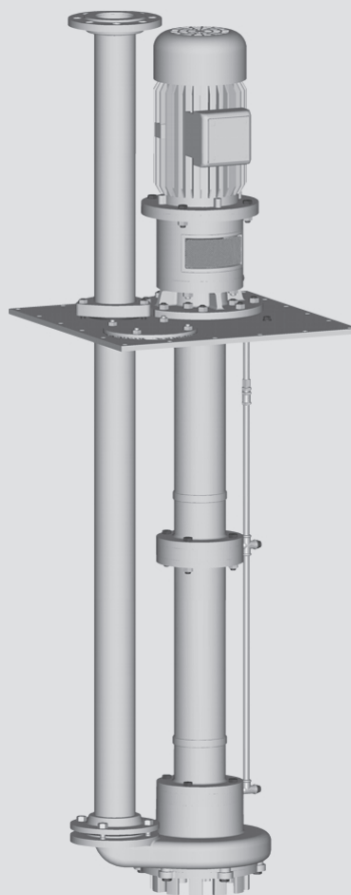
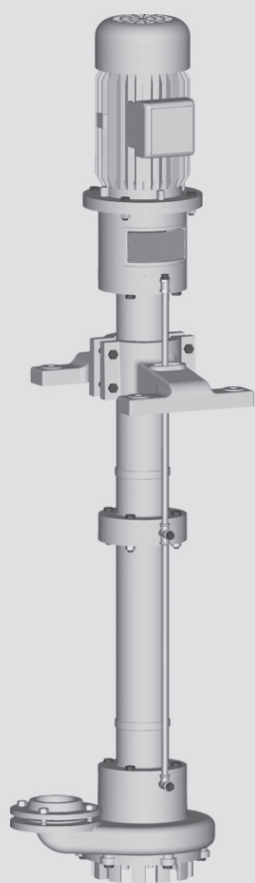




281S

**Vertical sewage pump
Type B/M**

Operating instructions



Herborner Pumpenfabrik J.H. Hoffmann GmbH & Co. KG

Address
Littau 3-5
D-35745 HERBORN

Phone
+49
(0) 2772
933 - 0

Telefax
+49
(0) 2772
933 - 100

Internet
<http://www.herborner-pumpen.de>

e-mail
info@herborner-pumpen.de

Original operating instructions

Translation

This operating instructions is to be translated into the language of the user country for shipment into countries of the European Economic Area.

If inconsistencies should occur in the translation, please consult the original operating instructions (German) for clarification or contact the manufacturer.

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1. Certificates

1.1 Declaration of conformity

EC-Declaration of conformity

in terms of

- the EC Machinery Directive 98/37/EC, Appendix II A (Version 2002)
- the EC Low Voltage Directive 73/23/EEG, Appendix III (Version 2002)
- the EC directive EMC 89/336/EEC, Appendix I and II (Version 2002)

also with explosion-proof model:

- the EU Directive Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres 94/9/EC (ATEX)

We hereby state that the model with the

Name: Vertical sewage pump

Type: 281S

corresponds to the above regulations and the DIN EN standards listed below in the supplied model:

Directive / Standard 98/37/EC	Title EC Machinery Directive	Version 1998	Comments Version 06/ 2004
DIN EN ISO 12100-1	Safety of machinery - Basic concepts; general principles for design; Part 1: Basic terminology, methodology	2004	
DIN EN ISO 12100-2	Safety of machinery; Basic concepts, general principles for design; Part 2: Technical principles and specifications	2004	
DIN EN 809	Pumps and pump units for liquids	1998	Harmonised standards
DIN EN 1050	Safety of machinery- Principles for risk assessment;	1997	Harmonised standards

Directive / Standard 73/23/EEG	Title EC Machinery Directive	Version 1973	Comments Version 06/ 2004
DIN EN 60204-1	Safety of machinery; Electrical equipment of machines; Part 1: General requirements	1998	Harmonised standards
DIN EN 62079	Preparation of instructions, Structuring, content and presentation	2001	Harmonised standards

Directive / Standard 89/336/EG	Title EC directive EMC	Version 1989	Comments Version 06/ 2004
DIN EN 50081-1	Electromagnetic compatibility (EMC);	1993	Harmonised standards
DIN EN 50082-2	Electromagnetic compatibility; Generic Immunity Standard; Industrial environment	1994	Harmonised standards

also with explosion-proof model:

Directive / Standard 94/9/EG (Atex 100a)	Title EU Directive Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres	Version 1994	Comments Version 02/ 2004
EN 1127-1	Explosive atmospheres- Explosion prevention and protection - Part 1: Basic concepts and methodology	1997	Harmonised standards
EN 13463-1	Non-electrical equipment for potentially explosive atmospheres; Part 1: Basic method and requirements;	2001	Harmonised standards
prEN 13463-5	Non-electrical equipment intended for use in potentially explosive atmospheres; Part 5: Protection by constructional safety		

This statement becomes invalid with a non-coordinated change.

Herborn, June 28, 2004



 Signature
 (Management)

1.2 Declaration of manufacturer (for supply without drive unit)

Declaration of manufacturer

in terms of

- the EC Machinery Directive 98/37/EC, Appendix II B (Version 2002)

also with explosion-proof model:

- the EU Directive Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres 94/9/EC (ATEX)

We hereby state that the model with the

Name: Vertical sewage pump

Type: 281S

is delivered without a drive unit, for installation in a machine or for assembly with other machines to a machine. It is prohibited to start the machine until it has been verified that the machine into which this pump will be integrated or to which this pump will be assembled meets the provisions above and the DIN EN standards listed below.

also with explosion-proof model:

Directive / Standard 98/37/EG	Title EG-Richtlinie Maschinen	Version 1998	Comments Version 06/ 2004
DIN EN ISO 12100-1	Safety of machinery - Basic concepts; general principles for design; Part 1: Basic terminology, methodology	1991	
DIN EN ISO 12100-2	Safety of machinery - Basic concepts, general principles for design; Part 2: Technical principles and specifications	1995	
DIN EN 809	Pumps and pump units for liquids	1998	Harmonised standards
DIN EN 1050	Safety of machinery- Principles for risk assessment;	1997	Harmonised standards

Directive / Standard 94/9/EG (Atex 100a)	Title EU Directive Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres	Version 1994	Comments Version 02/ 2004
EN 1127-1	Explosive atmospheres- Explosion prevention and protection - Part 1: Basic concepts and methodology	1997	Harmonised standards
EN 13463-1	Non-electrical equipment for potentially explosive atmospheres; Part 1: Basic method and requirements;	2001	Harmonised standards
prEN 13463-5	Non-electrical equipment intended for use in potentially explosive atmospheres; Part 5: Protection by constructional safety		

This statement becomes invalid with a non-coordinated change.

Herborn, June 28, 2004

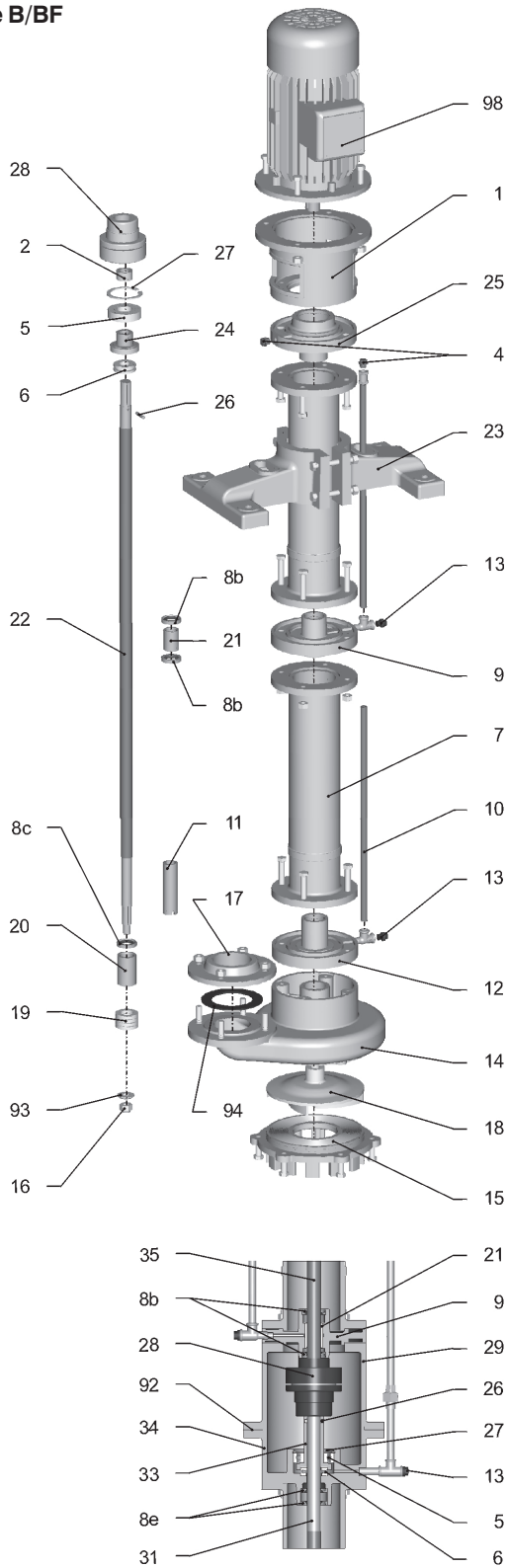


.....
Signature
(Management)

2. General

2.1 Explosion view

Type B/BF



Components

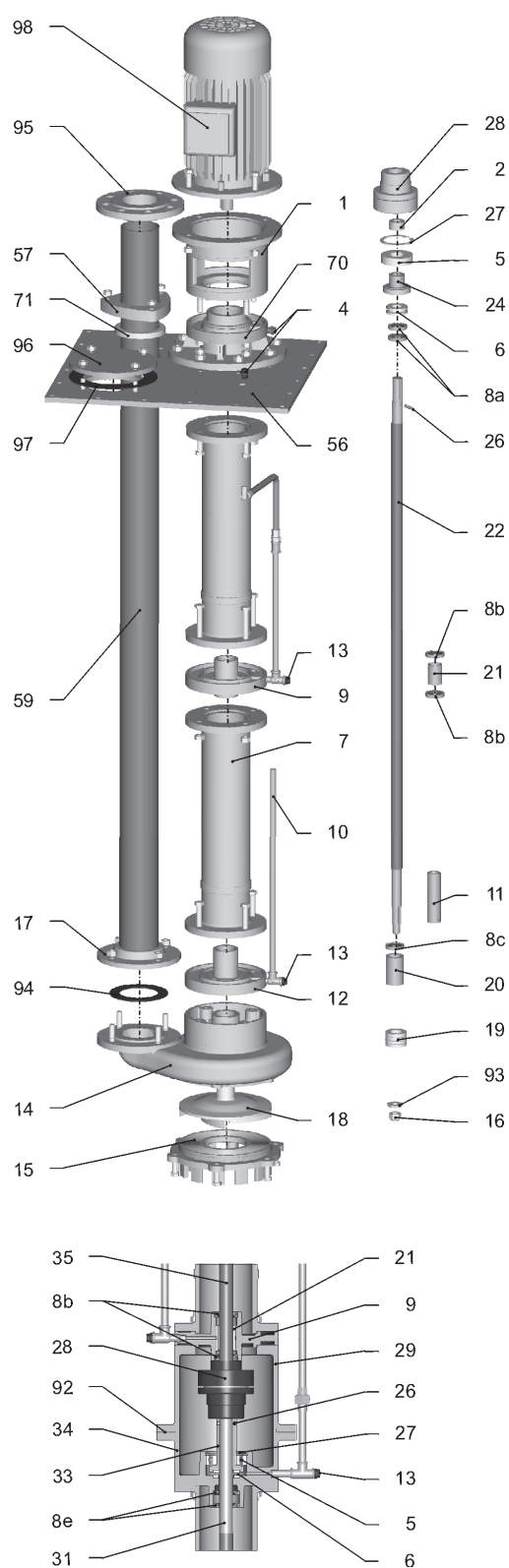
1. Lantern
2. Spacer bush**
4. Lubrication point
5. Deep groove ball bearing
6. Thrust ball bearing
7. Shaft tube
- 8b. Shaft seal ring
- 8c. Shaft seal ring
- 8e. Shaft seal ring
9. Intermediate bearing
10. Lubricating pipe
11. Shaft wearing sleeve
12. Stuffing box bearing
13. Vent plug
14. Casing
15. Cover
16. Impeller nut
17. Screwed flange
18. Impeller
19. Gland packing*
20. Bush
21. Bush
22. Shaft
23. Flange
24. Locking sleeve
25. Bearing mounting
26. Grooved pin
27. Circlip
28. Coupling
29. Cover
31. Bottom shaft
33. Locking sleeve
34. Bearing mounting
35. Top shaft
92. Joint
93. Washer
94. Joint
98. Motor

Fig. 2-1a Explosion view

* For DN100 replaced by shaft seal ring 8c

** For designs including grease lubrication pump replaced by V-rope pulley

Type M/MF



Components

1. Lantern
2. Spacer bush**
4. Lubrication point
5. Deep groove ball bearing
6. Thrust ball bearing
7. Shaft tube
- 8a. Shaft seal ring
- 8b. Shaft seal ring
- 8c. Shaft seal ring
- 8e. Shaft seal ring
9. Intermediate bearing
10. Lubricating pipe
11. Shaft wearing sleeve
12. Stuffing box bearing
13. Vent plug
14. Casing
15. Cover
16. Impeller nut
17. Screwed flange
18. Impeller
19. Gland packing*
20. Bush
21. Bush
22. Shaft
24. Locking sleeve
26. Grooved pin
27. Circlip
28. Coupling
29. Cover
31. Bottom shaft
33. Locking sleeve
34. Bearing mounting
35. Top shaft
56. Manhole cover
57. Pressure pipe gland
59. Pressure pipe
70. Support housing
71. Pressure pipe seal
92. Joint
93. Washer
94. Joint
95. Screwed flange
96. Blank flange
97. Joint
98. Motor

Fig. 2-1b Explosion view

* For DN100 replaced by shaft seal ring 8c

** For designs with grease lubrication pump replaced by v-belt pulley

2.2 Wear parts

The specifications for the selection of wear parts are based on the first demand for a two-year operation, in accordance with DIN 24 296.

Wear parts (if existing)	No. of pumps							
	1	2	3	4	5	6-7	8-9	10-...
Impeller	1	1	1	1	2	2	2	20%
Cover	1	1	1	1	2	2	2	20%
Bushes	1	1	1	2	2	2	3	25%
Anti-friction bearing set	1	1	1	2	2	2	3	25%
Shaft seal ring set	1	1	1	2	2	2	3	25%
Gland packing	1	1	1	2	2	2	3	25%
Shaft wearing sleeve	1	1	1	2	2	2	3	25%
Shaft + accessories	1	1	1	1	2	2	2	20%



Every pump is exclusively designed for a purpose as specified above. Any other use exceeding the intended purpose, or a modification of the pump without a written agreement by the manufacturer is considered as non-conforming to the intended purpose. The manufacturer will not be responsible for any damages resulting therefrom. The risk rests fully on the operator.

The pump must not be operated unless it is ensured that all safety equipment are completely installed and function properly, and that the system into which the pump is installed meets the provisions.

2.3 Usage according to intended purpose

The pumps of the series indicated on the front page are suitable for the conveyance of:

Nominal diameter 40-80

Sewage – soil water – waste water (for the drainage of heating cellars, boiler houses, heating centres, slaughter houses, washing rooms, sculleries, laundries, gully pits, etc.)

Nominal diameter 100

Faeces – sewage – ground water pits – dirty waste water (particularly suited for removal of faeces from collective lines and pits).



The media used for pump operation according to its intended purpose, and the hazards in connection with it are subject to the sole responsibility of the operator.



Not allowed is the use of the pumps for conveying

- combustible or explosive fluids;
- fluids with abrasive constituents;
- chemical agents attacking the pump material.



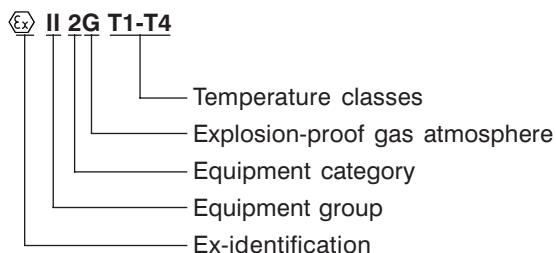
For the conveyance of aggressive and/or abrasive media, *bronze* or *special steels* will be available as pump materials.



In **areas subject to explosion hazards**, only pumps of explosion-proof design (**Ex**) can be used, meeting the proper specifications.



The use conforming to the intended purpose also includes the maintenance of the prescribed operation, maintenance and repair specifications.



The explosion-proof vertical pumps / pump components (if supplied without drive units) meet the requirements of electric facilities subject to explosion-hazard, according to the Guideline 94/9/EC of the European Council, dated 23rd March 1994, for intended purpose use in explosion-hazard areas of

Equipment Group II Categories 2.

Conditions of Use for Zone I and Zone II.



By the temperature class T4, the pumps also meet the requirements of the temperature classes T1 to T3.

The Ex-identification on the nameplate of the pump is related only to the pump components and the coupling provided by the manufacturer. The drive unit proper is subject to separate consideration. If the motor and the pump are of different identification, the lower specifications shall apply to both.



Explosion-proof behaviour is ensured only for the use conforming to its intended purpose. The limits indicated in the purchase order and/or on the nameplate must not be exceeded, in any case.



To maintain the explosion proof behaviour of the pump, if supplied without motor, the following conditions shall be maintained for the motor:

The temperatures permitted on the motor flange and motor shaft must be higher than the temperatures developed by the pump.



Pumps with an integrated motor and ATEX Certification, made by Herborner Pumpenfabrik, meet this condition.

2.4 Specifications

2.4.1 Type identification

Example:

2 8 1 S H / 1 0 0 - 2 S P - 2 3 0 - B F - 9 2 5 - E X - W 1 - S 1

Design

- = Standard
- S1 = Special design of serial number

Materials

- W0 = mixed materials
- W1 = all castings of EN-GJL-250
- W2 = all castings except impeller of EN-GJL-250, Impeller of G-CuSn 10
- W3 = all castings of G-CuSn 10
- W4 = all castings of 1.4408
- W5 = all castings of EN-GJS-400-15
- W6 = all castings of 1.4439

Permitted usage

- = Standard
- EX = Explosion proof quality

Dimension "e"

Design

- = unsectioned version
- F = sectioned version

Type

- B = for installation in open pits
- M = for installation in tanks and shafts

Impeller diameter

Impeller version (if deviating from standard)

Number of blades

Nominal diameter of pressure connection DN [mm]

Hydraulic variation

Pump type

2.4.2 Impeller



Open screened impeller with automatic fibre cutting tool for safe conveyance.

2.4.3 Installations

The type series can be supplied in different installation types:



Type B / BF = for installation in open pits



Type M / MF = for installation in tanks and shafts

2.4.4 Shaft sealing

Sealing of all types is effected on the media-side via a gland packing (19), from DN 100 upward via shaft seal rings.

For type M additionally by shaft seal rings (8a).



Dry-running of a pump will destroy the shaft sealing!

2.4.5 Drive motor

The pump is equipped with a three-phase a.c. squirrel cage motor.



The **exact motor data** shall be derived from the nameplate!

Motor cooling is effected by heat transfer of the cooling ribs to the ambient atmosphere.



Follow the coolant temperature specified on the nameplate!

Motor connection sizes according to DIN 42677 (IM B5).

Protection system	IP 55
Revolution rate	1450 (1750) /rpm (Standard)
Frequency	50 (60) Hz
Power supply < 2.2 kW	230/400 (265/460) V
Power supply > 3.0 kW	400/690 (460) V
Insulation class	
VDE 0530	F
Type	V1



Max. deviation of power supply permitted $\pm 10\%$, for the explosion-proof designs $\pm 5\%$ of the power rating.



If a pump is delivered ex works without motor, the latter shall be set up according to the design data of the purchase order and the specifications indicated.

2.4.6 Coupling

The manufacturer supplies pumps with elastic torsion claw couplings with elastic elements of PUR-plastics.



Couplings for Ex-service are specifically identified by the **EX**-stamp and information referring to the manufacturer.

2.4.7 Support of pump unit

On the drive side, the pump is supported by two anti-friction bearings with a re-lubricating facility in the bearing mounting (25.) / support housing (70.). In the split design (BF/MF), there are 2 additional anti-friction bearings in the bearing mounting (34.).

The shaft is supported in the stuffing box bearing (12.) and intermediate bearing (9.) by lubricated slide bearings. These are either grease-lubricated or media-lubricated, depending on the conditions of use. The number of intermediate bearings (9.) depends on the construction length of the pump.

2.4.8 Dimensions, weight, performance data

The dimensions and installation sizes are shown in chapter 5.6 Dimensions and the weights in chapter 5.4 Pump weights. The performance and connection data of each pump type are included in the purchase order and the nameplate data.

2.4.9 General data

Media temperature range for:

lower temperature limit: 0 °C

upper temperature limit: +100 °C

Ambient temperature range for:

lower temperature limit: - 5 °C

upper temperature limit: + 40 °C

Density and toughness of pumped media:

Density: max. 1000 kg/m³

Kinematical viscosity: max. 1 mm²/s (1 cST)



For media of deviating density or toughness, make sure to observed motor performance in the case of hydraulic power change.

Acoustic Pressure Level:

The acoustic pressure level of the pump at cavitation-free operation in the Range of Q_{opt.} remains below the limits specified in the EC-Guideline 98/37/EG for machinery.

3. Safety

3.1 Notes / explanations



Warnings

are included in a frame and marked by a "STOP sign".



Hazard notes

are included in a frame and highlighted by a warning triangle.



Hints

are included in a frame and marked by a "hand".



Squeezing hazards

are included in a frame and identified by the adjacent symbol.



Hazards due to electric power

are included in a frame and identified by the adjacent symbol.



Hazards due to explosive atmosphere

are included in a frame and identified by the adjacent symbol.



Biological hazard

Biological hazards may develop during decomposition of organic products in sewage waters.



Instructions to wear personal safety outfit

Are included in a frame and identified by the adjacent symbol.



Burning hazard

e.g. on electric motors are identified by the adjacent symbol.

3.1.1 Machine identification

The data in the operating manual are exclusively applicable to the type of pump shown on the front page.



We recommend to paste the accompanying type nameplate of the pump into the operation manual or into the switchgear, so that they are available to you whenever you need them.

The nameplate is affixed to the fan cover above the switchbox or on the lantern (if supplied without drive unit).



For queries and ordering of spare parts, make sure to indicate the pump type and the purchase order number. Follow any additional nameplates on the motor.

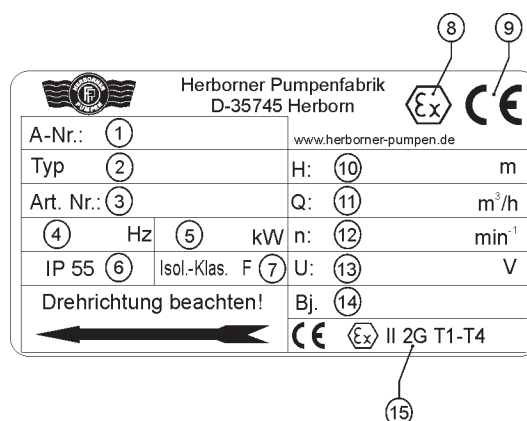


Fig. 3-1 Nameplate

Legend to fig. 3.1

- | | |
|--------------------------------|-------------------------------------------------|
| 1. Purchase order no. | 9. CE-mark |
| 2. Type description | 10. Nominal head [m] |
| 3. Item no. | 11. Nominal flow rate [m³/h] |
| 4. Frequency [Hz] | 12. Rpm [min⁻¹] |
| 5. Power output [kW] | 13. Operation voltage [V] |
| 6. Protection class | 14. Year of construction |
| 7. Insulation class F | 15. Ex-proof identification (only for Ex-pumps) |
| 8. Ex-mark (only for Ex-pumps) | |

3.2 Integrated safety systems (Option)

The integrated safety systems shall be inspected at regular intervals **j** = annually.

The inspection methods to be applied are:

S = visual inspection, **F** = functional checkout.

Thermal winding protection

If the pump is additionally protected by direct temperature control of the winding, the motor will be stopped at excessive heat-up.

Checkout	
Interval	Method
j	S, F



This operation manual is an integral part of the machine and must be available to the operators at any time. The included safety precautions shall be followed.



It is strictly forbidden to cheat any safety equipment or to vary their functioning.

3.3 Interfaces on the pump

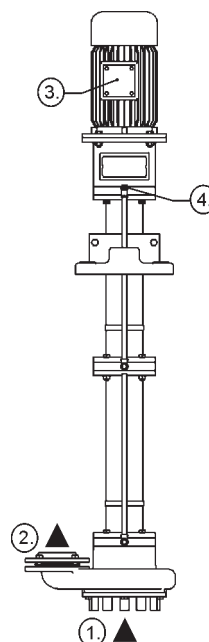


Fig. 3-2 Interfaces on the pump

There are the following interfaces on the pump:

1. Inlet connector flange
2. Outlet connector flange
3. Electric connection (terminal box)
4. Re-lubricating unit

3.4 Safety instructions



It is essential that the user instructs his operators and maintenance personnel:

- on the **protection equipment** of the pump;
- and supervises them to follow the safety provisions.

This operation manual shall be retained for future reference. The frequency of inspections and supervision measures shall be maintained. The operations described in this manual are set up in such a manner that they are

- understood in the operation manual chapters handling and operation modes by an **operator**;
- in the chapters transportation, installation and setup, maintenance, malfunction/cause/rectification by an **experienced engineer**.

The chapters **Transportation, Installation and setup, Maintenance, Malfunction/cause/rectification** are provided for **skilled engineers only**. Operations described in these chapters shall be performed by skilled engineers only.

3.5 Responsibility of user



In the European Economical Region, the national adoption of the Framework Guideline (89/391/EEC) and the accompanying individual guidelines, in particular the Guideline (89/655/EEC) and the Minimum Provisions for Safety and Health Protection for the Use of Working Tools and Utilities by Working People, in their applicable wording shall be followed and maintained.

The Working Safety Rules shall be observed. g

Trained person



A person trained by a skilled engineer to fulfil the functions assigned to him/her and informed about the potential hazards in the case of improper behaviour an instructed, if required, about the protective equipment and safety provisions needed.

The user shall strive to obtain the local operation permit and follow the impositions connected to it. At the same time, he shall meet the local provisions for

- the safety of personnel (Provisions for the Prevention of Accidents)
- the safety of working tools (Protection equipment and Maintenance)
- the disposal of products (waste law)
- the disposal of materials (waste law)
- cleaning (cleaning agents and their disposal)
- the protection of environment.

Trained engineer



A person who can judge the assigned duties and potential hazard on the basis of his/her technical education, know-how and experience as well as the relevant standards.

In its definition similar to EN 60204-1.

Connections:

Before operating the pump, the user shall ensure that during assembly and startup, if this is carried out by the user himself, the local provisions (e.g. for electric supply) are met.

4. General hazard notes

4.1 Hazards

The safety systems and safety provisions described in this manual shall be used and followed, respectively. The pump shall be operated on the control elements or from a remote control system. Make sure to keep the access ways free from objects when opening the pump, so that an unobstructed access is possible at any time.



During preparation, maintenance and repairs, make sure to avoid any **squeezing hazards!**

4.2 Hazardous areas around the pump



For preparatory, maintenance, repair and cleaning activities, the area of about 1 m around the pump shall be regarded as a **hazardous area**. The operating area is limited to the **operating controls**.



Make sure to install and/or fasten the pump so that no persons can stay in the direction of pumping

4.3 Assembling, operators and maintenance personnel

The personnel required for assembly, operation and maintenance includes persons who are responsible for transportation, assembly, installation, operation, preparation, and cleaning of the pump and for troubleshooting.

1. The pump may be mounted and operated by trained and authorized persons only.
2. The responsibilities for operating the pump must be clearly established and followed, so as to avoid any misunderstandings and doubtful competences.
3. For all activities (operation, maintenance, repair, etc.) the shutdown procedures stated in the operation manual shall be followed.
4. The operator shall abstain from any handling mode that certainly would deteriorate the safety of the pump.
5. The operator shall ensure that only authorized persons are allowed to work on the pump.
6. The operator undertakes to report any changes occurred on the pump that would affect safety to the user immediately.
7. The user undertakes to operate the pump in an unobjectionable state only.
8. The user shall provide any protective equipment needed meeting the legal provisions and the requirements of the media to be conveyed.

4.4 Installation of spare and wear parts

We expressly point out that any spares and wear parts not delivered by us consequently are neither tested nor released by us. The installation and/or the use of such products may adversely affect the properties of your pump in terms of design and performance.

The responsibility and liability of Herborner Pumpenfabrik will be excluded for any damage caused by the use of non-original components or non-original accessories.

4.5 Shutdown procedures



It is essential that the following shutdown procedure is maintained prior to any maintenance, cleaning and/or repair activities (by skilled personnel only).

Disconnect the pump from power supply

- Turn the power switch on the power supply cabinet to "0".
- Make sure that no voltage is applied.
- Secure the power switch against inadvertent re-starting by a padlock



Close the open electric cabinets during cleaning, to avoid any ingress of water or dust. If not observed carefully, hazards will occur for the life and health of your operators!

5. Installation

5.1 Scope of supply



The detailed scope of supply is revealed in the order confirmation.

The counter flange with thread "G" according to the nominal width, is part of the supply for type B.

Suitable motor sizes depending on lantern:

80 L, 90 S, 90 L, 100 L, 112 M, 132 S, 132 M, 160 M, 160 L
Motor connection sizes acc. to DIN 42677 (IM B5).

5.2 Transit and packing

The pumps from Herborner Pumpenfabrik are carefully checked and packed prior to shipment, but no damage can be excluded during transit.

5.2.1 Delivery (also of spares and wear parts)

Receiving inspection

Check for complete delivery by comparison with the delivery note!

For damages

Check the supply for damages (visual inspection)!

For complaints

If the delivery has been damaged during transit:

- Immediately make contact with the last forwarder!
- Keep the packing as an evidence (for a possible review by the forwarding agent or for return shipment).

Packing for return shipment

If possible make use of the original packing container and the original packing material. If both is no more available:

- If available, request a packing company with expert personnel. Place the pump on a pallet (must be designed according to weight).
- Any queries arising to packing and transport security should be referred to Herborner Pumpentechnik.

Packing for road traffic by lorry

For transport by road traffic, the pump is packed and fastened to a transit pallet.

5.2.2 Intermediate storage

On arrival, the freight packing of the pump and spare parts are laid out for approx. 3 months.

Storage conditions

Closed and dry room with an ambient temperature of 5 - 40 °C.

5.3 Transit to the installation site (of the customer)



Transit shall be performed by skilled personnel under local conditions only.



The pump is transferred on the transit pallet right to the installation site of the customer.



Hoisting gear and sling belts must be of sufficient dimension for the total pump weight (see chapter 5.4 Pump weights). If necessary, secure the pump during transit by appropriate sling gear, because there might exist a hazard of tilting, especially for top-heavy objects. The pump shall be placed on a horizontal surface of sufficient firmness in all directions.

5.3.1 Handling by a fork lift

- The fork lift must be designed in conformity with the weight of the pump.
- The driver shall have a proper driving license for moving loads by fork lift.

5.3.2 Handling by crane

- The crane must be designed for handling weights of the pump.
- The operator must be authorized to operate a crane.
- Fasten the pump to the crane by means of appropriate sling gear (e.g. crossbeam, belt, multi-point suspensions, ropes, etc.) at the lifting points and move it.

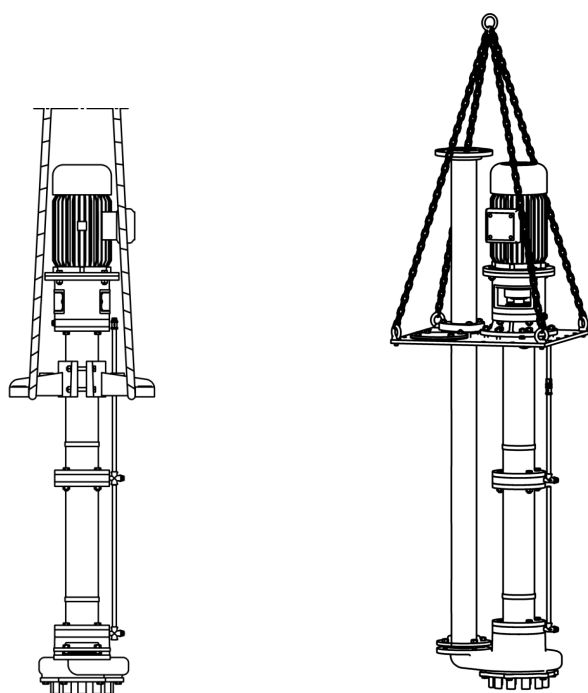


Fig. 5-1 Handling by crane

5.4 Pump weights

5.4.1 Pump weights, type B/BF

	dimension "e" [mm]	281S...						
		40 [kg]	50 [kg]	H65 [kg]	65 [kg]	80 [kg]	H100 [kg]	100 [kg]
Type B	525	47	71	75	169	119	101	157
	725	50	73	78	174	123	106	162
	925	53	76	81	179	128	111	167
	1025	54	78	83	181	130	113	169
	1225	57	81	85	185	135	117	174
	1450	63	87	92	197	146	129	187
	1550	65	88	93	200	149	131	189
	1650	66	90	94	202	151	134	192
	1750	68	91	96	204	153	136	194
	1850	69	92	97	206	156	138	197
	1950	71	94	99	209	158	141	199
	2050	72	95	100	211	160	143	202
	2150	73	97	102	213	162	145	204
	2250	75	98	103	216	165	147	207
	2375	79	103	108	225	174	157	217
	2450	78	101	106	220	169	152	211
Type BF	2575	82	106	111	229	179	161	222
	2675	84	107	112	232	181	164	224
	2625	100	123	128	253	202	184	244
	2825	103	126	131	257	206	189	249
	3025	105	129	134	262	211	194	253
	3125	107	130	135	264	213	196	256
	3325	110	133	138	269	218	200	261
	3550	116	139	144	280	229	212	273
	3650	117	141	146	283	232	214	276
	3750	119	142	147	285	234	217	278
	3850	120	143	148	287	236	219	281
	3950	122	145	150	289	239	221	283
	4050	123	146	151	292	241	224	286
	4150	124	148	153	294	243	226	288
	4250	126	149	154	296	245	228	291



For designs with flanges, the total weights of the types 40, 50 and H65 are increased by 11 kg, for the Types 65, 80, H100 and 100 by 26 kg.



The total weights may vary by larger-sized motors and different producers.

5.4.2 Pump weights, type M/MF

	dimension "e" [mm]	281S...						
		40 [kg]	50 [kg]	H65 [kg]	65 [kg]	80 [kg]	H100 [kg]	100 [kg]
Type M	525	87	112	117	215	164	155	219
	725	91	116	121	221	170	162	226
	925	95	119	125	227	176	169	234
	1025	96	121	126	230	179	173	237
	1225	100	125	130	236	185	180	245
	1450	107	132	137	249	198	194	260
	1550	109	133	139	252	201	198	264
	1650	111	135	141	255	204	201	268
	1750	112	137	142	258	207	205	271
	1850	114	139	144	261	210	208	275
	1950	116	141	146	264	213	212	279
	2050	118	142	148	267	216	215	282
	2150	120	144	150	270	219	219	286
	2250	121	146	151	273	222	222	290
	2375	126	151	156	283	232	233	301
	2450	125	150	155	279	228	229	297
Type MF	2575	130	155	160	289	238	240	309
	2675	132	157	162	292	241	244	313
	2625	148	172	178	312	261	264	332
	2825	151	176	181	318	267	271	339
	3025	155	179	185	324	273	278	346
	3125	157	181	187	327	276	282	350
	3325	160	185	190	333	282	289	357
	3550	165	190	195	343	292	300	369
	3650	167	191	197	346	295	303	373
	3750	169	193	199	349	298	307	376
	3850	170	195	200	352	301	310	380
	3950	172	197	202	355	304	314	384
	4050	174	199	204	358	307	318	387
	4150	176	200	206	361	310	321	391
	4250	178	202	208	364	313	324	395

The following aspects shall be maintained for installation:

- The pump assembly shall be firmly mounted for permanent stability.
- The pump shall not be subject to mechanical stress when tightening the mounting screws.
- The deviation of the pump centreline from the vertical shall not exceed 2°.
- The pump cover (15) shall be relieved from the total weight by additional fastening means (flange or manhole cover).
- The assembly components (e.g. lubricating pipe) must not be damaged.
- The motor and the upper bearing support shall be flood-safe.



Sufficient space shall be provided for maintenance and repair!



The total weights may vary by larger-sized motors and different producers.



For the installation of the pump, follow the safety provisions for working in closed rooms in sewage disposal facilities, as well as the generally approved **"Rules of the Art"**.

5.5 Installation and setup

The connecting flanges must be properly aligned and be fastened by screws so that no leakages occur. The seals must be resistant against the operating medium.



Pumps in split design BF/MF shall be finally pre-mounted prior to installation according to chapter 9.2 Assembly (from Fig. 51).

5.6 Dimensions

Type B/BF

Flange connector dimensions of the pump casing acc. to DIN 2501, PN 6.

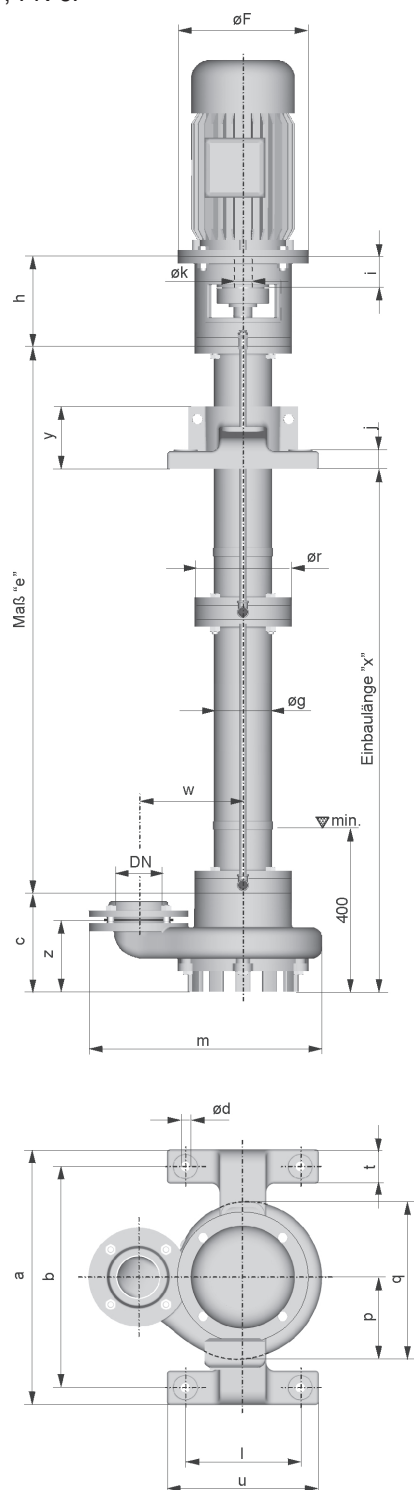


Fig. 5-2a Dimensions

Type M/MF

Flange connector dimensions of the pressure pipe acc. to DIN 2501, PN 10.

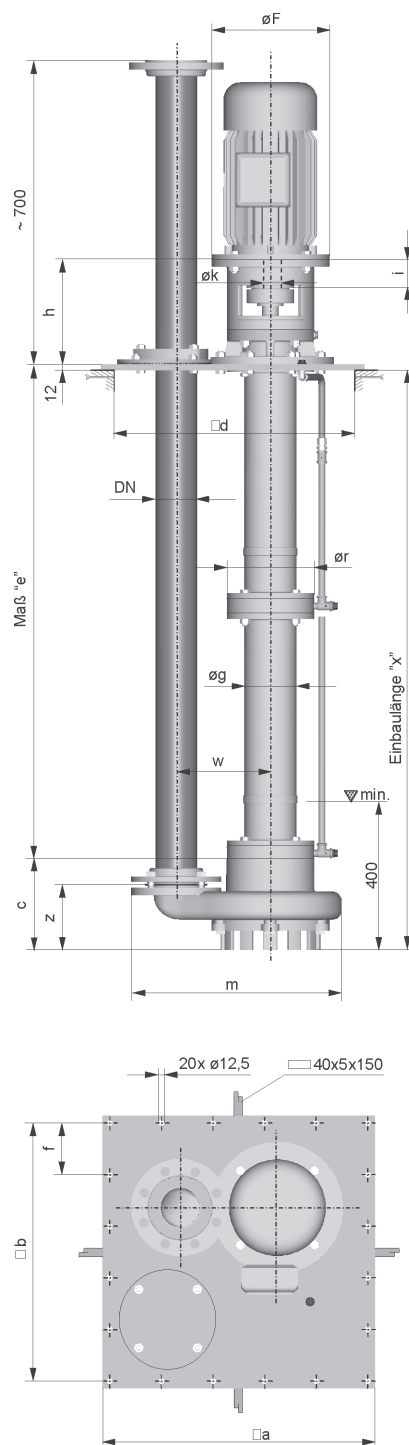


Fig. 5-2b Dimensions

5.6.1 Installation lengths and dimensions of type B/BF

Motor types, lanterns, couplings

DN	40, 50, H65		
	<div> <div>40, 50, H65</div> <div> <div>LF 11/1</div> <div>LF 11/2</div> <div>LF 11/4</div> </div> </div>		
Ø F	200	250	300
Motor types	80 L 90 S	100 L 112 M	132 S 132 M
Ø k max.	28	38	38
h	156	166	201
i max.	50	60	80

DN	65, 80, H100, 100			
	<div> <div>65, 80, H100, 100</div> <div> <div>LF 12/1</div> <div>LF 12/2</div> <div>LF 12/4</div> <div>LF 12/5</div> </div> </div>			
Ø F	200	250	300	350
Motor types	90 S 90 L	100 L 112 M	132 S 132 M	160 M 160 L
Ø k max.	28	38	38	45
h	162	172	207	250
i max.	50	60	80	110

Installation lengths "x"

	DN							Maß "e"
	40	50	H65	65	80	H100	100	
Type B (unsectioned version)	515	515	525	530	545	595	605	525
	715	715	725	730	745	795	805	725
	915	915	925	930	945	995	1005	925
	1015	1015	1025	1030	1045	1095	1105	1025
	1215	1215	1225	1230	1245	1295	1305	1225
	1440	1440	1450	1455	1470	1520	1530	1450
	1540	1540	1550	1555	1570	1620	1630	1550
	1640	1640	1650	1655	1670	1720	1730	1650
	1740	1740	1750	1755	1770	1820	1830	1750
	1840	1840	1850	1855	1870	1920	1930	1850
	1940	1940	1950	1955	1970	2020	2030	1950
	2040	2040	2050	2055	2070	2120	2130	2050
	2140	2140	2150	2155	2170	2220	2230	2150
	2240	2240	2250	2255	2270	2320	2330	2250
	2365	2365	2375	2380	2395	2445	2455	2375
	2440	2440	2450	2455	2470	2520	2530	2450
	2565	2565	2575	2580	2595	2645	2655	2575
	2665	2665	2675	2680	2695	2745	2755	2675
Type BF (sectioned version)	2615	2615	2625	2630	2645	2695	2705	2625
	2815	2815	2825	2830	2845	2895	2905	2825
	3015	3015	3025	3030	3045	3095	3105	3025
	3115	3115	3125	3130	3145	3195	3205	3125
	3315	3315	3325	3330	3345	3395	3405	3325
	3540	3540	3550	3555	3570	3620	3630	3550
	3640	3640	3650	3655	3670	3720	3730	3650
	3740	3740	3750	3755	3770	3820	3830	3750
	3840	3840	3850	3855	3870	3920	3930	3850
	3940	3940	3950	3955	3970	4020	4030	3950
	4040	4040	4050	4055	4070	4120	4130	4050
	4140	4140	4150	4155	4170	4220	4230	4150
	4240	4240	4250	4255	4270	4320	4330	4250

Sizes of the pump and flange

	DN						
	40	50	H65	65	80	H100	100
a	355	355	355	490	490	490	490
b	310	310	310	425	425	425	425
c	143	149	158	178	192	240	252
Ø d	15	15	15	18	18	18	18
Ø g	75	75	75	110	110	110	110
j	23	23	23	33	33	33	33
l	150	150	150	220	220	220	220
m	325	365	400	440	450	470	525
p	110	140	140	170	165	160	200
q	210	270	260	320	310	290	365
Ø r	140	140	140	185	185	185	185
t	45	45	45	65	65	65	65
u	200	200	200	290	290	290	290
w	160	160	185	200	200	220	240
y	105	105	105	120	120	120	120
z	97	99	120	114	136	152	152

5.6.2 Installation lengths and dimensions of type M/MF

Motor types, lanterns, couplings

DN	40, 50, H65		
	<div> <div>40, 50, H65</div> <div> <div>LF 11/1</div> <div>LF 11/2</div> <div>LF 11/4</div> </div> </div>		
Lanterns	200	250	300
Ø F	200	250	300
Motor types	80 L 90 S	100 L 112 M	132 S 132 M
Ø k max.	28	38	38
h	206	216	251
i max.	50	60	80

DN	65, 80, H100, 100			
	<div> <div>65, 80, H100, 100</div> <div> <div>LF 12/1</div> <div>LF 12/2</div> <div>LF 12/4</div> <div>LF 12/5</div> </div> </div>			
Lanterns	200	250	300	350
Ø F	200	250	300	350
Motor types	90 S 90 L	100 L 112 M	132 S 132 M	160 M 160 L
Ø k max.	28	38	38	45
h	212	222	257	300
i max.	50	60	80	110

Installation lengths "x"

	DN							Maß "e"
	40	50	H65	65	80	H100	100	
Type M (unsectioned version)	655	660	670	690	705	755	765	525
	855	860	870	890	905	955	965	725
	1055	1060	1070	1090	1105	1155	1165	925
	1155	1160	1170	1190	1205	1255	1265	1025
	1355	1360	1370	1390	1405	1455	1465	1225
	1580	1585	1595	1615	1630	1680	1690	1450
	1680	1685	1695	1715	1730	1780	1790	1550
	1780	1785	1795	1815	1830	1880	1890	1650
	1880	1885	1895	1915	1930	1980	1990	1750
	1980	1985	1995	2015	2030	2080	2090	1850
	2080	2085	2095	2115	2130	2180	2190	1950
	2180	2185	2195	2215	2230	2280	2290	2050
	2280	2285	2295	2315	2330	2380	2390	2150
	2380	2385	2395	2415	2430	2480	2490	2250
	2505	2510	2520	2540	2555	2605	2615	2375
	2580	2585	2595	2615	2630	2680	2690	2450
Type MF (sectioned version)	2705	2710	2720	2740	2755	2805	2815	2575
	2805	2810	2820	2840	2855	2905	2915	2675
	2755	2760	2770	2790	2805	2855	2865	2625
	2955	2960	2970	2990	3005	3055	3065	2825
	3155	3160	3170	3190	3205	3255	3265	3025
	3255	3260	3270	3290	3305	3355	3365	3125
	3455	3460	3470	3490	3505	3555	3565	3325
	3680	3685	3695	3715	3730	3780	3790	3550
	3780	3785	3795	3815	3830	3880	3890	3650
	3880	3885	3895	3915	3930	3980	3990	3750
	3980	3985	3995	4015	4030	4080	4090	3850
	4080	4085	4095	4115	4130	4180	4190	3950
	4180	4185	4195	4215	4230	4280	4290	4050
	4280	4285	4295	4315	4330	4380	4390	4150
	4380	4385	4395	4415	4430	4480	4490	4250

Sizes of the pump and flange

	DN						
	40	50	H65	65	80	H100	100
a	560	560	560	560	560	560	630
b	530	530	530	530	530	530	600
c	143	149	158	178	192	240	252
d	500	500	500	500	500	500	570
f	106	106	106	106	106	106	120
ø g	75	75	75	110	110	110	110
m	325	365	400	440	450	470	525
ø r	140	140	140	185	185	185	185
w	160	160	185	200	200	220	240
z	97	99	120	114	136	152	152

5.7 Power supply



The power connection must be performed by a skilled electrician only.



Grounding, zero connection, current-operated earth leakage protection, etc. must meet the provisions of the local power supplier and function properly, as checked by the skilled electrician.



The section and voltage drop of the power supply line shall meet the relevant requirements. The voltage indicated on the nameplate of the pump shall meet the existing power supply voltage.



The connection of a potential equalisation shall be provided between the pump and foundation ground.

5.8 Motor protection

A motor protection switch or an adequate protector with a tripping characteristic according to DIN VDE 0660 shall be used.



Direct start:

At direct start, the motor protection switch shall be regulated for nominal motor current.

**Star-delta start:**

The motor protection switch shall be included in the delta circuit and adjusted to 0.58 times the nominal power maximum.



The pump shall be stopped immediately after starting.

Dry-running of the pump will destroy the shaft sealing.



Motors with additionally installed PTC-resistor sensors:

- Test voltage of PTC-sensors **1.5 V** max.!
- To be operated with a tripping aid only!



By rotation sense control, the pump shall be safeguarded so that no personal injury can happen by a rotating impeller. Avoid gripping into the pressure pipe joint or the suction opening of the pump casing.

**EX:**

If the thermal winding protector optionally installed performs the tripping, the system must not start again automatically unless the malfunction is checked and corrected again.



At a control system with several pumps, each pump shall be tested individually.

5.9 Rotation sense control

Three-phase current motor shall be subject to a thorough rotation sense control, at first start-up and when re-started on a new installation site. Rotation in the wrong direction means less pumping output and may damage the pump.



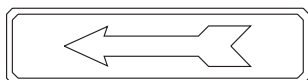
If an explosion hazard exists also during installation, the rotation sense must in no case be checked by momentary starting the empty pump.



When viewed on the motor fan, the latter shall rotate clockwise.

5.9.1 Changing the rotation sense

At incorrect rotation sense, the direct shall be reversed by commuting two phases of the lead cable in the control system.



Rotation sense
conforming to the rotation
arrow!

5.10 Motor connection diagrams:

Operating voltage	Operating frequency	Motor voltage (motor nameplate)	
		230/400V Δ/Y 50Hz 275/480V Δ/Y 60Hz	400/690V Δ/Y 50Hz 655-725V Y 50Hz 448-480V Δ 60Hz 460-500V Δ 60Hz
220-240V 230V	50Hz		
380-420V 400V	50Hz		
655-725V 690V	50Hz		
440-480V 460V	60Hz		



Incorrect electric circuit type lead to failure of the electric motor!g



The following rules are specifically required for the application range of **DIN 1986**:

The pressure line shall be routed with a back-pressure loop (180° arc) through the backflow level and then with slope into the collective line or sewer.

Do not connect the pressure line to a down-pipe.

No other pressure supplies shall be connected to the pressure line.



Make sure to **install** a

shutoff gate valve for closing the lines immediately in front of the pump, to remove the pump without draining the lines first.

Backflow preventer between the pressure pipe joint and the shutoff valve, to prevent the return flow of the pumped medium and fluid bounces after shutting down the pump.

5.11 Routing of pipelines

For the routing of the pressure line, the currently valid specifications and the relevant regulations for the prevention of accidents shall be followed.



For laying the pipes, suitable measures shall be taken to ensure complete ventilation.

The pressure line shall be routed free from freezing.

The pressure lines shall be supported and connected free from stress. No piping forces and moments shall act on the pump.

5.12 Anti-freezing



In the case of freezing hazard or prior to longer periods of standstill, make sure to run the pump empty.

6. Commissioning

Before starting up the pump, inspect the pump and perform a functional checkout. Make sure to observe the following items:

- Avoid the pump running dry!
- Has the electric connection been made in compliance with local provisions?
- Is the temperature protector connected?
- Is the motor protector switch correctly set?
- Is the rotation sense of the pump correct, also if operated by an emergency power supply?
- Does the level control operate correctly?
- Are the gate valves needed for operation open?
- Are the connection and control cables installed correctly?
- Is the pump mounted firmly?
- Has the shaft been cleaned?
- Are the inlets and outlets of the pumping station checked and free from any hazard?
- Is for explosion-proof pumps the casing permanently immersed in the medium?



Coupled machines must be grounded to exclude electric sparking.



Any lubricators additionally installed need a start-up period of approx. 5 to 7 days, at a room temperature of about 20°C.

6.1 Operation modes and starting frequency

All types are designed for the S1 mode (permanent operation) with an immersed casing component.



A motor protection switch or an adequate motor protector shall be used, having a tripping characteristic according to DIN VDE 0660.



Level controls must be installed so that explosion-proof pumps are permanently immersed with their casing.



Prolonged operation against closed valves is not permitted, to avoid the pumped medium and the pump being heated up.

To avoid severe temperature rise in the motor and overloading of the pump, coupling, motor, seals and bearings, 10 starting procedures per hour shall not be exceeded.



The switching frequency permitted for any starting equipment shall be requested from the producer concerned.

6.2 Starting

- Open gate valves and shutoff cocks.
- Start the motor..
- Open the shutoff cocks of pressure gauges.

First turn the gate valve open slightly on empty pressure line., then at full power until reaching the motor capacity permitted (compare ammeter reading with respective data on the motor nameplate!).

7. Service / maintenance / cleaning



The chapter Service / maintenance / cleaning is intended for skilled personnel. Maintenance, repair and cleaning activities must be performed by skilled engineers only. The skilled personnel shall be provided with personal protective wear (e.g. protective gloves).

Skilled engineer:

Any person who, based on his/her technical education, know-how and experiences as well as the knowledge of the relevant standards is capable of judging the duties assigned to him/her and who can recognize any potential hazards.

Definition is similar to EN 60204-1.



The content and setup of this maintenance instruction has been based on DIN 31 052 "Trouble-shooting".

To ensure smooth operation of the pump free from troubles, it is necessary that the pump is cleaned and maintained at regular intervals.



Give the impeller time to decelerate until standstill, otherwise there will be a hazard of injury. Make sure that the pump cannot roll away or trip over. There will be a danger of injury of damage!



Make always sure to wear personnel protective clothing like safety glasses and rubber gloves, when pumping matter harmful to your health.

During operation the pump is subject to vibrations that may cause fastening screws or clamps to work loose. To prevent damage, make sure to inspect the pump for loose connections, at regular intervals (recommend interval for one-shift operation: 6 months). Regularly remove any dust accumulations and dirtiness.



Before performing any maintenance, repair and cleaning operations, make sure to follow the shutdown procedure (see chapter 4.5 Shutdown procedures). Make sure to only use tools and objects specifically intended for these operations.



When installing the pump, make sure to follow the safety precautions for work in closed rooms of sewage disposal systems and the generally approved "**Rules of the Art**".

7.1 Service



The hoisting gear must be of sufficient capacity and dimensions for the total weight of the pump. Make sure to follow the provisions for the prevention of accidents and the general rules of technology.

Subject the hoisting gear to a visual inspection for wear and corrosion, at half-yearly intervals, and replace it as necessary.



During maintenance and repairs, be sure to prevent squeezing hazards!



During maintenance, observe the hazards by electric power!



Waste and emissions shall be collected in suitable containers and disposed of as legally specified.



Interventions in explosion-proof pumps must be performed in/by workshops/persons authorized to do so, using only original components produced by the manufacturer. Otherwise, the Ex-Certificate will expire.

7.2 Maintenance instructions at prolonged periods of standstill

In regular cases, the pumps do not need any maintenance. However, to prevent the pump from blocking, rotate the motor shaft several times at half-yearly intervals by hand. The anti-friction bearings of the motor are free from maintenance.



The pumps must be protected against weather effects (UV-radiation, sunlight, high air humidity, frost, etc.).



Prior to removal of the pump in areas subject to explosion hazard, make sure to ventilate the shaft or building sufficiently, since otherwise there might be a danger of explosion by spark ignition.

• Prior to installation of the sewage pump

Before connection to electrical power rotate the motor shaft several times by hand.



Repairs and extensive maintenance work of pumps in explosion-proof design shall be performed on un-mounted units in separate rooms.



Dry-running of Ex-pumps used in areas subject to explosion hazard is not permitted.

7.3 Bearing lubrication

The bearing temperature (pump and motor) may be max. 50 °C higher than room temperature, but not exceed +90°C.



Place the pump on a firm base and secure against tipping over!



Danger of tipping exists when disconnecting the pump from the piping system.



Ball bearings at a revolution rate of 1450 (1750) rpm shall be re-lubricated after 20.000 operating hours, at a rate of 2900 (3600) rpm after 10.000 operating hours, but not later than after 3 years, or replaced as necessary.



Ball bearings used in Ex-areas at a revolution rate of 1450 (1750) rpm shall be replaced at intervals of 20.000 and such of 2900 (3600) rpm at intervals of 10.000 operating hours.



Make sure to use only physiologically safe oil and greases for applications in used or raw waters.

7.3.1 Bearing lubrication of motor shaft

Permanently lubricated and maintenance-free anti-friction bearings for the motor shaft of all pumps.

7.3.2 Bearing lubrication of pump shaft



Anti-friction bearings are pre-lubricated ex-works.

7.4 Re-lubrication



Make sure to use the same grade of lubricant or re-lubricate anew. Use water-resistant grease.



Make sure to avoid over-lubricating the bearings.



Lubrication grease is harmful to your health if swallowed.



Grease shall be disposed of properly!

7.4.1 Re-lubrication of anti-friction bearings



Anti-friction bearings are re-lubricated on tapered grease nipples H1, G $\frac{1}{4}$ (DIN 71412).

DN 40/50/H65: At a revolution rate of 1450 (1750) rpm re-lubricate at intervals of 5000 and at a revolution rate of 2900 (3600) rpm at intervals of 2500 operating hours with 7 g of grease.

DN 65/80/H100: At a revolution rate of 1450 (1750) rpm re-lubricate at intervals of 4000 and at a revolution rate of 2900 (3600) rpm at intervals of 2000 operating hours with 8 g of grease.

DN 100: At a revolution rate of 1450 (1750) rpm re-lubricate at intervals of 3500 and at a revolution rate of 2900 (3600) rpm at intervals of 2000 operating hours with 10 g of grease.

7.4.2 Re-lubrication of slide bearings



Slide bearings are re-lubricated on flat grease nipples M1, G $\frac{1}{4}$ (DIN 3404).

By hand

At a revolution rate of 1450 (1750) rpm 1 x and at a revolution rate of 2900 (3600) rpm apply 10 g of grease 2 x per week.

7.4.3 Re-lubrication by grease pump (available as an accessory only)

If lubrication is ex-works by automatic grease pump, the slide bearings on the pump will be re-lubricated automatically during operation by a grease pump. For this purpose, the grease is pumped automatically from the tank through the lubricant lines to each lubrication point.



The pumped quantity shall be regulated during operation of the pump.



Re-fill grease in time, before air is pumped into the lubrication lines.



Ex-works the grease pump is set to full stroke.



Re-fill the grease tank only after release of the motor in accordance with the 5 safety rules of electrical engineering.

For regulating the grease volume needed:

- Loosen the counter-nut of the adjusting bolt at the grease pump.
- Turn the adjusting bolt gently clockwise to its stop.
- Turn the adjusting bolt approx. ½ turn counter clockwise (corresponds to 1/8 of the full stroke volume = approx. 1 g of grease per hour).
- Re-tighten the counter-nut



Do not tighten the counter-nut by force.

After loosening the counter-nut, gently turn the adjusting bolts at connections not needed clockwise until they stop.



Do not plug the outlet boreholes of connections no longer needed by blind screws or blind rivets.
Use wooden or cork plugs instead.

Grease filling of the grease pump and the lubricant lines:

- Actuate the drive shaft of the grease pump until the grease leaves all outlet boreholes without any air bubbles.
- Connect cleaned lubricant pipes.
- Re-start the grease pump until all lubricating lines are filled and the grease emerges at the end free from bubbles.
- Tighten the lubricant lines at each lubrication point.



Only use greases of the NLGI Class 2 according to DIN 51818.
Do not mix different grease types.

Perform thorough cleaning of the grease pump including lubricant lines using petrol or kerosene:

- at least once per year;
- when re-starting the pump after a prolonged period of delivery;
- after several months of standstill.

Now the grease pump shall be filled with grease again.

7.4.4 Re-lubrication with lubricant dispenser (available as an accessory only)

On ex-works delivery with an automatic lubricant dispenser, the slide bearing on the pump will be re-lubricated automatically. For this purpose, the lubricant dispenser permanently presses the grease with a constant pressure of 4 bar max. through the lubricant lines to each lubrication point.

Ambient temperature:

lower temperature limit: 0 °C

upper temperature limit: + 40 °C

The lubricant dispenser dispenses a grease volume of approx. 5 g per week. This results in a dispensing duration of 6 months.



The consumption of lubricant shall be checked on the filling level indicator at regular intervals.



Do not unscrew the lubricant dispenser during the dispensing duration.



Replacement of the lubricant dispenser only after release of the motor according to the 5 safety rules of electrical engineering.

Replacement of lubricant dispenser:

- Unscrew the used-up lubricant dispenser.
- Keep the lubricant dispenser vertical.
- Screw-in the red activation screw until the annular lub tears off at the predetermined breaking point.
- Unscrew the plug.
- Turn the lubricant dispenser by hand onto the lubrication point.



Only greases of the NLGI Class 2 according to DIN 51818 shall be used
Make sure to mix greases only with lithium complex soap or barium complex soap as thickening agent.



The lubricant dispenser needs a start-up preparation time of approx. 5 to 7 days at a room temperature of about 20°C.



The lubricant dispenser remains at pressure even some days after use.
Do not open the lubricant dispenser.

7.5 Couplings



Works on the coupling shall be performed at standstill only. The drive unit must be secured against accidental start-up.



Any protection equipment shall be installed as required after any maintenance work.



The torsion backlash control must take place, for the first time, after 3000 operating hours, but not later than after 4 months. If only a small wear is found by this control, the control can be done after 6000 hours or 1 year later. At high wear, the installation conditions of the coupling and the operating conditions of the pump shall be revised. For this purpose, we recommend to make contact with Herborner Pumpenfabrik.

To check the torsion backlash, one coupling part is rotated to the stop, without any torque, and a marking is applied to both coupling halves. By another rotation of the coupling half into the opposite direction until it stops, the distance is determined (max. distance approx. 8 mm).

The coupling provided ex-works permits emergency operation to be run after the elements have worn. This causes direct contact between the metal parts, leading to damage.



Emergency operation is not permitted in Ex-areas.



On the coupling, the threaded pins for securing the hub shall be safeguarded additionally against working loose, e.g. by pasting with Loctite (medium-hard).

7.6 Cleaning

When removing or disassembling the pump, clean it from any deposits, if necessary by mechanical means, to ensure smooth operation.

In case the pump is to be shut down and taken out of service for a prolonged working period, it shall first be thoroughly flushed with clean water and cleaned carefully. Any dirt residues dried-in, lime deposits, etc. may obstruct the impeller and the shaft.

7.7 Tightening torques for bolts

thread	stainless (A4) [Nm]	not stainless	
		8.8 [Nm]	10.9 [Nm]
M8	18,5	23,0	32,0
M10	37,0	46,0	64,0
M12	57,0	80,0	110,0
M16	135,0	195,0	275,0
M20	230,0	385,0	540,0



All bolts and screws shall be tightened properly during mounting.

8. Malfunction / cause / rectification



The facts and remarks to "troubleshooting, reason, correction" are in such wording that any persons with technical education (see the definition in chapter 3.4 "Safety instructions") in

- Electricity / electronics
 - Mechanics / service
- are able to follow them.



This personnel shall be equipped with adequate tools and testing utilities. Prior to any maintenance and repair activities, make sure to follow the shutdown procedures (see chapter 4.5). If the instructions provided to not yield success you should make contact with Herborner Pumpenfabrik.



No malfunctioning will be expected when following the operational provisions with responsibility. The pump shall not be removed before all other measures have proved to be without success. If any troubles cannot be eliminated, we recommend to contact our customer service.

Malfunction	Cause	Rectification
Pump does not work! Danger of dry-running!	Pump or pipeline not filled completely	Ventilate or fill pump and pressure line
	Feed line and/or impeller clogged	Clean feed. Remove any deposits in the pump/piping
	Motor does not rotate	Check electric installation
	Gate valve closed	Open gate valve
	Pumping head too high	Check system for contamination or check pump layout
Pump delivers not enough.	Density of pumped medium too high	Dilute pumped medium or modify process
	Too high content of air/gas in pumped medium	Clarification required
	Incorrect rotation sense of pump	Verify rotation and exchange two phase of motor supply, if necessary
	Impeller loose or worn-out	Check impeller and replace if necessary
	Pump works against too high pressure	Check pressure. Change routing of pipe. Verify pump design
	Gate valve closed too much	Open gate valve
	Piping or pump clogged	Check piping or pump, clean if necessary
	Running on 2 phases	Replace defective fuse or check connectors

Malfunction	Cause	Rectification
Pump vibrates or makes noise	Too high content of air/gas in pumped medium	Clarification necessary
	Incorrect rotation sense of pump	Check rotation sense and exchange two phases to the motor, if necessary
	Impeller loose or worn-out	Check impeller and replace, if necessary
	Pump does not operate in specified operation range	Check operation conditions
	Anti-friction bearing of motor defective	Replace anti-friction bearing.
	Anti-friction bearing of pump not lubricated properly	Clean and re-lubricate anti-friction bearing
	Anti-friction bearing of pump defective	Replace anti-friction bearing
	Pump installed under tension	Connector piping must be routed without tension
	Cavitation	Check the suction side for clogging. Check operating point, adjust if necessary
Pump starts but stops immediately	Thermal switch has tripped. Insufficient cooling of motor	Verify motor cooling
	Thermal switch has tripped.	Check rotation sense
	Incorrect rotation sense of pump	
	Power consumption too high	Check the pump for smooth functioning
	Density of pumped medium too high	Dilute pumped medium or modify process

Malfunction	Cause	Rectification
Pump starts but stops immediately	Pump does not operate in the operation range specified	Verify operation conditions
	Clogged pump has tripped motor protection relay	Check pump for smooth running
	Float switch not adjusted correctly	Check float switch
	Pump switches over too often	Observe operation mode
	Motor incorrectly connected	Connect motor for existing operating voltage
Bearing runs hot	Bearing runs without lubrication: a) grease is missing b) air bubbles in lubricant pipes (if existing)	Refill grease, replace bearings if necessary
	Too much grease in bearing (only for anti-friction bearings of pump)	Remove any excessive grease until balls are just covered by grease
	Pump installed under tension	Connection lines must be routed free of tension
	Anti-friction bearing defectiv	Replace anti-friction bearing
Electric motor runs excessively hot	Incorrect rotation sense of pump	Verify rotation sense, if necessary exchange two phase to motor
	Pump does not operate in specified range	Check operational conditions
	Density of pumped medium too high	Dilute pumped medium or modify process

Malfunction	Cause	Rectification
Electric motor runs excessively hot	Feed line and/or impeller clogged	Clean feed line. Remove deposits in pump/piping system
	Motor too weak	Replace by stronger motor
	Motor connected incorrectly	Connect motor for existing operation voltage
	Coolant temperature >40°C	Check the ventilation paths
	Pump switches too frequently	Verify operation mode

9. Disassembly / assembly



The pump is mainly constructed of steel and shall be disposed of in compliance with the local environment rules. Oils and cleaning agents shall be disposed of in compliance with local provisions.

Cleaning tools (brushes, cloths, etc.) shall be disposed of in compliance with valid environment provisions or in accordance with the manufacturer's specifications.

9.1 Disassembly



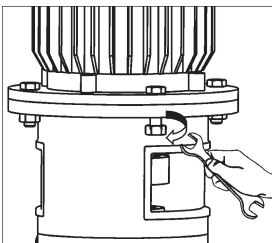
Electric power may lead to the death of persons.

Relieve the motor in compliance with 5 safety provisions.



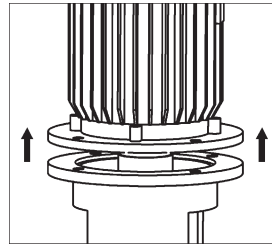
For the design BF/MF, additionally refer to item 30.

1.



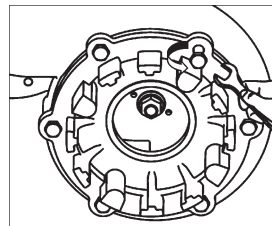
Unscrew the connection screws of the lantern (1) and motor (98).

2.



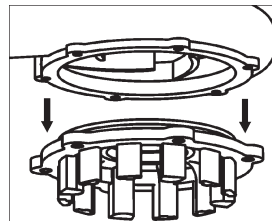
Lift the motor (98) from the lantern (1).

3.



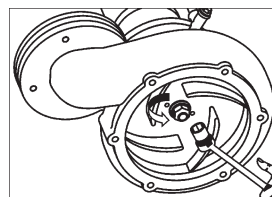
Unscrew the connecting screws of the casing (14) and the cover (15).

4.



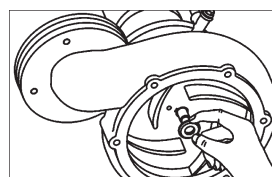
Lift to cover (15) from the casing (14).

5.



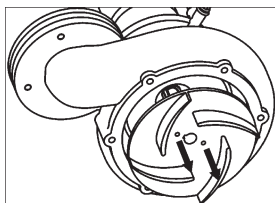
Unscrew the impeller nut (16).

6.



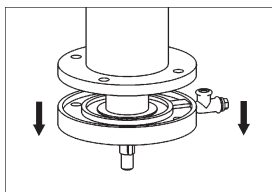
Remove the washer (93) (omitted for DN 100).

7.



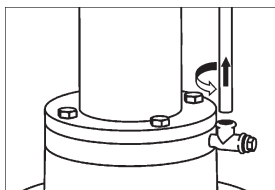
Pull off the impeller (18) from shaft (22) by means of an extractor. 2 threaded boreholes (M6 / M8) exist in the impeller.

12.



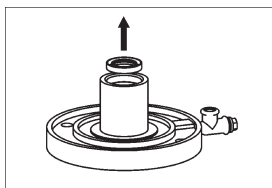
Lift off the stuffing box bearing (12).

8.



Remove the lubricant pipe (10) from the stuffing box bearing (12).

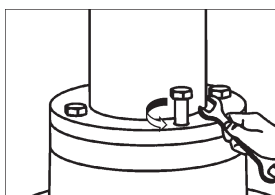
13.



Remove the shaft seal ring (8c) from the stuffing box bearing (12).

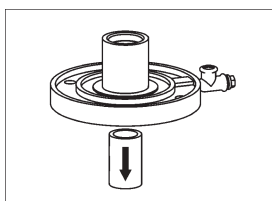
For DN 100 additionally remove 2 lower shaft seal rings (8c).

9.



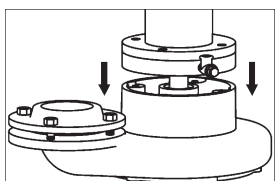
Unscrew the connection screws between the shaft tube (7), the stuffing box bearing (12) and the casing (14).

14.



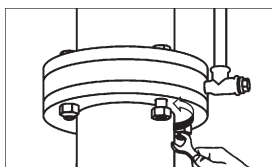
Remove the bush (20) from the stuffing box bearing (12).

10.



Lift off the casing (14).

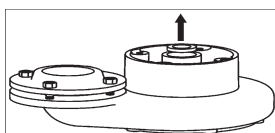
ZL1.



Design with intermediate bearing:

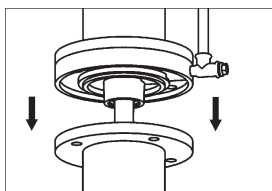
Remove connection screws between the upper side of the shaft tube (7), the intermediate bearing (9) and the lower side of shaft tube (7).

11.



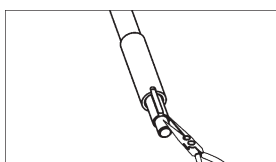
Remove the gland packing (19) from the casing (14).
Omitted for DN 100.

ZL2.



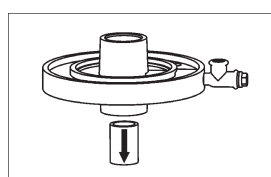
Lift off the lower side of the shaft tube (7).

15.



Remove the key from the shaft keyway.

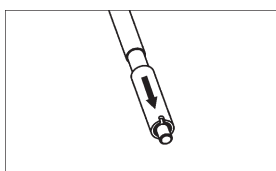
ZL6.



Design with intermediate bearing:

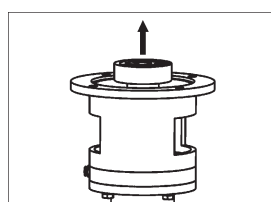
Remove the bush (21) from the intermediate bearing (9).

16.



Pull off the shaft wearing sleeve (11) from the shaft (22).

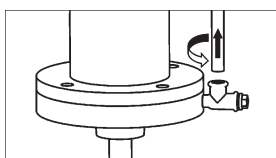
17.



NOTE: Remove the protective grid from the lantern (1)!

Pull off the lower coupling half (package sie) from the shaft (22).

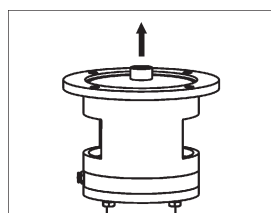
ZL3.



Design with intermediate bearing:

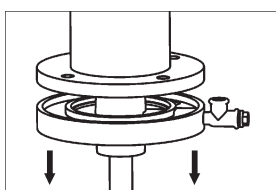
Remove the lubricating pipe (10) from the intermediate bearing (9).

18.



Pull off the Spacer bush (2) from the shaft (22).

ZL4.

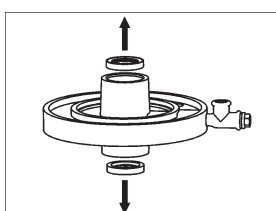


Lift off the intermediate bearing (9).

NOTE:

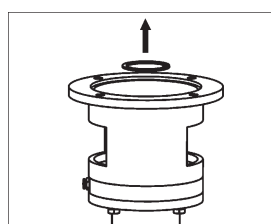
For the design with grease pump replaced by v-belt pulley.

ZL5.



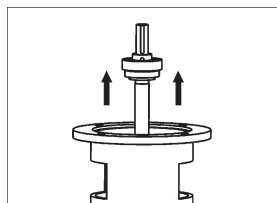
Remove the shaft seal rings (8b) from the intermediate bearing (9).

19.



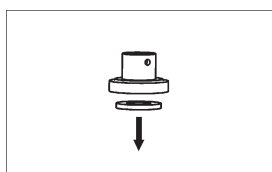
Remove the circlip (27) using grippers.

20.



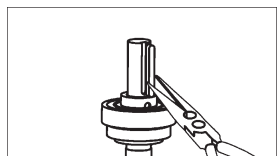
Pull out the shaft (22) with components.

25.



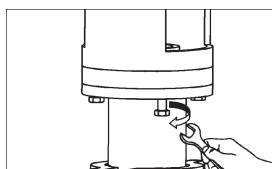
Remove the upper half of the Thrust ball bearing (6) (shaft washer) from the locking sleeve (24).

21.



Remove the key from the keyway.

26.



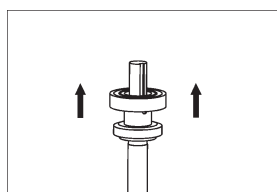
a) Design B/BF:

Unscrew the connection screws between the shaft tube (7), the bearing mounting (25) and the lantern (1).

b) Design M/MF:

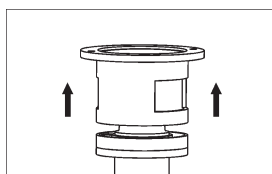
Unscrew the connection screws between the shaft tube (7) and the support housing (70) as well as between the support housing (70) and the lantern (1).

22.



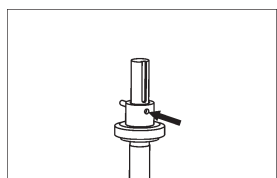
Pull off the grooved ball bearing (5) from the locking sleeve (24).

27.



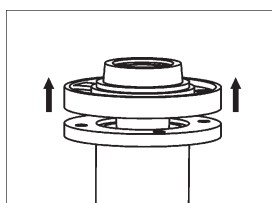
Lift off the lantern (1).

23.



Drive out the grooved pin (26) from the locking sleeve (24).

28.



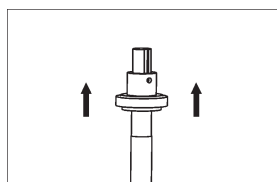
a) Type B/BF:

Lift off the bearing mounting (25).

b) Type M/MF:

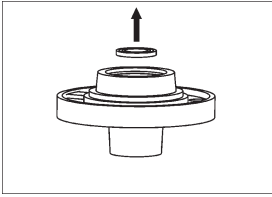
Lift off the support housing (70) with manhole cover (56).

24.



Pull off the locking sleeve (24) from the shaft (22).

29.

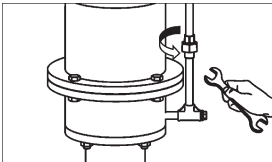


Remove the lower half of the Thrust ball bearing (6) (casing washer) and cage with ball set from the bearing mounting (25) (design B/BF) or the support housing (70) (design M/MF).

For type M/MF additionally remove 2 shaft seal rings (8a) from the support housing (70).

Clean the shaft with extremely fine abrasive cloth from any deposits and contaminations.

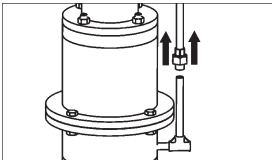
30.



Design BF/MF:

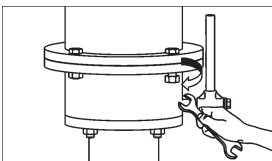
Unscrew the nut from the lubricating pipe (10).

31.



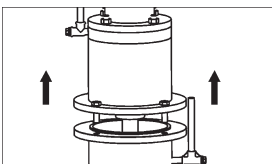
Remove the lubricating pipe (10).

32.



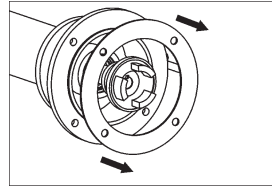
Unscrew the connection screws from the cover (29) and the bearing mounting (34).

33.



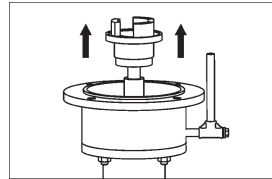
Lift off the cover (29).

34.



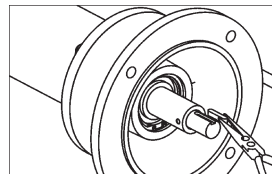
Remove the joint (92).

35.



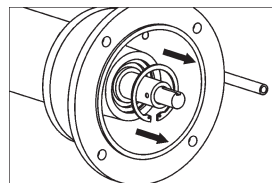
Pull off the lower coupling haft (claw side) from the bottom shaft (31).

36.



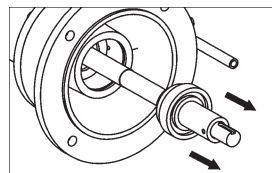
Remove the key from the keyway.

37.



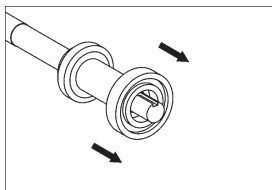
Remove the circlip by means of grippers.

38.



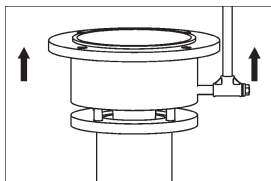
Pull out the bottom shaft (31) with components.

39.



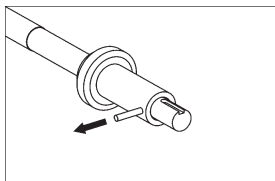
Pull off the grooved ball bearing (5) from the locking sleeve (33).

44.



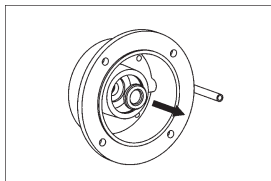
Lift off the bearing mounting (34).

40.



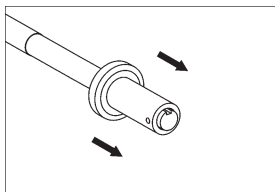
Drive out the grooved pin (26) from the locking sleeve (33).

45.



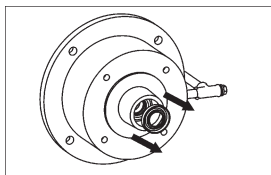
Remove the lower half of the thrust ball bearing (6) (casing washer) and the cage from the bearing mounting (34).

41.



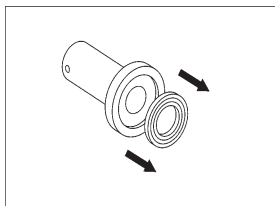
Pull off the locking sleeve (33) from the bottom shaft (31).

46.



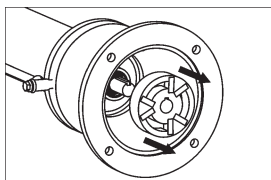
Remove the shaft seal rings (8e) from the bearing mounting (34).

42.



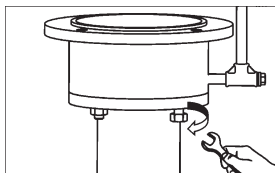
Remove the upper half of the thrust ball bearing (6) (shaft washer) from the locking sleeve (33).

47.



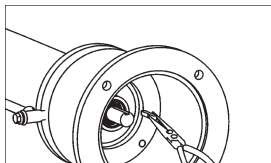
Pull off the upper coupling half (package side) from the top shaft (35).

43.



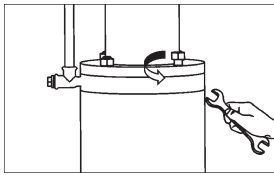
Unscrew the connection screws between the bearing mounting (34) and the shaft tube (7).

48.



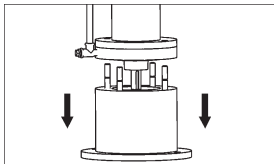
Remove the key from the keyway.

49.



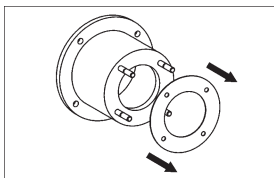
Unscrew the connection screws between the cover (29), the intermediate bearing (9) and the shaft tube (7).

50.



Lift off the cover (29).

51.



Remove the joint (92).

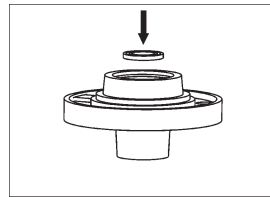
9.2 Assembly

CAUTION: Before reassembly, all disassembled components shall be

- checked for damage and wear;
- replaced by **original spare parts**, if necessary;
- cleaned before assembly;
- principally replaced, if anti-friction bearings and seals are concerned.

NOTE: For design BF/MF additionally refer to item 33.

1.



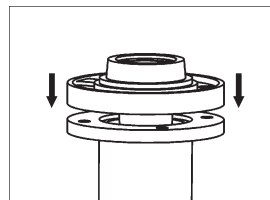
Press the lower half of the thrust ball bearing (6) (casing washer) into the bearing mounting (25) (type B/BF) or support housing (70) (type M/MF) and place the cage with ball set on top of it.

For type M/MF additionally insert 2 shaft seal rings (8a) into the support housing (70).

NOTE: Fill the anti-friction bearings with lubricant adapted to the operational conditions.

NOTE: Fill the clearance between the shaft seal rings with grease.
The sealing lip must face the side to be sealed (medium).

2.



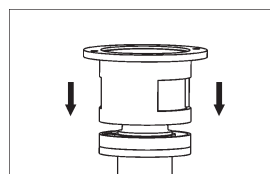
a) Design B/BF:

Push the bearing mounting (25) to the upper shaft tube (7).

b) Design M/MF:

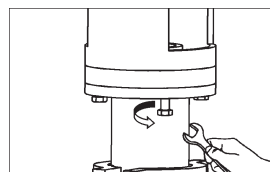
Push the support housing (70) with manhole cover (56) to the upper shaft tube (7).

3.



Push the lantern (1) to the bearing mounting (25) (type B/BF) or the support housing (70) (type M/MF).

4.



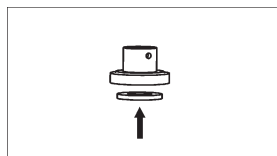
a) Design B/BF:

Screw the upper shaft tube (7) to the bearing mounting (25) and lantern (1).

b) Design M/MF:

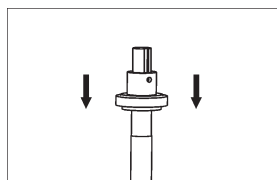
Screw the upper shaft tube (7) and lantern (1) to the support housing (70).

5.



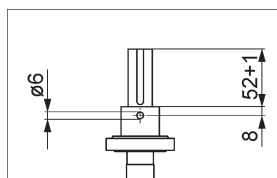
Press the upper half of the thrust ball bearing (6) (shaft washer) into the locking sleeve (24).

6.



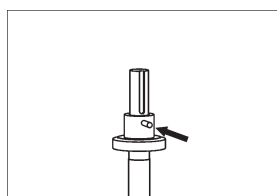
Push the locking sleeve (24) onto the shaft (22).

7.



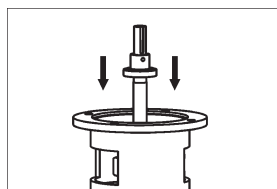
Bore the locking sleeve (24) with shaft (22) to final dimension.

8.



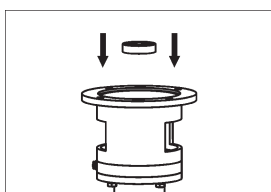
Drive in the grooved pin (26) into the locking sleeve (24) and shaft (22).

9.



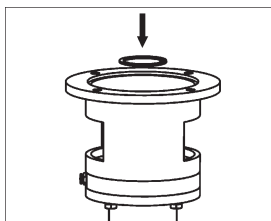
Push-in the shaft (22) into the lantern (1) with bearing mounting (25) (design B/BF) or the support housing (70) (design M/MF) right to the stop.

10.



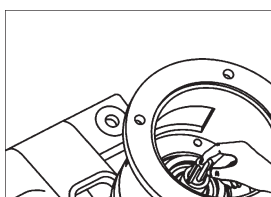
Press the deep groove ball bearing (5) into the bearing mounting (25) (design B/BF) or the support housing (70) (design M/MF) against the locking sleeve (24).

11.



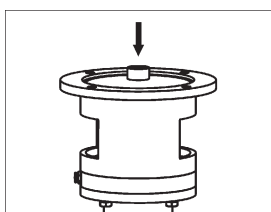
Install the circlip (27) by means of a mounting pliers in the bearing mounting (25) (design B/BF) or the support housing (70) (design M/MF).

12.



Insert the key in the keyway.

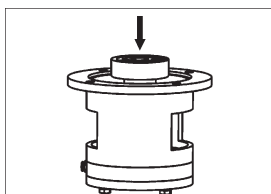
13.



Shift the Spacer bush (2) on the shaft (22).

NOTE: In the design with central grease pump replaced by a v-belt pulley.

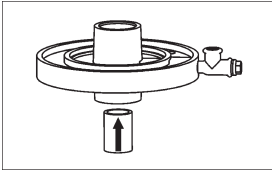
14.



Shift the lower coupling half on the shaft (22).

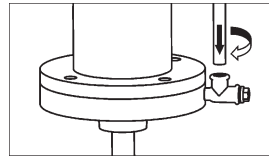
NOTE: Install the protection grid on the lantern (1)!

ZL1.


Design with intermediate bearing:

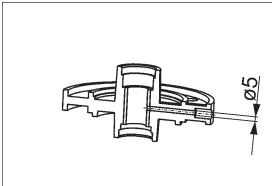
Blow the bush (21) into the intermediate bearing (9) and ream to the fit E8.

ZL6.



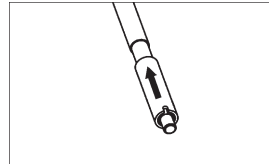
Screw-in the lubricating pipe (10) into the intermediate bearing (9).

ZL2.



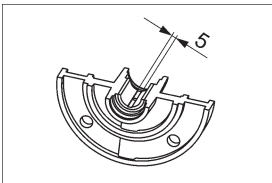
Bore the bush (21) on one side through the lubricating pipe borehole of the intermediate bearing (9).

15.



Shift the shaft wearing sleeve (11) onto the shaft (22).

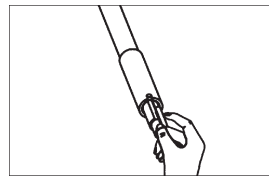
ZL3.



Apply lubrication groove of 0,5 to 1 mm depth to borehole.

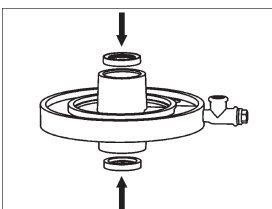
CAUTION: A rim of 5 mm must be left laterally.

16.



Place the key into the keyway.

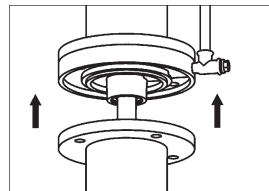
ZL4.



Insert shaft seal rings (8b) in the intermediate bearing (9).

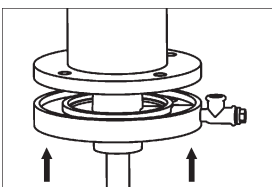
NOTE: Sealing lip must face the side (medium) to be tight.

ZL7.


Design with intermediate bearing:

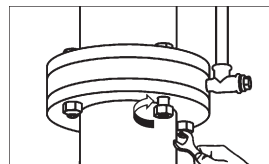
Shift the lower end of the shaft tube (7) to the intermediate bearing (9).

ZL5.



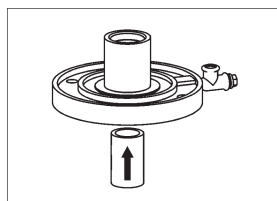
Shift the intermediate bearing (9) onto the shaft tube (7).

ZL8.



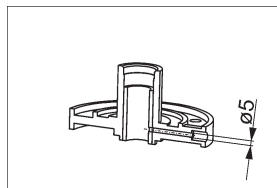
Screw the upper side of the shaft tube (7) to the intermediate bearing (9) and shaft tube (7).

17.



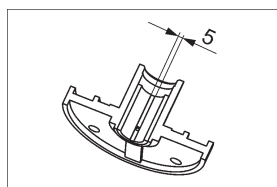
Insert the bush (20) in the stuffing box bearing (12) and ream to fit E8.

18.



Bore the bush (20) through on one side of the lubricating pipe of the stuffing box bearing (12).

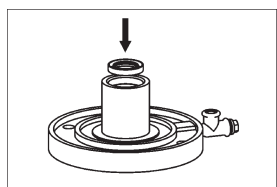
19.



Apply a lubrication groove of 0.5 to 1 mm depth to the borehole.

CAUTION: A rim of 5 mm shall be left on the side.

20.

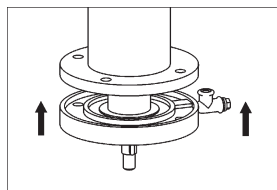


Insert the shaft seal ring (8c) into the stuffing box bearing (12).

For DN100, 2 additional shaft seal rings (8c) shall be inserted at the bottom end.

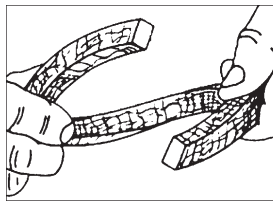
NOTE: Fill the gap between the shaft seal rings with grease.
The sealing lip shall face the side to be sealed (medium).

21.



Shift the stuffing box bearing (12) to the shaft tube (7).

22.

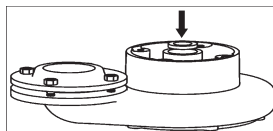


Bend individual slit packing rings laterally to a spiral and insert them in the casing (14).

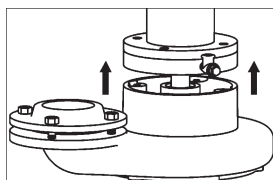
Omitted for DN100.

CAUTION: Insert the packing rings with cut faces displaced by each other by 90°.

Make sure that the packing rings are not damaged or destroyed.

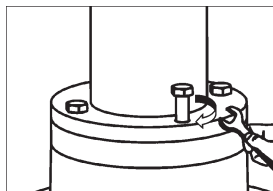


23.



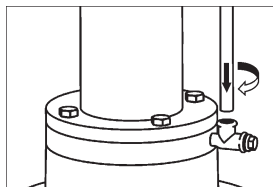
Shift the casing (14) onto the stuffing box bearing (12).

24.



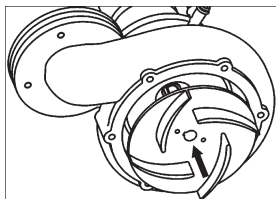
Screw the shaft tube (7) to the stuffing box bearing (12) and casing (14).

25.



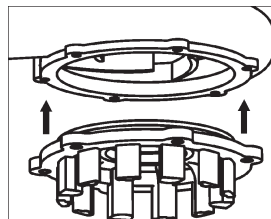
Screw the lubricating pipe (10) into the stuffing box bearing (12).

26.



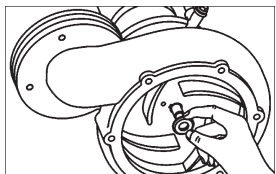
Shift the impeller (18) to the shaft (22).

29.



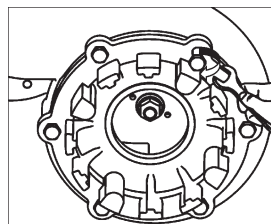
Push the cover (15) to the casing (14).

27.



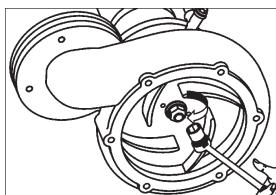
Shift the disk (93) onto the shaft (22) (omitted for DN 100).

30.



Screw the casing (14) to the cover (15).

28.



Tighten the impeller nut (16).

Air gap adjustment:

- Air gap between the blade front face and the counter face of the casing (14): 0.5 - 0.7 mm.
- Check by depth gauge, feeler gauge, etc.

1.) Impeller gap too **tight**:

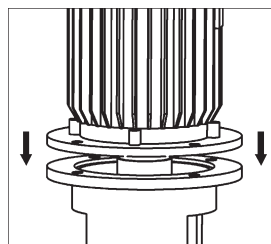
Place a joint between the cover (15) and the casing (14) when the impeller (18) makes contact with the casing (1).

2.) Impeller gap too **wide**:

Insert one or several shims behind the impeller (18) to compensate for the air gap.

NOTE: Too wide an air gap reduces the performance of the pump considerably.

31.



Shift the motor (98) onto the lantern (1).

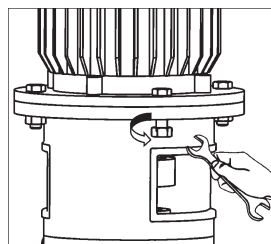
CAUTION: Maintain the coupling gap!

x = 3 mm (Lantern: LF11/1, LF12/1, LF11/2, LF12/2)

x = 5 mm (Lantern: LF11/4, LF12/4)

x = 6 mm (Lantern: LF12/5)

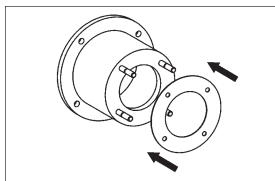
32.



Screw the lantern (1) to the motor (98).

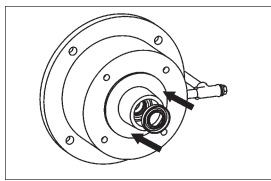
NOTE: Insert the protective grid to the lantern (1)!

33.



Design BF/MF:
Place joint to the cover (29).

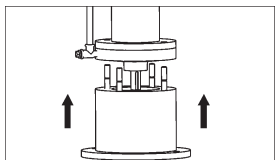
38.



Insert the shaft seal rings (8e) into the bearing mounting (34).

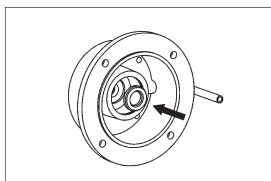
NOTE: Fill the gap between the shaft seal rings with grease.
The sealing lip shall face the medium side of the shaft.

34.



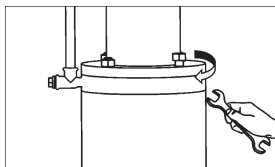
Shift the cover (29) to the intermediate bearing (9).

39.



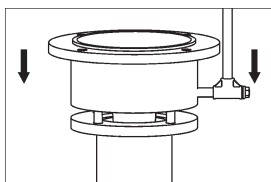
Press the lower half of the thrust ball bearing (6) (casing washer) in the bearing mounting (34) and lay the cage with the set of balls on top.

35.



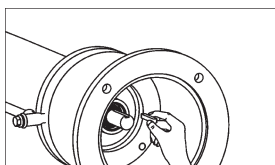
Screw the cover (29) to the intermediate bearing (9) and the shaft tube (7).

40.



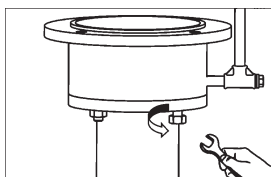
Shift the bearing mounting (34) on to the shaft tube (7).

36.



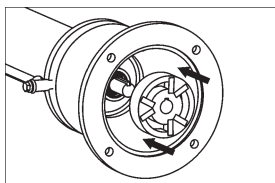
Insert the key into the keyway.

41.



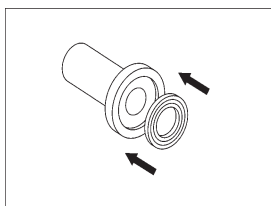
Screw the bearing mounting (34) to the shaft tube (7).

37.



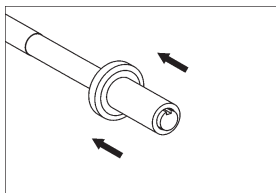
Shift the lower coupling half (package side) to the top shaft (35).

42.



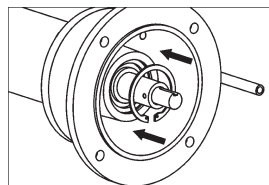
Press the upper half of the thrust ball bearing (6) (shaft washer) into the locking sleeve (33).

43.



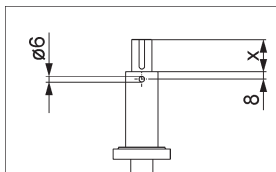
Shift the locking sleeve (33) on to the bottom shaft (31).

48.



Insert the circlip (27) into the bearing mounting (34) using a mounting pliers.

44.

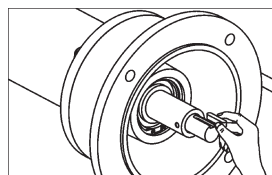


Bore the locking sleeve (33) to the final dimension with the bottom shaft.

$x = 30-1$ (S40, S50, SH65)

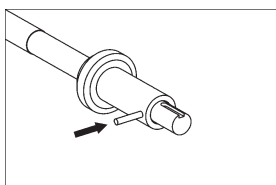
$x = 35-1$ (S65, S80, SH100, S100)

49.



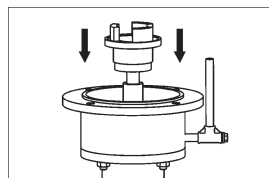
Insert the key into the keyway.

45.



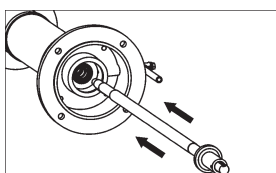
Drive the grooved pin (26) into the locking sleeve (33) and bottom shaft (31).

50.



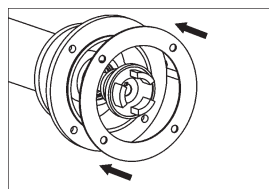
Shift the lower coupling half (claw side) to the bottom shaft (31).

46.



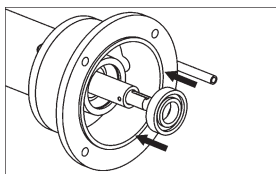
Push the bottom shaft (31) into the bearing mounting (34) right to the stop.

51.



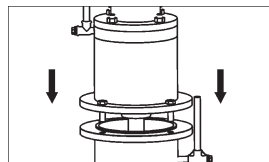
Place the seal (92) to the bearing mounting (34).

47.



Press the deep groove ball bearing (5) in the bearing mounting (34) against the locking sleeve (33).

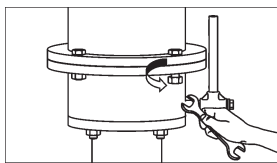
52.



Mount the cover (29) to the bearing mounting (34).

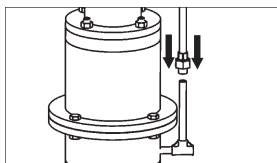
CAUTION: The coupling gap shall be 3 mm!

53.



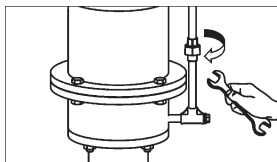
Screw the cover (29) on to the bearing mounting (34).

54.



Assemble the lubrication piping (10).

55.



Tighten the nut on the lubricating pipe (10).

- CAUTION:**
- Check the impeller (18) for free motion by turning the fan!
 - Connect the motor to power supply!
 - Observe connection diagram (see motor nameplate and operation manual).
 - Ensure "clockwise" rotation sense.

NOTE: Start up the pump set (refer to operation manual).

