

VERDERHUS[®]

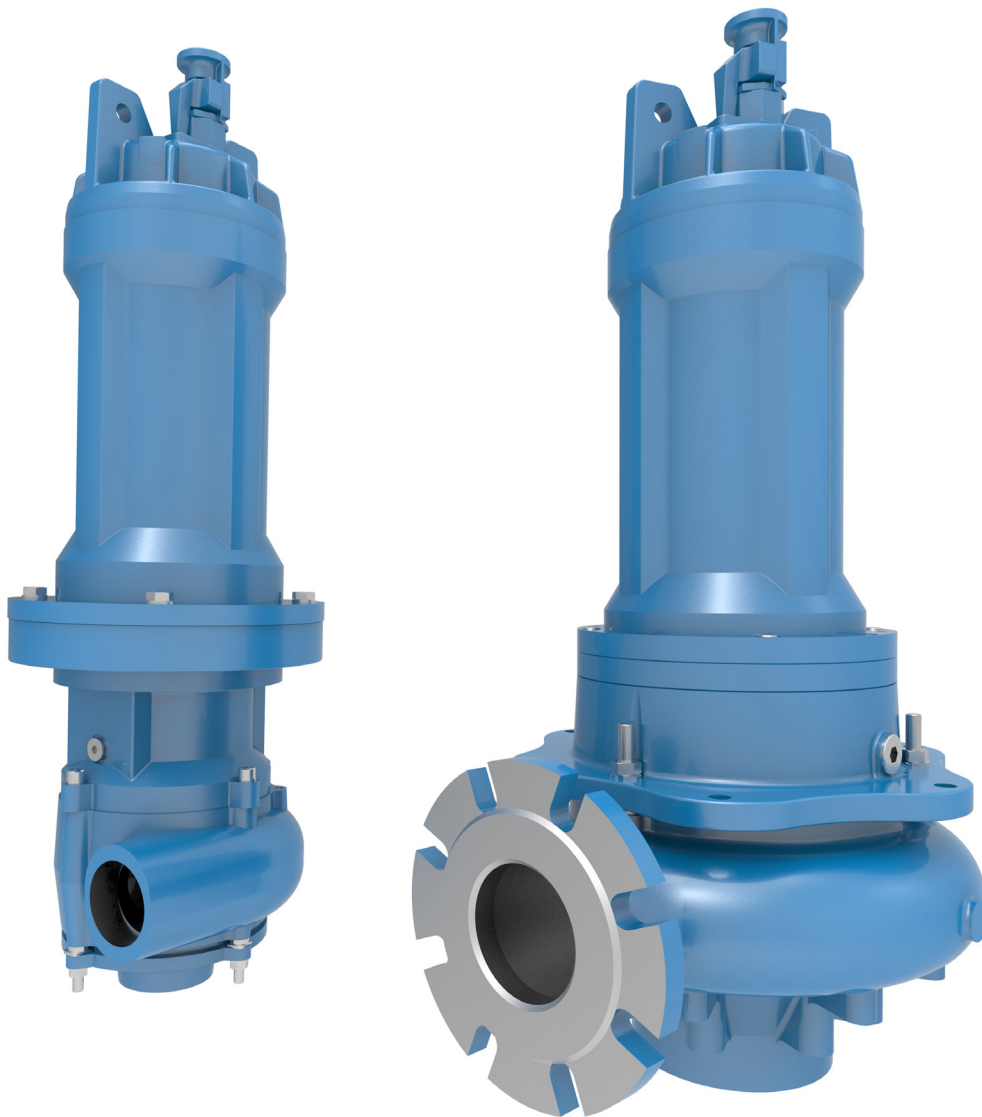
Screw Channel Pump

Original Operating Manual

HSTA 50 - 150

Version 1.0v-08/2017

Print-No. 01



VERDER
passion for pumps

Version 1.0v -08/2017
Print-N o. 01

HSTA 50 - 150



The information in this document is essential for the safe operation of Verderhus®. This document must be read and understood thoroughly prior to installation of pump, electrical connection and commissioning.

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1. About this Document

Verderhus®, Series HSTA 50-50 to 150-100, have been developed according to the latest technology and subject to continuous quality control. These operating instructions are intended to facilitate familiarization with the pump and its designated use. This manual will act as a guide for operating the pump. You are advised to follow these guidelines to operate the pump correctly. These operating instructions do not take local regulations into account; the operator must ensure that such regulations are strictly observed by all, including the personnel responsible for installation.

1.1 Target Groups

Target Groups	Duty
Operating Company	<ul style="list-style-type: none"> ▶ Keep this manual available at the operating site of the pump. ▶ Ensure that personnel read and follow the instructions in this manual and any other applicable documents, especially all safety instructions and warnings. ▶ Observe any additional rules and regulations referring to the system.
Qualified personnel, fitter	<ul style="list-style-type: none"> ▶ Read, observe and follow this manual and the other applicable documents, especially all safety instructions and warnings.

Table 1 Target Groups

1.2 Warnings and Symbols Used in the Manual





Warning	Risk Level	Consequences of disregard
	Immediate risk	Death, serious bodily harm
	Potential acute risk	Death, serious bodily harm
	Potential hazardous situation	Potential damage to the pump
	For information	Possible incorrect use / maintenance of pump

Table 2 Warnings Used in the Manual





Symbol	Meaning
	Safety warning sign in accordance with DIN 4844 - W9 <ul style="list-style-type: none"> ▶ Take note of all information highlighted by the safety warning sign and follow the instructions to avoid injury or death.
	Instruction
1., 2.,	Multiple-step instructions
✓	Precondition
→	Cross-reference
	Information

Table 3 Symbols Used in the Manual

2. Safety

 The manufacturer does not accept any liability for damage resulting from disregard of this documentation.


2.1 Intended Use

- ▶ Only use the pump to handle compatible fluids as recommended by the manufacturer (→ Appendix A - 11 Pump Specifications)
- ▶ Adhere to the operating limits
- ▶ Consult the manufacturer regarding any other use of the pump
- ▶ Pumps delivered without a motor must be fitted with a motor in accordance with the provisions of EC Machine Directive 2006/42/EC.

Prevention of misuse (examples)

- ▶ Note the operating limits of the pump with regard to temperature, pressure, flow rate and motor speed (→ Appendix A - 11 Pump Specifications)
- ▶ Do not operate the pump with any inlet/outlet valves closed
- ▶ Only install the pump as recommended in this manual. For example, the following are not allowed:
 - Installing the pump without proper support
 - Installation in the immediate vicinity of extreme hot or cold sources (→ Appendix A - 11 Pump Specifications)

2.2 General Safety Instructions

 Observe the following instructions before carrying out any work.

2.2.1 Product Safety

- These operating instructions contain fundamental information which must be complied with during installation, operation and maintenance. Therefore this operating manual must be read and understood both by the installing personnel and the responsible trained personnel / operators prior to installation and commissioning, and it must always be kept easily accessible within the operating premises of the machine.
Not only must the general safety instructions laid down in this chapter on “Safety” be complied with, but also the safety instructions outlined under specific headings.
- Operate the pump only if it and all associated systems are in good functional condition.
- Only use the pump as intended, be fully aware of safety and risk factors involved and the instructions in this manual.
- Keep this manual and all other applicable documents complete, legible and accessible to personnel at all times.
- Refrain from any procedure or action that would pose a risk to personnel or third parties.
- In the event of any safety-relevant faults, shut down the pump immediately and have the malfunction corrected by qualified personnel.

- The installation of the pump must comply with the requirements of installation given in this manual and any local, national or regional health and safety regulations.

2.2.2 Obligation of the Operating Company

Safety-conscious operation

- ▶ Ensure that the following safety aspects are observed and monitored:
 - Adherence to intended use
 - Statutory or other safety and accident-prevention regulations
 - Safety regulations governing the handling of hazardous substances if applicable
 - Applicable standards and guidelines in the country where the pump is operated
- ▶ Make personal protective equipment available appropriate to operation of the pump.

Qualified personnel


- ▶ Ensure that all personnel tasked with operating the pump have read and understood this manual and all other applicable documents, including the safety, maintenance and repair information, prior to use or installation of the pump.
- ▶ Organize responsibilities, areas of competence and the supervision of personnel.
- ▶ Have all work carried out by specialist technicians only.
- ▶ Ensure that trainee personnel are under the supervision of specialist technicians at all times when working with the pump.

Safety equipment

Provide the following safety equipment and verify its functionality:

- For hot, cold and moving parts: safety guarding should be provided by the operating company.
- For potential build up of electrostatic charge: ensure appropriate grounding if and when required.

Warranty

 The warranty is void if the customer fails to follow any Instruction, Warning or Caution in this document. Verder has made every effort to illustrate and describe the product in this document. Such illustrations and descriptions are however, for the sole purpose of identification and do not express or imply a warranty that the products are merchantable or fit for a particular purpose, or that the products will necessarily conform to the illustration or descriptions.

Obtain the manufacturer's approval prior to carrying out any modifications, repairs or alterations during the warranty period. Only use genuine parts or parts that have been approved by the manufacturer.

For further details regarding warranty, refer to terms and conditions.

2.2.3 Obligation of Personnel



It is imperative that the instructions contained in this manual are complied with by the operating personnel at all times.

- ▶ Pump and associated components:
 - Do not lean or step on them or use as climbing aid
 - Do not use them to support boards, ramps or beams
 - Do not use them as a fixing point for winches or supports
 - Do not de-ice using gas burners or similar tools
- ▶ Do not remove the safety guarding for hot, cold or moving parts during operation.
- ▶ Reinstall the safety equipment on the pump as required by regulations after any repair / maintenance work on the pump.

2.3 Specific Hazards

2.3.1 Hazardous Pumped Liquids

Follow the statutory safety regulations when handling hazardous pumped liquids (e.g. hot, flammable, poisonous or potentially harmful).

Use appropriate Personal Protective Equipment when carrying out any work on the pump.


2.3.2 Sharp Edges

Pump parts, such as the shims and impellers, can be sharp

- Use protective gloves when carrying out any work on the pump

3. Transport, Storage and Disposal

3.1 Transport

 Always transport the pump in a stable position and ensure that the pump is securely attached to the pallet.

3.1.1 Unpacking and Inspection on Delivery

1. Report any transport damage to the manufacturer/distributor immediately.
2. Retain the pallet if any further transport is required.
3. Remove the transportation bracket before installing the pump.

3.1.2 Lifting

 **DANGER**

Death or crushing of limbs can be caused by falling loads!

1. Use lifting gear appropriate for the total weight to be transported.
2. Make sure the pump and accessories are lifted and moved by qualified lifting personnel equipped with suitable lifting gear.
3. Do not stand under suspended loads.
4. Use a suitable lifting device to lift the pump and secure the pump as outlined in the following sketch. Take note of the centre of gravity.
5. Never use the electrical cable to lift the pump.
6. Before you lift the pump, ensure that neither the pump, the motor, nor the coupling guard can be moved on the base plate.



Figure 1 Lifting the Pump

3.2 Treatment for storage

1. Unpainted steel surfaces should be coated with rust inhibitor and the pump should be stored in a dry, dust free environment not exceeding +5 to 60°C (+40 to 140°F). (→ Appendix A - 11 Pump Specifications)
2. Close all openings with blanks, plugs or plastic covers.
3. Make sure the storage room meets the following conditions:
 - Dry, humidity not to exceed 85%, non-condensing
 - Out of direct sunlight
 - Frost-free; temperature range +5 to 60°C (+40 to 140°F)
 - Vibration-free; minimize
 - Dust-free; minimize
4. Turn the shaft of the impeller every two weeks to prevent oxidation and rust by rotating the impeller.
5. Ensure the rust inhibitor is fully removed from the pump before putting it back into use.

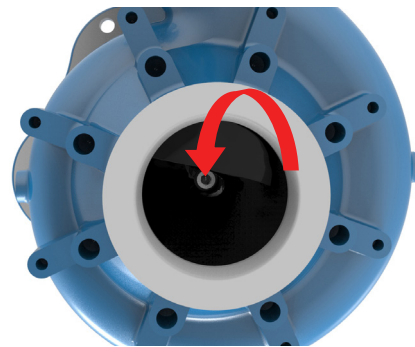



Figure 2 Turn the Shaft of the Impeller

3.3 Disposal

 With prolonged use, pump parts can get contaminated by hazardous pumped liquids to such an extent that cleaning may be insufficient.

 **WARNING**

Risk of poisoning and environmental damage by the pumped liquid or oil!

- ▶ Use suitable personal protective equipment when carrying out any work on the pump.
 - ▶ Prior to disposal of the pump:
 - Collect and dispose the lubricant in accordance with local regulations.
 - Collect and dispose of any leaking pumped liquid or oil in accordance with local regulations.
 - Neutralize residues of pumped liquid in the pump.
-
- ▶ Dispose of the pump and associated parts in accordance with local regulations.

4. Layout and Function

i Verderhus® screw-channel pumps can transport numerous types of slurry and sludge with minimal wear, thanks to a large, open impeller based on the working principle of a corkscrew. The suction port is a large inlet of at least 50 mm (2 in) which allows the easy passage of pulverized and intact solids. The wide flow path is unsusceptible to clogging, ragging and when pumping long fibrous fluids. The Verderhus® range of screw channel pumps is available in several different inlet sizes, ranging from 50 -150 mm (2-6 in).

4.1 Design Details

i The Verderhus® range of screw channel pump has an open channel impeller design. Because of the combination of an open channel and the centrifugal forces high flow rates and efficiencies are accomplished.

4.2 Labelling

4.2.1 Name Plate

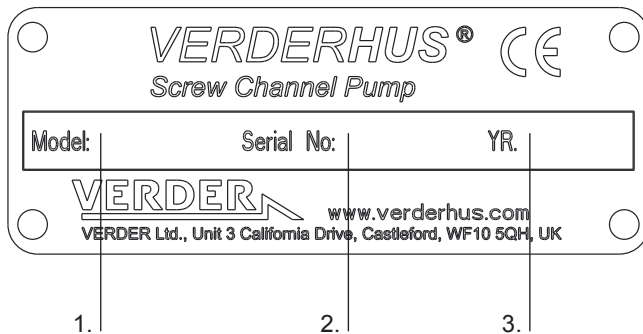


Figure 3 Name Plate

1. Pump Type
2. Serial Number
3. Year of manufacture

i When requesting spares, the model and serial number should always be quoted.

4.3 Verderhus® Submersible - an overview

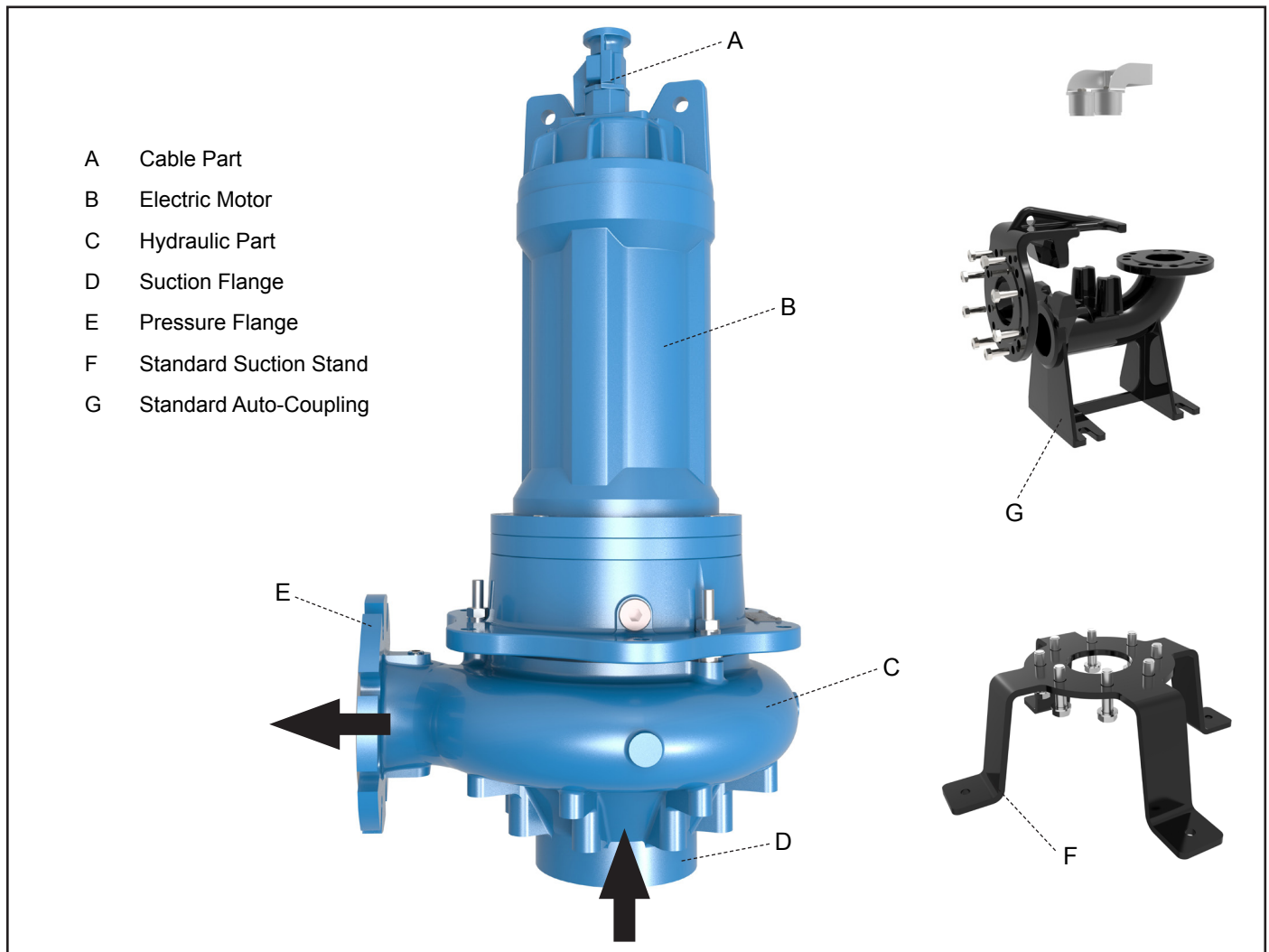


Figure 4 Verderhus® Submersible - an overview

- A. POWER CABLE
- B. ELECTRIC MOTOR
 - Pump is suitable for submerged installation, depending on type of electric motor.
- C. HYDRAULIC PART
- D. SUCTION FLANGE
 - A large inlet of at least 50 mm (2 in)
 - Allows the easy passage of pulverized and intact solids.
- E. DISCHARGE FLANGE
- F. STANDARD SUCTION STAND (purchased separately)
 - Ensures the pump is precisely positioned on the suction stand.
- G. STANDARD AUTO-COUPLING (purchased separately)
 - Ensures the pump is precisely positioned on the auto-coupling on the discharge outlet.

For more information, see (→ Appendix B - 12.1 Operational Safety Components).

4.4 Layout

4.4.1 Verderhus® Submersible - HSTA 50-50; 80-50; 80-80

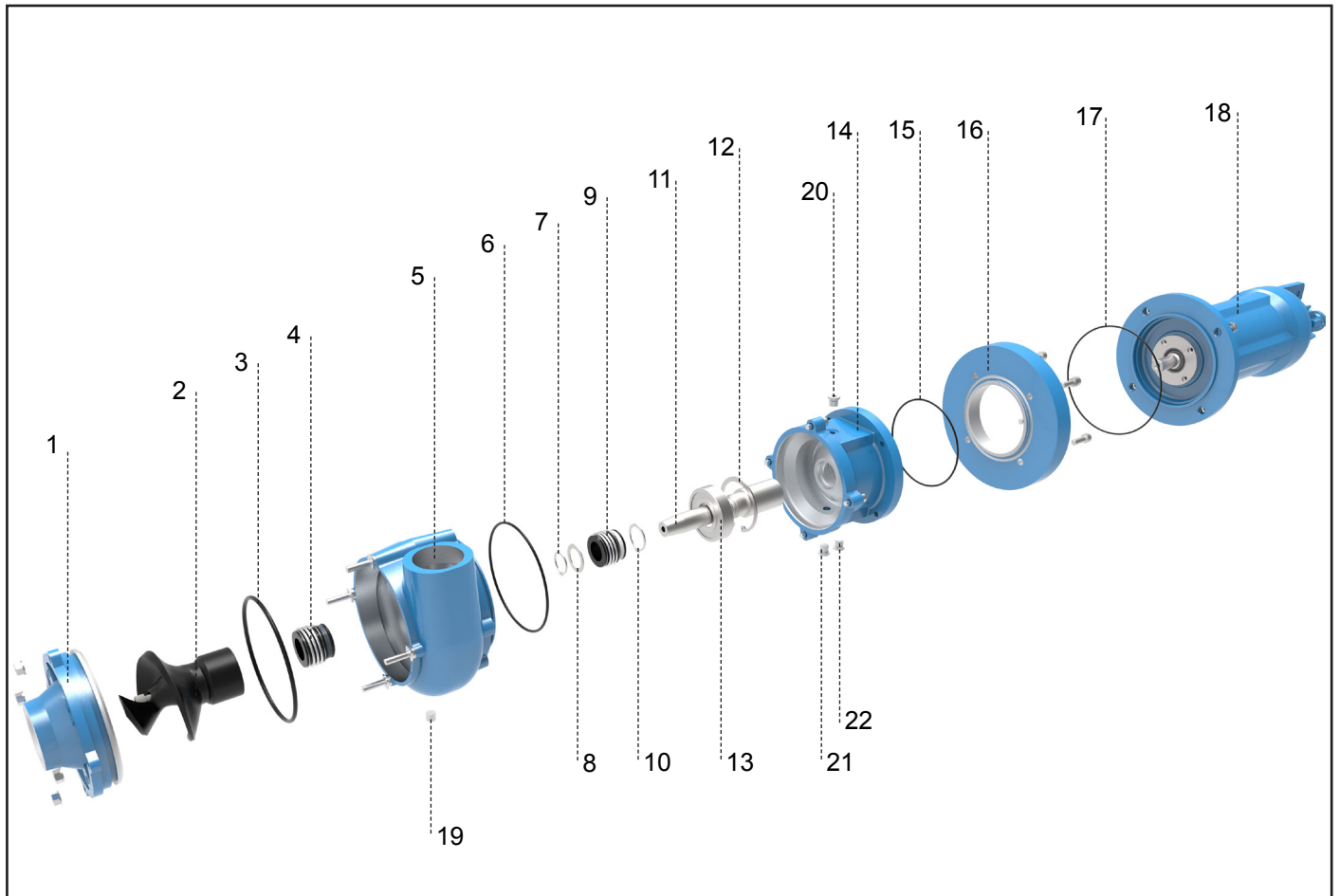


Figure 5 Verderhus®, Series HSTA 50-50; 80-50; 80-80 - Exploded View (generic view)

1	Intake Socket	6	O-Ring	11	Shaft	16	Transition Flange	21	Oil Drain Plug
2	Impeller	7	External Cir-Clip	12	Internal Cir-Clip	17	O-Ring	22	Plug
3	O-Ring	8	Spacer	13	Bearing	18	Motor		
4	Mechanical Seal	9	Mechanical Seal	14	Bearing Flange	19	Media Drain Plug		
5	Pump Housing	10	External Cir-Clip	15	O-Ring	20	Oil Level/Filler Plug		

4.4.2 Verderhus® Submersible - HSTA 100-80; 100-100; 150-100

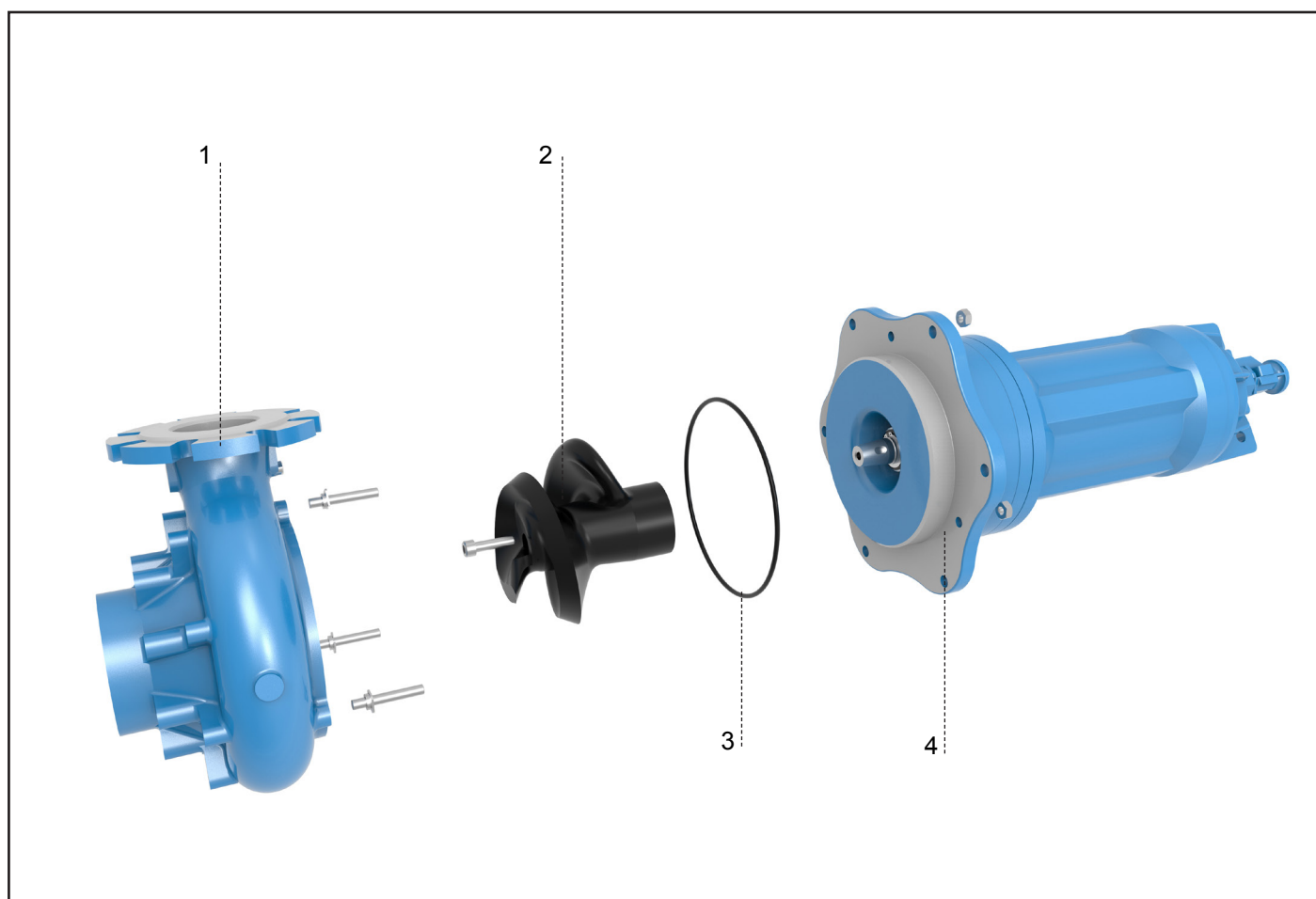


Figure 6 Verderhus®, Series HSTA 100-80; 100-100; 150-100 - Exploded View (generic view)

- | | | | |
|---|--------------|---|----------------|
| 1 | Pump Housing | 3 | O-Ring |
| 2 | Impeller | 4 | Electric Motor |

5. Installation and Connection

CAUTION

Material damage due to unauthorized modification on pump

- ▶ Unauthorized modification will invalidate the warranty.
- ▶ Do not make any structural modifications to the pump or pump casing.
- ▶ Do not carry out any welding work on the pump or pump casing.

NOTE

Material damage caused by ingress!

- Do not remove any protective flange covers until immediately before connecting the pipes to the pump

5.1 Preparing for Installation

5.1.1 Checking the Ambient Conditions

1. Make sure that the operating conditions are in accordance with the pump specifications
2. Make sure the required ambient conditions are fulfilled (→ Appendix A - 11 Pump Specifications)

5.1.2 Preparing the Installation Site

- ▶ Ensure the installation site meets the following conditions:
 - Pump is freely accessible
 - Sufficient space is available for the installation/removal of the pipes and for maintenance and repair work.

5.1.3 Preparing the Foundation and Surface

- ▶ Make sure the foundation and surface meet the following conditions:
 - Level
 - Clean (no oil, dust or other impurities)
 - Capable of bearing the weight of the pump and all operating forces
 - Ensure the transportation bracket is removed before installing the pump and the pump is anchored securely at all required locations.

5.1.4 Do not Run the Pump Dry

- ▶ Ensure the pump is submerged and is not running dry. For more information for the actual dimensions of the pump's submergence, please check the technosheets for individual pumps.

5.2 Planning the Pipes

1. Always use pipes with a nominal diameter and pressure rating that is greater than or equal to the pump connections.
2. Pipes should be straight for at least 5 times diameter of the outlet before any obstructions are mounted.
3. Include drainage taps in discharge lines at the lowest point.
4. The motor has to be submerged during the operations. The minimum submergence of the pump will be as per *Figure 7*. For more information for the actual dimensions of the pump's submergence, please check the technosheets for individual pumps.



Figure 7 Minimum Submergence of the Pump

5.3 Electrical Connection

CAUTION

Failure to follow safe and proper electrical installation practices may result in pump malfunction or dangerous operation

- ▶ Make sure the pump is installed correctly.
- ▶ Perform electrical connections according to electrical diagram. (→ Appendix C - 13 Connection Diagram)

5.3.1 Connecting to a Power Supply

⚠ DANGER

Isolate power supply from the pump before performing the installation.

1. The pump must be installed by a qualified individual.
2. The impeller must be turned by hand to ensure free rotation.
3. The motor cover and cable inlet must be checked for visible damage.
4. Ensure that the cable is firmly clamped in the cable inlet.
5. The PTC thermistor must be connected in such a way that motor is deenergized without delay in case of overheating (→ Appendix B - 12 Moisture Probe)
6. The moisture must be checked. (→ Appendix B - 12 Moisture Probe)
7. Check rotational direction. (→ 5.3.2 Check rotational direction)

5.3.2 Check Rotational Direction

⚠ WARNING

Risk of injury and damage to property due to incorrect rotational direction!

► Incorrect rotational direction can result in serious injuries or property damages.

1. The pump must be suspended or placed on its side on the ground.
2. Make sure the impeller's direction of rotation is counter clockwise from suction end.

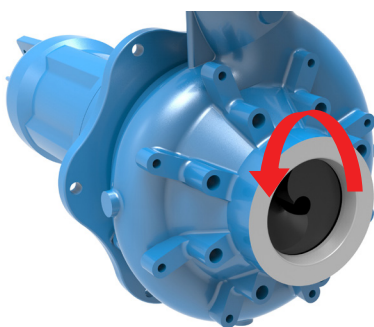


Figure 8 Impeller's Direction of Rotation

NOTE

If the rotational direction is incorrect, switch only the pump's cable conductors or speed with wrong rotational direction at the corresponding starting switch in the control panel.

6. Commissioning and Operation

NOTE

Start-up is not permitted until such time as the pump and all associated and connected devices have been installed and checked, and the safety officer has given the go-ahead for operation to commence.

⚠ DANGER

Pumped Medium

The pump may only be operated using the medium specified in the data sheet. The materials used to build the pump are compatible with this medium.

1. Make sure the pump and all levels control are installed correctly.
2. The valves on the suction and discharge side must be completely opened.
3. Ensure the pump is not run dry. (→ 5.3.2 Check rotational direction)

6.1 Shutdown and Removal / Storing the Pump over Longer Periods

1. The parts that come into contact with the pumped medium are to be cleaned and neutralised if necessary.
2. Refer to the storage conditions. (→ 3.2 Treatment for storage)

6.2 Shutdown Without Removal Over Longer Periods (On-Site Preservation)

1. Rinse, and neutralise if necessary, the pump section between the valves.
2. Make sure the pump is drained completely.
3. It is recommended that the impeller is rotating manually or switching the pump on every two weeks to lubricate the mechanical seal.

7. Inspection, Maintenance and Repairs

DANGER

Risk of injury due to running pump!


- ▶ Do not carry out any repair/maintenance work on a pump whilst running.
- ▶ Follow the safety procedures for handling the product being pumped.
- ▶ Decontaminate before handling as per local safety regulations.
- ▶ Appropriate measures must be taken to relieve any pressure build up.

DANGER

Risk of electrocution!


- ▶ Have all electrical work carried out only by qualified electricians.

7.1 Inspections

 The inspection intervals depend on the pump operating cycle.

1. Check at appropriate intervals:
 - No changes in operating conditions
 - The setting distance between impeller and pump housing with feeler gauge after impeller's rotations. (→ Appendix D - 14 Impeller Adjustment)
2. For trouble-free operation, always ensure the following:
 - No leaks
 - No unusual running noises or vibrations
 - Oil Quantity, Oil Quality, Oil Change Interval (→ Appendix E - 15 Oil Cup Flange)
 - Temperature is stable

7.2 Maintenance

 VERDER LTD offers customers a service contract, which covers maintenance and repairs to the pump. Contact Customer Service, to request a non-binding offer.

7.2.1 Cleaning the Pump

Make sure that no cleaning agent contaminates the pump bearings and motor.

- ▶ Cover all parts that should not come into contact with cleaning agent.
- ▶ Never spray cold liquids such as water on hot pump parts. The casing may crack if it cools too quickly, and may render the pump unusable.

NOTE

Contact VERDER LTD. before you use a liquid cleaning agent, and confirm that the product that you intend to use is safe. The operator must ensure that the product is safe to use with the pumped medium.

- ▶ Select a suitable method for cleaning the electrical material, and consult a qualified electrician.

7.3 Repair

DANGER

Risk of death due to electric shock!

- ▶ Have all electrical work carried out by qualified electrician only.

WARNING

Risk of injury due to heavy components!


- ▶ Pay attention to the component weight. Lift and transport heavy components using suitable lifting gear.
- ▶ Set down components safely and secure them against overturning or rolling away.

7.3.1 Returning the Pump to the Manufacturer

Obtain prior authorization before repair or return of the pump.

- ▶ Enclose a completed document of compliance when returning pumps or components to the manufacturer.

7.4 Ordering Spare Parts

 For trouble-free replacement in the event of faults, we recommend keeping spare parts available on site.

NOTE

The Verderhus® spare parts list contains the following kits:

1. seal kit including o-rings;
2. impeller kit including fasteners;
3. mounting kits and other accessories.

- ▶ The following information is mandatory when ordering spare parts (→ Name plate):
 - Pump model
 - Year of manufacture
 - Part number / Description of part required
 - Serial number
 - Quantity

8. Troubleshooting

8.1 Pump malfunctions

If malfunctions occur which are not specified in the following table or cannot be traced back to the specified causes, please consult the manufacturer.

Possible malfunctions are identified and respective cause and remedy are listed in the table.

Malfunction								Potential Cause	Recommended Solution ¹⁾
No flow	Motor overloaded	Low flow	Low discharge pressure	Vibration level high	Overheating	Iregular pressure	Oil chamber overflows		
X	-	X	X	-	-	-	-	closed inlet	<ul style="list-style-type: none"> ▶ check suction valve setting ▶ check for blockages ▶ DO NOT RUN IN THIS CONDITION
X	-	-	-	-	-	-	-	closed discharge	<ul style="list-style-type: none"> ▶ check discharge valve setting ▶ DO NOT RUN IN THIS CONDITION
X	-	-	-	-	-	-	-	motor not running	▶ check wiring
-	-	X	X	-	-	-	-	motor direction	▶ check wire connections are correct
-	-	X	X	-	-	-	-	NPSH exceeded	▶ check suction conditions including pipe work and any associated equipment
-	-	X	-	-	X	-	-	low suction head	▶ check pressures and adjust as required
-	-	X	-	-	X	-	-	high discharge head	▶ check pressures and adjust as required
-	-	X	-	-	X	-	-	low cooling oil level	▶ check oil level and address any shortage
-	-	X	-	-	X	-	-	dirt covering pump	▶ clean
-	-	-	X	-	-	-	-	discharge valve	▶ close down to reinstate pressure
-	-	X	X	X	-	-	-	cavitation	▶ increase suction head; can suction valve be opened up
-	X	-	-	X	X	-	-	duty too high	▶ reconsider impeller choice
-	X	-	-	X	X	-	-	bearing failure	▶ stop pump and repair
-	X	X	-	-	-	X	-	pumped media changed	▶ incorrectly specified impeller for media
-	-	-	-	-	X	-	-	fluid temperature too high	▶ add cooling
-	-	-	-	-	-	-	X	seal leaking	▶ stop pump and repair
-	-	-	-	X	-	-	-	impeller rubbing	▶ stop pump and repair

¹⁾ Make sure the pipe sizes are correct for the pump and installation.

Table 4 Troubleshooting

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10. Declaration of Conformity

<p>EC declaration of conformity according to machine directive, appendix II A</p> <p>We, VERDER Ltd., Unit 3 California Drive, Castleford hereby declare that the following machine adheres to the relevant EC directives detailed below:</p> <p>Designation Type series HSTA 50-50 to 150-100 Description of product HUS-screw channel pumps for all liquids under the pourpoint</p> <p>EC directive: • Machine Directive (2006/42/EC)</p> <p>Applicable harmonized norms: • EN ISO 12100: 2010 • BS EN 809</p>		
<p>Manufacturer</p>	<p>VERDER Ltd. Unit 3 California Drive Castleford WF10 5QH UK</p>	
<p>Date: 01/ 08/ 2017</p>	<p>Company stamp / signature:</p> <p><i>Ben Allmond</i></p> <p>Ben Allmond Head of Development/Construction</p>	<p>Company stamp / signature:</p> <p><i>David Hoyland</i></p> <p>David Hoyland Head of Quality</p>

Table 5 Declaration of Conformity

Appendix A


11 Pump Specifications

11.1 Pump Range Specifications

Size	Value
Max. flow rate	250 m³/h (1100 GPM)
Max. delivery pressure	30 mwc (97 ft.wc)
Temperature of pumped liquid	< +40 °C (+104 °F)
Dimensions	→ refer pump datasheet

Table 1 Pump Range Specifications

11.2 Ambient conditions

 Operation under any other ambient condition would require approval from the manufacturer


Operating conditions

- Ambient temperature +5 °C to +40 °C (+40 to +100 °F)
- Relative humidity (non-condensing) – long—term ≤ 85 %
- Setup height above sea level ≤ 1000 m (320 ft)

Storage conditions

- Ambient temperature +5 °C to +60 °C (+40 to +140 °F)
- Relative humidity (non-condensing) – long—term ≤ 85 %


11.3 Tightening Torques

 Tightening torques should be applied at the following torque values:

Position	Torque Value (Nm)					
	50-50	80-50	80-80	100-80	100-100	150-100
Impeller Screw	27	27	27	27	27	54
Nut to Impeller Housing Stud	22	22	22	43	74	74
Adaptor Ring Screw	-	-	-	43	43	43
Bearing Flange Screw	22	22	22	-	-	-
Connection Flange Screw	43	43	43	-	-	-
Motor Screw	43	43	43	-	-	-

Table 2 Pump Fastener Tightening Torques

11.4 Preservatives

 Use e.g. RUST-BAN 335 or similar preservatives on bare metal.

Appendix B

12 Moisture Probe

12.1 Operational Safety Components

NOTE

- Make sure the following components are installed:
1. Cable Protection
 2. Winding head with built-in temperature limiter
 3. Moisture probe
-

1. **Cable inlet** - prevents moisture from entering the interior of the motor. The cables are sealed with epoxy resin; the wires are fed into separate conductors, which also form the connection to the motor, thus completely sealing the interior space between the cable sheathing and the wires.
2. **Overtemperature protection of windings (when in inverter mode)** - takes place via PTC thermistor and PTC thermistor triggering device.

PTC thermistor sensors protect against excessive temperatures in case of:

- blocking rotors
- heavy start-ups
- counter-current operation
- undervoltage and phase failure
- increased ambient temperature
- impaired cooling.

3. **Moisture**

Ingress of moisture is monitored by means of a moisture probe, applicable for 100/80; 100/100; 150/100 units only.

If the water content in the oil cup chamber reaches a predefined level, an alarm is triggered, when the probe is connected via a suitable Conductivity monitoring device.

In submersible pumps, motor and pump assembly are often separated by an oil-cup housing with product side and motor side mechanical seals fitted as standard.

To prevent motor malfunctions or breakdowns it is good practice to detect possible leakages of the shaft seal and to carry out maintenance works at a convenient time.

The electrode consists of a threaded metal sleeve and a metal sensor rod forming one block by means of a creepage-proof insulation material.

Depending on type and application, moisture detection electrodes can be used for temperatures from -25 °C to +150 °C.

It is recommended that the probe is connected to the motor control panel via an “Electrode Relay for Conductive Limit Switches” (e.g. KOBOLD NE-104) to provide an alarm signal to user.

The Relay manufacturer’s installation and settings should be adhered to and the design, installation, connection and commissioning of the moisture probe and relay should be carried out by a competent electrician.

Appendix C

13 Connection Diagram

13.1 Three Phase Submersible Motor with Thermistors PTC and Leakagecontrol for Oil Cup

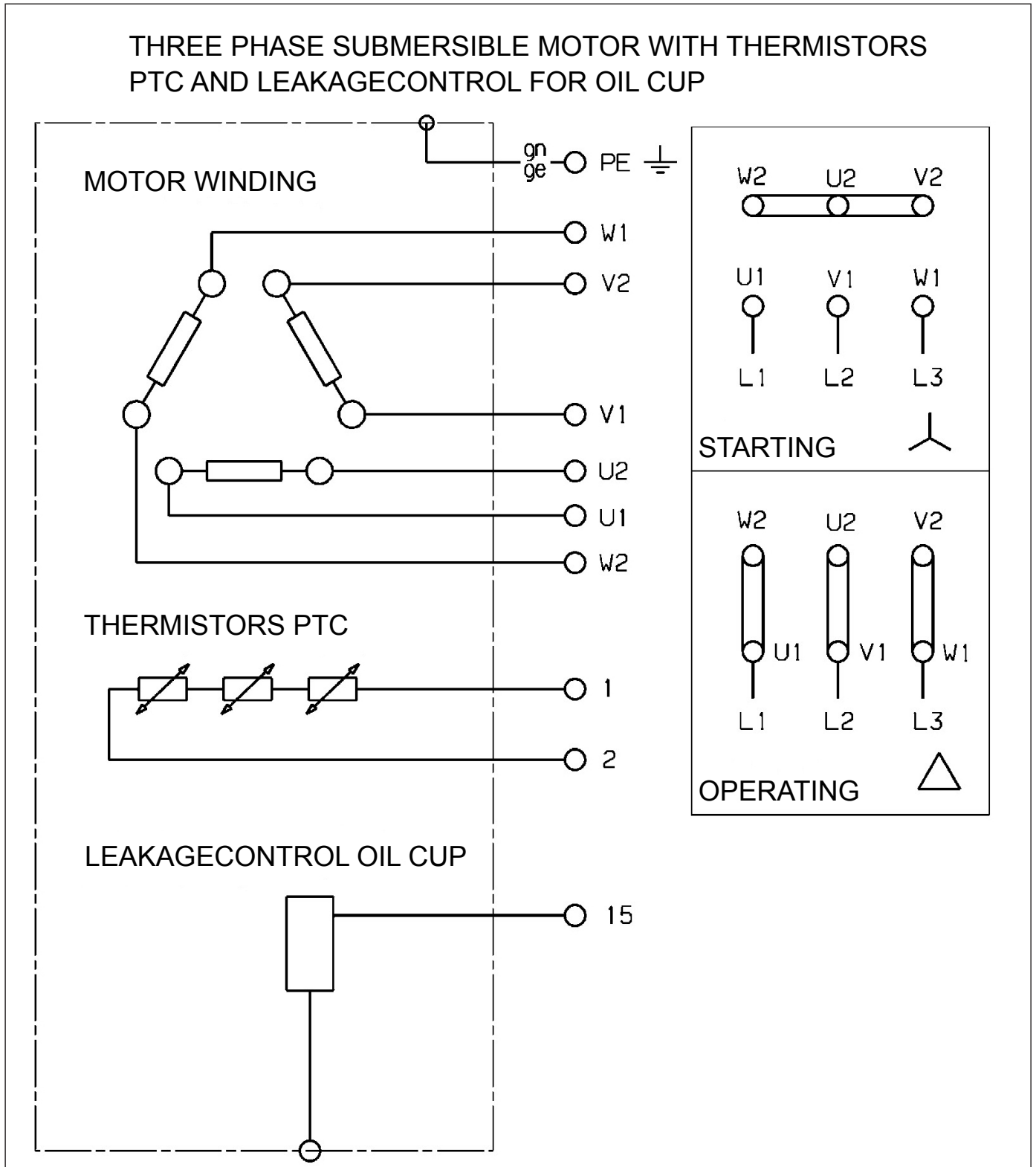


Figure 1 Connection Diagram - Three Phase Submersible Motor

13.2 Submersible Motor's Power Current Leads

The submersible motor's power current leads are defined according to the following table:

Motor Type	Number of Revolutions	Number of Conductors	Speed	Winding Connection	Designation at cable end, according to standard DIN VDE 0530
up to 4 kW, direct start	1	3+C+E	-	Y	U1 V1 W1
via 4 kW star delta start	1	6+C+E	-	Δ	U1 V1 W1 W2 U2 V2
Dahlander pole changing Y/YY for two speeds, direct start	2	6+C+E	N	Y	1U 1V 1W
			H	YY	1U 1V 1W 2U 2V 2W
Pole-changing motor, all speeds with direct start	2	6+C+E	N	Y	1U1 1V1 1W1
			H	YY	2U1 2V1 2W1
Pole changing motor, low speed: Direct start, high speed: Star delta start	2	9+C+E	N	Y ¹⁾	1U1 1V1 1W1
			H	Δ	2U1 2V1 2W1 2U2 2V2 2W2
Pole changing motor, low and high speed with star delta start	2	12+C+E	N	Δ	1U1 1V1 1W1 1U2 1V2 1W2
			H	Δ	2U1 2V1 2W1 2U2 2V2 2W2

Table 1 Submersible Motor's Power Current Leads

The abbreviations are explained according to the following table:

Abbreviation	Designation	Explanation
Number of Conductors	E	Earthing (yellow-green)
	C	Control conductor
Speed	N	Low speed
	H	High speed
Winding connection	Y/YY	Direct start (Dahlander)
	Δ	The starting current at this speed is lower than the starting current at high speed during star delta start
	1)	Star delta start possible

Table 2 Submersible Motor Type - Designation/Explanation

Appendix D

14 Impeller Adjustment

Check the setting distance between impeller and pump housing with feeler gauge after impeller's rotations.

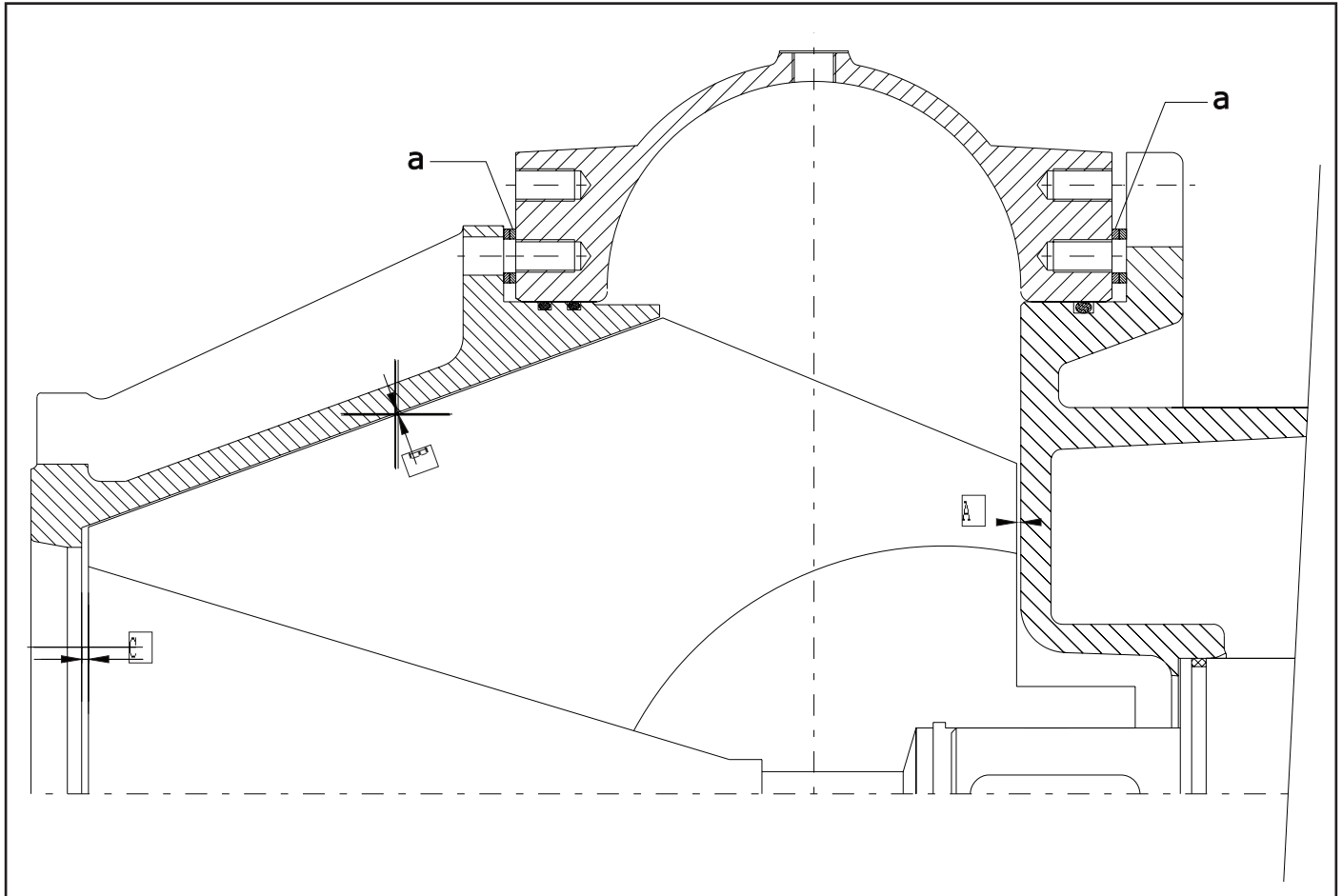


Figure 1 Impeller Setting

a Document for adjusting settings

Pump Type	A min.	B	C
HS50-50	1,5 – 2,5	0,3 – 0,6	1 - 3
HS80-50	1,5	0,3 – 1,0	1 – 3
HS80-80	1,5	0,3 – 1,0	1 – 3
HS100-80	2	0,3 – 1,0	1 – 3
HS100-100	3	0,3 – 1,5	1 – 3
HS150-100	1,5	0,3 – 1,5	1 – 3

Table 1 Impeller Setting

Appendix E

15 Oil Cup Flange (Oil Quantity, Oil Quality, Oil Change Interval)

Make sure the non-polluting and biodegradable oils (water-endangering grade 0) only is used to refill as follows:

Frame Size	Flange - a ₁	Oil Quantity (litre)	Oil Quality (standard)	Oil Change Interval	
				with leakage control	without leakage control
TMU 90	280	1.7	HETG 37 Bio	Once a year	Every six month
TMU 112	335	2.8			

Table 1 Oil cup flange (Oil quantity, oil quality, oil change interval)

For more information, see (→ [Appendix G - 17.3 Filling the Pump with Oil](#))

Appendix F

16 Disassembly the Spare Parts

16.1 Impeller Removal

DANGER

Risk of death due to electric shock!

- ▶ Always isolate the power supply before working on the pump.
- ▶ System secured against being switched back on again.
- ▶ Make sure the power supply cable never gets in contact with water during the pump servicing.

WARNING

Risk of injury due to heavy components!

- ▶ Pay attention to the component weight. Lift and transport heavy components using suitable lifting gear.
- ▶ Set down components safely and secure them against overturning or rolling away.

1. Remove the pump housing (item 1).
2. Remove the screws (item 2), using 2 Pry Bars or similar from the two sides ease the impeller from the shaft.

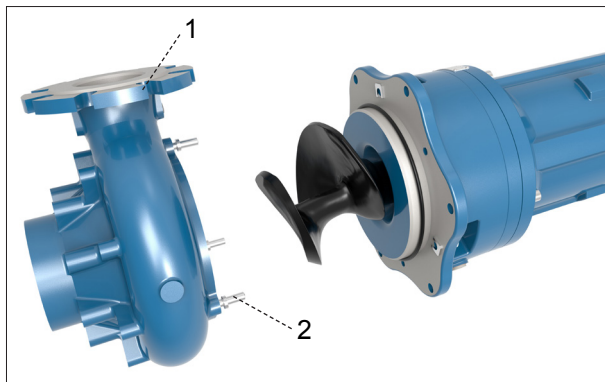


Figure 1 Remove the Pump Housing

3. Untighten the screw (item 3) to remove the impeller (item 4).

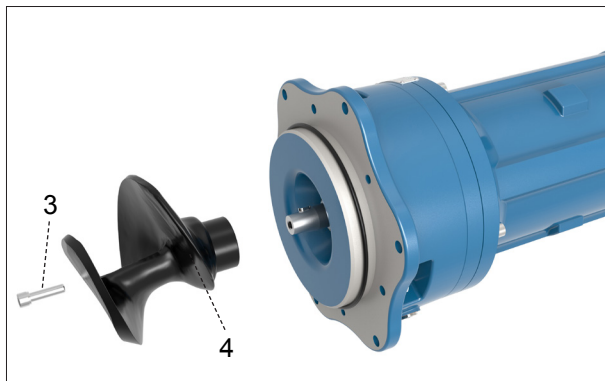


Figure 2 Remove the Impeller

16.2 Mechanical Seal Removal (outer)

1. Draining the oil.

WARNING

Slip hazard due to spill oil!

- ▶ Care must be taken when the oil is drained into a container.
- ▶ Dispose of used oil in accordance with local laws and good environmental practices.

2. Remove the drain plug (item 5).
3. Drain the oil into a suitable container.
4. Rotate the pump as shown in the figure and allow any excess oil to drain out.

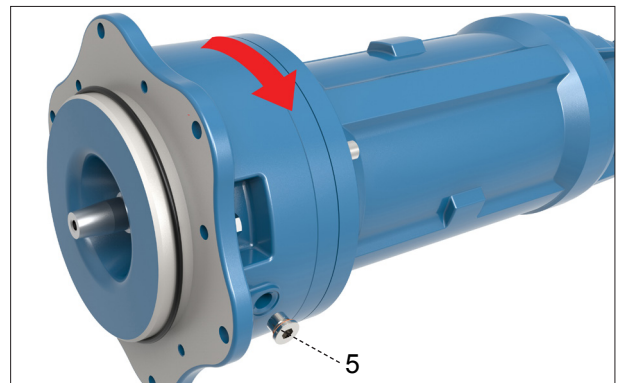


Figure 3 Draining the oil

5. Remove the cir-clip (item 6) and support washer (item 7).
6. Slide out the rotating ring (item 8) and stationary ring (item 9).
7. The mechanical seal (outer) is removed.

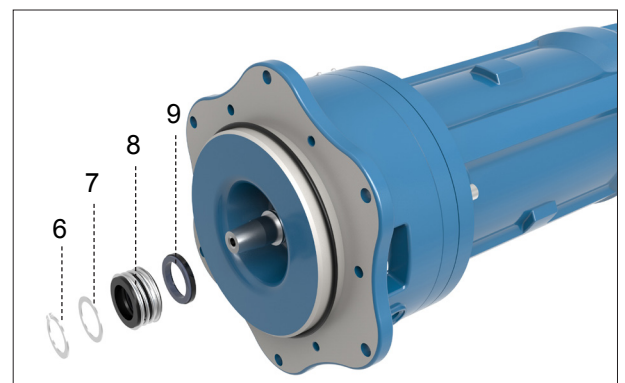


Figure 4 Remove the Mechanical Seal (outer)

16.3 Mechanical Seal Removal (Inner)

1. Remove the oil-cup housing (item 10).

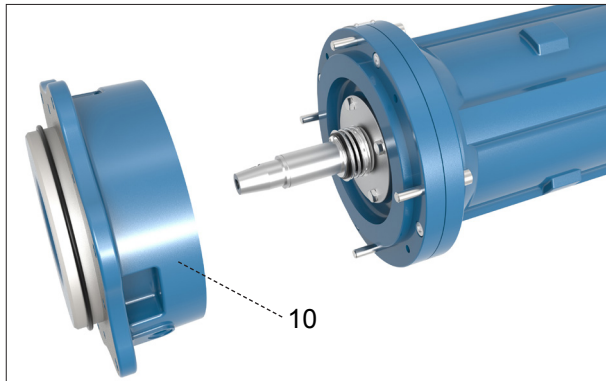


Figure 5 Remove the Oil-Cup Housing

2. Remove the cir-clip (item 11) and support washer (item 12).
3. Slide out the rotating ring (item 13) and stationary ring (item 14).
4. The mechanical seal (inner) is removed.

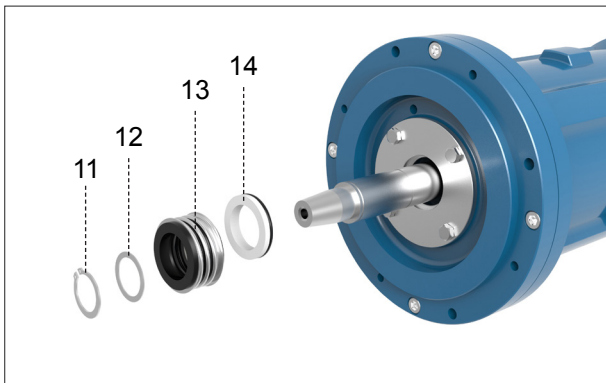



Figure 6 Remove the Mechanical Seal (inner)

16.4 Spare Parts Replacement

 For trouble-free replacement in the event of faults, we recommend keeping spare parts available on site.

NOTE

The Verderhus® spare parts list contains the following kits:

1. seal kit including o-rings;
2. impeller kit including fasteners;
3. mounting kits and other accessories.

► The following information is mandatory when ordering spare parts (→ Name plate):

- Pump model
- Year of manufacture
- Part number / Description of part required
- Serial number
- Quantity

Appendix G

17 Reassembly the Spare Parts

17.1 Installation of the Mechanical Seal (Inner)

DANGER

Risk of death due to electric shock!

- ▶ Always isolate the power supply before working on the pump.
- ▶ System secured against being switched back on again.
- ▶ Make sure the power supply cable never gets in contact with water during the pump servicing.

WARNING

Risk of cracking or chipping the ceramic seal face!

- ▶ Care must be taken when reassembly the stationary ring to avoid cracking or chipping the ceramic seal face.
- ▶ Apply Petroleum Gel to the stationary ring (item 2).
- ▶ Use a plastic tube for applying pressure to the stationary ring surface to seat it correctly in the seal housing.

1. Press the stationary ring (item 2).
2. Slide rotating ring (item 1) onto drive shaft and locate the seal faces.

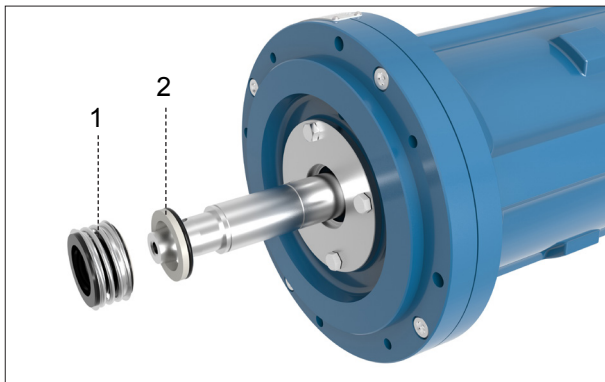


Figure 1 Install the Mechanical Seal (inner)

3. Fit the support washer (item 3) and the cir-clip (item 4). Make sure the cir-clip locates in the correct position.

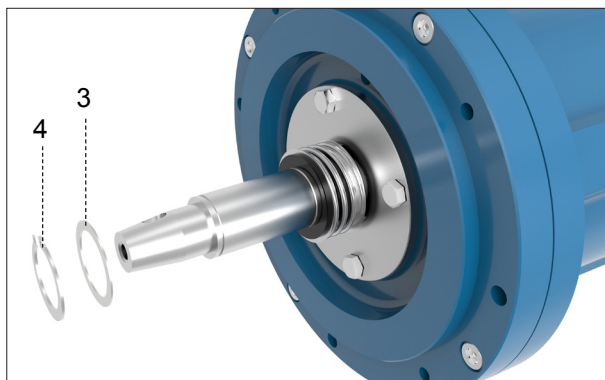


Figure 2 Fit the Support Washer and Cir-Clip

4. Install the oil-cup housing (item 5).

NOTE

Care must be taken when reassembly the oil-cup housing to avoid damaging the moisture probe.

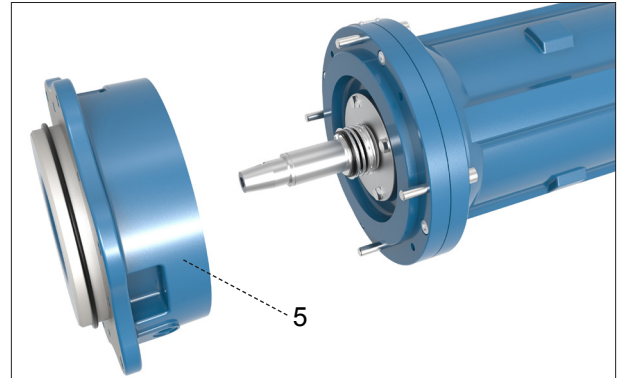


Figure 3 Install the Oil-Cup Housing

5. Tighten the screws.
(→ Appendix A - 11 Pump Specifications)

17.2 Installation of the Mechanical Seal (Outer)

DANGER

Risk of death due to electric shock!

- ▶ Always isolate the power supply before working on the pump.
- ▶ System secured against being switched back on again.
- ▶ Make sure the power supply cable never gets in contact with water during the pump servicing.

WARNING

Risk of cracking or chipping the ceramic seal face!

- ▶ Care must be taken when reassembly the stationary ring to avoid cracking or chipping the ceramic seal face.
- ▶ Apply Petroleum Gel to the stationary ring (item 7).
- ▶ Use a plastic tube for applying pressure to the stationary ring surface to seat it correctly in the oil-cup housing.

1. Press the stationary ring (item 7).
2. Slide rotating ring (item 6) onto drive shaft and locate the seal faces.

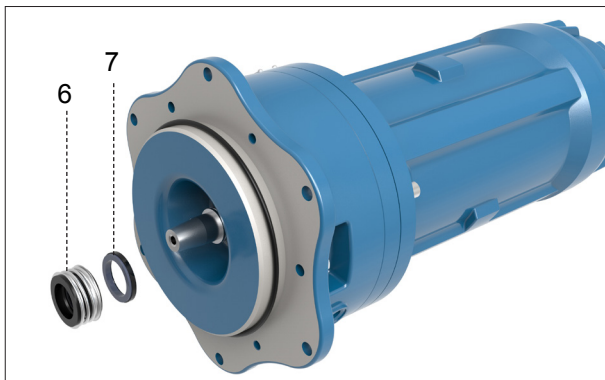


Figure 4 Install the Mechanical Seal (outer)

3. Fit the support washer (item 8) and the cir-clip (item 9). Make sure the cir-clip locates in the correct position.
4. Attach the o-ring (item 10) to the oil-cup housing.

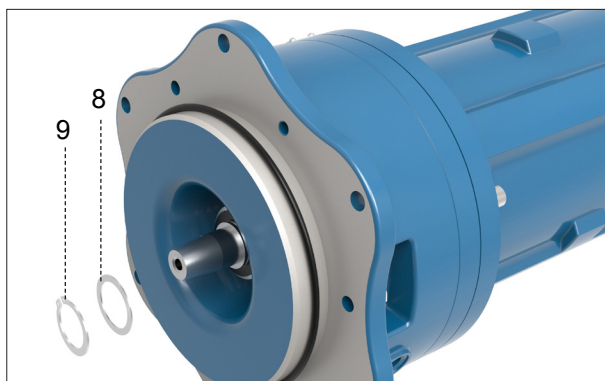



Figure 5 Fit the Support Washer and Cir-Clip

17.3 Filling the Pump with Oil

 The safety data sheets are available from the manufacturer for compatibility check.

1. Provide a suitable container to collect spilt oil.
2. Refill the oil-cup with the correct grade and quantity of oil. (→ Appendix E - 15 Oil Cup Flange (Oil Quantity, Oil Quality, Oil Change Interval))
3. Fix the drain plug (item 10).

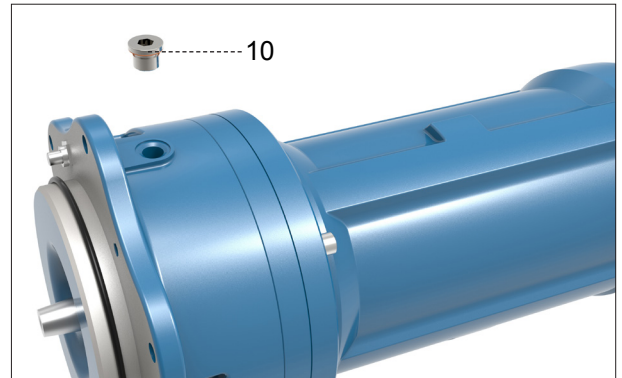


Figure 6 Filling the Pump with Oil

17.4 Install the Impeller

WARNING

Risk of injury due to heavy components!

- ▶ Pay attention to the component weight. Lift and transport heavy components using suitable lifting gear.
- ▶ Set down components safely and secure them against overturning or rolling away.

1. Attach the key (item 11) to the drive shaft.
2. Attach the impeller (item 12) to the drive shaft.
3. Fix the impeller with a screw (item 13) on the top of impeller.

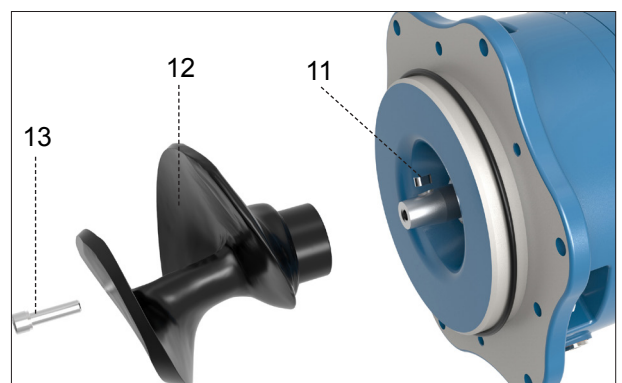


Figure 7 Install the Impeller

17.5 Installation the Pump Housing



WARNING

Risk of injury due to heavy components!

- ▶ Pay attention to the component weight. Lift and transport heavy components using suitable lifting gear.
- ▶ Set down components safely and secure them against overturning or rolling away.

1. Attach the o-ring (item 18).
2. Attach the studs (item 15) with the spacers (item 16) to the pump housing (item 14). Add grease on the studs.
3. Fit 4 mm wide spacer (item 17). Set and shim the impeller correctly. (→ see Appendix D - 14 Impeller Adjustment)

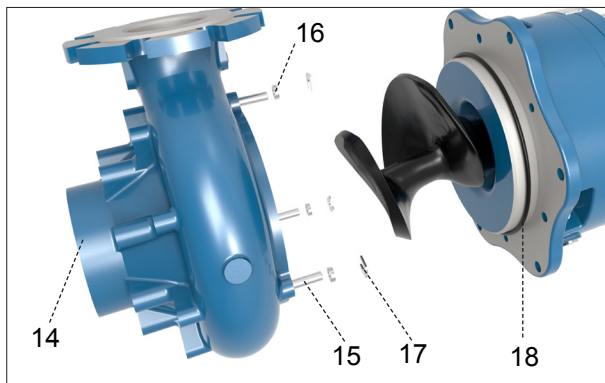


Figure 8 Install the Pump Housing

17.6 Completing the Reassembly of the Spare Parts

After completing the installation and before switching on the pump, carry out the following steps:

1. Check that all previously loosened threaded connections are tight (→ Appendix A - 11.3 Tightening Torques).
2. Check that all previously removed protective devices and covers have been replaced properly.
3. Check that all tools, materials and other equipment used have been removed from the work area.
4. Make sure that the work area was cleaned as per local safety regulations.
5. Make sure the pump and all levels control are installed correctly. (→ 5 Installation and Connection)