

Service instructions



SE1.50 ≥ 2.2 kW,

SE1.80, SE1.100

SEV.65 ≥ 2.2 kW,

SEV.80, SEV.100

50 Hz

3~

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1. Servicing Grundfos pumps with explosion-proof motors

The explosion protection classification of the pump is:

Europe:

CE 0344 II 2 GD, EEx dc IIB T4, IP68 T 135 °C

CE 0344 II 2 GD, EEx dc IIB T3, IP68 T 200 °C (pumps with variable frequency converter).

Australia:

Ex nA II T3 according to IEC 79-15: 1987 (corresponding to AS 2380.9).

Intervention in the flameproof enclosure of the pump is not allowed.

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
- seal ring and wear ring
- 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.



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Product Engineering Manager



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2. Nameplate

The nameplate is fitted on the top cover of the pump. The additional nameplate supplied with the pump can be fitted at the installation site for easier access to the nominal data of the pump.

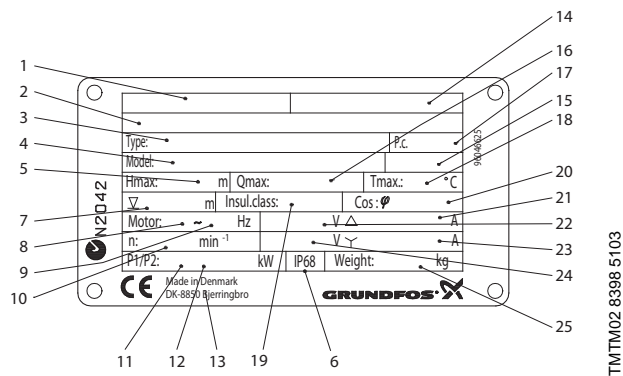




Fig. 1 Nameplate


Pos.	Description
1	Notified body and explosion protection mark 
2	Explosion protection mark, X, for special requirements applicable to explosion-proof equipment according to IEC 60079-15
3	Type designation
4	Product number, serial number
5	Maximum head [m]
6	Enclosure class
7	Maximum installation depth
8	Number of phases
9	Frequency [Hz]
10	Speed [min^{-1}]
11	Motor input power P1 [kW]
12	Motor output power P2 [kW]
13	Frame size
14	Explosion protection designation and certificate number
15	EN approval
16	Maximum flow rate [m^3/h]
17	Production code (year/week)
18	Maximum liquid temperature [$^{\circ}\text{C}$]
19	Insulation class
20	Power factor
21	Rated current 1
22	Rated voltage 1
23	Rated current 2
24	Rated voltage 2
25	Weight [kg]

Explanation to Ex approval


The explosion protection classification of the pump is:


Europe:

CE  0344 II 2 GD, EEx dc IIB T4, IP68 T 135 °C

CE  0344 II 2 GD, EEx dc IIB T3, IP68 T 200 °C (pumps with variable frequency converter).

Australia:

Ex  nA II T3 according to IEC 79-15: 1987 (corresponding to AS 2380.9).

Directive/ standard	Code	Description
ATEX	CE 0344	= EC declaration of conformity according to the ATEX directive 94/9/EC, Annex X. 0344 is the number of the notified body which has certified the quality system for ATEX.
		= Marking of explosion protection
	II	= Equipment group according to the ATEX directive, Annex II, point 2.2, defining the requirements applicable to the equipment in this group
	2	= Equipment category according to the ATEX directive, Annex II, point 2.2, defining the requirements applicable to the equipment in this category.
	G	= Explosive atmospheres caused by gasses, vapours or mists
	D	= Explosive atmospheres caused by dust (EN 50281-1-1: 1998)
Harmonised European standard EN 50014	EEx	= The equipment conforms to harmonised European standard
	d	= Flameproof enclosure according to EN 50018: 2000
	c	= Constructional safety
	II	= Suitable for use in explosive atmospheres (not mines)
	B	= Classification of gases, see EN 50014: 1997, Annex A. Gas group B includes gas group A.
	T4/T3	= Maximum surface temperature is 135 °C/200 °C
	T 135 °C/ 200 °C	= Maximum surface temperature on all pump parts according to EN 50281-1-1: 1998
	IP68	= Enclosure class according to IEC 60529.
X	The letter X in the certificate number indicates that the equipment is subject to special conditions for safe use. The conditions are mentioned in the certificate and the installation and operating instructions.	

2.0.1 Australia

Class 1, zone 2.

Ex variants for Australia are approved as EX-n variants according to AS 2380.9.

Standard	Code	Description
IEC 79-15: 1987	Ex	= Area classification according to AS 2430.1
	nA	= Non-sparking according to AS 2380.9: 1991, section 3 (IEC 79-15: 1987)
	II	= Suitable for use in explosive atmospheres (not mines)
	T3	= Maximum surface temperature is 200 °C
	X	The letter X in the certificate number indicates that the equipment is subject to special conditions for safe use. The conditions are mentioned in the certificate and the installation and operating instructions.

3. Type key

The pump can be identified by means of the type designation on the pump nameplate. See fig. 1, pos. 3.

Code	Example	SE	1	.80	.80	.40	.A	.Ex	.4	.5	1D
	Pump type:										
SE	Grundfos wastewater pump/sewage pump										
	Version - material:										
[]	Standard										
	Impeller type:										
1	Channel impeller, number of channels										
V	Free-flow impeller (SuperVortex)										
	Pump passage:										
80	Maximum solids size [mm]										
	Pump discharge:										
80	Nominal diameter of pump discharge port [mm]										
	Power:										
40	Motor output power P2/100 [W]										
	Equipment:										
[]	Standard										
A	Sensor version										
	Pump version:										
Ex	Explosion-proof pump										
[]	Standard pump										
	Number of poles:										
2	2-pole, 3000 min ⁻¹ , 50 Hz										
3	4-pole, 1500 min ⁻¹ , 50 Hz										
	Number of phases:										
[]	Three-phase motor										
	Frequency:										
5	50 Hz										
	Voltage and starting method:										
0D	380-415 V, DOL, 50 Hz										
1D	380-415 V, Y/D, 50 Hz										
0E	220-240 V, DOL, 50 Hz										
1E	220-240 V, Y/D, 50 Hz										
0B	400-415 V, DOL, 50 Hz										
	Generation:										
[]	First generation										
A	Second generation										
B	Third generation, etc.										
	The generation code distinguishes between structurally different pumps with the same power rating										
	Pump material:										
[]	Standard										

4. Power and frame size

Power	1.1 kW	1.3 kW	1.5 kW	2.2 kW	3.0 kW	4.0 kW	5.5 kW	6.0 kW	7.5 kW	9.2 kW	11.0 kW
2-pole	*			B		C22	*	C		D	
4-pole	B				C			*	D	*	

* Not in the pump range.

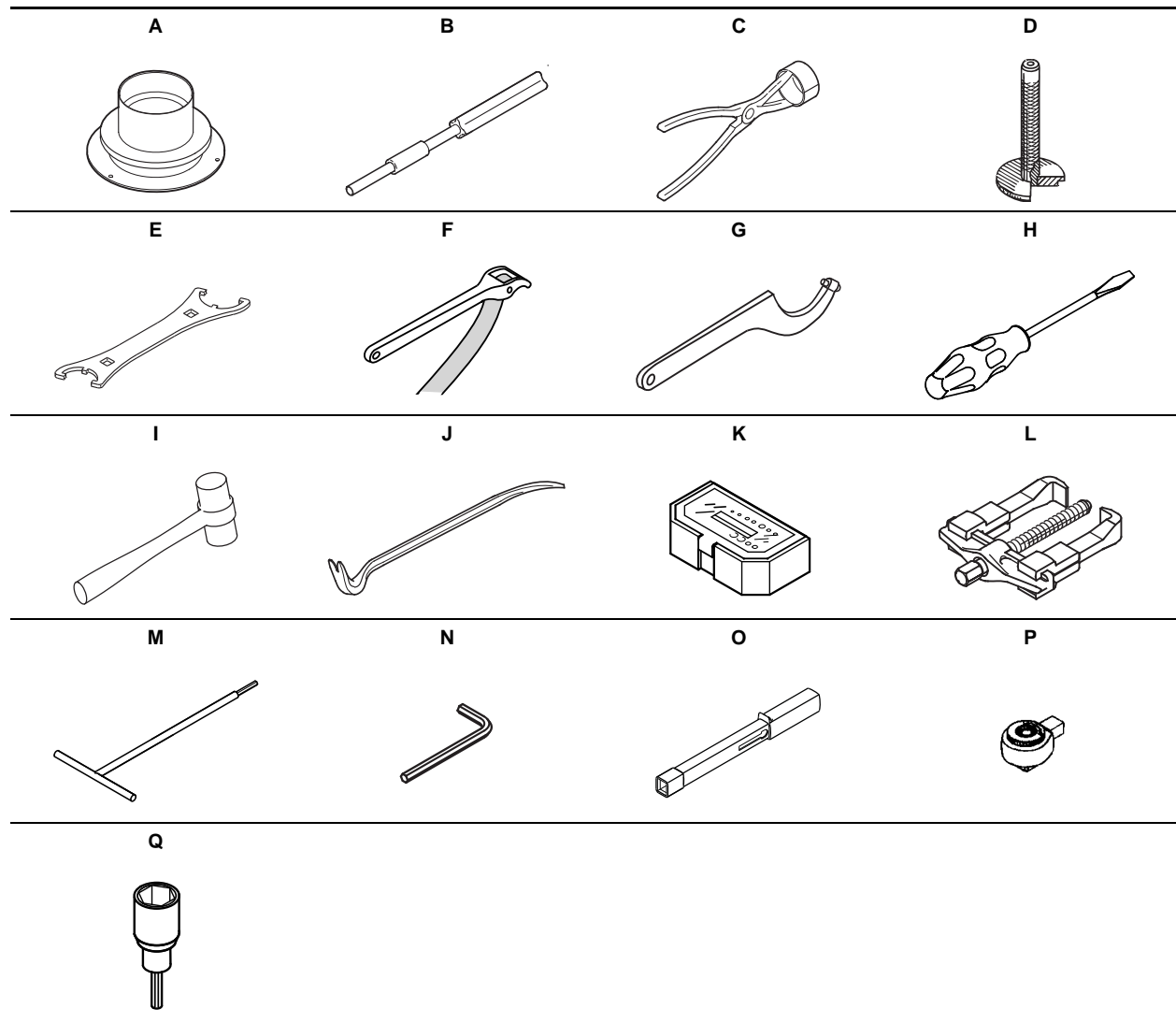
5. Torques and lubricants

Pos.	Designation	Quantity	Dim.	Torque [Nm]	Lubricant
92a	Screw	1	8 x 70	12 ± 2	Thread-Eze
173	Screw	1	5 x 30		Thread-Eze
174	Screw	1			Thread-Eze
182	Screw	4	8 x 20	18 ± 2	Thread-Eze
183	Screw	1	30 x 50	200 ± 10	Thread-Eze
			24 x 40	150 ± 10	Thread-Eze
184	Screw	6	10 x 40	30 ± 3	Thread-Eze
186	Screw	2	6 x 10	7 ± 2	Thread-Eze
188	Screw	4	8 x 30	20 ± 2	Thread-Eze
188a	Screw	1	10 x 25	50 ± 5	Thread-Eze
			12 x 35	75 ± 5	Thread-Eze
193	Screw	2	12 x 20	16 ± 2	Thread-Eze
	O-rings	All			Rocol 22

Thread-Eze, part number 96611372 (0.5 l).

Rocol 22 (SAPPHIRE AGUA SIL), part number RM2924 (1 kg).

6. Service tools



Special tools

Pos.	Designation	For pos.	Description	Part number
A	Stator guide	48	Frame size B	V7183107
			Frame size C	V7181333
			Frame size D	V7189087
B	Pin pusher	176		SV2117
C	Multi-plug pliers	176	7-pole or 10-pole	SV2118
			7-pole or 10-pole	
D	Punch for wear ring	46	DN 80	SV0255
			DN 100	
			DN 150	
E	Spanner for cable nut	181		95043464

Standard tools

Pos.	Designation	For pos.	Description	Part number
F	Strap wrench	49		SV0853
G	Hook spanner	181		SV5225
H	Screwdriver		Straight slot	-
I	Plastic hammer	50, 49c, 155	No 2	SV0349
J	Crowbar	55	Width < 30 mm	-
K	Bits kit			SV2010
L	Puller	105	130-180 mm	-
		58	200-270 mm	-
M	Tee key	188, 182	M8 - 6 mm	SV0246/ SV0051
		188a	M12 - 10 mm / M10 - 8 mm	SV0050
N	Hexagon key	186	M6 - 5 mm	SV0124
		173	M5 - 4 mm	SV0181

Torque tools

Pos.	Designation	For pos.	Description	Part number
O	Torque wrench		4-20 Nm	SV0292
			20-200 Nm	SV0400
P	Ratchet insert tool	H	9 x 12, ½" x ½"	SV0295
Q	Hexagon head driver		M5 - 4 mm	-
			M6 - 5 mm	-
			M8 - 6 mm	-
			M10 - 8 mm	-
			M24 - 19 mm	-
		M30 - 22 mm	-	

7. Safety



Pump installation in wells must be carried out by specially trained persons.
Work in and near wells must be carried out according to local regulations.

Sumps and wells for submerged wastewater pumps contain 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.

8. Transportation and storage

Transportation

The pump can be transported in a vertical or horizontal position. Make sure that it cannot roll or fall over. Always lift the pump by its lifting bracket, never by the motor cable or the hose/pipe.

Storage

For long periods of storage, the pump must be protected from extremes of heat and cold.

If the pump has been in use, the oil should be changed before storage. See section [10.1 Oil change](#).

After a long period of storage, the pump should be inspected before it is put into operation. Make sure that the impeller can rotate freely. Pay special attention to the shaft seal and cable entry.

Contaminated pumps

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 such a 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 for service.

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. Before a pump is returned, it must be cleaned in the best possible way.

9. Electrical connection

The electrical connection must be carried out in accordance with local regulations.



The pump must be connected to a mains switch with a minimum contact gap of 3 mm in all poles.

The motor-protective circuit breaker must be set to the current consumption of the pump. The current consumption is stated on the pump nameplate.

The explosion protection classification of the pump is:

Europe:

CE Ⓜ 0344 II 2 GD, EEx dc IIB T4, IP68 T 135 °C

CE Ⓜ 0344 II 2 GD, EEx dc IIB T3, IP68 T 200 °C (pumps with variable frequency converter).

Australia:

Ex Ⓜ nA II T3 according to IEC 79-15: 1987 (corresponding to AS 2380.9).

The classification of the installation site must in each case be approved by the local fire-fighting authorities.



Grundfos control boxes, pump controllers and Ex barriers must not be installed in potentially explosive environments.

Make sure that all protective equipment has been connected correctly.

If the pump has an "X" on the nameplate (pos. 1), it must be ensured that the pump is connected in accordance with the instructions given in this booklet.

On explosion-proof pumps, it **must** be ensured that an external earth conductor is connected to the terminal on the pump top cover. The cross section of the earth conductor must be minimum 4 mm², e.g. type H07 V2-K (PVT 90 °) yellow/green.

Float switches used in potentially explosive environments must be approved for this application.

They must be connected to the Grundfos LC/D 108 pump controller via the intrinsically safe LC- Ex4 barrier to ensure a safe circuit.

The supply voltage and frequency are stated on the pump nameplate. The voltage tolerance must be within -10%/+6 % ($\pm 10\%$ for Australian versions) of the nominal voltage. Make sure that the motor is suitable for the power supply available at the installation site.

The pump must be connected to a control box with motor-protective circuit breaker, such as a Grundfos control box CU 100 or a Grundfos LC, LCD 107, LC, LCD 108 or LC, LCD 110 pump controller.

See the installation and operating instructions for the selected control box or pump controller.

Wiring diagram

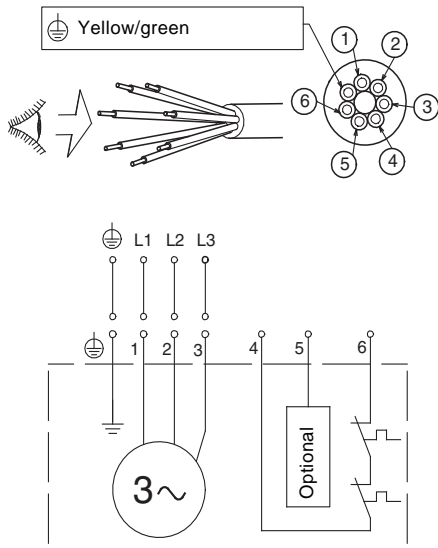


Fig. 2 Wiring diagram, 7-conductor cable

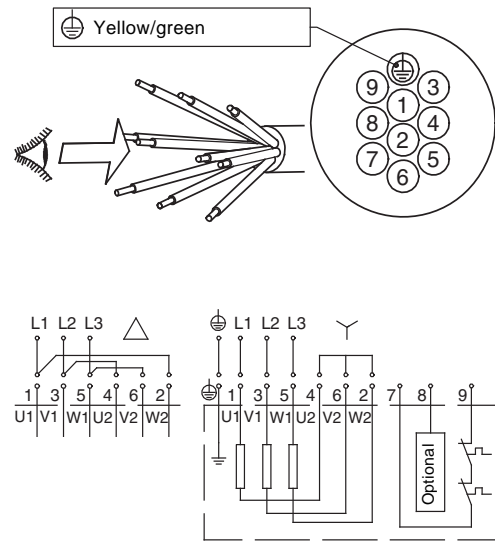


Fig. 3 Wiring diagram, 10-conductor cable

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Thermal switch

All SE pumps have a thermal switch in the stator windings.

Via the pump controller safety circuit, the thermal switch will stop the pump by breaking the circuit in case of overtemperature (approx. 150 °C). The thermal switch will close the circuit after cooling.

The maximum operating current of the thermal switch is 0.5 A at 500 VAC and $\cos \varphi$ 0.6.

The switch must be able to break a coil in the supply circuit.

In the case of standard pumps, the thermal switch can (when closing the circuit after cooling) restart the pump automatically via the controller.



In the case of explosion-proof pumps, the thermal switch must not restart the pump automatically. This ensures protection against overtemperature in potentially explosive environments.



The separate motor-protective circuit breaker/control box must not be installed in potentially explosive environments.

Inspection intervals

Pumps running normal operation should be checked at least once a year or at least after 3000 operating hours. If the pumped liquid is very muddy or sandy, check the pump at shorter intervals.

The following points should be checked:

- **Power consumption**
See pump nameplate.
- **Oil level and oil condition**
When the pump is new or after replacement of the shaft seal, check the oil level after one week of operation. If the oil contains water, the shaft seal is defective. The oil should be changed after 3000 operating hours or once a year.
Use Shell Ondina 917 (product No 96001442, 1 l) or similar type.
- **Plug**
The cable is cast with the plug to protect the motor against water ingress. Check that the casting is intact, and that the cable is not sharply bent and/or pinched.
- **Pump parts**
Check the impeller, 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. In case of defective ball bearings or poor motor function, a general overhaul of the pump is usually required. This work must be carried out by Grundfos or an authorised service 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.



Explosion-proof pumps must be checked by an authorised Ex workshop once a year.

10. Dismantling the pump

10.1 Oil change

After 3000 operating hours or once a year, change the oil in the oil chamber as described below.
If the shaft seal has been replaced, the oil must be changed.



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

Draining of oil

1. Place the pump on a plane surface with one oil screw downwards.
2. Place a transparent container (approx. 1 litre) under the oil screw.
Note: Used oil must be disposed of in accordance with local regulations.

3. Remove the lower oil screw.
4. Remove the upper oil screw.

Note: If the oil in the container contains water, the shaft seal is defective and must be replaced. Water and oil separate almost immediately. If the shaft seal is still used, the motor will be damaged within a short time.

If the quantity of oil is lower than the quantity stated in section [Oil quantities](#) below, the shaft seal is defective.

5. Clean the faces for gaskets for oil screws.

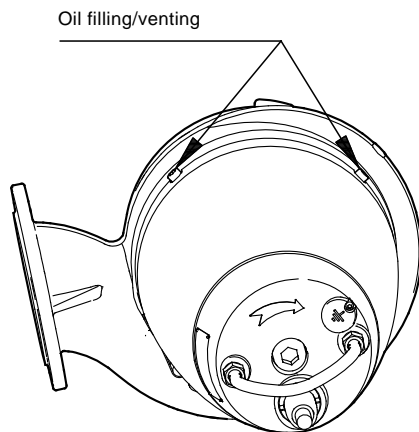
Oil quantities

Frame size	Oil quantity [l]
B	0.3
C	0.55
D	0.7

Use Shell Ondina 917 (product No 96001442, 1 l) or similar type.

Oil filling

1. Turn the pump so that the oil filling holes point upwards.



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Fig. 4 Oil filling holes

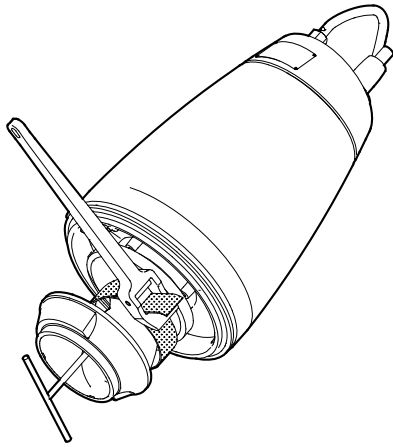
2. Pour oil into the chamber.
3. Fit the oil screws with new gaskets.

10.2 Removing the cable

1. Remove the union nut of the plug by means of the spanner for cable nut (pos. [E](#)).
2. Remove the outer plug part (pos. 181).

10.3 Removing the pump housing and impeller

1. Loosen the clamp (pos. 92).
2. Remove the screw (pos. 92a).
3. Remove the pump housing (pos. 50) by lifting the pump by the lifting bracket (pos. 190) with a crane and knocking on the pump housing.
4. Remove the screw (pos. 188a). Hold the impeller by means of a strap wrench.



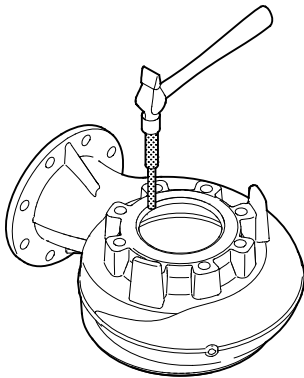
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Fig. 5 Removing the impeller

5. Loosen the impeller (pos. 49) with a light blow on the edge. Remove the impeller.
6. Remove the key (pos. 9a) and the spring for impeller (pos. 157).

10.4 Removing the seal ring and wear ring

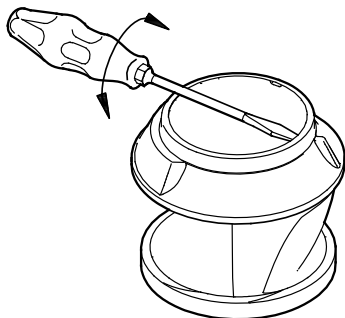
1. Turn the pump housing upside-down.
2. Knock the seal ring (pos. 46) out of the pump housing using a punch.



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Fig. 6 Removing the seal ring

3. Clean the pump housing where the seal ring was fitted.
4. Remove the wear ring (pos. 49c) using a screwdriver.



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Fig. 7 Removing the wear ring

5. Clean the impeller where the wear ring was fitted.

10.5 Removing the shaft seal

1. Drain the oil. See section [Draining of oil](#), page 13
2. Remove the screws (pos. 188).
3. Fit the screw (pos. 180a), and remove the cover for oil chamber (pos. 58) with a puller.
4. Remove the screws (pos. 186).
5. Remove the shaft seal (pos. 105) using the puller.
6. Remove the screw (pos. 188a) and the O-ring (pos. 153b).
7. Remove the O-ring (pos. 37).

10.6 Removing the rotor



On Ex pumps, this work must be carried out by an authorised Ex workshop.

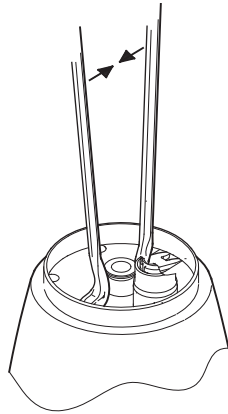
1. Remove the screws (pos. 182).
2. Remove the bearing cover (pos. 59).
3. Fit two screws (pos. 182) in the bearing retainer (pos. 60), and tighten them until the rotor is free.
4. Carefully pull out the rotor.
5. Remove the corrugated spring (pos. 158) from the stator housing (pos. 55).

10.7 Removing the stator housing



On Ex pumps, this work must be carried out by an authorised Ex workshop.

1. Lift the motor housing into vertical position by means of a crane. Block up the motor housing.
2. Remove five of the screws (pos. 184).
3. Remove the top cover (pos. 151) by lifting the pump slowly by the lifting bracket (pos. 190) with a crane.
4. Pull the sleeve (pos. 150) free of the stator housing (pos. 55) using two crowbars.



TM03 1673 2605

Fig. 8 Removing the sleeve

5. Remove the O-rings (pos. 159), (pos. 37b) and (pos. 37a).
6. Remove the screws (pos. 184) and washers (pos. 184a).
7. Fit the top cover and screw (pos. 184).
8. Place the motor housing horizontally by means of a crane.
Place the motor housing on a block so that the intermediate flange is free.
9. Remove the last screw (pos. 184).
10. Remove the intermediate flange (pos. 155) by means of a soft hammer.
Carefully pull the intermediate flange free.
11. Carefully lay down the intermediate flange in front of the stator housing.

10.8 Removing the stator



On Ex pumps, this work must be carried out by an authorised Ex workshop.

1. Remove the inner plug part (pos. 176) using the pin pusher (pos. B), and the plug protector (pos. 177) using the multi-plug pliers (pos. C).
2. Remove the screw (pos. 173) and the washer (pos. 173a).
3. Fit a distance piece and the screw (pos. 183) on the stator housing to prevent the bearing retainer (pos. 61) from dropping during heating.
4. Block up the stator housing so that it stands on the flange at a height where the stator can come out underneath.
5. Heat the stator housing until the stator drops out. Heat the stator housing uniformly so that it is not deformed.
When using a gas burner, to approx. 200 °C. When using a pre-heated oven, to approx. 300 °C.

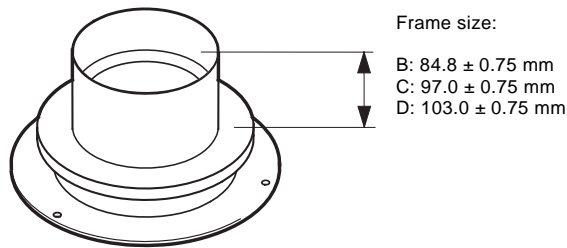
11. Assembly

11.1 Fitting the stator



On Ex pumps, this work must be carried out by an authorised Ex workshop.

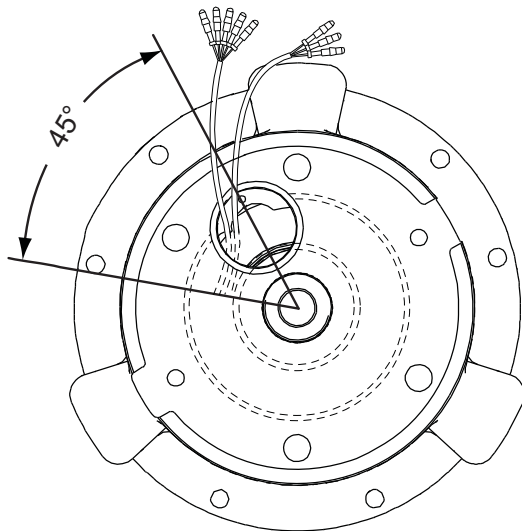
1. Place the stator (pos. 48) on the stator guide (pos. A) with the wire end upwards.



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Fig. 9 Stator guide

2. Tie together the wires with a steel wire.
3. Place the stator housing, with fixed bearing retainer (pos. 61), on the stator, and run the wires through the stator housing.
Make sure that the stator housing is placed so that the bore for plug is turned 45° in relation to the point where the wires leave the stator.



TM03 3622 0506

Fig. 10 Position of stator in relation to stator housing

4. Heat the stator housing to 200°C (maximum 240°C) until the stator housing slides down on the stator. Heat the stator housing uniformly so that it is not deformed. Make sure that wires are not pinched, and that the bottom flange of the stator housing touches the stator guide (pos. A).
5. Let the stator housing cool.
6. Fit the protective conductor (green/yellow) with the screw (pos. 173) and washer (pos. 173a).
7. Fit the inner plug part (pos. 176) and the plug protector (pos. 177). See section 9. [Electrical connection](#).

11.2 Fitting the stator housing



On Ex pumps, this work must be carried out by an authorised Ex workshop.

1. Apply cooling paste on the bottom flange of the stator housing, and distribute an even layer on the entire flange using a fine-toothed putty knife.
2. Fit the intermediate flange (pos. 155).
Frame size D: Note the position of the guide pin.
In the case of frame sizes B and C, the threaded holes for the screws (pos. 184) are placed asymmetrically.
3. Fit the screws (pos. 184) and washers (pos. 184a), but do not tighten the screws.
4. Push the rubber seal and spring washers home on the hole in the intermediate flange.
5. Lift the motor housing into vertical position by means of a crane. Block up the motor housing.
Note: The position of the pin (pos. 6a) so that the pin is not damaged.
6. Tighten the screws (pos. 184) with 30 Nm.
7. Remove the screw (pos. 183) and the washer (pos. 183a). Lift off the top cover by means of a crane.
8. Lubricate and fit the O-rings (pos. 37a).
9. Fit the oil screws (pos. 193) and the nylon washers (pos. 194).
10. Lubricate the lower inner part of the sleeve (pos. 150) with O-ring grease, and lower it down on the stator housing. Press the sleeve home (it may be necessary to knock it with a hammer and a wooden block).
Note: That the punchings in the bottom of the sleeve fit the oil screws.
11. Lubricate and fit the O-rings (pos. 37b) and (pos. 159).
12. Fit the top cover (pos. 151), washer (pos. 183a) and screw (pos. 183). See section [5. Torques and lubricants](#).

11.3 Fitting the rotor



On Ex pumps, this work must be carried out by an authorised Ex workshop.

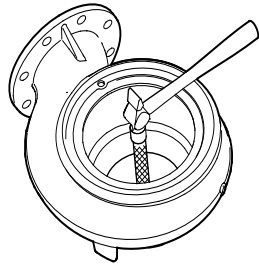
1. Place the motor housing horizontally by means of a crane.
2. Fit the O-ring (pos. 108) on the bearing retainer and lubricate it.
3. Fit the corrugated spring (pos. 158) into the stator housing (pos. 55).
It may be necessary to keep it in position with a little grease.
4. Lubricate the outside of the bearing (pos. 154) with O-ring grease.
5. Insert the rotor into the stator housing.
6. Fit the O-ring (pos. 108) on the end flange of the bearing retainer and lubricate it.
7. Fit the bearing cover (pos. 59).
8. Fit the screws (pos. 182) and tighten them diagonally.

11.4 Fitting the shaft seal

1. Fit and lubricate the O-rings (pos. 153b) and (pos. 106, 2 pcs).
2. Carefully push the shaft seal (pos. 105) onto the shaft.
3. Fit and tighten the screws (pos. 186).
4. Lubricate the O-ring (pos. 107) and fit it into the cover for oil chamber (pos. 58).
5. Fit the cover for oil chamber (pos. 58).
6. Fit and tighten the screws (pos. 186) diagonally.
7. Fill in oil. See section [Oil quantities](#), page [13](#).

11.5 Fitting the seal ring and wear ring

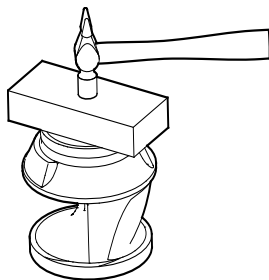
1. Moisten the seal ring (pos. 46) with soapy water.
2. Place the seal ring in the pump housing.
3. Knock the seal ring home in the pump housing using a punch or wooden block.
Check on the outside that the seal is completely home in the housing.



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Fig. 11 Fitting the seal ring

4. Place the wear ring (pos. 49c) on the impeller.
5. Knock the wear ring home using a hammer and a wooden block.



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Fig. 12 Fitting the wear ring

11.6 Fitting the impeller and pump housing

1. Fit the spring (pos. 157) and key (pos. 9a).
Keep the key in position while the impeller is fitted.
2. Fit the impeller (pos. 49).
3. Fit the washer (pos. 66) and the screw (pos. 188a).
4. Tighten the screw (pos. 188a). See section [5. Torques and lubricants](#). Hold the impeller with the strap wrench.
5. Mark the position of the pin on the pump housing.
6. Mark the position of the pin hole on the oil chamber.
7. Fit and lubricate the O-ring (pos. 37).
8. Lower the pump part down over the pump housing (pos. 50) by means of a crane.
9. Mark the sleeve and pump housing in order to place the pump part correctly.
Lower the pump part down on the pump housing.
10. Fit the clamp (pos. 92).
11. Tighten the screw (pos. 92a) with 12 Nm.
12. Check that the impeller rotates freely and without drag.

11.7 Fitting the cable

1. Fit the O-ring (pos. 198).
2. Fit the outer plug part (pos. 181).
3. Fit the union nut of the plug by means of the spanner for cable nut (pos. [E](#)).

12. Start-up



Make sure that all protective equipment has been connected correctly.
The pump must not run dry.

1. Check that the monitoring equipment, if any, is functioning.
2. Check the setting of level pickups, float switches or electrodes.
3. Before starting up the pump, check the direction of rotation.
4. Mount the pump in the system, and switch on the power supply.
5. Open the isolating valves, if fitted.
6. Check that the system has been filled with liquid and vented. The pump is self-venting.
7. Start the pump.

Note: In case of abnormal noise or vibrations from the pump or other pump or supply failures, stop the pump immediately. Do not attempt to restart the pump before the cause of the fault has been found and the fault corrected. After one week of operation after replacement of the shaft seal, the condition of the oil in the chamber should be checked.

12.1 Direction of rotation

Note: The pump may be started for a very short period without being submerged for check of the direction of rotation.

Checking the direction of rotation

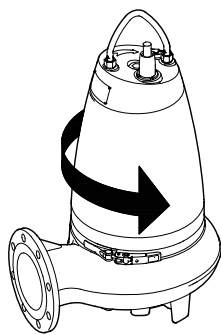
The direction of rotation can be checked in one of the following ways and should be checked every time the pump is connected to a new installation.

Procedure 1

1. Start the pump, and measure the quantity of liquid or the discharge pressure.
2. Stop the pump, and interchange two phases.
3. Restart the pump, and measure the quantity of liquid or discharge pressure.
4. Stop the pump.
5. Compare the results taken under points 1 and 3. The connection which gives the larger quantity of liquid or the higher discharge pressure, is the correct direction of rotation.

Procedure 2

1. Let the pump hang from a lifting device, for instance the hoist used for lowering the pump into the well.
2. Start and stop the pump while observing the movement (jerk) of the pump.
3. If connected correctly, the pump will jerk in the opposite direction of the direction of rotation. See fig. 13.
An arrow on the pump top cover indicates the correct direction of rotation.
If the direction of rotation is not correct, interchange any two of the incoming supply wires.



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Fig. 13 Jerk direction

13. Fault finding



Before fault finding, remove the fuses or switch off the mains switch. It must be ensured that the power supply cannot be accidentally switched on.

All rotating parts must have stopped moving.



All regulations applying to pumps installed in potentially explosive environments must be observed.

It must be ensured that no work is carried out in potentially explosive atmosphere.

Fault	Cause	Remedy
1. Motor does not start. Fuses blow or motor-protective circuit breaker trips out immediately. Caution: Do not start again!	a) Supply failure; short-circuit; earth-leakage fault in cable or motor winding.	Have the cable and motor checked and repaired by a qualified electrician.
	b) Fuses blow due to use of wrong type of fuse.	Fit fuses of the correct type.
	c) Impeller blocked by impurities.	Clean the impeller.
	d) Level pickup, float switch or electrode out of adjustment or defective.	Check the level pickups, float switches or electrodes.
2. The pump operates, but the motor-protective circuit breaker trips after a short while.	a) Low setting of thermal relay in motor-protective circuit breaker.	Set the relay in accordance with data on the pump nameplate.
	b) Increased current consumption due to large voltage drop.	Measure the voltage between two motor phases. Tolerance: -10 %/+6 %, Australia: ± 10 %.
	c) Impeller blocked by impurities. Increased current consumption in all three phases.	Clean the impeller.
	d) Wrong direction of rotation.	Check the direction of rotation, and interchange two phases, if necessary. See section 12.1 Direction of rotation .
3. The thermal switch of the pump trips out after some time of operation.	a) Too high liquid temperature.	Insufficient cooling. Use a pump with oversize motor.
	b) Too high liquid viscosity	Dilute the liquid. Use a pump with oversize motor.
	c) Incorrect electrical installation (wrong type of connection).	Check and correct the electrical installation.
4. Pump performs at below-standard performance and power consumption.	a) Impeller blocked by impurities.	Clean the impeller.
	b) Wrong direction of rotation.	Check the direction of rotation, and interchange two phases, if necessary. See section 12.1 Direction of rotation .
5. Pump operates, but gives no liquid.	a) Discharge valve closed or blocked.	Check the discharge valve and open/clean it.
	b) Non-return valve blocked.	Clean the non-return valve.
	c) Air in pump.	Vent the pump.
6. Pump clogged.	a) The liquid contains large particles.	Select a pump with a larger size of passage.
	b) A float layer has formed on the surface.	Install a mixer in the pump sump.

14. Drawing

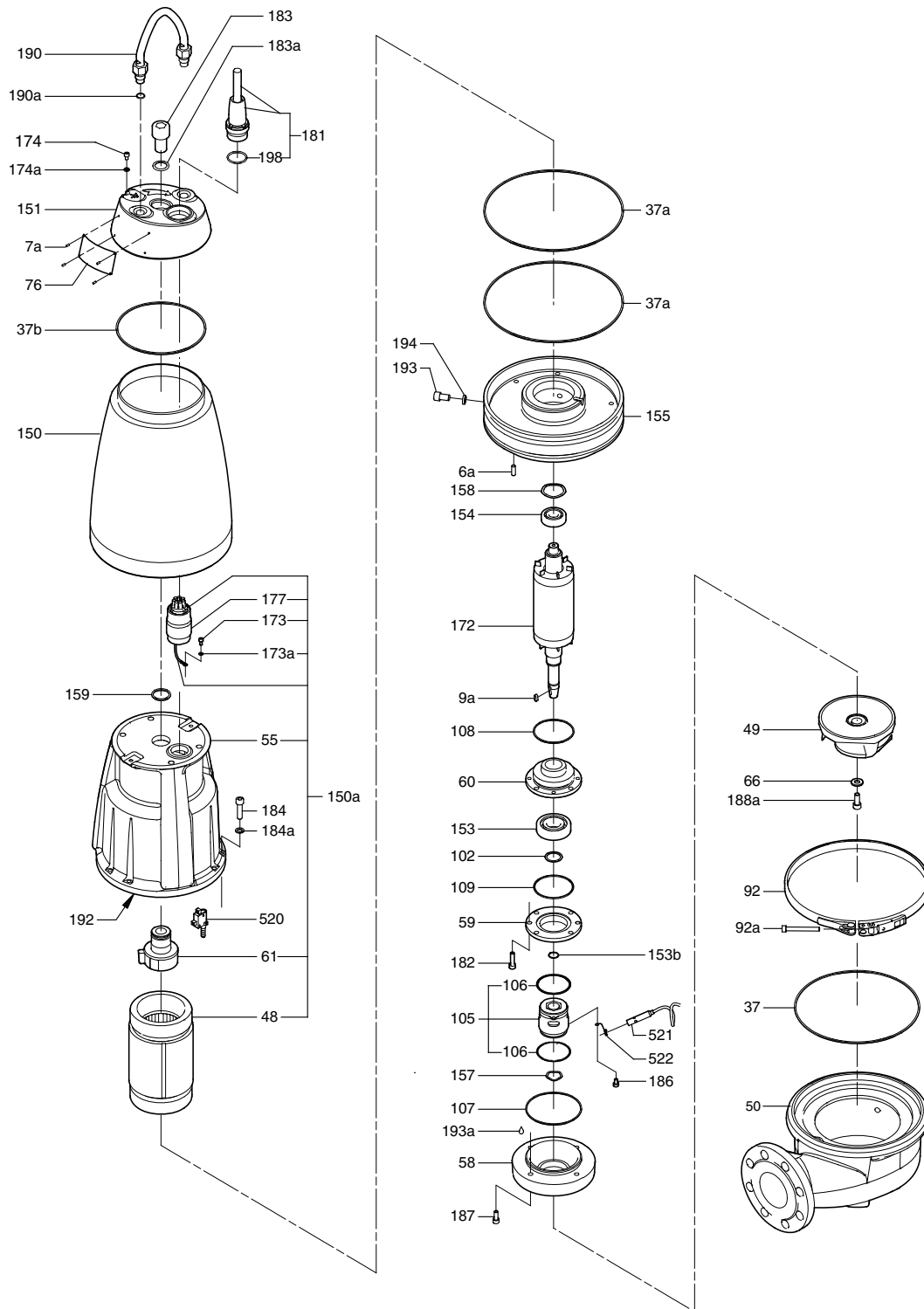


Fig. 14

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Subject to alterations.