S-pumps, ranges 66 and 70

50/60 Hz

Service instructions

Installation and operating instructions in English and other languages for 50/60 Hz.

QR96838602

http://net.grundfos.com/qr/i/96838602

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Original service instructions

In this document there are references to the installation and operating instructions for the S pumps, ranges 50-70 (96838602). The installation and operating instructions are accessible via the QR code and the link on the front of this document.

CONTENTS

1. Symbols used in this document

1.1 Hazard statements

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

DANGER

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

WARNING

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

CAUTION

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

The hazard statements are structured in the following way:

SIGNAL WORD

Description of hazard

Consequence of ignoring the warning.

- Action to avoid the hazard.

1.2 Notes

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

Observe these instructions for explosion-proof products.

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

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

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

Tips and advice that make the work easier.

2. Safety

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 submerged sewage and wastewater pumps contain gasses 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 hygienic regulations in force.

DANGER

Crushing hazard

Death or serious personal injury

- 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 stared on the pump nameplate.

WARNING

Crushing of feet

Death or serious personal injury

- Always lift the pump by its lifting bracket or by means of a fork-lift truck.

3. Receiving the product

3.1 Transporting the product

You can transport the pump in vertical or horizontal position. Make sure that the pump cannot roll or fall over.

During long periods of storage, the pump must be protected against moisture and heat.

For further information, see the installation and operating instructions for S pumps, range 50-70. The installation and operating instructions are accessible via the QR code and the link on the front page of this document.

3.2 Contaminated pumps

CAUTION

Biological hazard

Minor or moderate personal injury

- Flush the pump thoroughly with clean water and rinse the pump parts in water after dismantling.

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

4. Handling the pump

S pumps weigh up to 2375 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 *5.1 Nameplate*.

4.1 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*.

4.2 Lifting points

DANGER

Electric shock

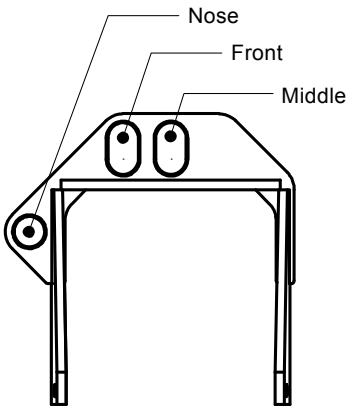
Death or serious personal injury

- Never lift the pump by the power supply cables.

Lifting the pump by the power supply cables may result in electric short circuit and risk of electric shock when the pump is connected to the mains. The cables and the cable entry may be damaged, leading to loss of watertightness and consequent severe damage to the motor.

4.2.1 Lifting points (top)

Use the right lifting point to keep the pump balanced. S pumps are equipped with a lifting bracket with lifting points ensuring that the pump can be lifted in a safe manner. See fig. 1 and table below for the correct lifting points.



TM04 7173 1710

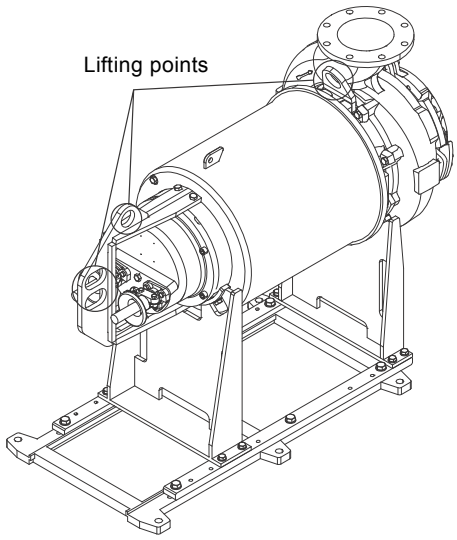
Fig. 1 LIfting points for installation types S, C and D

Always lift installation type ST pumps in the middle lifting point to make sure the pump is in balance.

Outlet flange size	Pump range	
	66	70
DN 200	Middle	Middle
DN 250	Middle	Middle
DN 300	Middle	Middle
DN 500	Nose	Front
DN 600	Nose	Front

4.2.2 Lifting points (bottom)

S pumps, ranges 66 and 70, are equipped with a lifting bracket on the motor top cover and on the lower bearing bracket. See fig. 2.



TM06 5922 0316

Fig. 2 Lifting points for installation type H

4.3 Raising the pump to upright position

DANGER

Crushing hazard

Death or serious personal injury

- Make sure the lifting bracket or the strap is tightened before attempting to lift the pump. Tighten if necessary.

DANGER

Crushing hazard

Death or serious personal injury

- Do not stand under or next to the pump when raising it to upright position in order to avoid crushing in case the pump overturns.
- Make sure the pump is raised gently into upright position to avoid the lifting chain slipping off the crane when the pump is not in balance.

Carelessness during the lifting or transportation may cause injury to persons or damage the pump.

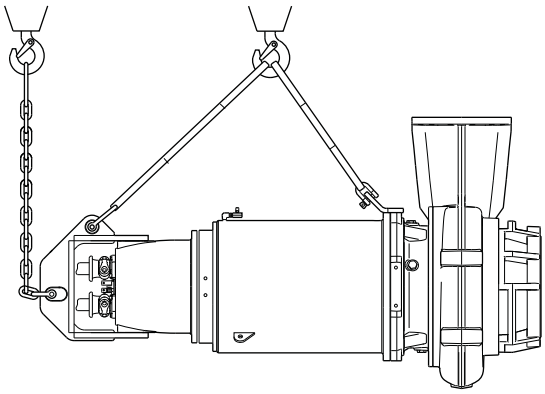


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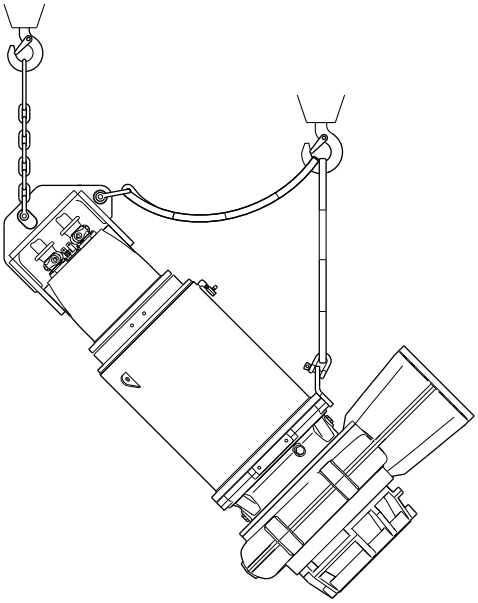
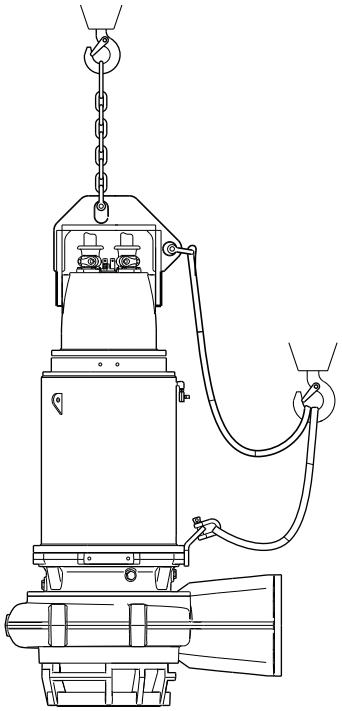
Fig. 3 Raising the pump to upright position, step 1



TM03 3035 0208

Fig. 4 Raising the pump to upright position, step 2



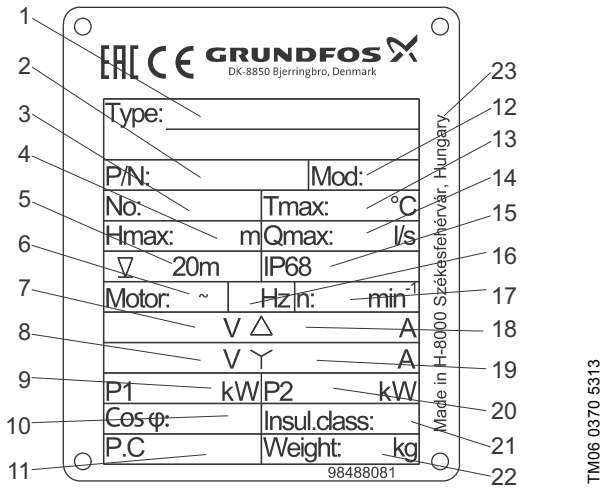
TM03 3036 0208

Fig. 5 Raising the pump to upright position, step 3

5. Identification

5.1 Nameplate

5.1.1 Nameplate



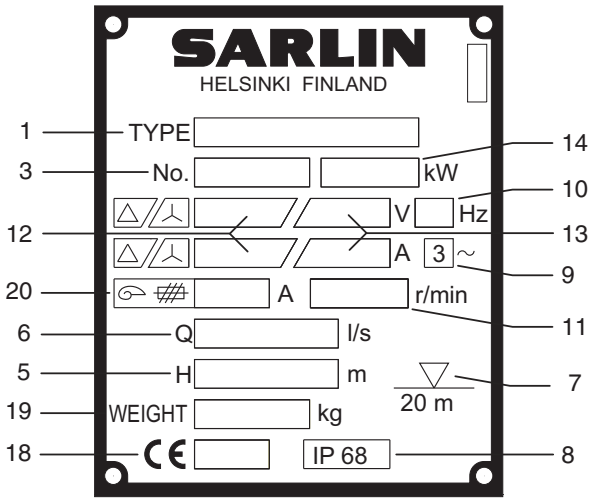
TM06 0370 5313

Fig. 6 Nameplate, Grundfos version

Pos.	Description
1	Type designation
2	Product number
3	Serial number
4	Maximum head [m]
5	Maximum installation depth [m]
6	Number of phases
7	Voltage, delta connection
8	Voltage, star connection
9	Rated power input [kW]
10	Cos φ, 1/1-load
11	Production code, year and week
12	Production number
13	Maximum liquid temperature [°C]
14	Maximum flow rate [l/s]
15	Enclosure class
16	Frequency [Hz]
17	Rated speed
18	Current, delta connection
19	Current, star connection
20	Rated power output P2
21	Insulation class
22	Net weight [kg]
23	Place of production

5.1.2 Sarlin version

Pumps manufactured in 2001 and before.



TM03 2548 4505

Fig. 7 Nameplate, Sarlin version

Pos.	Description
1	Type designation
2	*
3	Serial number
4	*
5	Maximum head [m]
6	Maximum flow rate [l/s]
7	Maximum installation depth [m]
8	Enclosure class
9	Number of phases
10	Frequency [Hz]
11	Rated speed
12	Voltage/current, delta connection
13	Voltage/current, star connection
14	Power input
15	*
16	*
17	*
18	Production code, year and week
19	Pump weight [kg]
20	Fuse rating, delta connection

* Position not used.

5.2 Approval plates

See the installation and operating instructions for S pumps, ranges 50-70. The installation and operating instructions are accessible via the QR code or the link on the front page of this document.

5.3 Type keys

5.3.1 Type key

The S pumps are identified by the type code stated in the order confirmation and other documentation supplied with the pump.

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

Code	Explanation	Designation
S	Grundfos sewage and wastewater pump	Pump type
ST	Multi-channel impeller pump installed in a column pipe	
1	Single-channel	Impeller type
2	Two-channel	
3	Three-channel	
V	SuperVortex	
100	Maximum solid size [mm]	Pump passage
100	Nominal diameter of pump outlet port [mm]	Pump outlet, S-type
	Nominal diameter of column pipe [mm]	Pump outlet, ST-type
55	P2 = Code number from type designation / 10	Output power [kW]
2	2-pole motor	Number of poles
4	4-pole motor	
6	6-pole motor	
8	8-pole motor	
10	10-pole motor	
12	12-pole motor	
50	Range 50	Pump range
54	Range 54	
58	Range 58	
62	Range 62	
66	Range 66	
70	Range 70	
S	Super-high	Pressure version
H	High	
M	Medium	
L	Low	
E	Extra-low	
F	Super-low	
S	Submersible installation without cooling jacket	Installation type
C	Submersible installation with cooling jacket	
D	Dry installation, vertical	
H	Dry installation, horizontal	
205	Impeller diameter [mm]	Impeller diameter (mean)
G	Cast iron impeller, pump housing and stator housing	Material code for impeller, pump housing and stator housing
Q	Stainless steel impeller, DIN W.-Nr. 1.4408	
S	Stainless steel impeller and pump housing, DIN W.-Nr. 1.4408	
R	Stainless steel impeller, pump housing and stator housing, DIN W.-Nr. 1.4408	
N	Non-explosion proof pump	Pump version
Ex	Pump with explosion-proof motor	
B	S pump with built-in SM 113 module. PTC sensors are connected directly to IO 113 or other PTC relay.	Sensor version
C	Not in use	
D	S pump without built-in SM 113 module.	
5	50 Hz	Frequency [Hz]
6	60 Hz	
11	3 x 400 / 690 V, Y/D (50 Hz only)	Voltage code and connection
	3 x 460 V, Y/D (60 Hz only)	
13	3 x 415 V, Y/D (50 Hz only)	
15	3 x 380 / 660 V, Y/D (60 Hz only)	
GPA	Pumps only for Australia	Customisation
Z	Custom-built products	

5.3.2 Sarlin version (old)

Code	Explanation		Designation
S	Grundfos (or Sarlin) sewage and wastewater pump		Pump type
ST	Multi-channel impeller pump installed in a column pipe		
1	Single-channel		Impeller type
V	SuperVortex		
[ ]	Standard pump		Pump version
X	In conformity with the ATEX directive		
5	Motor power [kW]		Power [kW]
2	2-pole motor		Number of poles
4	4-pole motor		
[ ]	First generation		Generation*
2	Second generation		
3	Third generation		
[ ]	No classification		Pressure version
L	Low		
M	Medium		
H	High		
1	Submersible installation on auto-coupling		Installation type
2	Submersible installation on auto-coupling. May operate continuously with motor exposed.		
3	Dry vertical installation with base stand		
4	Submerged installation, portable		
5	Submerged installation, portable. May operate continuously with motor exposed.		
6	Horizontal dry installation with base stand and bracket.		
[ ]	No letter indicates full interchangeability of parts and use of the same spare parts catalogue.		Interchangeability
A,B,C	The letters (A,B,C,...) indicates interchangeability of parts between otherwise identical pumps.		
1	Single-phase		Number of phases
[ ]	Three-phase		
5	50 Hz		Frequency [Hz]
6	60 Hz		
	50 Hz	60 Hz	Voltage code and connection
01	400 V, DOL	460 V, DOL	
03	415 V, DOL	500 V, DOL	
05		380 V, DOL	
07		220 V, DOL	
11	400 V, Y/D	460 V, Y/D	
13	415 V, Y/D	500 V, Y/D	
15		380 V, Y/D	
17		220 V, Y/D	
U	Flanges Sized According To Ansi Specifications		Special Equipment
Z	See confirmation of order for further details		Non-standard parts

* The generation code distinguishes between structurally different pumps which have the same power rating.

6. Torques and lubricants

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 (stainless steel screws)

Dimension	M3	M4	M5	M6	M8	M10	M12	M16	M20	M24	M27	M30
Torque [Nm]	1.1 ± 0.3	2.6 ± 0.6	5.2 ± 1	8.8 ± 2	21 ± 5	42 ± 10	73 ± 15	175 ±1 5	350 ± 30	600 ± 30	860 ± 40	1160 ± 60

6.2 Special torques and lubricants

Range	Pos.	Description	Quantity	Size	Torque [Nm]	Lubricant
All	67	Screw	1	M20	280	-
66	72	O-ring	1	349.3 x 5.7	-	Oil
70				399.3 x 5.7		
66	72a	O-ring	1	349.3 x 5.7	-	Oil
70				399.3 x 5.7		
All	-	Shaft end	-	-	-	Silicon spray
All	105	O-ring (stationary part)	1	75.57 x 5.34	-	Oil
		O-ring (rotating part)	1	65.1 x 3.53	-	Oil
		Set screw	3	-	6	-
All	105b	O-ring (stationary part)	1	74.2 x 5.7	-	Oil
		O-ring (rotating part)	1	64.77 x 2.62	-	Oil
		Set screw	3	-	6	-
All	107	O-ring	1	139.3 x 5.7	-	Oil

Oils:

Silicone spray Valvoline: 96249498

Motor oil with viscosity grade SAE 10 W 40.

6.3 Quantities of grease in bearings

Range	Bearing	Amount of grease
66	Lower bearing	0.530 litres
70		0.675 litres

Range	Bearing	Amount of grease
66	Upper bearing	0.300 litres
70		0.290 litres

Grease: Esso Unirex S2: 96248520.

6.4 Motor oil

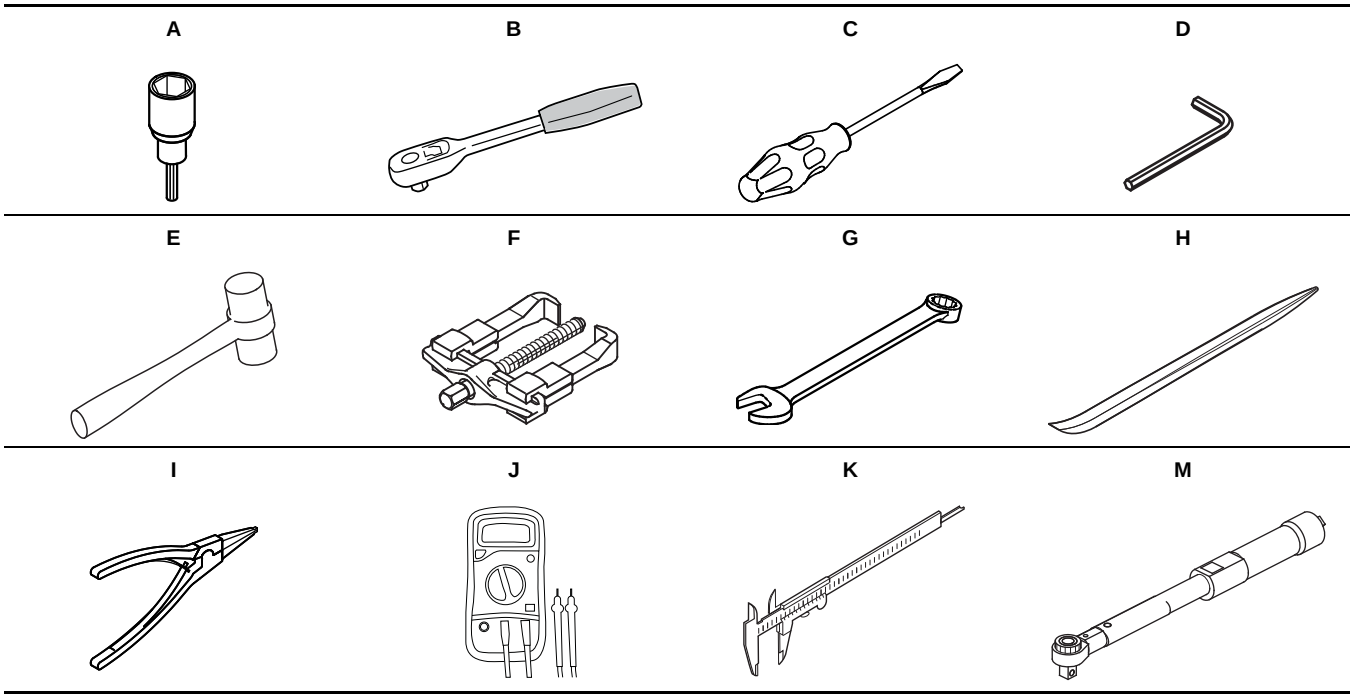
Range	Installation type	Amount of motor oil
66	S	11.5 litres
	C, D and H	9.2 litres
70	S	12.4 litres
	C, D and H	9.0 litres

Motor oil with viscosity grade SAE 10 W 40.

7. Service tools

The following table shows standard and special tools for pump service.

7.1 Standard tools

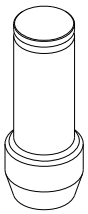


Standard tools

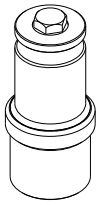
Pos.	Range	Description
A	All	Hexagon head driver
B	All	Ratchet handle 1/2"
C	All	Screwdriver
D	All	Hexagon key
E	All	Plastic hammer
F	All	Puller for bearing
G	All	Ring/open-end spanner
H	All	Pinch bar
I	54	Lock-ring pliers
J	All	Multimeter
K	All	Caliber
M	All	Torque wrench

7.2 Special tools

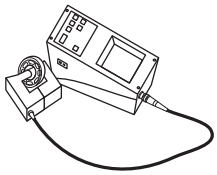
N



O



P

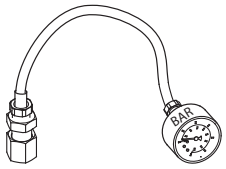


Special tools

Pos.	Range	Designation	Description	Part number
N	All	Seal assembly tool for secondary shaft seal (PUR116)	-	96061560
O		Seal assembly tool for primary shaft seal (PUR121)	-	96061563
P	All	Bearing heater	-	-

7.3 Tightness test tools

Q



R

Tightness test tools

Pos.	Designation	Description	Part number
Q	Pressure gauge	-	-
R	Test plug (KOE045) 2 pcs.	Connector M3\8-24 UNF F-ISO 228-G 3\8M	96061209

7.4 Lifting tools

S

Lifting tools

Pos.	Designation	Description	Part number
S	Eye bolt	All	-

8. Service

8.1 General information

DANGER

Electric shock

Death or serious personal injury

- Before starting work on the pump, make sure that the mains switch has been locked in position 0. Make sure that the power supply cannot be accidentally switched on.

WARNING

Crushing of hands

Death or serious personal injury

- Make sure that all rotating parts have stopped moving.

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 *6. Torques and lubricants*.

8.2 Servicing pumps with explosion-proof motors

Intervention in the flameproof enclosure of the pump is only allowed for authorised Ex workshops.

Service not affecting the explosion protection of the pump is allowed without violating Ex regulations.

Consequently, service persons who are not Ex authorised are allowed to replace the following parts of explosion-proof pumps:

- pump housing
- impeller
- shaft seal.

All other service work must be carried out by an authorised Ex workshop. Violation of this requirement will invalidate the Ex classification of the pump.

8.3 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.

8.4 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 *5.1 Nameplate*.
- **Oil level and oil condition**
  See section *8.5 Oil check and oil change*.
- **Electrical measurements**
  See section *8.7 Electrical measurements*.
- **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 the sensors are working. Replace the sensors if necessary.
  See section *9.2 Replacing the protection sensors*
- **Impeller clearance**
  Check the impeller clearance.
  See section *8.6 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.

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.

Do not reuse used rubber parts.

8.5 Oil check and oil change

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

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

Lack of oil may cause overheating and damage of the mechanical seals. The WIO sensor in the oil chamber will trip the alarm if the oil quality is poor or there is no oil in the oil chamber.

The oil in the oil chamber can be changed with the pump in either horizontal or upright position. We recommend that you carry out the oil change with the pump in horizontal position, if possible, because in that way it is much easier to drain all the used oil out of the chamber.

Horizontal position

Proceed as follows:

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

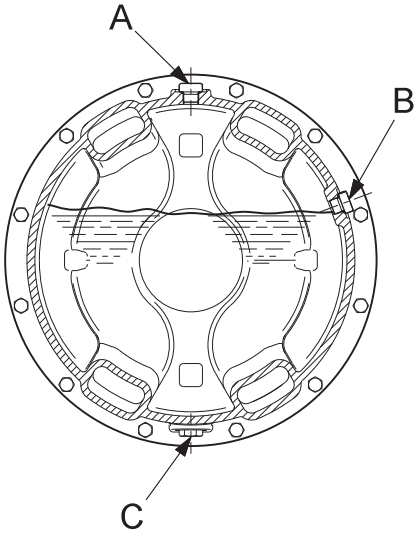


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Fig. 8 Pump with oil plugs

2. Place a clean container under the pump to collect all the drained-off oil. Remove the screw B and observe the oil level.

CAUTION

Pressurised system

Minor or moderate personal injury

- When loosening the screw 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.

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.
   Change the oil if it contains water. Oil not containing water can be reused.
4. If the oil needs to be changed, remove screw C and allow all the oil to drain from the chamber into the container. Emulsified oil must be changed and disposed of.

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. 8.

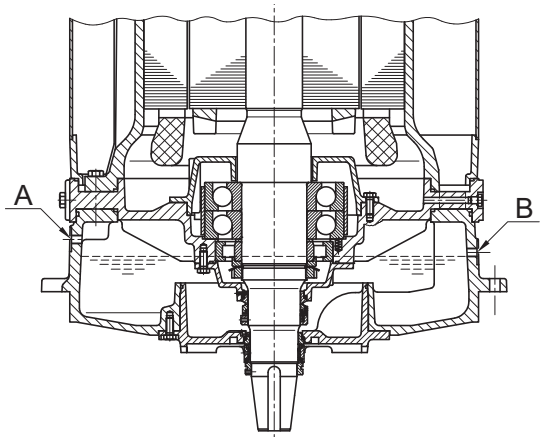

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Fig. 9 Correct oil level of upright position

2. Use screw B for indication of the level of oil in the oil chamber. See fig. 9.
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 deeply 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.
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.

8.6 Inspection and adjustment of impeller clearance

The correct axial clearance is 0.7 mm ± 0.2. Reset the clearance if it is 0.7 mm or more. The method for resetting the clearance is different for submersible pumps, installation types S, C and ST, and for dry-installed pumps, installation types D and H. For dry-installed pumps there are two methods.

All methods are described here.

It is not possible to adjust the clearance of SV pumps.

You can check the impeller and pump housing for wear only.

8.6.1 Submersible pumps, installation types S, C and ST

Submersible pumps have a separate, adjustable pump inlet cover which may be shaped as an inlet bell. When the pump is installed or pulled out of the pit for service, locate the six fastening screws of the inlet cover and the three set screws.

Use a feeler gauge to check the clearance between the impeller and the inlet cover all around the perimeter of the inlet opening. See fig. 10.

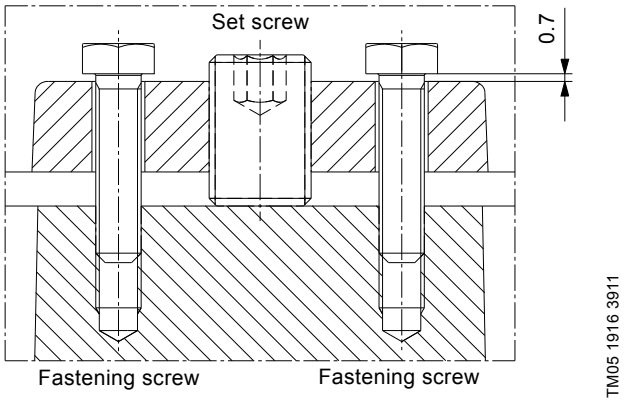


Fig. 10 Impeller clearance adjustment

8.6.2 Dry-installed pumps, Installation types D and H

Proceed as follows:

1. Loose the six fastening screws and close the impeller clearance by tightening the three set screws. Tighten the screws diagonally to move the inlet cover evenly.

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 inlet 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. Loosen the set screws and draw back the inlet cover by between 0.5 and 0.9 mm using the six fastening screws (approx. one 270 ° turn of an M12 fastening screw) and the distance "L" as reference. See fig. 11.
4. Tighten all set screws and check that the distance "L" at the three reference points is stable at the new value.

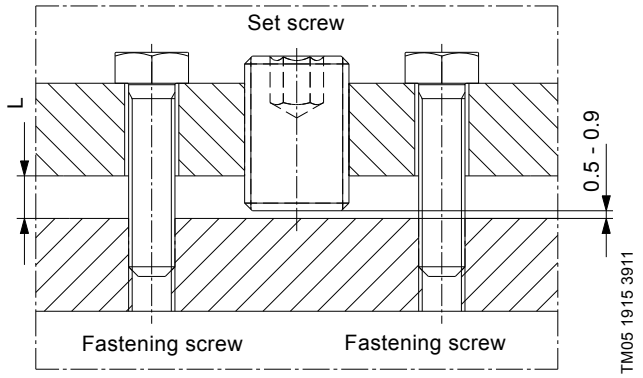


Fig. 11 Impeller clearance adjustment

8.7 Electrical measurements

In case the cable is damaged, measure from the cable terminal with the cable disconnected.

Connections in terminal boards are accessible by hand once the motor has been removed. See section *9. Dismantling and assembly instructions*.

8.7.1 Checking the internal motor control devices

1. Connect tester (test bell, test lamp, etc.) to leads P1 and P2 (1 and 2).
2. If tester functions (bell rings, lights come on) the control circuit is closed and intact.

8.7.2 Checking the earth connection

DANGER

Electric shock

Death or serious personal injury

- The pump must not be connected to the mains if the earth connections is not intact.

1. Connect one tester to the earth lead (yellow-green wire).
2. Connect second tester to the pump body.

Do not connect the tester to the cooling jacket, if any.

3. In case the tester functions, the earth connector is in order. In case the tester doesn't function, the earth connector is faulty and must be repaired.

8.7.3 Checking the insulation resistance

Insulation resistance can be measured from the cable end (control cabinet) or from the stator wires. Use a tester that can apply at least 500 VDC.

1. Measure the insulation resistance. As a minimum there must be 100 MΩ between:
   – earth (body) to phases U, V and W
   – earth (body) to control circuit leads P1 and P2 (1 and 2)
   – control circuit leads P1 and P2 to phases U, V and W
   – between phases.
2. If any of the above-mentioned measurements are below 100 MΩ, measure cable, windings and devices separately to find out where the insulation resistance has decreased. Reduction of insulation resistance due to moisture requires drying of the relevant parts, see sections *8.7.5 Drying of the cable* and *8.7.6 Drying of the stator and the rotor*.
3. Check that the conductor markings are indicated at the end of the cables.

8.7.4 Checking the stator winding resistance

Always disconnect the stator winding wires from the terminal board before measuring resistance values from them.

The measurements can be performed with a reliable multimeter that is capable of measuring Ω-values with 3 digit accuracy.

The maximum allowed difference between phases is ± 10 %.

Proceed as follows:

1. Disconnect the stator winding wire ends from the terminal board.
2. Identify the wire markings and proceed according to step 3 or step 4.

Step 3 applies only for the wires marked with the letters **U**, **V** and **W**.

3. Measure the stator winding resistance between:
   – U1 and U2
   – V1 and V2
   – W1 and W2.

Step 4 applies only for the wires marked with the letter **T**.

4. Measure the stator winding resistance between:
   – T1 and T4
   – T2 and T5
   – T3 and T6
   – T7 and T8 (2 phases in series)
   – T8 and T9 (2 phases in series)
   – T9 and T7 (2 phases in series).
5. Compare the measured values to the values in the winding resistance value table. See section *11.4.1 Cable and winding resistances*. In case of 2 phases in series, the measured values need to be divided by 2 before comparing them to the values in the tables.
   If no or only very few readings are obtained, the stator must be dried before the measurements are carried out again. See section *8.7.6 Drying of the stator and the rotor*.
   Consistent false reading of the stator winding resistance values is sufficient evidence of a winding damage. In case the stator needs to be replaced, see section *9. Dismantling and assembly instructions*.

8.7.5 Drying of the cable

1. See section *9.3.5 Removing the motor top cover*.
2. See section *9.1 Checking and replacing the cable*.

Make sure that the cables are disconnected from the terminal board before removing the cable entry.

3. Blow clean air (max. 0.8 bar) through the cable.
4. Dry for approx. 20 hours.
5. Connect the old cable or replace it with a new one.
6. Measure the resistance. See section *8.7.3 Checking the insulation resistance*.

8.7.6 Drying of the stator and the rotor

1. See section *9. Dismantling and assembly instructions*.

If the stator is wet, not only the stator but also the rotor must be dried. If this is not done, the stator may become moist again after re-assembly and trip the moisture switch.

2. Place the stator and rotor in an oven at 100-110 °C.
3. Dry for 6 to 12 hours.
4. Let the stator and rotor cool down.
5. Measure the winding resistance.
   If the measurements are not valid, replace the stator. See section *9.3.12 Removing the stator*.
6. See section *9. Dismantling and assembly instructions*.

9. Dismantling and assembly instructions

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

There are several service videos available as guidance on Grundfos Product Center or YouTube.

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.

Always use original service parts from the manufacturer.

9.1.1 Cable change

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

Disconnecting the cables will shorten them significantly.

Disconnect the cable - composite cable entry (non-Ex)

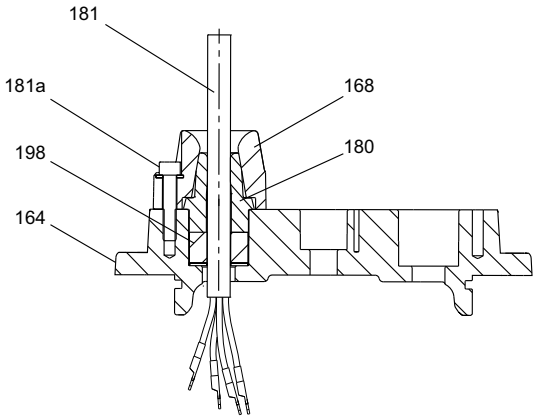


Fig. 12 Cable entry attached to motor top cover

1. See section *9.3.4 Removing the cooling jacket*.
2. See section *9.3.5 Removing the motor top cover*.

Make sure that the cables are disconnected from the terminal board before removing the cable entry.

3. Remove the screws (181a). See fig. 12.
4. Pull the cable (181) including the cable entry assembly out of the motor top cover (164a).
5. Remove the cable entry (168) including the rubber seal (198) and cable clamp (180), if any, from the cable (181).
6. Remove the rubber seal (198) from the cable entry (168).
7. Remove the cable clamp (180) from the cable entry (168).

Connecting the new cable - composite cable entry (non-Ex)

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

1. Slide cable entry (168) on the cable (181).
2. Slide the cable clamp (180) and rubber seal (198) on the cable (181).
3. Fit the cable clamp (180) and rubber seal (198) on the cable entry (168).
4. Fit the cable entry to the motor top cover (164) with screws (181a).
5. Tighten the screws (181a) evenly with a torque. See section *6. Torques and lubricants*.

Connect according to the wiring diagrams.

Disconnect the cable - metal cable entry (non-Ex/Ex)

This section is only valid for range 70 pumps.

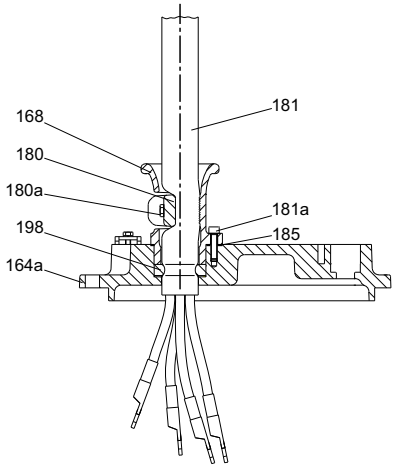


Fig. 13 Cable entry attached to motor top cover

1. See section *9.3.4 Removing the cooling jacket*.
2. See section *9.3.5 Removing the motor top cover*.

Make sure the cables are disconnect from the terminal board before removing the cable entry.

3. Remove the screws (180a). See fig. 13.
4. Remove the cable clamp (180).
5. Remove the screws (181a).
6. Pull the cable out of the motor top cover (164a).
7. Remove the cable entry (168) including the rubber seal (198) and washer (185), if any, from the cable (181).
8. Remove the rubber seal (198) from the cable entry (168).

Connecting the new cable - metal cable entry (non-Ex/Ex)

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

1. Measure (*K*) the outer diameter of the cable (181) and the hole diameter (cable ID) from the motor top cover (164a). Check the number of washers (185) needed, if any, in the table below.

Cable ID [mm-ver.]	Cable [mm]		Washer [pcs.]	Torque [Nm]
	min.	max.		
36-1	14.4	15.4	-	10
	15.4	16.4	1	
36-2	17.2	17.5	0	
	17.5	18.8	1	
	18.8	20.0	3	
46-1	15.7	17.2	-	45
46-2	17.8	18.5	-	
	18.5	19.2	1	
	19.2	20.0	2	
46-3	20.9	21.5	-	
	21.5	22.4	1	
	22.4	23.4	3	
46-4	23.8	24.6	-	
	24.6	26.0	2	
	26.0	27.0	5	
65-1	28.3	31.4	-	
65-2	32.5	33.6	2	
	33.6	34.7	3	

2. Slide cable entry (168) on the cable (181).
3. Fit the cable entry (168), washer(s) (185) and rubber seal (198) on the cable (181).
4. Fit the cable entry to the motor top cover (164a) with screws (181a).
5. Tighten the screws (181a) evenly to the torque specified in the table above.

If a gap remains between the motor top cover and cable gland/washer wait for 30-60 minutes and retighten the screws.

6. Fit the cable clamp (180a) to the cable entry (168) with screws (180a).

Connect according to the wiring diagrams.

9.2 Replacing the protection sensors

9.2.1 Moisture switch

The standard pumps have one moisture switch under the motor top cover. The Ex pumps have two moisture switches, one under the motor top cover and one in the stator housing. On Ex pumps manufactured before February 2009, both moisture switches are placed under the motor top cover

The changing method is the same, no matter where the switch is placed.

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.

Checking the moisture switch

1. Connect the switch to a simple bell circuit or another test circuit.
2. Adjust the clearance between expander part and the switch body to 2.5 mm by using the adjustment gauge
3. Remove the adjustment gauge.

Checking the microswitch

1. Connect the test bell or other test circuit.
2. Place the adjustment gauge between the expander part and the switch body.
3. Pull the expander outward two to three times to make sure the that the bell stops ringing (the electric circuit will be broken) when the expander is pulled outward and starts to ring when the expander is free.

Adjusting the clearance of the moisture switch

1. Place the adjustment gauge between the expander part and the switch body.
2. Pull the expander outward:
   – If the bell rings, turn the adjusting screw clockwise until the bell stops ringing
   – If the bell is not ringing, turn the adjusting screw counterclockwise until the bell starts ringing.
3. Remove the adjustment gauge

Install the switch and test the microswitch.

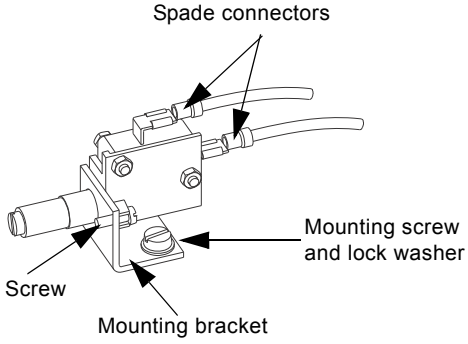


Fig. 14 Moisture switch

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.
3. Remove the screw.
4. Remove the switch from the mounting bracket.

Fitting a 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 *11.4 Electrical connections*.

9.2.2 Pt100 sensor on lower bearing bracket

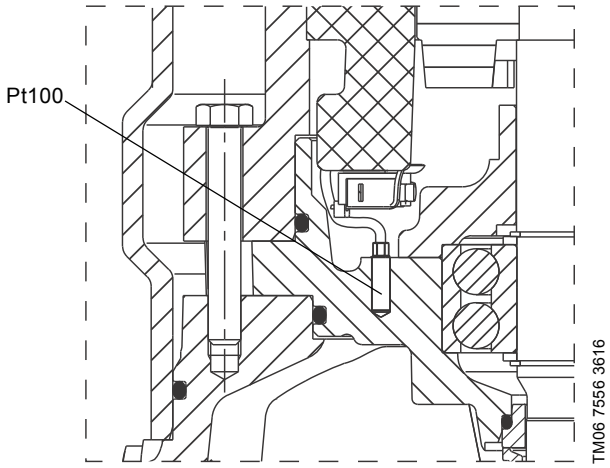


Fig. 15 Pt100 sensor in lower bearing bracket

Removing Pt100

1. Cut the wire of the Pt100 sensor right next to sensor. Remove the wire.
2. Drill out the sensor from the lower bearing bracket (155).

Fitting new Pt100

3. Dip the sensor head in glue and insert it in the hole in the lower bearing bracket (61).
4. Connect according to the wiring diagram. See section *11.4 Electrical connections*.

9.2.3 Pt100 sensor on the stator

Removing Pt100

1. Cut the wire of the Pt100 sensor right next to the sensor and remove the wire.
2. Leave the old sensor on the stator.

Fitting new Pt100

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

3. Glue the sensor onto the stator windings (48).
4. Connect according to the wiring diagram. See section *11.4 Electrical connections*.

9.2.4 Water-In-Oil sensor (WIO)

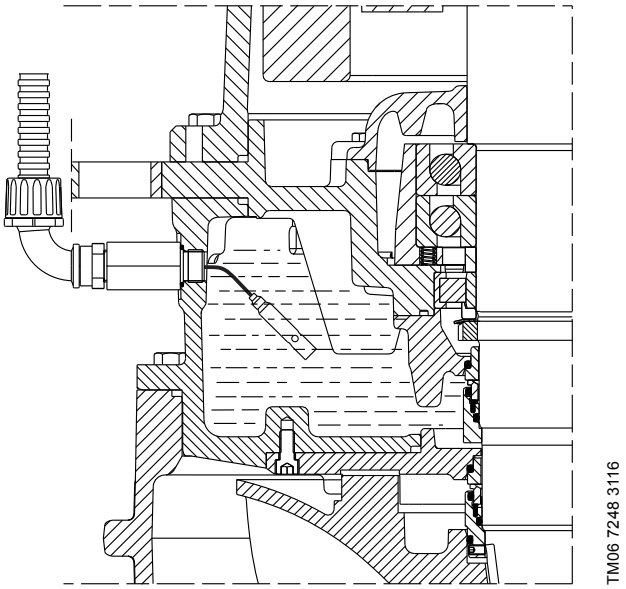


Fig. 16 External Water-In-Oil sensor (WIO)

We recommend to change the motor oil in case the WIO sensor is changed.

Removing the WIO sensor

1. Place the pump on vertical position.
2. Loosen the WIO inlet and remove the sensor.
3. Replace immediately with new sensor or the oil plug (193) and the O-ring (194).

Fitting new WIO sensor

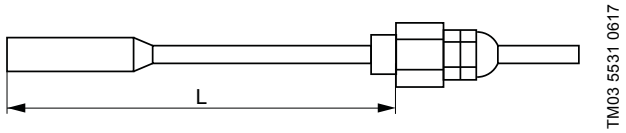


Fig. 17 Installation of WIO sensor

Range	Installation length [L]
66 and 70	100 mm

1. Fit the WIO sensor in the hole of oil plug B. See figs 8 and 9 for correct position. Make sure that the sensor head is inside the oil chamber. See installation length above.
2. Connect according to the wiring diagram. See section *11.4 Electrical connections*.

9.3 Dismantling - S pump

For position numbers, see section *11. Drawings*.

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

9.3.1 Removing the pump housing and impeller

1. Place the pump in vertical position and support it by means of a hoist fastened to the lifting bracket (190).
2. Remove the screws (26c) in the pump housing (50).
3. Lift the motor including the impeller (49) out of the pump housing (50).
   If necessary, tap all around the housing with a soft hammer to remove the motor or pry it loose with a pry bar.
4. Place the motor in horizontal position on a firm workbench or trestle with the impeller facing outward.
5. Support the impeller by means of lifting belt.
6. Loosen the impeller screw (67).
7. Loosen the impeller (49), use pinch bars if needed.
8. Remove the impeller screw (67), O-ring (67b) and the impeller cap (66).
   For some non-SuperVortex pumps it is necessary to use an impact puller (*M*) to remove the impeller cap (66).
9. Remove the impeller (49).

9.3.2 Draining the oil

1. See section *8.5 Oil check and oil change*.

9.3.3 Removing the primary shaft seal

Handle seal parts with extreme care to prevent damage. Be very careful not to damage the precision-finished seal faces; even fingerprints can shorten the seals life.

CAUTION

Sharp element

Minor or moderate personal injury

- Cover the sharp edges of the keyway on the shaft, for instance with tape.

1. See section *9.3.1 Removing the pump housing and impeller*.
2. See section *9.4.3 Draining the oil*.
3. Remove the key (9a). Tap gently with plastic hammer if needed.
4. Loosen the set screws in the shaft seal (105) and remove the rotating part.
5. Gently remove the stationary ring of the shaft seal (105).

9.3.4 Removing the cooling jacket

1. Remove connections of external WIO sensor cables, if any.
2. Remove the screws (190b) and lifting bracket (190).
   Tap gently with plastic hammer bottom of the cooling jacket to loose the fitting, if needed.
3. Pull out the cooling jacket (150c) from the brackets with a hoist.
4. Remove O-rings (37a and 157b)

9.3.5 Removing the motor top cover

1. See section *9.3.4 Removing the cooling jacket*.
2. Remove the screws (178).
3. Lift the motor top cover (164a) approx. 10 cm. Tap lightly, if needed.
4. Disconnect the cables.
5. Remove the motor top cover (164a).
6. Remove the O-ring (157).
7. Make sure the pin (59b) stay's in the groove of upper bearing bracket (61c).

9.3.6 Removing the shaft seal housing

1. See section *9.3.1 Removing the pump housing and impeller*.
2. Loosen the screws (26a).
3. Loosen the seal house cover (77). Use pinch bars to loosen the fitting.
4. Remove the screws (26a) and the seal house cover (77) including O-ring (107).
5. Remove the screws (184).
6. Remove the seal housing (58) including O-ring (72). Tap gently with plastic shammer if needed.
7. Remove the O-rings (72 and 72a).

9.3.7 Removing the secondary shaft seal

1. See section *9.3.6 Removing the shaft seal housing*.
2. Loosen the set screws in the secondary shaft seal (105b).
3. Remove the rotating and stationary parts of the shaft seal (105b) from the shaft. Use pinch bars if needed.

9.3.8 Removing the upper bearing bracket

1. Disconnect the sensor cables from the terminal block (176c).
2. Remove the moisture absorbing bag.
3. Remove the pin (59b).
4. Place screw in the screw hole in the upper bearing bracket (61c). Use M10 for both ranges.
5. Turn the screw in the hole so that the upper bearing bracket (61c) starts to pull up.
6. Remove the upper bearing bracket (61c).

9.3.9 Removing the upper bearing

1. See section *9.3.10 Removing the rotor*.
2. Pull out the bearing (154) from the shaft by using a bearing puller, if needed.

9.3.10 Removing the rotor

We recommend drawing a marking on the stator housing (55) and lower bearing bracket (155) so that you are able to position the lower bearing bracket correctly at the assembly.

1. See section *9.3.7 Removing the secondary shaft seal*.
2. Place the motor in vertical position so that the shaft end is pointing upwards.
3. Insert an eyebolt in the shaft end.
4. Lift the rotor assembly off the stator housing (55) using a hoist.
   If the fitting is tight, loosen it using pinch bars.
5. Place the rotor assembly in horizontal position.
6. Remove the eyebolt and protect the shaft end from dirt.

9.3.11 Removing the lower bearings

1. See section *9.3.10 Removing the rotor*.
2. Remove the screws (182b).
3. Lower the bearing bracket cover (60) so that it is lying against the stator.
4. Remove the lower bearing bracket (155) by using a puller.
5. Remove the circlip (188) and the locking ring (197).
6. Remove the ball bearing(s) (153) by using a bearing puller.
7. Remove the circlip (187) and the washer (187a).
8. Remove the bearing bracket cover (60).

9.3.12 Removing the stator

If the stator package is reused the support ring must be placed below the stator package to avoid break down.

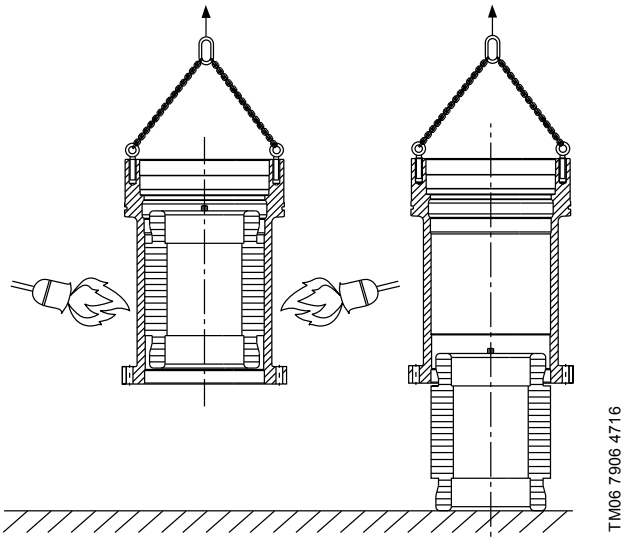


Fig. 18 Removing stator

1. Lift the stator slightly off the floor.
2. Heat the stator housing (55) at the same time with 2 or 3 gas burners beginning from the bottom edge. See fig. 18.

Make sure you use suitable protection equipment.

3. Carry out the heating as quickly as possible. The stator package (48) will drop to the floor when enough heat has been applied.

9.4 Dismantling - ST pump

9.4.1 Removing the outlet bowl

1. Secure the pump on vertical from the lifting bracket (190) position by means of hoist.
2. Remove screws (26) and seat ring (1).
3. Lift carefully the motor (301) together with the impeller (49) from the outlet bowl (50).

9.4.2 Removing the impeller

1. Place the motor assembly in horizontal position on a firm workbench or trestle with the impeller facing outward.
2. Support the impeller by means of lifting belt.
3. Loosen the impeller screw (67).
4. Loosen the impeller (49), use pinch bars if needed.
5. Remove the impeller screw (67) including the O-ring (67b) and the impeller cap (66) including the O-ring 862a).
6. Remove the impeller (49).
7. Remove key (9a).

9.4.3 Draining the oil

See section *9.3.2 Draining the oil*.

9.4.4 Removing the primary shaft seal

See section *9.3.3 Removing the primary shaft seal*.

9.4.5 Removing the cooling jacket

See section *9.3.4 Removing the cooling jacket*.

9.4.6 Removing the motor top cover

See section *9.3.5 Removing the motor top cover*.

9.4.7 Removing the shaft seal housing

See section *9.3.6 Removing the shaft seal housing*.

9.4.8 Removing the secondary shaft seal

See section *9.3.7 Removing the secondary shaft seal*.

9.4.9 Removing the upper bearing bracket

See section *9.3.8 Removing the upper bearing bracket*.

9.4.10 Removing the upper bearings

See section *9.3.9 Removing the upper bearing*.

9.4.11 Removing the rotor

See section *9.3.10 Removing the rotor*.

9.4.12 Removing the lower bearing

See section *9.3.11 Removing the lower bearings*.

9.4.13 Removing the stator

See section *9.3.12 Removing the stator*.

9.5 Assembling - S pump

The torques for the screws and the lubricants for the O-rings are specified in section *6. Torques and lubricants*.

9.5.1 Fitting the stator

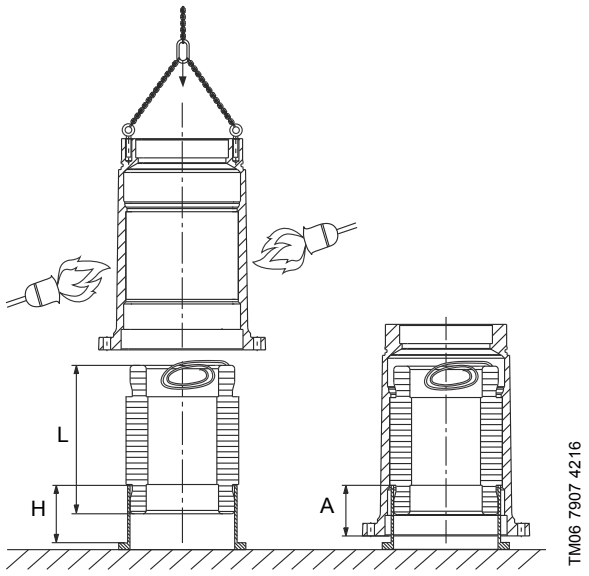


Fig. 19 Fitting the stator

Range	Lamination length L [mm]	Assembly ring height H [mm]	Stator wires	Assembly dimension A [mm]
66	210	min. 215	Up	210
	250	min. 175		170
	255	min. 170		165
	280	min. 145		140
70	400	min. 250		245
	450	min. 200		195
	260	min. 235		230
	300	min. 195		190
	340	min. 155		150

1. Place the stator package (48) in the assembly ring. Make sure that the stand is high enough (dimension H).
2. Heat the stator housing (55) to 200-250 °C with gas burners or in a oven.
3. Lift the heated stator housing (55) over the stator (48) and lower it carefully onto the stator (48). Make sure the position is correct.
4. Check the assembly dimension A.

9.5.2 Fitting the rotor

1. Fit and lubricate the O-rings (72 and 72a).
2. Fit the eye bolt in the shaft end and lift the rotor assembly into the stator housing (55) using a hoist.
   Make sure to position the rotor assembly in accordance with the marking made during dismantling so that the oil holes of the oil cover are positioned directly above the oil holes of the seal housing.
3. Carefully tap on the lower bearing bracket (155) into the stator housing (55).

9.5.3 Fitting the upper bearing

1. Place the shaft (172) in vertical position so that the shaft end is pointing downwards.
2. Heat up the ball bearing (154) to 110 °C and fit it on the shaft.
3. Let the assembly cool down.
4. Grease the ball bearing (154). Fill only 50 % of the free space of the bearing.

9.5.4 Fitting the upper bearing bracket

1. Pull the stator cables through from the cable holes.
2. Fit the upper bearing bracket (61) to the stator housing (55). If needed, tap gently.
3. Fit the pin (59b).
4. Connect according to the wiring diagram. See section *11.4 Electrical connections*.

9.5.5 Fitting the lower bearing

1. Place the shaft in vertical position with the shaft end pointing upwards.
2. Fill the bearing bracket cover (60) with grease and place the cover on the shaft so that it is lying against the rotor.
3. Place the washer (187a) and the circlip (187) on the shaft.
4. Heat up the ball bearing to 110 °C and fit it on the shaft.

Only press on the inner ring of the bearing.

5. Let the assembly cool down.
6. Grease the ball bearing (153). Fill only 50 % of the free space of the bearing.
7. Heat up the lower bearing bracket (155) to 110 °C and press it home.
8. Fit the bearing bracket cover (60) and screws (182b) to the lower bearing bracket cover (155).

9.5.6 Fitting the secondary shaft seal

1. Place the motor in horizontal position.
2. Make sure that the shaft is clean and smooth.
3. Fit the O-ring on the stationary part of the secondary shaft seal (105b).
4. Lubricate the O-ring and fit the stationary part on the secondary shaft seal (105b) on the shaft and press it home (*N*).
5. Check that the O-ring is fitted on the rotating part of the secondary shaft seal (105b).
6. Fit the rotating part of the secondary shaft seal (105b) on the shaft.
7. Fit the set-up clip between the seal parts and press the rotating part of the seal home (*N*).
8. Tighten the set screws in the secondary shaft seal (105b) to a torque of 6 Nm.
9. Remove the PUR-tool and the set-up clip from the secondary shaft seal (105b).

9.5.7 Fitting the shaft seal housing

1. Fit the O-rings (72 and 72a).
2. Fit the shaft seal housing (58) on the stator housing (55).
3. Fit the screws (184).
4. Fit the O-ring (107) on the seal housing cover (77). Lubricate the O-ring.
5. Fit the seal housing cover (77).

9.5.8 Fitting the primary shaft seal

1. Make sure that the shaft is clean and smooth.
2. Fit the O-ring on the stationary part of the primary shaft seal (105).
3. Lubricate the O-ring and fit the stationary part on the secondary shaft seal (105) on the shaft.
   Make sure that the gap in the stationary part meets the projection on the lower bearing bracket (155).
4. Press home the stationary part of the primary shaft seal (105) (*O*).
5. Check that the O-ring is fitted on the rotating part of the primary shaft seal (105).
6. Fit the rotating part of the primary shaft seal (105b) on the shaft.
7. Fit the set-up clip between the seal parts and press the rotating part of the seal home (*O*).
8. Tighten the set screws in the primary shaft seal (105) to a torque of 6 Nm.
9. Remove the PUR-tool and the set-up clip from the primary shaft seal (105b).
10. See section *10.1 Tightness test of shaft seal housing*.

Check the possible leak paths with leak detecting liquid.

The tightness of the complete motor must be verified through a submersion test.

9.5.9 Fitting the motor top cover

1. Fit the O-ring (157) on the motor top cover (164a).
2. Place the cover near the pump and connect the cables according to the wiring diagram. See section *11.4 Electrical connections*.
3. Fit the absorbing bag.

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

4. Fit the motor top cover (164a). Tap gently, if needed.
   Make sure the groove in the motor top cover comes on the pin (59b).
5. Fit the screws (178).

9.5.10 Fitting the cooling jacket

This section applies only to pumps with cooling jacket.

1. Fit the O-rings (37a and 157b).
2. Mount the cooling jacket (150c) on the stator housing (55) using a hoist. Tap gently, if needed.
3. Fit the screws (150a).

9.5.11 Fitting the lifting bracket

Make sure the orientation of the lifting bracket is correct. Wrong installation can cause pump tilt during lifting.

1. Fit the lifting bracket (190) so that the "nose" is pointing towards the pump outlet.
2. Fit the screws (190b).

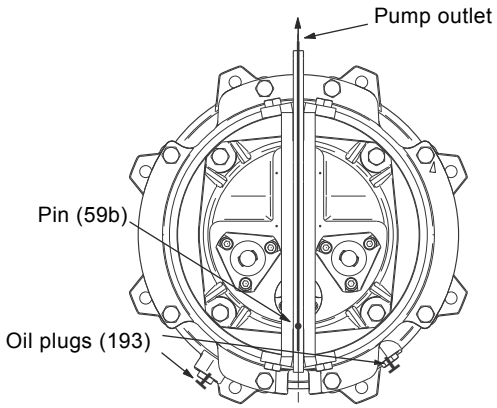


Fig. 20 Lifting bracket orientation, installation type S

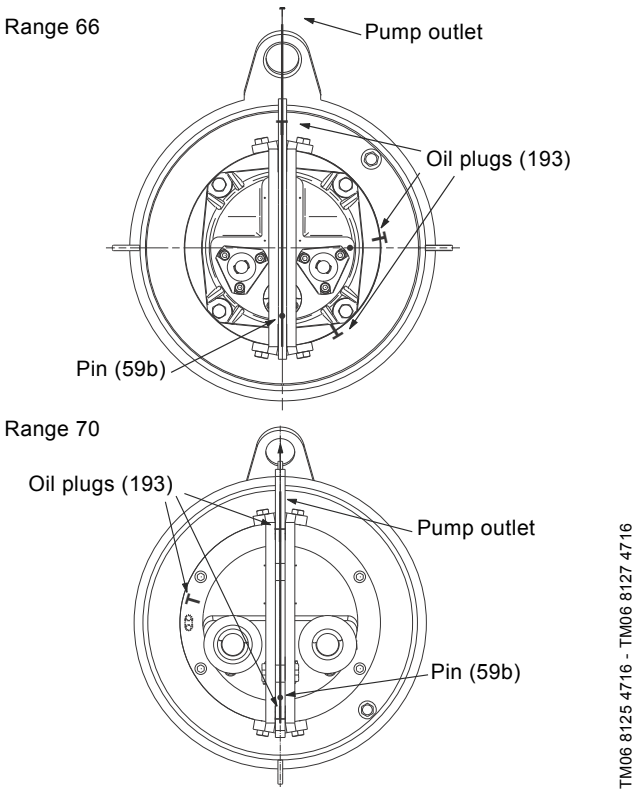


Fig. 21 Lifting bracket orientation, installation type C, D and H

9.5.12 Oil filling

1. See section *8.5 Oil check and oil change*.

9.5.13 Fitting the impeller and pump housing

1. Fit the key (9a). Tap lightly, if needed.
2. Lubricate the cone of the shaft slightly.
3. Fit the impeller (49).
4. Fit the screw (67), washer (66b) and impeller cap (66). Make sure the key (9a) is fitted in the groove in the cap (66).
5. Fit the screw (67) and tighten to correct torque.
6. Mount the motor on the pump housing (50).
7. Fit screws (26).
8. Check the impeller clearance. See section *8.6 Inspection and adjustment of impeller clearance*.

9.6 Assembling - ST pump

The torques for the screws and the lubricants for the O-rings are shown in section *6. Torques and lubricants*.

9.6.1 Fitting the stator

See section *9.5.1 Fitting the stator*.

9.6.2 Fitting the rotor

See section *9.5.2 Fitting the rotor*.

9.6.3 Fitting the upper bearing

See section *9.5.3 Fitting the upper bearing*.

9.6.4 Fitting the upper bearing bracket

See section *9.5.4 Fitting the upper bearing bracket*.

9.6.5 Fitting the lower bearing

See section *9.5.5 Fitting the lower bearing*.

9.6.6 Fitting the secondary shaft seal

See section *9.5.6 Fitting the secondary shaft seal*.

9.6.7 Fitting the shaft seal housing

See section *9.5.7 Fitting the shaft seal housing*.

9.6.8 Fitting the primary shaft seal

See section *9.5.8 Fitting the primary shaft seal*.

9.6.9 Fitting the motor top cover

See section *9.5.9 Fitting the motor top cover*.

9.6.10 Fitting the cooling jacket

See section *9.6.10 Fitting the cooling jacket*.

9.6.11 Fitting the impeller

1. Fit O-ring (37b).
2. Fit the intermediate ring (1) so that it is lying against the motor.
3. Fit O-ring (37).
4. Fit the impeller (49).
5. Fit key (9a)
6. Fit the screw (67) including the O-ring (67b) and cap (66) including the O-ring (62a).

9.6.12 Fitting the outlet bowl

1. Fit the motor assembly (301) including the impeller (49) in the outlet bowl (50).
2. Fit the screws (26).
3. Check the impeller clearance. See section *8.6 Inspection and adjustment of impeller clearance*.

10. Tightness test

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

The tightness test always has to be carried out if the motor has been opened, and before refilling of oil.

Use nitrogen gas to test the tightness. If moisture enters the stator chamber with compressed air, the moisture switch will trip.

Make sure that the pressure never exceeds 1 bar. This could displace the seal.

Do not immerse the free end of the cable.

10.1 Tightness test of shaft seal housing

Make sure that there is tight seal between the seal housing (58) and the stator housing (55). Make sure that no water gets into the stator housing via the hose.

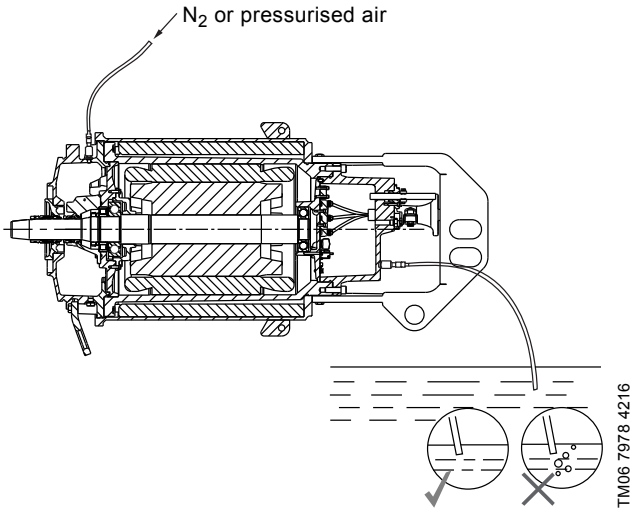


Fig. 22 Checking the shaft seal housing

1. Place the motor in horizontal position with a hoist.
2. Remove **one** oil plug (193) including the O-ring (194) from the shaft seal housing (58).

Step 3 applies **only** to Ex pumps.

3. Fit the gas hoses (N_2 or dry pressurised air) to the test plug and pressurize the seal housing to 0.8 bar.
4. Remove the locking screw (25a) from the motor top cover (164a).
5. Remove the screw (25) and O-ring (100) from the motor top cover (164a).
6. Fit the test plugs () instead of the oil plug (193) and the screw (25).
7. Submerge the hose end fitted to the motor top cover under water in a test basin.

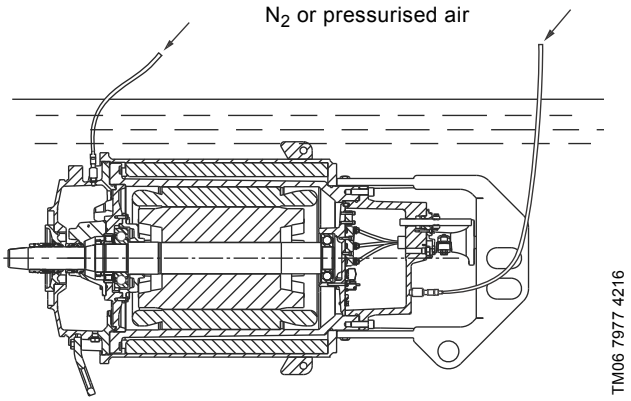
In order to detect possible leaks, let the hose end be submerged for 15 minutes.

8. If air emerges (water bubbles) from the end of the hose, the joint must be dismantled and the cause of the leak found and corrected.
9. Lift the hose end out of the test basin.
10. Disconnect the gas hoses and the test plugs.
11. Fit the oil plug (193) including the O-ring (194) on the shaft seal housing (58).

Step 12 applies **only** to Ex pumps.

12. Fit the screw (25) including the O-ring (100).
13. Fit the locking screw (25a).

10.2 Tightness test of stator housing (submerged)



1. Place the motor in horizontal position with a hoist.
2. Remove **one** oil plug (193) including the O-ring (194) from the shaft seal housing (58).

Step 3 applies **only** to Ex pumps.

3. Remove the locking screw (25a) from the motor top cover (164a).
4. Remove the screw (25) and O-ring (100) from the motor top cover (164a).
5. Fit the test plugs () instead of the oil plug (193) and the screw (25).
6. Fit the gas hoses (N_2 or dry pressurised air) to the test plug and pressurize the motor to 0.8 bar.
7. Submerge the motor under water in a test basin.

In order to detect possible leaks, let the hose end be submerged for 15 minutes.

8. If air emerges (water bubbles) from the joints, the joints must be dismantled and the cause of the leak must be found and corrected.
9. Lift the motor out of the test basin.
10. Disconnect the gas hoses and the test plugs.
11. Fit the oil plug (193) including the O-ring (194) on the shaft seal housing (58).

Step 12 applies **only** to Ex pumps.

12. Fit the screw (25) including the O-ring (100).
13. Fit the locking screw (25a).

11. Drawings

Please note that the position numbers in the drawings on pages 24 to 36 are listed in section *11.1.4 Position numbers and material specification*.

11.1 Sectional drawings

11.1.1 Range 66

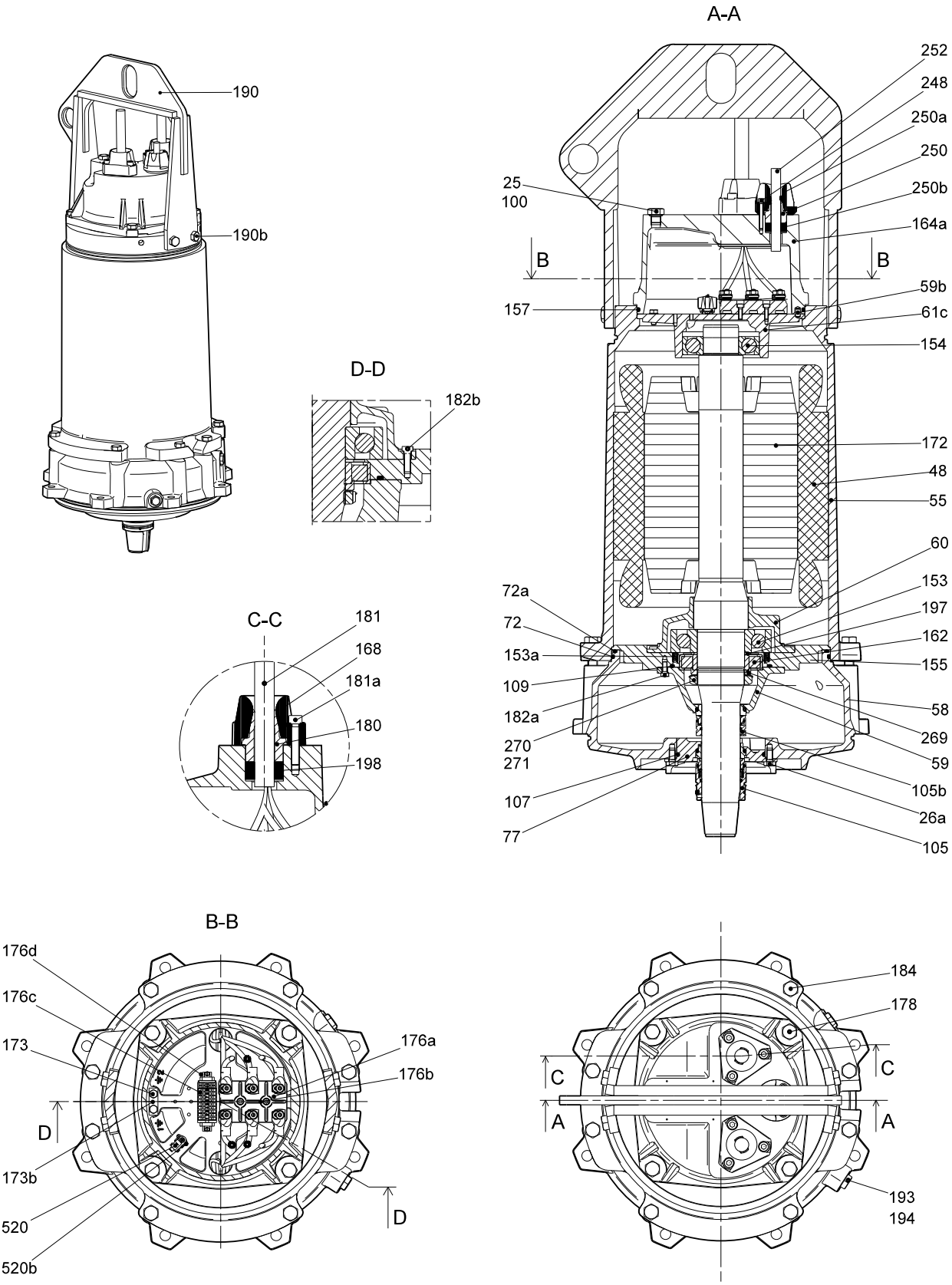


Fig. 23 Non-explosion-proof motor without cooling jacket

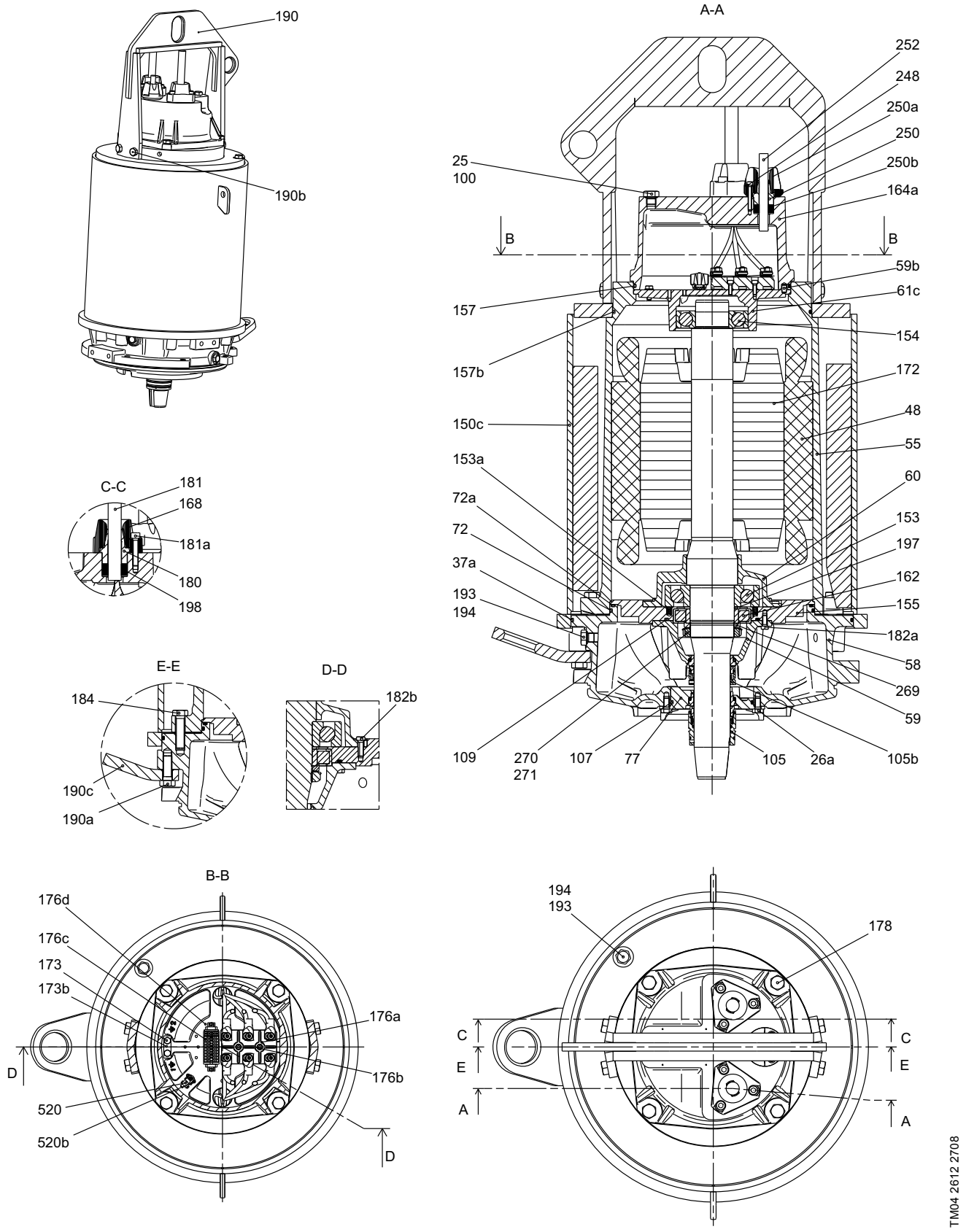


Fig. 24 Non-explosion-proof motor with cooling jacket

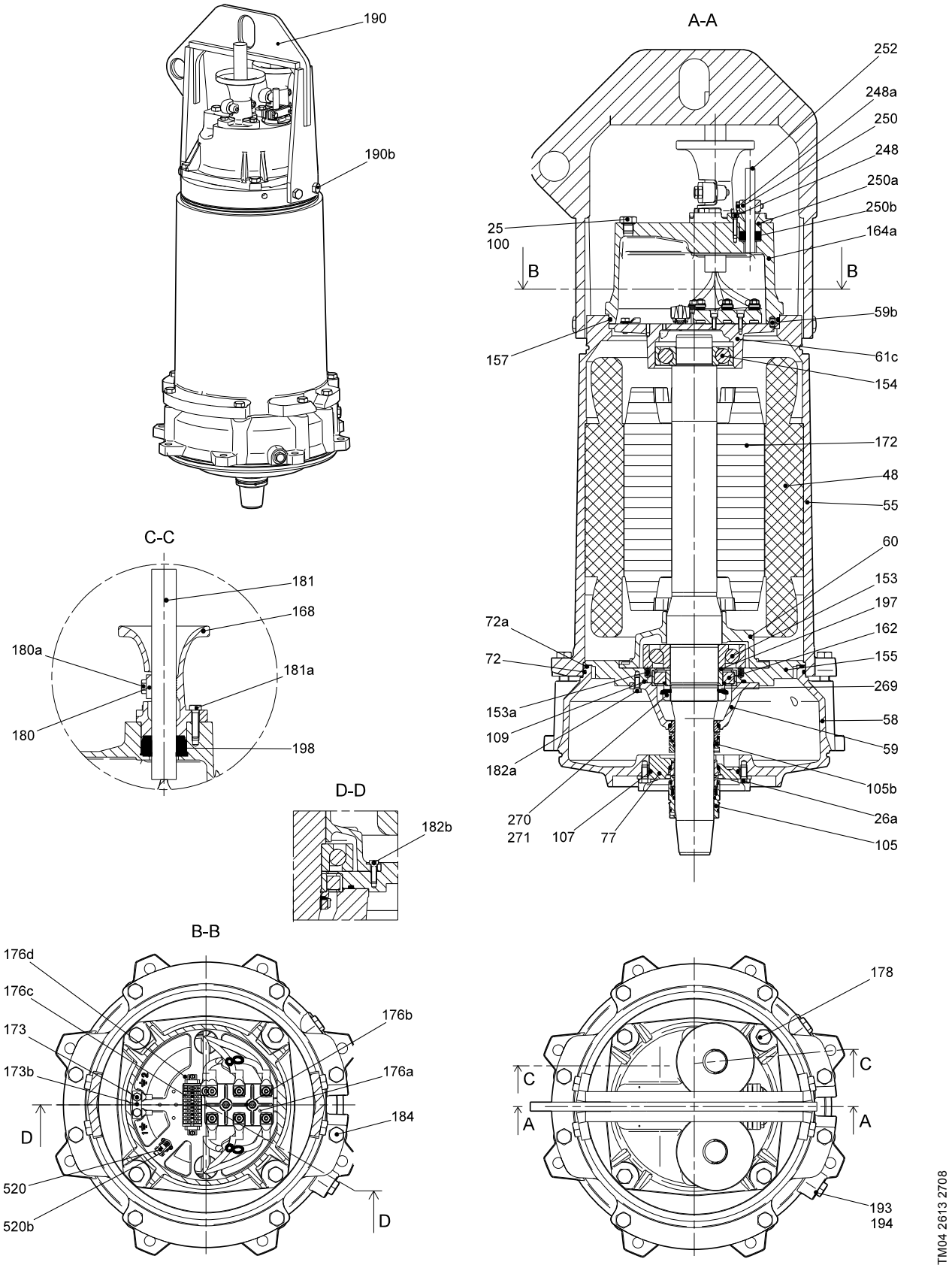


Fig. 25 Explosion-proof motor without cooling jacket

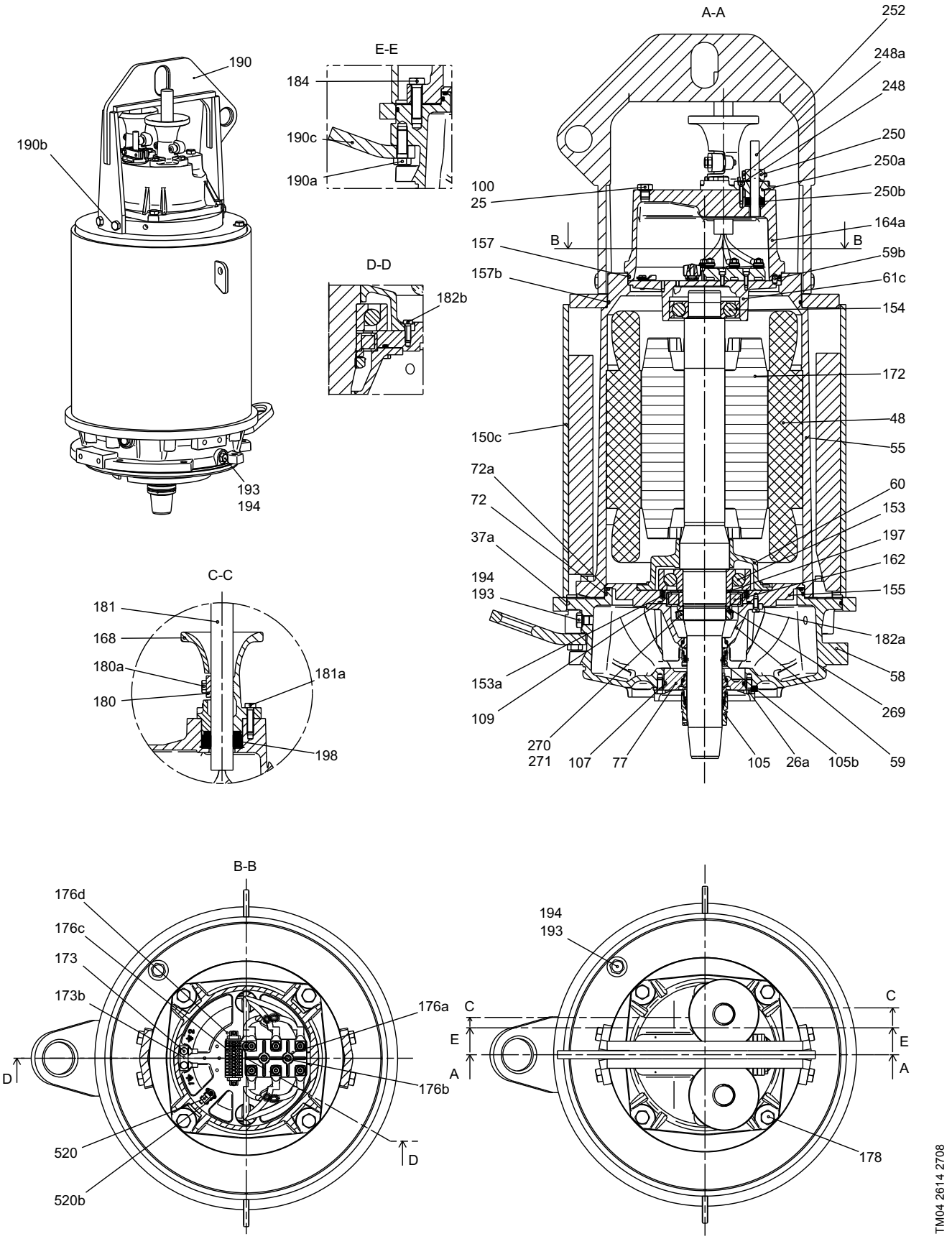


Fig. 26 Explosion-proof motor with cooling jacket

11.1.2 Range 70

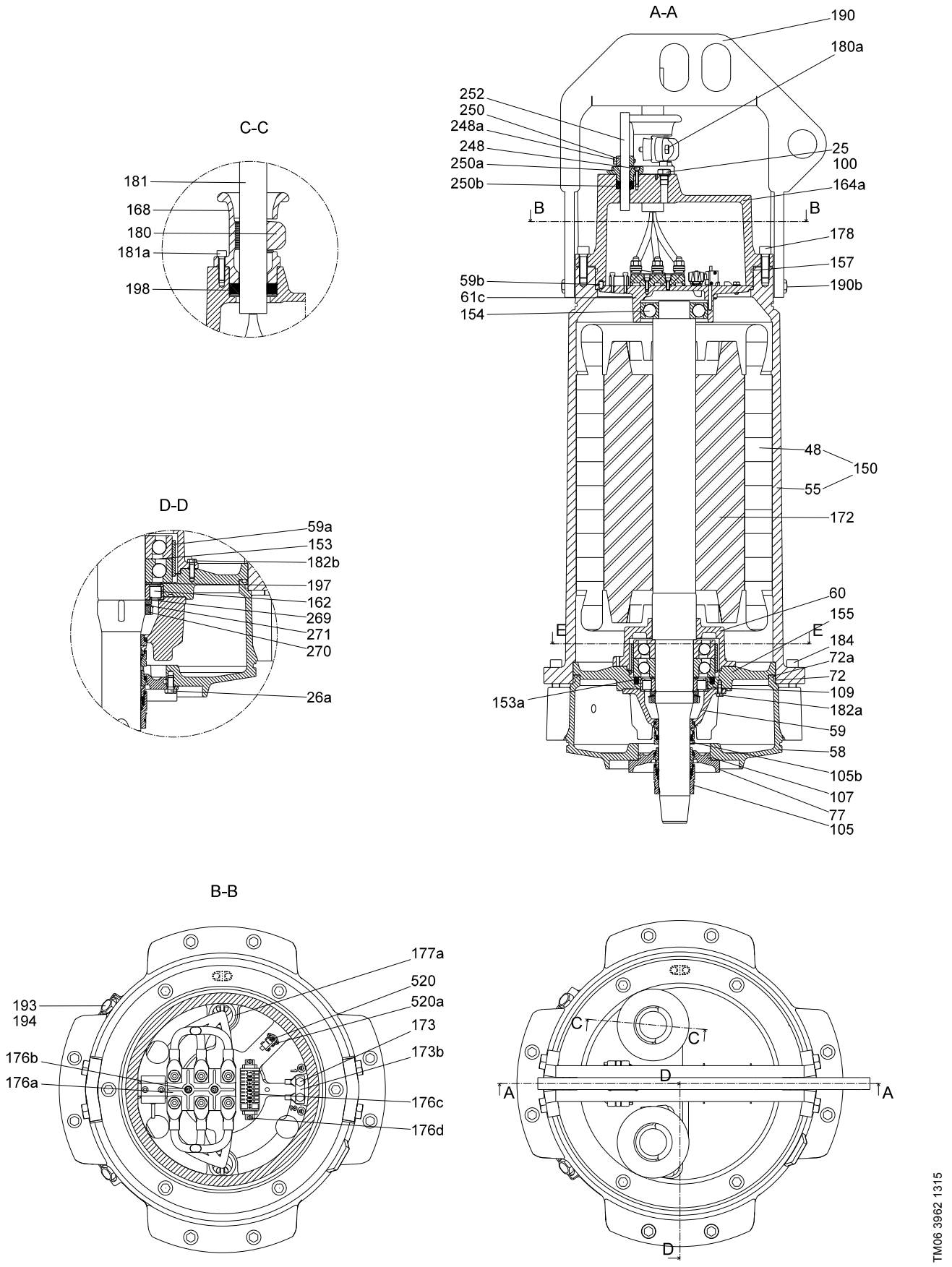


Fig. 27 Non-explosion-proof motor without cooling jacket

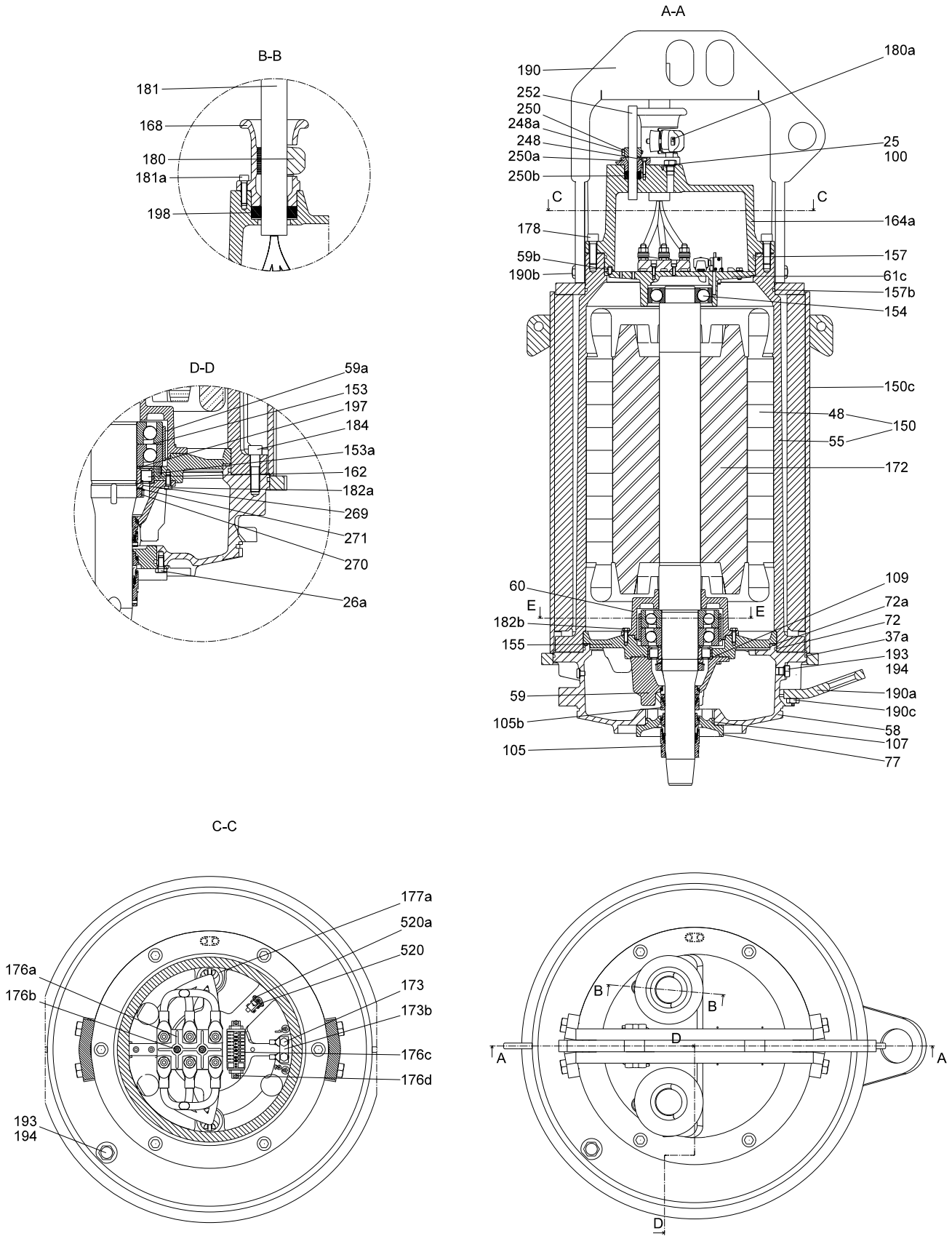


Fig. 28 Non-explosion-proof motor with cooling jacket

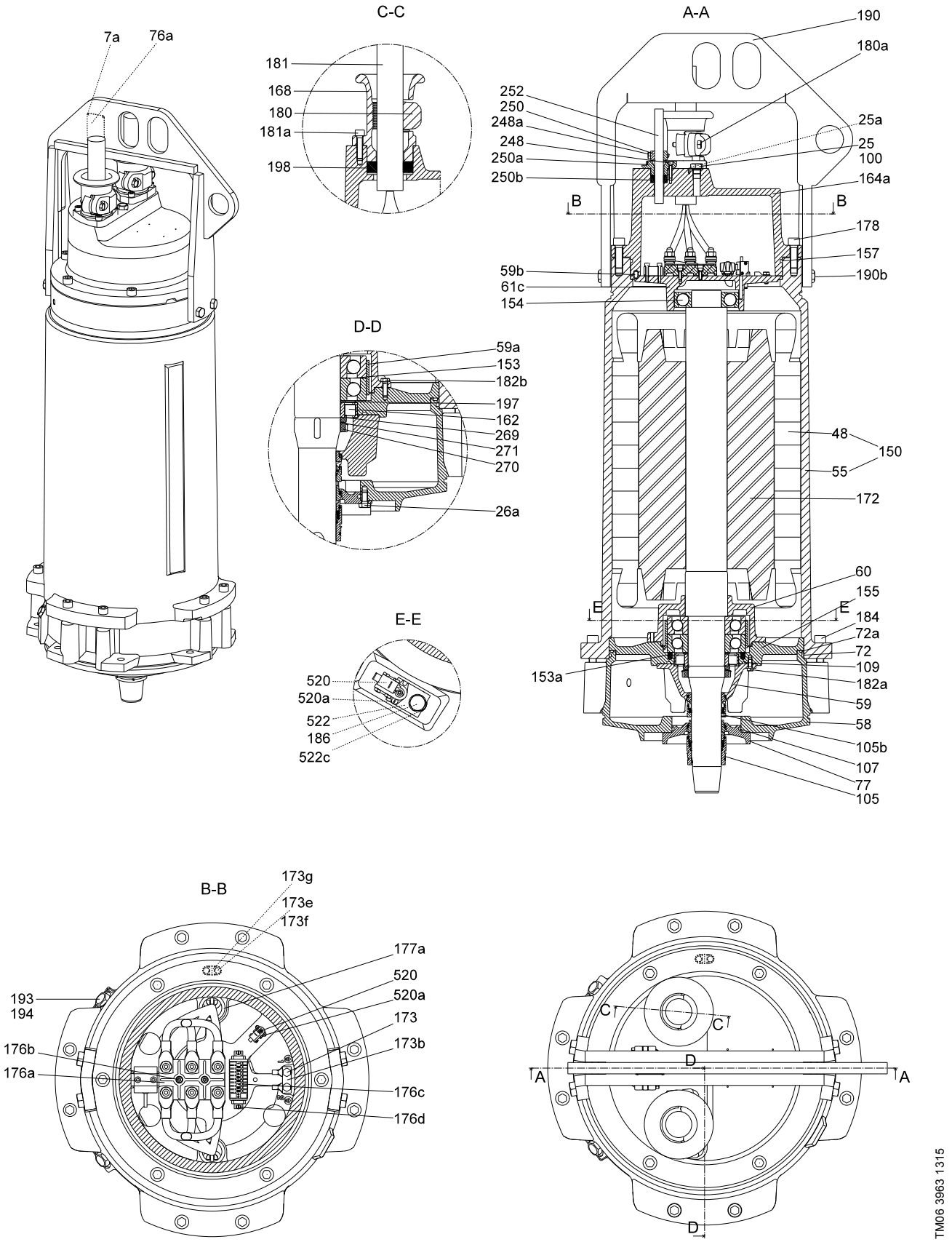


Fig. 29 Explosion-proof motor without cooling jacket

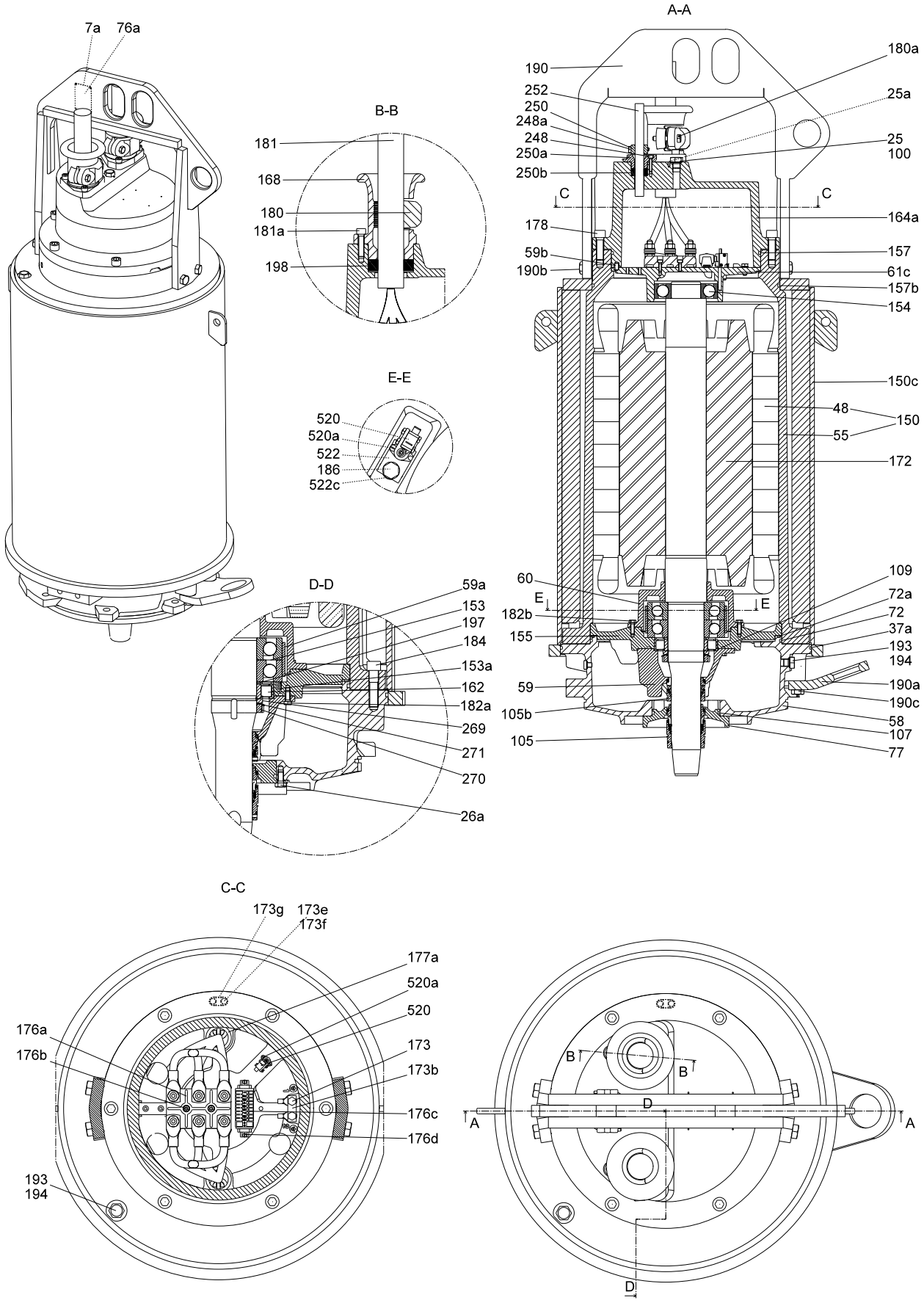


Fig. 30 Explosion-proof motor with cooling jacket

11.1.3 Sectional drawings - Pump

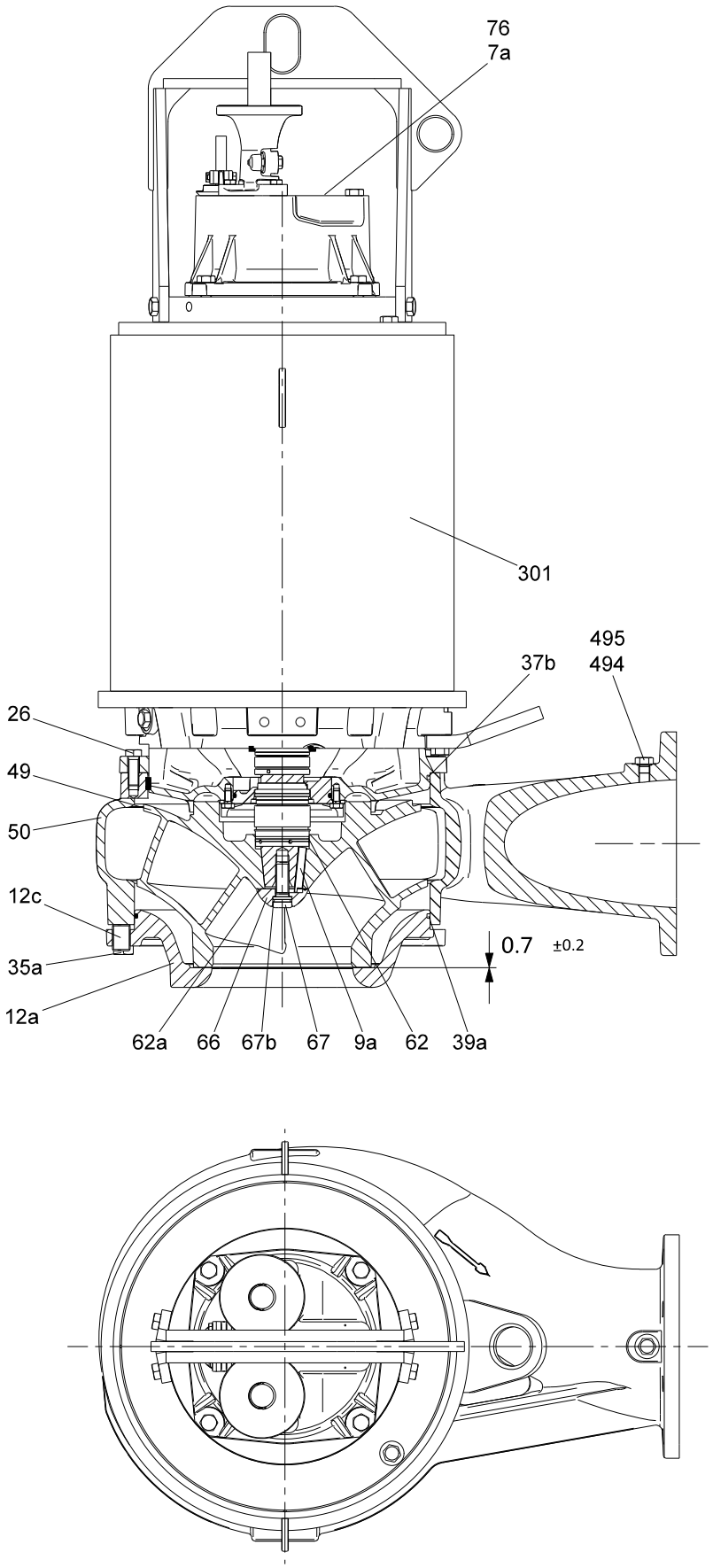


Fig. 31 Submerged installation pump with cooling jacket

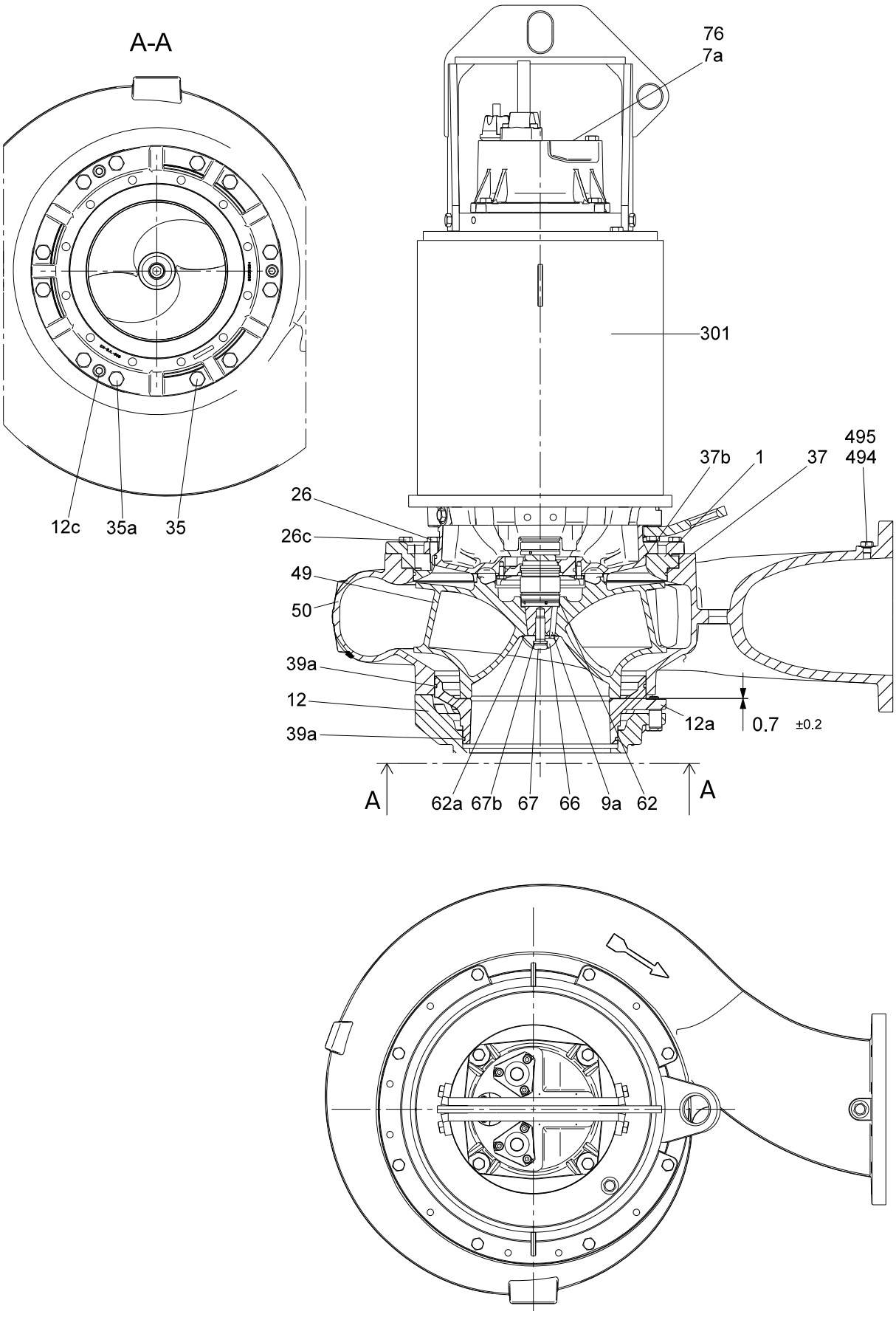


Fig. 32 Dry installation pump with cooling jacket

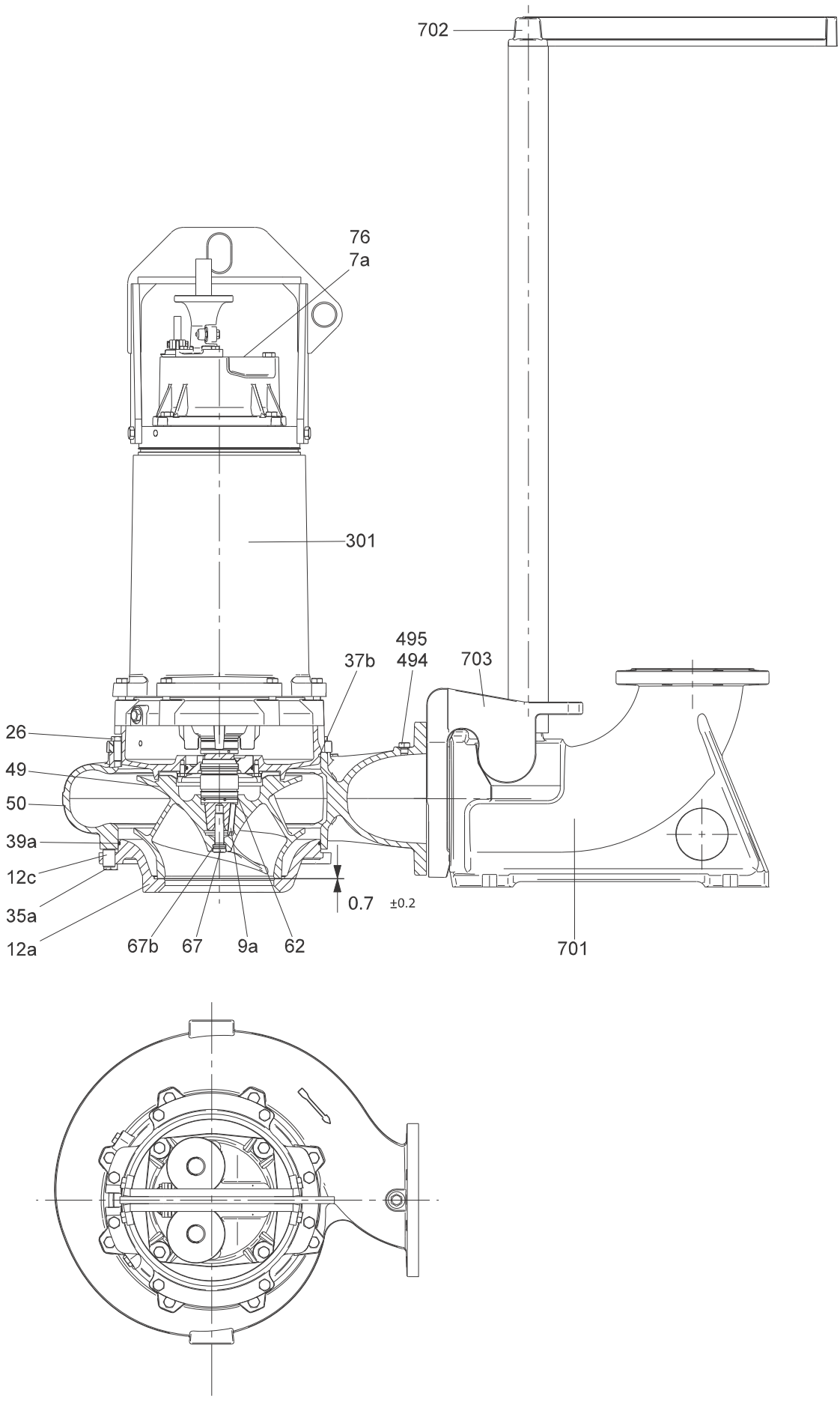


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Fig. 33 Installation type S pump on auto coupling

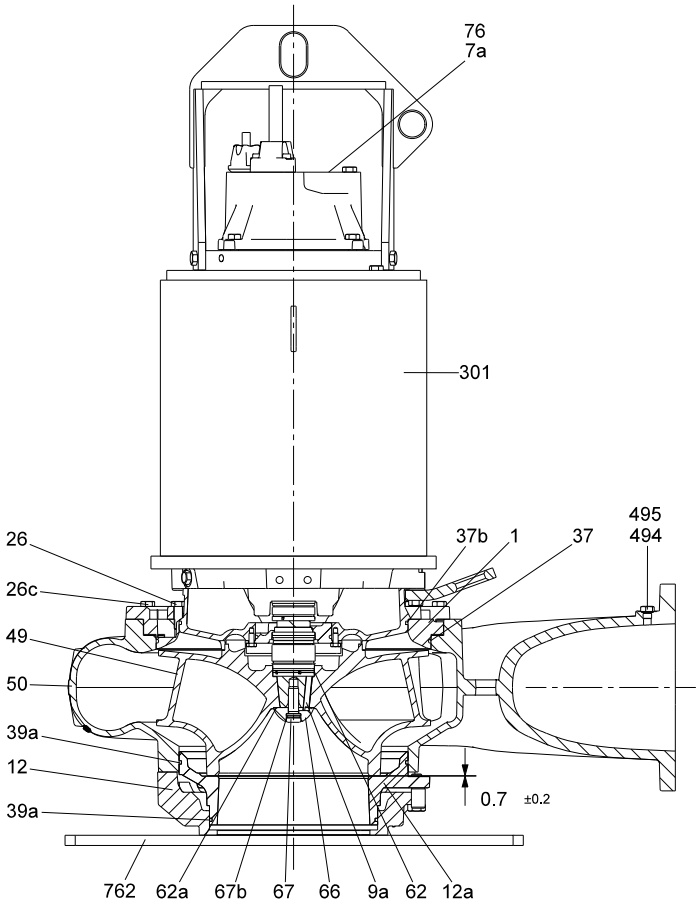

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Fig. 34 Installation type D pump (1)

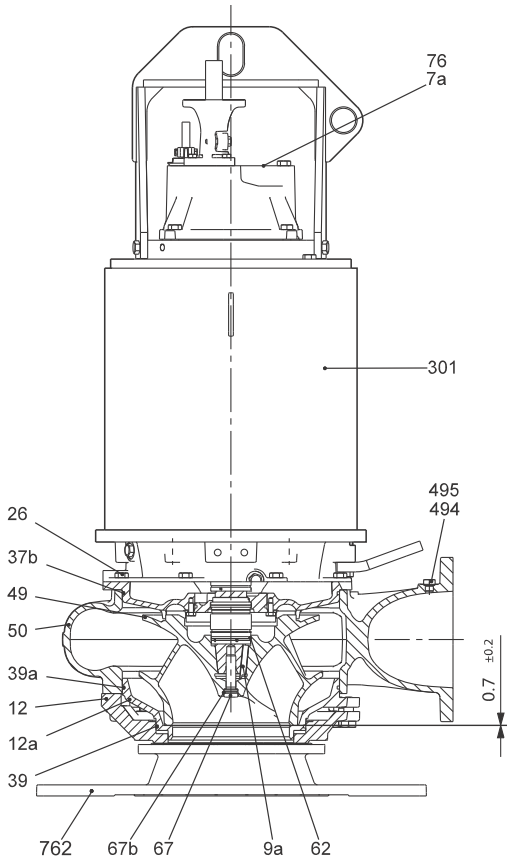

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Fig. 35 Installation type D pump (2)

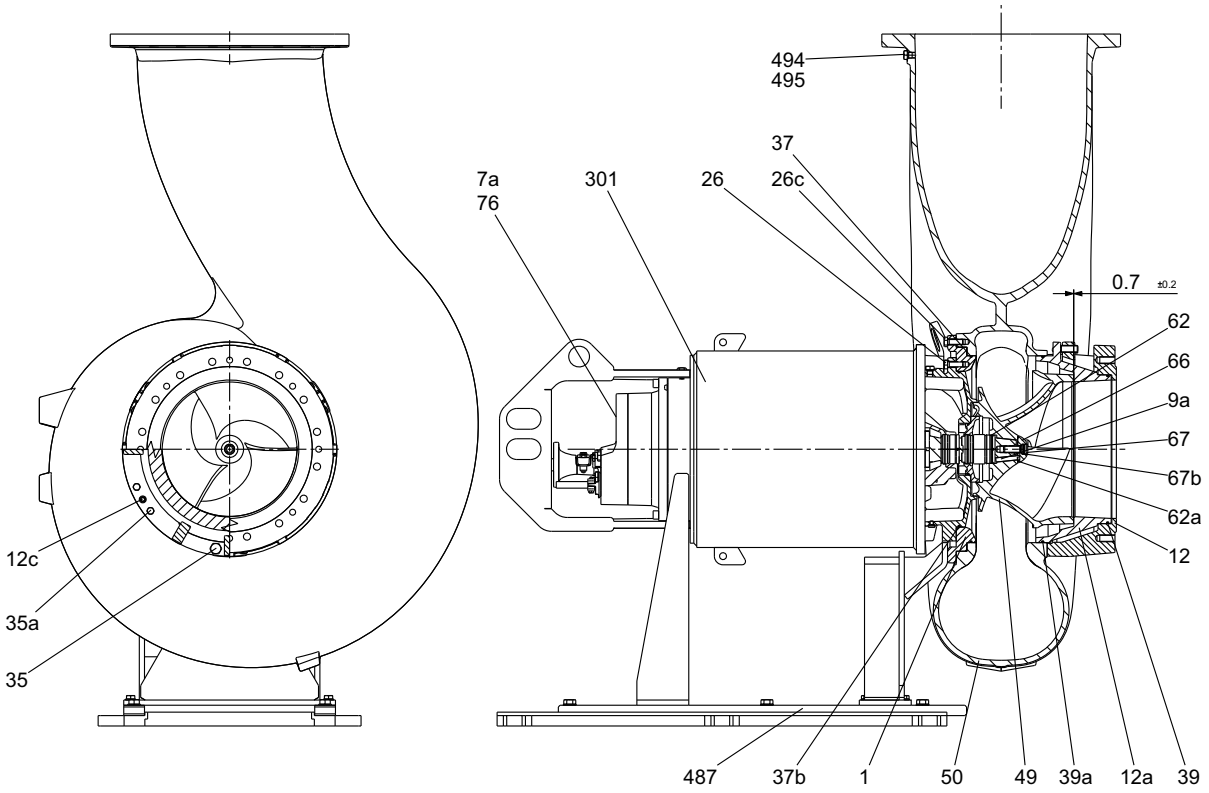

Fig. 36 Dry, horizontal installation type H (1)

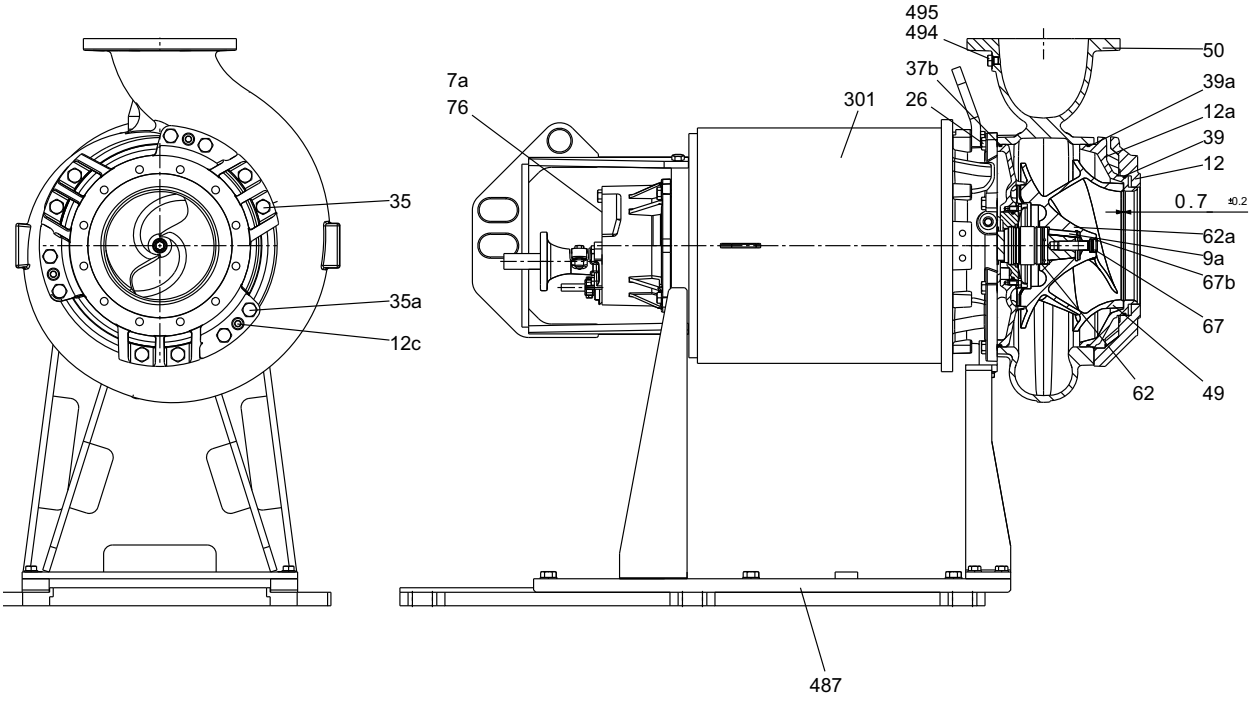

Fig. 37 Dry, horizontal, installation type H pump (2)

11.1.4 Position numbers and material specification

Motor

Pos.	Component	Material
7a	Rivet	Stainless steel (1.4436/316)
25	Pressure test plug	Stainless steel (1.4436/316)
25a	Screw	Stainless steel (1.4436/316)
26a	Screw	Stainless steel (1.4436/316)
37a	O-ring	NBR rubber
48	Stator	
55	Stator housing	Cast iron (EN-JL 1040/A48 30)
58	Seal housing	Cast iron
59	Bearing bracket cover	Cast iron
59a	Locking ring	Aluminium
59b	Pin	Steel
60	Bearing bracket cover	Cast iron
61c	Upper bearing bracket	Cast iron
72	O-ring	NBR rubber
72a	O-ring	NBR rubber
76a	Approval plate**	Stainless steel
77	Seal housing cover	Cast iron
100	O-ring	NBR rubber
105	Mechanical seal	SiC/SiC or SiC/carbon
105b	Mechanical seal	SiC/SiC or SiC/carbon
107	O-ring	NBR rubber
109	O-ring	Viton rubber
150	Stator housing comp.	
150c	Cooling jacket	Galvanized steel
153	Ball bearing	Stainless steel
153a	Spring	Steel
154	Ball bearing	Stainless steel
155**	Lower bearing bracket	Cast iron
157	O-ring	NBR rubber
157b	O-ring	NBR rubber
162	Roller bearing	Steel, brass or steel cage
164a	Motor top cover	Cast iron
168*	Cable entry	PA or cast iron
172	Shaft with rotor	Stainless steel (1.4462/329)
173	Screw	Stainless steel (1.4436/316)
173b	Earth terminal	
173e	Screw	Stainless steel (1.4436/316)
173f	Spring washer	Stainless steel (1.4436/316)
173g	Earth connector	
176a	Terminal block	
176b	Screw	Stainless steel (1.4436/316)
176c	Terminal block	
176d	Terminal block	
177a	Protection sleeve	Rubber or plastic
178	Screw	Stainless steel (1.4436/316)
180	Cable clamp	PA or cast iron
180a	Screw	Stainless steel (1.4436/316)
181	Cable	ATON
181a	Screw	Stainless steel (1.4436/316)
182a	Screw	Stainless steel (1.4436/316)
182b	Hexagon socket head cap screw	Stainless steel (1.4436/316)
184	Screw	Stainless steel (1.4436/316)
186	Screw	Stainless steel (1.4436/316)
190	Lifting bracket	Steel
190a	Screw	Stainless steel
190b	Screw	Stainless steel
190c	Lifting bracket	Galvanized steel
193	Plug	Stainless steel (1.4408/316)
194	O-ring	NBR rubber
197	Washer	Stainless steel (1.4436/316)
198	Rubber seal	
248	Screw	Stainless steel (1.4436/316)
248a	Screw	Stainless steel (1.4436/316)
250a	Cable entry	PA or cast iron
250b	Rubber seal	
250	Cable clamp	PA or cast iron
252	Cable	ATON
269	Angle ring	Steel
270	Lock nut	Steel
271	Lock washer	Steel
520*	Moisture switch	
520a	Screw	Stainless steel (1.4436/316)
522	Holder	
522c	Spring washer	

* Ex versions have cast iron cable entry and two moisture switches.

** Only in Ex versions.

Pump

Pos.	Component	Material
1	Intermediate ring	Cast iron
7a	Rivet	
9a	Key (for keyway)	Stainless steel (1.4436/316)
12	Flange	Cast iron
12a	Inlet cover	Cast iron
12c	Adjusting screw	Stainless steel (1.4436/316)
26	Screw	Stainless steel (1.4436/316)
26c	Screw	Stainless steel (1.4436/316)
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 EN-JL 1050
50*	Volute casing	Cast iron EN-JS 1050
62	O-ring	NBR rubber
62a	O-ring	NBR rubber
66	Cap	Cast iron or stainless steel
67	Impeller screw	Stainless steel (1.4436/316)
67b	O-ring	NBR rubber
76	Nameplate	
301	Motor housing	
487	Base stand, horizontal	Steel
487a	Base plate	
494	Plug	Stainless steel (1.4436/316)
495	O-ring	NBR rubber
762	Stand	

* Only in Ex versions.

Accessories

Pos.	Component	Material
701*	Auto-coupling base unit	Cast iron
702*	Guide rail bracket	Cast iron
703*	Guide claw	Cast iron
762	Base plate	Cast iron or steel

* Available in stainless steel (custom-built option).

11.2 ST pumps

For sectional drawings of motors see section *11.1.1 Range 66* and *11.1.2 Range 70*.

11.2.1 Sectional drawings - pump

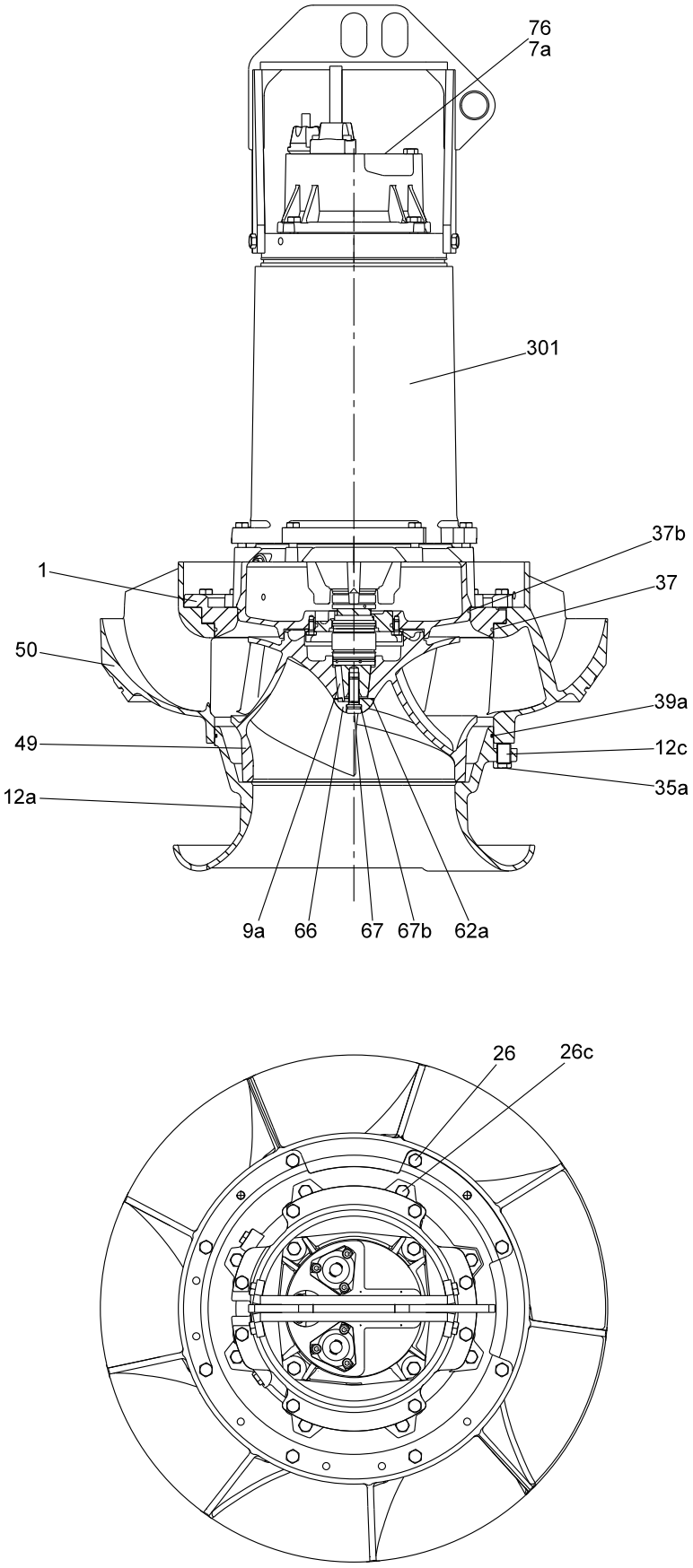

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Fig. 38 Installation type ST

11.2.2 Position number and material specification

Pump

Pos.	Component	Material
1	Intermediate ring	Cast iron
9a	Key	Stainless steel (1.4436/316)
12a	Inlet cover	Cast iron
12c	Adjusting screw	Stainless steel (1.4436/316)
26	Screw	Stainless steel (1.4436/316)
26c	Screw	Stainless steel
35a	Screw	Stainless steel
37	O-ring	NBR rubber
37b	O-ring	NBR rubber
39a	O-ring	NBR rubber
49	Impeller	Cast iron EN-JL 1050
50	Outlet bowl	Cast iron EN-GJL-250
62a	O-ring	NBR rubber
66	Cap	Cast iron or stainless steel
66b	Washer	Stainless steel (1.4404/316L)
67	Impeller screw	Stainless steel (1.4436/316)
67b	O.ring	NBR rubber

11.3 Sensor positions

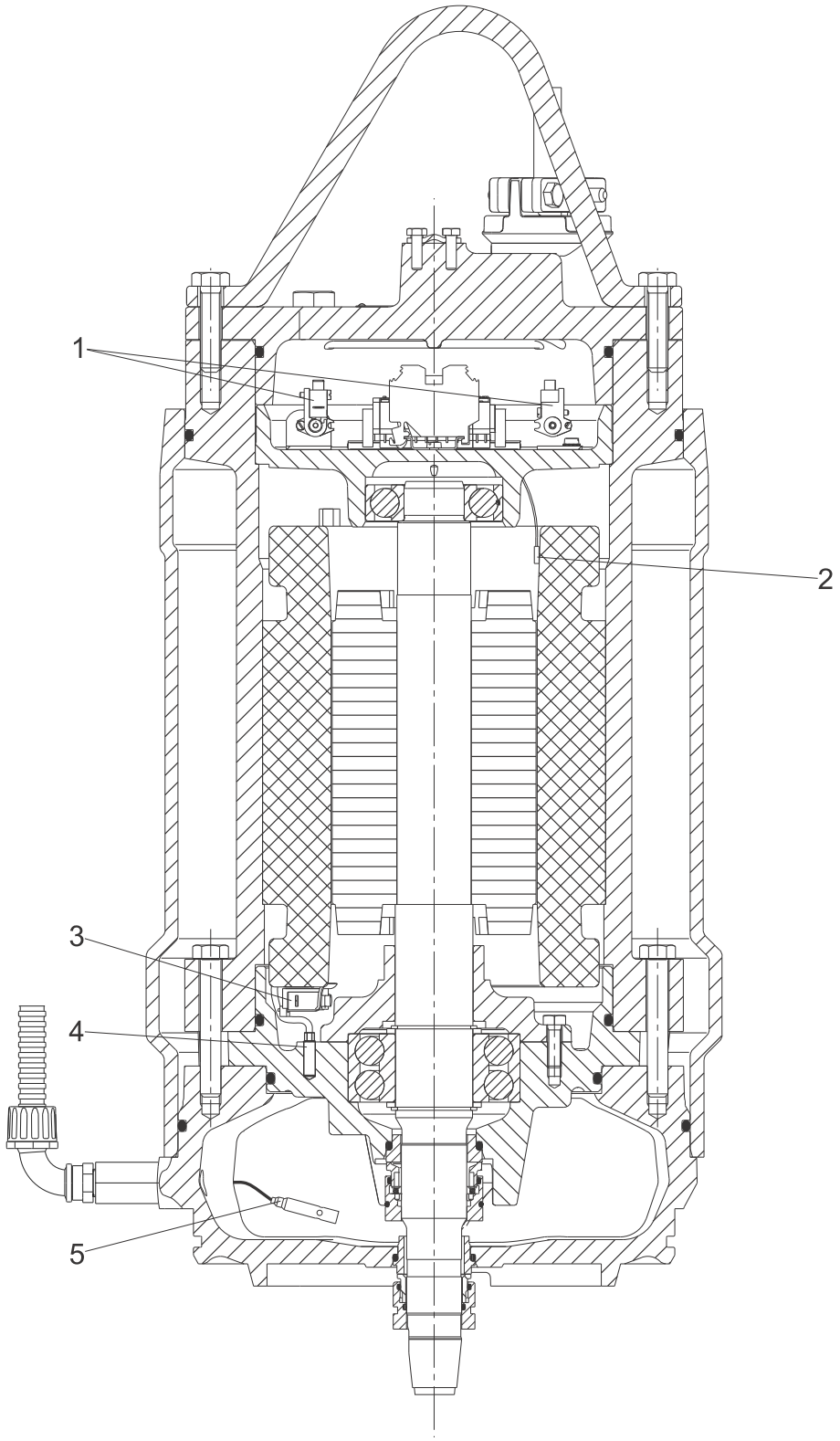

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Fig. 39 Sensor positions

Legend to figure 39:

Pos.	Description
1	Moisture switch (Ex pumps two sensors)
2	Pt100 on stator windings (optional)
3	Moisture switch
4	Pt100 on lower bearing bracket (optional)
5	External WIO (optional)

11.4 Electrical connections

11.4.1 Cable and winding resistances

50 Hz

Range	Pump code	Voltage	Pump variant					
			Standard		Ex		GPA (Australia)	
			Cable [mΩ/m]	Winding [Ω]	Cable [mΩ/m]	Winding [Ω]	Cable [mΩ/m]	Winding [Ω]
66	S1.100.200.550/650.	400/690 V	0.780	0.075	0.780	0.064	N/A	N/A
	S2.110.250.500...		1.210	0.213	0.780	0.119		
	S2.110.250.650.		0.780	0.075	0.780	0.064		
	S2.140.300.350...		1.910	0.300	N/A	N/A		
	S3.110.500.220...		1.910	0.392				
	S3.110.500.350...		1.910	0.270				
	S3.110.500.500...		1.210	0.213	0.780	0.119		
	S3.120.300.500...		1.210	0.213	0.780	0.119		
	S3.120.600.350...		1.910	0.270	N/A	N/A		
	S3.120.600.500...		1.210	0.213	0.780	0.119		
	ST3.110.1000.xxx...		Contact Grundfos		N/A	N/A		
	ST3.120.1000.xxx...							
	S1.100.200.550/650...	415 V	0.780	0.079	0.780	0.064	1.170	0.079
	S2.110.250.500...		1.210	0.228	0.780	0.136	1.820	0.228
	S2.110.250.650...		0.780	0.079	0.780	0.064	1.170	0.079
	S2.140.300.350...		1.910	0.336	N/A	N/A	2.870	0.336
	S3.110.500.220...		1.910				2.870	
	S3.110.500.350...		1.910				2.870	
	S3.110.500.500...		1.210	0.228	0.780	0.136	1.820	0.228
	S3.120.300.500...		1.210	0.228	0.780	0.136	1.820	0.228
	S3.120.600.350...		1.910		N/A	N/A	2.870	
	S3.120.600.500...		1.210	0.228	0.780	0.136	1.820	0.228
	ST3.110.1000.xxx...		Contact Grundfos		N/A	N/A	N/A	N/A
	ST3.120.1000.xxx...							

Range	Pump code	Voltage	Pump variant					
			Standard		Ex		GPA (Australia)	
			Cable [mΩ/m]	Winding [Ω]	Cable [mΩ/m]	Winding [Ω]	Cable [mΩ/m]	Winding [Ω]
70	S1.100.200.850...	400/690 V	0.780	0.064	0.780	0.064	N/A	N/A
	S2.90.200.1150...		0.390	0.044	0.390	0.044		
	S2.90.200.1600...		0.270	0.030	0.270	0.030		
	S2.100.200.1150...		0.390	0.044	0.390	0.044		
	S2.100.200.1600...		0.270	0.030	0.270	0.030		
	S2.110.200.850...		0.780	0.064	0.780	0.064		
	S2.110.200.1150...		0.390	0.044	0.390	0.044		
	S2.110.200.1600...		0.270	0.030	0.270	0.030		
	S2.120.250.650...		0.780	0.119	0.780	0.119		
	S2.120.250.800/1000...		0.550	0.061	0.550	0.061		
	S2.120.250.1300...		0.270	0.037	0.270	0.037		
	S2.120.250.1600...		0.027	0.030	0.027	0.030		
	S3.110.500.650...		0.780	0.119	0.780	0.119		
	S3.110.500.800...		0.550	0.061	0.550	0.061		
	S3.110.500.1000...		0.550	0.061	0.550	0.061		
	S3.110.500.1600...		0.270	0.037	0.270	0.037		
	S3.120.300.650...		0.780	0.119	0.780	0.119		
	S3.120.300.800...		0.550	0.061	0.550	0.061		
	S3.120.300.1000...		0.550	0.061	0.550	0.061		
	S3.120.300.1600...		0.270	0.037	0.270	0.037		
	S3.120.600.650...		0.780	0.119	0.780	0.119		
	S3.120.600.1000...		0.550	0.061	0.550	0.061		
	S3.120.600.1600...		0.270	0.037	0.270	0.037		
	S2.90.200.1150...	415 V	0.390	0.050	0.390	0.050	0.590	0.050
	S2.90.200.1600...		0.270	0.035	0.270	0.035	0.410	0.035
	S1.100.200.850...		0.780	0.070	0.780	0.070	1.170	0.070
	S2.100.200.1150...		0.390	0.050	0.390	0.050	0.590	0.050
	S2.100.200.1600...		0.270	0.035	0.270	0.035	0.410	0.035
	S2.110.200.850...		0.780	0.070	0.780	0.070	1.170	0.070
	S2.110.200.1150...		0.390	0.050	0.390	0.050	0.590	0.050
	S2.110.200.1600...		0.270	0.035	0.270	0.035	0.410	0.035
	S2.120.250.650...		0.780	0.136	0.780	0.136	1.170	0.136
	S2.120.250.800/1000...		0.550	0.070	0.550	0.070	0.830	0.070
	S2.120.250.1300...		0.270	0.041	0.270	0.041	0.410	0.041
	S2.120.250.1600...		0.270	0.035	0.270	0.035	0.410	0.035
	S3.110.500.650...		0.780	0.136	0.780	0.136	1.170	0.136
	S3.110.500.800...		0.550	0.070	0.550	0.070	0.830	0.070
	S3.110.500.1000...		0.550	0.070	0.550	0.070	0.830	0.070
	S3.110.500.1300...		0.270	0.041	0.270	0.041	0.410	0.041
	S3.120.300.650...		0.780	0.136	0.780	0.136	1.170	0.136
	S3.120.300.800...		0.550	0.070	0.550	0.070	0.830	0.070
	S3.120.300.1000...		0.550	0.070	0.550	0.070	0.830	0.070
	S3.120.300.1300...		0.270	0.041	0.270	0.041	0.410	0.041
	S3.120.600.650...		0.780	0.136	0.78	0.136	1.170	0.136
	S3.120.600.1000...		0.550	0.070	0.550	0.070	0.830	0.070
	S3.120.600.1600...		0.270	0.041	0.270	0.041	0.410	0.041

60 Hz

Range	Pump code	Voltage	Pump variant			
			Standard		Ex	
			Cable [mΩ/m]	Winding [Ω]	Cable [mΩ/m]	Winding [Ω]
66	S1.100.200.730...	380/660 V	0.780	0.054	0.550	0.042
	S2.100.200.730...		0.780	0.054	0.550	0.042
	S2.120.250.570...		1.210	0.132	0.780	0.085
	S2.145.300.320/410...		1.210	0.204	N/A	N/A
	S2.145.300.570...		1.210	0.132	0.780	0.085
	S3.115.500.570...		1.210	0.132	0.780	0.085
	S1.100.200.730...	460 V	0.780	0.075	0.780	0.064
	S2.100.200.730...		0.780	0.075	0.780	0.064
	S2.120.250.570..		1.210	0.213	0.780	0.119
	S2.145.300.320/410...		1.910	0.300	N/A	N/A
	S2.145.300.570...		1.210	0.213	0.780	0.119
	S3.115.500.570...		1.210	0.213	0.780	0.119
70	S2.90.200.1000...	380/660 V	0.550	0.042	0.550	0.042
	S2.90.200.1200...		0.270	0.035	0.270	0.035
	S2.100.200.1000...		0.550	0.042	0.550	0.042
	S2.100.200.1200...		0.270	0.035	0.270	0.035
	S2.122.250.800...		0.780	0.085	0.780	0.085
	S2.122.250.1100...		0.390	0.044	0.390	0.044
	S2.122.250.1400...		0.270	0.037	0.270	0.037
	S2.145.300.1100...		0.390	0.044	0.390	0.044
	S3.115.500.800...		0.780	0.085	0.780	0.085
	S3.115.500.1400...		0.270	0.037	0.270	0.037
	S3.120.300.800...		0.780	0.085	0.780	0.085
	S3.120.300.1400...		0.270	0.037	0.270	0.037
	S2.90.200.1000...	460 V	0.780	0.064	0.780	0.064
	S2.90.200.1200...		0.390	0.044	0.390	0.044
	S2.100.200.1000...		0.780	0.064	0.780	0.064
	S2.100.200.1200...		0.390	0.044	0.390	0.044
	S2.122.250.800...		0.780	0.119	0.780	0.119
	S2.122.250.1100...		0.550	0.061	0.550	0.061
	S2.122.250.1400...		0.270	0.037	0.270	0.037
	S2.145.300.1100...		0.550	0.061	0.550	0.061
	S3.115.500.800...		0.780	0.119	0.780	0.119
	S3.115.500.1400...		0.270	0.037	0.270	0.037
	S3.120.300.800...		0.780	0.119	0.780	0.119
	S3.120.300.1400...		0.270	0.037	0.270	0.037

11.4.2 Cable ends

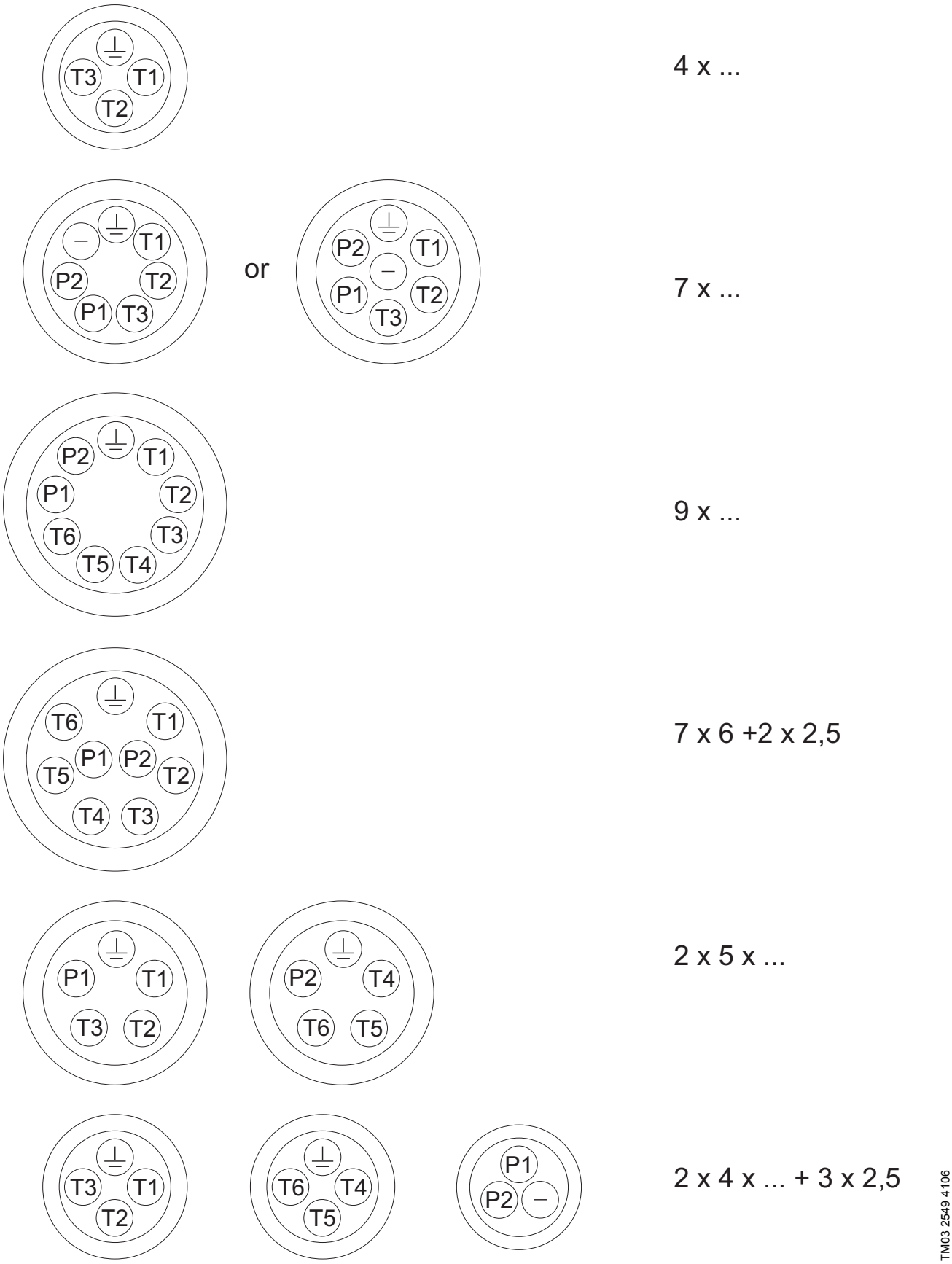


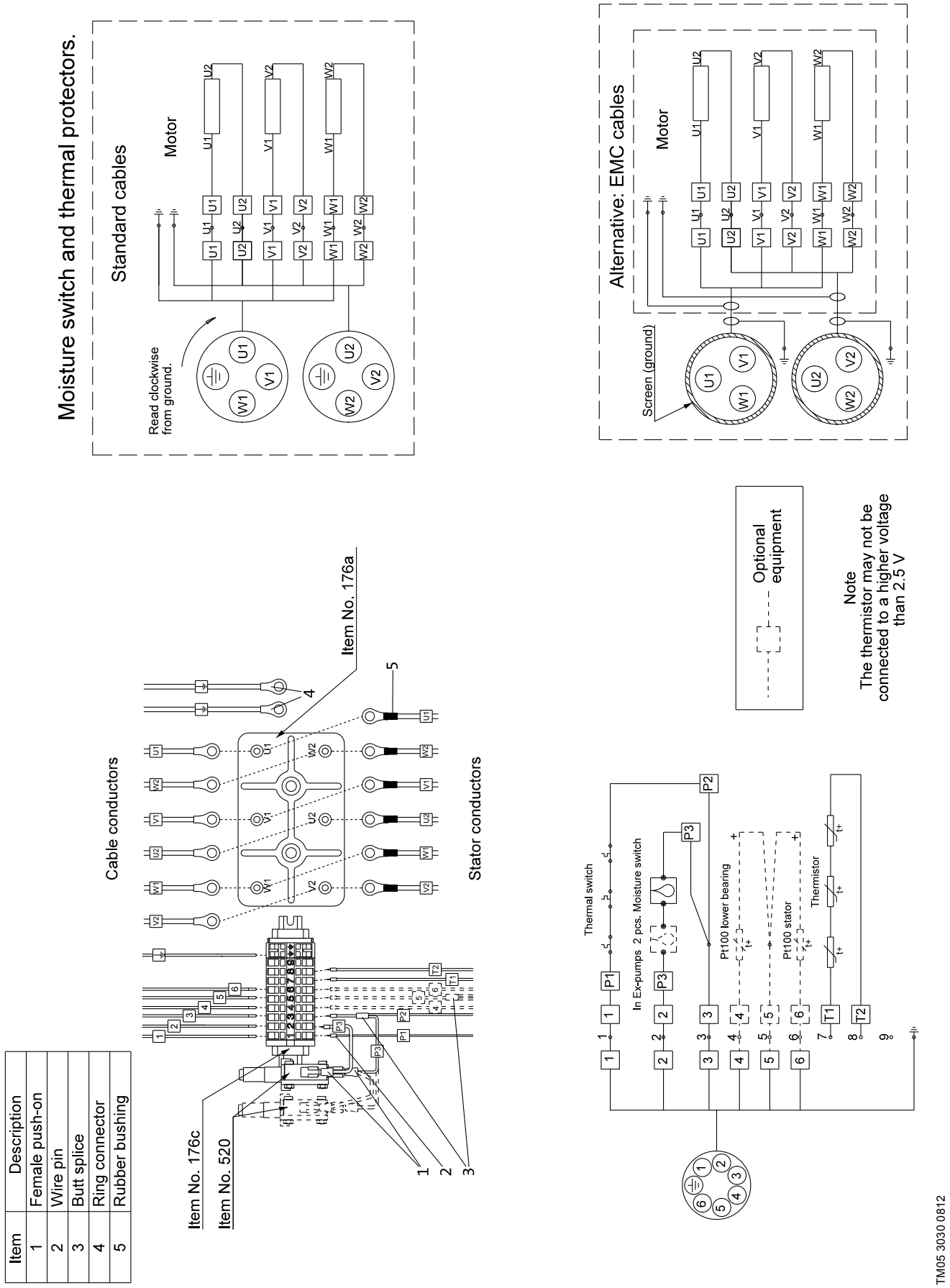
Fig. 40 Cable ends seen from free end

⏚ Wire always yellow-green.

⊖ Wire not in use.

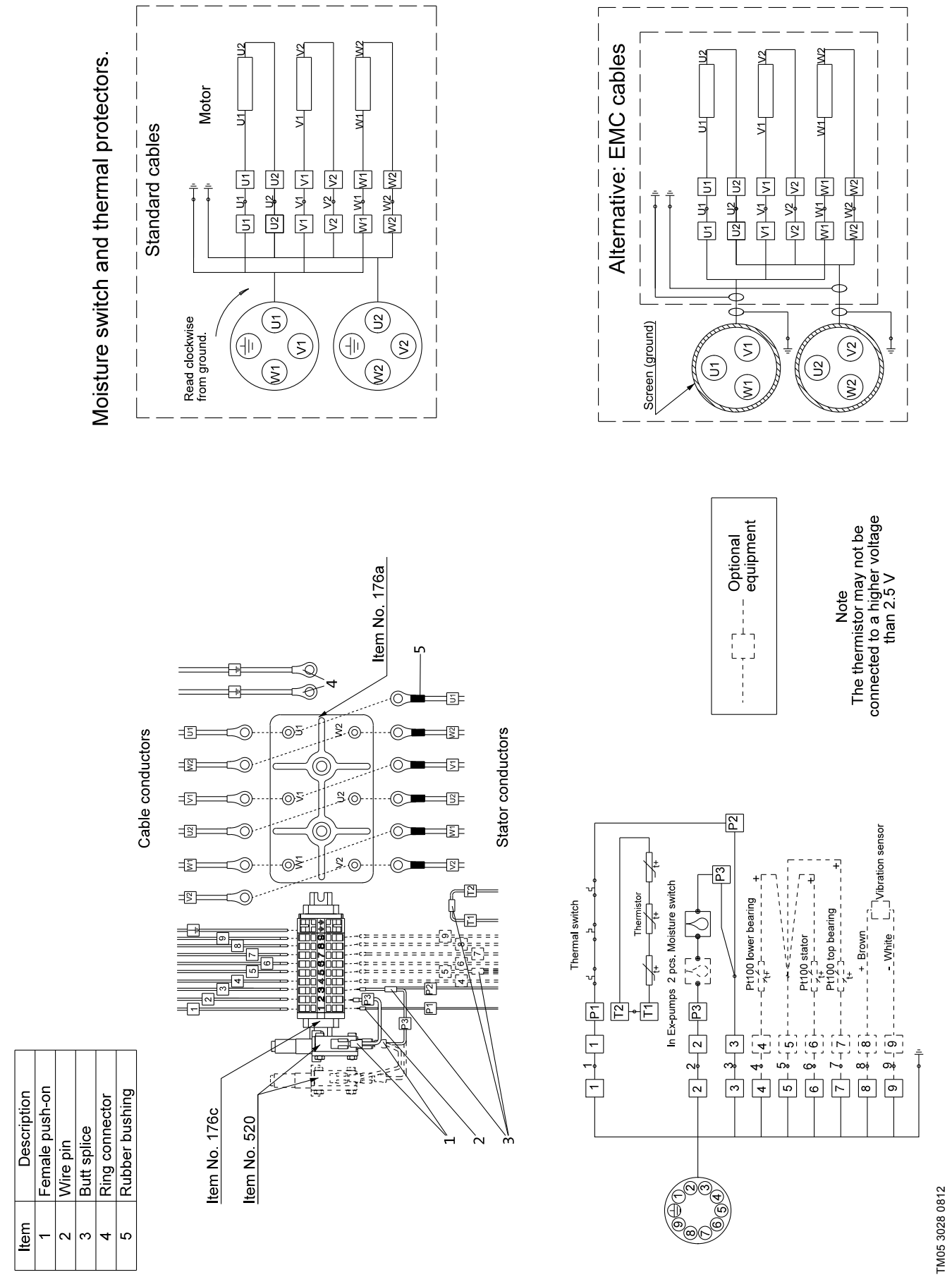
11.4.3 Wiring diagrams

Y/D connection - 7 wire



Item	Description
1	Female push-on
2	Wire pin
3	Butt splice
4	Ring connector
5	Rubber bushing

Fig. 41 Diagram Y/D connection, 7 wire



Item	Description
1	Female push-on
2	Wire pin
3	Butt splice
4	Ring connector
5	Rubber bushing

Fig. 42 Diagram for Y/D connection, 10 wire

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