

# S pumps, range 72 - 74 - 78

DIN 50/60 Hz

Service instructions



## English (GB) Service instructions

Original service instructions.

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## 1. Symbols used in this document

**Warning**

*If these safety instructions are not observed, it may result in personal injury.*

**Warning**

*These instructions must be observed for explosion-proof pumps. It is advisable also to follow these instructions for standard pumps.*

**Warning**

*If these instructions are not observed, it may lead to electric shock with consequent risk of serious personal injury or death.*

**Warning**

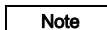
*The surface of the product may be so hot that it may cause burns or personal injury.*

**Warning**

*The sound pressure level is so high that hearing protection must be used.*

**Caution**

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

**Note**

*Notes or instructions that make the job easier and ensure safe operation.*

## 2. Servicing S pumps with explosion-proof motors

S pumps, range 72 to 78 have the following explosion protection classification:

72	Direct drive, 50 or 60 Hz	CE 1180 II2 G Ex bc d IIB T4
	Frequency converter drive	CE 1180 II2 G Ex bc d IIB T3
74, 78	Direct drive, 50 or 60 Hz	Only on request
	Frequency converter drive	Only on request

Service work on Ex pumps must be carried out by Grundfos or a workshop authorised by Grundfos. Violation of this requirement will invalidate the Ex classification of the pump.

Overhauled and repaired explosion-proof pumps are provided with a repair plate giving the following information:

- the repair symbol R
- name of registered trade mark of the repairing workshop
- workshop reference number relating to the repair
- date of overhaul or repair.

In case of subsequent repairs, the existing repair plate should be replaced by a new, updated repair plate and earlier markings must be recorded.

The repairing workshop must keep records of performed overhauls and repairs together with records of all previous overhauls, repairs and possible modifications. Copies of the repairing workshop's detailed records should be filed by the owner or operator together with the original type certificate of the explosion-proof motor in question.

## 3. Safety



### Warning

**Pump installation in pits must be carried out by specially trained persons.**

**Work in or near pits must be carried out according to local regulations.**

For safety reasons, all work in pits must be supervised by a person outside the pump pit.

Pits for submersible sewage and wastewater pumps contain sewage and wastewater with toxic and/or disease-causing substances. Therefore, all persons involved must wear appropriate personal protective equipment and clothing, and all work on and near the pump must be carried out under strict observance of the hygienic regulations in force.



### Warning

**Before attempting to lift the pump, make sure the rated capacity of the lifting equipment (lifting chain etc.) is adequate for the lifting work.**

**The rated capacity of the lifting equipment is stated on the equipment nameplate. The weight of the pump is stated on the pump nameplate.**

### Note

**If a pump has been used for a liquid which is injurious to health or toxic, the pump will be classified as contaminated.**

If Grundfos is requested to service the pump, Grundfos must be contacted with details about the pumped liquid, etc., before the pump is returned for service. Otherwise Grundfos can refuse to accept the pump.

Possible costs of returning the pump are paid by the customer.

However, any application for service (no matter to whom it may be made) must include details about the pumped liquid if the pump has been used for liquids which are injurious to health or toxic.

## 4. Identification

### 4.1 Nameplate

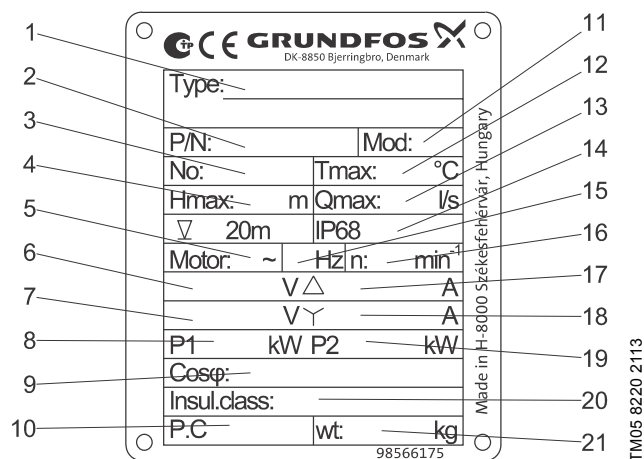


Fig. 1 Pump nameplate

All pumps can be identified by means of the nameplate on the motor top cover, see fig. 1.

Pos.	Description
1	Type designation
2	Product number
3	Serial number
4	Maximum head (m)
5	Number of phases
6	Voltage, delta connection
7	Voltage, star connection
8	Rated power input (kW)
9	Power factor (Cos φ)
10	Production code (YYWW)
11	Model
12	Maximum liquid temperature
13	Maximum flow rate (l/s)
14	Enclosure class according to IEC 60529
15	Frequency (Hz)
16	Rated speed
17	Current, delta connection
18	Current, star connection
19	Rated power output P2
20	Insulation class
21	Weight

TM05 8220 2113

## 4.2 Type key

All S pumps, range 72, 74 and 78, described in this product guide are identified by the type designation stated in the confirmation of order and other documentation supplied with the pump.

Please note that the pump type described in this type key is not necessarily available in all variants.

Code	Example	S	2	.90	.250	.2250	.4	.72	S	.C	.496	.G	.N	.D	.5	13	.Z
	<b>Pump type:</b>																
S	Grundfos sewage and wastewater pump																
ST	Multi-channel impeller pump installed in a column pipe																
	<b>Impeller type:</b>																
2	Two-channel																
3	Three-channel																
4	Four-channel																
	<b>Pump passage:</b>																
	Maximum solids size [mm]																
	<b>Pump discharge, S type:</b>																
250	Nominal diameter of pump discharge port [mm]																
	<b>Pump discharge, ST-type:</b>																
[ ]	Nominal diameter of column pipe [mm]																
	<b>Output power, P2:</b>																
	P2 = Code number from type designation/10 [kW]																
	<b>Number of poles:</b>																
4	4-pole motor																
6	6-pole motor																
8	8-pole motor																
10	10-pole motor																
12	12-pole motor																
14	14-pole motor																
	<b>Pump range:</b>																
72	72																
74	74																
78	78																
	<b>Pressure version:</b>																
S	Super-high																
H	High																
M	Medium																
L	Low																
E	Extra-low																
F	Super low																
	<b>Installation type:</b>																
S	Submerged installation without cooling jacket																
C	Submerged installation with cooling jacket																
D	Dry installation with cooling jacket																
H	Dry horizontal installation with cooling jacket																
	<b>Impeller diameter (average):</b>																
	[mm]																
	<b>Material code for impeller, pump housing and stator housing:</b>																
G	Cast iron impeller, pump housing and stator housing																
Q	Cast iron pump with stainless steel impeller																
	<b>Pump version:</b>																
N	Non-explosion-proof pump																
Ex	Pump with explosion-proof motor																
	<b>Sensor version:</b>																
B	S pump with built-in SM 113 module. PTC sensors are connected directly to IO 113 or other PTC relay.																
D	S pump without built-in SM 113 module																
	<b>Frequency:</b>																
5	50 Hz																
6	60 Hz																
	<b>Voltage and connection:</b>																
	50 Hz 60 Hz																
11	3 x 400 / 690 V Y/D 3 x 575 / (996) V Y/D																
13	3 x 415 / 719 V Y/D																
18	3 x 380-400 / 660-690 V Y/D																
58																	
1G	3 x 380 / 660 V Y/D 3 x 380 / 660 V Y/D																
1H	3 x 460 / (797) V Y/D																
1B	3 x 400-415 / 690-719 V Y/D																
1D	3 x 380-415 / 660-719 V Y/D																
Z	Custom-built products																

Type key used for frame size 74 and 78 until 2010. May still be used for spare pumps manufactured later.

Code	Example	S	2	X	250	4	H	2	5	11	Z
S	<b>Pump type:</b> Grundfos (or Sarlin) wastewater pump/sewage pump										
	<b>Impeller type:</b>										
2	Two-channel										
3	Three-channel										
4	Four-channel										
A	Axial Propeller										
N	Multi-channel, small pump passage										
	<b>Pump version:</b>										
[ ]	Standard pump										
X	In conformity with the ATEX directive										
	<b>Power:</b>										
100	Motor power in kW										
	<b>Number of poles:</b>										
2	2-pole motor										
4	4-pole motor										
6	6-pole motor										
8	8-pole motor										
10	10-pole motor										
12	12-pole motor										
14	14-pole motor										
	<b>Pump generation:</b>										
[ ]	First generation										
A	Second generation										
B	Third generation										
	<b>Pressure version:</b>										
[ ]	No classification										
S	Super high										
H	High										
M	Medium										
L	Low										
F	Super extra low										
	<b>Installation type:</b>										
1	Submerged installation without cooling jacket										
2	Submerged installation with cooling jacket										
3	Dry installation with cooling jacket										
4	Submerged installation, portable. Pump without cooling jacket.										
5	Submerged installation, portable. Pump with cooling jacket.										
6	Dry horizontal installation with base stand and bracket. Pump with cooling jacket										
7	Submerged column installation										
	<b>Interchangeability:</b>										
[ ]	No letter indicates full interchangeability of parts and use of the same spare parts catalogue.										
A,B,C	The letters (A, B, C...) indicate interchangeability of parts between otherwise identical pumps.										
	<b>Number of phases:</b>										
1	Single-phase										
[ ]	Three-phase										
	<b>Frequency:</b>										
5	50 Hz										
6	60 Hz										
	<b>Voltage and starting method:</b>										
	50 Hz 60 Hz										
06	660-690 V Y										
10	288-500 V Y/D										
11	400-690 V Y/D 460-(796) V Y/D										
12	220-380 V Y/D										
13	415-(719) V Y/D										
14	500-(865) V Y/D										
15	380-660 V Y/D										
	<b>Special equipment:</b>										
U	Flanges sized according to ANSI specifications										
	<b>Non-standard parts:</b>										
D	Special diameter in impeller										
C	Special length of cable										
Z	Combination of C and D or other special part										
	<b>Material code for impeller, pump and stator housing:</b>										
R	Stainless steel impeller, pump housing and stator housing, AISI 316 (DIN W.-Nr. 1.4408)										
S	Stainless steel impeller and pump housing, AISI 316 (DIN W.-Nr. 1.4408)										
Q	Stainless steel impeller, AISI 316 (DIN W.-Nr. 1.4408)										

## 5. Handling the pump

S pumps, range 78 weigh up to 7800 kg without accessories. It is therefore very important to use the right lifting equipment.

The pump weight is stated on the pump nameplate. See section [4.1 Nameplate](#).

### 5.1 Lifting the pump

All lifting equipment must be rated for the purpose and checked for damage before any attempt to lift the pump. The lifting equipment rating must under no circumstances be exceeded. See section [7.4 Lifting tools](#).

### 5.2 Lifting points

#### Warning



**Never lift the pump by the power supply cables. It may result in electric short-circuit and risk of electric shock when the pump is connected to the mains. The cables and cable entry may be damaged, leading to loss of watertightness and consequent severe damage to the motor.**

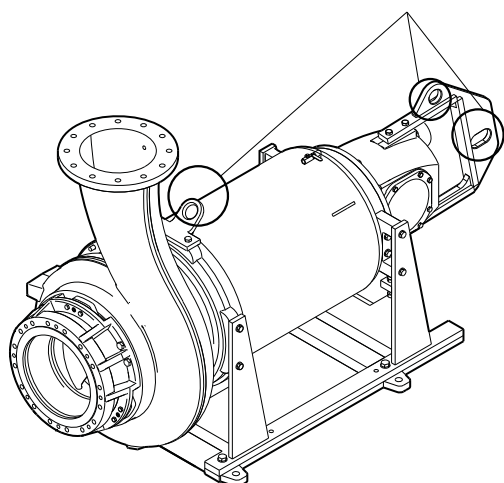


Fig. 2 Lifting points, range 72

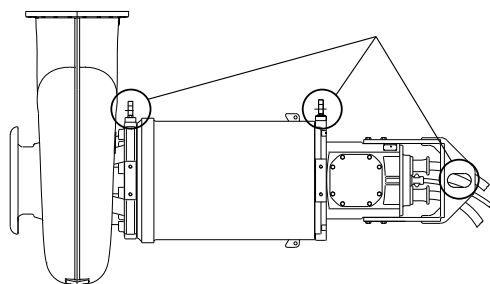


Fig. 3 Lifting points, range 74 and 78

### 5.3 Raising pump to upright position

#### Warning



**Make sure that the lifting brackets are tightened before attempting to lift the pump. Tighten if necessary. Carelessness during lifting or transportation may cause injury to personnel or damage to the pump.**

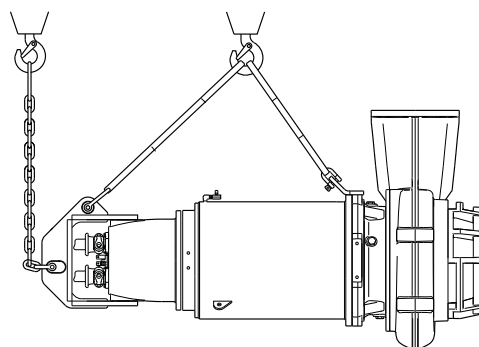


Fig. 4 Raising the pump to upright position, step 1

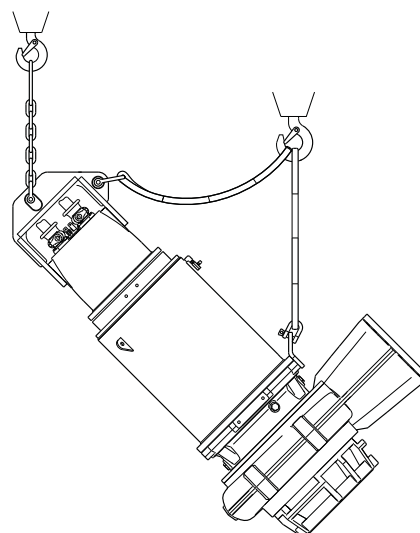


Fig. 5 Raising the pump to upright position, step 2

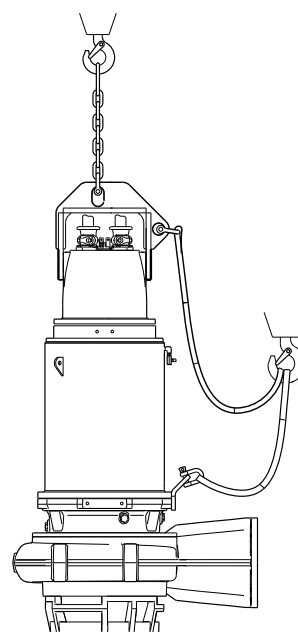


Fig. 6 Raising the pump to upright position, step 3

TM03 3034 0208

TM03 4459 0208

TM03 3035 0208

TM04 6068 4809

TM03 3036 0208

## 6. Torques, lubricants and special liquids

This section shows the screws and nuts that must be tightened to a certain torque and the lubricants to be used.

### 6.1 Common torques

Dimension	M8	M10	M12	M16	M20	M24	M27	M30
Torque [Nm]	20	40	70	170	330	570	820	1120

### 6.2 Special torques and lubricants

Range	Pos.	Description	Quantity	Dimension	Torque [Nm]	Lubricant
74, 78	61a	O-ring (primary shaft seal)	2	-	-	Oil
74, 78	62	O-ring	1	-	-	Oil
72, 74	67	Screw (impeller)	1	M24	600	Oil
78	67	Screw (impeller)	1	M24	160	Oil
	67a	Screw (fastening plate of impeller)	3	-	170	Oil
All	72a	O-ring	1	-	-	Oil
All	105	O-ring (inside of stationary part)	1	-	-	Oil
		Primary shaft seal (sliding surfaces)	1	-	-	Silicone spray
72	105	Screw of primary shaft seal	5	-	8	-
74, 8	105	Screw of primary shaft seal	5	-	15	-
All	105b	O-ring (inside stationary part)	1	-	-	Oil
		Secondary shaft seal (sliding surfaces)	1	-	-	Silicone spray
72, 74	105b	Screw of secondary shaft seal	5	-	8	-
78	105b	Screw of secondary shaft seal	5	-	15	-
74, 78	153	Angular contact ball bearings	2	-	-	Unirex S2 / LGHP 2
All	157	O-ring	1	-	-	Oil
All	157a	O-ring	1	-	-	Oil
All	162	Roller bearings	1	-	-	Unirex S2 / LGHP 2
All	154	Ball bearing	1	-	-	Unirex S2 / LGHP 2
All	193	Oil plug	3	R 3/4	55 ± 5	-
74, 78	756	O-ring	1	-	-	Oil

#### Oils:

Silicone spray Valvoline: 96249498.

Esso Unirex S2: 96248520/SKF LGHP 2 (-).

Motor oil with viscosity grade SAE 10 W 30 or SAE 10 W 40.

### 6.3 Quantities of grease in bearings

Range	Bearing	Amount of grease
72	Lower bearings	2.2 litres
74		2.3 litres
78		4.2 litres
Range	Bearing	Amount of grease
72	Upper bearing	0.28 litres
74		1.0 litres
78		1.7 litres

### 6.4 Special liquids

Range	Pos.	Component	Liquid
All	523	Cable gland for WIO	Ergo 4307
	520d	Moisture switch	Loclite 290
	177	Terminal board	Silcoset 151

Würth Ergo 4307 or similar (thread-locking compound)

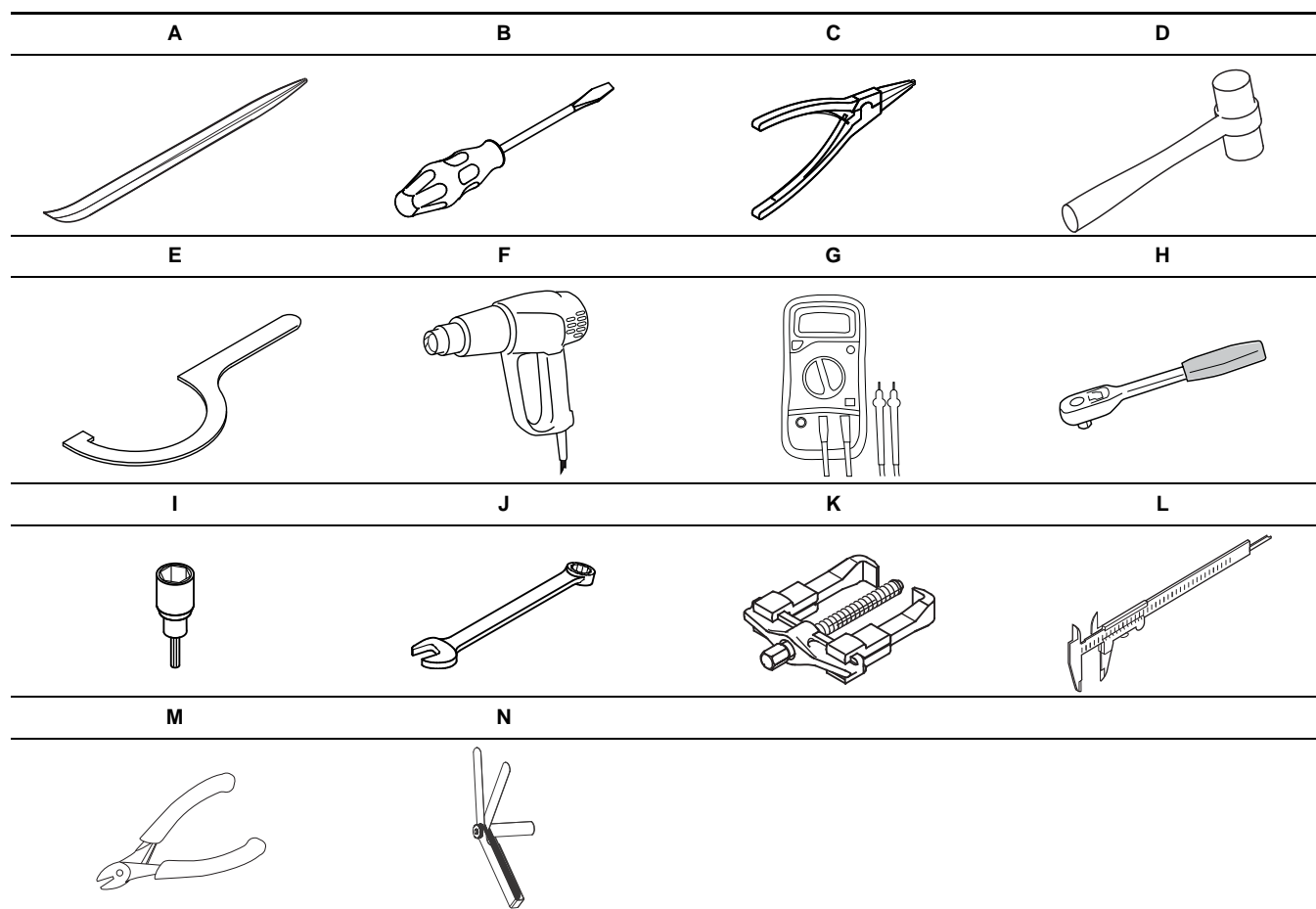
Henkel Loclite 290 or similar (thread-locking compound)

ACC Silicone Silcoset 151 (glue, FM approved).

## 7. Service tools

The following sections shows tools for pump service.

### 7.1 Standard tools

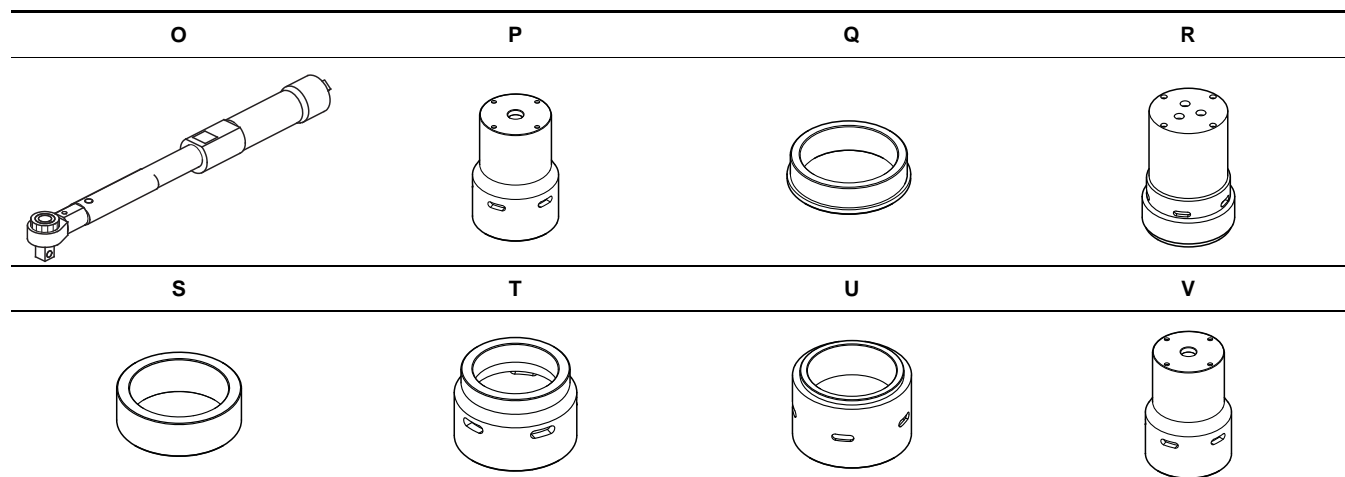


#### Standard tools

Pos.	Range	Designation	Description	Part number
A	All	Pinch bar	-	SV5201
B	All	Screwdriver	Straight slot	-
C	All	Lock-ring pliers	-	SV2014
D	All	Plastic hammer	-	SV0349
E	72	Hook spanner (Walter)	120-130 mm	-
	74	Hook spanner (SKF)	HN22	-
	78	Impact spanner (TMFN)	30-40	-
F	All	Warm-air heater	-	-
G	All	Multimeter	-	-
H	All	Ratchet handle 1/2"	-	96777072
I	All	Hexagon head driver	4 mm	SV0414
			M6 - 5 mm	SV0296
			M8 - 6 mm	SV0297
			M10 - 8 mm	SV0298
			M12 - 10 mm	SV0299
			M16 - 12 mm - 1/2"	SV0394
J	All	Ring/open-end spanner	8 mm	SV0273
			10 mm	SV0083
			12 mm	SV0274
			16 mm	SV0185
			20 mm	-
			24 mm	SV0122
			27 mm	SV0084
			30 mm	SV0073
K	All	Puller for bearing	-	SV0335
L	All	Sliding gauge	0-150 mm	SV0307
M	All	Cable pliers	-	-
N	All	Feeler gauge	-	-



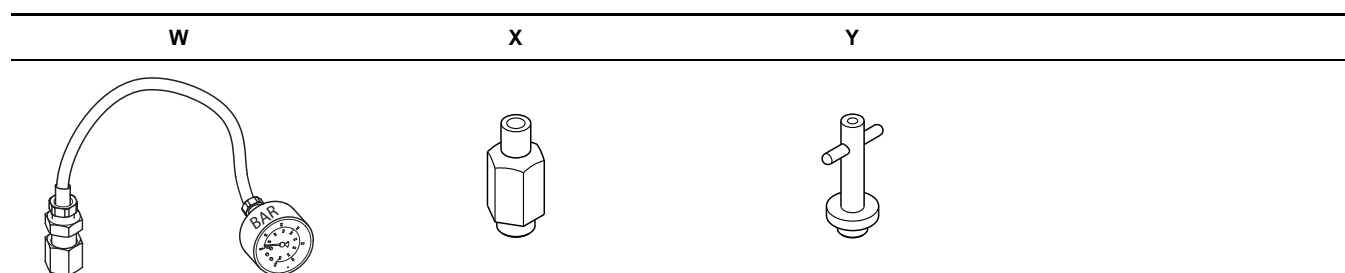
## 7.2 Special tools



### Special tools

Pos.	Range	Designation	Description	Part number
O	All	Torque wrench	-	-
P	74	Seal assembly tool (PUR127)	Roplan 85 mm	96242908
Q	74	Seal assembly tool (PUR128)	Roplan 95 mm	96242909
R	78	Seal assembly tool (PUR129)	Roplan 110 mm	96242910
S	78	Seal assembly tool (PUR130)	Roplan 110 mm	96242911
T	74	Seal assembly tool (PUR131)	Roplan 100 mm	96242912
U	78	Seal assembly tool (PUR132)	Roplan 120 mm	96242913
V	72	Seal assembly tool (PUR133)	Roplan 65 mm	96255372

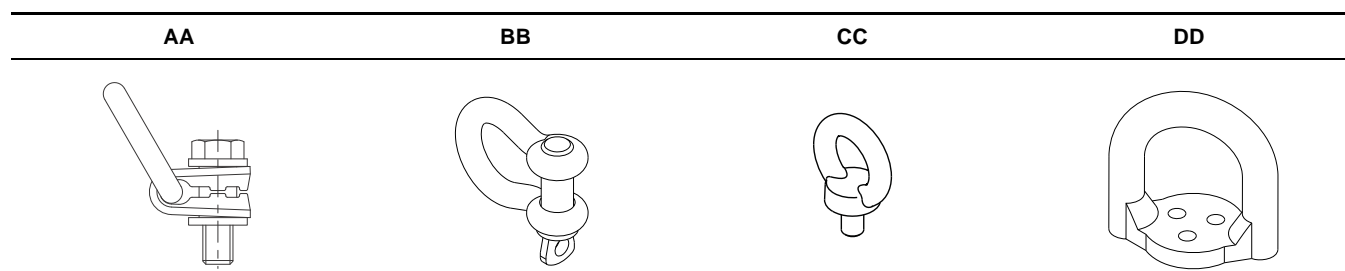
## 7.3 Tightness test tools



### Tightness test tools

Pos.	Designation	Description	Part number
W	Pressure gauge	-	-
X	Test plug (KOE045)	Connector M3\8-24 UNF F-ISO 228-G 3\8M	96061209
Y	Test plug (KOE171)	Connector R3/4	96061213

## 7.4 Lifting tools



### Lifting tools

Pos.	Designation	Description	Part number
AA	Eyebolt with rotating swivel	Range 74 and 78	-
BB	Shackle	All	-
CC	Eye bolt	All	-
DD	Lifting clamp	Range 78	98253177

## 8. Service

### 8.1 General information



#### **Warning**

**Before starting work on the pump, make sure that the mains switch has been locked in position 0. All rotating parts must have stopped moving.**



#### **Warning**

**Except for replacement/dismantling of bearings, all other service work must be carried out by Grundfos or an authorised service workshop.**

Service must be carried out by specially trained persons. Before carrying out maintenance and service, it must be ensured that the pump has been thoroughly flushed with clean water. Rinse the pump parts with water after dismantling.

Before assembly:

- Clean and check all parts.
- Replace defective parts with new parts.
- Order the necessary service kits.
- Gaskets and O-rings should always be replaced when the pump is overhauled.

During assembly:

- Lubricate and tighten screws and nuts to correct torque as stated in section.

### 8.2 Pump cleaning and visual inspection

A simple maintenance measure is to clean the pumps at regular intervals. The pumps may be cleaned on site at the pumping station when lifted up from the wet pit. Hose down the pump externally using a high-pressure jet cleaner (maximum pressure 100 bar). Caked dirt on the motor must be removed to ensure good heat conductivity. A mild detergent approved for disposal into the sewage system may be used. The pumps may be scrubbed, using a soft brush, if necessary.

Visual inspection of the pump should include search for cracks or other external damage. Inspect the lifting bracket and lifting chain for wear and corrosion. Inspect the pump cable for cracks or lacerations in the sheath, kinks or other damage. Inspect visible parts of the cable entry for cracks and for being firmly connected to the motor top cover. Check all visible screws and tighten, if necessary.

The air vent valve at the top of the cooling jacket may be removed and cleaned, if necessary. Clean the vent hole before refitting the valve after cleaning.

### 8.3 Annual maintenance

Pumps in normal operation should be inspected once a year. If the pumped liquid is very muddy or sandy, check the pump at shorter intervals.

The following points should be checked:

- **Power consumption**  
See section 4.1 *Nameplate*.
- **Oil level and oil condition**  
See section 8.4 *Oil check and oil change*.
- **Cable entry**  
Make sure that the cables are not sharply bent or pinched. Replace the cables if necessary.  
See section 9.1 *Checking and replacing the cable*.
- **Sensors**  
Make sure that sensor are working. Replace the sensors if necessary.  
See section 9.3 *Replacing the protection sensors*
- **Impeller clearance**  
Check the impeller clearance.  
See section 8.5 *Inspection and adjustment of impeller clearance*.
- **Pump parts**  
Check the pump housing, etc. for possible wear. Replace defective parts.
- **Ball bearings**  
Check the shaft for noisy or heavy operation (turn the shaft by hand). Replace defective ball bearings.  
A general overhaul of the pump is usually required in case of defective ball bearings or poor motor function. This work must be carried out by an authorized service workshop.



#### **Warning**

**On Ex pumps, the ball bearings must only be replaced by an authorised Ex workshop.**

- **O-rings and similar parts**  
During service / replacement, it must be ensured that the grooves for O-rings and seal faces have been cleaned before the new parts are fitted.

#### **Note**

**Used rubber parts must not be reused.**

## 8.4 Oil check and oil change

The oil chamber is filled with oil acting as lubricant and coolant for both mechanical shaft seals.

**Note** *Check the oil regularly to avoid damage and breakdown of the pump.*

Low oil level may indicate that the upper mechanical shaft seal is defective. Contact an authorized service workshop for further overhaul of the pump and repair, if required.



### Warning

**Lack of oil may cause overheating and damage of the mechanical shaft seals. The WIO sensor in the oil chamber will trip the alarm if the oil quality is poor or there is not enough oil in the oil chamber.**

**Note** *Use oil with viscosity grade SAE 10 W 30 or SAE 10 W 40.*

Range	Oil quantity		
	Installation type		
	S	C and D	ST
72	25 litres	18.5 litres	25 litres
74	-	20 litres	25 litres
78	-	80 litres	80 litres

The oil in the oil chamber can be changed with the pump in either horizontal or upright position.

### Horizontal position

Proceed as follows:

1. Place the pump in such a position that inspection screw A is pointing upwards.

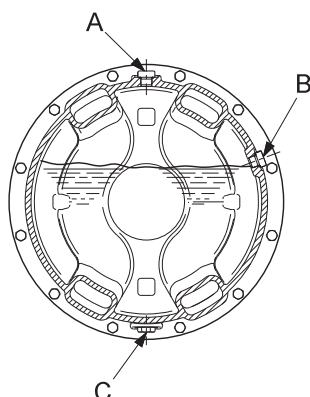


Fig. 7 Pump with inspection screw A upwards



### Warning

**When slackening the screw A of the oil chamber, note that pressure may have built up in the chamber. Do not remove the screw until the pressure has been fully relieved!**

2. Place a clean container under the pump to collect all the drained-off oil. Remove screw B and observe the oil level.
3. Check the oil level and take an oil sample to inspect the condition of the oil. The oil becomes greyish white like milk if it contains water. In normal operation a small leakage through the mechanical shaft seals is expected to happen, but if the water content in the oil is high, this may be the result of a defective shaft seal. The oil should be changed if it contains water.

4. If the oil needs to be changed, remove screw C and allow all the oil to drain from the chamber into the container. Pour an oil sample into a glass container and observe the condition of the oil.

Clear oil can be reused.

Emulsified oil must be changed and disposed of.

**Note** *Used oil must be disposed of in accordance with local regulations.*

5. Replace the O-rings, refit screw C and tighten securely. Fill the oil chamber with oil to the correct level. Refit screws A and B and tighten securely.

### Upright position

Proceed as follows:

1. Identify the screws A, B and C and their positions relative to each other. See fig. 7.

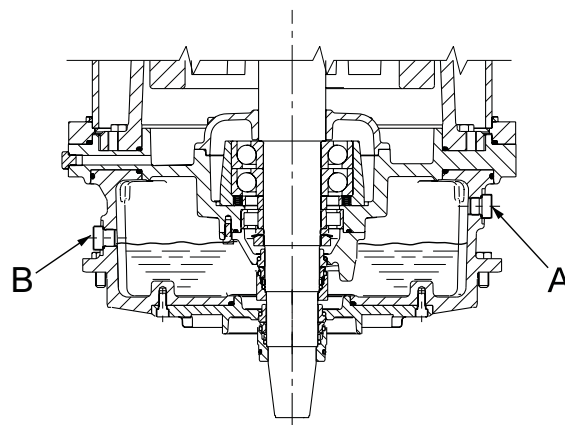


Fig. 8 Correct oil level of upright pump



### Warning

**When slackening the screw A of the oil chamber, note that pressure may have built up in the chamber. Do not remove the screw until the pressure has been fully relieved!**

2. Proceed as above and use screw B again for indication of the level of oil in the oil chamber. See fig. 8.
3. When the pump is upright, the oil has to be pumped out of the oil chamber. Use a suction pump with a flexible suction hose that can be inserted deep into the oil chamber.
4. Pump out the oil using all the screw holes in turns so as to reach all sections of the interior of the oil chamber. Collect the drained oil in a clean container.

**Note**

*Used oil must be disposed of in accordance with local regulations.*

5. Replace the O-rings, refit screw C and tighten securely. Fill the oil chamber with oil to the correct level. Refit screws A and connecting block B and tighten securely.

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## 8.5 Inspection and adjustment of impeller clearance

Position numbers of parts (digits) refer to section 11. *Drawings* and section 11.4 *Position numbers and material specification*.

The correct impeller clearance is  $1.3 \text{ mm} \pm 0.2 \text{ mm}$ .

The clearance should be reset if it is 2.0 mm or more.

The method for resetting the clearance is different for dry-installed pumps, type D, and submersible pumps, types S and C. For dry-installed pumps there are two methods. All methods are described here.

### 8.5.1 Submersible pumps, installation types S, C and ST

Submersible pumps have a separate adjustable pump suction cover which may be shaped as a suction bell. When the pump is installed or withdrawn, locate the six fastening screws of the suction cover and the three set screws.

Use a feeler gauge (N) to check the clearance between the impeller and the suction cover all around the perimeter of the suction opening. See fig. 9.



#### Warning

**Never work under a pump when it is hanging from hoist!**

#### Note

**Before adjusting the clearance, clean the gap between impeller and suction cover.**

If the clearance needs adjustment proceed as follows:

1. Slacken all fastening screws (35) and set screws between suction cover and pump housing.
2. Use a rubber mallet to tap the suction cover to close the clearance.
3. Open the clearance to specified value by turning the three set screws (12c).
4. Check that the clearance is uniform around the perimeter of the suction opening.
5. Tighten the fastening screws (35) and check that the clearance is stable.
6. Turn the impeller (49) by hand and check at several points.

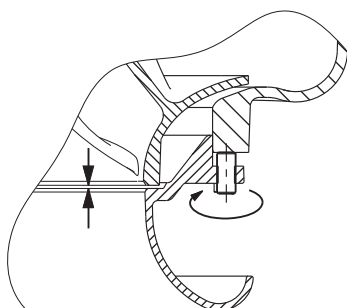


Fig. 9 Impeller clearance, installation types S, C and ST

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### 8.5.2 Dry-installed pumps, installation types D and H

The impeller clearance can be inspected and set with the pump installed on the pump stand and connected to the pipework. In these pumps, the suction cover is located between pump housing and outer connection flange on the suction side of the pump.

Depending on the construction, there are two ways to set the impeller clearance.

#### Method 1

Range	Pump types
72 and 74	S2.90.xxx.xxxx.x.xxx.
	S2.100.xxx.xxxx.x.xxx.
	S3.135.600.xxxx.x.xxx.
78	S3.115.xxx.xxxx.x.xxx.
	S3.130.xxx.xxxx.x.xxx.
	S3.145.xxx.xxxx.x.xxx.
	S4.135.xxx.xxxx.x.xxx.

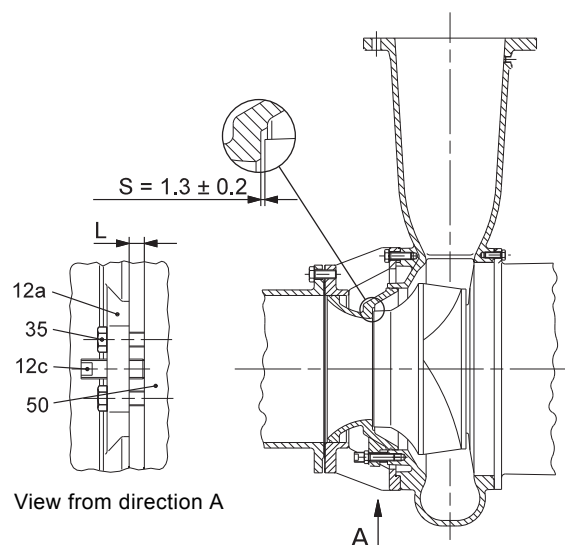


Fig. 10 Impeller clearance, installation types D and H, method 1

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These pump types have threaded holes for the fastening screws (35) of the suction cover (12a) in the pump housing (50) as shown in fig. 10. Set the impeller (49) clearance as follows:

1. Slacken the three set screws (12c) and close the impeller clearance "S" by tightening the six fastening screws (35) diagonally to move the suction cover evenly.



#### Warning

**Do not use too much force when tightening the fastening screws as this may damage the bearings. The movement is usual 1 to 3 mm.**

2. Measure the distance "L" between suction cover and pump housing at three points, next to the set screws, using feeler gauges or callipers and make a note of the distance.
3. Slacken the fastening screws and draw back the suction cover by  $1.3 \text{ mm} \pm 0.2 \text{ mm}$  using the three set screws (approx. one  $150^\circ$  turn of an M27 set screw) and the distance "L" as reference.
4. Tighten all fastening screws and check that the distance "L" at the three reference points is stable on the new value.

## Method 2

Range	Pump types
	S3.110.xxx.xxxx.x.xxx.
72 and 74	S3.120.xxx.xxxx.x.xxx.
	S3.135.500.xxxx.x.xxx.

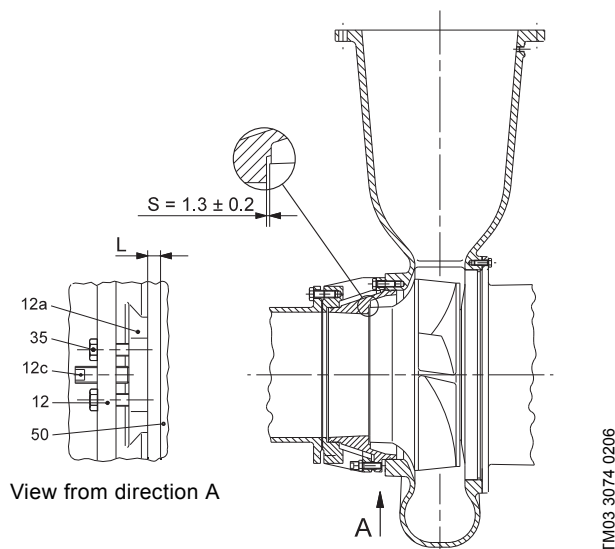


Fig. 11 Impeller clearance, installation type D and H, method 2

These pump types have threaded holes in the suction cover (12a) for the fastening screws (35) as shown in fig. 11. Set the impeller clearance as follows:

1. Slacken the six fastening screws (35) and close the impeller clearance "S" by tightening the three set screws (12C). Tighten the screws diagonally to move the suction cover evenly.

**Warning**

**Do not use too much force when tightening the fastening screws as this may damage the bearings. The movement is usual 1 to 3 mm.**

2. Measure the distance "L" between suction cover and pump housing at three points, next to the set screws, using feeler gauges or callipers and make a note of the distance.
3. Slacken the set screws and draw back the suction cover by 1.3 mm ± 0.2 mm using the six fastening screws (approx. one 270 ° turn of an M12 fastening screw) and the distance "L" as reference.
4. Tighten all set screws and check that the distance "L" at the three reference points is stable on the new value.

## 9. Dismantling and assembly instructions

Position numbers of parts (digits) refer to section 11. *Drawings* and section 11.4 *Position numbers and material specification*, and position numbers of tools (letters) refer to section 7. *Service tools*.

## 9.1 Checking and replacing the cable

Make sure that the cables are not sharply bent or pinched and that the cable sheath has no visual defects.

**Warning**

**In case of repairs, always use original service parts from the manufacturer.**

**Cable change**

There are two different methods of changing the cables. Both methods are described here.

**Note**

**Do not disassemble the cable entry unless you are going to replace it.**

**Caution**

**Disconnecting the cables will shorten them significantly.**

## 9.1.1 Change of cable without adapter flange, method A

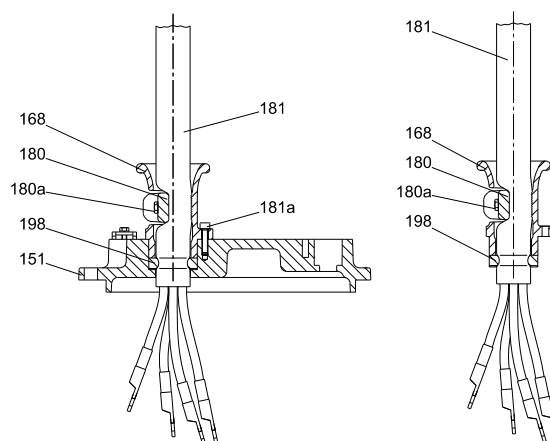


Fig. 12 Cable entry without adapter flange attached to motor top cover (left) and cable entry (right)

**Disconnecting the old cable**

1. Remove the screws (180a). See fig. 12.
2. Remove the cable clamp (180).
3. Remove the screws (181a).
4. Pull the cable out of motor top cover/terminal box (151/164a).
5. Remove the cable entry (168) including the rubber seal (198) from the cable (181).
6. Remove the rubber seal (198) from the cable entry (168).

**Connecting the new cable**

1. Slide cable entry (168) on to cable.
2. Slide rubber seal (198) on to cable.

**Make sure that the washer is below the rubber seal and fitted against the cable entry.**

**Note**

**Not all rubber seals include the washer (especially pumps manufactured before 2010).**

3. Fit the cable entry to the motor top cover/terminal box (151/164a) with screws (181a).
4. Fit the cable clamp (180a) to the cable entry (168) with screws (180a).

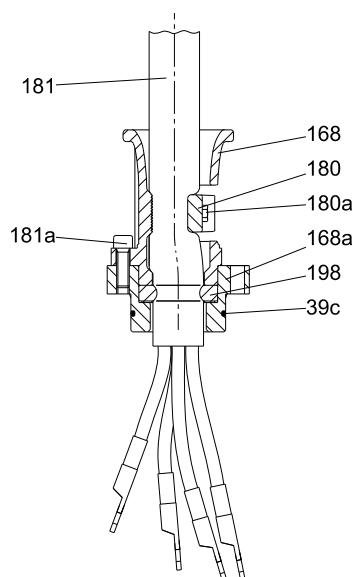
**Note**

**To prepare a new cable (length of leads, cable clips, cable markings, etc.), please use the old cable as reference.**

**Note**

**Connect according to the wiring diagram.**

### 9.1.2 Change of cable with adapter flange, method B



**Fig. 13** Cable entry with adapter flange

#### Disconnecting the old cable

1. Disconnect the cables from the terminal box (164a).
2. Remove the screws (180a). See fig. 13.
3. Remove the cable clamp (180).
4. Remove the screws (183).
5. Pull out the cable including adapter flange (168a), rubber seal (198) and cable entry (168).
6. Remove the screws (181a).
7. Pull out the adapter flange (168a).
8. Pull out the cable entry (168) including the rubber seal (198).
9. Remove the rubber seal (198) from the cable entry (168).

#### Connecting the new cable

1. Slide cable entry (168) on to cable.
2. Slide rubber seal (198) on to cable.

**Note** *Make sure that the washer is below the rubber seal and fitted against the cable entry.*

3. Slide adapter flange (168a) on to cable.
4. Fit the screws (181a).
5. Fit the cable clamp (180a) on the cable entry (168) with screws (180a).
6. Fit the cable to motor top cover/terminal box (151/164a).

**Note** *To prepare a new cable (length of leads, cable clips, cable markings, etc.), please use the old cable as reference.*

**Note** *Connect according to the wiring diagram.*

### 9.2 Replacing the terminal board



#### Warning

**Do not change the terminal board unless it is damaged or it is absolutely necessary.**

Please note that the position numbers below refer exclusively to the replacing of the terminal board.

Pos.	Description	Dimension	Torque [Nm]
1	Copper stud bolt*	-	-
2	Sleeve	-	-
3	Washer plate (round)	-	-
4	Plastic bar	-	-
5	Washer plate (rectangular)	-	-
6	Washer plate (square)	-	-
7	Locking plate (round)	-	-
8	Locking plate (square)	-	-
9	Brass bolt	M8	-
10	Brass screw	M12	12
11	Brass nut	M8	20
12	Brass nut	M12	16
13	Brass nut	M16	40
14	Brass nut	M20	60
15	Spring washer	M8	-
16	Spring washer	M10	-
17	Spring washer	M12	-
18	Spring washer	M16	-
19	Washer plate	M24	-
20	O-ring	12.0 x 3	-
21	O-ring	19.2 x 3	-
22	O-ring	24.0 x 3.53	-
23	O-ring	34.2 x 3.53	-
24	Glue (Silcoset 151)	-	-

\* Range 74 pumps manufactured between 1995 and 1997 may have brass stud bolts.

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### 9.2.1 Range 72

S pumps, range 72, have two types of terminal board, standard and Ex. Changing method for both types are described here.

#### Standard terminal board, method 1

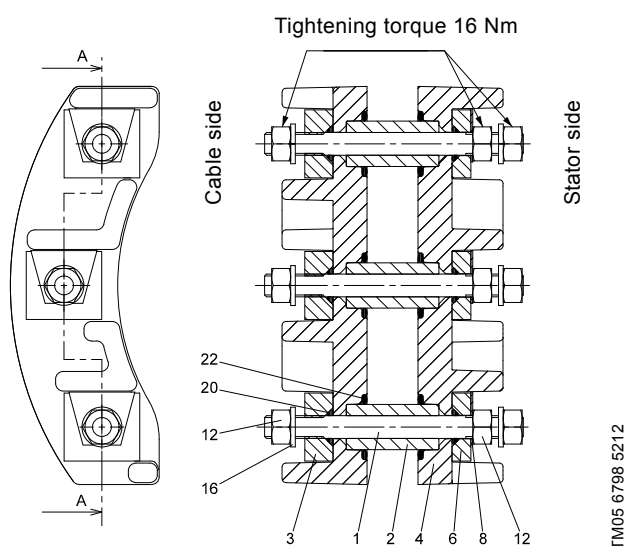


Fig. 14 Standard terminal board, range 72

#### Dismantling the terminal board

1. Remove the brass nuts (12) and the spring washers (10) from cable side. See fig. 14.
2. Release the locking of the brass nuts (12) on the stator side by bending down the tabs of the locking plates (8). Remove the brass nuts (12) and the plates (8).
3. Remove the washers (3 and 5) including the O-rings (20).
4. Remove the plastic bars (4) including O-rings (22) from both sides.
5. Remove the copper stud bolts (1) including sleeves (2).

#### Assembling the terminal board

1. Fit the copper stud bolts (1) into the sleeves (2) and fit them to the bottom of the upper bearing bracket (61c).
2. Fit the O-rings (22) around the sleeves (2).
3. Fit the plastic bars (4).
4. Fit the washers (3 and 5) including O-rings (20) to the copper stud bolts (1) on the both sides. Fit the locking plates (8) and brass nuts (12) on the stator side. Bend one tab of the locking plates (8) against the nuts (12) to lock the nuts.
5. Connect according to the wiring diagram, use spring washers (10) and brass nuts (12).

#### Ex terminal board, method 2

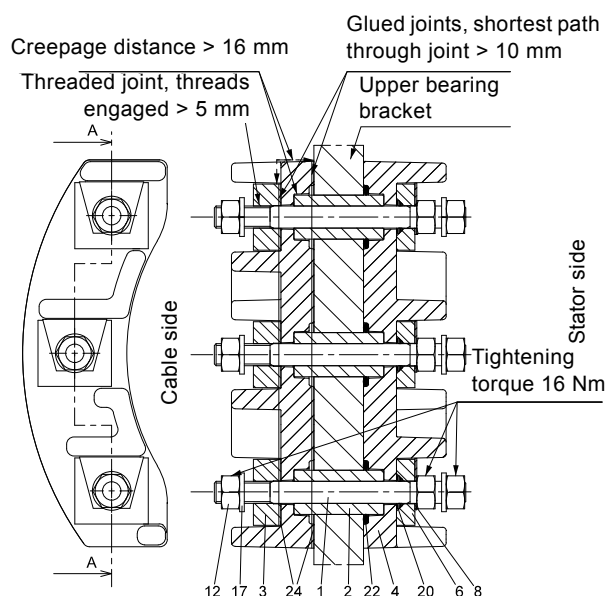


Fig. 15 Ex terminal board, range 72

#### Dismantling the terminal board



#### Warning

**Ex terminal board parts have been glued together. You might need to use more force in removing than normally.**

**Ex terminal board parts cannot be reused.**

1. Remove the brass nuts (12) and the spring washers (17). Disconnect the cables from both cable and stator sides. See fig. 15.
2. Release the locking of the brass nuts (12) on the stator side by bending down the tabs of the locking plates (8).
3. Remove the washers (5) including the O-rings (20).
4. Remove the copper stud bolts (1) including washers (3).
5. Remove the sleeves (2).

#### Note

**Upper bearing bracket (61c) must be cleaned carefully before assembly.**

#### Assembling the terminal board

1. Fit the copper stud bolts (1) into sleeves (2) and fit them to the bottom of the upper bearing bracket (61c).

#### Note

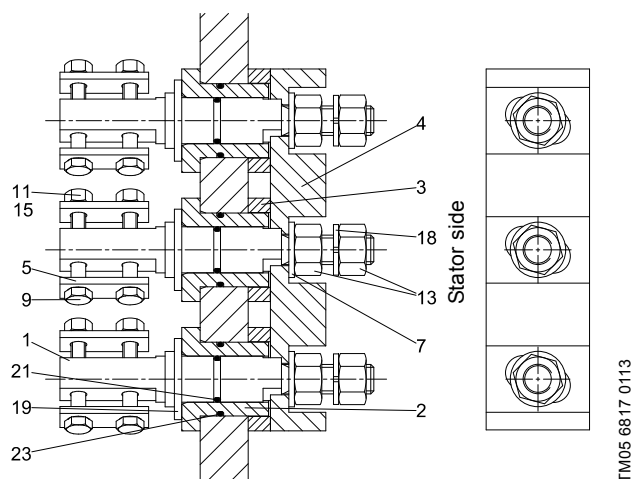
**Use glue, such as Silcoset 151.**

2. Apply glue to the bottom of the plastic bars (4) and fit to upper bearing bracket (61c) on the cable side.
3. Apply glue to the bottom of the washers (3) and fit them to the plastic bars (4).
4. Fit the O-rings (22) around the sleeves (2) on the stator side.
5. Fit the plastic bars (4) on the upper bearing bracket (61c) on the stator side. Fit the locking plates (8) and brass nuts (12). Lock the nuts by bending one tab of locking plates (8) towards the brass nuts (12).
6. Connect according to the wiring diagram, use spring washers (17) and brass nuts (12).

### 9.2.2 Range 74 and 78

For S pumps, range 74 and 78, there are two main types of terminal board depending on pump manufacturing year and model. Changing methods for all are described here.

#### Pumps manufactured between 1995 and 1997



**Fig. 16** Terminal board for pumps manufactured between 1995 and 1997, range 74 and 78

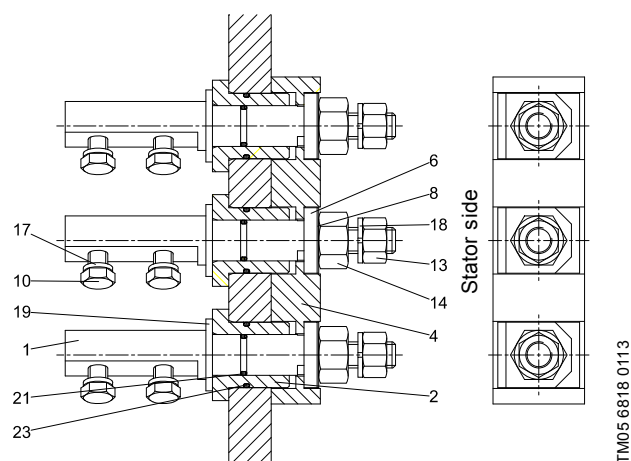
#### Dismantling the terminal board

1. See fig. 16.
2. Disconnect the cables from cable side by removing nuts (11), bolts (9), washer plates (5) and spring washers (15).
3. Disconnect the cables from stator side by removing nuts (13) and spring washers (18).
4. Remove the nuts (13) and locking plates (7).
5. Remove the plastic bars (4) and washers (3).
6. Remove washers (19).
7. Remove the copper stud bolts (1) and sleeves (2) including O-rings (21 and 23).

#### Assembling the terminal board

1. Fit the O-rings (21 and 23) and lubricate with silicone spray
2. Fit the copper stud bolts (1) in the sleeves (2) fit them to wall.
3. Fit washers (3 and 19).
4. Fit the plastic bars (4).
5. Fit the washers (7) and nuts (13).
6. Connect the cables on the stator side according to the wiring diagram. Use brass nuts (13) and washers (18).
7. Connect the power cables on the cable side according to the wiring diagram. Use brass bolts (9), nuts (1) and washers (5 and 15).

#### Pumps manufactured after 1997



**Fig. 17** Terminal board for pumps manufactured 1997 and later, range 74 and 78

#### Dismantling the terminal board

1. See fig. 17.
2. Disconnect the cables from the cable side by removing nuts (10) and spring washers (17).
3. Disconnect cables from the stator side by removing nuts (13) and spring washers (18).
4. Release the locking of the nuts (14) by bending down the tabs of the locking plates (8).
5. Remove the nuts (14).
6. Remove the locking plates (8) and washers (6).
7. Remove the copper stud bolts (1), washer plates (19) and sleeves (2) including O-rings (21 and 23).

#### Assembling the terminal board

1. Fit the O-rings (21 and 23) and lubricate with silicone spray.
2. Fit the plastic bars (4) to the wall in the terminal box.
3. Fit the copper stud bolts (1) including sleeves (2) and washers (19).
4. Fit the washers (6) and the locking plates (8).
5. Fit the nuts (14) and tighten with a torque of 60 Nm.
6. Lock the nuts (14) by bending up one tab of the washers (8).
7. Connect the cables on the stator side according to the wiring diagram.
8. Connect the cables on the cable side according to the wiring diagram.



## 9.3 Replacing the protection sensors

### 9.3.1 Moisture switch

The pumps can have up to three moisture switches, two in the terminal box (164a) and one on the lower bearing bracket (155). The changing method is the same, no matter where the switch is placed.



#### Warning

**Do not touch the head of the moisture switch with wet or oily hands. Moisture on the sensor head before installation will cause false measuring values.**

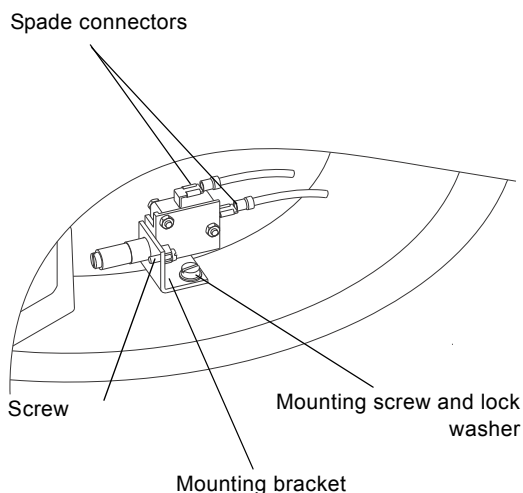


Fig. 18 Moisture switch on lower bearing bracket

#### Removing the moisture switch

1. Disconnect the spade connectors from the switch.
2. Remove the mounting screw and lock washer from the mounting bracket. Remove the switch from the base of the terminal box/upper bearing bracket (164a/61c).
3. Remove the screw.
4. Remove the switch from the mounting bracket.

#### Fitting new moisture switch

5. Fit the moisture switch to the mounting bracket.
6. Fit the screw to attach the switch to the mounting bracket.
7. Fit the mounting bracket including the switch on the base with the mounting screw and the lock washer.
8. Connect the spade connectors.
9. Connect the wires according to the wiring diagram. See section [11.6 Electrical connections](#).

### 9.3.2 Pt100 sensor in upper bearing bracket

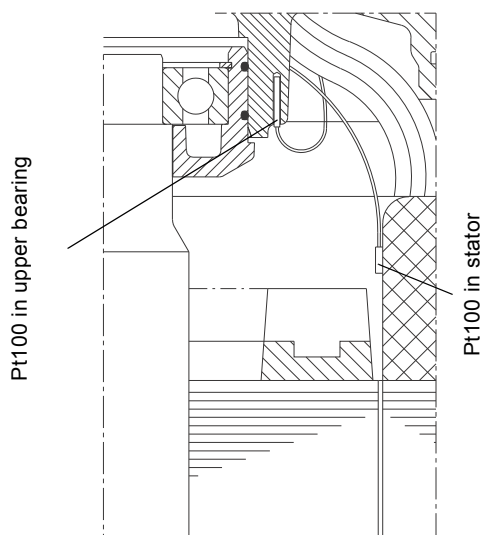


Fig. 19 Pt100 in upper bearing and in stator

#### Removing Pt100

1. Cut the wire of the Pt100 sensor right next to sensor.
2. Drill out the sensor from the upper bearing bracket (61c).

#### Fitting new Pt100

3. Dip the sensor head in glue and insert it into the hole in the upper bearing bracket (61c).
4. Connect according to the wiring diagram. See section [11.6 Electrical connections](#).

### 9.3.3 Pt100 sensor on the stator

#### Removing Pt100

1. Cut the wire of the Pt100 sensor right next to sensor and remove the wire. See fig. 19.
2. Leave the old sensor on the stator (48).

#### Fitting new Pt100

#### Warning

#### Caution

**Make sure that the wire of new sensor is protected by a protection sleeve.**

3. Glue the sensor on to stator windings (48).
4. Connect according to the wiring diagram. See section [11.6 Electrical connections](#).

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### 9.3.4 Pt100 sensor in lower bearing bracket

Pt100 in lower bearing bracket can be fitted in three places depending on pump manufacturing year. In pumps manufactured before 2012, sensors are fitted to the locking ring (59a) and lower bearing bracket (155). See fig. 20. One sensor can be fitted to the lower bearing bracket (155), but in a different place, see fig. 21. There are two methods for changing the sensors, and both methods are described here.

#### Method A

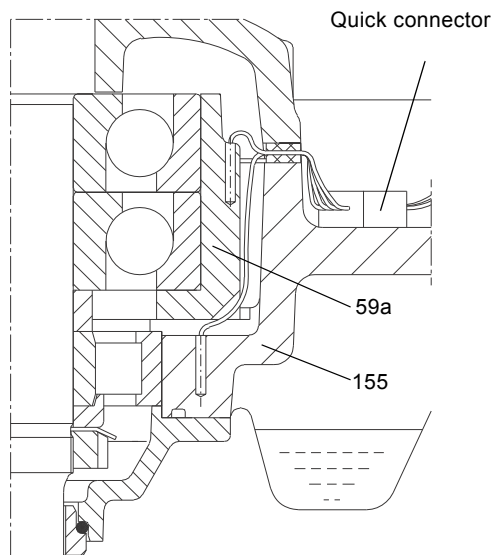


Fig. 20 Pt100 sensor positions in the lower bearings

#### Removing Pt100

1. See fig. 20. Cut the wire of the Pt100 right next to the sensor.
2. Drill out the sensor from the locking ring/bearing bracket (59a/155).
3. Clean the area with pressurised air.

#### Fitting new Pt100

4. Dip the whole sensor in the glue and insert it into the hole in locking ring/bearing bracket (59a/155).
5. Apply a small amount of glue to root of sensor to make sure that it sticks.
6. Connect according to the wiring diagram. See section 11.6 [Electrical connections](#).

#### Method B

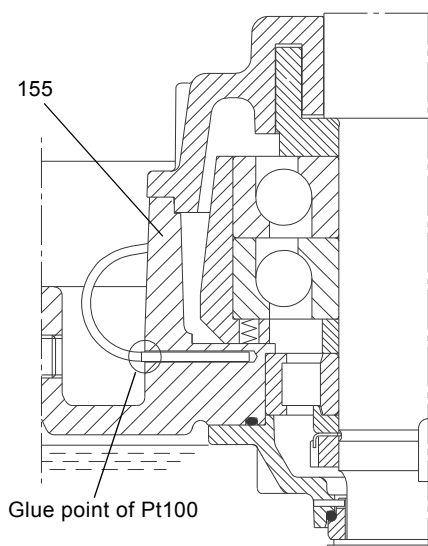


Fig. 21 Pt100 in lower bearing bracket on pumps manufactured after 2010

### Removing Pt100

1. See fig. 21. Pull out the sensor using a pair of tongs.
2. Clean the sensor hole carefully.

#### Fitting new Pt100 sensor in the lower bearing bracket

3. Insert the sensor into the hole in the lower bearing bracket (155).
4. Spread glue around the sensor end, see fig. 21.
5. Connect according to the wiring diagram. See section 11.6 [Electrical connections](#).

### 9.3.5 Water-In-Oil sensor (WIO)

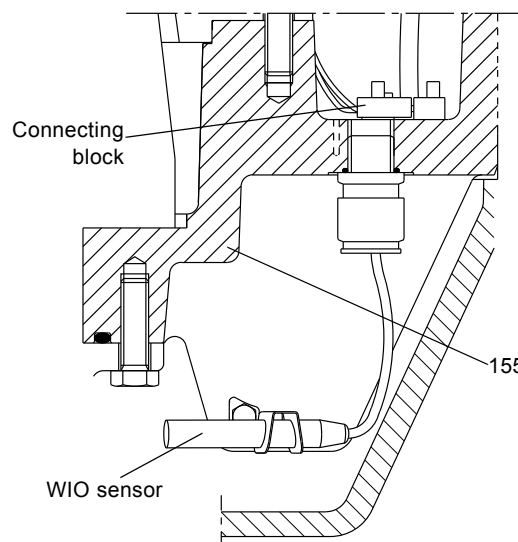


Fig. 22 Water-In-Oil sensor (WIO)

#### Removing the WIO sensor

1. See section 9.4.10 *Removing the rotor*.
2. Remove the sensor from the bracket on lower bearing bracket (155).
3. Open the cable gland.
4. Remove the wires from the connecting block.
5. Pull the sensor cable out through the cable entry in the lower bearing bracket.

#### Fitting new WIO sensor

1. Fit the sensor in the bracket.
2. Put the sensor cable up through the cable entry in the lower bearing bracket.
3. Tighten the cable gland.
4. Cut the cable to a suitable length and connect the wires to the connecting block. Connect according to the wiring diagram. See section 11.6 [Electrical connections](#).

## 9.4 Dismantling range 72

For position numbers, see section [11.1 Range 72](#).



### Warning

**Maintenance and service work on explosion proof pumps must be carried out by Grundfos or a service workshop authorised by Grundfos.**

### 9.4.1 Removing the impeller and pump housing

#### Note

**Before dismantling, support the pump from lifting bracket with hoist and beneath the discharge flange with wedges.**

1. Remove the outer screws (26).
2. Lift the pump including the impeller (49) and intermediate ring (1) out of the pump housing (50). Use wedges, if necessary.
3. Remove the O-ring (39a).
4. Place the motor with impeller in horizontal position on for instance a stable trestle.
5. Remove the O-ring (37b).
6. Support the impeller with a lifting strap, board and hoist to prevent movement.
7. Bend out the locking tab in the cap (66) and loosen the impeller screw (67) but do not remove the screw yet.
8. Remove the impeller (49), use wedges, if necessary.
9. Remove the impeller screw (67), the O-ring (67b), the cap (66) and the O-ring (62a).
10. Remove the impeller (49).
11. Remove the key (9a).

### 9.4.2 Draining the oil

1. See section [8.4 Oil check and oil change](#)

### 9.4.3 Removing the primary shaft seal

1. See section [9.4.1 Removing the impeller and pump housing](#).
2. See section [9.4.2 Draining the oil](#).
3. Loosen the set screws in the shaft seal (105) and remove the rotating part.
4. Gently remove the stationary ring of the shaft seal (105).

### 9.4.4 Removing the terminal box

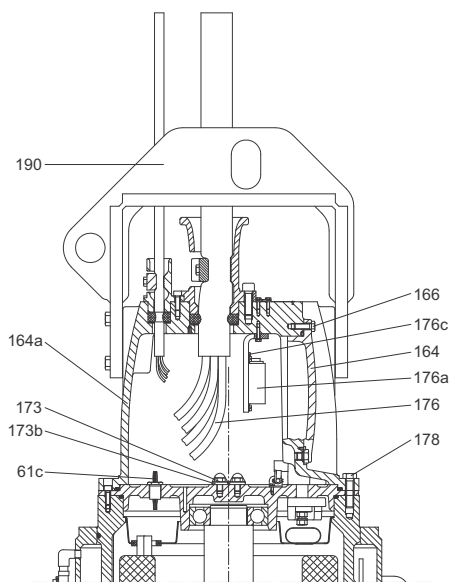


Fig. 23 Terminal box, range 72

1. See section [9.4.3 Removing the primary shaft seal](#)
2. Place the motor in vertical position on for instance a stable trestle (shaft downwards).
3. Remove the screws (166). See fig. [23](#).
4. Remove the terminal box cover (164) including O-ring (165).
5. Remove the screws (173) and locking plate (173b).
6. Disconnect the power cable wires (181) from the terminal board (177) on upper bearing bracket (61c).
7. Disconnect protection sensor cables from the terminal block (176a). Do not disconnect the control cable wires from the terminal block.
8. Straighten the corners of the locking plate (173b) and remove the screws (173) and the locking plate.
9. Disconnect the control cable (252) earth conductors.
10. Remove the outer screws (178).
11. Lift off the terminal box (164a).

### 9.4.5 Removing the cooling jacket

1. Remove the screws (150a).
2. Remove the cooling jacket (150c) using a hoist by lifting from the lifting eyes on both sides of the cooling jacket. Remove the O-rings (37a and 157b).

### 9.4.6 Removing the upper bearing bracket

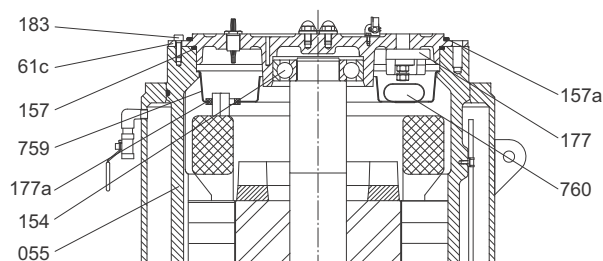


Fig. 24 Upper bearing bracket, range 72

1. See section [9.4.4 Removing the terminal box](#).
2. See section [9.4.5 Removing the cooling jacket](#).
3. Remove the screws (183) and fit them in the holes in the upper bearing bracket (61c).
4. Loosen the bearing bracket by driving the four screws (183) against the end of the stator housing. Screws will push the bearing bracket up from the stator housing (55).
5. Pull the upper bearing bracket (61c) approximately 20 cm out of the stator housing.
6. Disconnect the sensor cables from the terminal board (177) under upper bearing bracket (61c).
7. Disconnect the cables by removing the screws and locking plates from the terminal board (177) under the upper bearing bracket. See fig. [24](#).
8. Remove the upper bearing bracket (61c) including O-rings (157a and 157) from the stator housing (55).
9. Remove the moisture absorbing bag (760) from the protection ring (759).
10. Remove the protection ring (759) including protection sleeve (177a).

### 9.4.7 Removing the upper bearing

1. See section [9.4.6 Removing the upper bearing bracket](#)
2. Gently heat up the inner ring of the roller bearing and remove the bearing (154) with a bearing puller (K).

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### 9.4.8 Removing the shaft seal housing

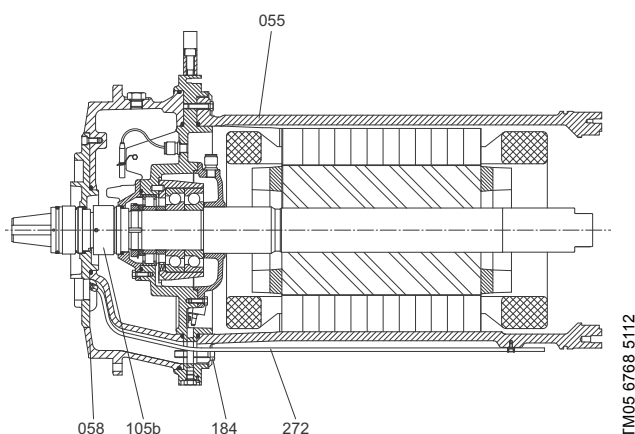


Fig. 25 Removing the shaft seal housing, range 72

1. See section [9.4.3 Removing the primary shaft seal](#).
2. Place the motor in horizontal position on for instance a stable trestle or other support.
3. Remove the vent pipe (272) from the stator housing (55).
4. Secure the shaft seal housing (58) with the lifting strap and remove screws (184).
5. Remove the shaft seal housing (58) including the vent pipe (272).

### 9.4.9 Removing the secondary shaft seal

1. See section [9.4.8 Removing the shaft seal housing](#).
2. Loosen the set screws in the secondary shaft seal (105b). Remove the rotating and stationary parts of the shaft seal (105b).

### 9.4.10 Removing the rotor

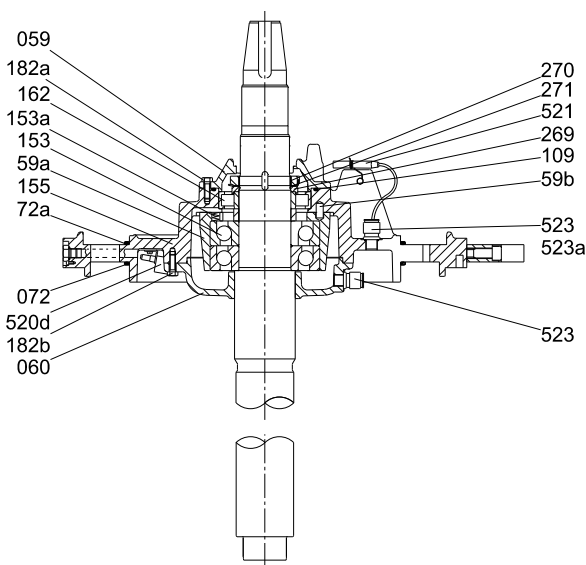


Fig. 26 Rotor, range 72

1. See section [9.4.9 Removing the secondary shaft seal](#).
2. Remove the screws (184a).
3. Pull the rotor (172) with the lower bearing bracket (155) approximately 15 cm out of the stator housing to be able to disconnect the sensors from the connecting block.

**Note**

**Support the rotor by placing boards between the stator housing and the rotor.**

4. Disconnect the sensors from the connecting block.
5. Remove the rotor and place it in vertical position (shaft upwards) on for instance a stable trestle.

### 9.4.11 Removing the lower bearings

1. See section [9.4.10 Removing the rotor](#).
2. See fig. 26. Disconnect the cable gland (523) in the lower bearing bracket cover.
3. Disconnect the bearing sensor and remove the cable gland from the upper bearing bracket cover (60).
4. Remove the screws (182b) and remove upper bearing bracket cover (60) of the lower bearing bracket. Leave the cover lying against the stator windings.
5. Loosen and remove the screws (182a).
6. Remove the lower bearing bracket cover (59) of the lower bearing bracket and remove the O-ring (109).
7. Remove the lock nut (270), lock washer (271) and angle ring (269).
8. Remove the lower bearing bracket (155) using a hoist.

**Note**

**The outer ring of the roller bearing and the rolls will be removed together with the bearing bracket.**

9. Collect the springs (153a).
10. Check that the pin (59b) is attached to the lower bearing bracket.
11. Gently heat up the inner ring of the roller bearing (162) and remove the ring from the shaft.
12. Gently heat up the outer ring of the roller bearing (162) and remove the ring from the lower bearing bracket (155).
13. Remove the supporting ring (197) from the shaft.
14. Heat the locking ring (59a) to 200 °C and remove it.
15. Remove the angular contact ball bearings (153) from the shaft.
16. Remove the upper bearing bracket cover (60) of the lower bearing bracket from the shaft.

## 9.5 Assembling range 72

### 9.5.1 Fitting the lower bearings

1. Place the motor in vertical position on for instance a stable trestle (shaft seal upwards).
2. Fill the upper bearing bracket cover (60) with grease and fit the cover on the rotor. See section 6.3 *Quantities of grease in bearings*.
3. Grease the angular contact ball bearings (153). Fill only 50 % of the free space of the bearings.
4. Heat up the greased angular contact ball bearings (153) to 120 °C and fit them on the shaft. For the angular contact bearing to absorb the axial forces, the bearing must be fitted so that the large surface of the inner ring is resting on the bearing shoulder of the shaft and the large surface of the outer ring is resting on the locking ring (59a).
5. Heat the locking ring (59a) to 180 °C and fit it on the bearings (153).
6. Fit the springs (153a) in the holes of the locking ring.
7. Fit the supporting ring (197) on the rotor.
8. Heat the inner ring of roller bearing (162) to 120 °C and fit it on the rotor.
9. Fit the outer ring of roller bearing (162) on to the lower bearing bracket (155).
10. Grease the roller bearings (162). Fill only 50 % of the free space of the bearings.
11. Check that the pin (59b) and the Pt100 sensor are fitted on the lower bearing bracket (155).
12. Fit the lower bearing bracket (155) on the rotor.
13. Fit the angle ring (269), lock washer (271) and nut (270) on the rotor.

#### Note

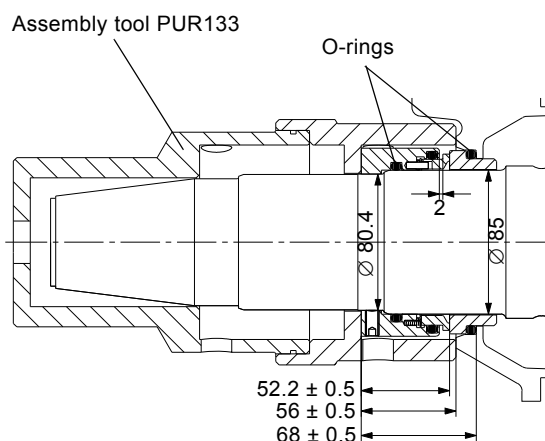
**Check that the locking ring and the outer ring of the bearings can be rotated without any disturbances.**

14. Bend one wing of the lock washer (271) into the notch of lock nut (270).
15. Fit the O-ring (109) in the groove of the lower bearing bracket (155).
16. Fit the lower bearing bracket cover (59) on the lower bearing bracket (155) with screws (182a).
17. Fit the upper bearing bracket cover (60) on the lower bearing with screws (182b).

### 9.5.2 Fitting the rotor

1. Fit the O-ring (72) on the lower bearing bracket (155).
2. Lower the rotor with shaft into the stator (55), leaving a space of approximately 20 cm.
3. Connect the sensor connecting block.
4. Complete the fitting of the rotor/shaft.
5. Fit the screws (184a).

### 9.5.3 Fitting the secondary shaft seal



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**Fig. 27** Fitting the secondary shaft seal, range 72

1. Place the motor in horizontal position on for instance a stable trestle.
2. Clean the shaft.
3. Fit the O-ring on the stationary part of the secondary shaft seal (105b).
4. Fit the O-ring inside the stationary part of the secondary shaft seal (105b).
5. Lubricate the moving parts with silicone spray.
6. Fit the stationary part of the secondary shaft seal (105b) on the shaft and press it home (V). See fig. 27.
7. Tighten the set screws in the secondary shaft seal (105b) with a torque of 8 Nm.
8. Check the setup length (2 mm) and the assembly length ( $56 \pm 0.5$  mm) of the secondary seal (L).

### 9.5.4 Fitting the shaft seal housing

1. Fit the O-ring (72a) on the lower bearing bracket (155).
2. Fit the O-ring (37c) in the groove of the shaft seal housing (58).
3. Secure the shaft seal housing (58) including the air went pipe with the lifting strap and fit it to the stator housing (55).
4. Fit the screws (184).
5. Attach the air went pipe (272) on the stator housing (55).

### 9.5.5 Fitting the upper bearing

1. Place the motor in vertical position on for instance a stable trestle (shaft seal downwards).
2. Heat the upper bearing (154) to 120 °C and fit on the shaft.
3. Grease the upper bearing (154). Fill only 50 % of the free space of the bearing with grease. See section 6.3 *Quantities of grease in bearings*.

### 9.5.6 Fitting the upper bearing bracket

1. Check that the protection sleeves are placed against the protection ring (759).
2. Take the stator cables and protection sensor cables through the protection sleeves.
3. Fit the protection ring (759) to the stator housing (55).
4. Fit the upper bearing bracket (61c) into the stator housing (55), leaving a space of approximately 20 cm.
5. Fit the O-ring (157) to the upper bearing bracket (61c).
6. Connect the stator wires to the terminal board (177) according to the wiring diagram. Fit the wires, spring washers and screws. Tighten the screw with a torque of 16 Nm.
7. Connect the protection sensor wires according to the wiring diagram.
8. Fit the moisture absorbing bag (760) to the protection ring (759).

**Note**

**Upper bearing bracket must be closed within one hour after the new moisture absorbing bag has been exposed to atmospheric humidity.**

9. Complete the fitting of the upper bearing bracket and fit screws (183).
10. See section 10.1 *Tightness test of stator (submerged)*.

### 9.5.7 Fitting the cooling jacket

**Note**

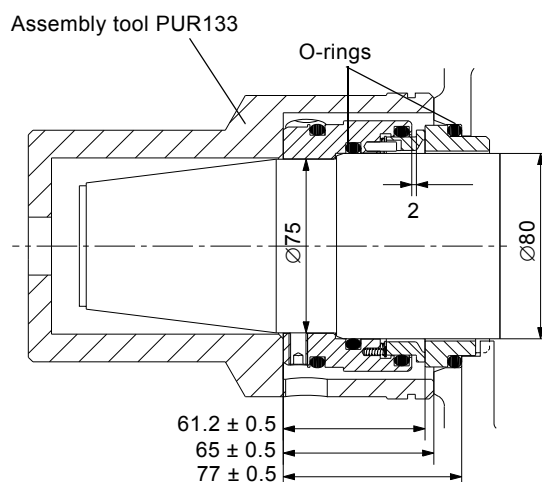
**This section applies only to pumps with cooling jacket.**

1. Fit the O-ring (37a) on the lower bearing bracket (155).
2. Fit the O-ring (157b) in the groove of the stator housing (55).
3. Fit the cooling jacket (150c) by lifting with a hoist from the lifting eyes on both sides of the cooling jacket.
4. Fit the screws (150a).

### 9.5.8 Fitting the terminal box

1. Fit the O-ring (157a).
2. Fit the terminal box (164a) on the stator housing using a hoist.
3. Fit the screws (178).
4. Connect the power cable earth conductors on the upper bearing bracket (61c) with locking plate (173b) and screws (173). Bend one corner of the locking plate towards the screw.
5. Connect the protection sensor cables coming from the motor side to the terminal block (176a).
6. Connect the power cables to the terminal board (177) with spring washers and screws.
7. Fit the O-ring (165) to the terminal box cover (164).
8. Fit the terminal box cover (164) including the O-ring (165) to the terminal box (164a).
9. See section 10.2 *Tightness test of terminal box (cable side, submerged)*.

### 9.5.9 Fitting the primary shaft seal



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**Fig. 28** Fitting the primary shaft seal, range 72

1. Place the motor in horizontal position on for instance a stable trestle.
2. Make sure that the shaft is clean and smooth.
3. Lubricate the sliding surfaces with silicone spray.
4. Fit the O-ring on the stationary part of the primary shaft seal (105).
5. Fit the stationary part on the primary seal (105) on the shaft.
6. Check that the O-ring is fitted inside the rotating part of the primary shaft seal.
7. Fit the rotating part of the primary shaft seal on the shaft and press it home (V). See fig. 28.
8. Tighten the set screws in the primary shaft seal (105) with a torque of 8 Nm.
9. Check the setup length (2 mm) and the assembly length ( $65 \pm 0.5$  mm) of the primary shaft seal (L).
10. See section 10.1.1 *Tightness test of shaft seal housing (submerged)*.

**Note**

**Tightness of complete motor must be verified through a submersion test.**



### 9.5.10 Oil filling

1. See section 8.4 *Oil check and oil change*.

### 9.5.11 Fitting the impeller and the pump housing

1. Fit the key (9a).
2. Lubricate the cone of the shaft slightly.
3. Fit the O-ring (62a) in the groove of the cap (66). Lubricate the O-ring.
4. Fit the O-ring (67b) in the groove of screw (67). Lubricate the thread and the screw head slightly.
5. Support the impeller (49) with a hoist and fit it to the lower bearing bracket (155).
6. Fit the cap (66) including O-ring (62a) and the screw (67) including O-ring (67b). Tighten the screw with a torque of 570 Nm.

**Note**

*The new impeller may be higher than the old impeller, so open the impeller clearance before fitting the pump housing.*

7. Place the motor in vertical position on for instance a stable trestle (shaft seal downwards).
8. Fit the O-ring (37).
9. Mount the motor on the pump housing.
10. Fit the outer screws (26) and tighten them.
11. Check the impeller clearance. See section 8.5 *Inspection and adjustment of impeller clearance*.

## 9.6 Dismantling range 74

For position numbers, see section 11.2 *Range 74*.



**Warning**

*Maintenance and service work on explosion proof pumps must be carried out by Grundfos or a service workshop authorised by Grundfos.*

### 9.6.1 Removing impeller and pump housing

**Note**

*Before dismantling, support the pump unit from the lifting bracket with hoist and beneath the discharge flange with wedges.*

1. Remove the outer screws (26).
2. Lift the pump including the impeller (49) out of the pump housing (50) using a hoist. Use wedges, if necessary.
3. Place the motor with impeller in horizontal position on for instance a stable trestle.
4. Remove the O-ring (37b).
5. Support the impeller with a lifting strap, board and hoist to prevent movement.
6. Bend out the locking tab in the cap and loosen the impeller screw (67), but do not remove the screw yet.
7. Remove the impeller (49), use wedges if necessary.
8. Remove the impeller screw (67), the cap (66) and the O-ring (62a).
9. Remove the impeller (49).
10. Remove the key (9a).

### 9.6.2 Draining the oil

11. See section 8.4 *Oil check and oil change*.

### 9.6.3 Removing the primary seal

1. See section 9.6.1 *Removing impeller and pump housing*.
2. See section 9.6.2 *Draining the oil*.
3. Loosen the set screws in the shaft seal (105) and remove the rotating part.
4. Gently remove the stationary ring of the shaft seal (105).

**Note**

*Lever the stationary ring out of the shaft seal by inserting screwdrivers in positions 0°, 90°, 180° and 270°.*

### 9.6.4 Removing the motor top cover

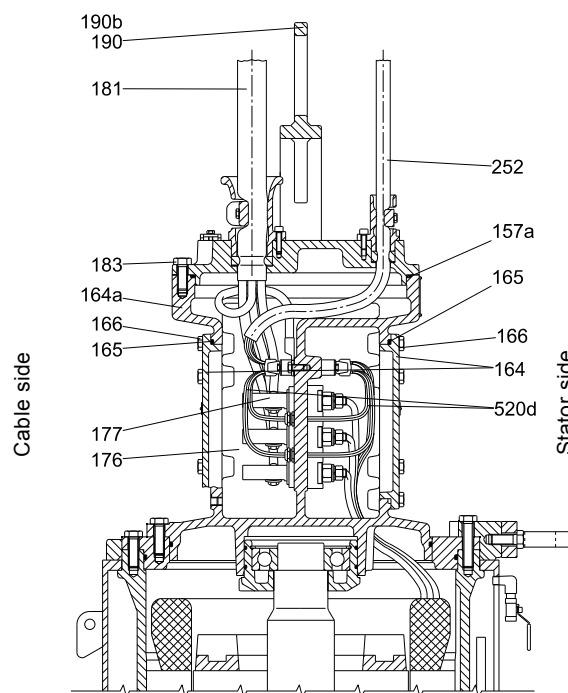


Fig. 29 Terminal box, range 74

1. Remove the screws (166) from the terminal box cover (164) on the cable side. See fig. 29.
2. Remove the terminal box cover (164) from the terminal box (164a) including the O-ring (165).
3. Disconnect the control cable wires (252) from the terminal block. See fig. 30.
4. Remove the screws and the spring washers from the terminal block bracket.
5. Remove the terminal block including the bracket. Leave the terminal block and bracket suspended from wires coming through the partition wall.

**Note**

*The terminal block is connected to the protection sensor wires coming through the partition wall.*

6. Remove the brass nuts and the spring washers from the terminal board (177) on the cable side. Disconnect the power cables (181).

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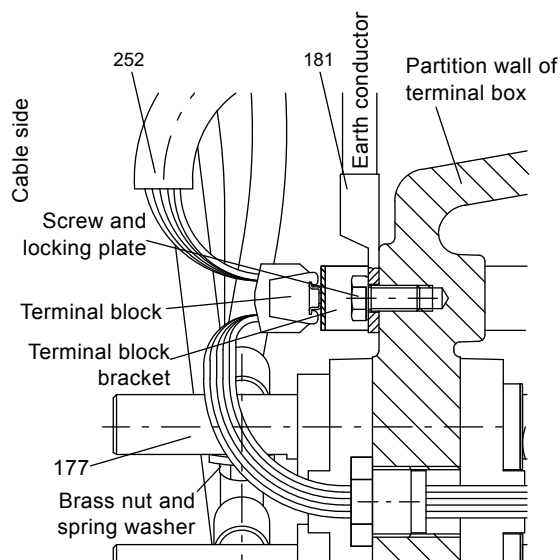


Fig. 30 Terminal block in terminal box, cable side

7. Bend down the corner of the locking plate, remove the screws and the plate.
8. Disconnect the earth conductors of the power cable (181).
9. Support the lifting bracket (190) with a hoist, remove screws (190b) and remove the lifting bracket.
10. Support the cables with a hoist.
11. Remove the screws (183).
12. Remove the motor top cover (151).
13. Remove the O-ring (157a).  
In order to change the cables, see section 9.1 *Checking and replacing the cable*.

#### 9.6.5 Removing the cooling jacket

**Note** *This section applies only to pumps with cooling jacket.*

1. See section 9.6.4 *Removing the motor top cover*.
  2. Place the motor in vertical position on for instance a stable trestle (shaft seal downwards).
  3. Remove the screws (150a).
- Step 4 applies **only** to pumps with a locking ring.
4. Remove the locking ring (754) with a hoist.
  5. Remove the cooling jacket (150c) by lifting the pump with a hoist from the lifting eyes on both sides of the cooling jacket.
  6. Remove the O-rings (37a and 157b).

#### 9.6.6 Removing the terminal box

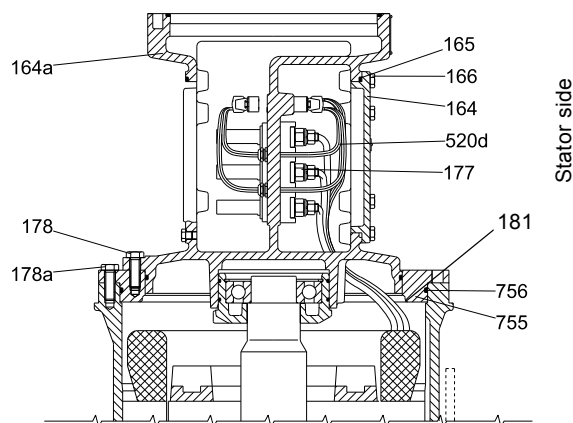


Fig. 31 Terminal box (without motor top cover), range 74

1. See section 9.6.4 *Removing the motor top cover*.
2. See section 9.6.5 *Removing the cooling jacket*.
3. Remove the screws (166) from the terminal box cover (164) on the stator side. See fig. 31.
4. Remove the terminal box cover (164) including the O-ring (165) from the terminal box (164a).
5. Disconnect the protection device cables from the terminal block.

**Note** *The terminal block is connected to the protection sensor wires coming through the partition wall.*

6. Disconnect the power cables (181) from the terminal board (177) by removing the hexagon head screws (10) and washers (11).
7. Remove the screws (178a or 178 in models without intermediate ring).
8. Remove the terminal box (164a) including the intermediate ring (755) using a hoist.

**Caution** *Lift the terminal box carefully to avoid damage to the cables.*

Step 9 applies **only** to pumps with intermediate ring.

9. Remove the O-ring (756) from the intermediate ring (755).

#### 9.6.7 Removing the upper bearing

1. Heat up (max. 110 °C) the inner ring of the roller bearing and pull off the bearing including the bearing housing (61).
2. Remove the circlip (61b).
3. Remove the O-rings (61a) from the outer wall of the bearing housing (61).
4. Turn the bearing housing (61) so that the roller bearing (154) is underneath it. Gently heat up (max. 110 °C) the bearing housing (61) and remove the roller bearing (154).

#### 9.6.8 Removing the shaft seal housing

1. Place the motor in vertical position on for instance a stable trestle (shaft seal upwards).
2. Remove the screws (184).
3. Remove the shaft seal housing (58) with a hoist. If the connection is tight, knock gently with a rubber hammer to ease the separation.

#### 9.6.9 Removing the secondary shaft seal

1. Loosen the set screws in the secondary shaft seal (105b).
2. Carefully remove the rotating part of the shaft seal (105b).
3. Gently remove the stationary ring of the shaft seal (105b).

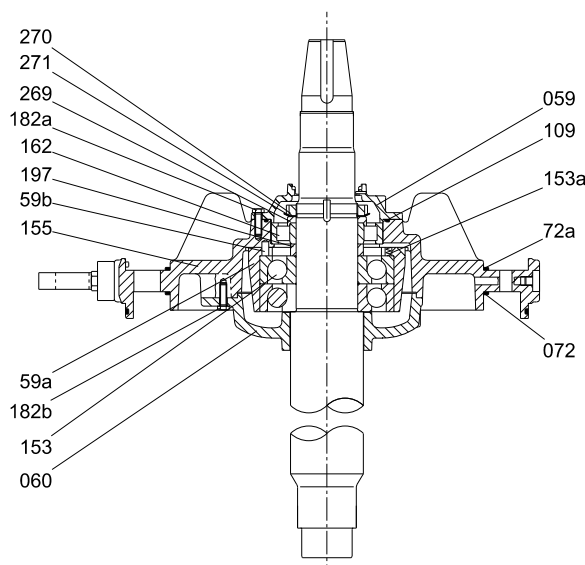
**Note** *Lever the stationary ring out of the shaft seal by inserting screwdrivers in positions 0°, 90°, 180° and 270°.*



### 9.6.10 Removing the rotor

1. Remove the screws (184a).
2. Loosen the lower bearing bracket (155) from the stator housing (58) by pushing components apart from each other with bolts. Lift the rotor (172) at the same time, but no higher than approximately 10 cm out of the stator housing.
3. Secure lower bearing bracket with boards, and disconnect the connecting block.
4. Remove the rotor assembly and place it in vertical position (shaft upwards) on for instance a stable trestle.

### 9.6.11 Removing the lower bearings



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Fig. 32 Rotor, range 74

1. Remove the screws (182b). See fig. 32.
2. Separate the upper bearing bracket cover (60) from the lower bearing bracket by pushing components apart from each other with bolts (182b). Leave the cover on to stator wings.
3. Remove the screws (182a).
4. Remove the lower bearing bracket cover (59).
5. Remove the O-ring (109).
6. Bend the tab of the lock washer (271) out of the notch in the lock nut (270).
7. Remove the lock nut (270), lock washer (271) and angle ring (269).
8. Remove the lower bearing bracket (155) with a hoist and remove O-ring (72a).

**Note** The outer ring of roller bearing and the rolls will be removed together with the bearing bracket.

9. Remove the outer ring of roller bearing from lower bearing bracket by lightly tapping the outer wall of the bearing.
10. Remove the springs (153a).
11. Gently heat up the roller race of the bearing (162) and remove it.
12. Remove the supporting ring (197).
13. Heat the locking ring (59a) up to 200 °C to loosen it. Remove the ring.
14. Remove the angular contact ball bearings (153) from the shaft.

**Note** Angular contact ball bearings might need to be cut in two to remove them.

15. Remove the upper bearing bracket cover (60).

## 9.7 Assembling range 74

### 9.7.1 Fitting the lower bearings

1. Place the rotor in vertical position (shaft upwards) on for instance a stable trestle.
  2. Grease the angular contact ball bearings (153) and the roller bearing (162). Fill only 50 % of the free space of the bearings. See section 6.3 Quantities of grease in bearings.
  3. Fill the bottom of the upper bearing bracket cover (60) with grease and fit it on the shaft.
- Step 4 applies **only** to pumps that have a labyrinth seal.
4. Heat the labyrinth seal (60a) up to 120 °C and fit it on the shaft.
  5. Heat the greased angular contact ball bearing (153) up to 120 °C and fit it on the shaft.
  6. Fit the supporting ring (197) on the shaft.
  7. Heat the inner ring of the roller bearing (162) up to 120 °C and fit it on the shaft.

**Note** Let rotor and bearing cool down before continuing.

8. Heat the locking ring (59a) up to 180 °C and fit it on the shaft.

**Note** Let rotor and bearing cool down before continuing.

9. Fit the six springs (153a) in the locking ring (59a).
10. Fit the roller bearing (162) on the lower bearing bracket (155).
11. Make sure that the pin (59b) is inserted in the hole in the lower bearing bracket (155). Fit the lower bearing bracket (155) on the shaft.
12. Fit the angle ring (269) on the rotor.
13. Fit the lock washer (271) on the rotor. Make sure that the tab of the inner ring fits into the notch of the shaft.
14. Fit the lock nut (270) on the rotor and tighten it (E).

**Note** Check that the bearings rotate smoothly without any significant play. Adjust if necessary.

15. Bend one tab of the lock washer (271) into the notch of the lock nut (270).
16. Grease the roller bearing (162). Fill only 50 % of the free space of the bearing.
17. Fit the O-ring (109) into to the groove of the lower bearing (155).
18. Fill the bottom of the lower bearing bracket cover (59) with grease and fit it on the rotor with screws (182a).
19. Lift the upper bearing bracket cover (60) up against the lower bearing bracket (155) using boards. Fit the screws (182b) and tighten so that the components are pulled together.

**Note** Make an electrical test of sensors attached to lower bearing bracket.

### 9.7.2 Fitting the rotor

1. Lift up the rotor with a hoist and fit O-ring (72).
2. Lower the rotor/shaft into the stator housing (55), leaving approximately 10 cm open. Secure rotor/stator with boards between stator housing (55) and lower bearing bracket (155).
3. Connect the sensor connecting block.
4. Remove the boards and complete the fitting of the rotor/shaft. Pull protection sensor wires tight as the rotor is lowered down.
5. Fit the screws (184a).

**Caution**

**Older models only have two bolts between stator housing and lower bearing bracket. In these models, secure the assembly of the two components with four pairs of bolts and nuts.**

### 9.7.3 Fitting the upper bearing

1. Place the motor in vertical position (shaft downwards) on for instance a stable trestle.
2. Grease the upper bearing (154). Fill only 50 % of the free space of the bearing. See section 6.3 *Quantities of grease in bearings*.
3. Heat the bearing housing (61) up to 120 °C. Fit the upper bearing (154) in the bearing housing (61).
4. Fit the circlip (61b) in the bearing housing (C).
5. Heat bearing housing and bearing up to 120 °C and fit them on the shaft.

**Note**

**Let the bearing housing and bearing cool down before continuing.**

6. Fit and lubricate the O-rings (61a).
7. Fill up the bearing with grease.

### 9.7.4 Fitting the terminal box

1. Fit and lubricate the O-ring (756).
2. Fit the terminal box (164a) including the intermediate ring (755) on the stator housing (55). Guide the cables out of the stator side of the terminal box.
3. Fit the screws (178a)

**Note**

**If the intermediate ring is not included on the pump, fit the terminal box to stator housing with screws (178).**

4. Connect the protection sensor cables to terminal block according to the wiring diagram. See section 11.6 *Electrical connections*.
5. Fit the stator cables to the terminal board (177) with spring washers and nuts. Tighten the nuts with a torque of 40 Nm. Connect according to the wiring diagrams. See section 11.6 *Electrical connections*.

**Note**

**Test the electrical circuits.**

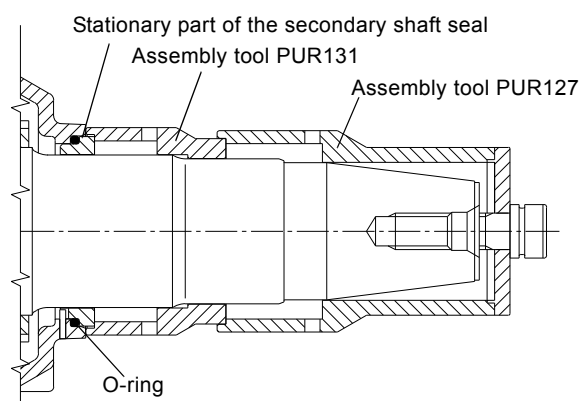
6. Fit the moisture absorbing bag (760) in the terminal box (164a).

**Caution**

**The terminal box must be closed within one hour after the new moisture absorbing bag has been exposed to atmospheric humidity.**

7. Lubricate and fit the O-ring (165) to the terminal box cover (164).
8. Fit the terminal box cover (164) on the terminal box (164a) with screws (166).

### 9.7.5 Fitting the secondary shaft seal



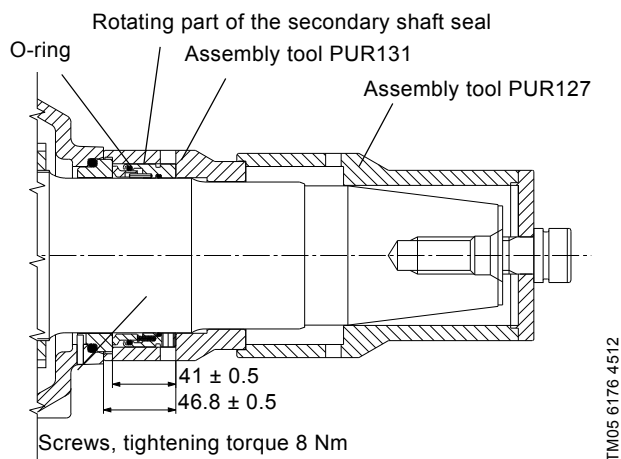
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**Fig. 33** Fitting the stationary part of the secondary shaft seal, range 74

1. Place the motor in horizontal position on for instance a stable trestle.
2. Make sure that the shaft is clean and smooth.
3. Fit and lubricate the O-ring on the stationary part of the secondary shaft seal (105b).
4. Fit the stationary part of the secondary shaft seal (105b) and press it home (P and T). See fig. 33.

**Note**

**Make sure that the pin in lower bearing bracket cover (59) fits into the notch of the stationary part.**



**Fig. 34** Fitting the rotating part of secondary shaft seal, range 74

5. Check that an O-ring is fitted inside the rotating part of secondary shaft seal (105b).
6. Lubricate sliding surfaces with silicone spray.
7. Fit the rotating part of the secondary shaft seal on the shaft and press it home (P and T). Tighten the set screws in the secondary shaft seal (105b) with a torque of 8 Nm. See fig. 34.
8. Check the assembly length ( $46.8 \text{ mm} \pm 0.5 \text{ mm}$ ) of the secondary shaft seal (L).

**Note**

*Check the possible leak paths with leak detecting liquid between stator housing and lower bearing bracket. See section 10.1 Tightness test of stator (submerged).*

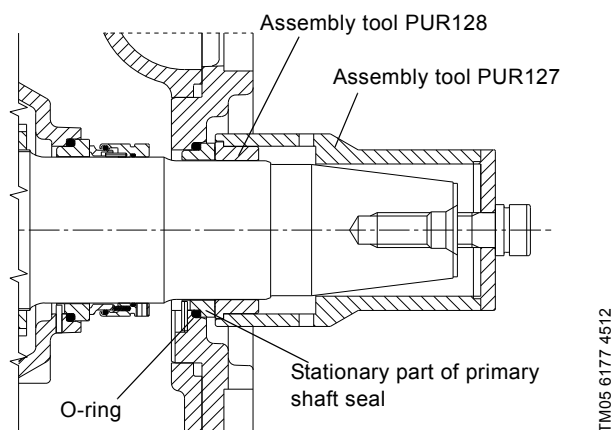
**Note**

*Tightness of complete motor must be verified through a submersion test.*

#### 9.7.6 Fitting the shaft seal housing

1. Lubricate and fit the O-ring (72a).
2. Fit the O-ring (37c) to shaft seal housing (58).
3. Fit the shaft seal housing (58) using a hoist.
4. Fit the screws (184).

#### 9.7.7 Fitting the primary shaft seal

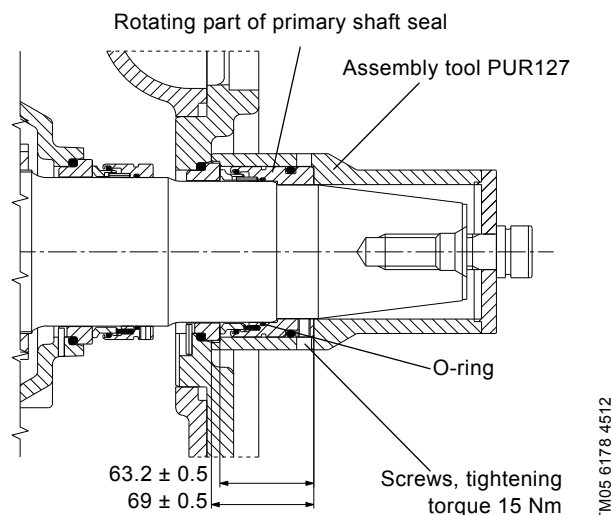


**Fig. 35** Fitting the stationary part of primary shaft seal, range 74

1. Make sure that the shaft is clean and smooth.
2. Lubricate and fit the O-ring on the stationary part of the primary shaft seal (105). Fit the shaft seal on the shaft and press it home (P and Q). See fig. 35.

**Note**

*Make sure that the pin in shaft seal housing (58) fits into the notch of the stationary part.*



**Fig. 36** Fitting the rotating part of primary shaft seal, range 74

3. Check that an O-ring is fitted inside the rotating part of primary shaft seal (105). Lubricate the O-ring.
4. Lubricate the sliding surfaces with silicone spray.
5. Fit the rotating part of the primary shaft seal on the shaft and press it home (P). See fig. 36. Tighten the set screws in the shaft seal with a torque of 15 Nm.
6. Check the assembly length ( $69 \text{ mm} \pm 0.5 \text{ mm}$ ) of the secondary shaft seal (L).

**Note**

*Check the possible leak paths with leak detecting liquid. See section 10.1.1 Tightness test of shaft seal housing (submerged).*

**Note**

*Tightness of complete motor must be verified through a submersion test.*

### 9.7.8 Fitting the cooling jacket

**Note**

*This section applies only to pumps with cooling jacket.*

1. Place the motor in vertical position (shaft downwards) on for instance a stable trestle.
2. Lubricate and fit the O-ring (37a).
3. Fit the cooling jacket (150c) with a hoist.
4. Lubricate and fit the O-ring (157b).
5. Fit the locking ring (754).
6. Fit the screws (150a).

### 9.7.9 Fitting the motor top cover and connections in the terminal box

1. Place the motor in horizontal position on for instance a stable trestle.

Steps 2 to 5 apply **only** to pumps without adapter flange.

2. Fit the O-ring (157a).
3. Support the motor top cover (151) with a lifting strap and hoist.
4. Fit the motor top cover (151) on the terminal box (164a).
5. Fit the screws (183).

Steps 6 to 12 apply **only** to pumps with adapter flange.

6. Secure the motor top cover (151) with hoist.
7. Fit the O-ring (157a).
8. Fit motor top cover (151) to terminal box (164a).
9. Fit screws (183).
10. Lubricate and fit O-ring (39c).
11. Support cable assembly with a lifting strap and fit to motor top cover.
12. Fit screws (183b).
13. Fit the lifting bracket (190).
14. Fit the screws (190b).
15. Connect the earth conductors of the power cables (181) to the terminal box (164a). Fit locking plate (11) and hexagon head screws (10) on the cable shoes. Secure connection by bending one corner of locking plate (11) up towards the screw (10).
16. Connect the power cable wires to the terminal board (177) according to the wiring diagram. Fit the spring washers and screws. Tighten the screw with a torque of 20 Nm. See section [11.6 Electrical connections](#).
17. Fit the terminal block including bracket in the terminal box (164a) with spring washers and screws.
18. Connect the protection sensor cables on the terminal block.

**Note**

**Test the electrical circuits.**

19. Fit the O-ring (165) to the terminal box cover (164).
20. Fit the terminal box cover (164) on the terminal box (164a) with screws (166).

**Check the possible leak paths through tightness test of terminal box (cable side).**

**Note**

**See section 10.2 Tightness test of terminal box (cable side, submerged).**

**Tightness of complete motor must be verified through a submersion test.**

**Note**

**The submersion test must be made before oil filling.**

### 9.7.10 Oil filling

1. See section 8.4 Oil check and oil change.

### 9.7.11 Fitting the impeller and the pump housing

1. Place the motor in horizontal position on for instance a stable trestle.
2. Make sure that the O-ring is fitted on the primary shaft seal.
3. Fit the key (9a) in the shaft groove (D).
4. Lubricate the cone of the shaft and the O-ring of the primary shaft seal.
5. Secure impeller (49) with a lifting strap and hoist.
6. Fit the impeller (49).
7. Fit the O-ring (62a) on the cap (66).
8. Fit the O-ring (67b) on the impeller screw (67).
9. Lightly lubricate the O-rings (62a and 67b) and the thread of the impeller screw (67).
10. Fit the cap (66) and the impeller screw (67).
11. Support the impeller (49) with a board and tighten the impeller screw (67) with a torque of 600 Nm. Before final tightening of the impeller screw, knock the impeller (D) to make sure it is on correct position.
12. Bend (B and D) the edge of the cap (66) into the notch of the impeller screw (67).

**Note**

**The new impeller may be higher than the old impeller, so open the impeller clearance before assembling the pump housing.**

13. Fit and lubricate the O-ring (37b).
14. Support the pump housing (50) beneath the discharge flange with wedges.
15. Place the motor in vertical position with a hoist and mount the motor on the pump housing (50).
16. Fit the screws (26).

### 9.7.12 Adjusting the impeller clearance

17. Check and adjust the impeller clearance. See section [8.5 Inspection and adjustment of impeller clearance](#).

## 9.8 Dismantling range 78

For position numbers, see section [11.3 Range 78](#).



### Warning

**Maintenance and service work on explosion proof pumps must be carried out by Grundfos or a service workshop authorised by Grundfos.**



### Warning

**When lifting range 78 pumps by the shaft, you must use special lifting tool (DD). See section [7.4 Lifting tools](#).**

### 9.8.1 Removing the impeller and the pump housing

#### Note

**Before dismantling, support the pump unit from the lifting bracket with a hoist and beneath the discharge flange with wedges.**

1. Remove the outer screws (26).
2. Lift the pump including the impeller (49) out of the pump housing (50) with a hoist. Use wedges, if necessary.
3. Place the motor with impeller in horizontal position on for instance a stable trestle.
4. Remove the O-ring (37b).
5. Support the impeller with the lifting strap, board and hoist to prevent movement.
6. Remove the impeller screw (67a) including O-ring (67b) and cap (66) including O-ring (62a).
7. Loosen the three impeller screws (67), but do not remove the screws yet.
8. Loosen the impeller (49), use wedges if necessary.
9. Remove the impeller screws (67) and locking plate (66a).
10. Remove the impeller (49).
11. Remove the key (9a).

### 9.8.2 Draining the Oil

1. See section [8.4 Oil check and oil change](#).

### 9.8.3 Removing the primary shaft seal

1. See section [9.6.3 Removing the primary seal](#).

### 9.8.4 Removing the motor top cover

1. See section [9.6.4 Removing the motor top cover](#).

### 9.8.5 Removing the cooling jacket

1. See section [9.6.5 Removing the cooling jacket](#)

### 9.8.6 Removing the terminal box

1. See section [9.6.6 Removing the terminal box](#).

### 9.8.7 Removing the upper bearing bracket

1. Remove screws (753).
2. Remove the upper bearing bracket (61c) from the stator housing (55) by driving the screws against the end of the rotor shaft. Use screws M20 x 140 DIN933.
3. Lift off the upper bearing bracket (61c).

### 9.8.8 Removing the upper bearing

1. See section [9.6.7 Removing the upper bearing](#).

### 9.8.9 Removing the shaft seal housing

1. See section [9.6.8 Removing the shaft seal housing](#).

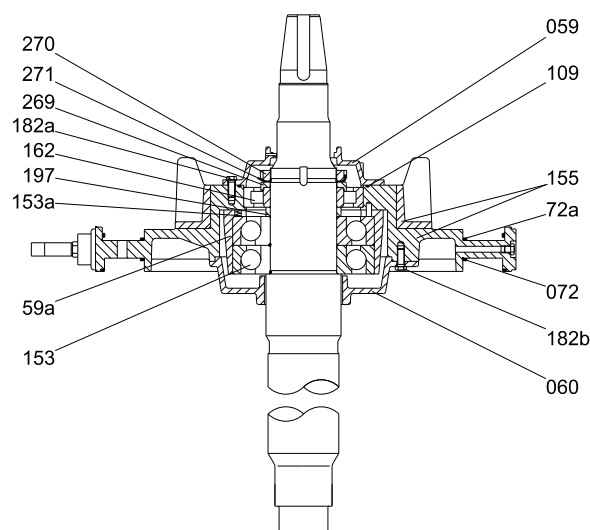
### 9.8.10 Removing the secondary shaft seal

1. See section [9.6.9 Removing the secondary shaft seal](#).

### 9.8.11 Removing the rotor

1. See section [9.6.10 Removing the rotor](#).

### 9.8.12 Removing the lower bearings



**Fig. 37** Rotor and lower bearings, range 78

1. Remove the screws (182b). See [fig. 37](#).
2. Remove the upper bearing bracket cover (60) and leave it on the stator windings.
3. Remove the screws (182a).
4. Remove the lower bearing bracket cover (59).
5. Remove the O-ring (109).
6. Remove the lock nut (270), lock washer (271) and angle ring (269).
7. Remove the lower bearing bracket (155) with the hoist and remove O-ring (72a).

#### Note

**The outer ring of the roller bearing and the rolls will be removed together with the bearing bracket.**

8. Collect the springs (153a).
9. Gently heat up the roller race and pull off the bearing (162) and supporting ring (197).
10. Heat up the locking ring (59a) to 200 °C and pull it off.
11. Remove the angular contact ball bearings (153) from the shaft.

#### Note

**Angular contact ball bearings might need to be cut in two to remove them.**

Step 12 applies **only** to pumps that have a labyrinth seal.

12. Gently heat up the labyrinth seal (60a) and pull it off.
13. Remove the upper bearing bracket cover (60).

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## 9.9 Assembling range 78

### 9.9.1 Fitting the lower bearings

1. See section 9.7.1 *Fitting the lower bearings*.

### 9.9.2 Fitting the rotor

1. See section 9.7.2 *Fitting the rotor*.

### 9.9.3 Fitting the upper bearing

1. See section 9.7.3 *Fitting the upper bearing*.

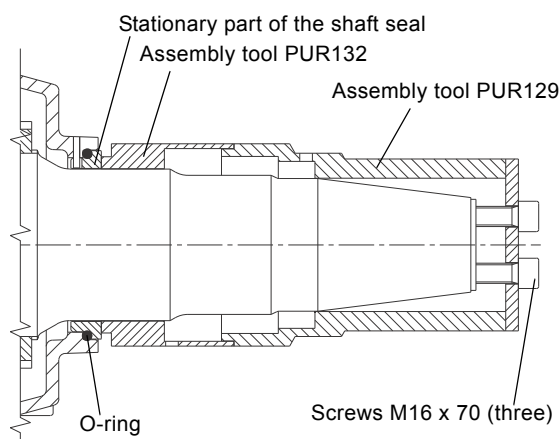
### 9.9.4 Fitting the upper bearing bracket

1. Lower the upper bearing bracket (61c) into the stator housing (55), leaving a space of approximately 20 cm.
2. Pull the cables gently through the holes in the upper bearing bracket. Complete the fitting of the bracket on the stator.
3. Fit the screws (753).

### 9.9.5 Fitting the terminal box

1. See section 9.7.4 *Fitting the terminal box*.

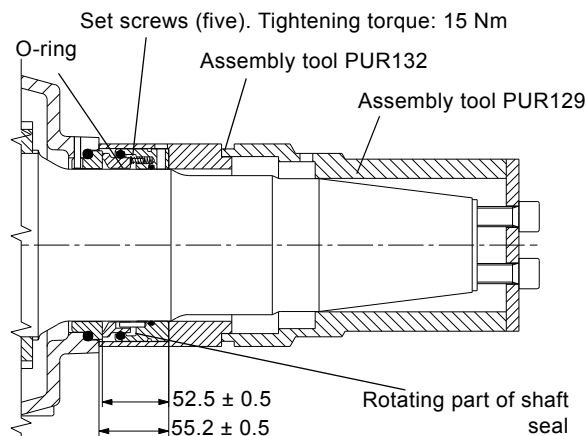
### 9.9.6 Fitting the secondary shaft seal



**Fig. 38** Fitting the stationary part of the secondary shaft seal, range 78

1. Place the motor in horizontal position on for instance a stable trestle.
2. Make sure that the shaft is clean and smooth.
3. Lubricate and fit the O-ring on the stationary part of the secondary shaft seal (105b).
4. Fit the stationary part of the secondary shaft seal (105b) and press it home (*R* and *U*). See fig. 38.

**Note** Make sure that the pin in lower bearing bracket cover (59) fits into the notch of the stationary part.



**Fig. 39** Fitting the rotating part of the secondary shaft seal, range 78

5. Check that an O-ring is fitted inside the rotating part of secondary shaft seal (105b).
6. Lubricate sliding surfaces with silicone spray.
7. Fit the rotating part of the secondary shaft seal on the shaft and press it home (*R* and *U*). Tighten the set screws in the secondary shaft seal (105b) with a torque of 15 Nm. See fig. 39.
8. Check the assembly length ( $55.2 \pm 0.5$  mm) of the secondary shaft seal (*L*).

**Check the possible leak paths with leak detecting liquid between stator housing and lower bearing bracket.**

**Note**

**See section 10.1 Tightness test of stator (submerged).**

**Note**

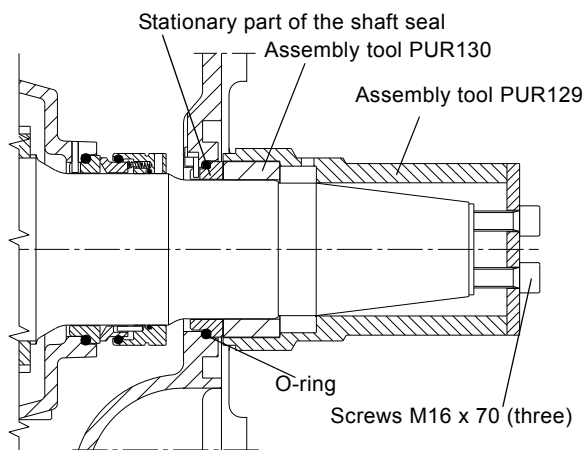
**Tightness of complete motor must be verified through a submersion test.**

### 9.9.7 Fitting the shaft seal housing

1. See section 9.7.6 *Fitting the shaft seal housing*.

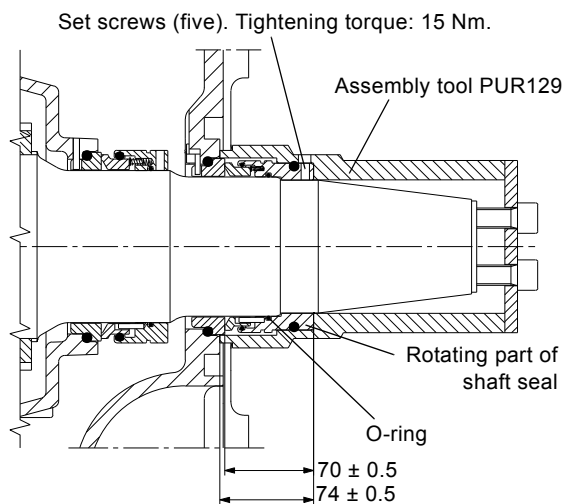


### 9.9.8 Fitting the primary shaft seal



**Fig. 40** Fitting the stationary part of primary shaft seal, range 78

1. Make sure that the shaft is clean and smooth.
2. Lubricate and fit the O-ring on the stationary part of the primary shaft seal (105). Fit the shaft seal on the shaft and press it home (R and S). See fig. 40.



**Fig. 41** Fitting the rotating part of primary shaft seal in range 78 pumps.

3. Check that the O-ring is fitted inside the rotating part of primary shaft seal (105). Lubricate the O-ring.
4. Fit the rotating part of the primary shaft seal on the shaft and press it home (R). Tighten the set screws in the shaft seal with a torque of 15 Nm. See fig. 41.
5. Check the assembly length ( $74 \pm 0.5$  mm) of the primary shaft seal (L).

**Check the possible leak paths with leak detecting liquid.**

**Note**

See section 10.1.1 Tightness test of shaft seal housing (submerged).

**Note**

Tightness of complete motor must be verified through a submersion test.

### 9.9.9 Fitting the cooling jacket

1. See section 9.7.8 Fitting the cooling jacket.
  2. Fitting the motor top cover and the connections of the terminal box
1. See section 9.7.9 Fitting the motor top cover and connections in the terminal box.

### 9.9.10 Oil filling

1. See section 8.4 Oil check and oil change.

### 9.9.11 Fitting the impeller and the pump housing

1. Check that the O-ring is fitted on the primary shaft seal (105).
2. Fit the key (9a) in the shaft groove (D).
3. Lightly lubricate the cone of the shaft and O-ring of the primary shaft seal.
4. Secure the impeller with lifting strap and hoist.
5. Fit the impeller (49) and support it with a board.
6. Fit the locking plate (66a) and three impeller screws (67). Tighten the screws with a torque of 170 Nm. Before final tightening of the impeller screws (67) knock the impeller (D) to make sure it is in correct position.
7. Fit the O-ring (62a) on the cap (66)
8. Fit O-ring (67b) on the screw (67a). Lightly lubricate the thread, screw head and the O-ring (67b).
9. Fit the cap (66). Make sure that the pin of the cap fits into the notch of the locking plate (66a).
10. Fit the screw (67a) and tighten to a torque of 160 Nm.

**Note**

**The new impeller may be higher than the old impeller, so open the impeller clearance before assembling the pump housing.**

11. Lubricate and fit the O-ring (37b).
12. Support the pump housing (50) beneath the discharge flange with wedges.
13. Lift the motor into vertical position with a hoist and mount the motor on the pump housing (50).
14. Fit the screws (26).

### 9.9.12 Adjusting the impeller clearance

1. Check and adjust the impeller clearance. See section 8.5 Inspection and adjustment of impeller clearance.

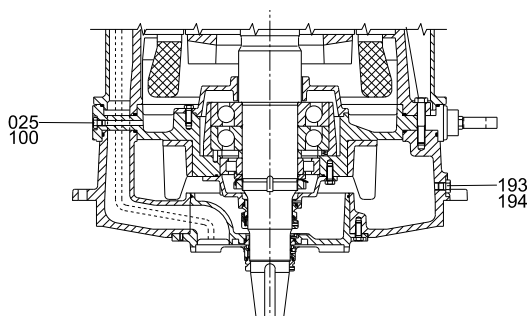
## 10. Tightness tests

### 10.1 Tightness test of stator (submerged)



#### Warning

**Maintenance and service work on explosion proof pumps must be carried out by Grundfos or a service workshop authorised by Grundfos.**



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**Fig. 42** Test plugs in shaft seal housing and lower bearing bracket

1. Place the motor in horizontal position with a hoist.
  2. Remove the **upper** oil plug (193) including O-ring (194) from the shaft seal housing. See fig. 42.
  3. Fit the test plug (Connector R3/4) in stead of the oil plug (193).
  4. Fit the hose (approx. 1 m) to the test plug.
- Step 5 applies **only** to Ex pumps.
5. Remove the screw (25a) from the lower bearing bracket.
  6. Remove the plug (25) including O-ring (100) from the lower bearing bracket (155).
  7. Fit the test plug (3/8-24 UNF F-ISO 228-G 3/8M) in stead of the plug (25).
  8. Fit the gas hose (N2) to the test plug and pressurise the stator housing to 0.8 bar.
  9. Submerge the motor into the test basin.
  10. Place the end of the hose coming from the shaft seal housing under the surface of the water.

#### Note

**In order to detect possible leaks, let the motor stay submerged for 15 minutes.**

11. Lift the motor out of the test basin.
12. Disconnect the gas hoses and the test plugs.
13. Fit the plug (25) including O-ring (100) on the lower bearing bracket.



#### Warning

**In explosion proof pumps, the plug (25) on the shaft seal housing must be locked with a screw (25a).**

14. Fit the **upper** oil plug (193) including O-ring (194) to the shaft seal housing.

#### 10.1.1 Tightness test of shaft seal housing (submerged)

1. Place the motor in horizontal position with a hoist.
2. Remove the oil plug (193) including O-ring (194) from the shaft seal housing.
3. Fit the test plug (R3/4) in stead of the oil plug (193). See fig. 42.
4. Fit the gas hose (N2) to the test plug and pressurise the shaft seal housing to 0.8 bar.
5. Submerge the motor into the test basin.

#### Note

**In order to detect possible leaks, let the motor stay submerged for 15 minutes.**

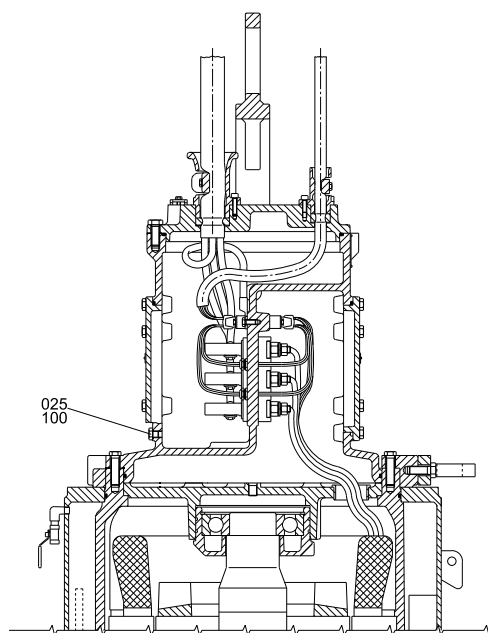
6. Lift the motor out of the test basin.
7. Disconnect the gas hose and the test plug.
8. Fit the oil plug (193) including O-ring (194) on the shaft seal housing.

### 10.2 Tightness test of terminal box (cable side, submerged)



#### Warning

**Maintenance and service work on explosion proof pumps must be carried out by Grundfos or a service workshop authorised by Grundfos.**



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**Fig. 43** Test plugs in terminal box

Step 1 applies **only** to Ex pumps.

1. Remove the screw (25a) from the terminal box (164a). See fig. 43.
2. Remove the plug (25) including O-ring (100) from the terminal box.
3. Fit the test plug (connector 3/8-24 UNF F-ISO 228-G 3/8M) in stead of plug (25).
4. Fit the gas hose (N2/dry pressurised air) to the test plug and pressurise the stator housing to 0.8 bar.
5. Submerge the motor into the test basin.

#### Note

**In order to detect possible leaks, let the motor stay submerged for 15 minutes.**

6. Lift the motor out of the test basin.
7. Disconnect the gas hose and the test plug.
8. Fit the plug (25) including O-ring (100) on the terminal box.



#### Warning

**In explosion proof pumps, the plug (25) on the terminal box must be locked with a screw (25a).**

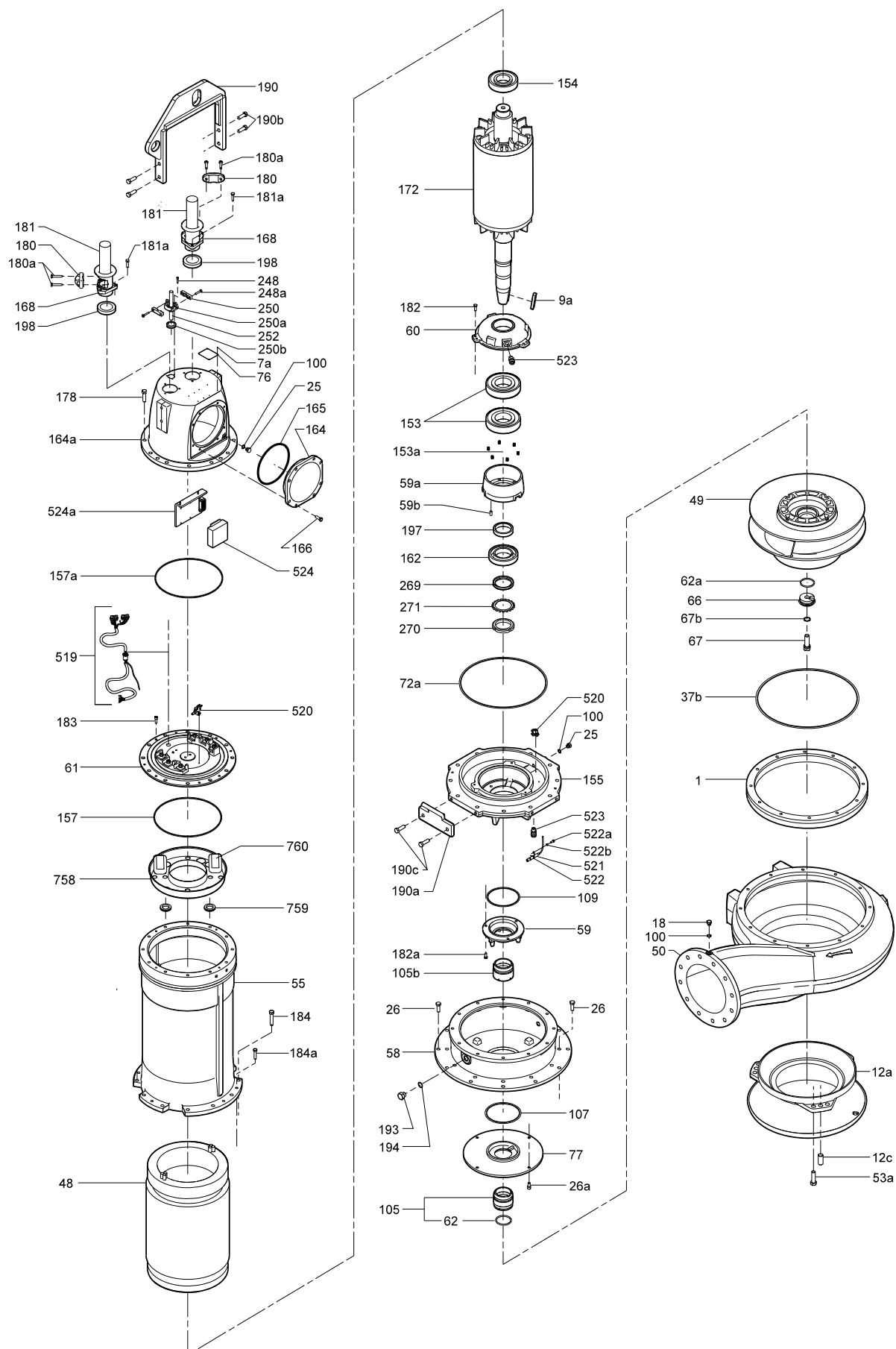


## 11. Drawings

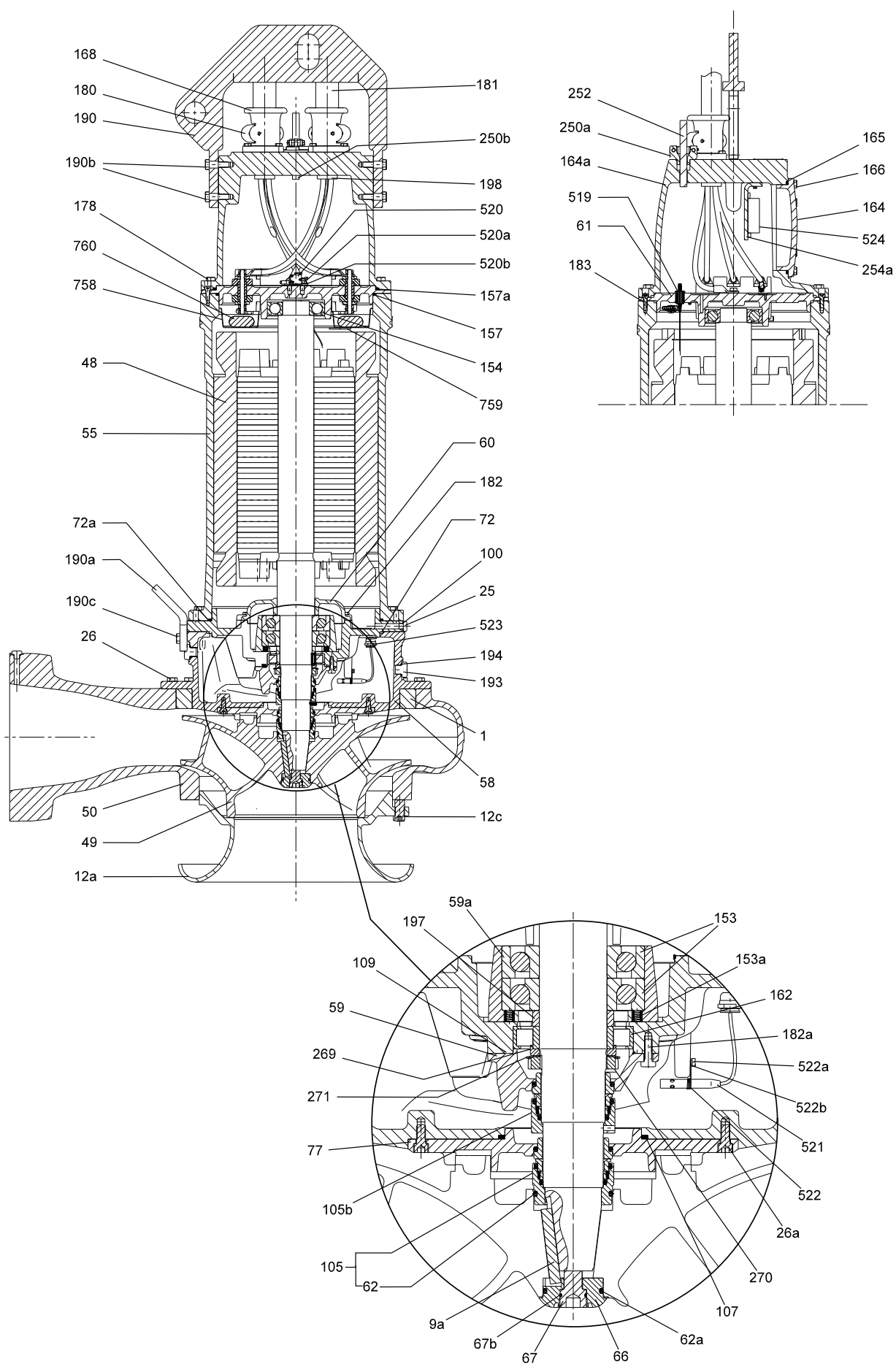
Please note that the position numbers in the drawings in sections 11.1 to 11.3 are listed in section [11.4 Position numbers and material specification](#).

### 11.1 Range 72

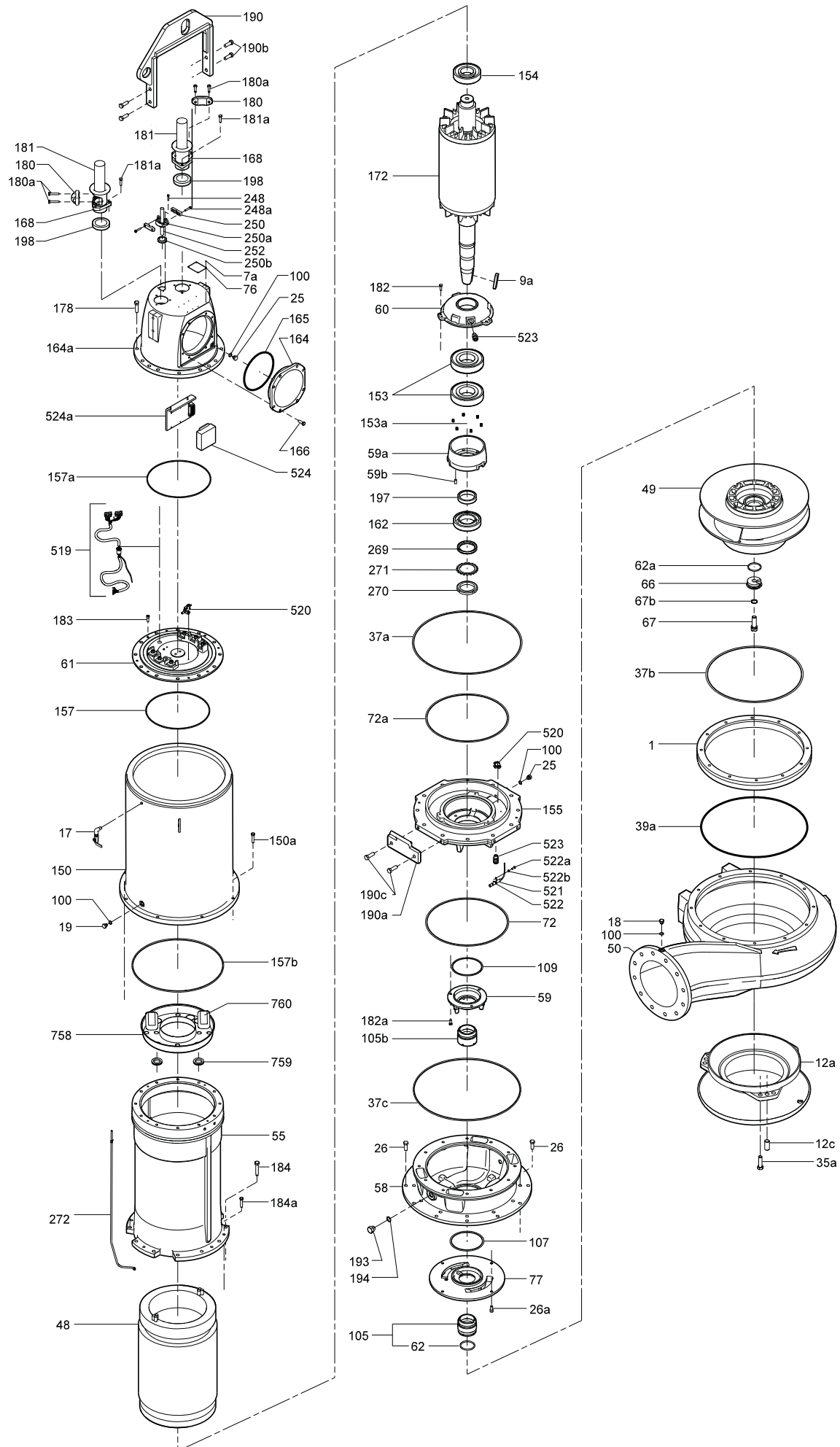
#### Exploded view, installation type S



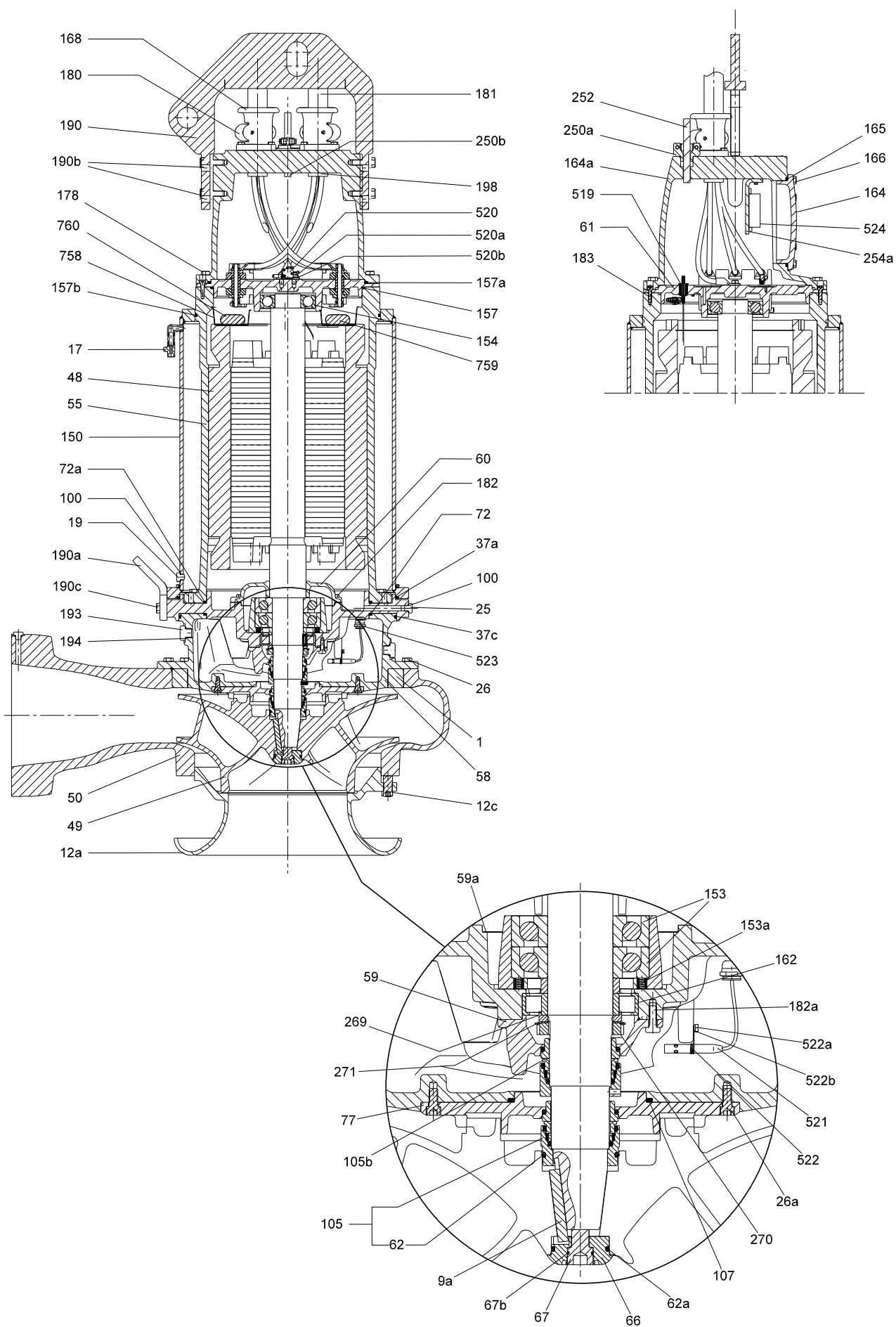
Sectional drawing, installation type S



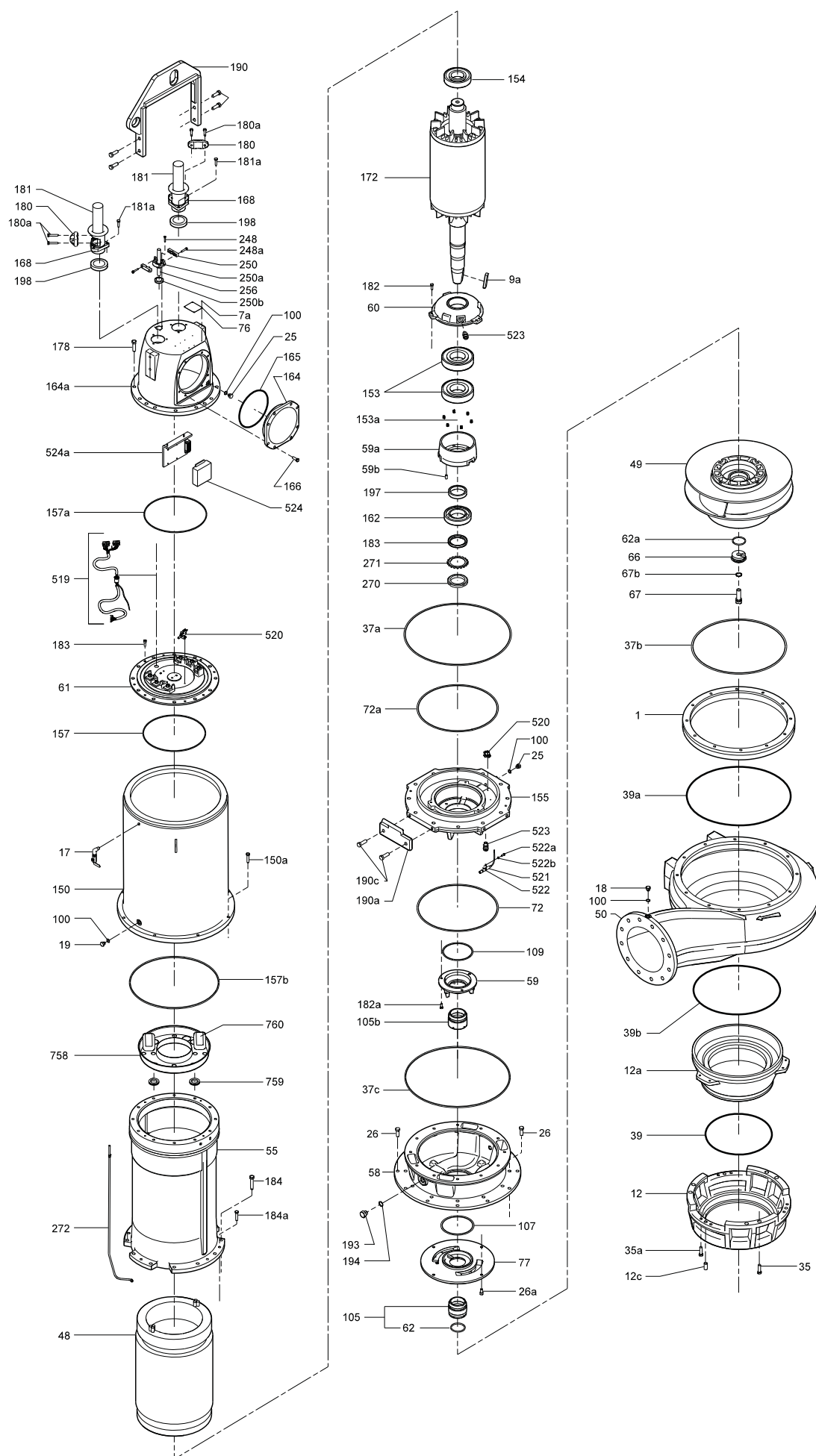
# Exploded view, installation type C



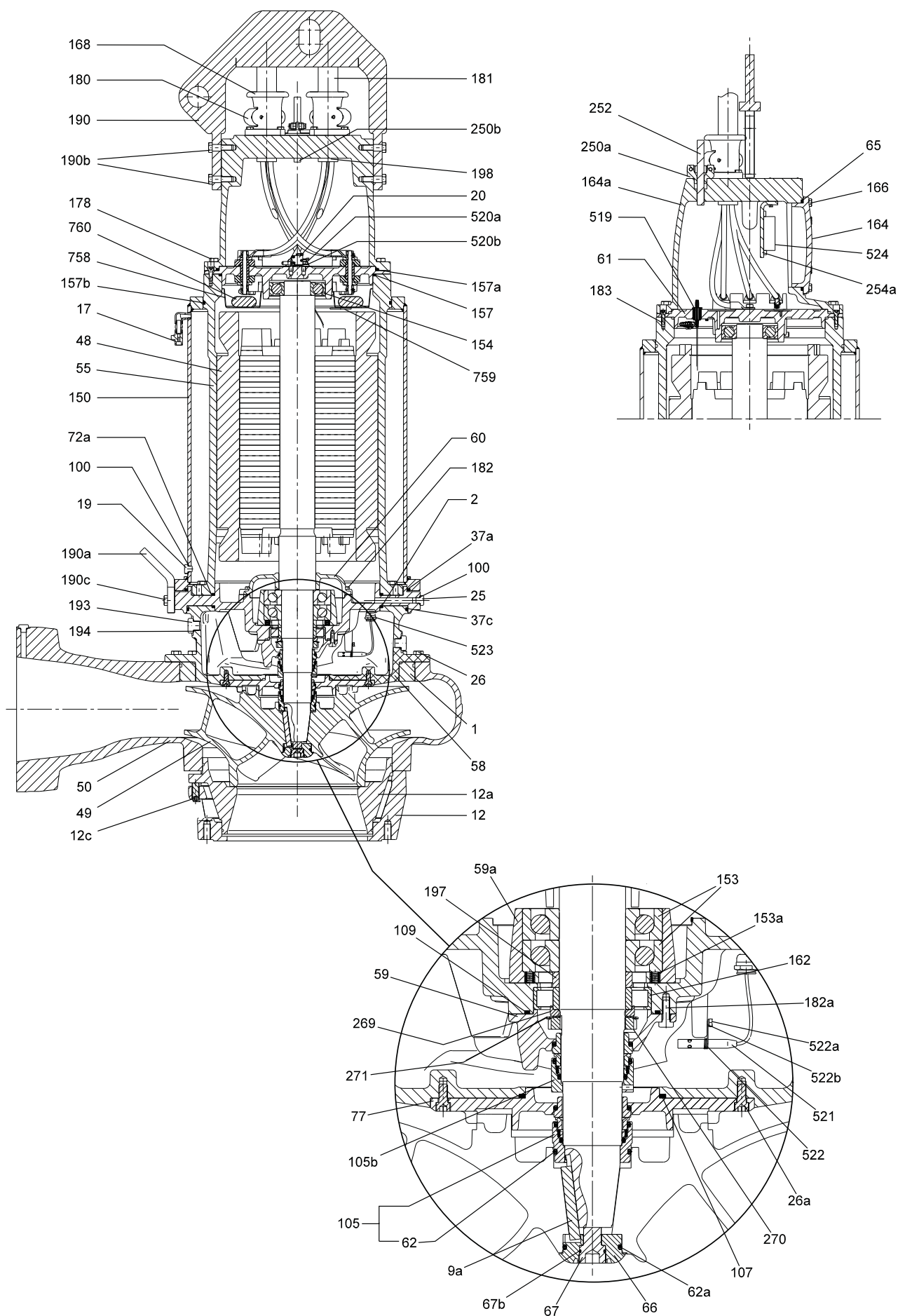
## Sectional drawing, installation type C



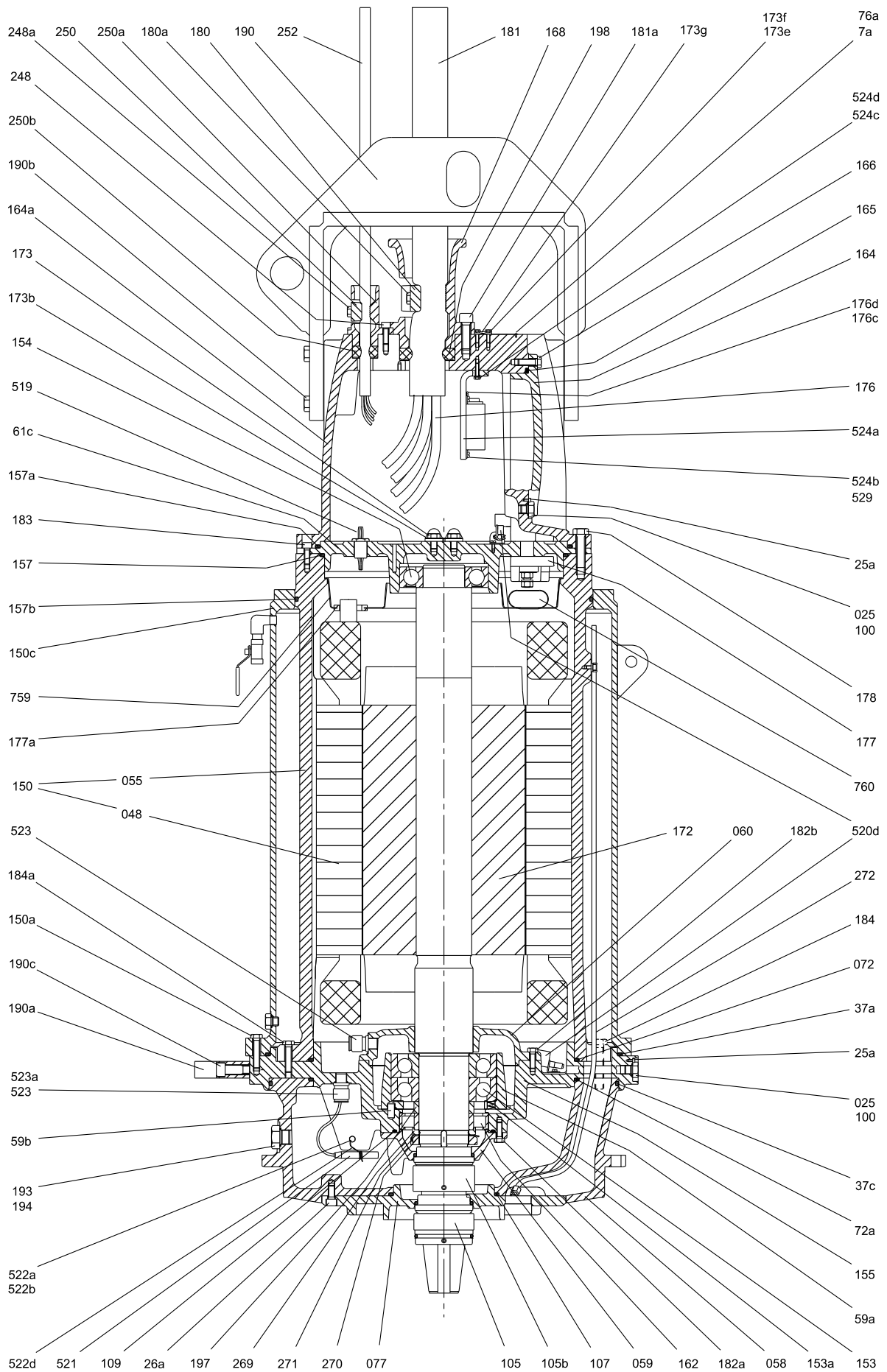
# Exploded view, installation type D



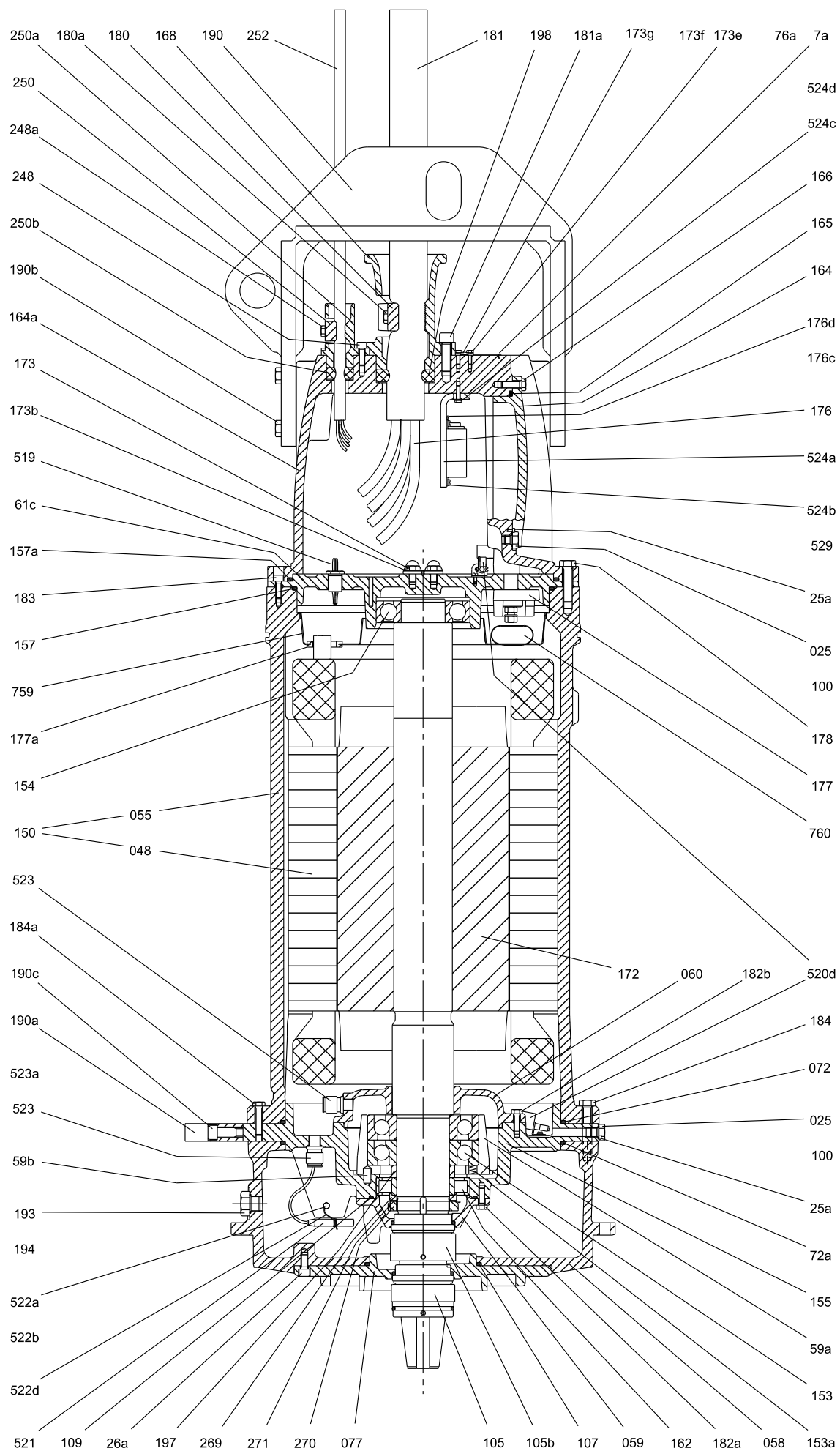
Sectional drawing, installation type D



# Installation type S with cooling jacket

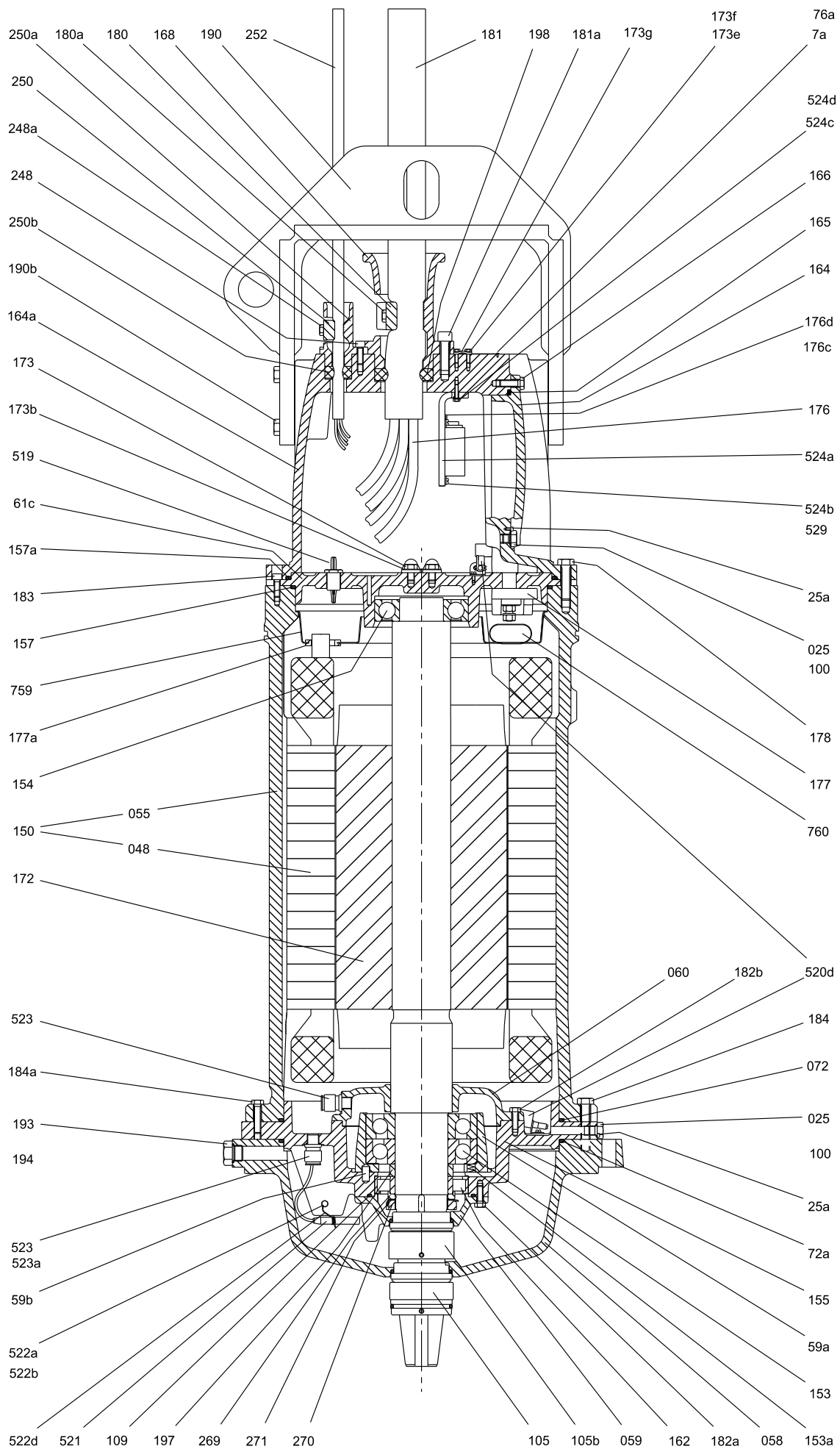


## Installation type S without cooling jacket



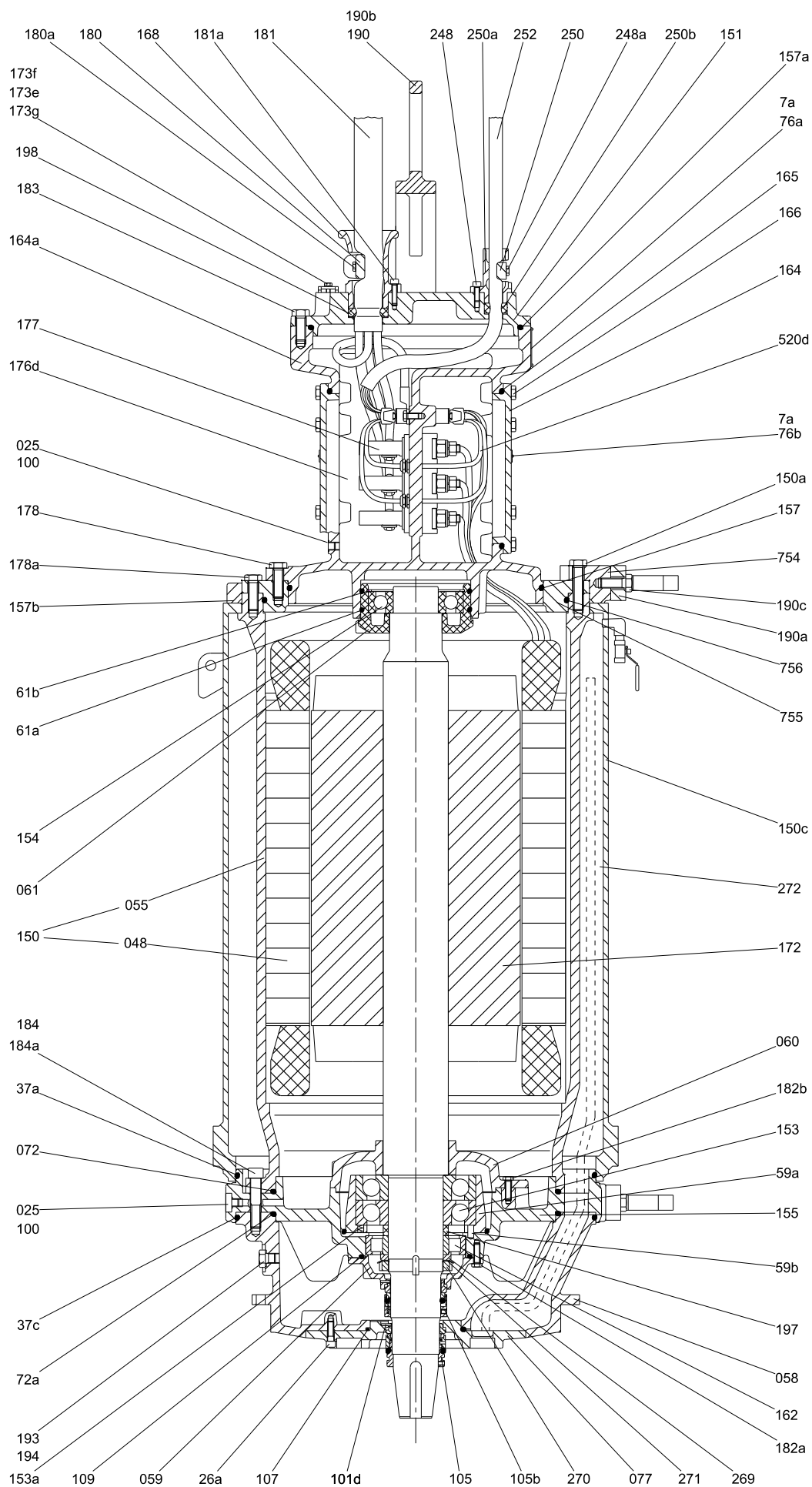


## Column pipe installation



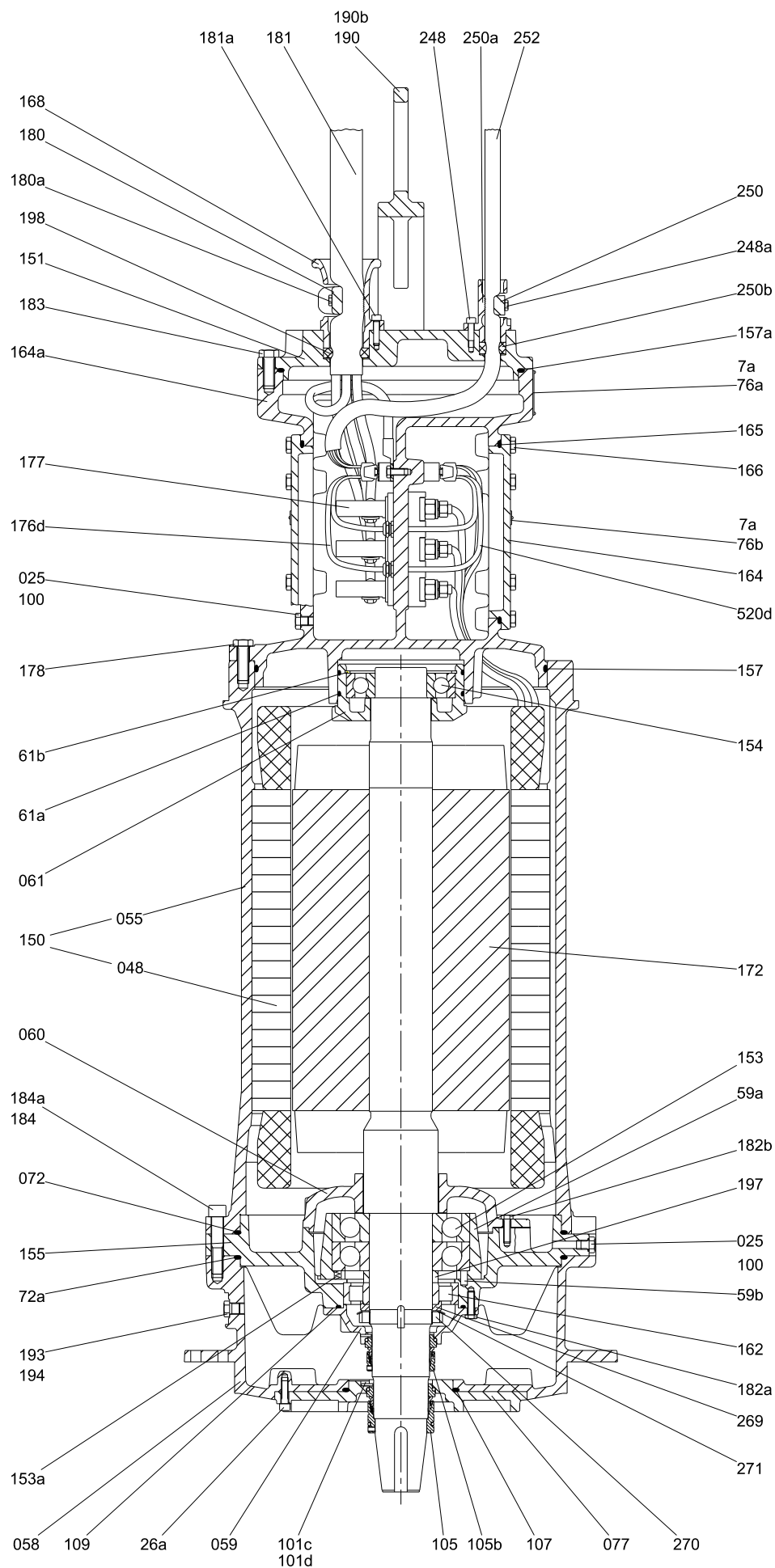
## 11.2 Range 74

## Sectional drawing, installation type C (with intermediate ring)

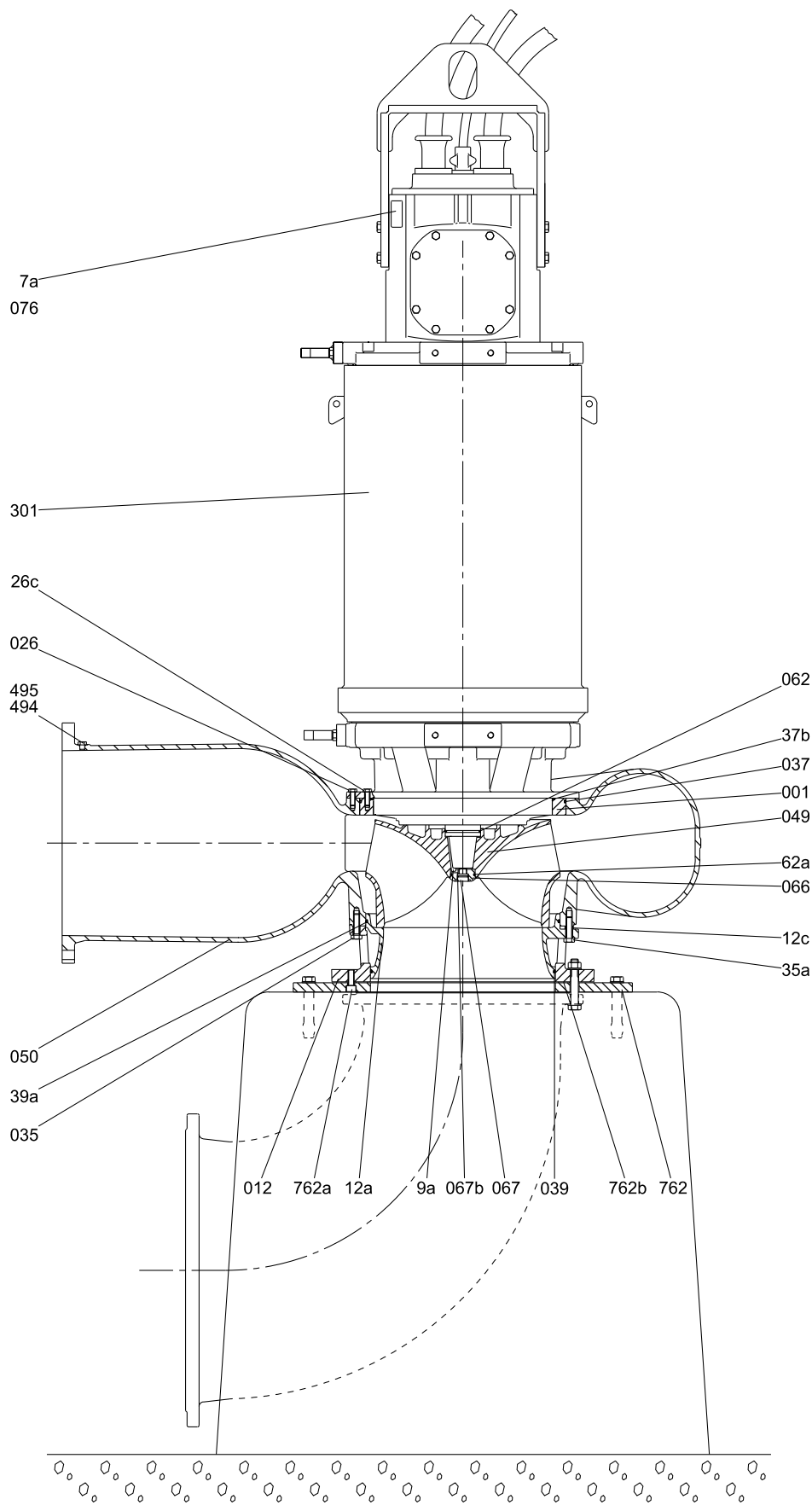


# Sectional drawing, column pipe installation 315\* (without cooling jacket)

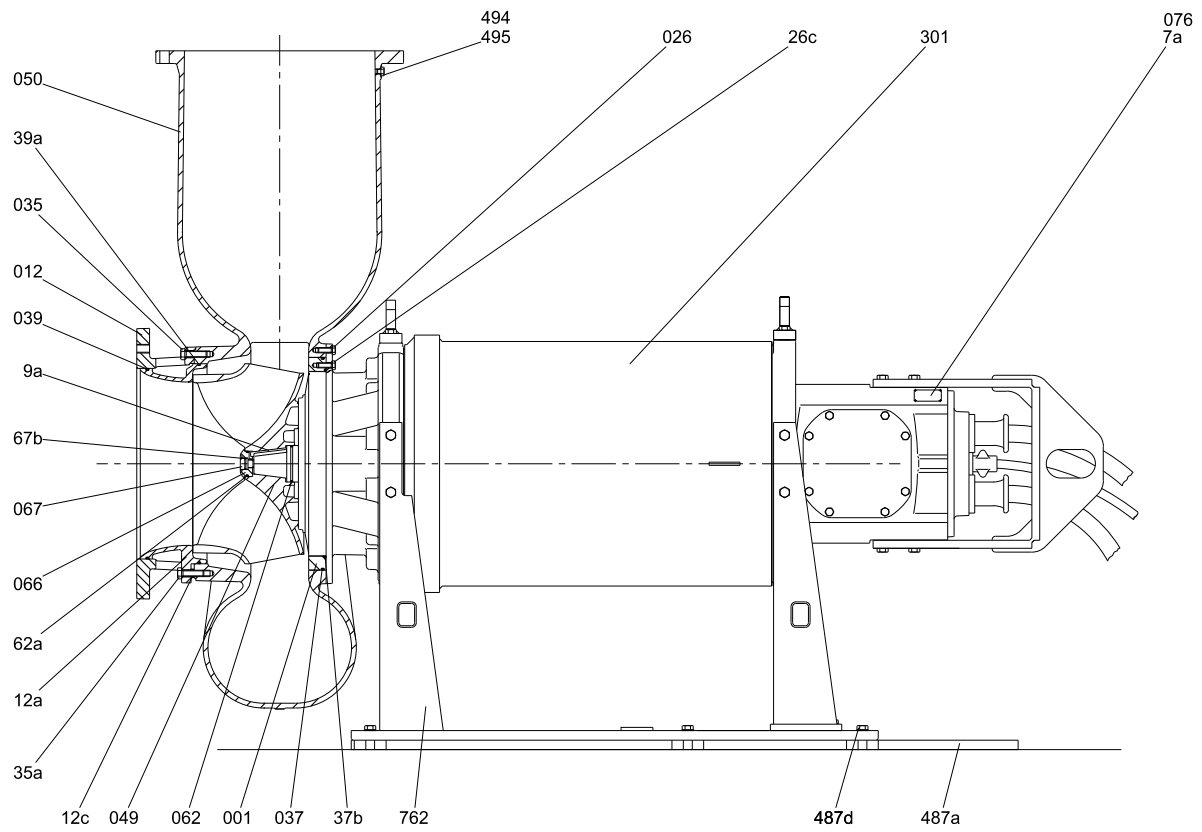
\* Based on IEC 315 motor series parts.



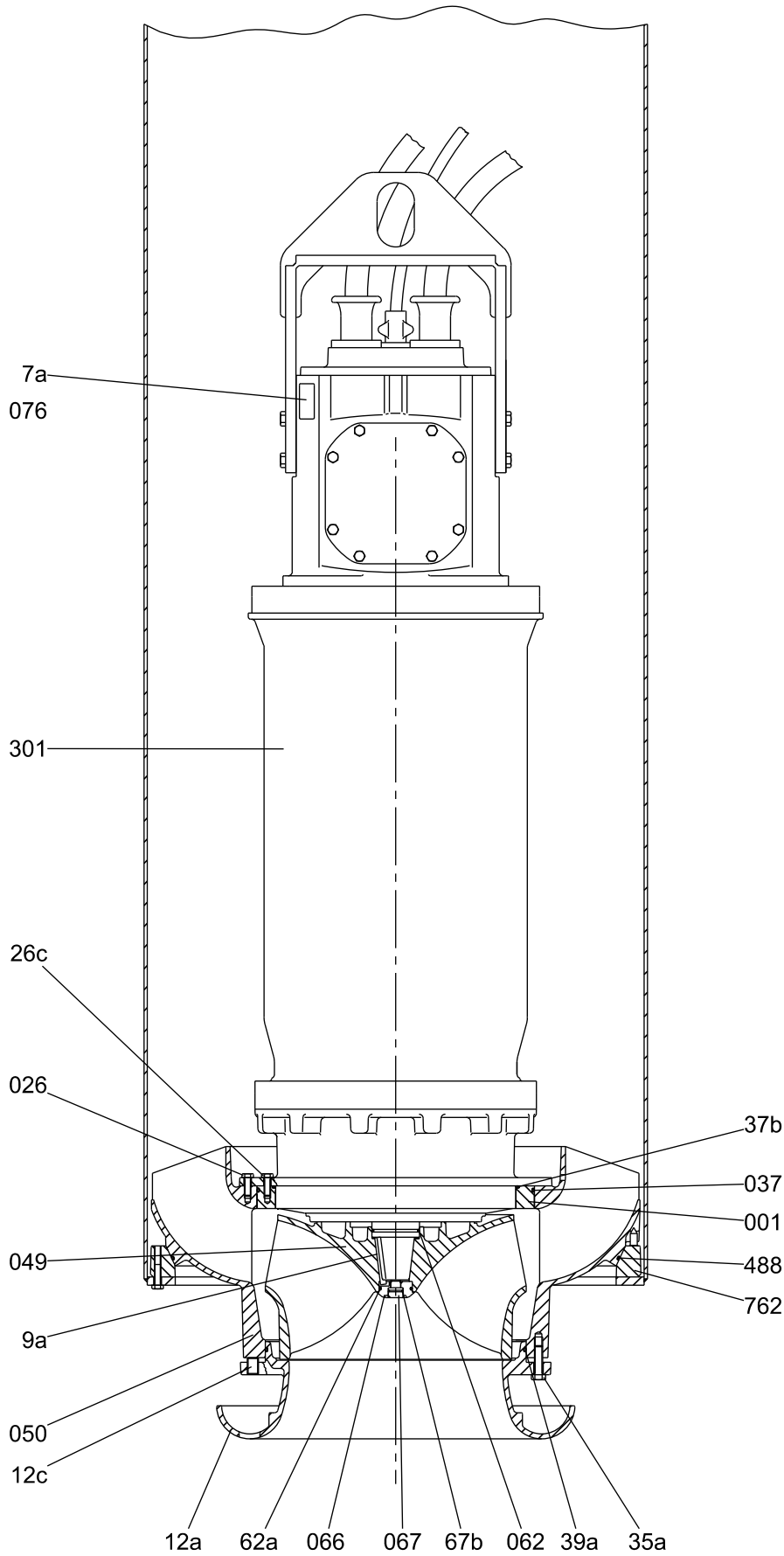




## Dry, horizontal installation



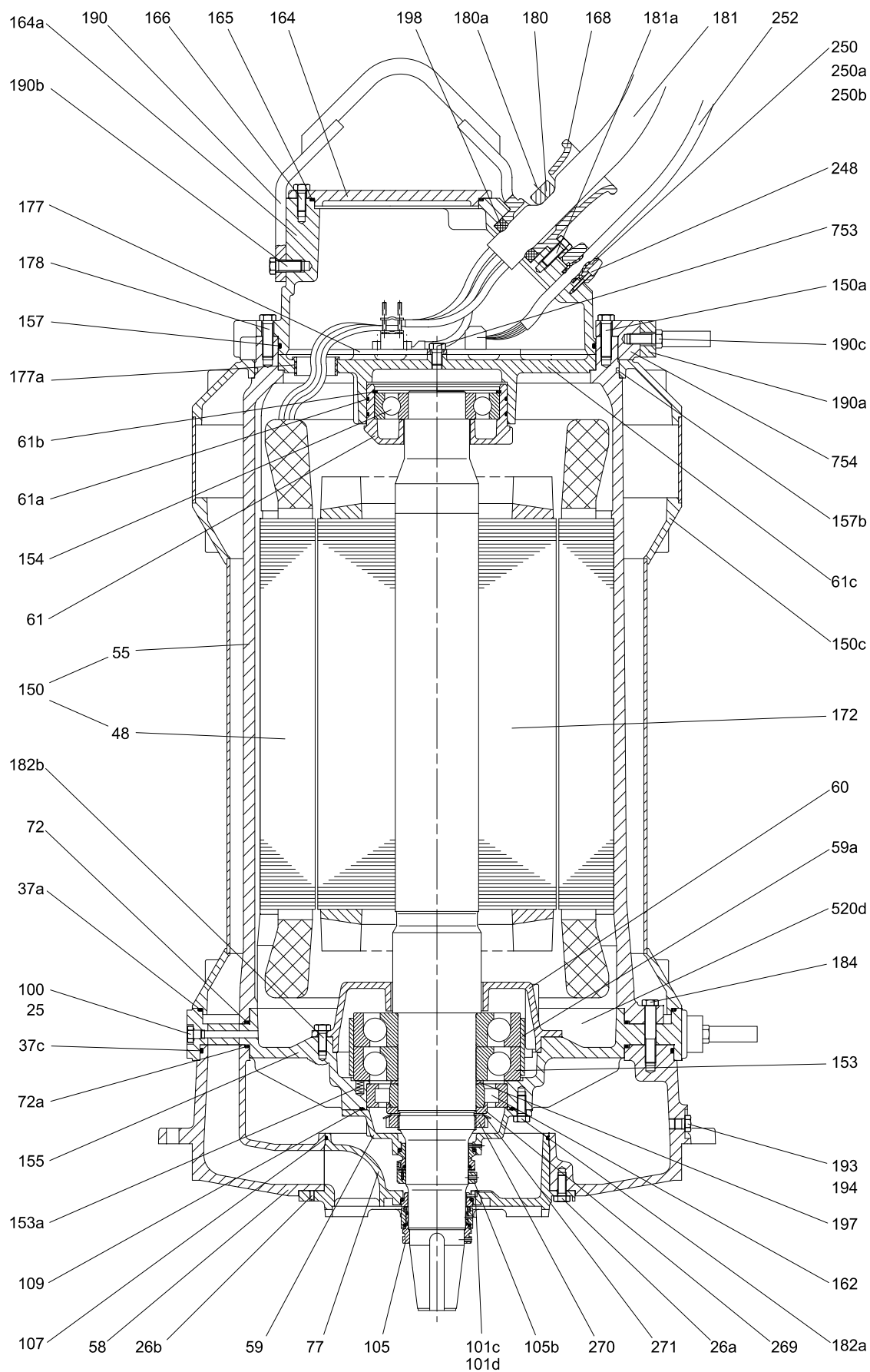
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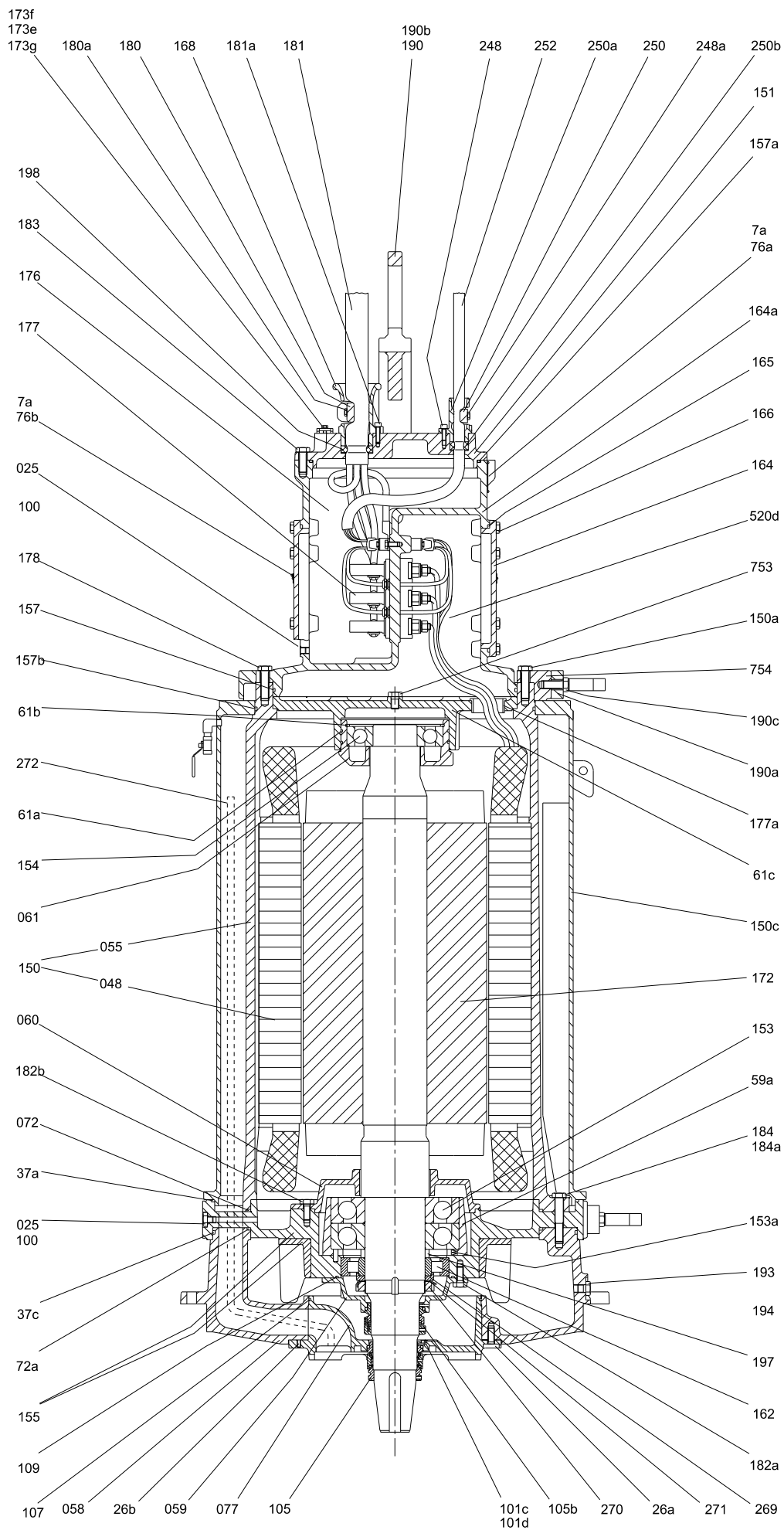


## 11.3 Range 78

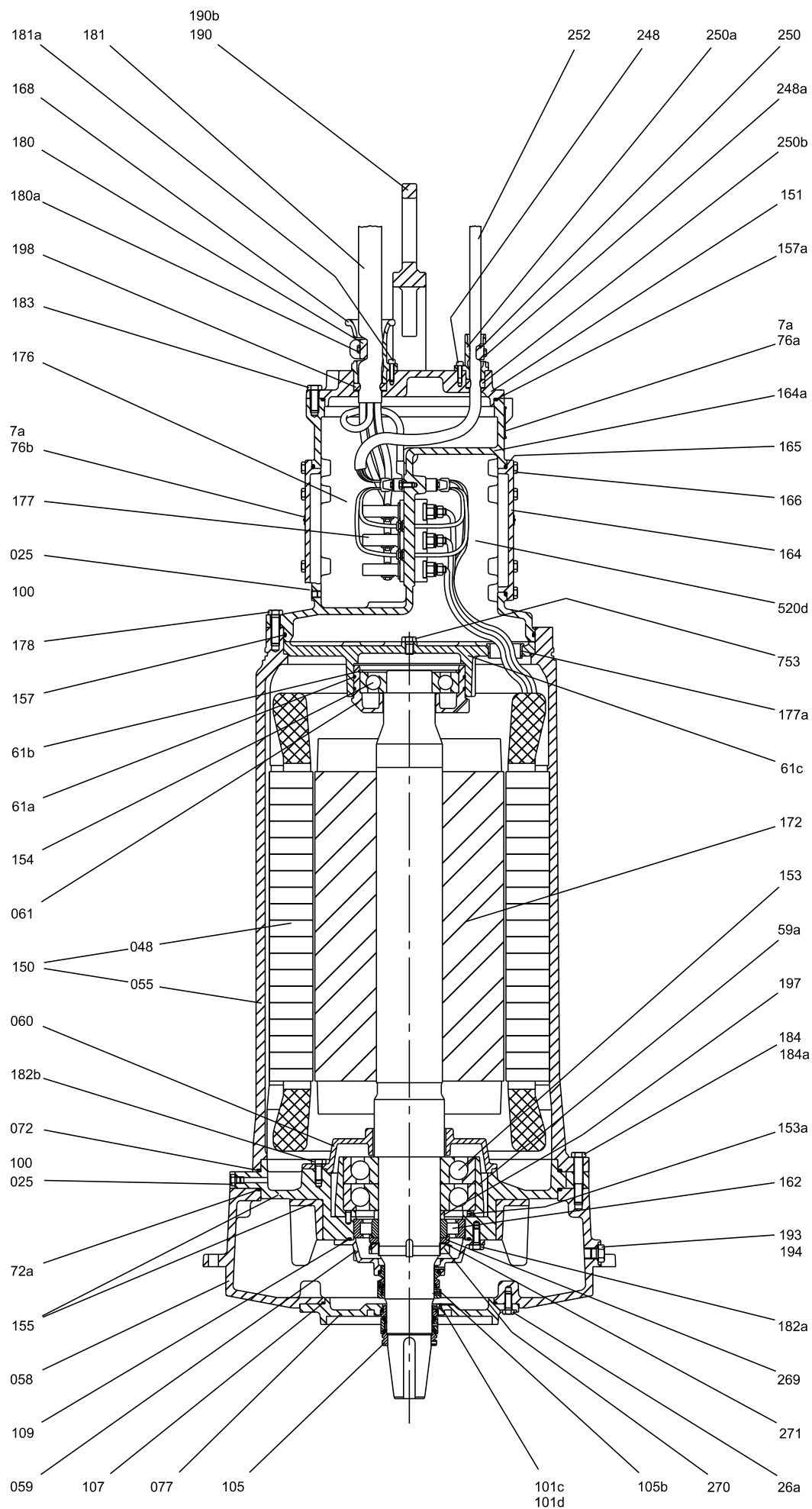
Installation type C with cooling jacket (manufactured between 1992 and 1996)

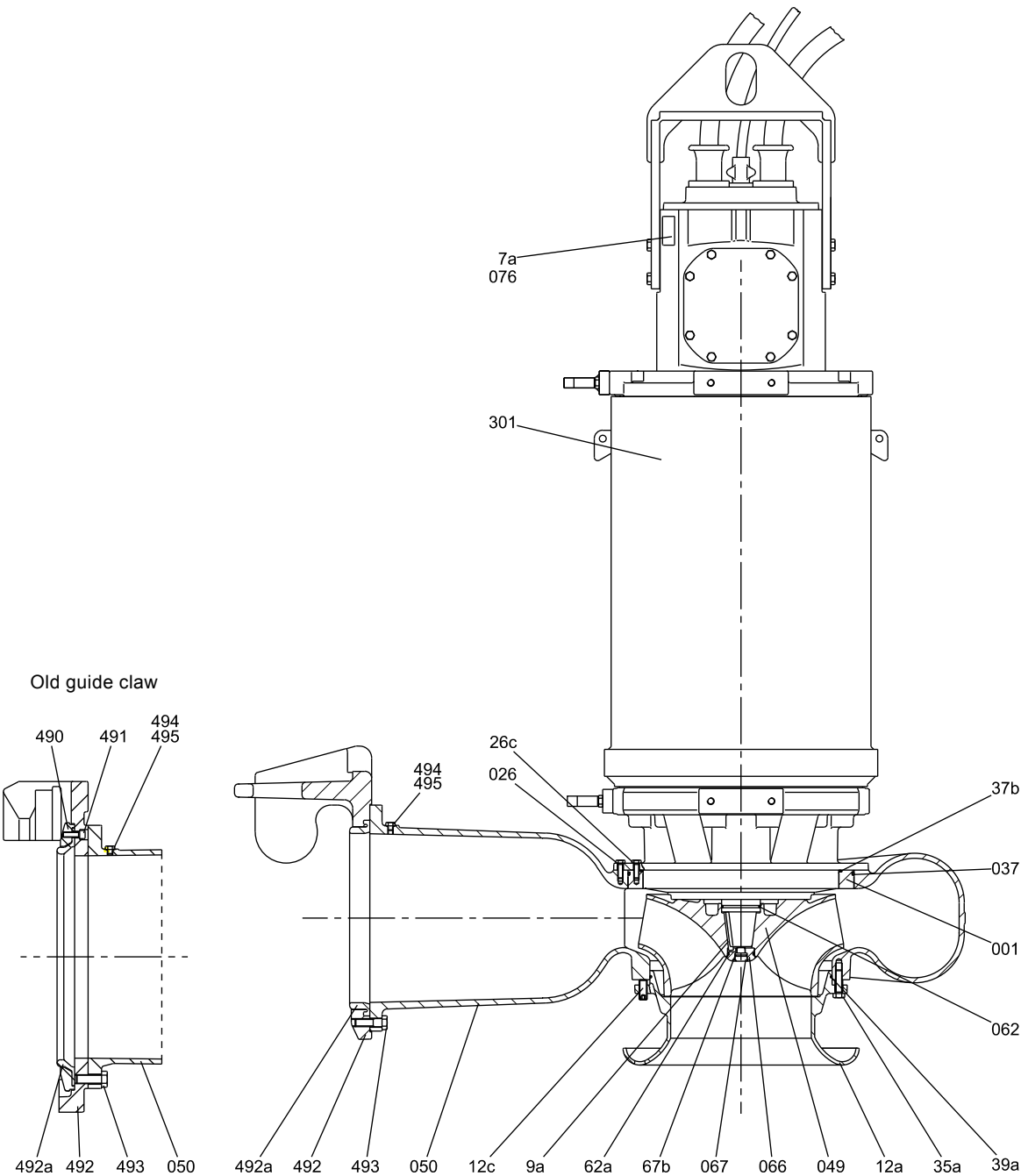


## 49



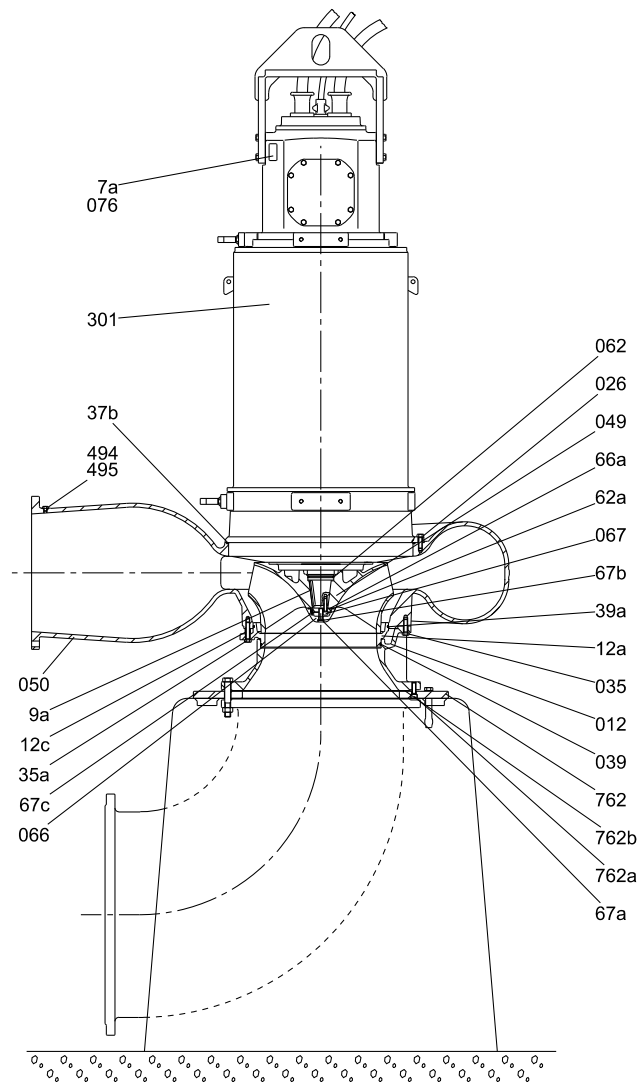
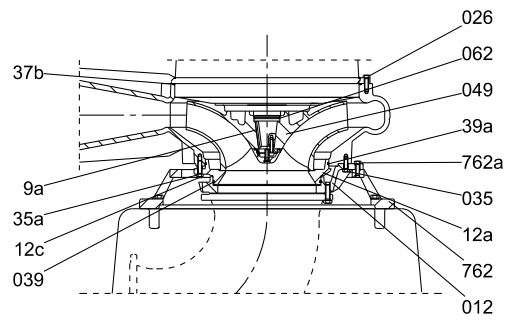
## Column pipe installation





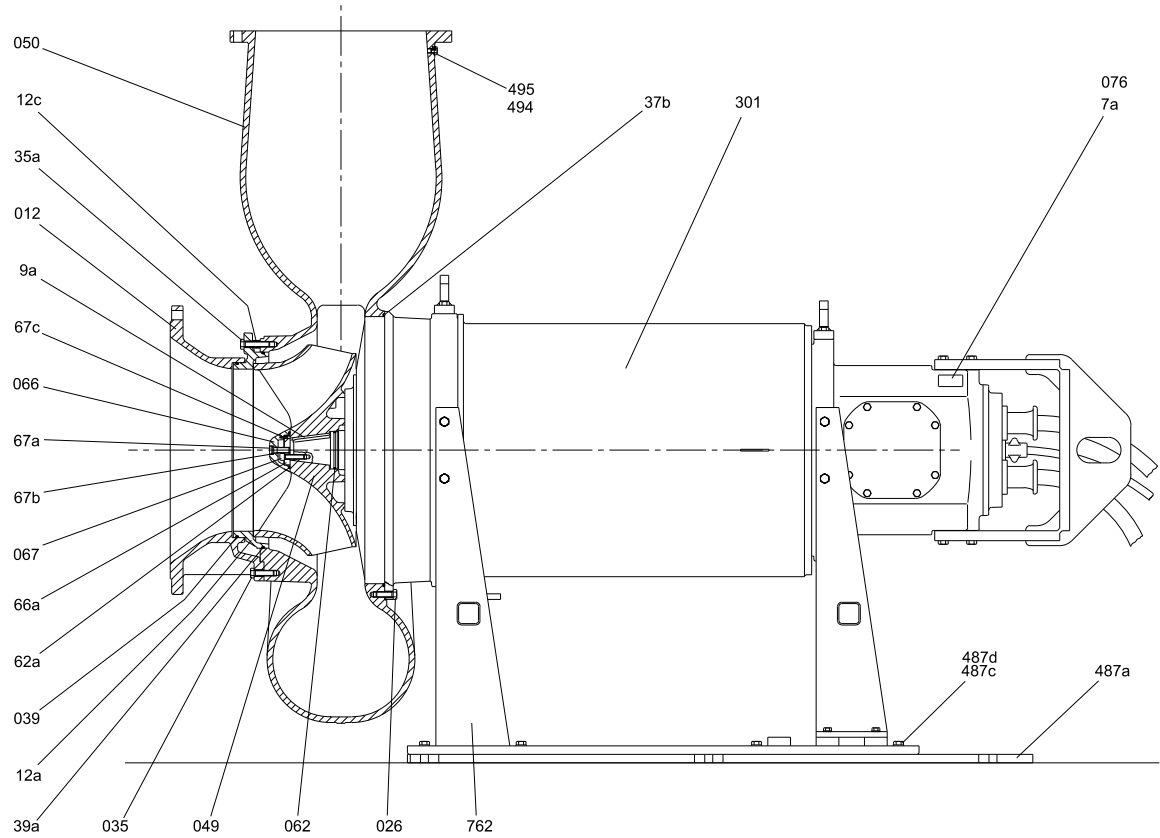
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Installation type D (vertical installation with concrete base)



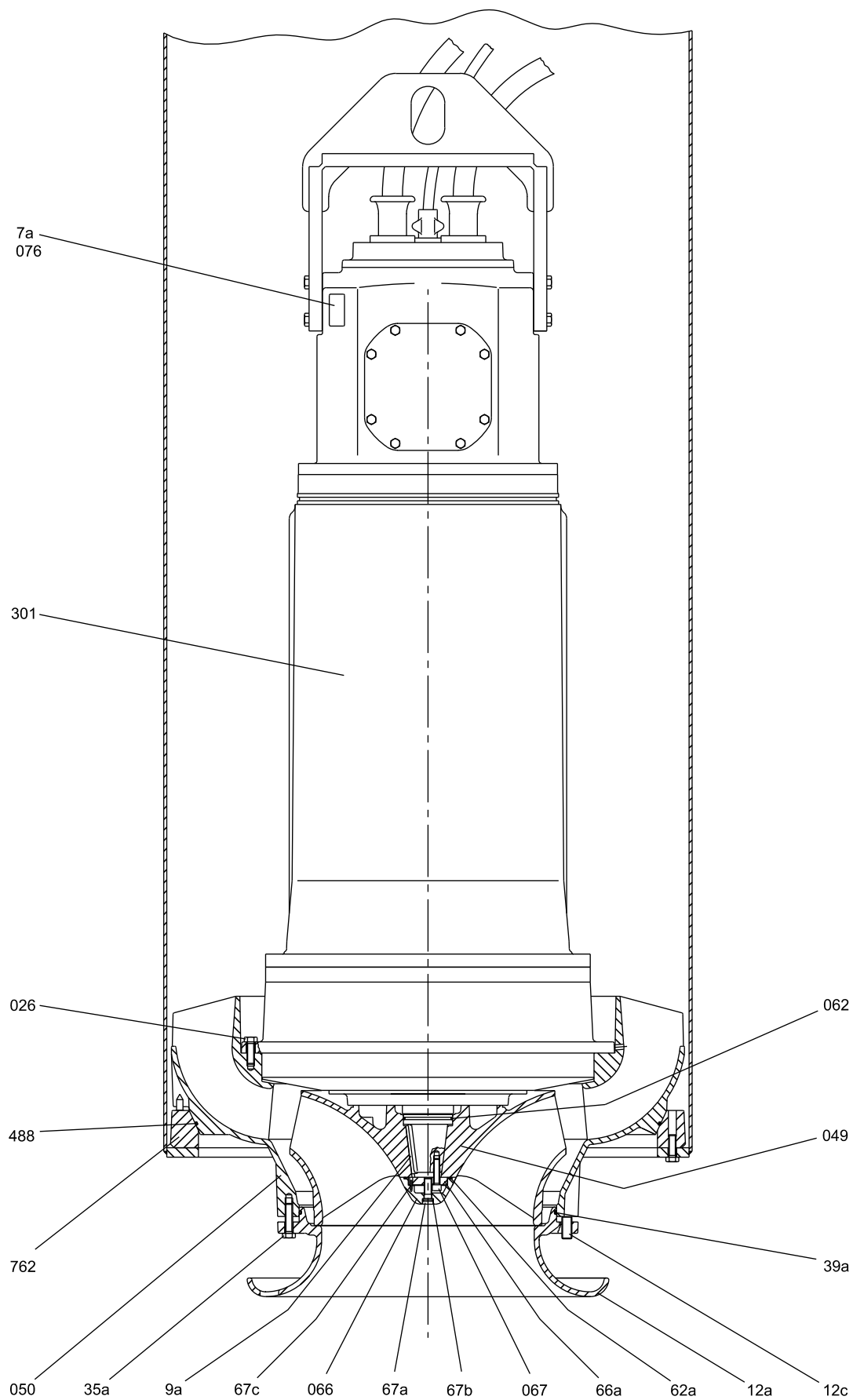
TM05 8619 2513

Installation type H (horizontal installation)



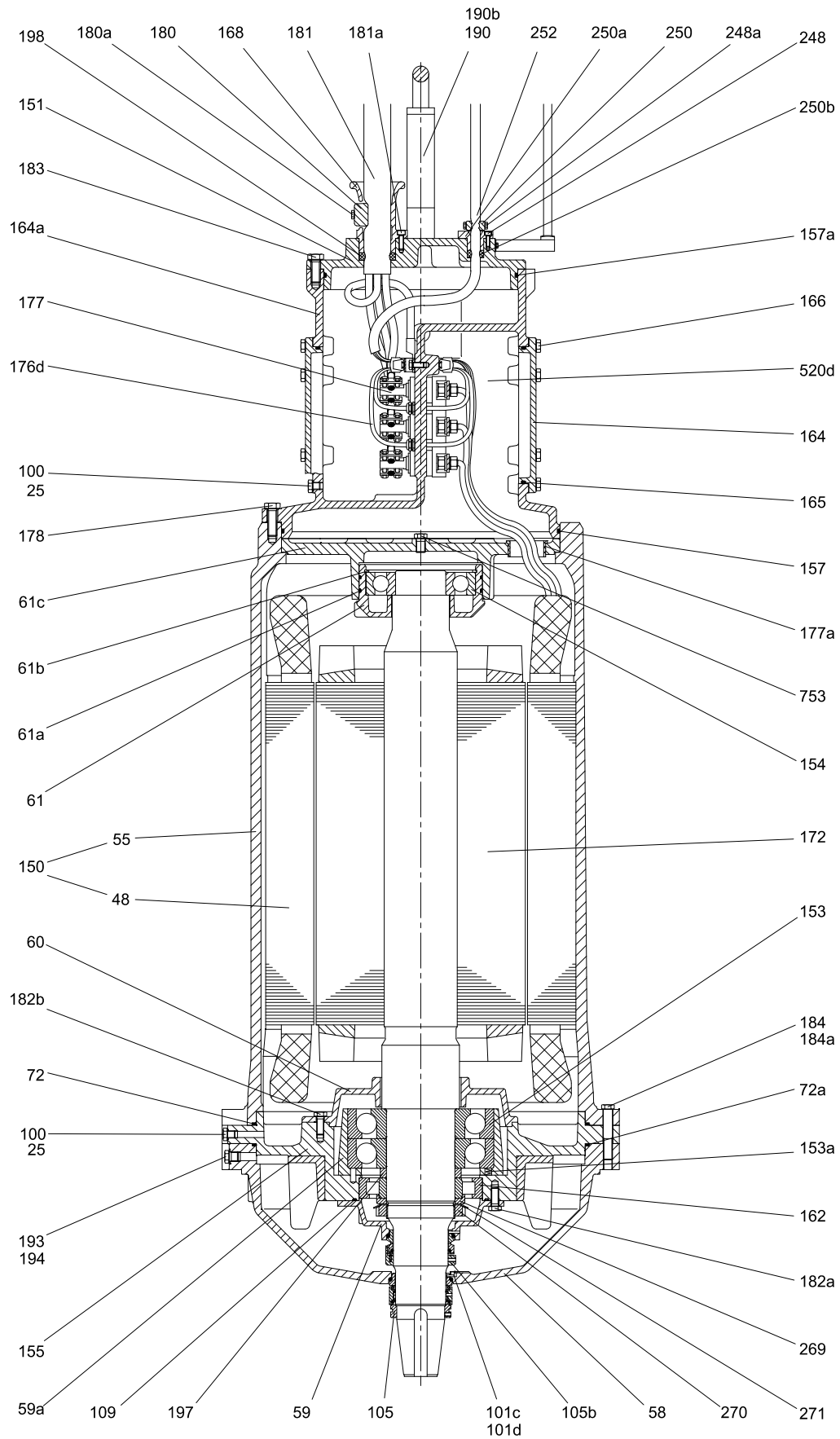
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## Installation type ST (column pipe installation)





# Installation type SA (column pipe installation, propeller)



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## 11.4 Position numbers and material specification

### Motor

Pos.	Component	Material
7a	Rivet	Stainless steel
25	Pressure test plug	Stainless steel
25a	Screw	Stainless steel
26a	Screw	Stainless steel
26b	Screw	Stainless steel
37a	O-ring	NBR rubber
37c	O-ring	NBR rubber
39c	O-ring	NBR rubber
48	Stator windings	
55	Stator housing	Cast iron
58	Shaft seal housing	Cast iron
59	Lower bearing bracket cover	Cast iron
59a	Locking ring	Aluminium
59b	Pin	Steel
60	Upper bearing bracket cover	Cast iron
60a	Labyrinth seal	
61	Bearing housing	Cast iron
61a	O-ring	Viton rubber
61b	Circlip	Steel
61c	Upper bearing bracket	Cast iron
72	O-ring	NBR rubber
72a	O-ring	NBR rubber
76a	Approval plate	Stainless steel
76b	Warning plate	Stainless steel
77	Seal housing cover	Cast iron
100	O-ring	NBR rubber
101c	Locking pin	Stainless steel
101d	Screw	Stainless steel
105	Mechanical shaft seal	SiC/SiC, stainless steel
105b	Mechanical shaft seal	SiC/carbon, stainless steel
107	O-ring	NBR rubber
109	O-ring	Viton rubber
150a	Screw	Stainless steel
150c	Cooling jacket	Galvanized steel
151	Motor top cover	Cast iron
153	Angular contact ball bearing	Steel, brass or steel cage
153a	Spring	Steel
154	Ball bearing	Steel, brass or steel cage
155	Lower bearing bracket	Cast iron
157	O-ring	NBR rubber
157a	O-ring	NBR rubber
157b	O-ring	NBR rubber
162	Roller bearing	Steel, brass or steel cage
164	Terminal box cover	Cast iron
164a	Motor top cover / terminal box	Cast iron
165	O-ring	NBR rubber
166	Screw	Stainless steel
168	Cable entry	Cast iron
168a	Adapter flange	Stainless steel
172	Shaft with rotor	Tempered steel
173	Screw	Steel
173b	Locking plate	Steel
173c	Washer	Steel
173e	Screw	Stainless steel
173f	Spring washer	Stainless steel
173g	Earth connector	Steel
176	Connector set	
176a	Terminal block	
176b	Screw	Stainless steel

Pos.	Component	Material
176c	Terminal block	
176d	Screw	Steel
177	Terminal board	
177a	Protection sleeve	Rubber or plastic
178	Screw	Stainless steel
178a	Screw	Stainless steel
180	Cable clamp	Cast iron
180a	Screw	Stainless steel
181	Cable	Copper, EPR-insulated
181a	Screw	Stainless steel
182a	Screw	Stainless steel
182b	Screw	Stainless steel
183	Screw	Stainless steel
184	Screw	Stainless steel
184a	Screw	Stainless steel
190	Lifting bracket	Galvanized steel
190a	Lifting bracket	Galvanized steel
190b	Screw	Stainless steel
190c	Screw	Stainless steel
193	Plug	Stainless steel
194	O-ring	NBR rubber
197	Supporting ring	Steel
198	Rubber seal	Neoprene rubber
248	Screw	Stainless steel
248a	Screw	Stainless steel
250	Cable clamp	Cast iron
250a	Cable entry	Cast iron
250b	Rubber seal	Neoprene rubber
252	Cable	Copper, EPR-insulated
269	Angle ring	Steel
270	Lock nut	Steel
271	Lock Washer	Steel
272	Vent pipe	
519	Conductor bushing	
520d	Protection sensors	
521	Water-in-oil sensor (WIO)	
522a	Screw	Steel
522b	Washer	Steel
522d	Pipe retaining clips	Steel
523	Cable gland	Steel / rubber
523a	O-ring	NBR rubber
524a	Bracket for SM113	Aluminium
524b	Screw	Steel
524c	Screw	Steel
524d	Spring washer	Steel
529	SM 113	
753	Screw	Steel
754	Locking ring	Cast iron
755	Intermediate ring	Cast iron
756	O-ring	NBR rubber
759	Protection ring	Aluminium
760	Moisture absorbing bag	Zeolite absorbent

**Pump**

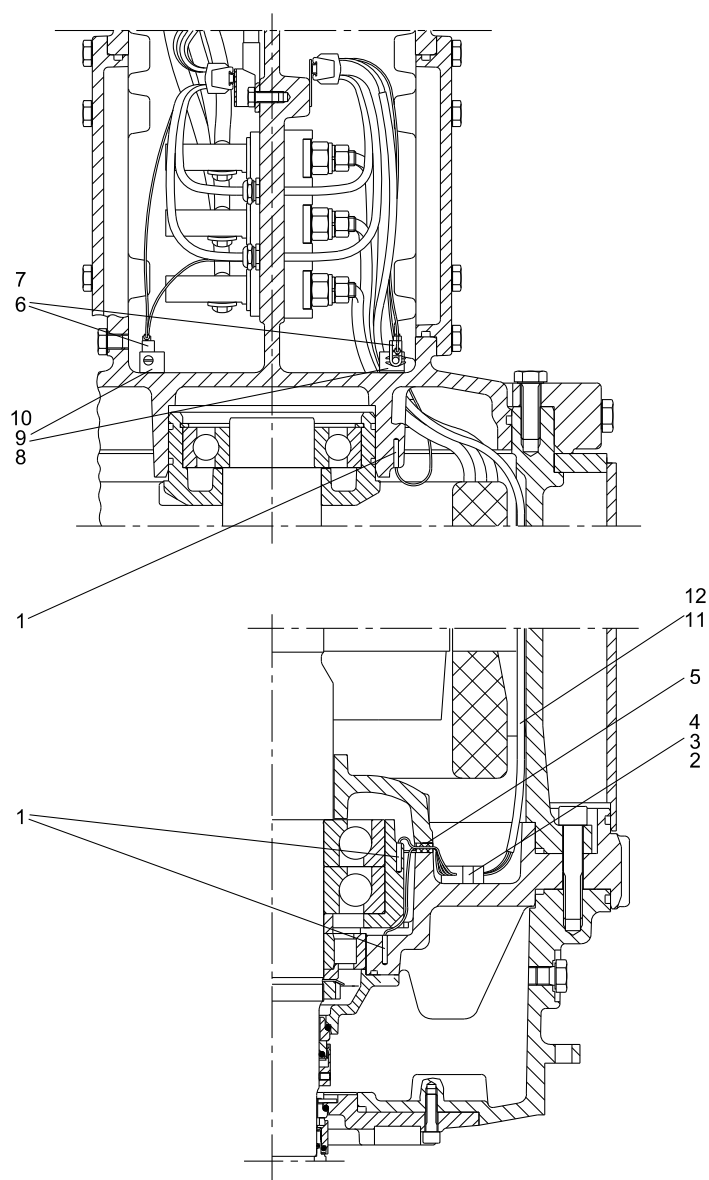
<b>Pos.</b>	<b>Component</b>	<b>Material</b>
1	Intermediate ring	Cast iron
7a	Rivet	Stainless steel
9a	Key (for keyway)	Steel
12	Flange	Cast iron
12a	Suction cover	Cast iron
12c	Set screw	Stainless steel
26	Screw	Stainless steel
26c	Screw	Stainless steel
35	Screw	Stainless steel
35a	Screw	Stainless steel
37	O-ring	NBR rubber
37b	O-ring	NBR rubber
39	O-ring	NBR rubber
39a	O-ring	NBR rubber
*49	Impeller	Cast iron
*50	Pump housing	Cast iron
62	O-ring	NBR rubber
62a	O-ring	NBR rubber
66	Cap	Cast iron or stainless steel
66a	Locking plate	Steel
67	Impeller screw	Stainless steel
67a	Screw	Stainless steel
67b	O-ring	NBR rubber
67c	Parallel pin	Steel
76	Nameplate	Stainless steel
301	Motor unit	
487a	Base plate	Steel
487c	Screw	Stainless steel
487d	Washer	Steel
488	O-ring	NBR rubber
492	Guide claw	Cast iron
492a	Rubber seal	Neoprene rubber
493	Screw	Stainless steel
494	Plug	Stainless steel
495	O-ring	NBR rubber
762a	Screw	Stainless steel
762b	Flange seal	

\* Available of stainless steel (custom-built option).

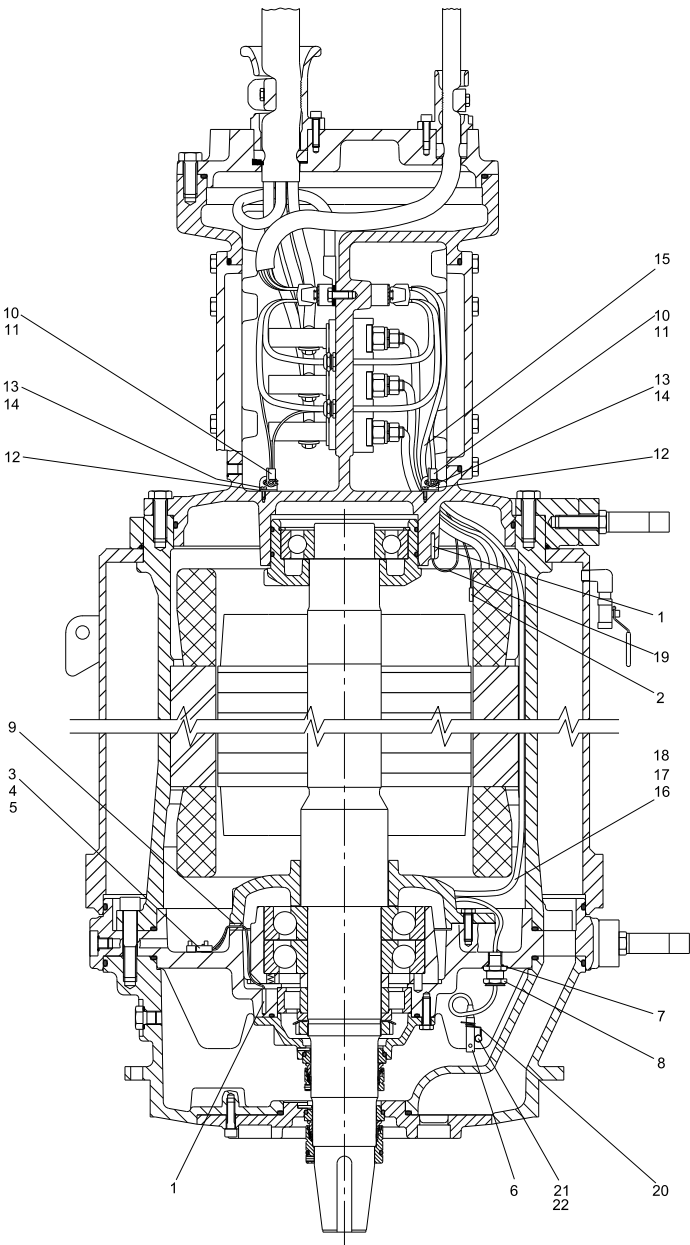
## 11.5 Sensor positions

Please note that the position numbers in section 11.5 refer exclusively to the sensors.

**Range 74 and 78 manufactured between 1992 to 2012**



Pos.	Description
1	Pt100 sensor
2	Plug strip (male)
3	Socket strip (female)
4	Cylinder screw
5	Rubber plate
6	Moisture switch
7	Cylinder screw
8	Bracket
9	Cylinder screw
10	Lock washer
11	Insulated conducting wire
12	Silicone rubber sleeve



Pos.	Description	Pos.	Description
1	Pt100 (temperature) sensor	12	Bracket
2	Pt100 (temperature) sensor insulated	13	Cylinder screw
3	Plug strip (male)	14	Lock washer
4	Socket strip (female)	15	Insulated conducting wire
5	Cylinder screw	16	Screen
6	WIO sensor	17	Silicone rubber sleeve
7	O-ring	18	Insulation ring
8	Cable gland	19	Sensor bracket (WIO)
9	Moisture switch	20	Hexagon head screw
10	Connector (female)	21	Spring washer
11	Cylinder screw		

Option

Pos.	Description
22	Vibration sensor
23	Hexagon head screw
24	Lock washer

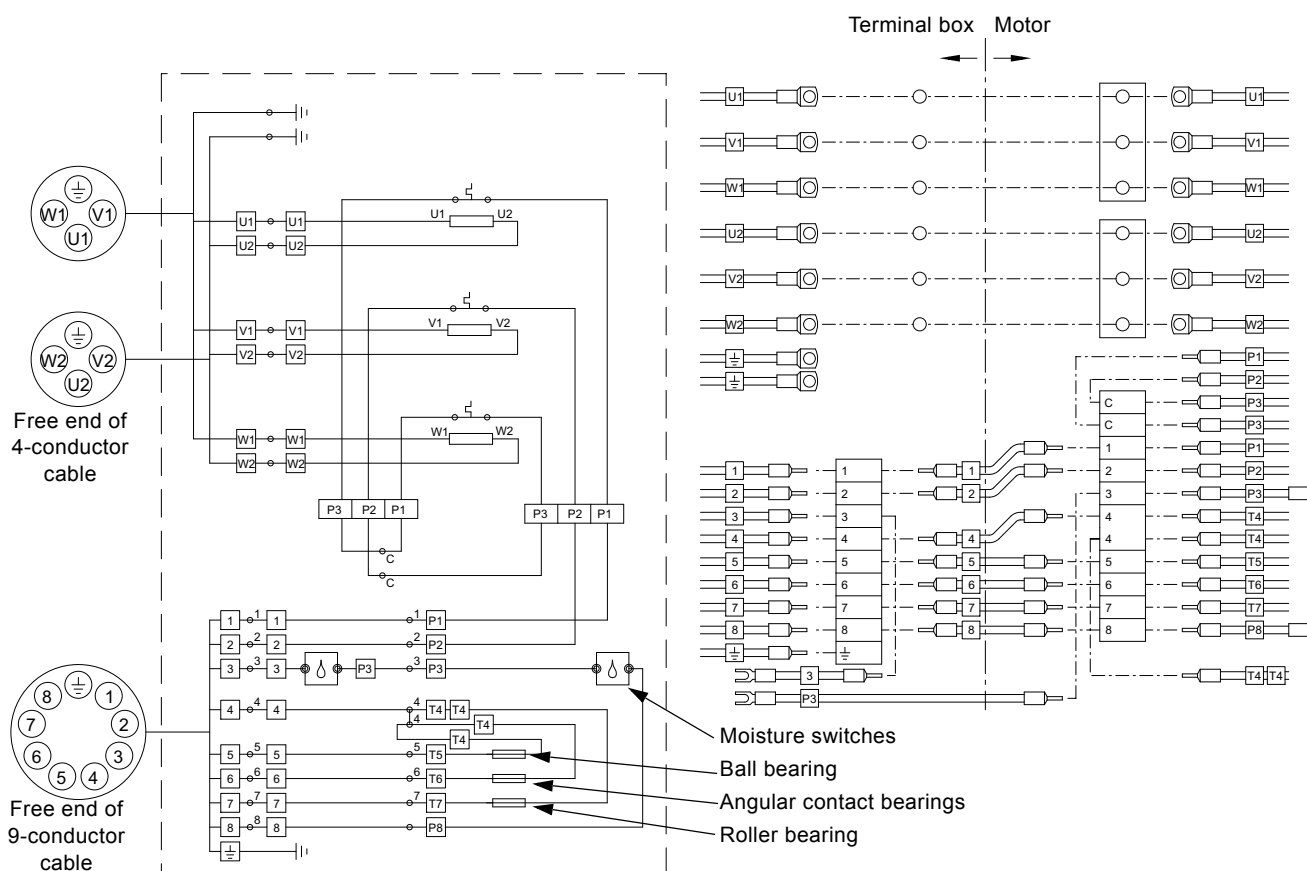
TM05 8680 2613

## 11.6 Electrical connections

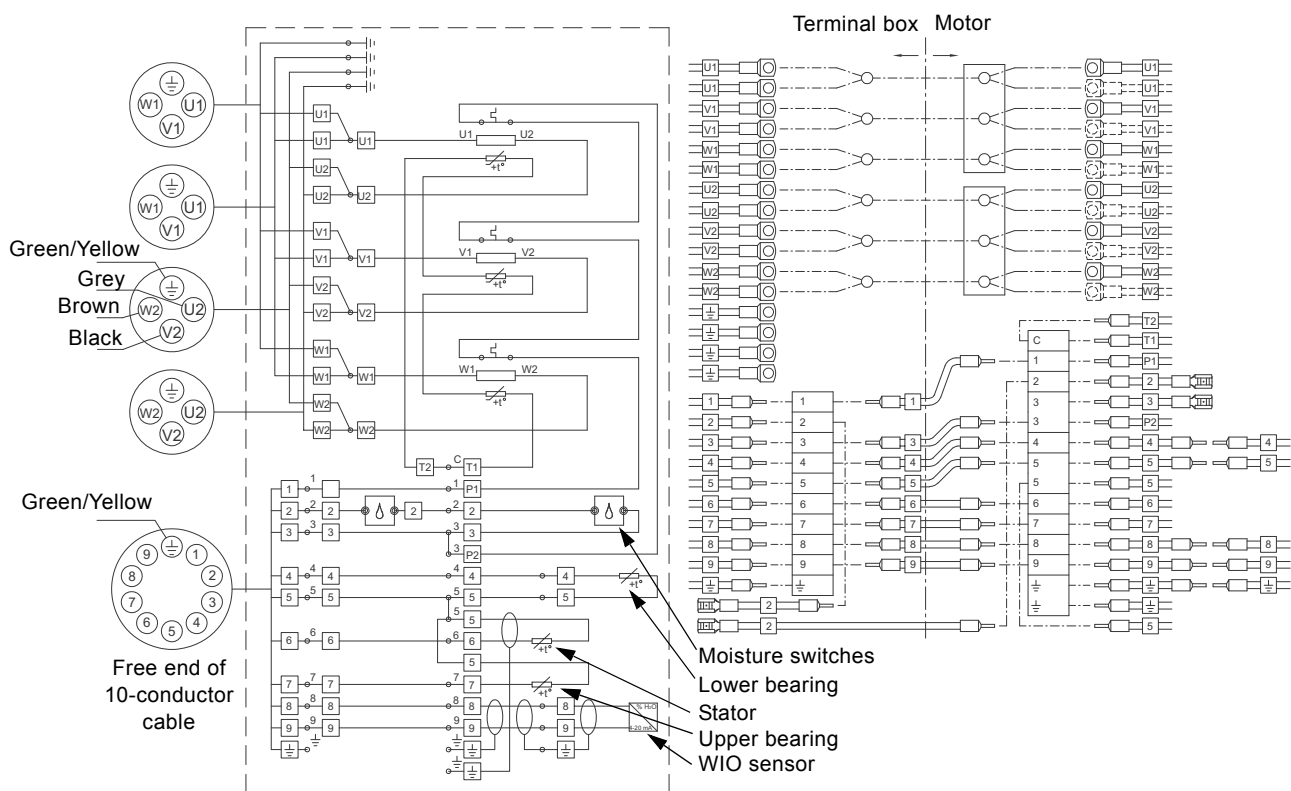
**Warning**

The following wiring diagrams are examples for standard pump models and they are not suitable for all pumps. Wrong electrical connections may cause injury to personnel or damage to the pump.

To make sure the wiring diagrams are suitable for the pump, contact Grundfos or an authorised service workshop.

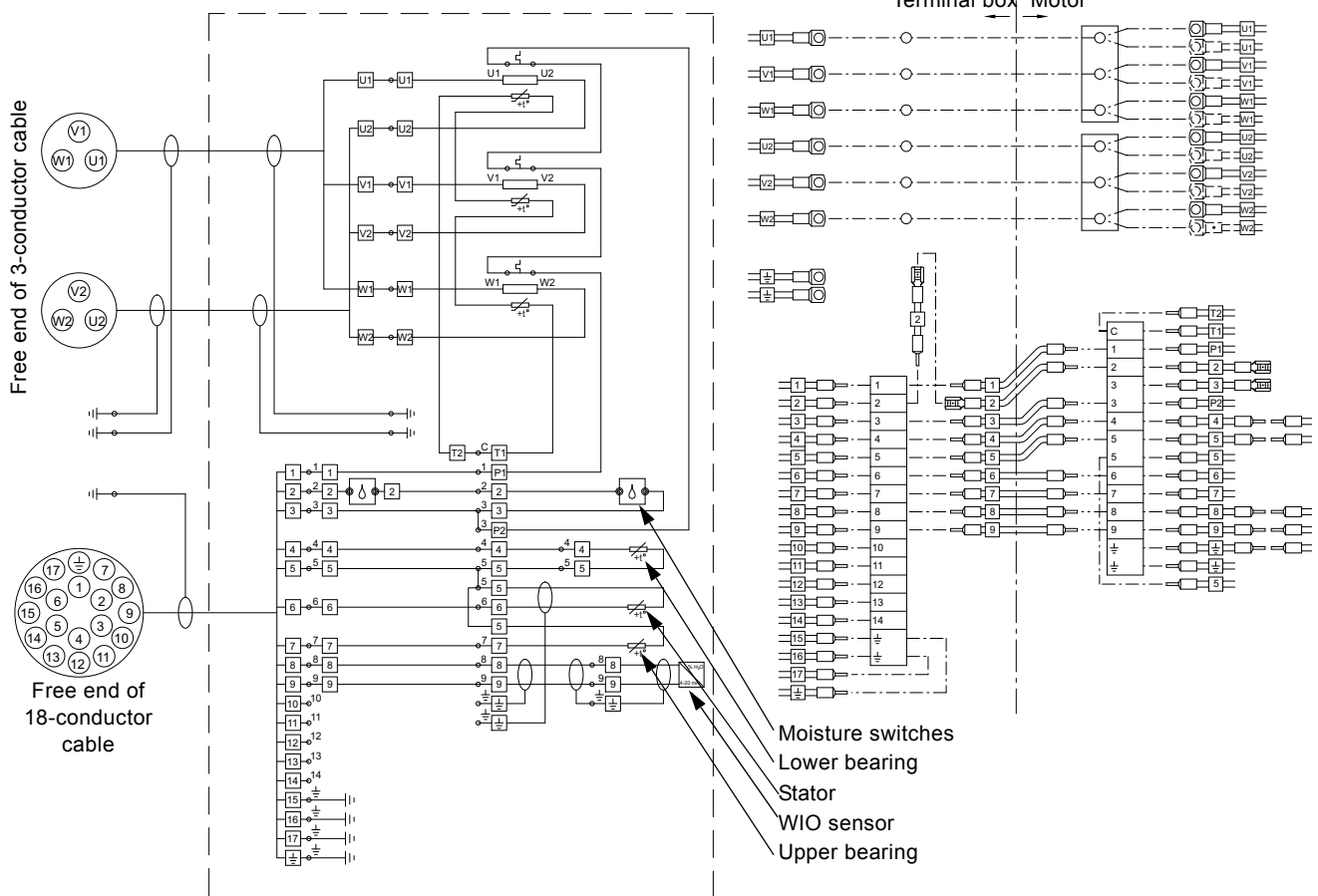
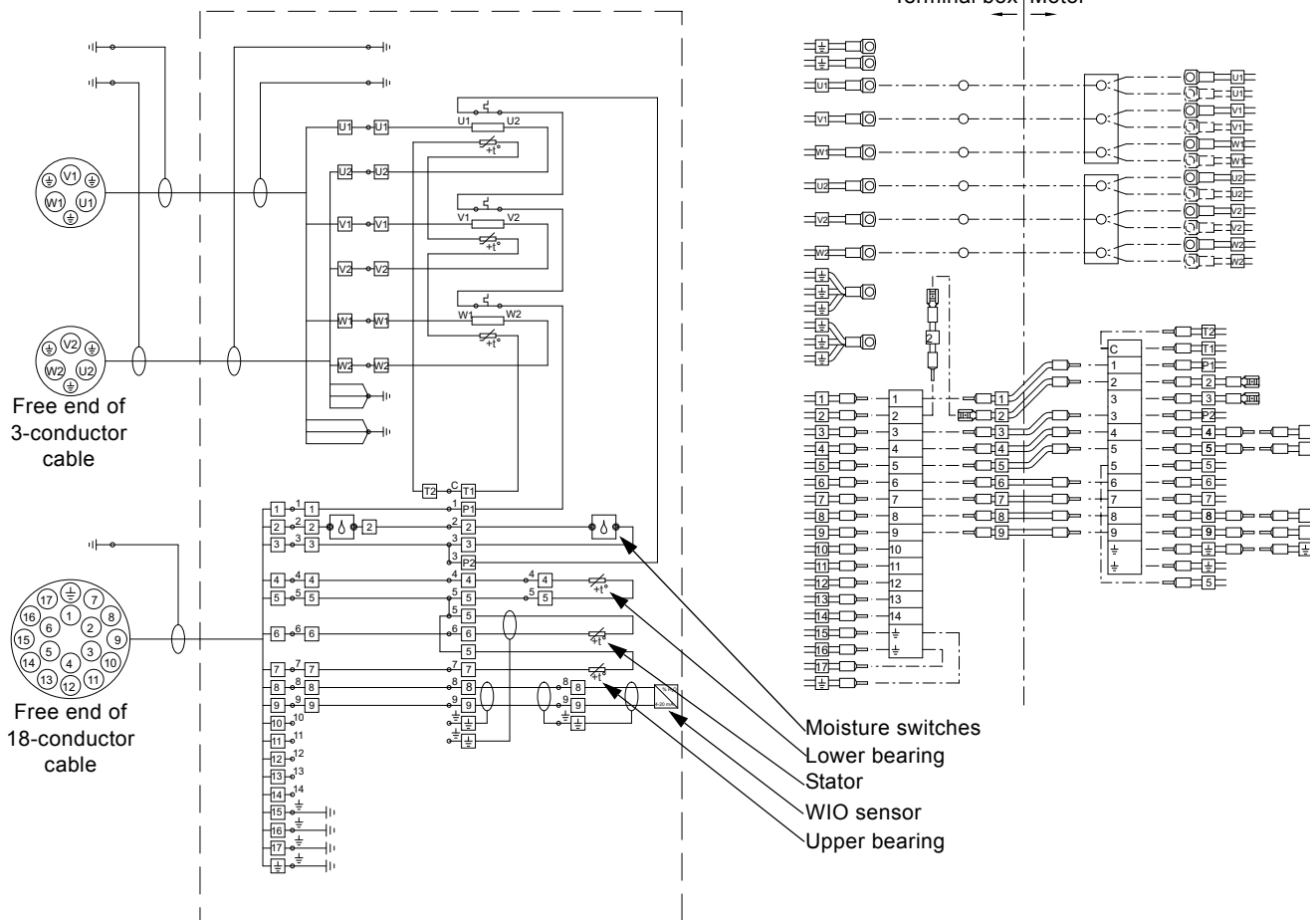
**Wiring diagram for pumps manufactured before 2009**

TM06 0371 5313

**Wiring diagram for pumps manufactured in 2009 and later**

TM06 0353 5113

## Wiring diagrams for EMC pumps



TM06 0373 5313

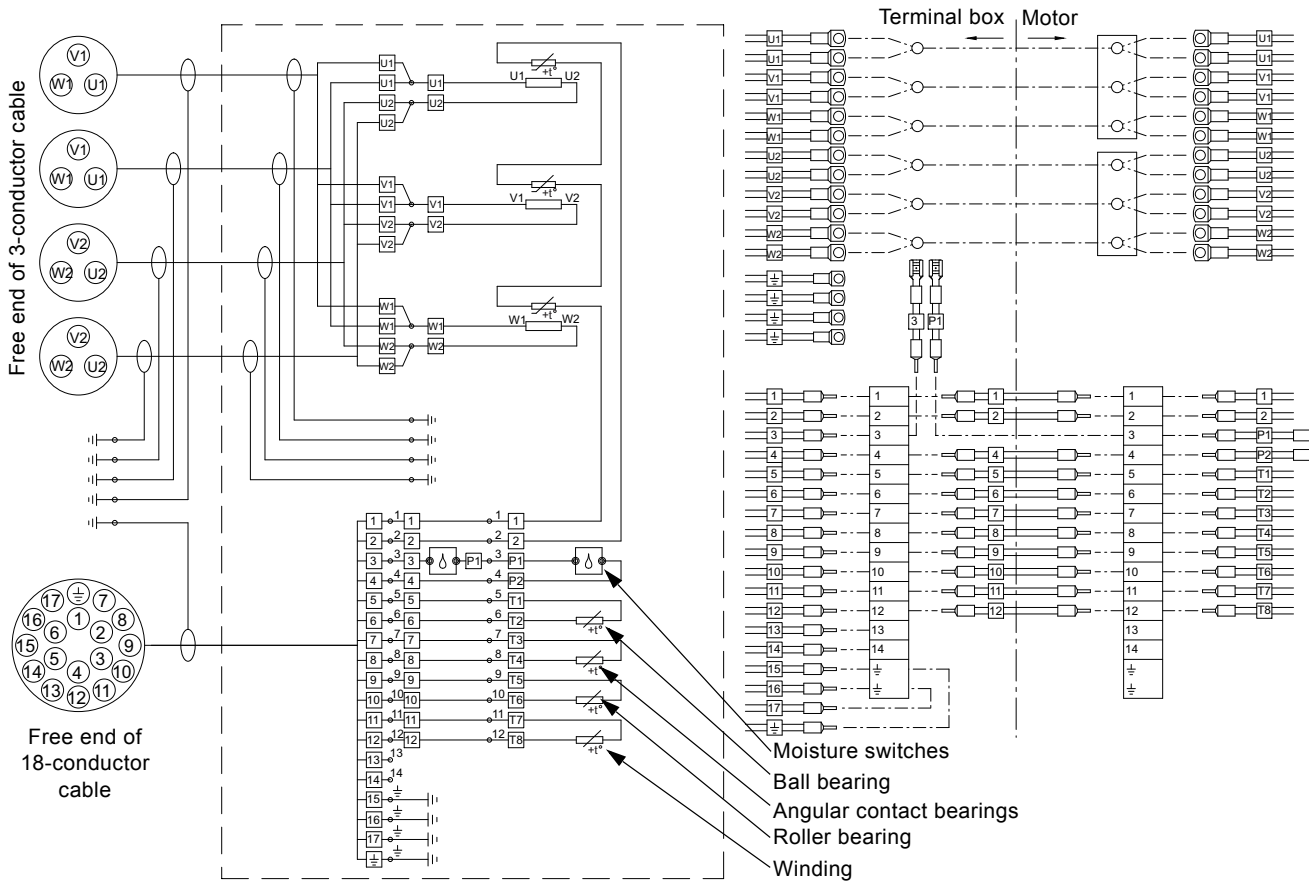
TM06 0374 5313



## Wiring diagram for Ex pumps

**Warning**

The control circuits are intrinsically safe circuits (see EN 50014 and EN 50020), and in the control panel they must be connected to an associated apparatus approved for EEx ia IIB circuits (typically safety barriers).



TM06 0372 5313

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