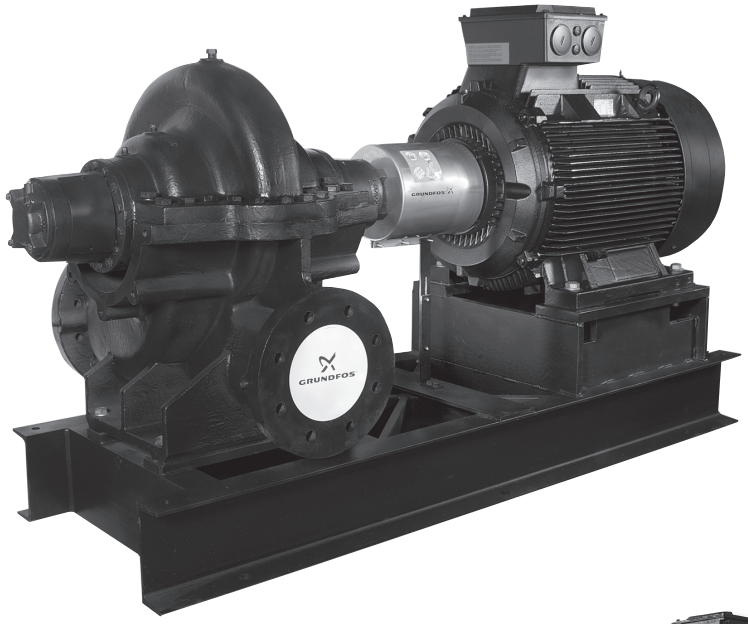
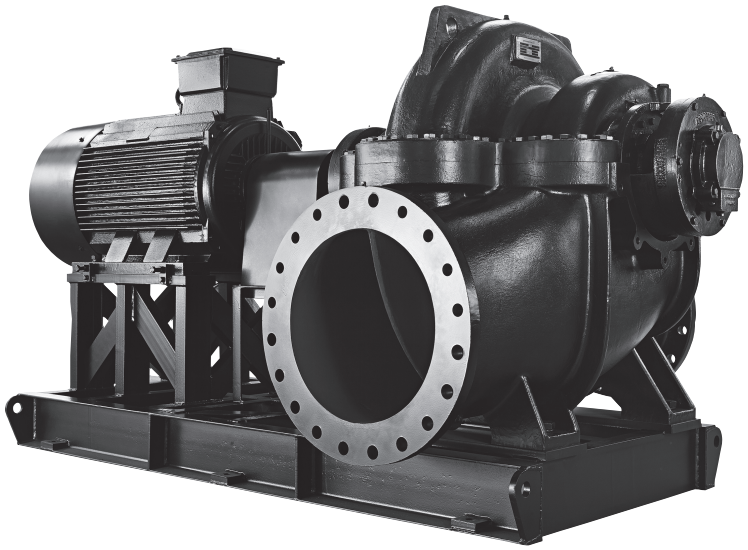
LS

Service instructions





GRUNDFOS

LS

English (GB)

Original service instructions

Table of contents

1. General information

1.1 Hazard statements

The symbols and hazard statements below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.

DANGER
Indicates a hazardous situation which, if not avoided, will result in death or serious personal injury.

WARNING
Indicates a hazardous situation which, if not avoided, could result in death or serious personal injury.

CAUTION
Indicates a hazardous situation which, if not avoided, could result in minor or moderate personal injury.

The hazard statements are structured in the following way:

SIGNAL WORD
Description of the hazard
Consequence of ignoring the warning
- Action to avoid the hazard.

1.2 Notes

The symbols and notes below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.

Observe these instructions for explosion-proof products.

A blue or grey circle with a white graphical symbol indicates that an action must be taken.

A red or grey circle with a diagonal bar, possibly with a black graphical symbol, indicates that an action must not be taken or must be stopped.

If these instructions are not observed, it may result in malfunction or damage to the equipment.

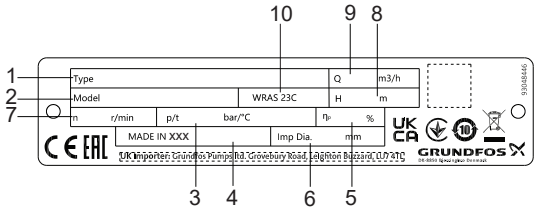
Tips and advice that make the work easier.

Please ensure that the safety instructions and I&O documentation are prepared on your end before commencing the service work.

2. Identification

2.1 Nameplate

The nameplate on the pump gives the details of the pump.



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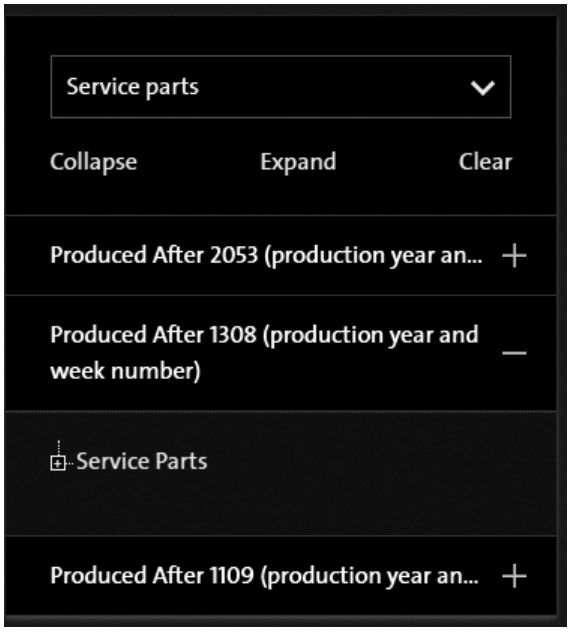
Nameplate of LS/LSV pump

Pos.	Description
1	Type
2	Model
3	Pressure rating and maximum temperature
4	Country of production
5	Hydraulic pump efficiency at optimum efficiency point
6	Impeller diameter [mm]
7	Speed of rotation [r/min]
8	Pump head at rated flow rate [m]
9	Rated flow rate [m^3/h]
10	Drinking water approval

2.1.1 Looking up service parts in Grundfos Product Center

- Check the production code (PC code) on the nameplate before looking up service parts in Grundfos Product Center.
- The production code contains a year and week code which is used to ensure that correct service parts are selected.
- This is used when new service part/s cannot be used on previous models.
  - Example 1: Pump has a year-week code 1748. This means that the pump is "produced after 1308" (and before 2053) The service parts list "produced after 1308" must be used.
  - Example 2: Pump has a year-week code 2142. This means that the pump is "Produced after 2053" and that this service parts list must be used.



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Find your Grundfos Product Center here:

2.1.2 Looking up service parts in Service Kit Catalogue

Extra service information can be found in the Service Kit Catalogue compared to the service information in Grundfos Product Center - such as:

- Full overview of service architecture including material variants.
- Small kit exploded view drawings with position numbers explain the bill of material of the service parts in details.
- If service is not available when searching product PN in Grundfos Product Center, the service parts can be found by looking into the type designation.
- No need for internet access with physical catalogue. PDF file can be downloaded to smart devices.

Find your Service Kit Catalogue here:

Service Kit Catalogues can be found in Grundfos Product Center.

2.2 Type key

Example: LS(V)125-100-305X,(W) 1F1DS BBQE 1											
Pos.	1	2	3	4	5	6	7	8	9	10	11
Example	LS(V)	125	-100	-305X	,(W)	1	F1	D	S	BBQE	1

Pos.	Code	Explanation
1	LS(V)	**Type range** LS: Horizontal version LSV: Vertical version
2	125	**Nominal diameter of inlet port (DN)**
3	-100	**Nominal diameter of outlet port (DN)**
4	-305X	**Nominal impeller diameter [mm]** If suffix "X" is used, the impeller or construction design is different, e.g. A, B, C,...Z. If suffix "X2" is used, the impeller is a double-stage impeller.
5	,(W)	**Drinking water approval (optional)** ACS or WARS certified pump
6	1	**Pump variant** 1: Grease-lubrication For LS, pump with motor, common base frame and non-spacer coupling For LSV, pump with motor, base frame, motor stool and non-spacer coupling
		2: Grease-lubrication For LS, bare shaft pump with common base frame, non-spacer coupling For LSV, bare shaft pump with base frame, motor stool and non-spacer coupling
		3: Grease-lubrication For LS, bare shaft pump For LSV, bare shaft pump with base frame
		4: Grease-lubrication For LS, pump with motor, separated base frame and spacer coupling For LSV, pump with motor, base frame, motor stool and spacer coupling
		5: Grease-lubrication For LS, pump with separated base frame and spacer coupling For LSV, bare shaft pump with base frame, motor stool and spacer coupling
		6: Oil-lubrication LS pump with motor, common base frame and non-spacer coupling
		7: Oil-lubrication LS bare shaft pump with common base frame and non-spacer coupling
		8: Oil-lubrication LS bare shaft pump
		9: Oil-lubrication LS pump with motor, separated base frame and spacer coupling
		A: Oil-lubrication LS bare shaft pump with separated base frame and spacer coupling
		X: Special variant
7	F1	**Code for pipe connection** F1: 10 bar, DIN PN 10 F2: 16 bar, DIN PN 16 F3: 25 bar, DIN PN 25 XX: Special flange G1: 175PSI(12 bar), ANSI125LB/150LB G2: 250PSI(17.2 bar), ANSI250LB/300LB G3: 400PSI(27.6 bar), ANSI250LB/300LB
8	D	**Code for shaft and sleeve materials** D: SS420 and no sleeve E: SS304 and no sleeve J: SS316 and no sleeve L: Duplex stainless steel and no sleeve X: Special B: SS420 and bronze A: SS420 and SS304 C: SS420 and SS316 K: Duplex stainless steel and duplex stainless steel Q: Alloy steel and no sleeve M: Alloy steel and bronze N: Alloy steel and SS304

Pos.	Code	Explanation
9	S	**Code for pump casing and impeller materials** B: Cast iron and bronze S: Cast iron and SS304 C: Cast iron and SS316 D: Cast iron and duplex stainless steel U: SS304 and SS304 K: Duplex stainless steel and duplex stainless steel X: Special A: Ductile iron and bronze Q: Ductile iron and SS304 G: Ductile iron and SS316 H: Ductile iron and duplex stainless steel J: SS316 and SS316 E: Cast steel and SS304 F: Cast steel and SS316
10	BBQE	**Code for shaft seals or stuffing box** BAQE: Rubber bellows unbalance seal, carbon [1], SiC, EPDM AAQE: O-ring unbalance seal, carbon [1], SiC, EPDM DAQE: O-ring balance seal, carbon [1], SiC, EPDM SAQE: Rubber bellows balance seal, carbon [1], SiC, EPDM BBQE: Rubber bellows unbalance seal, carbon [2], SiC, EPDM ABQE: O-ring unbalance seal, carbon [2], SiC, EPDM DBQE: O-ring balance seal, carbon [2], SiC, EPDM SBQE: Rubber bellows balance seal, carbon [2], SiC, EPDM BQQE: Rubber bellows unbalance seal, SiC, SiC, EPDM AQQE: O-ring unbalance seal, SiC, SiC, EPDM DQQE: O-ring balance seal, SiC, SiC, EPDM SQQE: Rubber bellows balance seal, SiC, SiC, EPDM BBVP: Rubber bellows seal, carbon [2], aluminium oxide, nitrile rubber SNEK: Stuffing box with synthetic polymer packing rings, uncooled, with internal barrier fluid BAQV: Rubber bellows unbalance seal, carbon [1], SiC, FKM AAQV: O-ring unbalance seal, carbon [1], SiC, FKM DAQV: O-ring balance seal, carbon [1], SiC, FKM SAQV: Rubber bellows balance seal, carbon [1], SiC, FKM BBQV: Rubber bellows unbalance seal, carbon [2], SiC, FKM ABQV: O-ring unbalance seal, carbon [2], SiC, FKM DBQV: O-ring balance seal, carbon [2], SiC, FKM SBQV: Rubber bellows balance seal, carbon [2], SiC, FKM BQQV: Rubber bellows unbalance seal, SiC, SiC, FKM AQQV: O-ring unbalance seal, SiC, SiC, FKM DQQV: O-ring balance seal, SiC, SiC, FKM SQQV: Rubber bellows balance seal, SiC, SiC, FKM
11	1	**Direction of rotation** (Pump direction of rotation as seen from motor end) 1 Clockwise 2 Counterclockwise

1) Metal-impregnated (antimony, not approved for potable water).

2) Resin-impregnated (approved for potable water).

The example shown is an LS 125-100-305F, standard type with standard coupling, DIN PN 10 flange, cast iron pump casing with SS304 impeller, BBQE mechanical shaft seal and clockwise direction of rotation.

2.2.1 Codes for mechanical shaft seal

Positions (1) - (4) cover four pieces of information about the mechanical shaft seal:

	Information for example
(1)	Grundfos type designation
(2)	Material, rotating seal face
(3)	Material, stationary seat
(4)	Material, secondary seal and other rubber and composite parts

The following table explains the positions (1), (2), (3) and (4).

Pos.	Code	Short description of seal
(1)	A	O-ring seal, unbalanced
	B	Rubber bellows seal, unbalanced
	D	O-ring seal, balanced
	S	Rubber bellows seal, balanced
	H	Cartridge seal, balanced
Pos.	**Code**	**Material**
(2) and (3)	A	Carbon, metal-impregnated (antimony, not approved for potable water)
	B	Carbon, resin-impregnated (approved for potable water)
	Q	Silicon carbide
	U	Tungsten carbide
	V	Aluminium oxide
Pos.	**Code**	**Material**
(4)	E	EPDM
	P	Nitrile rubber (NBR)
	V	FKM (Viton®)

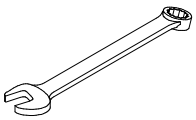
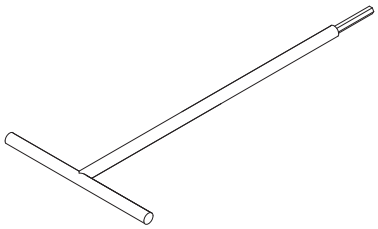
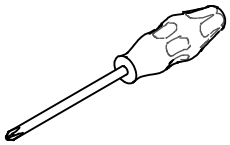
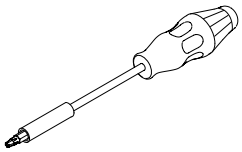
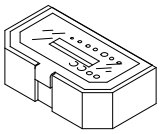
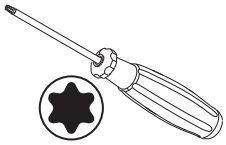
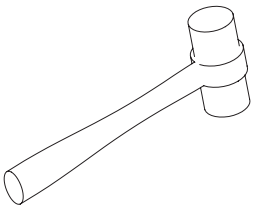
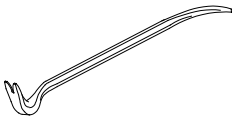
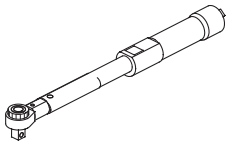
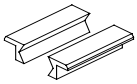
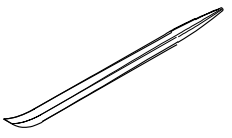
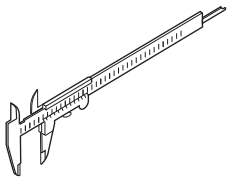
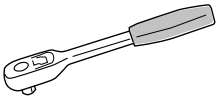
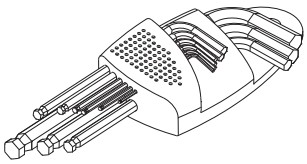
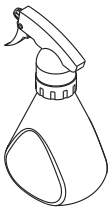
For other mechanical shaft seal variants, please contact Grundfos.

2.2.2 Codes for stuffing box

Pos.	Code	Short description of stuffing box
1	S	Stuffing box with packing rings
2	N	Uncooled stuffing box
3	E	With internal barrier fluid
4	K	Synthetic polymer packing rings, graphite impregnated. NBR O-ring in the pump

3. Service tool

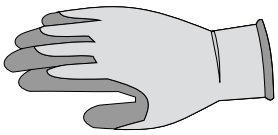
3.1 Standard tools

			
Ring/open-end spanner	Hexagon T-key	Cross-recess screwdriver	Reversible-bit screwdriver
			
Bits kit	Torx Screwdriver	Plastic hammer	Pry bar
			
Torque wrench	Gauge for inner diameter measurement of wear ring	Soft jaws	Pinch bar
			
Sliding gauge	Ratchet spanner with socket	Hexagon key set	Steel brush
			
Sprayer			

3.2 Personal Protective Equipment

Safety shoes

Safety helmet

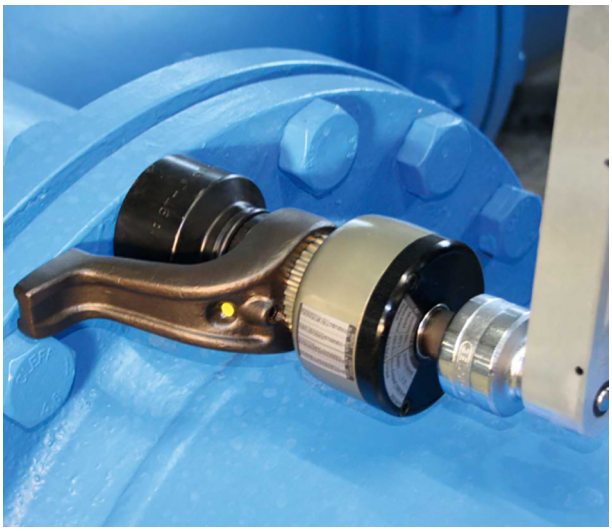


Safety gloves

3.3 Special tool

A torque multiplier is a tool to provide a mechanical advantage in applying torque to turn bolts, nuts or other items designed to be actuated by application of torque, particularly where there are relatively high torque requirements.

We recommend using a torque multiplier where torque requirements are higher than 500 Nm.



TM089237

Torque multiplier

4. Servicing the product

4.1 Contaminated pumps

CAUTION
Biological hazard
Minor or moderate personal injury
- Flush the pump thoroughly with water and rinse the pump parts in water after dismantling.

The product will be classified as contaminated if it has been used for a liquid which is injurious to health or toxic.

If you request Grundfos to service the product, contact Grundfos with details about the liquid before returning the product for service. Otherwise, Grundfos can refuse to accept the product for service.

Any application for service must include details about the liquid.

Clean the product in the best possible way before you return it.

Costs of returning the product are to be paid by the customer.

4.2 Operating checks

1. Check the pump and pipes for leaks.

CAUTION
High sound pressure level
Minor or moderate personal injury
- Use hearing protection.

2. Check and record the pressure gauge readings for future reference.
3. Check the differential pressure. If the differential pressure is lower than anticipated, the motor may be overloaded. We recommend that you install pressure gauges on the pump inlet and outlet flanges.
4. Measure the motor current consumption and compare the result with the rated current stated on the motor nameplate. In case of overload, throttle the outlet isolating valve or throttle valve until the motor is no longer overloaded.
5. Check the bearings for lubrication and temperature. Normal temperature is 70 °C (158 °F). The maximum temperature depends on the type of lubrication. See the lubricating plate on the pump.

Stop the pump immediately if you notice any defects.

Do not start the pump unless the defects have been remedied. See section Identification. Report immediately to the supplier that you cannot remedy the defects.

The operating checks apply both during the startup procedure and when checking the pump during normal operation.

4.3 Maintaining the product

DANGER
Electric shock
Death or serious personal injury
- Before starting work on the pump, make sure that the power supply has been switched off and that it cannot be accidentally switched on.

WARNING
Hot or cold surface
Death or serious personal injury
- Pay attention to the direction of the vent hole, and ensure that the escaping water does not cause injury to persons or damage to the motor or other components.
- In hot-water installations, pay special attention to the risk of injury caused by scalding hot water and hot surfaces.
- In cold-liquid installations, pay special attention to the risk of injury caused by cold liquids and cold surfaces.

WARNING
Crushing of hands
Death or serious personal injury
- Make sure the product won't tilt and fall down during transportation, installation and unloading.
- The unsecured pump must be placed on horizontal plane to prevent it from tilting and fall down.

4.3.1 General information

Routine maintenance is essential to maintain the pump in a good condition.

A high degree of cleanliness must be maintained during all maintenance procedures.

4.3.2 Frequency of inspections

Carry out inspections in accordance with the maintenance table below.

Depending on operating and environmental conditions together with a comparison of previous inspections, the frequency of inspections may be altered to maintain satisfactory operation of the pump.

Every week	• Visually check for leaks. • Check for vibrations. • Hand test the bearing housing for any sign of temperature rise. • Check if the leakage of the stuffing box meets the standards, see on section Startup.
Every month	• Check the pump bearing temperature.
Every 6 months	• Check the shaft for scores. • Check the alignment of the pump and motor. • Check the fixing bolts and tighten, if necessary. • Check the coupling for wear.
Every year	• Check whether the grease in the pump bearings has hardened. • Check the rotating assembly for wear. • Check the wear ring clearances.

CAUTION
Sharp element
Minor or moderate personal injury
- Wear protective gloves to protect yourself against sharp edges on the impeller and wear rings.

Between the regular maintenance inspections, be aware of signs of motor or pump trouble.

Common symptoms are listed in section Fault finding the product.

Remedy any fault immediately and avoid costly repairs and shutdowns.

Related information

12. Fault finding the product

4.3.3 Lubrication

Grease specifications: See section Ball bearing grease.

Pump bearings

Pump bearings are lubricated before delivery.

We recommend relubricating intervals of 2000 operating hours. However, depending on duty conditions, this may vary.

To refill the bearings with fresh grease, follow this procedure:

1. Remove the bearing cap.
2. Add enough grease to fill up 1/2 of the ball bearing.
3. Write down the quantity required.
4. Refit the bearing cap.

Grease quantity

Inlet size	Grease quantity [g]
DN 65 to DN 100	11
DN 125 to DN 150	17
DN 200 to DN 300	25
DN 350 to DN 450	50

Repeat this procedure the first three times. Based on the first three relubrications, determine the correct quantity of grease required.

For future relubrications, apply the established quantity of grease through the lubricating nipples. You do not have to remove the bearing caps.

For every 10,000 operating hours or every two years:

1. Remove the bearing caps from the pump.
2. Remove old grease.
3. Thoroughly clean the bearing caps.
4. Refill the bearings with fresh grease.
5. Refill the bearing caps completely with fresh grease.
6. Refit the bearing caps in accordance with the assembly instructions.
7. Start the pump briefly several times to distribute the grease in the bearings and to prevent overheating of the grease.

Do not overgrease.
Too much grease can cause overheating and premature bearing failure.

Motor bearings

Lubricate the motor bearings in accordance with the indications on the motor nameplate.

Ball bearing grease

Manufacturer	Lubricant
Shell	Gadus S2 V2202#reference_8ss_0cc_ud1/fn1
SKF	LGHP 2#reference_8ss_0cc_ud1/fn1
Exxon	Polyrex
Chevron	SRI grease NLGI 2
	Black pearl NLGI 2
Philips	Polytac
Texaco	Polystar RB

[3] Grundfos recommends Shell Gadus S2 V2202 or SKF LGHP 2 grease for relubrication.

Grid coupling

A grid coupling must be regreased at intervals. Normally, the interval is one year, but it can be shorter if the environment is aggressive or the operating conditions are harsh. Use the same grease for the coupling as for the ball bearings. See section Ball bearing grease.

Proceed like this:

1. Remove the coupling guards.
2. Remove the two lubricating plugs.

3. Pump grease into one of the lubricating holes to push the old grease out of the opposite hole.
4. Keep pumping until the fresh grease comes out.
5. Refit and fasten the two plugs.
6. Mount the coupling guards again.

5. Dismantling and assembling the product

5.1 General information

Before dismantling

- Disconnect the power supply to the motor.
- Close the isolating valves, if fitted, to avoid draining the system.
- Remove the electric cable in accordance with local regulations.

Before assembly

- Clean and check all parts.
- Replace defective parts by new parts.
- Order the necessary service kits.
- Always replace the gaskets and O-rings when the pump is serviced.

During assembly

Lubricate and tighten the screws and nuts to the correct torque. See section Tightening torques.

Related information

2.1.2 Looking up service parts in Service Kit Catalogue
8. Standard components and material specifications

5.2 Dismantling the pump without sleeve

5.2.1 Preparation

1. Find the service tools listed in section Service tools.

TM088674

2. Bearing assemble tool can also be used for shaft seal assemble.

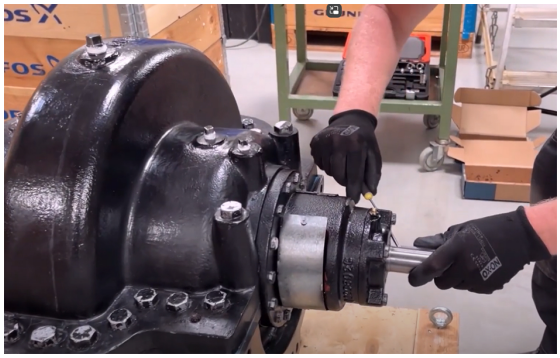
TM088675

3. For pump service, see the nameplate on the pump.

TM088676

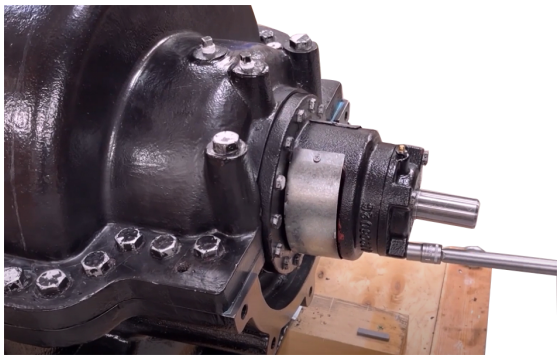
5.2.2 Removing the bearings

1. Remove the shaft key.



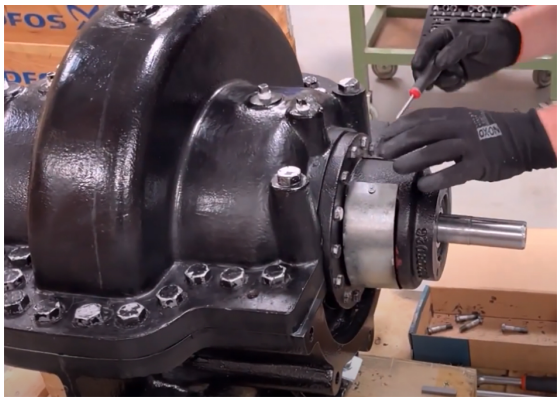
TM088677

2. Remove the four screws holding the bearing cover.



TM088678

3. Remove the shaft guards.

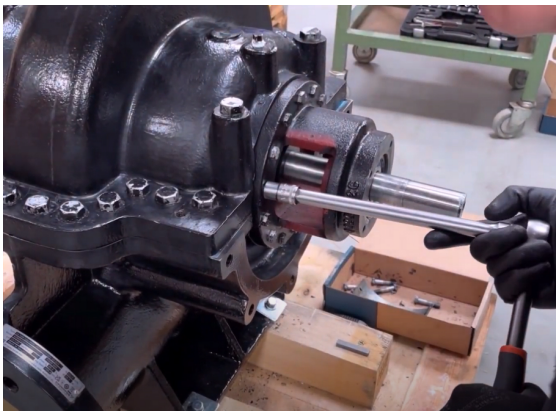


TM088680

4. Before dismantling, make a control measure of the drive-end shaft.

TM088681

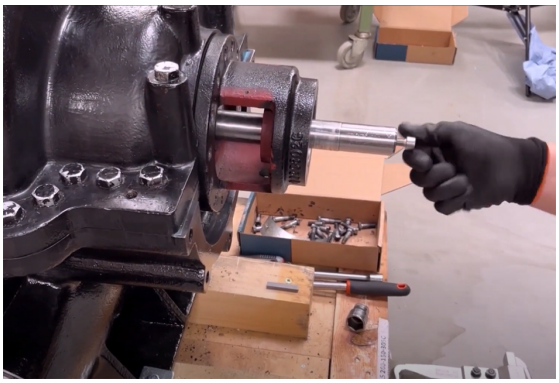
5. Remove the screws securing the seal housing.



TM088682

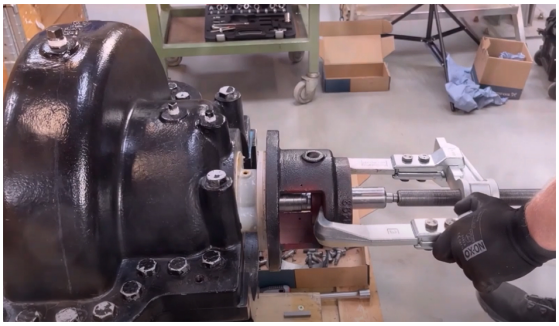
6.

Install a protecting screw to the shaft before using a puller.



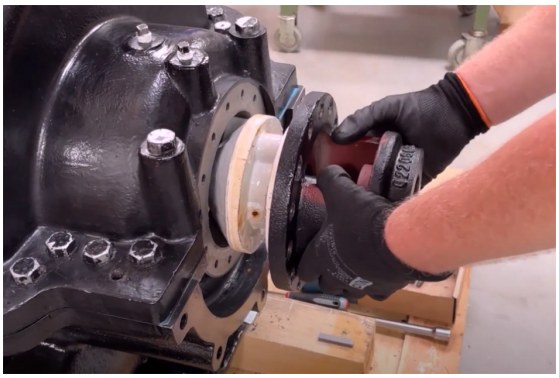
TM088683

7. Use a puller to remove the seal housing from the shaft.



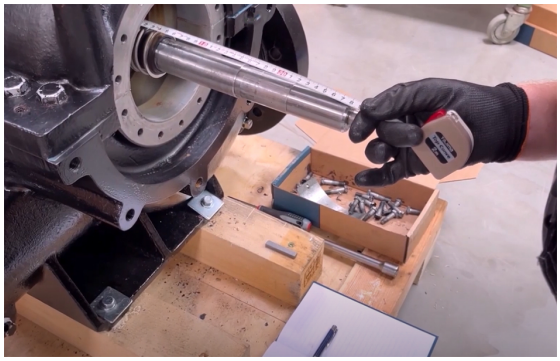
TM088684

8. Carefully remove the seal housing and catch the slinger.



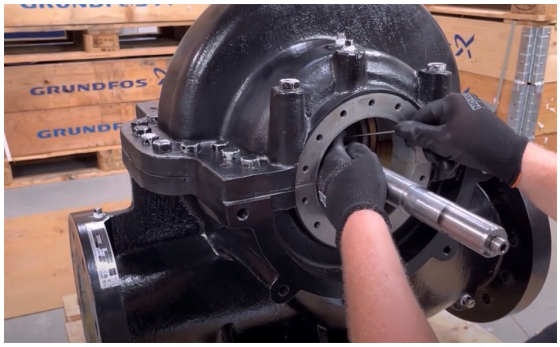
TM088685

9. Measure and record the distance from the end of shaft to the shaft seal.

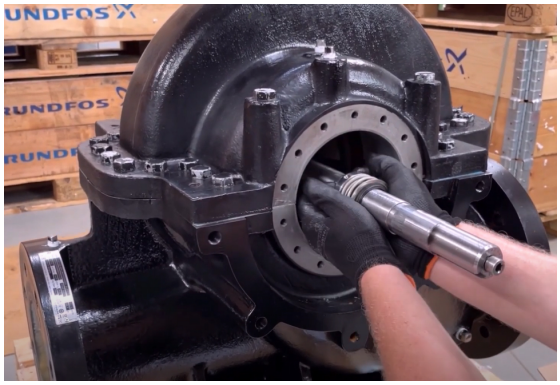


TM088686

10. Loosen the seal retaining ring and pull out the shaft seal.

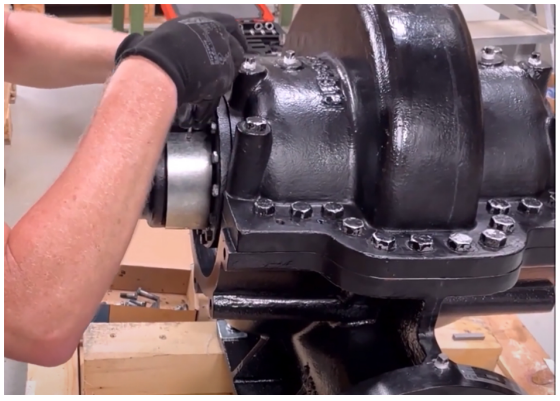


TM088687



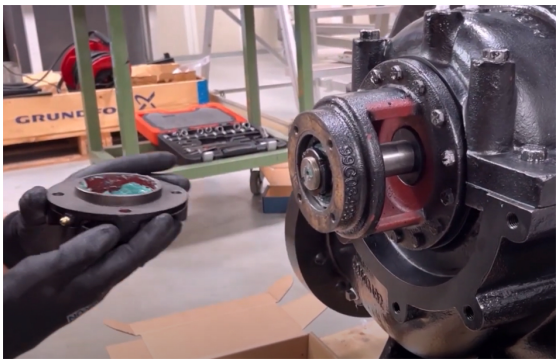
TM088688

11. Dismantle the components on the non-drive end the same way as the drive-end.



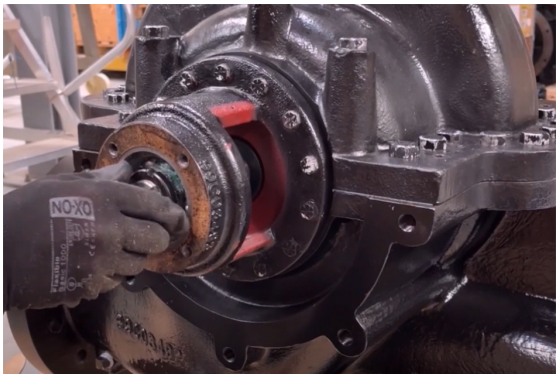
TM088689

12. Check the old grease to determine the pump condition.



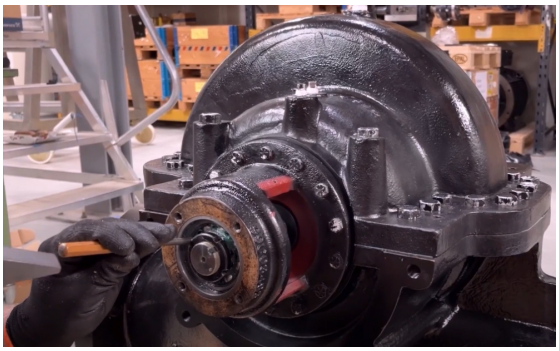
TM088690

13. Adjust the lock washer to allow the round nut to be loosened.



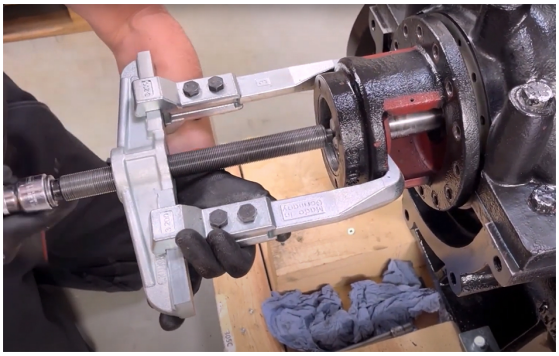
TM088691

14. Remove the lock washer and round nut.



TM088692

15. Use a puller to remove the seal housing from the shaft.



TM088693

16. Remove the seal housing from the non-drive end in the same way as you do from the drive-end.

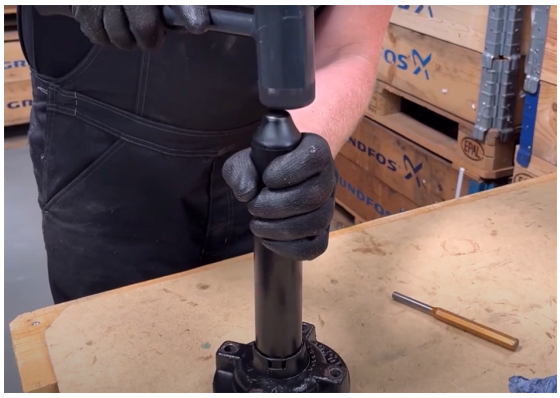
17. Pull the bearing out of the seal housing (depends on variants) and make sure to catch the spacer washer behind.

TM088697

18. Remove the old grease.

TM088699

19. Use the bearing tool to remove the lip seal, which will protect the seal during disassembly.



TM088700

20. Inspect and install the lip seal, replacing it with a new one if necessary.

TM088698

21. Use locally approved lubricants (example: Rocol sapphire aqua SIL).

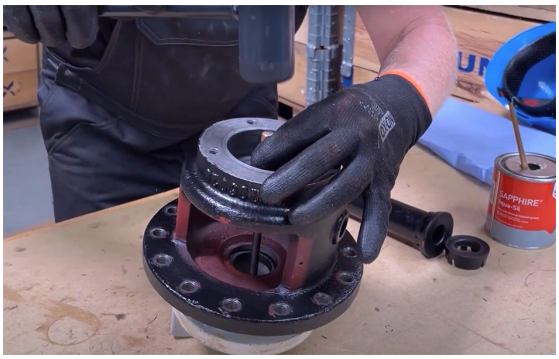
TM088701

22. Lubricate the seal with new grease, see service instruction for grease type.

TM088702

5.2.3 Removing the shaft seal

1. Pull out the stationary shaft seal carefully.



TM088703

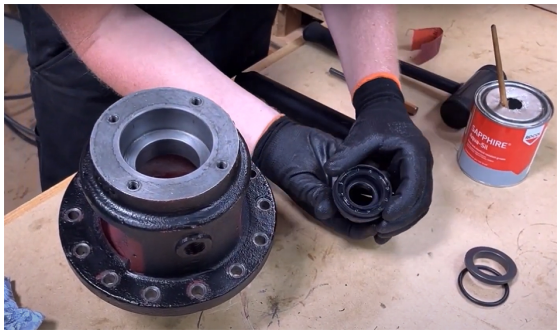
2. Use the bearing tool to remove the lip seal, which will protect the seal during disassembly.

TM088704

3. Clean and inspect the seal housing before assembling the other components.

TM088705

4. Inspect and install the lip seal, replacing it with a new one if necessary.



TM088706

5. Use locally approved lubricants (example: Rocol sapphire aqua SIL).

TM088707

6. Make sure the lip seal is mounted correctly, with the open end facing out.

TM088708

7. When the end of the bearing tool is wider than the lip seal, it will be positioned correct.

TM088709

8. Use locally approved lubricants (example: Rocol sapphire aqua SIL) or soapy water.

9. Use the bearing tool to position the stationary shaft seal part.

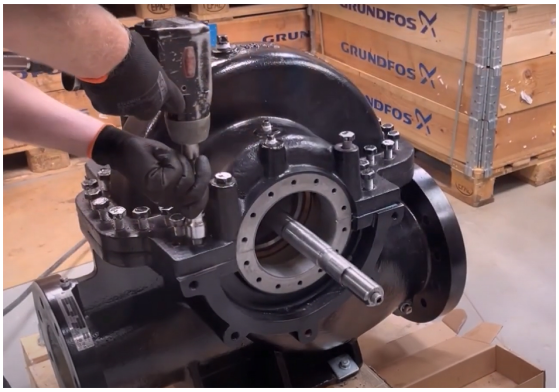
TM088713

5.2.4 Removing the upper pump housing

1. Use a thread tap to clean the threads of rust and paint.

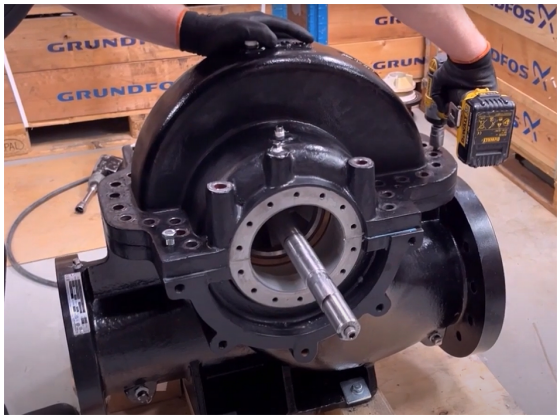
TM088715

2. Loosen the screws securing the upper pump housing.



TM088716

3. Loosen the upper pump housing using jacking screws (inch thread).



TM088717

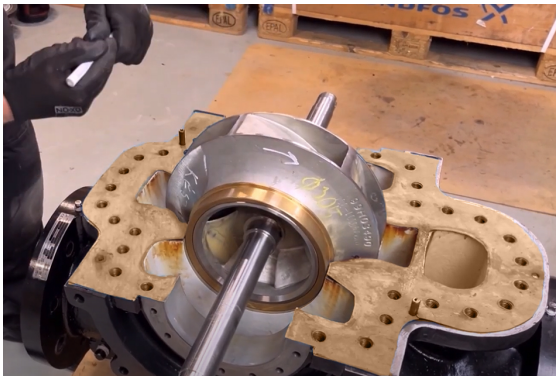
4. Fit approved lifting eyes and lift off the upper pump housing.

TM088718

Be careful not to damage the guide pins.

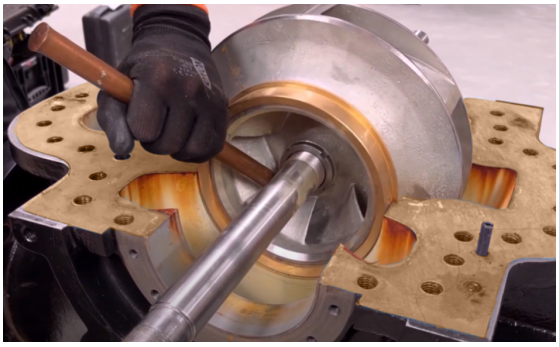
5.2.5 Removing the shaft, impeller and gasket

1. Mark the direction of impeller rotation.



TM088719

2. Use a solid punch (soft material such as brass) to loosen the round nuts for securing the impeller.



TM088721

3. Loosen only the inner round nut and leave it in place for support.

TM088722

4. Notice the pins for wear rings.

TM088723

Pay attention to the condition and wear on the wear rings and impeller.

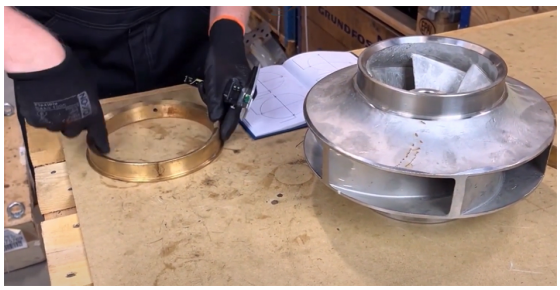
5. Remove the inner round nut from the shaft.

TM088724

6. Push the shaft out of the impeller and inspect for wear and marks.

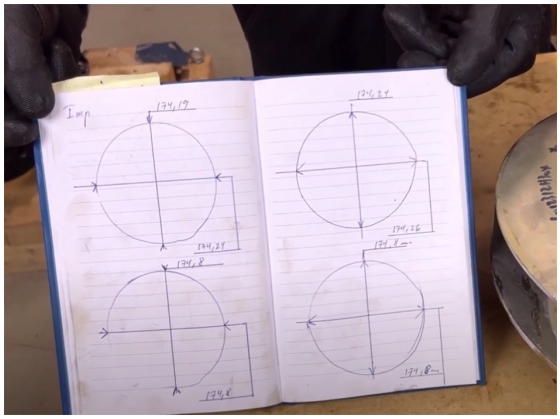
TM088725

7. Check the gap between wear rings and impeller.



TM088726

8. Maximum gap values can be checked with guidelines in section Gap between impeller and wear ring of pump housing.



TM088727

9. Polish rusted surfaces and burrs with an emery cloth or steel brush.

TM088728

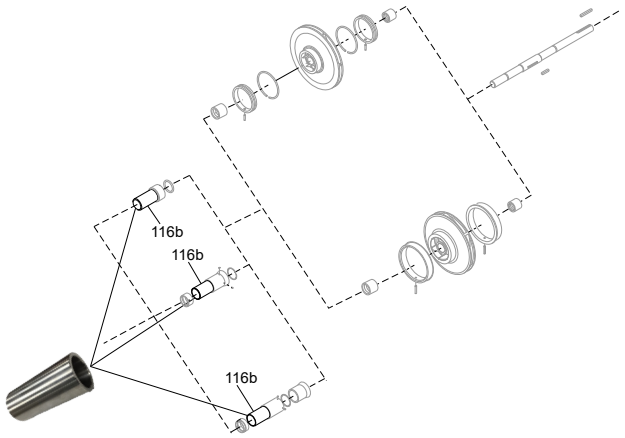
Related information

11.2 Gap between impeller and wear ring of pump housing

5.3 Dismantling the pump with sleeve

LS can be offered with sleeve and the service sequences of the pump with sleeve is the same as without sleeve. The sleeve is a wear part and can be ordered as a service part.

A shaft sleeve is a mechanical component shaped like a cylindrical sleeve installed between a rotating shaft and the shaft seal/bearing. The shaft sleeve acts as a wear-resistant tool, protecting the shaft surface to allow smooth operation by preventing abrasion, corrosion and contact with other interior pieces like bearings, seals and the impeller. When the shaft sleeve is worn, it can be replaced separately rather than replacing the entire shaft, thereby reducing costs. Its smooth and uniform surface lets it fit well with the rotating shaft, enhancing the sealing effect.



TM089240

Shaft sleeve

5.4 Assembling the pump without sleeve

5.4.1 Fitting the impeller and shaft

1. Clean and inspect the shaft and impeller before assembling.

TM088729

2. Use locally approved lubricants to lubricate impeller and shaft (example: Rocol sapphire aqua SIL).

TM088730

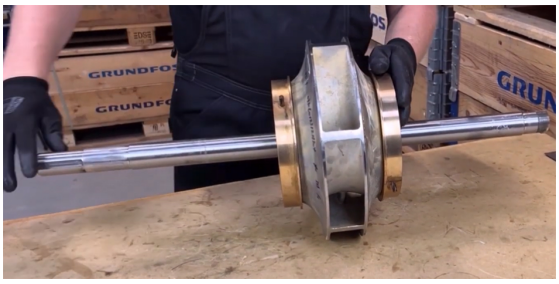
3. Install the shaft to impeller and make sure it fits to the impeller rotation.

TM088731

4. Install the inner round nut and tight it by hand.

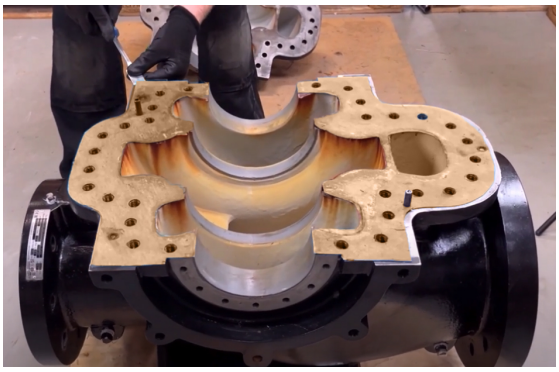
TM088732

5. Install the wear rings.



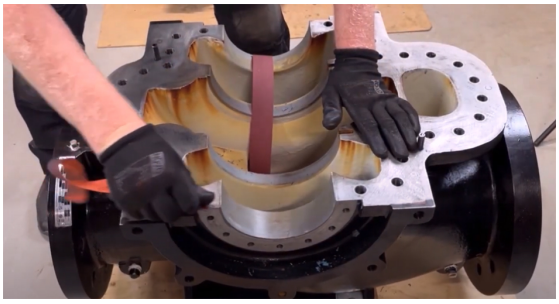
TM088733

6. Remove old gasket and clean the gasket surfaces.



TM088734

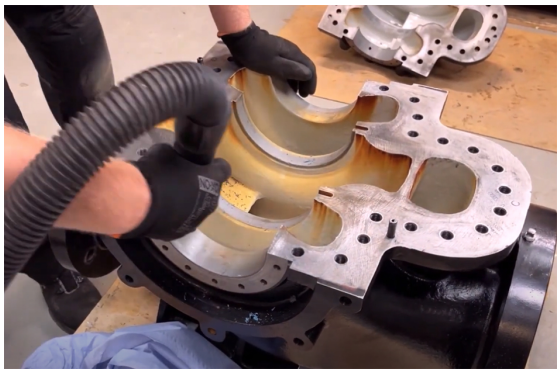
7. Polish rusted surfaces and burrs with an emery cloth.



TM088735

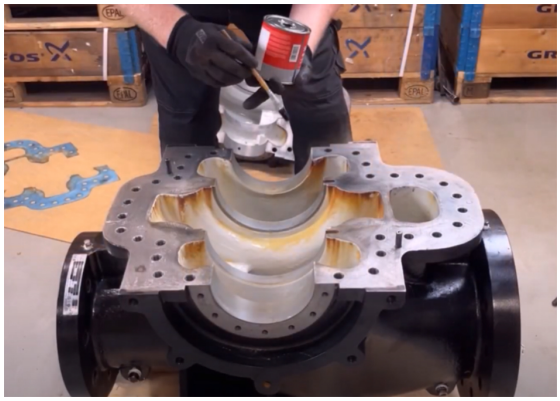
8.

Vacuums clean the lower pump housing and make sure that no water is trapped in the thread holes.



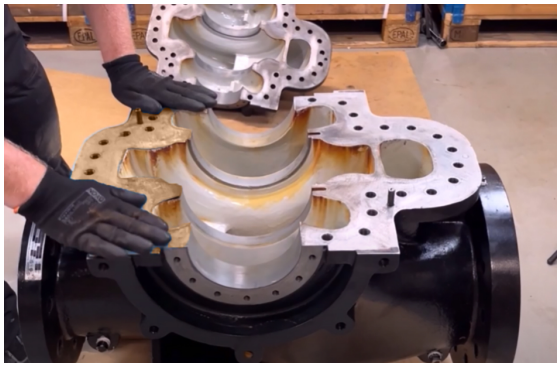
TM088737

9. Lubricate the lower and upper pump housing with locally approved lubricants.



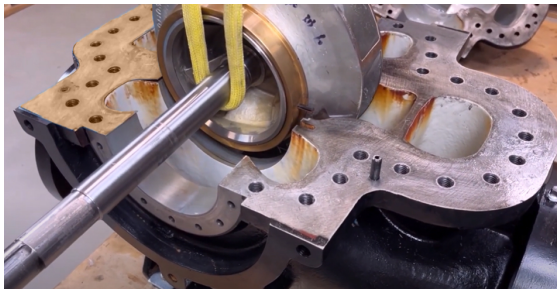
TM088736

10. Always fit new gaskets when servicing the pump.



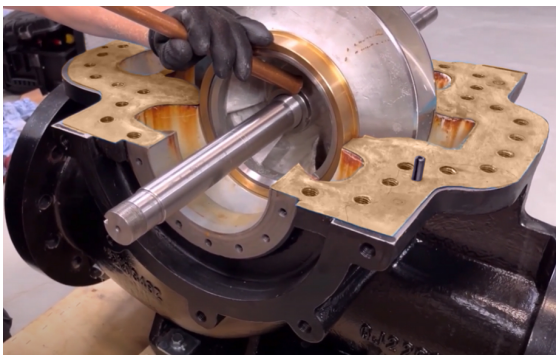
TM088738

11. Lower the shaft/impeller and make sure that the pins in the wear rings get in place.



TM088739

12. Tighten the round nuts for securing the impeller with a soft punch (brass).



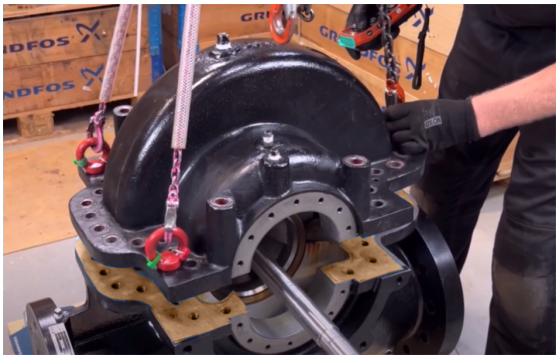
TM088740

13. Make sure that the shaft and impeller are in position.

TM088741

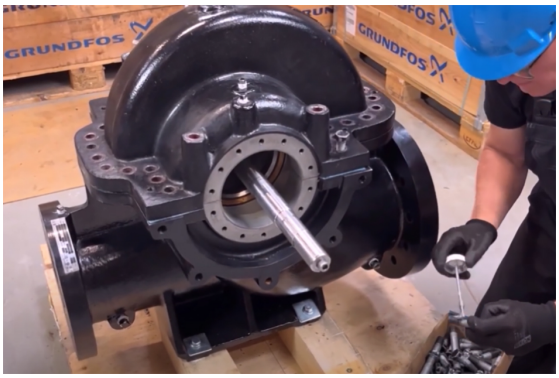
5.4.2 Fitting the upper pump housing and shaft seal

1. Lower the upper pump housing and make sure that the guide pins are in position.



TM088742

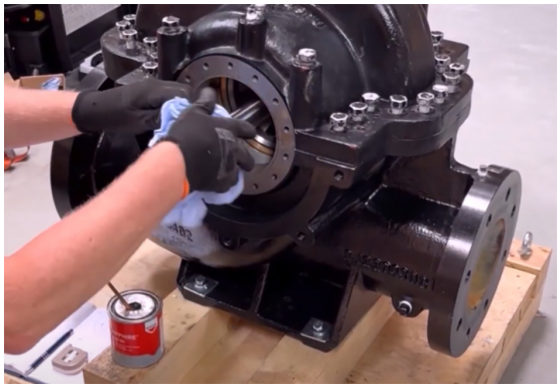
2. Install the pump housing screws and use locally approved thread lubricants (example: Never Seez).



TM088743

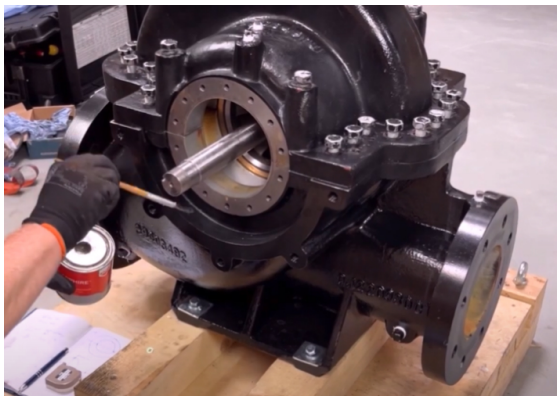
Must lubricate the area below the hex head and the thread.

3. Clean and install the shaft seal on the non-drive.



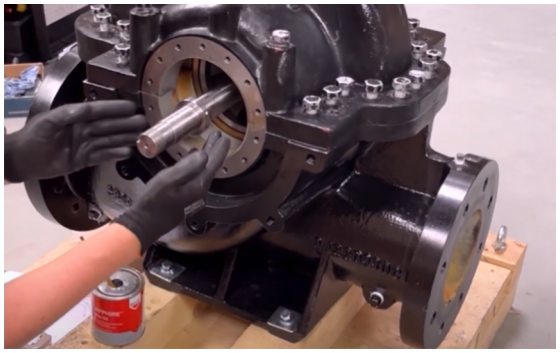
TM088744

4. Lubricate the shaft with locally approved lubricants or soapy water.



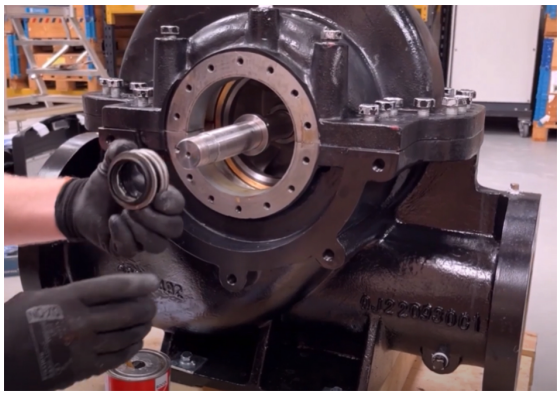
TM088745

5. Install the seal retaining ring.



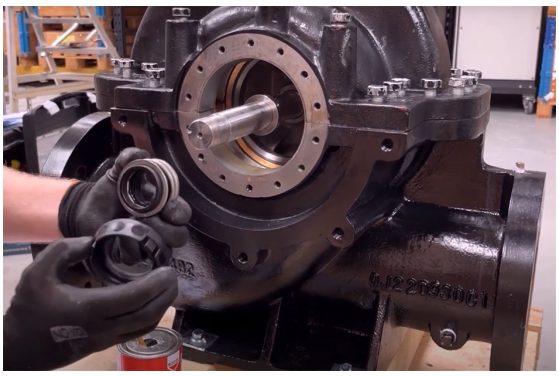
TM088746

6. Make sure not to touch the shaft seal surface.



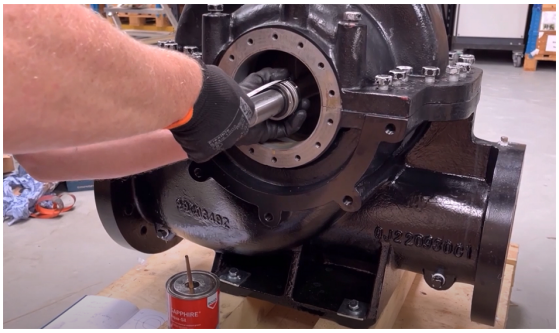
TM088747

7. Use the right size of bearing tool to push in the rotating seal part.



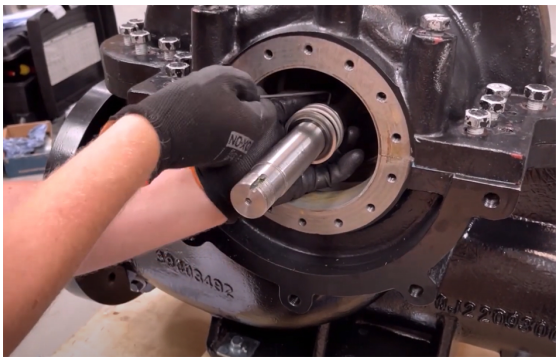
TM088748

8. Set the rotating shaft seal to the right position (measured when dismantled).



TM088749

9. Tighten the seal retaining ring.



TM088750

10. Install the shaft seal on the drive-end in the same way as the non-drive end.

5.4.3 Fitting the bearings

1. Lubricate the O-ring on the stationary shaft seal (Rocol sapphire aqua SIL).

TM088710

2. After installing the lip seal, install the stationary shaft seal. Make sure not to touch the stationary shaft seal surface.

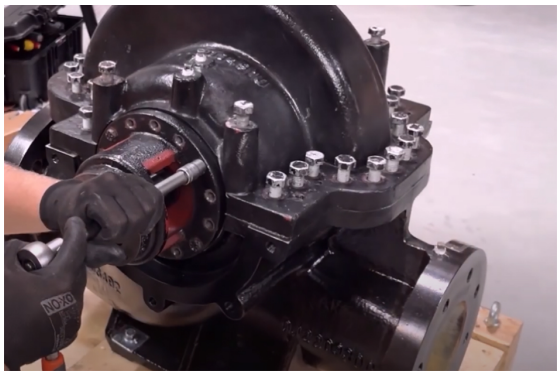
TM088712

3. Install the bearing house to the right end.

TM088751

4. Install the non-drive end bearing housing in the right position and make sure that the slinger gets in position.
5. Install the bearing housing with four screws.

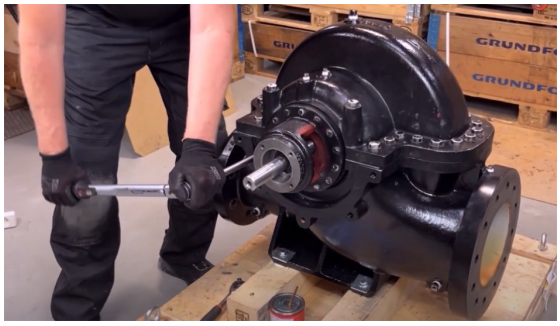
Hand-tighten the four screws to make sure that the upper pump housing is aligned



TM088752

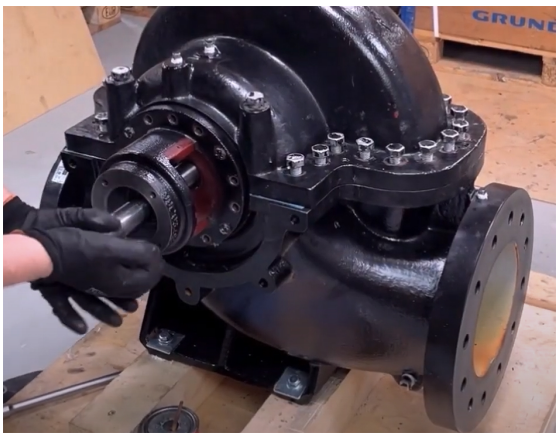
6. Install the drive end bearing housing in the right position and make sure that the slinger gets in position.
7. Install the bearing housing with four screws.

Hand-tighten to make sure that the upper pump housing is aligned



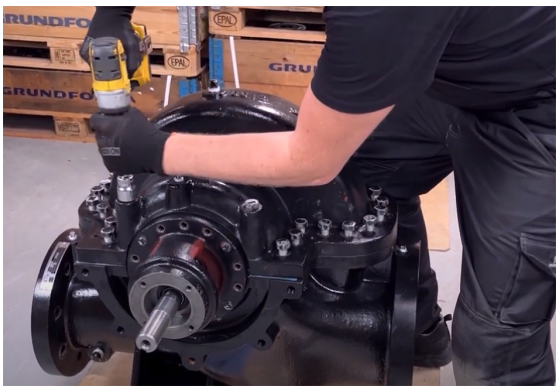
TM088756

8. Make sure that the shaft can move freely in both directions and with tension from the shaft seal springs.



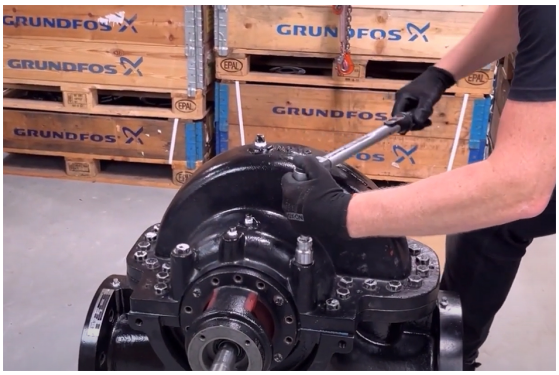
TM088753

9. Hand-tighten the screws before using torque tool.

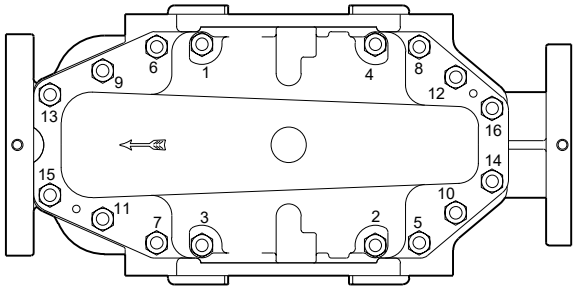


TM088754

10. Tighten the screws on the upper pump housing to the correct torque and right tighten order, see section Tightening torques.
11.



TM088755



TM041865

Tighten order

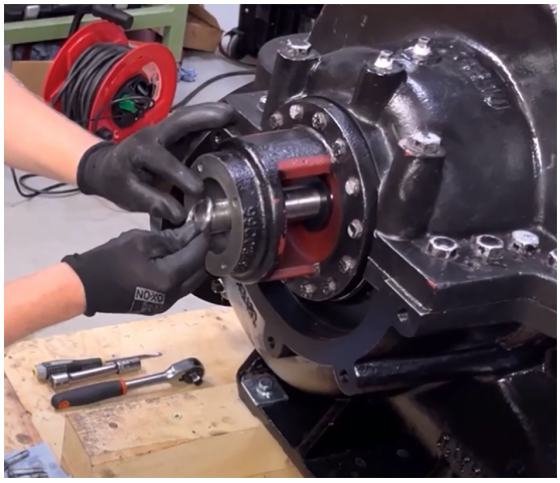
Install the rest of the bearing housing screw and tighten to the right torque, see section Tightening torques.

First, tighten the screws with 100 Nm. Then, adjust to the desired torque.

12. Take a final measurement of the drive-end shaft and compare it to the measurement taken before dismantling.

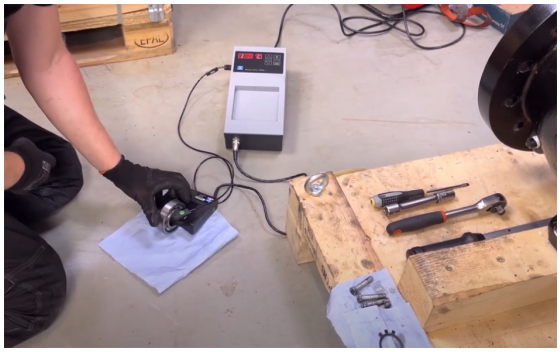
TM088757

13. Before assembling the bearing on non-drive end, install the spacer washer if fitted - depends on variants.



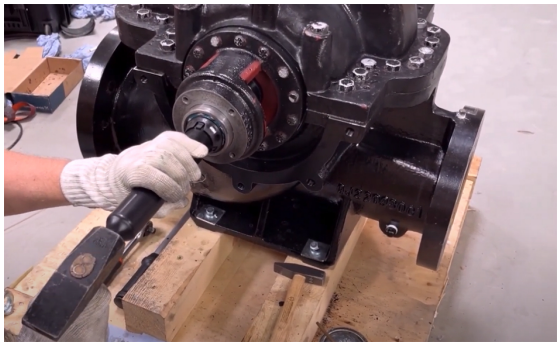
TM088758

14. Heat up the bearing to 110 °C with bearing heating inductor.



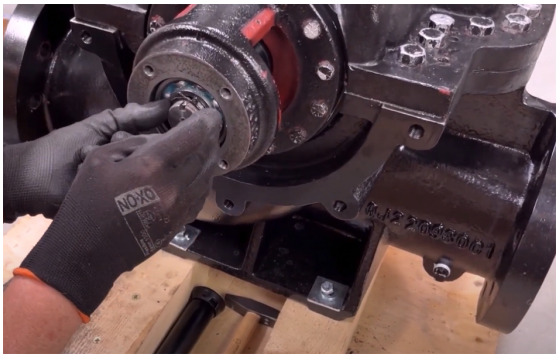
TM088759

15. Use bearing tool to push in the bearing in place.



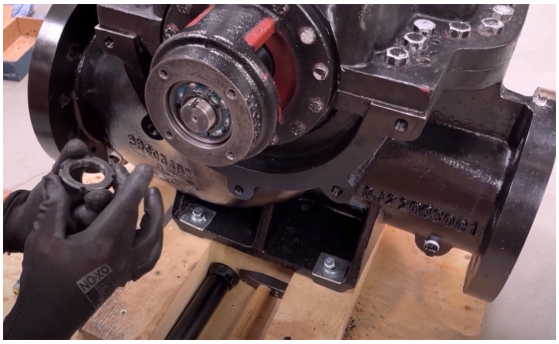
TM088760

16. Install the lock washer.



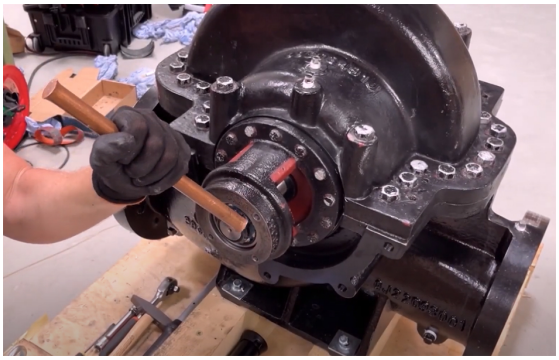
TM088761

17. Lubricate and install the round nut for bearing.



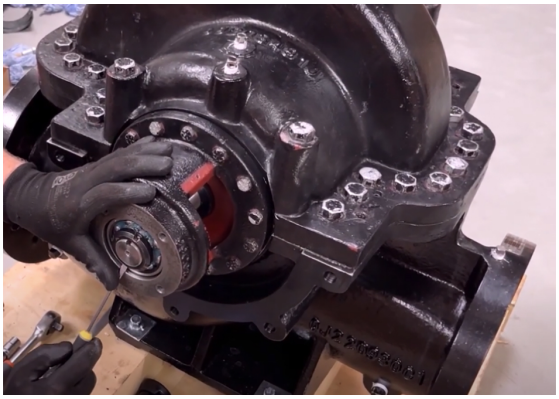
TM088762

18. Tighten the round nut for securing the bearing with a soft punch (brass).



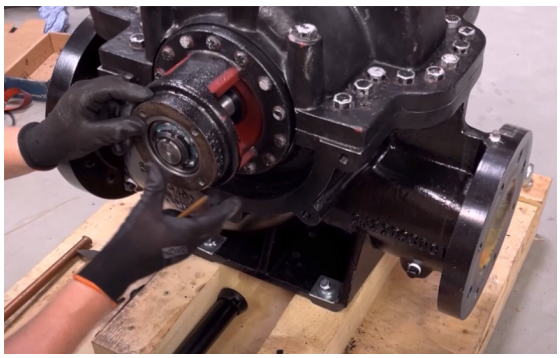
TM088763

19. Lock the round nut with the lock washer.



TM088764

20. Grease the gasket for the bearing cover, use locally approved lubricants (example: Rocol sapphire aqua SIL).

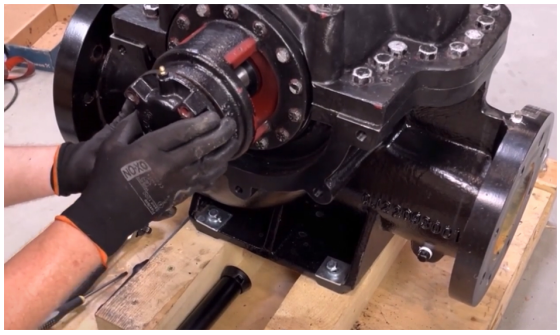


TM088765

21. Half fill the bearing cover with new grease, see section Ball bearing grease.

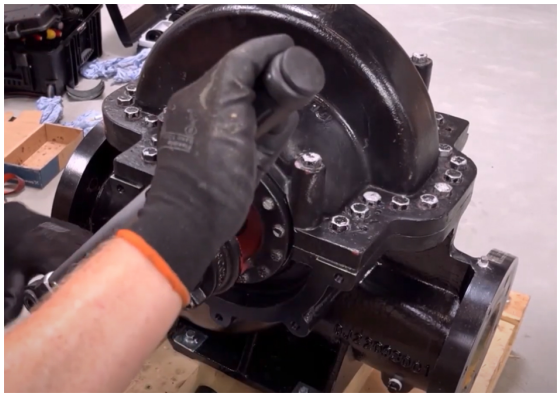
TM088766

22. Install the bearing cover and make sure the grease nipple points upwards.



TM088767

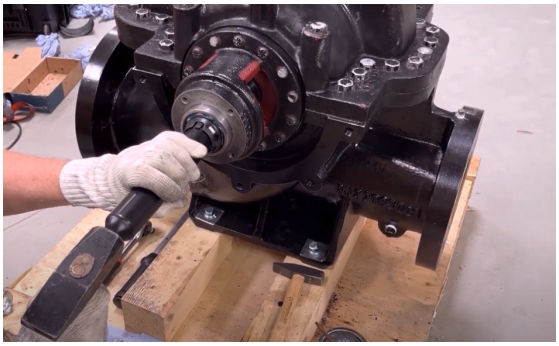
23. Tighten the screws to the correct torque, see section Tightening torques.



TM088768

24. Fitting the bearing on the drive-end in the same way as you did on the non-drive end.

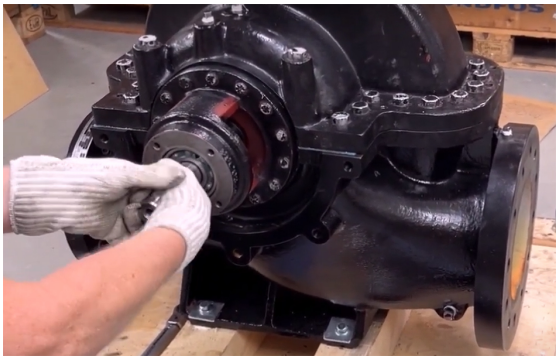
25. Use bearing tool to push in the bearing in place.



TM088760

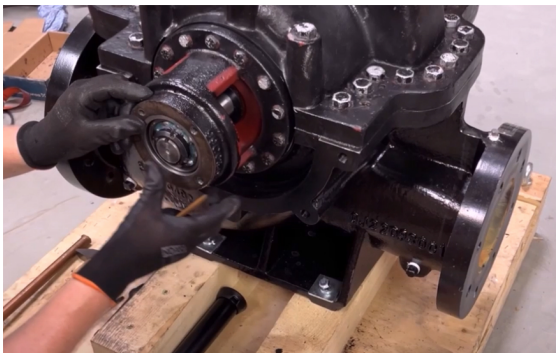
The sound of hammering changes when the bearing is in place.

26. Make sure that the shaft runs freely.



TM088769

27. Grease the gasket for the bearing cover, use locally approved lubricants (example: Rocol sapphire aqua SIL).



TM088765

28. Tighten the screws to the correct torque, see section Tightening torques.

29. Install the shaft guards.

TM088770

Related information

11.1 Tightening torques

5.5 Assembling the pump with sleeve

See section Dismantling the pump with sleeve.

Related information

5.3 Dismantling the pump with sleeve

6. Alignment

6.1 Preliminary alignment

DANGER
Electric shock
Death or serious personal injury
- Before starting work on the pump, make sure that the power supply has been switched off and that it cannot be accidentally switched on.

The pump and motor are pre-aligned on the base frame from the factory. Some deformation of the base frame may occur during transport and it is therefore essential to check alignment at the installation site before final grouting.

Inaccurate alignment results in vibration and excessive wear on the bearings, shaft and wear rings.

Carry out alignment of the motor only, as pipe strain will occur if the pump is shifted.

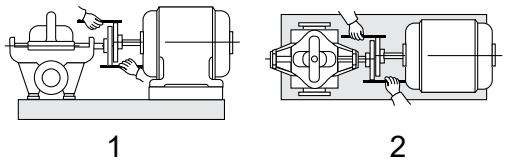
Carry out alignment of the motor by placing shims of different thickness under the motor. If possible, replace several thin shims with one thick shim.

The preliminary alignment procedure has four steps:

1. Check coupling clearance.
   Make sure that the gap between the coupling halves is equal to the values in the table and that the keyways are 180 ° displaced.

For a coupling with an outside diameter of ∅ [mm]	Coupling clearance [mm]	
	Nominal	Tolerance
∅90-213	3.2	0/-1
∅251-270	4.8	0/-1
∅306-757	6.4	0/-1

2. Check soft feet on pump and motor.
   A pump or a motor having a soft foot can be compared to sitting down at a table and finding that the table rocks when someone leans on it. Technically, it is a condition where the feet of a motor or a pump are not at the same level as the base plate.
   To check for soft foot, set the pump or motor on its base plate and bolt it down. Set a dial gauge on one foot, loosen the hold-down bolt, and watch the dial gauge. If the dial gauge indicator moves while loosening the bolt, the pump or motor has soft foot. The movement measured by the dial gauge indicates how many shims you need to level the pump or motor. Repeat this procedure at all four corners.
   If the pump was installed a long time ago, the stresses induced in the pump housing by soft foot can cause permanent deformation of the housing.
3. Check parallel alignment.
   Place a straight edge across both coupling rims at the top, the bottom and both sides. See figure Checking parallel alignment. After each adjustment, recheck all features of alignment. Parallel alignment is correct when the measurements show that all points of the coupling faces are within 0.2 mm of each other.



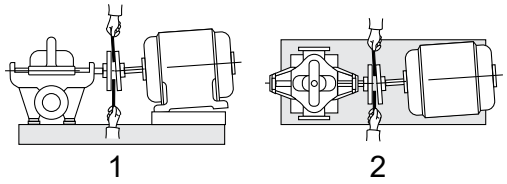
TM030209

Checking parallel alignment

Pos.	Description
1	Vertical
2	Horizontal

4. Check angular alignment.

Insert a pair of inside callipers or a taper gauge at four points at 90 ° intervals around the coupling. See figure Checking angular alignment. The angular alignment is correct when the measurements show that all points of the coupling faces are within 0.2 mm of each other.



TM030213

Check angular alignment

Pos.	Description
1	Vertical
2	Horizontal

Recheck the coupling clearance and tighten the set screws on the couplings.

Tightening torques

Description	Dimensions	Tightening torque [Nm]
Hexagon head screw	M6	10
	M8	12
	M10	23
	M12	40
	M16	80
	M20	120
	M24	120

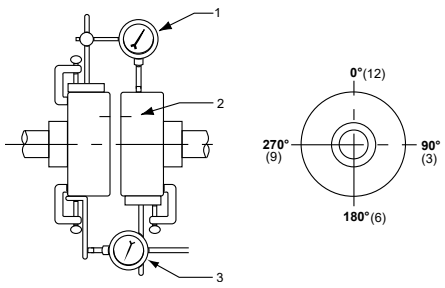
6.2 Final alignment

Make the final alignment by shimming the motor only.

1. Let the pump run until it has reached its operating temperature under normal operating conditions, approximately 1 hour.
2. Stop the pump.
3. Remove the coupling guard.
4. Check the alignment on the coupling by means of dial gauges. See below.

Checking coupling alignment by means of dial gauges

Alternatively, use laser equipment for the final alignment.



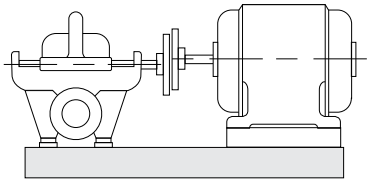
TM030210

Dial gauge arrangements; the end view of the coupling seen from the motor

Pos.	Description
1	Dial gauge (2) for parallel alignment
2	Index line
3	Dial gauge (1) for angular alignment

The coupling alignment procedure has four steps:

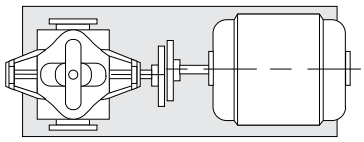
Parallel alignment - vertically



TM032939

1. Mount the dial gauge (2) in position 0 ° (12 o'clock). See fig. Dial gauge arrangements; the end view of the coupling seen from the motor.
2. Make the index lines on the two coupling halves. See fig. Dial gauge arrangements; the end view of the coupling seen from the motor.
3. Set the dial gauge pointer to zero, turn the motor and pump shaft simultaneously until the dial gauge is in position 180 ° (6 o'clock) and check that the index lines are still in line.
4. Read the dial gauge (2). If the dial gauge shows a deflection exceeding 0.2 mm, add or remove the shims under the motor until the reading of the dial gauge is within the allowable tolerance of 0.2 mm.

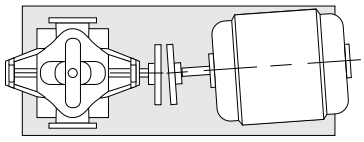
Parallel alignment - horizontally



TM032941

1. Turn the motor and pump shaft until the dial gauge (2) to 270 ° (9 o'clock).
2. Set the dial gauge pointer to zero, turn the motor and pump shaft to 90 ° (3 o'clock) and check that the index lines are still in line.
3. Read the dial gauge. If the dial gauge shows a deflection exceeding 0.2 mm, move the motor sideways until the reading of the dial gauge is within the allowable tolerance of 0.2 mm.
4. Remove the dial gauge (2).

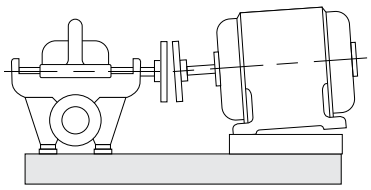
Angular alignment - horizontally



TM032942

1. Mount the dial gauge (1) in position 90 ° (3 o'clock). See fig. Dial gauge arrangements; the end view of the coupling seen from the motor.
2. Make the index lines on the two coupling halves. See fig. Dial gauge arrangements; the end view of the coupling seen from the motor.
3. Set the dial gauge pointer to zero, turn the motor and pump shaft simultaneously until the dial gauge is in position 270 ° (9 o'clock) and check that the index lines are still in line.
4. Read the dial gauge (1). If the dial gauge shows a deflection exceeding 0.2 mm, move the motor sideways until the deflection is halved.
5. Set the dial gauge pointer to zero, turn the motor and pump shaft simultaneously until the dial gauge is in position 90 ° (3 o'clock) and read the dial gauge (1) again.
6. Now the reading must be within the allowable tolerance of 0.2 mm. If not, repeat the procedure.

Angular alignment - vertically



TM032940

1. Turn the motor and pump shaft until the dial gauge (1) is in position 0 ° (12 o'clock).
2. Set the dial gauge pointer to zero, turn the motor and pump shaft simultaneously until the dial gauge is in position 180 ° (6 o'clock) and check that the index lines are still in line.
3. Read the dial gauge (1). If the dial gauge shows a deflection exceeding 0.2 mm, add or remove the shims under the motor until the deflection is halved.
4. Set the dial gauge pointer to zero, turn the motor and pump shaft simultaneously until the dial gauge is in position 0 ° (12 o'clock) and read the dial gauge (1) again.
5. Now the reading must be within the allowable tolerance of 0.2 mm. If not, repeat the procedure.
6. Remove the dial gauge (1).

The coupling tolerances may differ from coupling make to coupling make. For the standard coupling, the allowable tolerance is 0.2 mm. For other coupling types, see the coupling data supplied with the pump.

Finish the alignment procedure by refitting and tightening the coupling.

WARNING
Personal injury
Death or serious personal injury
- To protect persons from rotating machine parts, always install all guards after installation is complete and before starting the pump.

7. Taking the product out of operation

The following shutdown procedures apply to most normal shutdowns. If the pump is to be inoperative for a long time, follow the storage procedures in section Long-term shutdown.

1. Always close the outlet valve or throttle valve before stopping the pump. Close the valve slowly to prevent hydraulic shock, but make sure that the pump does not run against a closed valve for more than a few seconds.
2. Switch off the power supply to the motor.

Related information

7.2 Long-term shutdown

7.1 Short-term shutdown

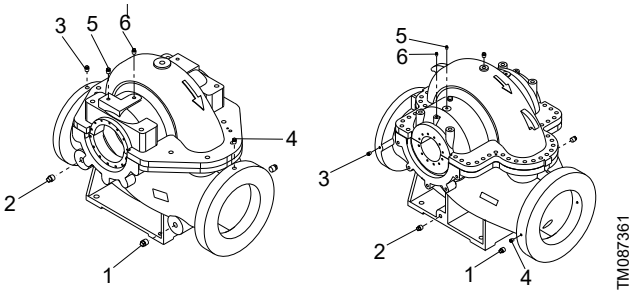
1. For overnight or temporary shutdown periods under non-freezing conditions, the pump may remain filled with liquid. Make sure the pump is fully primed before restarting.
2. For short or frequent shutdown periods at temperatures below 0 °C, keep the liquid moving within the pump housing and insulate or heat the pump exterior to prevent freezing.

7.2 Long-term shutdown

For long shutdown periods or to isolate the pump for maintenance, close the inlet and outlet valves. If no inlet valve is fitted and the pump has positive inlet height, drain all liquid from the inlet pipe to terminate the liquid flow into the pump inlet port. If applicable, turn off any external source of cooling or lubricating liquid to the stuffing boxes or shaft seals. Remove the plugs in the pump drain and vent tappings, as required, and drain all liquid from the pump housing. Remove the stuffing box glands and packing rings, if applicable.

CAUTION
Hot or cold surface
Minor or moderate personal injury

- Make sure that the escaping water does not cause injury to persons or damage to the motor or other components.
- In hot-water installations, pay special attention to the risk of injury caused by scalding hot water.
- In cold-liquid installations, pay special attention to the risk of injury caused by cold liquids and cold surfaces.



Example of drain plugs

Pos.	Description
1	Drain plug
2	Plug, drain outlet
3	Plug, inlet
4	Plug, outlet
5	Plug, shaft seal flushing
6	Plug, inlet chamber

1. After draining the pump during long shutdown periods under freezing conditions, blow out all liquid in passages and air pockets using compressed air. You can prevent freezing of pumped liquid by filling the pump with antifreeze solution.

   WARNING
   Harm to health
   Death or serious personal injury
   - Do not use antifreeze solution if you use the pump for public or potable-water supply.

2. Rotate the shaft by hand monthly to coat the bearings with lubricant and delay oxidation and corrosion.
3. Where applicable, follow the motor manufacturer's storage recommendations.

Do not tighten the vent screw or refit the drain plug until the pump is to be used again.

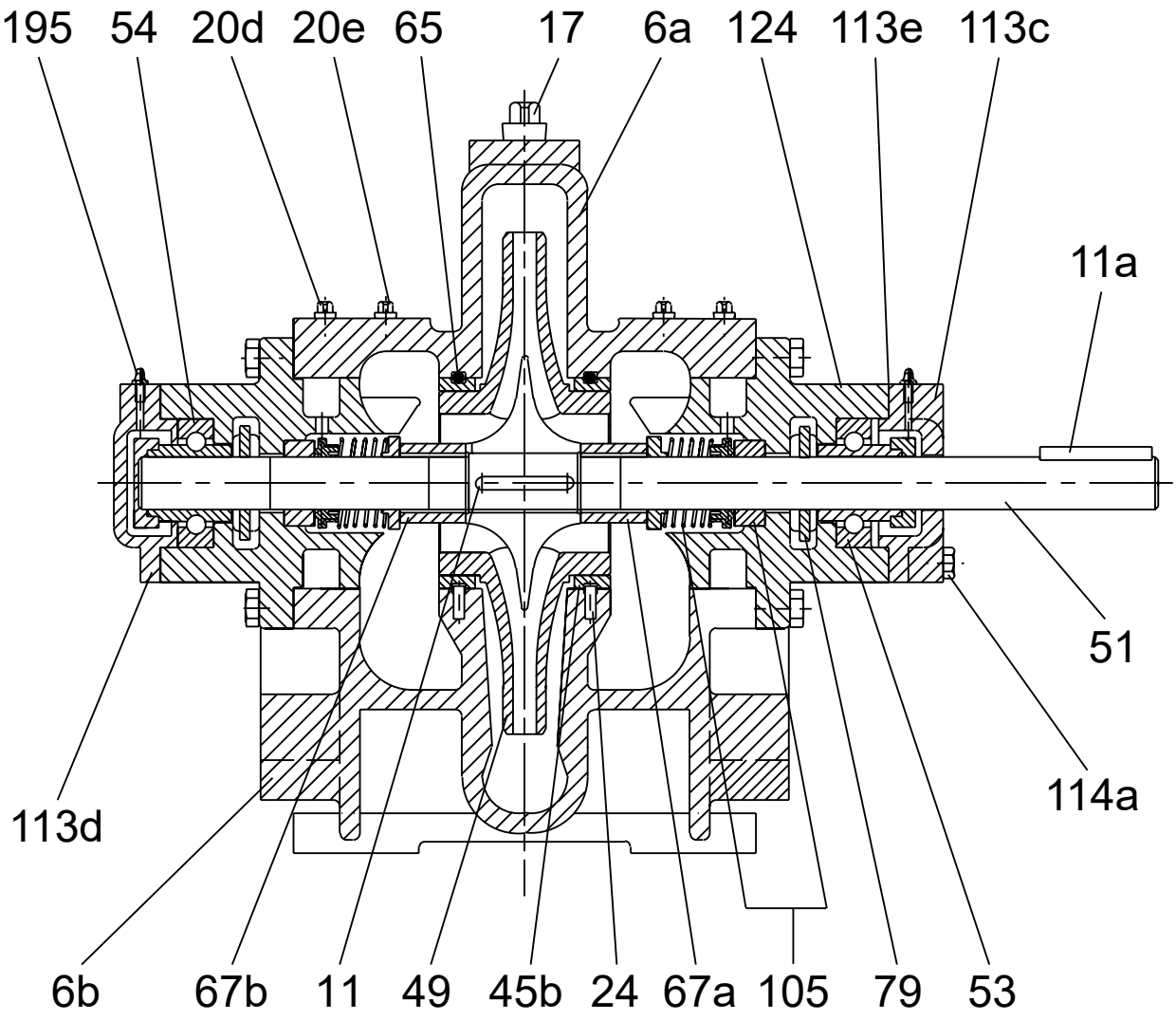
8. Standard components and material specifications

Pos.	Description	Material	Material standard
6a	Pump housing, upper	Cast iron	ASTM A48 Class35
		Ductile iron	ASTM A536, 65-45-12
6b	Pump housing, lower	Cast iron	ASTM A48 Class35
		Ductile iron	ASTM A536, 65-45-12
8a	coupling	Steel	
11	Key, impeller	Steel	ASTM A216 WCB
11a	Key, coupling	Steel	ASTM A216 WCB
17	Vent screw	Bronze	
20	Drain plug	Steel	
20a	Plug, drain outlet	Steel	
20b	Plug, inlet	Steel	
20c	Plug, outlet	Steel	
20d	Plug, shaft seal flushing	Steel	
20e	Plug, inlet chamber	Steel	
24	Locking pin, wear ring	Steel	ANSI/ASME B18.8
26b	Roll pin	Steel	ANSI/ASME B18.8
26c	Screw for pump housing	Steel	
32	Flushing pipe	Stainless steel	AISI 304
45	Wear ring	Bronze	ASTM B584, C90500
47c	Retainer for packing	Steel	ASTM A216 WCB
47d	Snap ring for packing	Carbon steel	
49	Impeller	Stainless steel	ASTM CF8
51	Shaft	Stainless steel	AISI 420
53	Bearing, drive end	Steel	
54	Bearing, non-drive end	Steel/bronze	
54c	Lock washer	Steel	
54d	Circlip	Steel	ASTM A216 WCB
54e	Round nut for bearing	Steel	ASTM A216 WCB
58	Seal cover	Cast iron	ASTM A48 Class35
58a	Screw	Steel	
65	Snap ring	Stainless steel	
66	O-ring for sleeve	NBR	
67b	Round nut for impeller	Stainless steel	
72a	Gasket	Vegetable fibre	
76	Nameplate	Stainless steel	AISI 304
79	Slinger	Neoprene	
90	Base plate	Steel	
105	Shaft seal	BBQV/GBQV	SiC/Carbon
105c	Seal retaining ring	Stainless steel	AISI 304
106	Packing gland	Cast iron	ASTM A48 Class35
107	Packing ring	PTFE	PTFE
108	Distribution ring	Steel	ASTM A216 WCB
109	O-ring	NBR	
109a	O-ring	NBR	
110	O-ring	NBR	
113	Bearing housing	Cast iron	ASTM A48 Class35
113c	Bearing cover, drive end	Cast iron	ASTM A48 Class35
113d	Bearing cover, non-drive end	Cast iron	ASTM A48 Class35
113e	Gasket	Vegetable fibre	
113f	Lip seal, non-drive end	NBR	

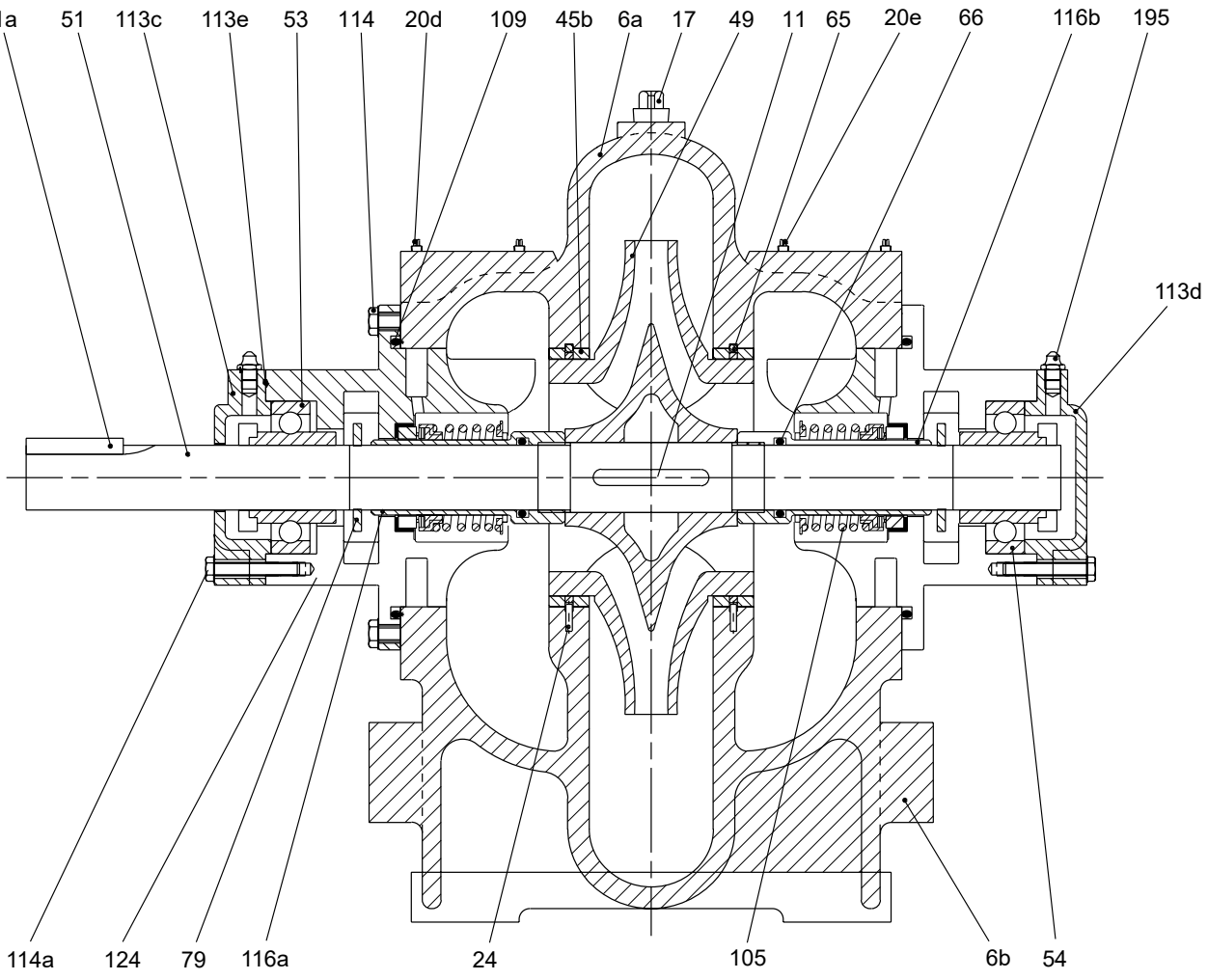
Pos.	Description	Material	Material standard
113g	Lip seal, drive end	NBR	
114	Screw for seal housing	Steel	
114a	Screw for bearing cover	Steel	
114b	Screw for bearing housing	Steel	
116	Shaft sleeve	Stainless steel	AISI 304
116a	Locking sleeve, drive end	Stainless steel	AISI 304
116b	Locking sleeve, non-drive end	Stainless steel	AISI 304
116c	Shaft sleeve, inner	Stainless steel	AISI 304
116e	Screw for shaft sleeve	Steel	
123	Shoulder ring	Steel	
124	Seal housing	Cast iron	ASTM A48 Class35
		Ductile iron	ASTM A536, 65-45-12
195	Lubricating nipple	Bronze	

9. Sectional drawings

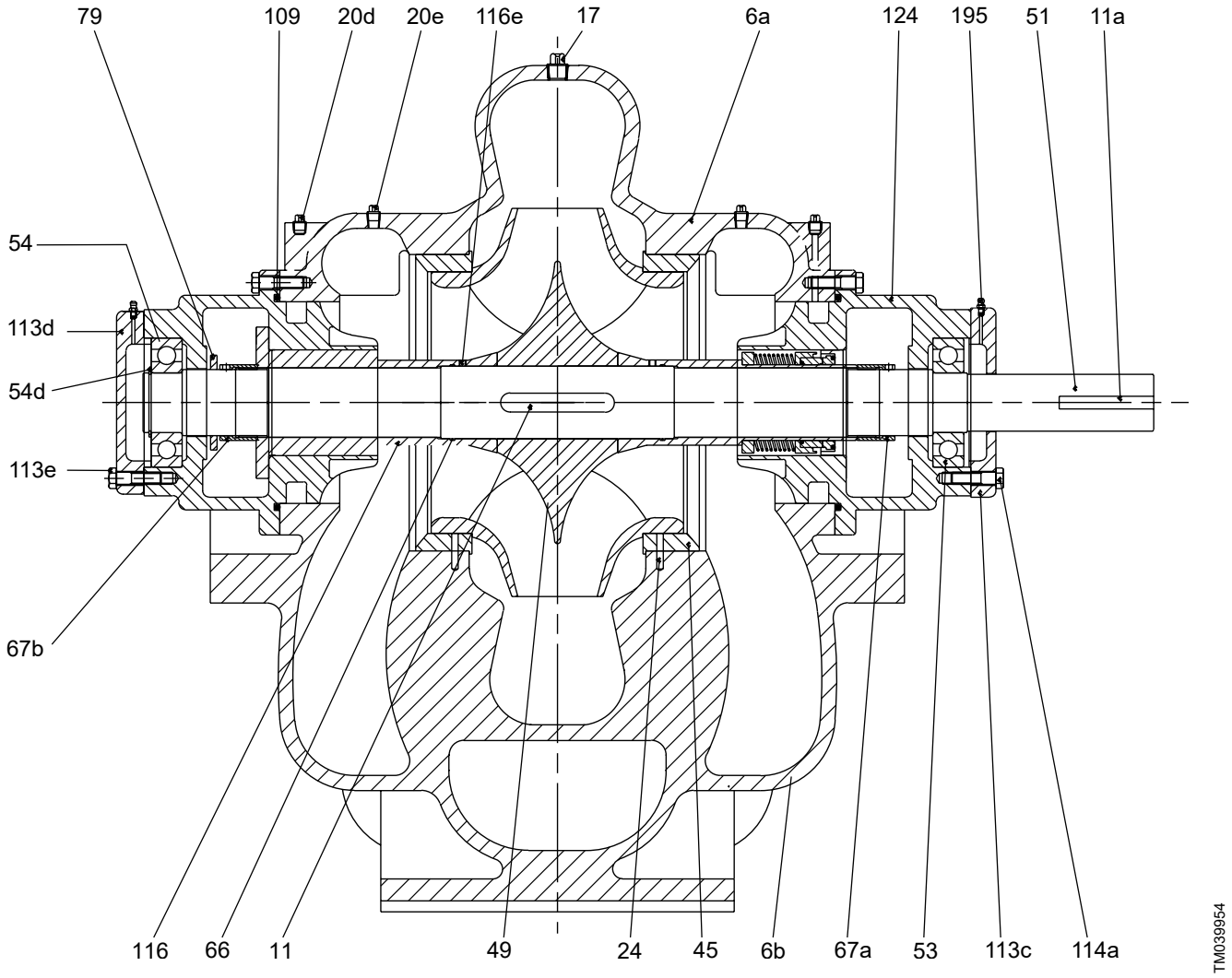
9.1 LS with sleeve, construction type 1



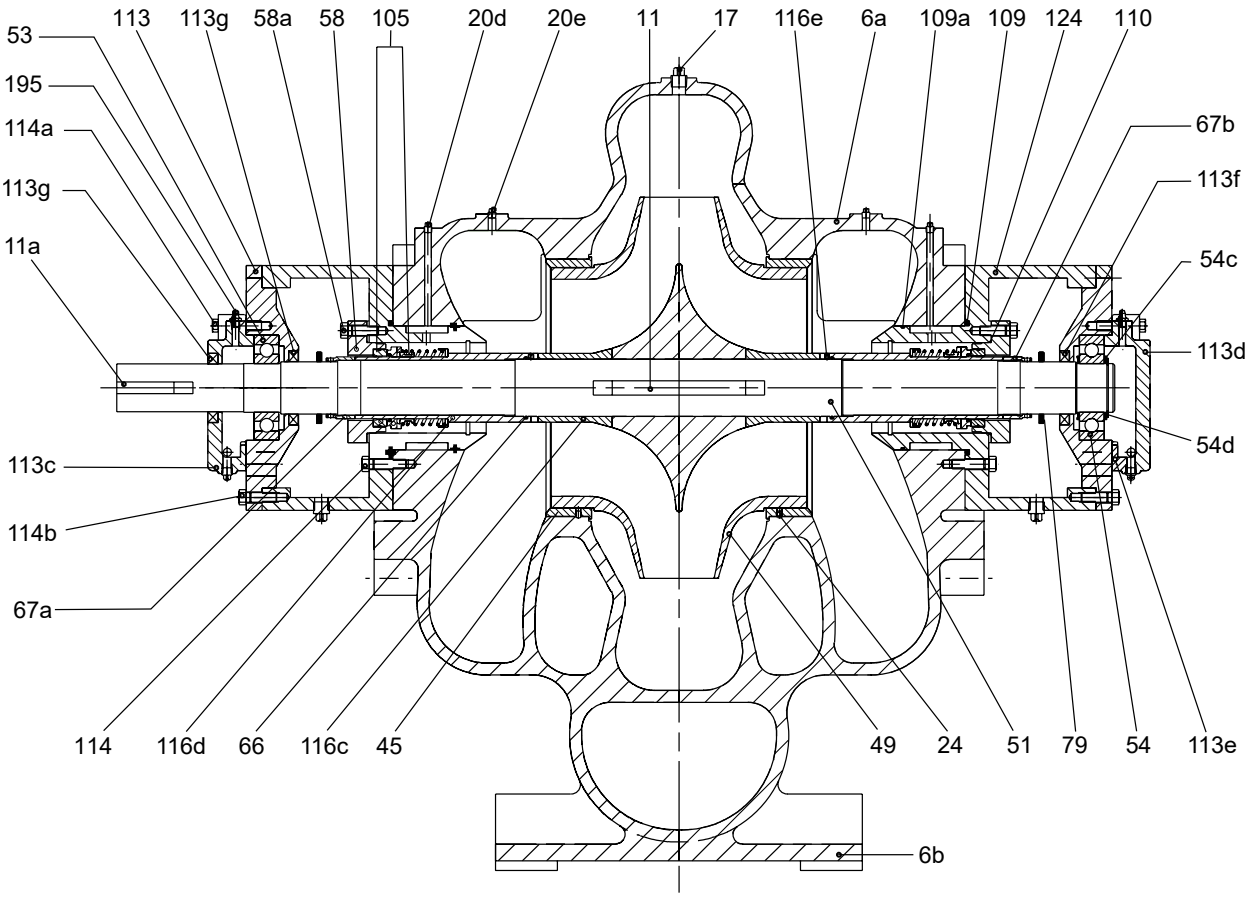
9.2 LS with sleeve, construction type 2



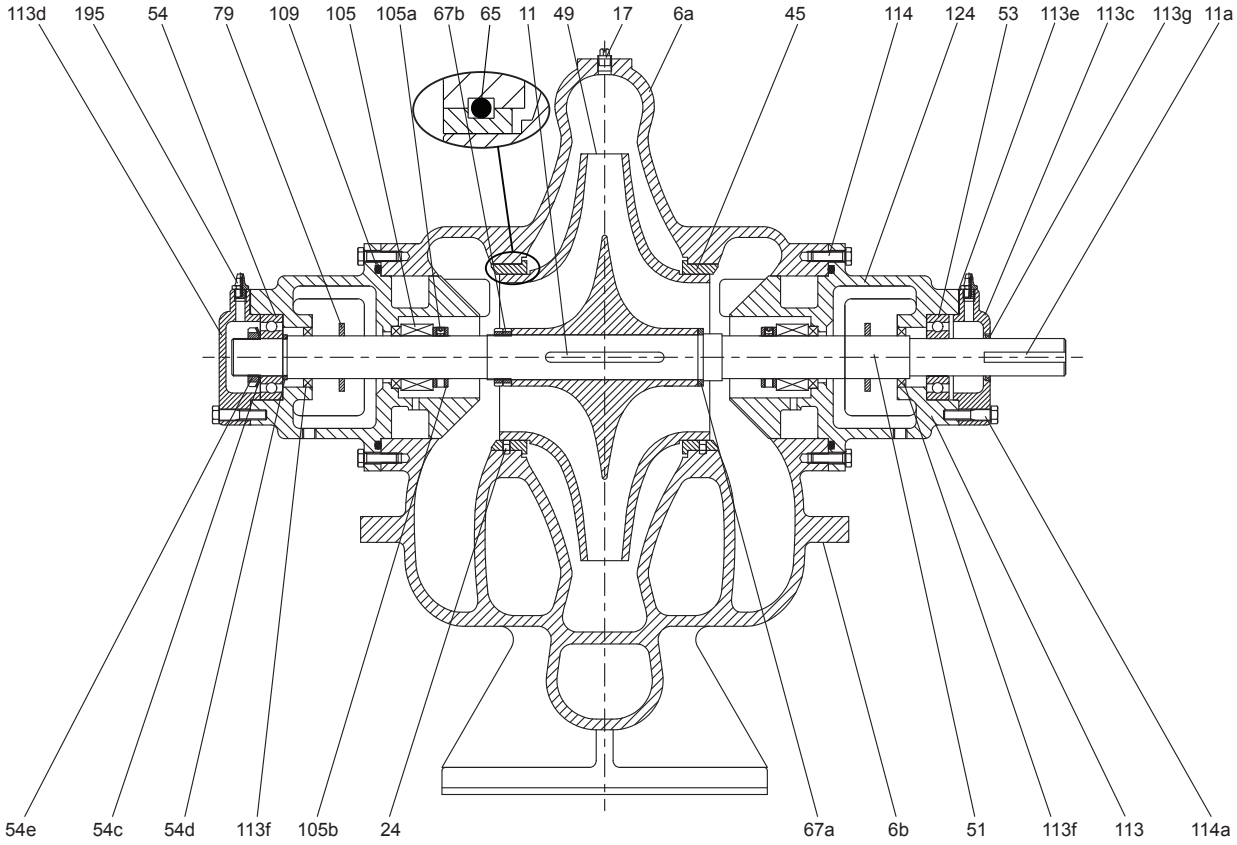
9.3 LS with sleeve, construction type 3



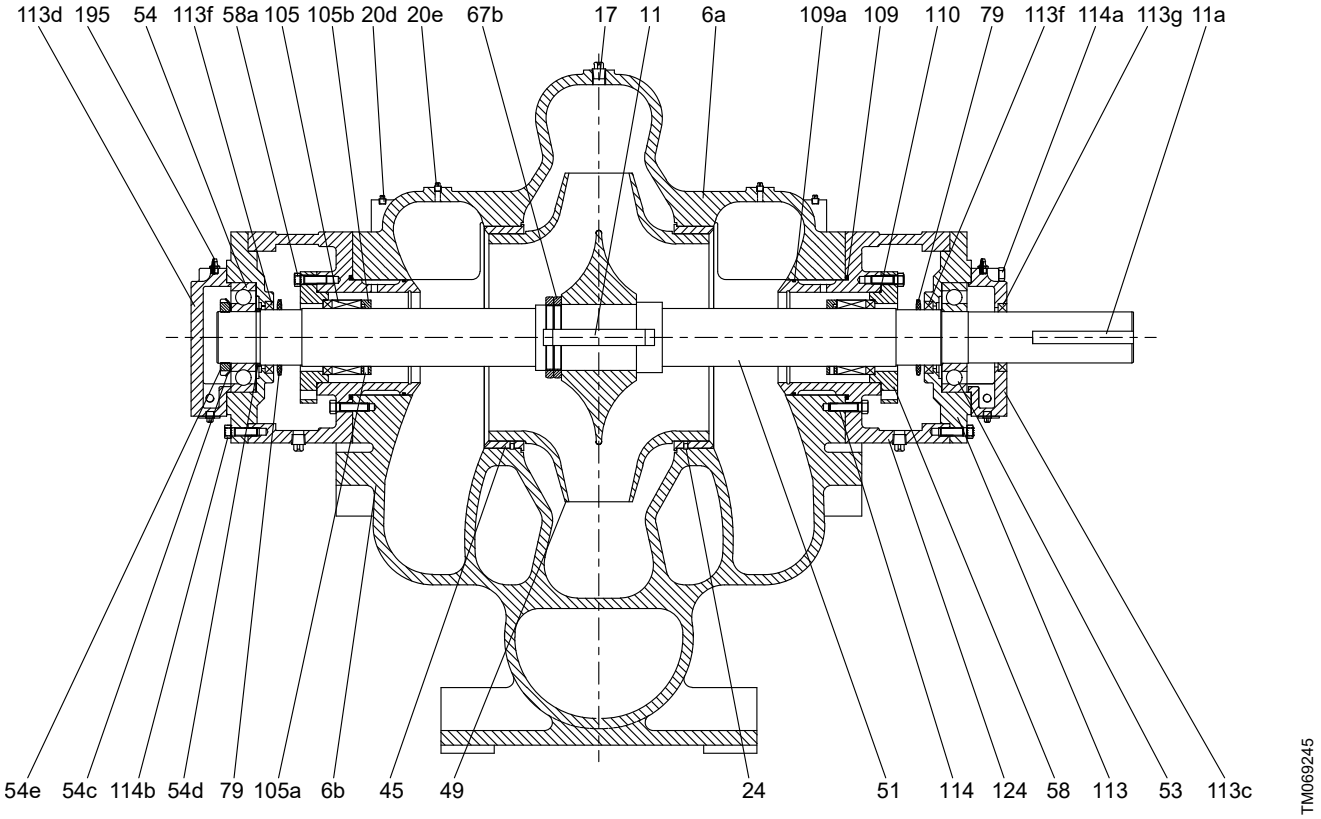
9.4 LS with sleeve, construction type 4



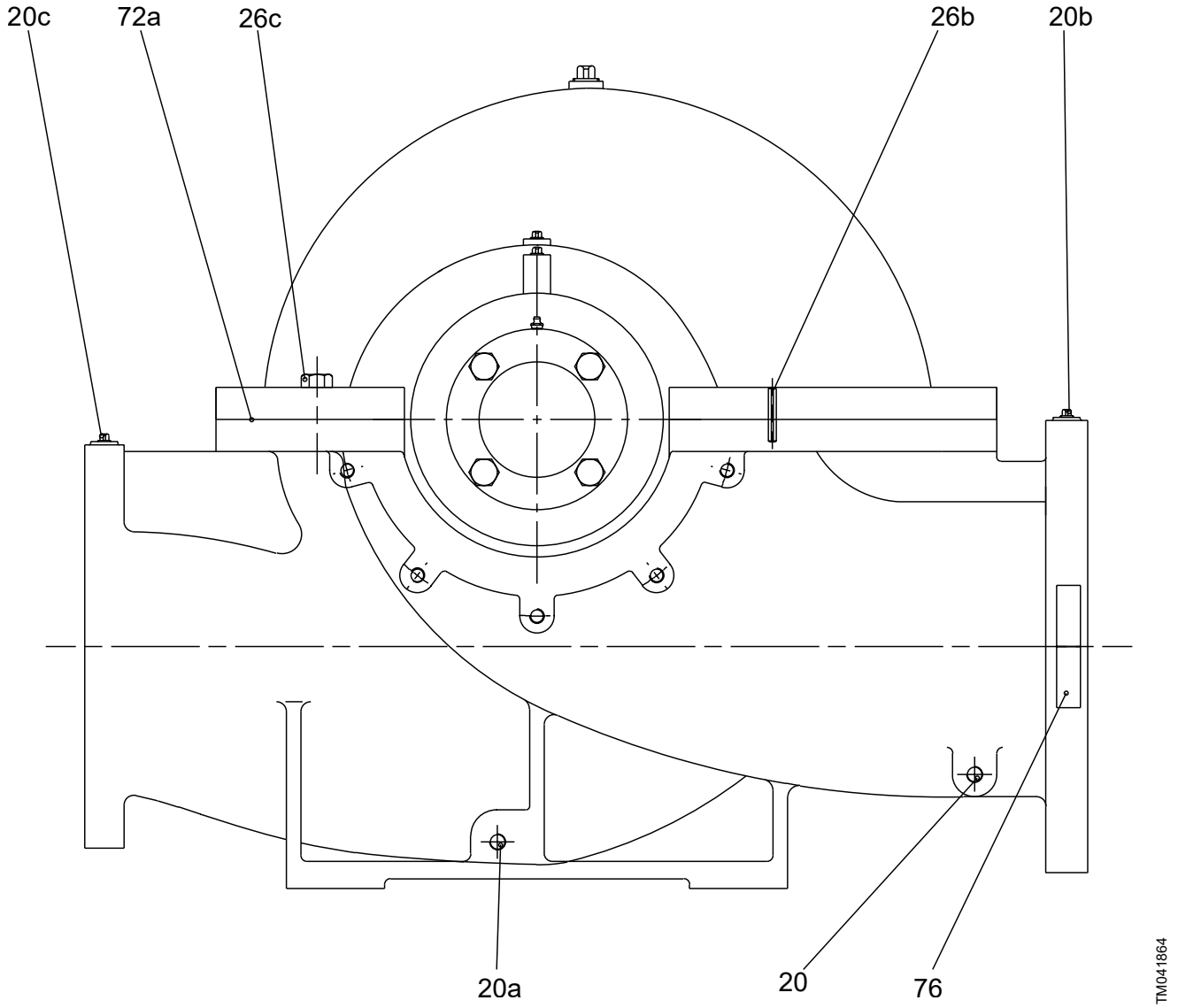
9.5 LS without sleeve, construction type 1



9.6 LS without sleeve, construction type 2

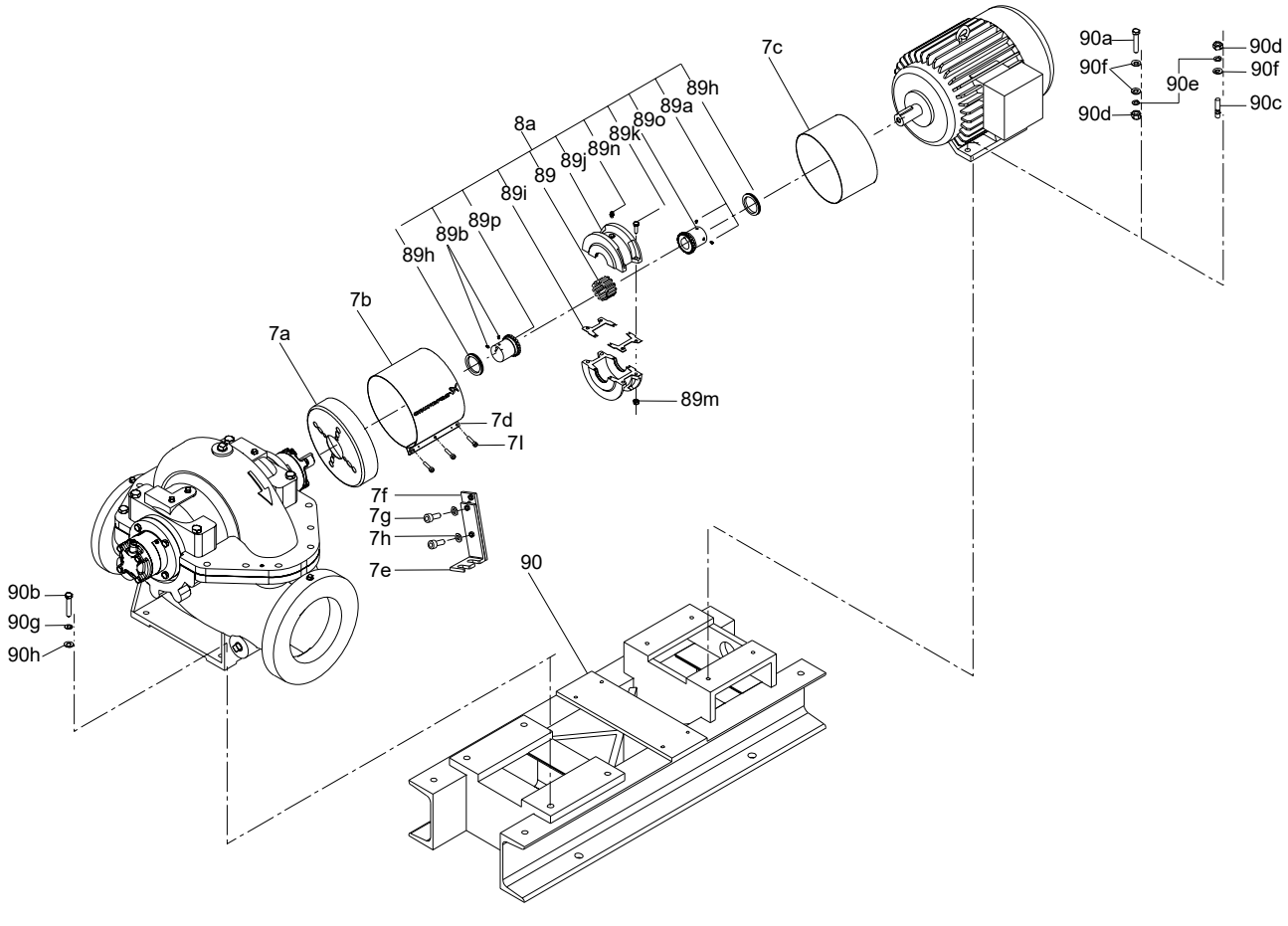


9.7 LS, typical end view, non-drive end



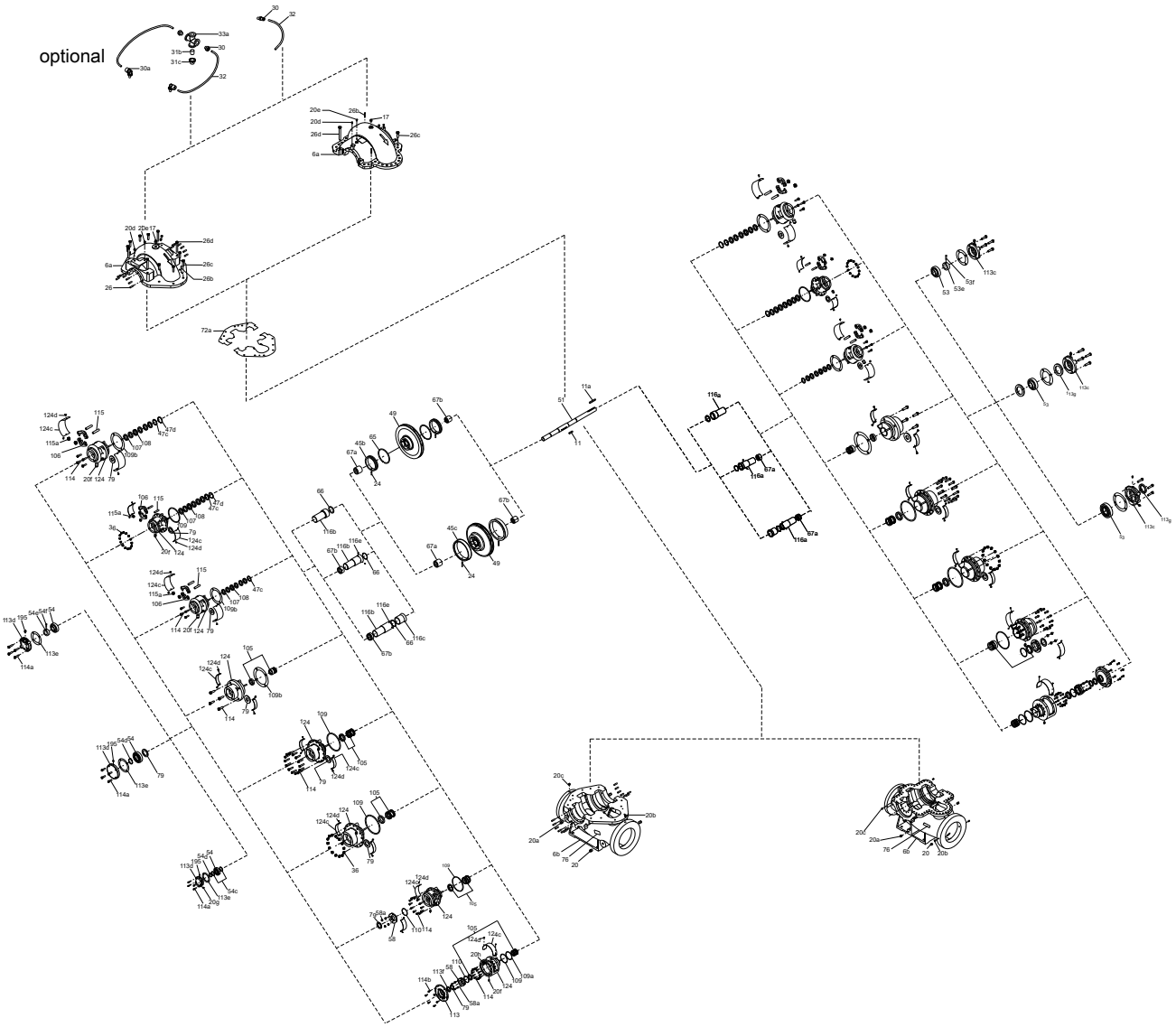
10. Exploded views

10.1 Coupling



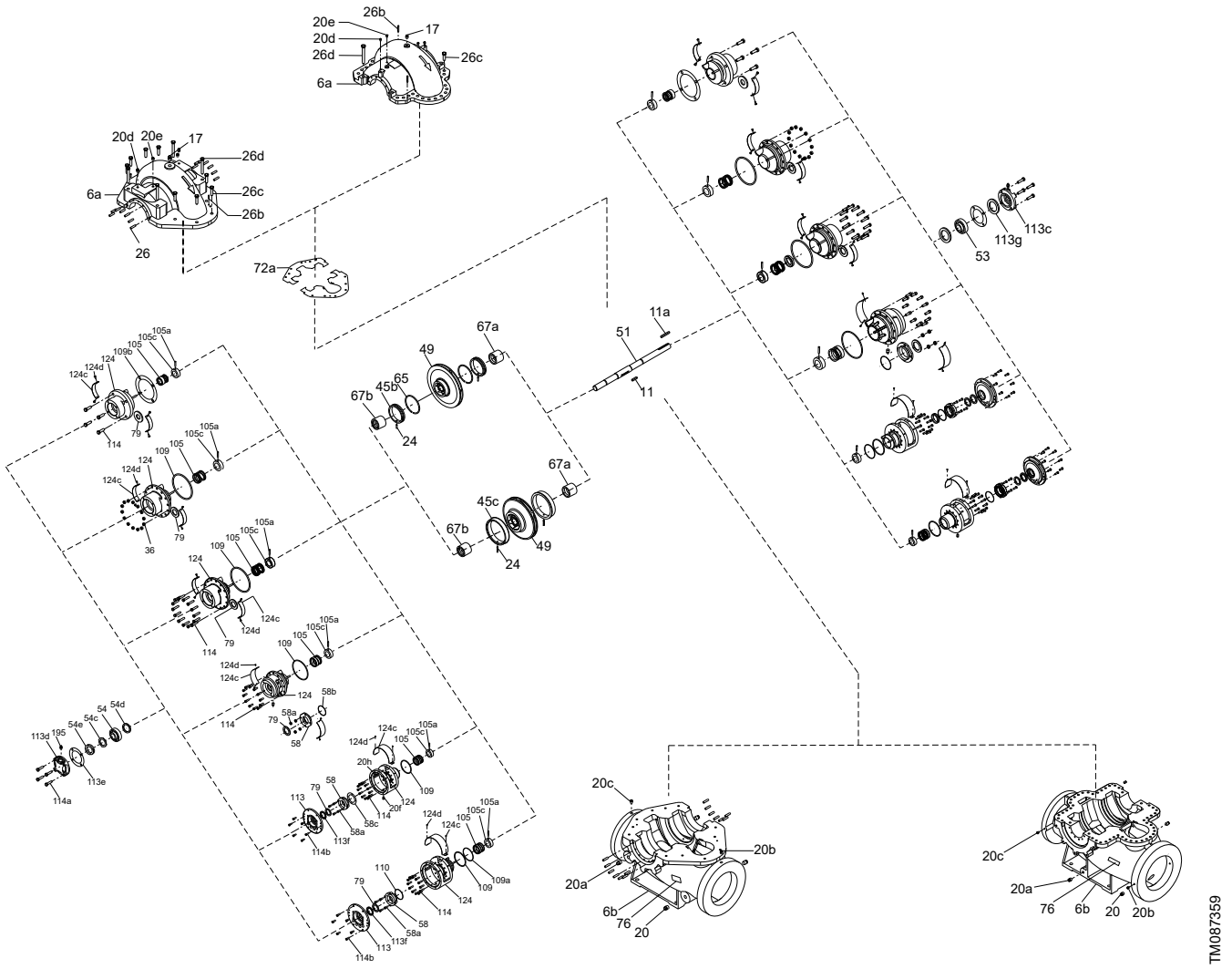
Joining with coupling

10.2 LS with sleeve



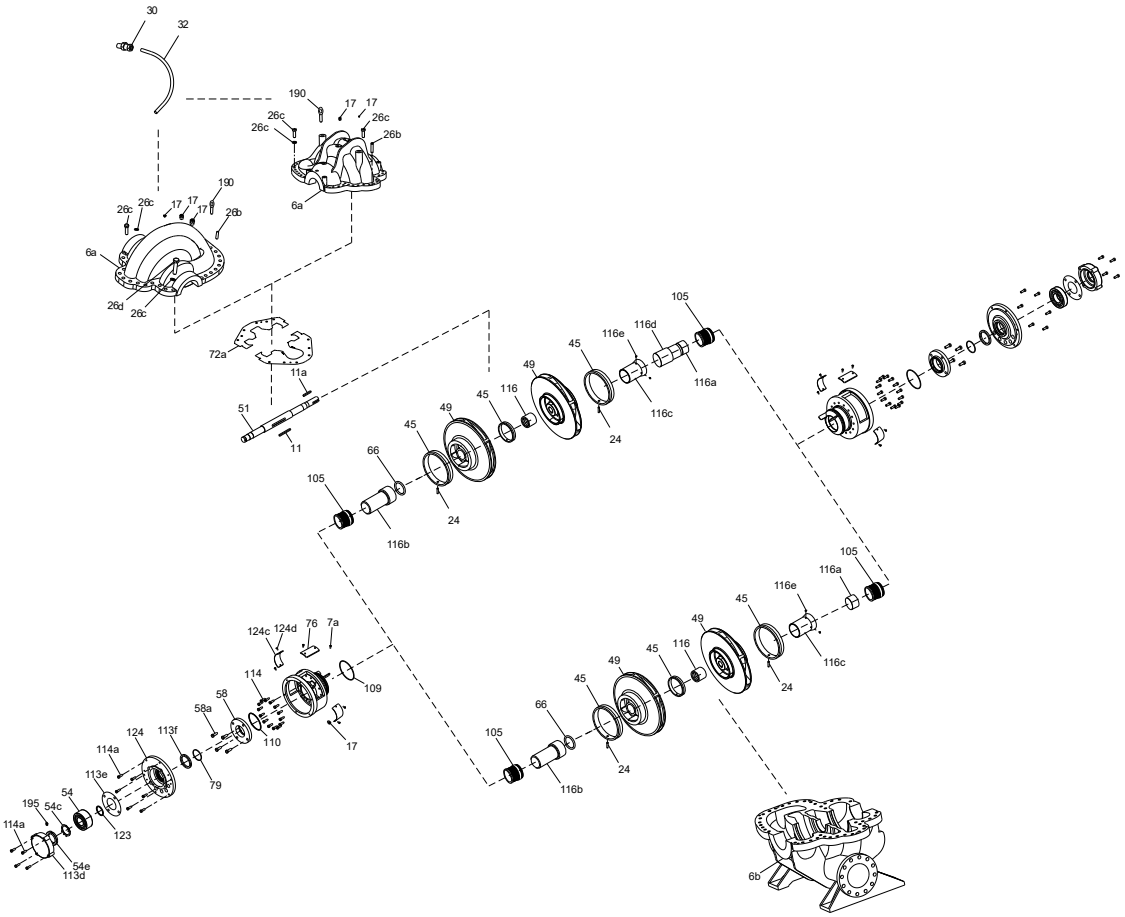
LS with sleeve

10.3 LS without sleeve



LS without sleeve

10.4 LS double stage



LS with double stage

11. Reference information

11.1 Tightening torques

Recommended torque for metric bolts		
Specification (Grade 5.6)	Recommended Torque (Nm)	Tolerance
M12	50	±10%
Specification (Grade 8.8)	Recommended Torque (Nm)	Tolerance
M4	3	±10%
M6	9	±10%
M8	21	±10%
M10	41	±10%
M12	72	±10%
M14	114	±10%
M16	177	±10%
M18	244	±10%
M20	345	±10%
M22	470	±10%
M24	597	±10%
M27	873	±10%
M30	1185	±10%
M33	1613	±10%
M36	2071	±10%
Specification (Grade 10.9)	Recommended Torque (Nm)	Tolerance
M16	300	±10%
M36	2800	±10%

Recommended torque for inch bolts		
Specification (Grade 5)	Recommended Torque (Nm)	Tolerance
1/4"	8	±10%
5/16"	16	±10%
3/8"	30	±10%
1/2"	75	±10%
5/8"	142	±10%
3/4"	244	±10%
7/8"	407	±10%
1"	597	±10%
1.125"	867	±10%
1.25"	1210	±10%
Specification (Grade 8)	Recommended Torque (Nm)	Tolerance
1/4"	12	±10%
5/16"	23	±10%
3/8"	41	±10%
1/2"	102	±10%
5/8"	190	±10%
3/4"	353	±10%
7/8"	569	±10%
1"	854	±10%
1.125"	1221	±10%
1.25"	1704	±10%

Recommended torques for metric set screw		
Specification (Grade 45H)	Recommended Torque (Nm)	Tolerance
M4	3	±10%
M5	6	±10%
M6	9	±10%
M8	21	±10%
M10	41	±10%
M12	72	±10%

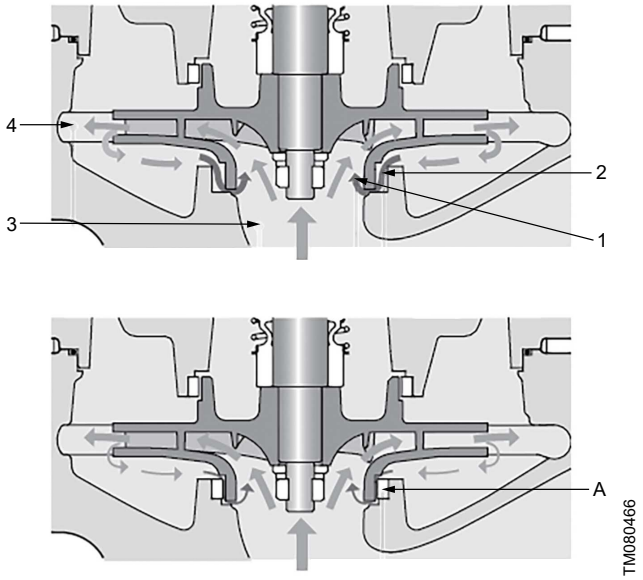
Recommended torques for round nut		
Specification	Recommended Torque (Nm)	Tolerance
GB/T812 M25X1.5 F	20	±10%
GB/T810 M30X1.5 H420	30	±10%
GB/T812 M35X1.5 F	30	±10%
GB/T810 M42X1.5 H420	60	±10%
GB/T810 M52X1.5 H420	100	±10%
DIN981 M60X2 F	100	±10%
GB/T810 M64X2 H420	100	±10%
GB/T812 M65X2 F	100	±10%
GB/T810 M72X2 H420	120	±10%
GB/T810 M76X2 H420	120	±10%
DIN981 M80X2	120	±10%
GB/T810 M95X2 H420	150	±10%
GB/T810 M100X2 H420	150	±10%

Recommended torques for NPT pipe threads		
Specification	Recommended Torque (Nm)	Tolerance
NPT 1/8"	16	±10%
NPT 1/4"	34	±10%
NPT 3/8"	54	±10%
NPT 1/2"	73	±10%
NPT 3/4"	106	±10%
NPT 1"	152	±10%

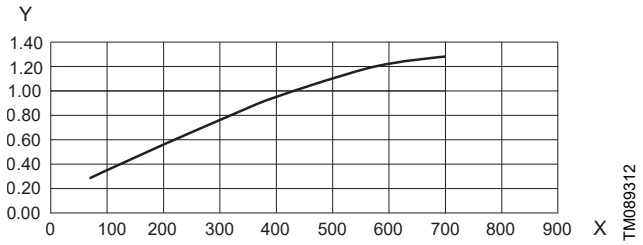
11.2 Gap between impeller and wear ring of pump housing

A leak flow (1) will occur in gap (2) between the rotating impeller and the stationary pump housing when the pump is operating. Leak flow (1) returns to impeller inlet (3) through gap (2).

Thus, the impeller must pump both leak flow (1) and the fluid through the pump from inlet (3) flange to outlet (4) flange. To minimize leak flow (1), an interchangeable wear ring (impeller seal) (A) is mounted.



We recommend that the gap between impeller and wear ring never exceeds the maximum limit curve calculated according to an efficiency loss of maximum 2%.



Pos.	Description
X	Outlet DN
Y	Maximum seal gap [mm]

Tolerance table

If the difference exceeds the maximum seal gab according to the above limit curve, the below table informs whether the wear ring or the impeller is worn out.

GG pump housing + bronze wear ring + SS impeller

Wear ring inside			Impeller outside		
Nominal diameter [mm]	Max. tolerance	Min. tolerance	Nominal diameter [mm]	Max. tolerance	Min. tolerance
88.9	0.102	0.051	88.9	-0.356	-0.4064
101.6	0.025	-0.025	101.6	-0.483	-0.533
139.7	0.102	0.051	139.7	-0.36	-0.46
155.6	0.102	0.051	155.6	-0.355	-0.395
171.5	0.508	0.457	171.5	0	-0.051
174.6	0.203	0.152	174.6	-0.355	-0.395
181	0.102	0.051	181	-0.356	-0.407
200	0.072	0	200	-0.5	-0.615
206.4	0.102	0.051	206.4	-0.356	-0.406
215.9	0.508	0.457	215.9	0	-0.05
235	0.052	0.001	235	-0.533	-0.583
248.5	0.512	0.44	248.5	-0.06	-0.19
260	0.081	0	260	-0.548	-0.6
263.5	0.101	0.05	263.5	-0.41	-0.46
265	0.081	0	265	-0.7	-0.781
267	0.31	0.208	267	-0.427	-0.554
281	0.178	0.127	281	-0.33	-0.46
305	0.081	0	305	-0.5	-0.63
320.5	0.15	0.048	320.5	-0.46	-0.511
330.8	0.076	0.025	330.8	-0.483	-0.533
308	0.081	0	308	-0.6	-0.681
320	0.089	0	320	-0.7	-0.84
325	0.089	0	325	-0.9	-0.989
340	0.081	0	340	-0.55	-0.69
352.6	0.089	0	352.6	-0.6	-0.74
362	0.089	0	362	-0.7	-0.84
365	0.089	0	365	-0.7	-0.84
395	0.089	0	395	-0.7	-0.84
407	0.097	0	407	-0.7	-0.855
455	0.12	0	455	-0.6	-0.697
510	0.11	0	510	-0.7	-0.875
549	0.11	0	549	-1	-1,175
590	0.11	0	590	-1	-1,175

12. Fault finding the product

DANGER
Electric shock
Death or serious personal injury

- Before you remove the terminal box cover and before you remove or dismantle the pump, make sure that the power supply has been switched off and that it cannot be accidentally switched on.

Faults	Causes
A:	The pump delivers no liquid.
B:	The pump does not deliver enough liquid.
C:	The pump does not create enough pressure.
D:	The pump loses liquid after running for a short time.
E:	The pump consumes too much power.
F:	The motor is overloaded.
G:	Vibrations.
H:	Cavitation noise.
I:	The pump bearings are overheated.
J:	The pump operates for a short time and then stops.

K: Reference numbers to remedies.

A	B	C	D	E	F	G	H	I	J		K
●									●	The pump is not primed, lack of priming liquid, incomplete priming.	1
●										Loss of priming liquid.	2
●	●		●						●	The suction lift or static lift is too high.	3
●	●									The outlet pressure is too high (measured at the outlet port).	4
●	●	●								The speed is too low.	5
●	●									Wrong direction of rotation.	6
●	●									The impeller is completely clogged.	7
	●									The inlet pipe is partially blocked.	8
	●	●	●				●		●	Air leak in the inlet pipe or flange.	9
	●		●						●	Air leak in the stuffing box. The flushing pipe may be blocked.	10
	●		●	●			●			Cavitation; insufficient NPSH (depending on installation).	11
	●	●		●						The impeller or wear rings are worn.	12
	●	●								Defective packing rings.	13
	●									The non-return valve is too small or partially obstructed. The cross section of the non-return valve port must be at least as large as the cross section of the inlet pipe.	14
	●		●				●			The inlet pipe is not immersed deeply enough.	15
		●								The impeller diameter is too small. This is the most probable cause, if none of the above causes apply.	16
		●								Obstruction in the housing.	17
		●	●	●			●			Air or gases in the liquid.	18
		●		●						The actual duty point of the pump lies to the right of the specified duty point on the pump curve. The result is lower head, higher flow and higher power consumption.	19
				●	●					The viscosity or specific gravity of the pumped liquid is higher than that of water.	20
				●	●	●		●		The shaft is bent due to damage.	21
				●	●	●		●		Mechanical failure of the bearing and/or impeller.	22
				●		●		●		Misalignment.	23
				●	●					Electrical defects.	24
				●	●		●			The speed is too high.	25
						●				The foundation is not rigid enough.	26
								●		The lubricating oil or grease is dirty or contaminated.	27

No.	Cause	Remedy
1	The pump is not primed, lack of priming liquid, incomplete priming.	Fill the pump and inlet pipe completely with pumped liquid.
2	Loss of priming liquid.	Mend possible leaks in the inlet pipe, joints and fittings. Vent the pump housing to remove accumulated air.
3	The suction lift or static lift is too high.	Reduce the difference in height between the water reservoir or water supply and the pump.
4	The outlet pressure is too high.	Make sure that valves in the outlet pipe are fully open. For parallel operation, this indicates that the outlet pressure is higher than designed friction losses in the pipes. Review system design and actual pressure developed in the system with parallel operation.
5	The speed is too low.	Make sure that the motor receives full voltage. Make sure that the frequency is correct. Make sure that all phases are connected.
6	Wrong direction of rotation.	Compare the direction of rotation with the directional arrow on the pump housing. If required, change the direction of rotation by interchanging two phases in the motor.
7	The impeller is completely clogged.	Dismantle the pump and clean the impeller.
8	The inlet pipe is partially blocked.	Remove any obstructions in the inlet pipe.
9	Air leak in the inlet pipe or flange.	Replace or repair the defective pipe section or flange.
10	Air leak in the stuffing box.	Clean the flushing pipe. Replace the stuffing box packing rings, if necessary.
11	Cavitation; insufficient NPSH (depending on installation).	Increase the net positive suction head by placing the pump in a lower position. Pressurise the inlet vessel.
12	The impeller or wear rings are worn.	Replace the impeller and/or wear rings. If necessary, also replace the bearings and the shaft.
13	Defective packing rings.	Replace the packing rings.
14	The non-return valve is too small or partially obstructed.	Replace or clean the non-return valve.
15	The inlet pipe is not immersed deeply enough.	Extend the inlet pipe so that the risk of sucking air is eliminated.
16	The impeller diameter is too small.	Check with Grundfos if you can use a larger impeller. If not, reduce the outlet pipe friction losses. But be careful not to seriously overload the motor.
17	Obstruction in pump housing.	Dismantle the pump and remove the obstruction.
18	Air or gases in the liquid.	Remove the gas or air from the pumped liquid. See 11 above.
19	The actual duty point of the pump lies to the right of the specified duty point on the pump curve. The result is lower head, higher flow and higher power consumption.	Install an orifice plate immediately after the outlet flange. The orifice plate will raise the system characteristic or increase the counterpressure thus increasing the head and lowering the flow. The size of the orifice plate must be adapted so that the pressure corresponds to the required duty point.
20	The viscosity or specific gravity of the pumped liquid is higher than that of water.	Use a larger motor. Consult Grundfos for recommended size. Test the liquid for viscosity and specific gravity.
21	The shaft is bent due to damage.	Check the deflection of the shaft. The total indicator runout must not exceed 0.05 mm. Possibly replace the shaft.
22	Mechanical failure of bearing and/or impeller.	Check the bearings and the impeller for damage. Replace the bearings or the impeller, if necessary.
23	Misalignment.	Realign the pump and motor.
24	Electrical defects.	Check that the voltage and frequency of the power supply are correct. Remedy the possible defects in the motor. Check that the motor is properly cooled.
25	The speed is too high.	Check that the frequency of the power supply corresponds to the frequency stated on the motor nameplate.
26	The foundation is not rigid enough.	Retighten the anchor bolt nuts. Make sure that the foundation is made according to the installation and operating instructions.
27	The lubricating oil or grease is dirty or contaminated.	Clean the bearings and bearing housings according to the instructions and relubricate the bearings.

13. Disposing of the product

This product or parts of it must be disposed of in an environmentally sound way.

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

The crossed-out wheelie bin symbol on a product means that it must be disposed of separately from household waste. When a product marked with this symbol reaches its end of life, take it to a collection point designated by the local waste disposal authorities. The separate collection and recycling of such products will help protect the environment and human health.

See also end-of-life information at *www.grundfos.com/product-recycling*.

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Argentina
Bombas GRUNDFOS de Argentina S.A.
Ruta Panamericana km. 37.500industin
1619 - Garín Pcia. de B.A.
Tel.: +54-3327 414 444
Fax: +54-3327 45 3190

Australia
GRUNDFOS Pumps Pty. Ltd.
P.O. Box 2040
Regency Park
South Australia 5942
Tel.: +61-8-8461-4611
Fax: +61-8-8340-0155

Austria
GRUNDFOS Pumpen Vertrieb Ges.m.b.H.
Grundfosstraße 2
A-5082 Grödig/Salzburg
Tel.: +43-6246-883-0
Fax: +43-6246-883-30

Belgium
N.V. GRUNDFOS Bellux S.A.
Boomsesteenweg 81-83
B-2630 Aartselaar
Tel.: +32-3-870 7300
Fax: +32-3-870 7301

Bosnia and Herzegovina
GRUNDFOS Sarajevo
Zmaja od Bosne 7-7A
BiH-71000 Sarajevo
Tel.: +387 33 592 480
Fax: +387 33 590 465
www.ba.grundfos.com
E-mail: grundfos@bih.net.ba

Brazil
BOMBAS GRUNDFOS DO BRASIL
Av. Humberto de Alencar Castelo Branco, 630
CEP 09850 - 300
São Bernardo do Campo - SP
Tel.: +55-11 4393 5533
Fax: +55-11 4343 5015

Bulgaria
Grundfos Bulgaria EOOD
Slatina District
Iztochna Tangenta street no. 100
BG - 1592 Sofia
Tel.: +359 2 49 22 200
Fax: +359 2 49 22 201
E-mail: bulgaria@grundfos.bg

Canada
GRUNDFOS Canada inc.
2941 Brighton Road
Oakville, Ontario
L6H 6C9
Tel.: +1-905 829 9533
Fax: +1-905 829 9512

China
GRUNDFOS Pumps (Shanghai) Co. Ltd.
10F The Hub, No. 33 Suhong Road
Minhang District
Shanghai 201106 PRC
Tel.: +86 21 612 252 22
Fax: +86 21 612 253 33

Colombia
GRUNDFOS Colombia S.A.S.
Km 1.5 vía Siberia-Cota Conj. Potrero Chico,
Parque Empresarial Arcos de Cota Bod. 1A.
Cota, Cundinamarca
Tel.: +57(1)-2913444
Fax: +57(1)-8764586

Croatia
GRUNDFOS CROATIA d.o.o.
Buzinski prilaz 38, Buzin
HR-10010 Zagreb
Tel.: +385 1 6595 400
Fax: +385 1 6595 499
www.hr.grundfos.com

Czech Republic
GRUNDFOS Sales Czechia and Slovakia s.r.o.
Čajkovského 21
779 00 Olomouc
Tel.: +420-585-716 111

Denmark
GRUNDFOS DK A/S
Martin Bachs Vej 3
DK-8850 Bjerringbro
Tel.: +45-87 50 50 50
Fax: +45-87 50 51 51
E-mail: info_GDK@grundfos.com
www.grundfos.com/DK

Estonia
GRUNDFOS Pumps Eesti OÜ
Peterburi tee 92G
11415 Tallinn
Tel.: + 372 606 1690
Fax: + 372 606 1691

Finland
OY GRUNDFOS Pumput AB
Trukkikuja 1
FI-01360 Vantaa
Tel.: +358-(0) 207 889 500

France
Pompes GRUNDFOS Distribution S.A.
Parc d'Activités de Chesnes
57, rue de Malacombe
F-38290 St. Quentin Fallavier (Lyon)
Tel.: +33-4 74 82 15 15
Fax: +33-4 74 94 10 51

Germany
GRUNDFOS GMBH
Schlüterstr. 33
40699 Erkrath
Tel.: +49-(0) 211 929 69-0
Fax: +49-(0) 211 929 69-3799
E-mail: infoservice@grundfos.de
Service in Deutschland:
kundendienst@grundfos.de

Greece
GRUNDFOS Hellas A.E.B.E.
20th km. Athinon-Markopoulou Av.
P.O. Box 71
GR-19002 Peania
Tel.: +0030-210-66 83 400
Fax: +0030-210-66 46 273

Hong Kong
GRUNDFOS Pumps (Hong Kong) Ltd.
Unit 1, Ground floor, Siu Wai industrial Centre
29-33 Wing Hong Street & 68 King Lam Street, Cheung Sha Wan
Kowloon
Tel.: +852-27861706 / 27861741
Fax: +852-27858664

Hungary
GRUNDFOS South East Europe Kft.
Tópark u. 8
H-2045 Törökbálint
Tel.: +36-23 511 110
Fax: +36-23 511 111

India
GRUNDFOS Pumps India Private Limited
118 Old Mahabalipuram Road
Thoraipakkam
Chennai 600 097
Tel.: +91-44 2496 6800

Indonesia
PT GRUNDFOS Pompa
Graha intirub Lt. 2 & 3
Jln. Cililitan Besar No.454. Makasar,
Jakarta Timur
ID-Jakarta 13650
Tel.: +62 21-469-51900
Fax: +62 21-460 6910 / 460 6901

Ireland
GRUNDFOS (Ireland) Ltd.
Unit A, Merrywell Business Park
Ballymount Road Lower
Dublin 12
Tel.: +353-1-4089 800
Fax: +353-1-4089 830

Italy
GRUNDFOS Pompe Italia S.r.l.
Via Gran Sasso 4
I-20060 Truccazzano (Milano)
Tel.: +39-02-95838112
Fax: +39-02-95309290 / 95838461

Japan
GRUNDFOS Pumps K.K.
1-2-3, Shin-Miyakoda, Kita-ku
Hamamatsu
431-2103 Japan
Tel.: +81 53 428 4760
Fax: +81 53 428 5005

Kazakhstan
Grundfos Kazakhstan LLP
7' Kyz-Zhibek Str., Kok-Tobe micr.
KZ-050020 Almaty Kazakhstan
Tel.: +7 (727) 227-98-55/56

Korea
GRUNDFOS Pumps Korea Ltd.
6th Floor, Aju Building 679-5
Yeoksam-dong, Kangnam-ku, 135-916
Seoul, Korea
Tel.: +82-2-5317 600
Fax: +82-2-5633 725

Latvia
SIA GRUNDFOS Pumps Latvia
Deglava biznesa centrs
Augusta Deglava ielā 60
LV-1035, Rīga,
Tel.: + 371 714 9640, 7 149 641
Fax: + 371 914 9646

Lithuania
GRUNDFOS Pumps UAB
Smolensko g. 6
LT-03201 Vilnius
Tel.: + 370 52 395 430
Fax: + 370 52 395 431

Malaysia
GRUNDFOS Pumps Sdn. Bhd.
7 Jalan Peguam U1/25
Glenmarie industrial Park
40150 Shah Alam, Selangor
Tel.: +60-3-5569 2922
Fax: +60-3-5569 2866

Mexico
Bombas GRUNDFOS de México
S.A. de C.V.
Boulevard TLC No. 15
Parque industrial Stiva Aeropuerto
Apodaca, N.L. 66600
Tel.: +52-81-8144 4000
Fax: +52-81-8144 4010

Netherlands
GRUNDFOS Netherlands
Veluwezoom 35
1326 AE Almere
Postbus 22015
1302 CA ALMERE
Tel.: +31-88-478 6336
Fax: +31-88-478 6332
E-mail: info_gnl@grundfos.com

New Zealand
GRUNDFOS Pumps NZ Ltd.
17 Beatrice Tinsley Crescent
North Harbour Industrial Estate
Albany, Auckland
Tel.: +64-9-415 3240
Fax: +64-9-415 3250

Norway
GRUNDFOS Pumper A/S
Strømsveien 344
Postboks 235, Leirdal
N-1011 Oslo
Tel.: +47-22 90 47 00
Fax: +47-22 32 21 50

Poland
GRUNDFOS Pompy Sp. z o.o.
ul. Klonowa 23
Baranowo k. Poznania
PL-62-081 Przeźmierowo
Tel.: (+48-61) 650 13 00
Fax: (+48-61) 650 13 50

Portugal
Bombas GRUNDFOS Portugal, S.A.
Rua Calvet de Magalhães, 241
Apartado 1079
P-2770-153 Paço de Arcos
Tel.: +351-21-440 76 00
Fax: +351-21-440 76 90

Romania
GRUNDFOS Pompe România SRL
S-PARK BUSINESS CENTER, Clădirea A2, etaj 2
Str. Tipografilor, Nr. 11-15, Sector 1, Cod 013714
Bucuresti, Romania
Tel.: 004 021 2004 100
E-mail: romania@grundfos.ro

Serbia
Grundfos Srbija d.o.o.
Omladinskih brigada 90b
11070 Novi Beograd
Tel.: +381 11 2258 740
Fax: +381 11 2281 769
www.rs.grundfos.com

Singapore
GRUNDFOS (Singapore) Pte. Ltd.
25 Jalan Tukang
Singapore 619264
Tel.: +65-6681 9688
Faxax: +65-6681 9689

Slovakia
GRUNDFOS s.r.o.
Prievozská 4D 821 09 BRATISLAVA
Tel.: +421 2 5020 1426
sk.grundfos.com

Slovenia
GRUNDFOS LJUBLJANA, d.o.o.
Leskoškova 9e, 1122 Ljubljana
Tel.: +386 (0) 1 568 06 10
Fax: +386 (0)1 568 06 19
E-mail: tehnika-si@grundfos.com

South Africa
GRUNDFOS (PTY) LTD
16 Lascelles Drive, Meadowbrook Estate
1609 Germiston, Johannesburg
Tel.: (+27) 10 248 6000
Fax: (+27) 10 248 6002
E-mail: lgradidge@grundfos.com

Spain
Bombas GRUNDFOS España S.A.
Camino de la Fuentecilla, s/n
E-28110 Algete (Madrid)
Tel.: +34-91-848 8800
Fax: +34-91-628 0465

Sweden
GRUNDFOS AB
Box 333 (Lunnagårdsgatan 6)
431 24 Mölndal
Tel.: +46 31 332 23 000
Fax: +46 31 331 94 60

Switzerland
GRUNDFOS Pumpen AG
Bruggacherstrasse 10
CH-8117 Fällanden/ZH
Tel.: +41-44-806 8111
Fax: +41-44-806 8115

Taiwan
GRUNDFOS Pumps (Taiwan) Ltd.
7 Floor, 219 Min-Chuan Road
Taichung, Taiwan, R.O.C.
Tel.: +886-4-2305 0868
Fax: +886-4-2305 0878

Thailand
GRUNDFOS (Thailand) Ltd.
92 Chaloem Phrakiat Rama 9 Road
Dokmai, Pravej, Bangkok 10250
Tel.: +66-2-725 8999
Fax: +66-2-725 8998

Turkey
GRUNDFOS POMPA San. ve Tic. Ltd. Sti.
Gebze Organize Sanayi Bölgesi
Ihsan dede Caddesi
2. yol 200. Sokak No. 204
41490 Gebze/ Kocaeli
Tel.: +90 - 262-679 7979
Fax: +90 - 262-679 7905
E-mail: satis@grundfos.com

Ukraine
ТОВ "ГРУНДФОС УКРАЇНА"
Бізнес Центр Європа
Столичне шосе, 103
м. Київ, 03131, Україна
Tel.: (+38 044) 237 04 00
Fax: (+38 044) 237 04 01
E-mail: ukraine@grundfos.com

United Arab Emirates
GRUNDFOS Gulf Distribution
P.O. Box 16768
Jebel Ali Free Zone, Dubai
Tel.: +971 4 8815 166
Fax: +971 4 8815 136

United Kingdom
GRUNDFOS Pumps Ltd.
Grovebury Road
Leighton Buzzard/Beds. LU7 4TL
Tel.: +44-1525-850000
Fax: +44-1525-850011

U.S.A.
Global Headquarters for WU
856 Koomey Road
Brookshire, Texas 77423 USA
Phone: +1-630-236-5500

Uzbekistan
Grundfos Tashkent, Uzbekistan
The Representative Office of Grundfos Kazakhstan in Uzbekistan
38a, Oybek street, Tashkent
Tel.: (+998) 71 150 3290 / 71 150 3291
Fax: (+998) 71 150 3292

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