do not touch rotating parts.

- Check that the panels of the drive unit not are damaged

Table 11: Maintenance chart

Absolute max. intervals for major inspection and replacement	Filter control cabinet	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
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.

10.3 Filter change

WARNING

High temperature oil

Risk of injury

- ▶ Do not open the filter with system running

Filter

1. Screw off the filter bowl.
2. Remove the filter element from the spigot by rotating it slightly.
3. Clean the filter components, if necessary.
4. Check the seals at the filter bowl for damage and renew them, if necessary. For suitable seal kits refer to chapter "Spare parts".
5. Install the new filter element on the spigot again by slightly rotating it.
6. The filter is to be assembled in reverse order.
7. The torque 50-60 Nm is to be observed.
8. Commission the system.



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.

10.4 Inspection of hydraulic fluid

CAUTION

Hot hydraulic fluid.

Risk of injury

- ▶ Use personal safety equipment

NOTICE

Danger associated to Hydraulic fluid.

Risk of environmental damage

- ▶ Store up used hydraulic fluid and contaminated filter elements for destruction.



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.

A common method is to take samples in a special bottle and send 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. If inline measurement has to be done, please contact your Bosch Rexroth representative for advice.

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.

Use a measuring coupling (can be of minimess type) to achieve the oil for the sample. When the sample is taken use a dedicated hose with correct suitable coupling that fits the measuring 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 sensible 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 beam.

Let minimum 2 litres (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 $\frac{3}{4}$ of the bottle shall be filled because the laboratory has to shake the sample to get a mixed fluid when they analyse it. Minimum 200 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.

Air filter breather change

1. Clean the area around the air filter breather. See *Fig. 2: Main components DOB*
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.

10.5 Electric motor

10.5.1 Electric motor

The main voltage and connection are marked on the electric motor marking plate, see *Fig. 26: Example Hoyer marking plate*

The electric motor is used with D-connection.

Electric motor must be properly grounded.

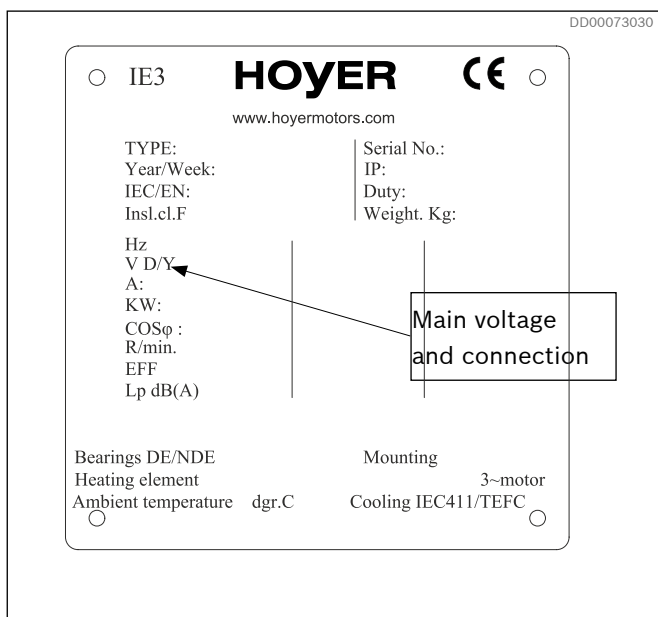


Fig. 26: Example Hoyer marking plate

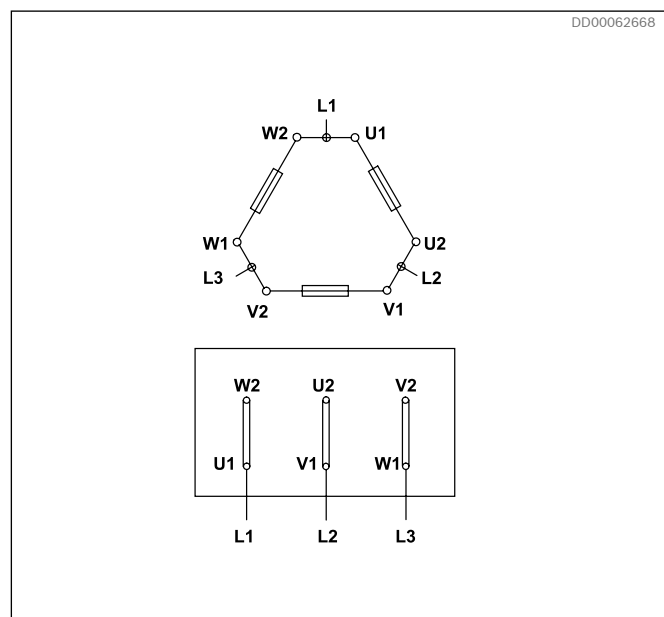


Fig. 27: D connections

10.5.2 Draining

The condensate drain holes must be opened at regular intervals, depending on climate 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 sealed again

10.5.3 Rotation direction

The motor must rotate clockwise viewed from fan side.

NOTICE

Wrong rotation direction of replaced electric motor

Damage to the pump and system functionality

- ▶ Check the rotation direction of the new electric motor. Correct direction is clockwise viewed from fan side of the motor. (See Fig. 28)

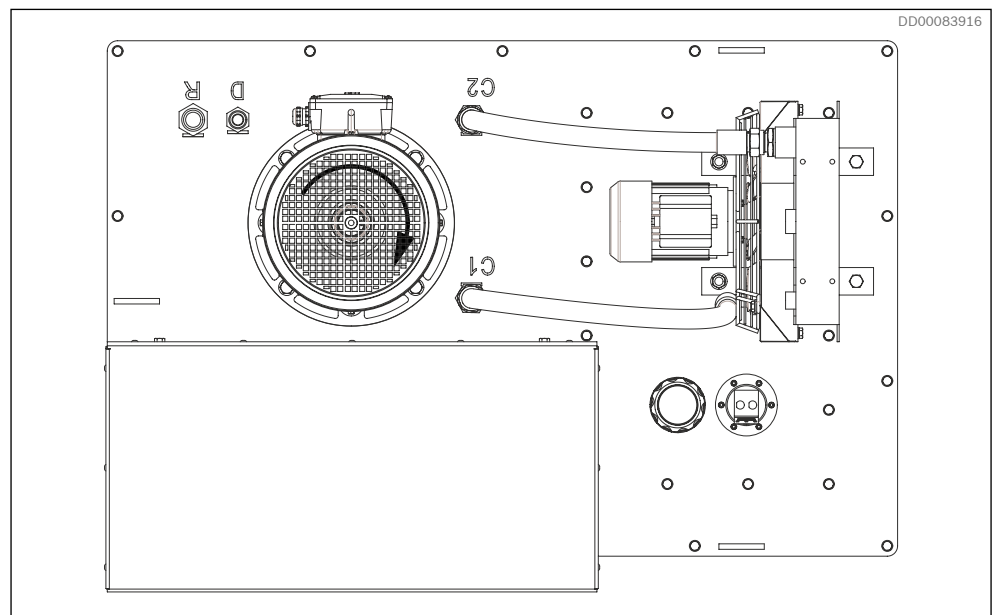


Fig. 28: Electric motor rotation direction

10.6 Cooler

10.6.1 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.
- Make sure that the cooler has cooled down.

NOTICE

Improper handling

Environmental risk

- ▶ Follow the safety precautions on the container of the cleaning agent used
- ▶ Cleaning agent and waste water from rinsing should not be desposed 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.
- The oil side of the cooling element is cleaned by flushing with a degreasing agent. Aterwards flush with the fluid/medium which is used later

10.7 Drive unit out of service

Periods out of service

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 aggresive environment.

Execution:

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 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.

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*.

10.8 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 10.9: Spare parts*

10.9 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.

11 Removal and replacement

11.1 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*

12 Disposal

WARNING

Danger when dismantling, components may contain accumulated energy

Risk of injury

- ▶ Check that the drive unit is completely disconnected.
- ▶ Take the fire hazard into consideration during dismantling.

12.1 Environmental protection

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

Observe the following points when disposing of the Hägglunds DOb:

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 DOb 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 15327 Hägglunds DOb .

13 Extension and conversion

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

14 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	<ol style="list-style-type: none"> 1. Coupling wrongly aligned 2. Coupling loose 3. Coupling defective 4. Loose mounting on pump or motor 5. Other transmission elements loose. 6. Pump or motor defective 7. Direction of rotation wrong 8. Noise dampening not incorporated in design (rubber-metal mountings) 	Suction line resistance excessive because:- <ol style="list-style-type: none"> 1. Suction line blocked or leaking 2. Fluid level too low 	<ol style="list-style-type: none"> 1. Pump is running too fast 2. Maximum pump pressure exceeded 3. Shaft seals, or seals on suction side are defective 4. Pump defective 5. Pressure and return lines connected wrongly 6. Control system oscillating 7. Noise dampening not incorporated in design 	<ol style="list-style-type: none"> 1. Line mounts missing or loose 2. Poor installation 3. Pipe bore too small 4. Installation not bled completely 	<ol style="list-style-type: none"> 1. Line mounts missing or loose. 2. Poor installation 3. Pipe bore too small 4. Installation not bled 5. Filter blocked
Insufficient power and torque at the hydraulic motor (pressure too low)	<ol style="list-style-type: none"> 1. Power transmission defective 2. V-belt or Toothed belt slipping 3. Motor defective 4. Key sheared at pump or motor 5. Incorrect parameter values regarding electric motor in the VFD 		<ol style="list-style-type: none"> 1. Internal leakages due to wear 2. Unsuitable type 3. Pump defective 4. Safety block pressure set too low, or control element defective 	<ol style="list-style-type: none"> 1. Leakages 2. Excessive line resistance 3. Pressure filter blocked 	<ol style="list-style-type: none"> 1. Excessive line resistance 2. Filter blocked
Jerky motor movements. (variations in pressure and/or flow)	<ol style="list-style-type: none"> 1. Coupling wrongly aligned 2. Coupling loose. 3. Coupling defective 4. Loose mounting on pump and/or motor 5. Other transmission elements loose 6. Pump or motor defective 	Suction line resistance excessive because:- <ol style="list-style-type: none"> 1. Suction line blocked or leaking 2. Fluid level too low 	<ol style="list-style-type: none"> 1. Incorrect parameter values in the VFD 2. Pump defective 3. The regulator doesn't work as intended. 	<ol style="list-style-type: none"> 1. Installation not bled completely 	<ol style="list-style-type: none"> 1. Excessive line resistance 2. Filter blocked.
Foaming of the hydraulic fluid		<ol style="list-style-type: none"> 1. Suction line leaks 2. Fluid level too low. 	<ol style="list-style-type: none"> 1. Shaft seals on the suction side are defective. 		

Causes Of Trouble And Its Effect In The Hydraulic Installation					
Pressure Valves	Flow Control Valves	Directional Control Valves	Fluid	Output Drive (motor)	Others
<p>1.Valve chatter due to dirt on valve seal 2.Insufficient damping (unsuitable flow) 3.Flow noises when operating 4.Unsuitable characteristic curve 5.Wrong design</p>	<p>1.The valve oscillates and excites other control elements into oscillation 2.Flow noises 3.Control system oscillating</p>	<p>1.Valve chatters due to defective solenoid or the voltage is too low 2.Valve defective due to dirt or wear 3.Flow through valve is excessive 4.Pilot pressure variations 5.On valves with adjustable damping the adjustment has not been performed 6.Check the electrical controls</p>	<p>1.Cavitation problems due to low fluid level or viscosity too high. (fluid temperature is too low) 2.Fluid is contaminated and dirty leading to damage and blockage of equipment 3.Fluid foams</p>	<p>1.Wear of running surfaces 2.Control system oscillating</p>	
<p>1.Operating pressure set too low 2.Internal leakage due to wear 3.Dirty or damaged valve seat 4.Broken spring 5.Unsuitable type. (setting too low)</p>	<p>1.Pressure losses excessive 2.False setting 3.Valve defective 4.Unsuitable type</p>	<p>1.Wrong switched position (eg pressureless) 2.Solenoid defective 3.Internal leakage due to wear 4.Excessive fluid velocity 5.Spool jams</p>	<p>1.Viscosity too low, causing excessive leakage. 2.Viscosity too high causing excessive flow resistance 3.Fluid foams.</p>	<p>1.Internal Leakage 2.Wear or running surfaces 3.Excessive internal friction causing low efficiency</p>	<p>1.In the case of pressure controls there is a defect in the open (or closed) loop control circuit 2.Display instruments are defective</p>
<p>1.Valve chatter due to dirt on valve seat or valve worn 2.Insufficient damping (unsuitable type) 3.Excessive length of undamped remote control line 4.Unsuitable remote-control valve</p>	<p>1.Valve dirty 2.Pressure losses excessive</p>	<p>1.Valve chatters due to defective solenoid or the voltage is too low 2.Valve defective due to dirt or wear 3.Flow through valve is excessive 4.Pilot pressure variations 5. Adjustable damping on valves, has not been set 6.Check the electrical controls.</p>	<p>1.Hydraulic fluid dirty 2.Hydraulic fluid foams.</p>	<p>1.Stick-slip effect due to friction 2.Operation below minimum recommended motor speed.</p>	<p>1.Insufficient load counter-balance (eg lowering control valve)</p>
			<p>1. Unsuitable fluid for the duty.</p>		

Causes Of Trouble And Its Effect In The Hydraulic Installation					
Source of trouble, effects	Mechanical Drive	Suction Line	Pump	Pressure Line	Return Line
Power Take-off either does not turn at all or too slowly. (no delivery flow or insufficient delivery flow)	1. Coupling wrongly aligned. 2. Coupling loose. 3. Coupling defective. 4. Loose mounting on pump and/or motor. 5. Other transmission elements loose. 6. Pump or motor defective. 7. Direction of rotation wrong.	Suction line resistance excessive because:- 1. Suction line blocked or leaking 2. Fluid level too low	1. Internal leakage due to wear. 2. Pump defective 3. Safety block pressure set too low or control element defective	1. Leakages. 2. Excessive line resistance. 3. Pressure filter blocked.	1. Excessive line resistance. 2. Filter blocked.
Excessive operating temperature			1. Reduction in efficiency due to wear. 2. Rotational speed and/or delivery excessive.	1. Pipe bore is too small, causing high frictional resistances. 2. Pressure filter blocked.	1. Pipe bore is too small, causing High frictional resistances. 2. Filter blocked.
Line shocks when switching takes place.				1. Line mounts are missing or loose. 2. Poor installation. 3. Pipe bore too small. 4. Installation not bled. 5. Oil volume in lines is excessive	Lines loose.

Causes Of Trouble And Its Effect In The Hydraulic Installation					
Pressure Valves	Flow Control Valves	Directional Control Valves	Fluid	Output Drive (motor, cylinder)	Others
<ol style="list-style-type: none"> 1. Operating pressure set too low. 2. Internal Leakage due to wear. 3. Dirty or damaged valve seat. 4. Broken spring. 5. Unsuitable type (setting range too low) 	<ol style="list-style-type: none"> 1. Flow rate set too low. 2. Unsuitable valve type (operatingrange too low). 3. Valve blocked due to dirt. 	<ol style="list-style-type: none"> 1. Wrong switched position . 2. Solenoid defective. 3. Internal leakage due to wear. 4. Excessive fluid velocity. 5. Spool jams or sticks. 6. Manually operated valves are not open. 	<ol style="list-style-type: none"> 1. Viscosity too low, causing excessive leakage. 2. Viscosity too high, causing excessive flow. 3. Fluid foams. 	<ol style="list-style-type: none"> 1. Internal leakage. 2. Wear of running surfaces. 3. Excessive internal friction, causing low efficiency. 4. Seizure in Hydraulic motor. 	<ol style="list-style-type: none"> 1. Conditions for starting not fulfilled. 2. Electrical lines opencircuit 3. Signalling elements, such as pressure or limit switches, are defective, wrongly set, or not connected.
<ol style="list-style-type: none"> 1. Constant delivery flow is too high. 2. Undersized valve. 3. Pressure setting too high. 4. Response time too long. 	<ol style="list-style-type: none"> 1. Flow rate set too low (excessive pump delivery through pressure-reliefvalve). 2. Valve defective. 	<ol style="list-style-type: none"> 1. Leakage losses too high. 2. Pressureless circulation, if used, fails to switch on. 3. Spool sticking. 	<ol style="list-style-type: none"> 1. Viscosity too low, causing excessive leakage. 2. Viscosity too high, causing excessive flow resistance. 3. Fluid foams. 	<ol style="list-style-type: none"> 1. Losses in efficiency due to wear. 2. Internal friction too high (poor level of efficiency). 3. Internal leakage losses. 	<ol style="list-style-type: none"> 1. Cooling performance inadequate. 2. Insufficient Hydraulic fluid. 3. Cooling set point set too high. 4. Fan not switched on. 5. Ambient temperature too high. 6. Deposits in radiator.
<ol style="list-style-type: none"> 1. Valve switches too quickly. 2. Restrictors or orifices are damaged or missing. 		<ol style="list-style-type: none"> 1. Switching time set too short. 2. Unsuitable type of valve (the openingcross-sectional area changes too quickly). 	<ol style="list-style-type: none"> 1. Foaming of the hydraulic fluid. 	<ol style="list-style-type: none"> 1. Excessive masses or forces. 2. No damping. 	<ol style="list-style-type: none"> 1. In accumulator systems, throttle valves have not been fitted in front of the switching valves.

15 Technical data

15.1 Weights

Total weight of the drive unit

The total weight of the drive unit, is marked on the product identification plate located on the cabinet frame, see *Fig. 29*

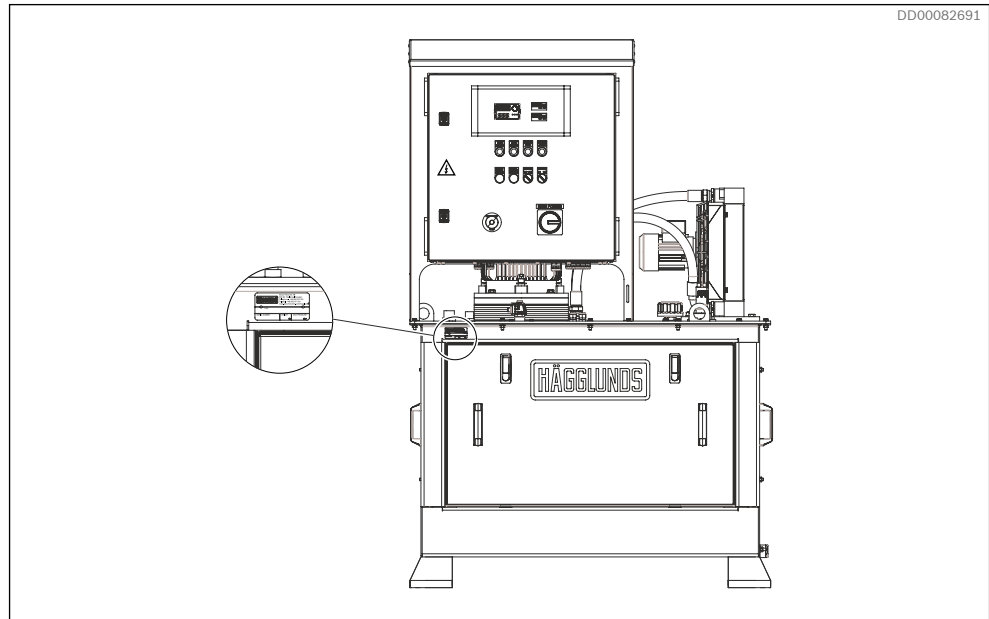


Fig. 29: Placement of product identification plate

Table 12: Weights

Part		Weight	
		kg	lb
Electric motor	7,5 kW	62	137
Pump	8,1 cc	6.4	14.1
	10,6 cc	6.4	14.1
Air cooler		16	35

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