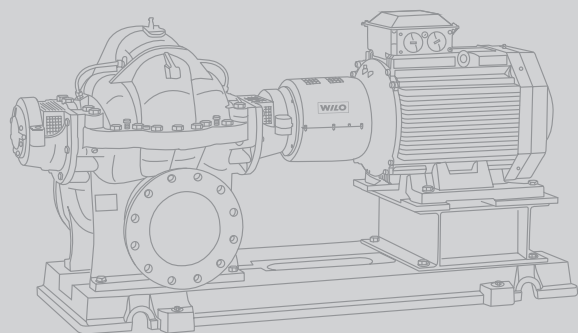


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Wilo-SCP

GB Installation and operating instructions

中 安装及操作维护说明书

Fig. 1:

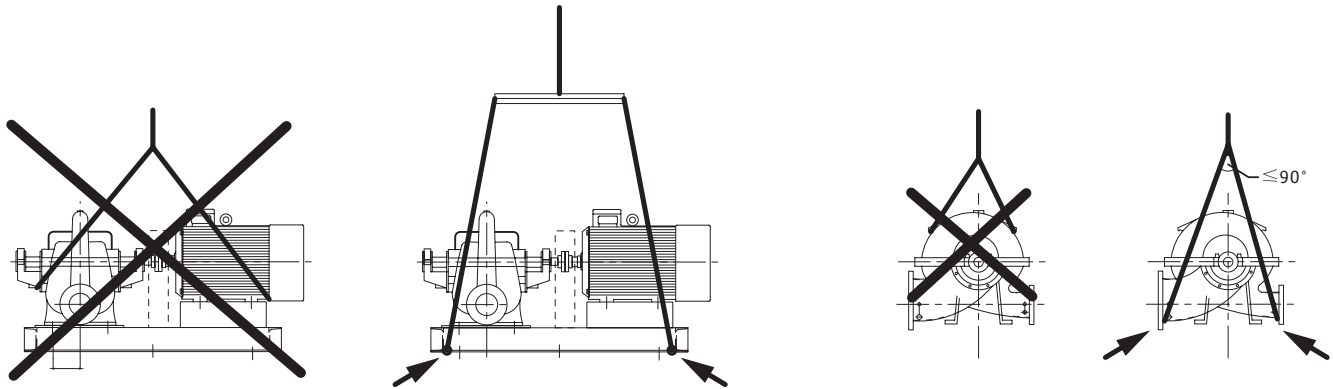


Fig. 2:

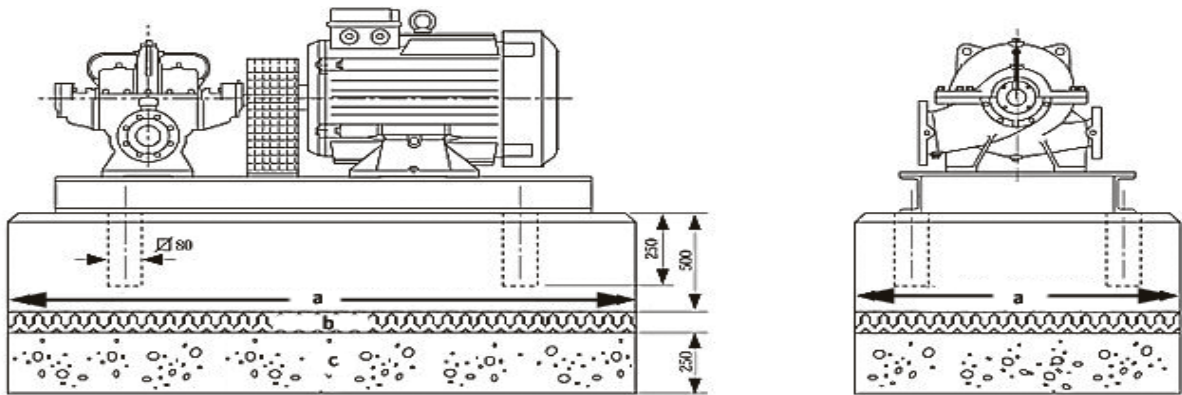


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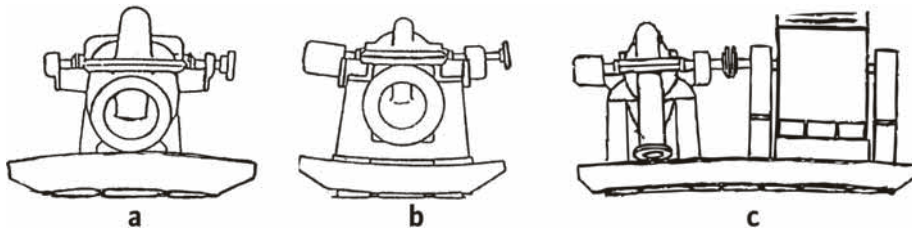


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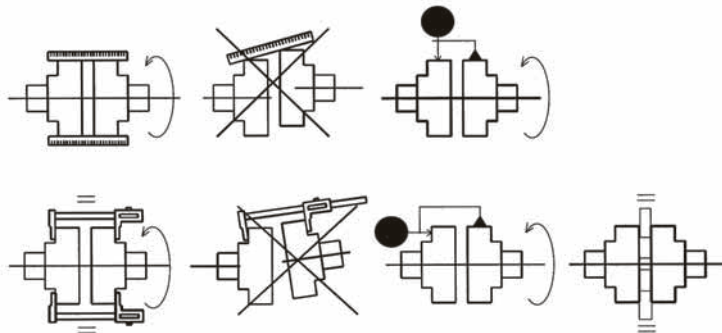


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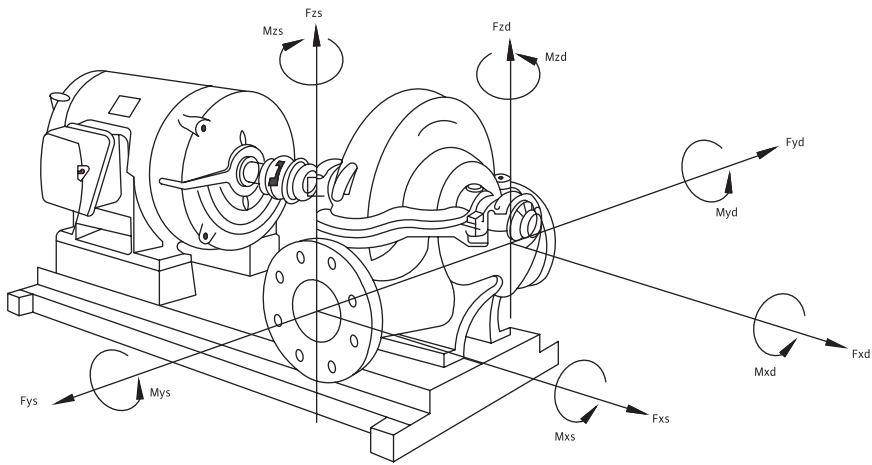


Fig.6:

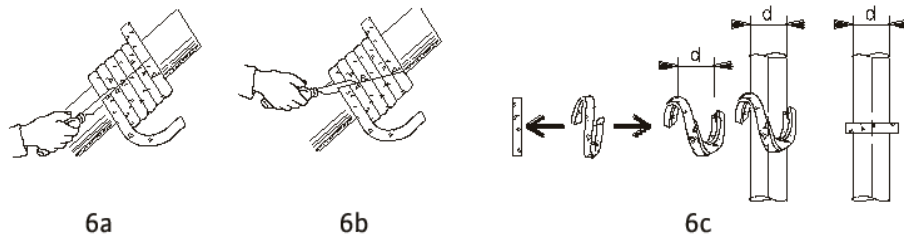


Fig.7:

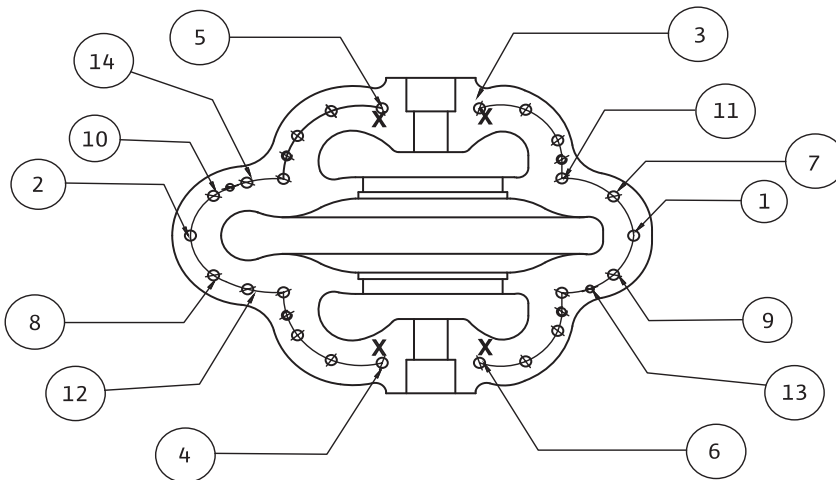


Fig. 8:

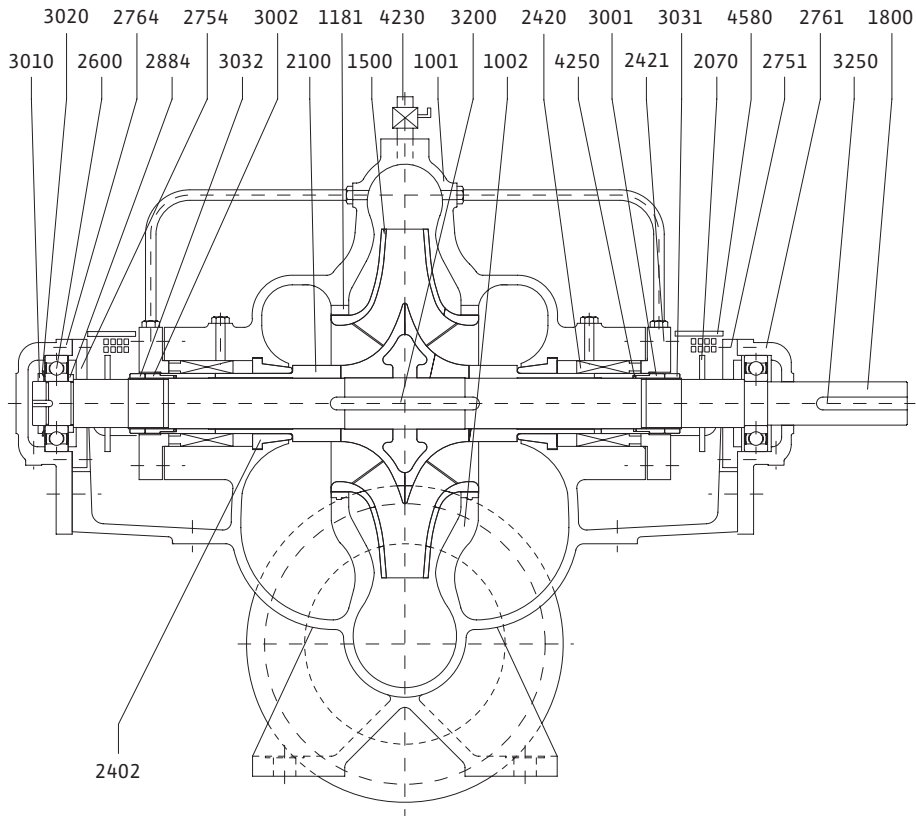


Fig. 9:

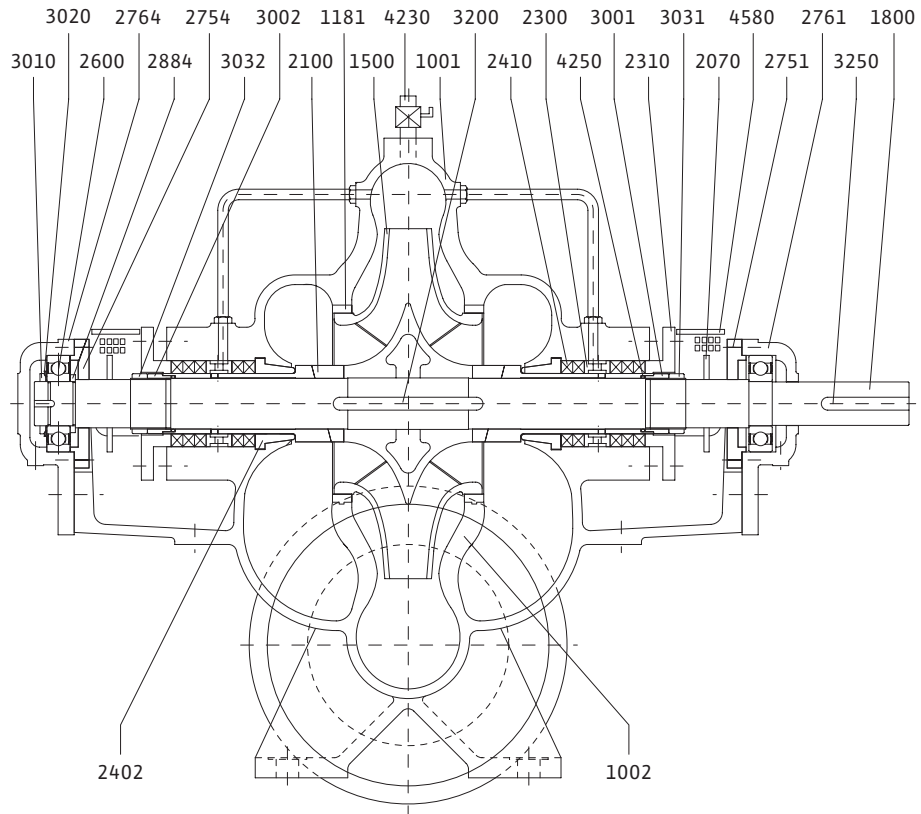


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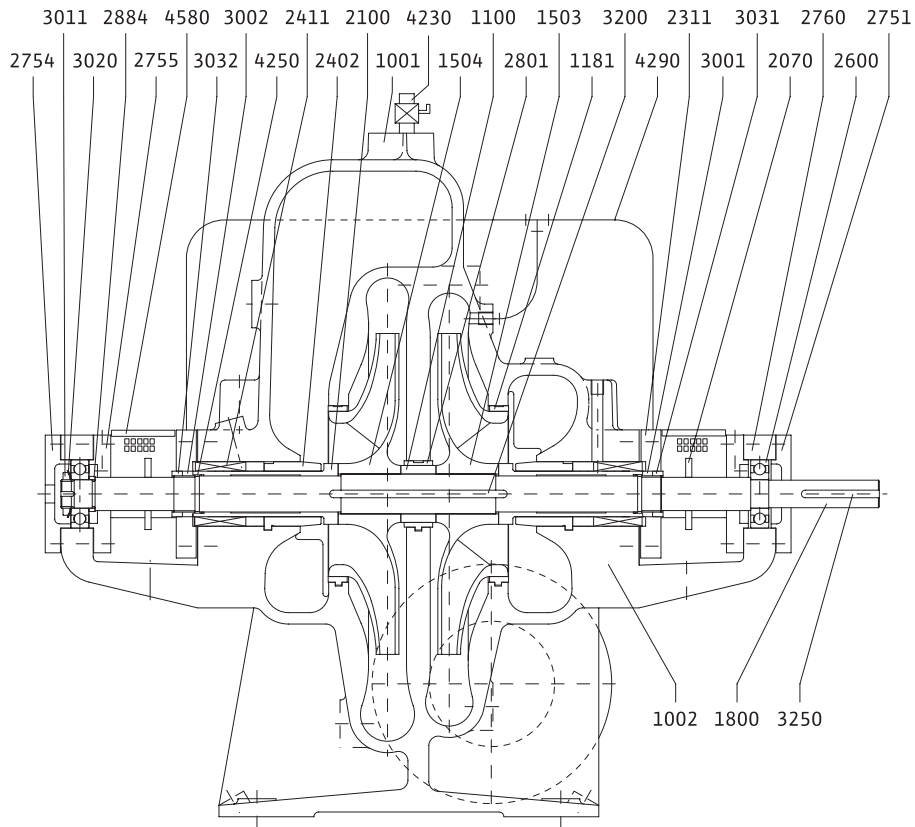
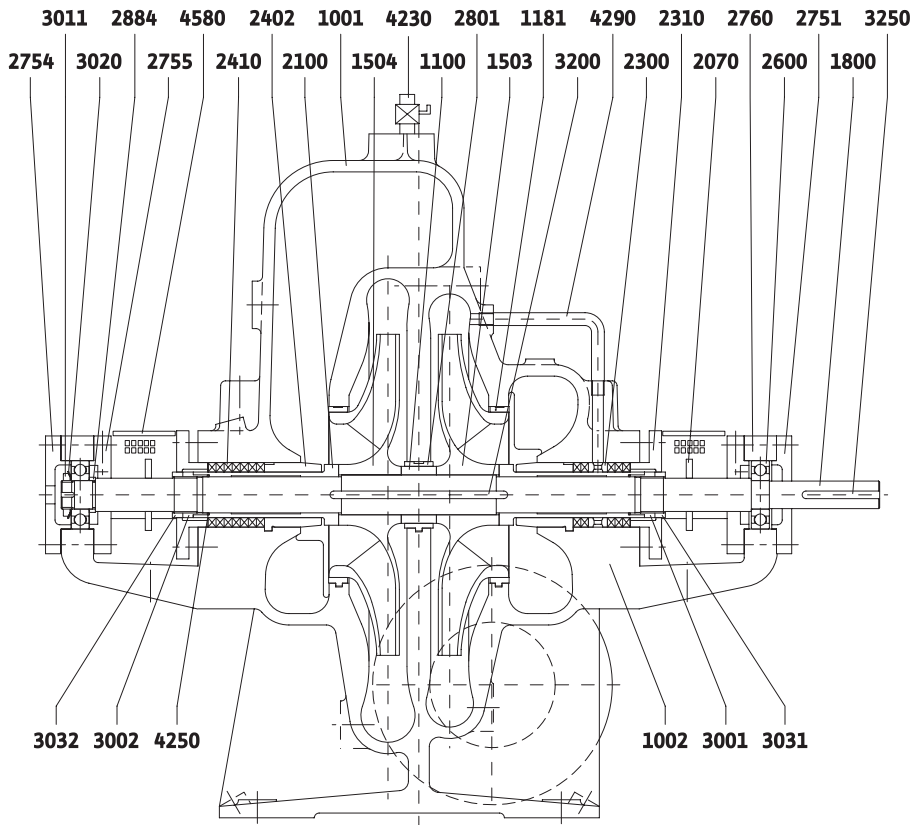


Fig.11:



Captions:

Fig. 1	Transport
Fig. 2	Example of foundation
Fig. 3	Example of foundation failures/distortion
Fig. 4	Alignment
Fig. 5	Forces and moments
Fig. 6	Stuffing box packing
Fig. 7	Re-assembly; tightening procedure

Fig. 8	Cross section (standard one-stage pump with mechanical seal)
1001	Casing top half
1002	Casing bottom half
1181	Neck ring
1500	Impeller
1800	Shaft
2070	Water deflector
2100	Shaft sleeve
2402	Stuffing box bush
2420	Mechanical seal (balanced)
2421	Gland plate (mechanical seal cover)
2600	Deep groove ball bearing
2751	Bearing end cover (drive side)
2754	Bearing end cover (non-drive side)
2761	Bearing housing (drive side)
2764	Bearing housing (non-drive side)
2884	Thrust collar
3001	Cowl nut (l. h.)
3002	Cowl nut (r. h.)
3010	Lock Nut
3020	Locking washer
3031	Sleeve nut (l. h.)
3032	Sleeve nut (r. h.)
3200	Impeller key
3250	Coupling key
4230	Air vent cock
4250	O-ring
4580	Guard

Fig. 9	Cross section (standard one-stage pump with stuffing box)
1001	Casing top half
1002	Casing bottom half
1181	Neck ring
1500	Impeller
1800	Shaft
2070	Water deflector
2100	Shaft sleeve
2300	Lantern ring
2310	Gland
2402	Stuffing box bush
2410	Gland packing
2600	Deep groove ball bearing
2751	Bearing end cover (drive side)
2754	Bearing end cover (non-drive side)
2761	Bearing housing (drive side)
2764	Bearing housing (non-drive side)
2884	Thrust collar
3001	Cowl nut (l. h.)
3002	Cowl nut (r. h.)
3010	Lock Nut
3020	Locking washer
3031	Sleeve nut (l. h.)
3032	Sleeve nut (r. h.)
3200	Impeller key
3250	Coupling key
4230	Air vent cock
4250	O-ring
4580	Guard

Fig. 10	Cross section (standard two-stage pump with mechanical seal)
1001	Casing top half
1002	Casing bottom half
1100	Inter stage collar
1181	Neck ring
1503	Impeller 1st stage (r. h.)
1504	Impeller 2nd stage (l. h.)
1800	Shaft
2070	Water deflector
2100	Shaft sleeve
2311	Gland plate
2402	Stuffing box bush
2411	Mechanical seal
2600	Deep groove ball bearing
2751	Bearing end cover (drive side)
2754	Bearing end cover (non-drive side)
2755	Bearing end cover (inside)
2760	Bearing housing
2801	Intermediate bearing bush
2884	Thrust collar
3001	Cowl nut (l. h.)
3002	Cowl nut (r. h.)
3011	Lock Nut
3020	Lock washer
3031	Sleeve nut (l. h.)
3032	Sleeve nut (r. h.)
3200	Impeller key
3250	Coupling key
4230	Air vent cock
4250	O-ring
4290	Mechanical seal flushing pipe
4580	Guard

Fig. 11	Cross section (standard two-stage pump with stuffing box)
1001	Casing top half
1002	Casing bottom half
1100	Inter stage collar
1181	Neck ring
1503	Impeller 1st stage (r. h.)
1504	Impeller 2nd stage (l. h.)
1800	Shaft
2070	Water deflector
2100	Shaft sleeve
2300	Lantern ring
2310	Gland
2402	Stuffing box bush
2410	Gland packing
2600	Deep groove ball bearing
2751	Bearing end cover (drive side)
2754	Bearing end cover (non-drive side)
2755	Bearing end cover (inside)
2760	Bearing housing
2801	Intermediate bearing bush
2884	Thrust collar
3001	Cowl nut (l. h.)
3002	Cowl nut (r. h.)
3011	Lock Nut
3020	Lock washer
3031	Sleeve nut (l. h.)
3032	Sleeve nut (r. h.)
3200	Impeller key
3250	Coupling key
4230	Air vent cock
4250	O-ring
4290	Water sealing tube
4580	Guard

1 General information

About this document

The language of the original operating instructions is English. All other languages of these instructions are translations of the original operating instructions.

These installation and operating instructions are an integral part of the product. They must be kept readily available at the place where the product is installed. Strict adherence to these instructions is a precondition for the proper use and correct operation of the product.

These installation and operating instructions correspond to the relevant version of the product and the underlying safety standards valid at the time of going to print.

EC declaration of conformity

A copy of the EC declaration of conformity is a component of these operating instructions.

If a technical modification is made on the designs Named there without our agreement, this declaration loses its validity.

2 Safety

These operating instructions contain basic information which must be adhered to during installation and operation. For this reason, these operating instructions must, without fail, be read by the service technician and the responsible operator before installation and commissioning. The machine operator list must be filled out completely. By signing this list, all persons working on or with the product confirms that they have received, read and understood this operating & maintenance manual.

It is not only the general safety instructions listed under the main point "safety" that must be adhered to but also the special safety instructions with danger symbols included under the following main points.

2.1 Designation of information in the operating instructions

Symbols:

General danger symbol



Danger due to electrical voltage



NOTE: . . .



Signal words:

DANGER!

Acutely dangerous situation.

Non-observance results in death or the most serious of injuries.

WARNING!

The user can suffer (serious) injuries. "Warning" implies that (serious) injury to persons is probable if this information is disregarded.

CAUTION!

There is a risk of damaging the pump/installation. "caution" implies that damage to the product is likely if the information is disregarded.

NOTE:

Useful information on using the product. It also draws attention to possible problems.

2.2 Personnel qualifications

The installation personnel must have the appropriate qualification for this work.

2.3 Danger in event of non-observance of the safety instructions

Non-observance of the safety instructions can result in risk of injury to persons and damage to product/installation. Non-observance of the safety instructions can result in the loss of any claims to damages.

In detail, non-observance can, for example, result in the following risks:

- Failure of important product/installation functions
- Failure of required maintenance and repair procedures
- Danger to persons from electrical, mechanical and bacteriological influences
- Property damage

2.4 Safety instructions for the operator

The existing directives for accident must be adhered to.

Danger from electrical current must be eliminated. Local directives or general directives [e.g. IEC, VDE Etc.] and local power supply companies must be adhered to.

Guards for moving parts (e.g. coupling) must not be removed from the machine while in operation. Use suitable personnel protective equipment to protect hands, eyes and so on.

2.5 Safety instructions for inspection and installation work

The operator must ensure that all inspection and installation work is carried out by authorised and qualified personnel who are sufficiently informed from their own detailed study of the operating instructions.

Work to the product/installation must only be carried out when at a standstill. It is mandatory that the procedure described in the installation and operating instructions for shutting down the product/unit be complied with.

2.6 Unauthorised modification and spare part production

Modifications to the product are only permissible after consultation with the manufacturer. Original spare parts and accessories authorised by the manufacturer ensure safety. The use of other parts can nullify the liability from the results of their usage.

2.7 Improper use

The operating safety of the supplied product only guaranteed for conventional use in accordance with Section 4 of the operating instructions. The limit values must on no account fall under or exceed those specified in the catalogue/data sheet.

2.8 Safety & control devices

Direct controls are applicable when the pump is supplied along with motor/panels. When motor/panel is in end user's scope of supply, it is advised to go for CE approved motors /panels.

2.9 Environmental safety

Disposal of any unwanted/scrap material should be disposed in appropriate way so as not to cause any harm to the environment. No hazardous material is used in Wilo SCP pumps.



NOTE

To avoid ambiguity in the use of the word „replace“ the words „replace“ and „renew“ are used in this manual in the following context:
 Replace - To put back, in its existing state, a part or component that has previously been removed.
 Renew - To substitute a new part of component for a worn or damaged one.

3 Transport and interim storage (fig. 1)

Immediately check the pump and transport packaging for damage in transit upon receipt. Take the necessary steps within the periods defined by the transport company in the event of damage in transit.

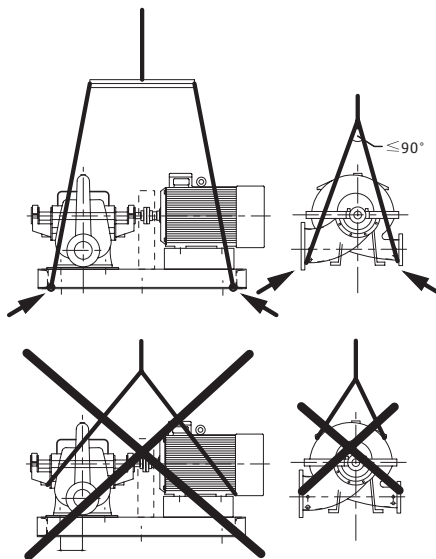


Fig. 1: Handling the pump



DANGER! Risk of getting crushed!
The installation or removal of the product must not be performed by one person alone.
Measures should be taken to bar persons from

standing beneath a suspended load. Furthermore, it is also prohibited to move suspended loads over exposed workplaces where people are present. The fastening devices should be adapted to the conditions at hand (weather, hooking system, load, etc.) Use suitable fastening devices to handle the weight of the product.



CAUTION! Risk of damage to the pump!
Risk of damage due to improper handling during transport and storage.
The pump should be protected against humidity, frost and mechanical damage during transport and interim storage.

3.1 Handling



CAUTION! Risk of damage to the pump! Risk of Falling!
Pumps should never be lifted with slings engaged below the bearing housing. Eyebolts on pump top casing are only for lifting top casing during maintenance. Do not lift complete pump with the eyebolts. Safe working load of wire ropes reduces with increase in included angle. Never put down or pick up the product when it is not secured. Tilting of the product should be avoided at all costs.

Only suitable lifting gear and load carrying equipment with valid test certificates and adequate lifting capacity for the loads involved (such as belts/wire ropes/slings) should be used for lifting& transporting the product. If chains are used, they should be secured against slipping along with protective cover to prevent damage to the product, paint and/or injury to personnel.
 When lifting the pump in combination with the bedplate, the lifting tackle should be attached to the lifting lugs provided on the base plate side member. To lift the pump the lifting slings should pass beneath the pump body at suction and delivery flanges (see lifting diagrams - see also „General Safety Information“, section 2). These must have sufficient load bearing capacity to ensure that the product can be transported safely.

3.2 Delivery

On arrival, the delivered items must be inspected for damage and a check made that all parts are present. If any parts are damaged or missing, the transport company or the manufacturer must be informed on the day of delivery. Any claim made at a later date will be deemed invalid. Damage to parts must be noted on the delivery or freight documentation.

3.3 Storage

3.3.1 Short-term storage

The equipments as shipped have adequate protection for short-term storage in a covered, dry and ventilated location at the job site prior to installation.

3.3.2 Long-term storage

If the equipment will be subject to extended storage condition prior to installation, then the manufacturer must be informed about storage duration, so that special protection can be recommended.

- Place the SCP pumps horizontally on firm foundation and secure it against falling.
- Any suction or delivery pressure connections on products should be closed tightly before storage to prevent impurities.
- The machine must be protected from direct sunlight, heat, dust, and frost.
- The rotors or propellers must be turned at regular intervals. This prevents the bearing from locking and the film of lubricant on the mechanical shaft seal is renewed.
- For mechanical seal, we recommend : relative air humidity below 65%, temperature between 15 °C and 25 °C. Direct exposure of the mechanical seal to heat(sun, heating) as well as to ozone, present or produced by ultraviolet light(halogen or fluorescent lamps), must be avoided because of the risk of embrittlement of elastomeric materials.

3.4 Pump returning back to the supplier

Products, which are delivered back to the plant, must be clean and correctly packaged. In this context, clean means that impurities have been removed and decontaminated if it has been used with materials, which are hazardous to health. The packaging must protect the product against damage.



CAUTION! Guarantee not applicable.
Products, which are not suitably packaged for delivery back, are no longer covered by guarantee!

4 Intended use

The pump supplied is intended for specific fluid. Refer pump data sheet and order confirmation For any change in pumped fluid refer Wilo beforehand. Horizontal Split case pumps are used in Water supply, Water-circulating systems, Injection water, Spray Pond, Air conditioning, Water treatment, Sprinkler & drip irrigation, Fire fighting, juices etc.

If the duty conditions of pump are going to be different than the specifications in purchase order / approved data sheet (e. g. liquid pumped, temperature or duty) it is requested that the user seeks the written agreement of WILO SE. , before start up.

5 Product information

5.1 Type key

SCP200/250HA-110/4/T4-C1/E0	
SCP	Name of the range
200	Discharge flange nominal diameter in mm
250	Nominal diameter of the impeller in mm
HA	Type of Hydraulic : - HA = Standard type version A - HB = Standard type version B - HS = Single suction impeller - DV = Double volute - DS = Double stage
110	Motor power rating in kW
4	Number of poles
T4	Voltage Three phases 380V
R1	Material configuration : Casing in cast iron, Bronze impeller, Stainless steel shaft (RoHS compliant)
E0	Mechanical seal material configuration Carbon / SiC EPDM type AQ1EGG

5.2 Technical data

Operating limits for the standard range

The technical features of the product - especially the fluid compatibility - have been described in the offer made for this product.

Property	Value	Remarks
Speed	2900, 1450, 980 1/min	
Nominal diameters DN	50 up to 400	
Pipe connections	Flange PN 16	EN 1092-2
Permissible min. /max. temperature		
-with mechanical seal [°C]	-8 up to + 120	
-with packed gland [°C]	-8 up to + 105	
Ambient min./max. temperature	0 to 40 °C	
Max. permissible operating pressure	16 bar	25 for some models
Insulation class	F	
Protection class	IP 55	
Motor protection	-	required onsite
Sound pressure level (dependent on motor)		
- 1.1 kW	< 54 dB (A)	see catalogue for details
up to - 630 kW	< 90 dB (A)	
Admissible fluids	Heating water in acc. with VDI 2035 Cooling/cold water Water/glycol mixture ≤40 °C with 20% vol. up to 40% vol. Heat transfer oil Other fluids	Standard version • Standard version • Standard version • Only for special version ◦ Only for special version ◦
Electrical connection	1~220 V , 50 Hz 3~380 V , 50 Hz other voltages/frequencies on request	•
Speed control	Control devices (Wilo control system) When using the corresponding Wilo switchgear; external frequency control	◦
Special motor version (on request)	Special voltage/frequency	◦

- Standard model
- Special model or optional equipment (additional charge)

5.3 Scope of delivery

Pump can be delivered as a complete pump set including electrical motor, baseplate, coupling and coupling guard; either without motor; either as bare shaft pump without baseplate.

5.4 Accessories

Accessories must be ordered separately:

- See catalogue for detailed list.

6 Description and function

6.1 Description of the product

Split casing pumps are either, single or two stages. They are of relatively simple construction, the casing being split along the pump axis so that normal maintenance work can be carried out without disturbing the position of either the pumping set or pipe work.

6.1.1 Casing

The pump casing is of volute form, cast in halves, which are bolted together along the pump axis. Gasket paper is provided between the split flanges of top and bottom casing. For accurate location casing halves, bearing housings/ brackets etc. are located with dowel pins.

The suction and delivery branches of the pump are cast integral with bottom half casing, which also incorporate the mounting feet. Tapings are drilled in suction and delivery branches for connecting the pressure gauges and providing casing drain. Bores of bottom half casing are grooved to provide location for neck rings and stuffing box bushes. Tapings are provided in the top of casing for taking liquid seal connection on both stuffing box regions. In other cases, alternative arrangements (see fig. 11) are provided. Tapings are also provided on the top half casing for mounting air cock for venting.

6.1.2 Neck ring

To prevent the pumped liquid from the delivery side of the impeller the pump casing is designed with fine running clearances around the impeller eye. These fine running clearances are essential for the satisfactory performance of the pump and their periodic restoration is necessary. Running clearance is provided between neck rings and impeller neck. Neck rings are renewable to allow this fine clearance to be restored periodically as wear takes place. These rings are located in the bottom half casing by a half-spigot and are prevented from rotating with the impeller since these are locked by the face of split flange of top casing.

6.1.3 Rotating element

The rotating element consists of a shaft on to which is keyed the impeller or impellers. Renewable shaft sleeves about the impeller hub and protect the shaft from corrosion and erosion. The impeller is locked by sleeve nuts, which have their threads left/right handed as per direction of rotation to prevent them from unscrewing by the rotation of the shaft.

The rotating element may be carried in deep groove ball bearings or in split-bush journal bearings, in which case ball thrust bearings or thrust discs and nuts are provided to restrict – axial movement.

Bearings are located in housings, which are attached to the ends of the pump casing.

Stuffing box bushes (stationary part) are provided on either side over the sleeve and located in bottom half casing. This helps in proper guiding of the liquid to impeller eye. Where as back face of stuffing box provides support to gland packing.

Logging rings (stationary part) are provided on either side over the sleeve, sandwiched between gland packing located in stuffing box below sealing arrangement. Logging ring provides proper stuffing box sealing arrangement. Logging ring provides proper stuffing box sealing arrangement. For 2 stage pumps instead of logging ring leak-off ring / bush is provided at second stage stuffing box.

For some of the models the shaft also carries water thrower, oil thrower. Please refer cross section drawing.

6.1.4 Sealing system

To prevent leakage along the shaft at the point of emergence from the pump casing, gland packing or mechanical seals may be fitted in the stuffing box situated at each end of the casing.

Mechanical seal description :

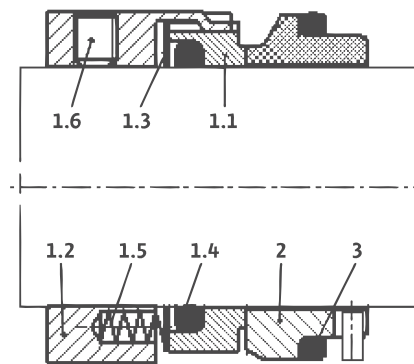


Fig. 12: Mechanical seal

- 1. 1 Seal face
- 1. 2 Drive collar
- 1. 3 Thrust ring
- 1. 4 O-ring
- 1. 5 Spring
- 1. 6 Set screw
- 2 Stationary seat
- 3 O-ring

7 Installation and electrical connection (Motor / pump coupling system)



DANGER! Risk of getting crushed!
 The installation or removal of the product must not be performed by one person alone. Measures should be taken to bar persons from standing beneath a suspended load. Furthermore, it is also prohibited to move suspended loads over exposed workplaces where people are present. The fastening devices should be adapted to the conditions at hand (weather, hooking system, load, etc.) Use suitable fastening devices to handle the weight of the product.



WARNING! Danger of personal injury!
 The installation and electrical connection should be performed only by qualified personnel in compliance with local regulations. This section provides instructions on the recommended methods of installing pumping sets on to concrete foundations. Careful attention must be paid to the customer and contractor's installation drawings during the installation procedures to ensure that the pumping set is accurately positioned on the correct datum levels.

The existing accident prevention regulations must be observed.



WARNING! Danger of electric shock!
 Any hazards from electrical current should be ruled out. Any instructions from local or general directives [e. g. IEC, VDE etc.] or directives of the local electricity supply companies must be observed.

7.1 Installation

- Before any installation work is carried out, the machine should be inspected for damage that may have occurred during handling, transport & storage.
- Installation within a building: install the pump in a dry, well ventilated and frost-resistant room.
- Pumping machinery should have adequate access and working room for maintenance operations. Adequate overhead space for lifting devices and working clearance must be provided.
- Installation outside a building (outdoor installation):
 - Install the pump with a suitable protection to avoid rainfalls strong wind and particles which can damage the pump or motor.
 - Avoid exposure of the pump to direct sunlight.
 - An appropriate solution to avoid frost must be implemented.



CAUTION! Risk of material damage!
 Ensure sufficient ventilation/heating if the ambient temperature exceeds/falls below the permitted limit values.

- Carry out all welding and soldering work prior to the installation of the pump.



CAUTION! Risk of material damage!
 Dirt from the pipe system can destroy the pump during operation. Flush the pipe system prior to the installation of the pump.

- Provide shut-off valves in front of and behind the pump.

7.1.1 Foundations (figures 2, 3 and 13)

The foundation should be sufficiently substantial to absorb any vibration and to form a permanent, rigid support for the baseplate. The foundation must get large dimensions (see figure 2):

- Foundation block 15–20 cm longer/wider than the pump baseplate
- Vibration isolation e. g. cork layer, rubber etc. (5 cm thick)
- Baseplate

Generally, the weight of the foundation is around 2 to 3 times the pump set weight. This is important in maintaining the alignment of a direct connected unit. In building the foundation, the top of the foundation should be left approximately one inch low to allow for grouting. Foundation bolts of the proper size should be embedded in the concrete, located by template (see fig.13).

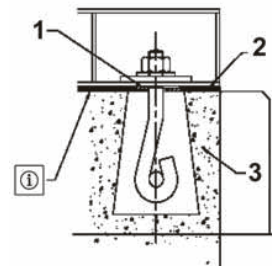


Fig. 13: Foundation bolt

- 1 Erection packers
- 2 Finish grout
- 3 Concrete



NOTE:
 Leave top of foundation rough! Do not finish with trowel.

- A pipe sleeve about 2 ½ diameters large than the bolt should be used to allow movement for the final positioning of the bolts. For installations where a low level of noise is expected, built the foundation in a pit lined with appropriate insulation material in order to avoid vibration transmission to the ground. (seedrawing)



CAUTION! Risk of material damage!
 Do not hold the pump by the motor/module when tightening the screwed connections. Apply the wrench surfaces to the suction/pressure port instead.

insufficient to check level on the machined pads of baseplate with a spirit level because it is possible that some types of errors will not be revealed or will be accepted as being within acceptable limits. These distortions as showed in fig. 3 a-c. Therefore it is necessary to use I beam straight edge along with engineers master level. (see pictures)

7.1.2 Levelling and installing the baseplate



CAUTION! Risk of material damage!
Pumps and drivers that are received with both machines mounted on a common baseplate are checked for alignment before shipment. However during shipment, storage it may get disturbed.

- Use “I” beam straight edge and an engineers master level (with accuracy of 0.02 mm / meter) for levelling the baseplate. I-beam should rest on the machined surfaces of the baseplate, or on the levelling pads if provided. These machined surfaces where level is being checked must be clean and free from paint, burrs etc.
- Check datum position of base frame as given in G. A. Adjust the level of the baseplate by inserting shims between the bed plate and the packer plate until the bed plate is levelled and supported on all the packing plates at the height required for the connection of suction and discharge branches. For checking the levels across two pads, I-beam type straight edge should be used extensively in conjunctions with engineer’s master level. Level should be achieved within 0.05 mm per 250 mm.
- When the baseplate is levelled, grout the foundation bolts only. Care should be taken so as not to disturb the verticality of foundation bolts. For grouting use rich mix of 1: 1:2 of cement, sand and gravel below 12 mm. Alternatively quick setting grout mix can be used.
- When the grout has set, gently but firmly tighten the foundation bolts. Care must be taken not to distort the baseplate or loosen the foundation bolts in the grout by excessive tightening.
- When the grout has set, gently but firmly tighten the foundation bolts. Care must be taken not to distort the baseplate or loosen the foundation bolts in the grout by excessive tightening.

- When the baseplate is levelled and the satisfactory-alignment is completed, proceed with connection of suction & delivery piping. Recheck the alignment after piping and run the final grout beneath the baseplate. Allow minimum seven days time for curing. Grout mix in the proportion specified earlier for foundation bolt grouting should be used. It is further recommend that all hollow pockets in the baseplate shall be filled after curing of earlier grout.
- Pumps, which operate at high temperature, e. g. boiler feed duty, are supported on feet machined in line with the center of the shaft, which prevents expansion causing misalignment. Transverse and longitudinal keys are provided to locate the pump on the baseplate. The holding down bolts securing the pumps to the baseplate are arranged to allow the feet to slide during expansion either by using spring washers or by locating the nuts on the bolts without nitting the feet.

7.1.3 Alignment of the pumps and its driving units

- When the baseplate is levelled and the satisfactory-alignment is completed, proceed with connection of suction & delivery piping. Recheck the alignment after piping and run the final grout beneath the baseplate. Allow minimum seven days time for curing. Grout mix in the proportion specified earlier for foundation bolt grouting should be used. It is further recommend that all hollow pockets in the baseplate shall be filled after curing of earlier grout.
- The following procedures outline recommended practice given in BS-3170 in 1972 (Appendix A) for checking shaft alignment. This method is independent of the truth of the coupling or shaft and is, therefore, not affected by canted coupling faces or eccentricity of the outside diameter of the coupling. Before commencing the alignment, rotate each shaft independently to check that the bearings run freely and that the shaft is true to 0.1mm or better. Check that no damage can be caused when the shaft of the driven unit is turned. Coupling should be loosely coupled and the halves must be free to move relative to each other, otherwise gauge Indicators can be incorrect. Where, tightly fitting pins or spring prevent loose coupling, the springs or pins should be removed and a line scribed across both half couplings and readings taken only when the two marks are aligned.



CAUTION! Risk of material damage!
All the alignments (angular as well as radial) have to be carried out by using 3 dial indicators, simultaneously

• **Angular alignment**

After isolating the driven unit from its power supply, clamp two dial indicators at diametrically opposite points on one half coupling or to the shaft behind it with the plunger resting on the back of the other half coupling (see fig.4). Rotate the coupling unit. The gauges are to be in line vertically and set the dial to read zero. Rotate the coupling by 180 and record the readings on each gauge. The readings should be identical, though not necessarily zero. Either positive or negative readings are acceptable provided they are equally positive or negative. Adjust the position of one of the units if necessary. Rotate the coupling unit. The gauges are to be in the line horizontally and adjust the dial to zero. Repeat the operation outlined above by rotating the coupling by 180°.

Fig 4 (To check the parallelism of axis)

• **Radial alignment**

Clamp a dial gauge on one of the couplings or to the shaft as shown in figure 12 with the plunger resting on the rim of the other half coupling. Set the dial zero. Rotate the coupling and note the reading at each quarter revolution. Any variation in the readings indicates the deviation from alignment and the position of one of the units must be adjusted until the readings at each quarter revolution are identical or within the tolerances given below.

Fig 4 (For detecting this type of error)

• **Alignment tolerances**

Operating limits		
<1000 rpm	0.15mm TIR	0.15mm TIR
>1000 rpm to 1800 rpm	0.10mm TIR	0.15mm TIR
1800 rpm to 3000 rpm	0.05mm TIR	0.1mm TIR

7.1.4 Pipe work

No stress must be imposed on the pump casing by the pipe work; neither by the weight of the pipes nor by the tightening of badly fitting pipes.

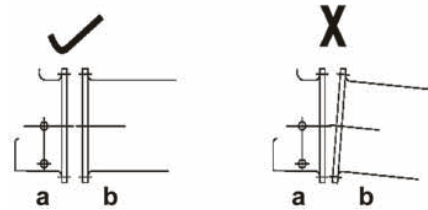


Fig. 14: Avoid stress on the pump casing
a: pump flange; b: pipe work

Experience has showed that such stress can seriously affect the alignment of the pump unit. All pipe work attached to the pump must be fully supported and the mating faces of the pipe flanges must be parallel and all bolt holes coinciding with each other. (see table of maximum forces on flanges) It is important, therefore, that alignment of the pump and motor should be re-checked after the pipes are finally fitted. Resetting or supporting the pipes must correct any deviation in the alignment.)

For difficult pumping on the suction side, to stabilise the flow, a pipe length 15 times the diameter of the suction branch should be installed before the suction branch

- The flow rate in the suction line or inflow line must not exceed 2 - 3 m/s.
- Pipe velocity may need to be reduced further to satisfy pump NPSH requirements and to control suction pipe losses.

Permissible forces and moments (see fig. 5)												
Each Side flange	Nominal Sizes of Flanges Forces (N) and Moments (Nm)											
	50	65	80	100	150	200	250	300	350	400	450	500
Fx	712	890	1068	1423	2491	3781	5338	6672	7117	8452	9341	10008
Fy	578	712	890	1245	2046	3114	4448	5338	5783	6672	7340	7896
Fz	890	1134	1334	1779	3114	4893	6672	8007	8896	10231	11121	7784
Fr	1290	1646	1913	2535	4493	6939	9786	11565	12900	14679	16236	17659
Each flange												
Mx	459	688,5	945	1323	2295	3510	4995	6075	6345	7290	7695	7965
My	351	526,5	715,5	999	1755	2565	3780	4590	4725	5400	5737,5	6075
Mz	229,5	438,75	472,5	675	1174,5	1755	2430	2970	3105	3645	3915	4185
Mr	621	972	1282,5	1795,5	3118,5	4725	6750	8235	8505	9720	10260	10800

7.1.5 Suction line

See the sketches below for the optimum layout of pump installation for flow and suction lift operation.

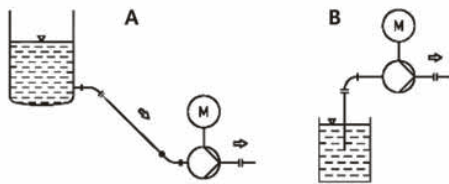


Fig. 15: Layout of pump installation
A: pump under pressure; B: Pump in suction

Ensure that air pockets cannot be created. Unequal nominal widths of the suction branch and suction line must be compensated by eccentric transition pieces (see fig.16) . .

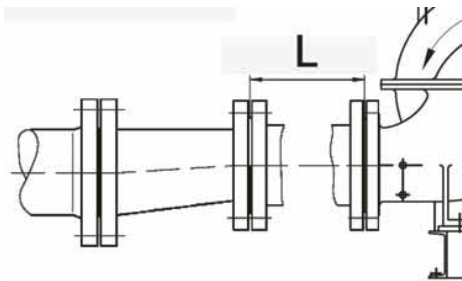


Fig. 16: Eccentric transition

- It is recommended that a strainer is installed in front of the pump with a filter surface of at least 3 times the pipe cross section (approx. 100 meshes/cm²).
- The suction opening of the suction line should be well below the liquid level, and a strainer should be used. The strainer must be far enough from the bottom to avoid excessive inlet losses, which could impair pumping performance. It is advisable to check that there is no leakage.

A shut-off valve should be installed in the feed line. It must be closed for maintenance work. It should be installed in order to avoid air pockets forming in the spindle cap, i.e. with the spindle in a horizontal position or pointing vertically downward. .

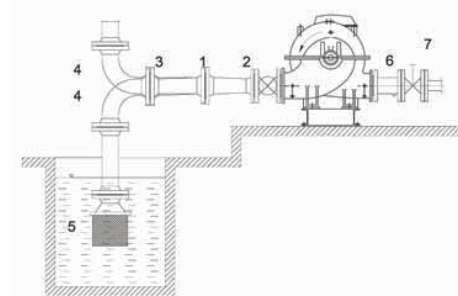


Fig. 17: Layout of pump installation

- 1 Eccentric reducer (suction) or concentric reducer (discharge)
- 2 Isolating valve
- 3 Suction line
- 4 Bend
- 5 Foot valve with strainer
- 6 Isolating valve
- 7 Regulating valve

7.1.6 Discharge line



CAUTION! Damage to the pump
Pump casings have sometimes been cracked by pressure surges imposed on them through the absence of a non-return valve. A back flow can seriously damage the bearings and the mechanical seal.

For flow regulation, a valve must be installed behind the pump. If non-return valves are used, they should close smoothly. Pressure shocks must be avoided.

7.1.7 Stuffing box packing (fig.6)



CAUTION! Risk of quick wear or leakages
Packing should be handled with care and it should not be allowed to pick up the dust or abrasive matter by coming into contact with floors or dirty benches. It is bad practice to hammer packing to facilitate the insertion.

Pumps are dispatched from our Works with the stuffing boxes unpacked; otherwise packing will be aged. The packing is packed with greaseproof paper and dispatched with the pump. The softest possible packing i.e. plaited cotton impregnated with oil and colloidal graphite is recommended for most duties. Required number of lengths of packing should be cut off so that each length will pass once round the shaft sleeve line and meet to end. The ends of packing must be cut square. After cleaning the stuffing box and shaft sleeves the packing should be inserted into the stuffing box. Each ring should be pushed into position individually using the glands joint of each ring must be positioned 180 Deg. from joints of its neighbour. If a logging ring is included in them, arrangement should be inserted into the stuffing box at the appropriate time during the packing sequence so that it is aligned with the cooling water connection. The gland should now be fitted square with the pump casing and the nut should be screwed up to little more than finger tightness.



CAUTION! Risk of material damage
Use screws of sufficient length. The screw thread must protrude at least one thread turn out of the screwnut.

- Clean any anticorrosive protection from the mounting surfaces using a cleaning rag impregnated with white spirit. Do not use any other chlorinated solvents such as carbon tetrachloride and trichloroethylene.
- Install appropriate flat gaskets between pump and counter flanges.
- Tighten the flange bolts cross-wise in two steps with the prescribed tightening torque (see table in chapter 7.1.4).
 - Step 1: 0.5x permitted tightening torque
 - Step 2: 1.0x permitted tightening torque
- Check the flange connections for leaks.

7.1.8 Mechanical seal



CAUTION! Damage to the pump
Never start the pump without liquid inside otherwise the mechanical seal will be damaged instantaneously.

No real operation is required during the setup of the pump. Only filling and venting the pump are mandatory before switching on the main.

7.2 Electrical connection



WARNING! Danger of electric shock
The electrical connection should be established by an electrician approved by the local electricity supply company in compliance with the applicable local regulations [e.g. VDE regulations].

- The current type and voltage of the mains connection must correspond to the specifications on the name plate
- Refer to the motor and panels instruction manual at the time of installation and connection. Motors or electrical control panels are operated with alternating or industrial high-voltage current.
- The electrical connection is established via a fixed mains connection line
- The local regulations must be adhered to.
- Ensure that there is a provision for isolation of all energy sources and locking. If the machine has been switched off by a protective device, it must not be switched on again until the error has been corrected.
- The electrical system (machine including protective devices and operating position) must always be grounded. Refer pump GA drawing & respective manuals of motor/electrical control panel for connecting earthing suitable as per motor rating and relevant regulations and standards including proper earthing lug size and fasteners..
- Under no circumstances may any connecting cables touch the pipeline or the pump or motor housing.
- If there is a possibility that people can come into contact with the machine and the pumped liquid (e.g. at construction sites), the grounded connection must be additionally equipped with a fault current protection device.
- To ensure drip water protection and strain relief of the cable connections, use cables with an appropriate outer diameter and screw the cable glands tight. Furthermore any cables nearby screwed connections for outlet loops should be bent in order to divert any accumulating drip water. Close any unassigned cable glands with the existing sealing discs and screw them tight.



8 Commissioning
WARNING! Danger of injury
 Guards for moving parts (e. g. coupling) must not be removed from the machine while in operation. Use suitable personnel protective equipment to protect hands, eyes and so on. The safety devices whether on pump/motor/ electrical panels must never be dismantled or disabled. They must be checked by an authorized technician for proper functioning before start-up. Refer to motor & Electrical panel instruction manuals for electrical safety & control devices information.



WARNING! Danger of pump damage!
 Do not operate the pump away from specified operating range. Operating beyond duty point may not pose a risk to the operator but will reduce the efficiency of the pump or damage the pump itself. Operation more than 5 minutes, at close valve condition is not recommended. For hot liquids this is not recommended at all. Ensure that always site NPSH-A is more than NPSH-R.

8.1 Cleaning prior to start

8.1.1 Pipe work flushing

Before the pumps are brought into service, either on initial commissioning or on re-commissioning after overhaul, the pipe work associated with the pumps must be flushed through. This will clear deposits or scales which may have accumulated in the pipes, and which could damage the internal components of the pumps.

8.1.2 Cleaning of bearings

Pumps fitted with pre-lubricated, sealed bearings do not require external lubrication for life. If the ball bearings are different and if the unit has been in store for a long period before commissioning, the bearings should be cleaned and flushed out with clean white spirit or good quality paraffin. Waste oil/paraffin & used cotton cloth should not be used for this purpose, as particles of foreign matter may be left behind which would cause damage when the bearing is in service. Bearings should be then filled with recommended grade and quality of fresh lubricant to the level. Refer list of lubricants at the end of this manual.

8.2 Filling and venting

Fill and vent the system correctly. Brief dry running will damage the pump. Please also note that these pumps are not self-priming, which means that the impeller & casing must always be fully filled with fluid to be handled before putting in operation



WARNING! Danger of injury!
 There is a risk of burns if the pump is touched! The entire pump may become very hot, depending on the operating state of the pump or system (fluid temperature).



CAUTION! Danger sealing system damage!
 Any attempt to run the pump dry or partially full may result in seizure of the rotating internal components.

8.2.1 Pumps Operating on Flooded Suction Head

When these pumps operate on a flooded open the air release valve situated on top of the pump casing, open the pump inlet isolating valve and vent the air out of the casing. When the liquid issues from the air vent, free of air, the pump is properly primed. The air vent must be closed after priming and before the pumping set is started.

8.2.2 Pumps Operating on Negative Suction Head

There are two methods of priming pumps that draw their liquid from an elevation lower than the pump inlet branch:

- If the inlet pipe work is fitted with a non-return foot valve, the pump casing and inlet pipe work can be fitted with liquid from an external source under pressure. The pressure imposed on the pump by this method must not exceed that for which the pump is designed. In certain cases priming can be achieved by flooding back from the delivery side of the pump.
- By extracting air or gas from the pump casing. To enable this method to be used, the gland arrangement must be sufficiently air-tight or it should be liquid sealed from an external supply. For operation details of gas exhausts reference should be made to the manufacturer's instructions. Some form of priming indicator is usually fitted to indicate when the priming operation is complete.

8.2.3 Pumps operating on hot liquids

Pumps operating on hot liquids are usually so arranged that the liquid flow into the pump is under pressure. If the saturation pressure of such liquids is above atmospheric pressure, any attempt to prime the pump will result in the liquid "flashing" from the air cocks. For these reasons, the air cocks at the top of the pump casing should be left slightly open when priming boiler circulating pumps until air has been driven out of the casing completely.

The cooling water services of a pump handling hot liquids should be turned on before the pump is primed. These services may supply cooling water to the bearings and/or stuffing boxes. Where the services are functioning, open the inlet valves and start warming the pump throughout. Never cut off the water services while the pump is "on temperature". Where bearings are water-cooled, adjust the cooling water supply until the bearings have a running heat. Over-cooling may lead to condensation of moisture from the atmosphere inside the bearing with consequent contamination of the oil. The suction valve, if provided, must be fully open and the delivery valve must be closed.

8.3 Starting the pump

8.3.1 Direction of rotation

Disconnect the drive coupling and run the motor to check its direction of rotation. A directional arrow is provided on the pump unit.

8.3.2 Pre-starting checks

- Check that the inlet isolating valve is open and that the delivery valve is closed.
- Check that there is no blockage in the strainer at the end of the suction line.
- Check for free rotation of the unit when coupled.
- Check that suction and delivery pressure gauges are connected. Test and make available any alarm, signals, interlock systems and any of the protective devices incorporated in the auxiliary and main pumping control system.
- Ensure that all electrical checks on motor, relay setting in panel etc have been carried out in accordance with the instructions of motor manufacturer.
- Ensure that stuffing box sealing water seal connection is provided as shown in GA Drawing.
- Check that priming procedure detailed in 8. 2 has been carried out.

8.3.3 Normal starting and running checks

- When all the foregoing pre-start checks are satisfactory, start the pump and check the direction of rotation(indicated by a direction arrow on the pump casing) otherwise stop the pump immediately for correction of direction of rotation. Then run the pump at its rated speed.
- Check the ammeter reading to ensure that the motor is not being overloaded.
- If applicable, ensure that the stuffing box is not overheating and that there is slight leakage from the gland (about 1 drop per second). There may be at first a tendency for the stuffing boxes to run warm because of the high viscosity lubricant in the packing. During the first few minutes of running with new packing, a small quantity of very viscous fluid will be extruded, but the flow should reduce when the packing has settled down.
- Check the mechanical seal for leak. In the start phase (and also after downtimes) slight leakage can be expected. Visual leakage checks are however required from time to time. Distinctly visible leakage will require an exchange of the seal. Wilo offers a repair set containing all parts required for an exchange.
- Check that the oil is being carried to the bearing bushes by the oil rings in case of bush bearing.
- Check that the bearing is not overheating. Bearings will normally run at a temperature of 30°C–35 °C above ambient temperature. The ideal running temperature of bearings is 40°C to 60°C for ball bearings and 40 °C to 55 °C for bush bearings. The temperature should never exceed 82°C for ball bearings and 75 °C for bush bearings. If the bearings are overheating its cause should be investigated immediately.

- If the foregoing checks are satisfactory, open the delivery valve slowly and bring the pump gradually up-to its rated parameters indicated in the data sheet /name plate and based on pressure gauge and ammeter readings. Unless the pump is fitted with a special leak-off device, it should not be run for a long period against a closed delivery valve. Check that the driving unit is not being overloaded during valve opening. Overloading may occur if the pump is discharging into an empty system. If the pumping unit fails to generate at least its rated delivery pressure it must be stopped immediately, the cause ascertained,
- Check vibration of pump set and ensure that vibration level is within limits specified. Check that noise level is within stipulated limits.
- the pumps may be run for 8 hours trial operation and all the parameters like delivery pressure, current, bearing temperature, etc. Be recorded periodically. Make the following checks at regular intervals. It is recommended that they be made at every change of shift.
- Check the suction and discharge pressure gauge for normal operating pressure, if there is significant drop in the suction or discharge pressure the pump may have lost its supply. In the event of this fault occurring, the pump must be stopped immediately and the cause of liquid loss eliminated.
- Check the mechanical seal or stuffing box assembly for overheating.

8.3.4 Normal shutdown

- Close the delivery valve to reduce the load on the driving unit.
- Stop the driver of the pump.
- When the pump has come to rest, close the suction-isolating valve.
- Isolate any ancillary supplies.

8.3.5 Emergency Shutdown

In the event of any malfunction of the equipment, switch off the pump set. When the pump has come to rest, close the suction & discharge valves, isolate the driving unit power supply & rectify the fault.

9 Maintenance

Have maintenance and repair work carried out by qualified personnel only.



WARNING! Danger of electric shock!

Any danger from electrical current should be ruled out.

- The pump should be electrically isolated and secured against unauthorised switch-on prior to any maintenance or repair work.
- Any damage to the connection cable should always be rectified by a qualifide electrician only.



WARNING! Risk of scalding!

At high fluid temperatures and system pressures, allow the pump to cool down first and then depressurise the system.

9.1 Routine maintenance and frequency of inspection

Centrifugal pump requires very little routine maintenance, However, serious troubles can be often avoided by regular observation and analysis of various working parameters. Some of the routine maintenance checks for this purpose are as under :

- To keep daily logbook records of working parameters like suction and discharge pressure, flow rate, current drawn, bearing temperature, etc. These parameters should be recorded twice a shift. Any sudden change should be a signal for investigation. Refer Section Maintenance & Inspection log.
- Check bearings for normal temperature. See 8.3.3
- Vibration & sound level readings should be taken once in a fortnight and values compared with that of previous records.
- Check that there is sufficient leakage from the gland packing to ensure proper cooling and lubrication. (if applicable) For mechanical seal, check that there is no visible leakage.
- For any abnormality observed from the visual/manual inspection and through maintenance & inspection logs, stop the pump and investigate.
- Fault Finding/Many of the common faults which occur on centrifugal pumps and which can be diagnosed by observations are given in the chart under section 10 Faults, causes and remedies.

NOTE :

In case fault can not be diagnosed, please fill up the form in section the Issue/Feed back and send it to service department at Wilo SE.



9.2 Overhaul maintenance

9.2.1 General information

After a long period of service, wear will occur in parts of the pump, necessitating the renewal of a few components. Logbook records will indicate wear as gradual deterioration of performance is noticed. Once this is known, pumps should be taken for overhaul. It is recommended that yearly stripping & checking of wear & tear and clearances should be done and overhauling where required. If related pair of components show a marked degree of wear in relation to the rest of the unit, then it may be sufficient to renew only the heavily worn components. If the wear is uniform throughout the pump, then all wearable components may require renewal.

Measurements should be taken and recorded of all wearable components at the first, and every subsequent overhaul period. Reference to these records will enable an accurate assessment of the rate of wear to be made, and a reasonably accurate forecast regarding when a particular component may require renewal can be made.

Information regarding original design dimensions and clearances is furnished in data sheet. Any other information, if needed, can be requested from Service Department, Wilo SE. Such request must quote name plate number and type of the pump in question.

The parts most likely to be affected are :

- Impeller
- Mechanical seal
- Neck Rings
- Sleeves
- Stuffing Box Bush
- Bearings
- Coupling Bushes/membrane set

Before commencing dismantling operations, ensure that the following tools and tackles are available :

- A crane / chain pulley block suitable for handling the weight of pumping unit.
- A selection of ring and open-ended spanners in British, American, and Metric sizes.
- Eyebolts in British and Metric sizes.
- Cotton rope, wire rope and slings.
- Hardwood and metal packing blocks.
- Miscellaneous tools including a set of Allen keys, drills, pin drivers, files etc.
- Extractor / puller for bearing and coupling.

The torque value (see table) to be set for a particular size of screw is dependent upon :

- Material of screw
- Parent metal

- Whether the screw is untreated or plated
- Whether the screw is dry or lubricated
- The depth of the thread

Tightening torques – Untreated Screw(black finish); Coefficient of Friction 0. 14

Property class	Torque	Nominal diameter – Coarse thread											
		M6	M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
Nm		10.5	26	51	89	215	420	725	1070	1450	1970	2530	3290
t.lby		7.7	19	37	65	158	309	534	789	1069	1452	1865	2426

9.2.2 Dismantling the pump

Dismantling the top casing

Prior to dismantle the pump make sure that safety measures described in the chapter 9 are observed and that this job is done by a competent personal.

- Isolate the pump system by closing suction and delivery valve.
- Drain the pump and open the upper air vent.
- Remove two dowel pins and the split flangs nuts.
- For gland packing :
Remove nuts of split gland from both ends and slide away the gland. Remove gland packing as well as logging ring.
- For mechanical seal :
Disconnect the flushing tubes, loose the nuts of the gland plate and slide them away on the shaft.
- Remove all fasteners joining top & bottom casing. Connect suitable lifting tackles to the eve bolts provided on top half casing. Remove the casing joint gasket.

Dismantling the rotating element

Remove the coupling screws /nuts, for coupling. Remove both the bearing housing top half after removing set screws and dowel pins. Rotating element can now be lifted clear off the casing along with neck rings and ball bearing.

Ensure that it is lifted off the casing evenly and does not twist; otherwise the neck ring may be damaged. Place and support the rotor on wooden cradle in horizontal position. Pump half coupling now is withdrawn from the spindle, if necessary, by using proper tackle like coupling puller. The coupling has a parallel bore and with a transition fit. Remove the coupling key.

After removing coupling proceed as follows:

- Dismantle both the inner and outer bearing end covers.
- Remove lock nut, lock washer, inner and outer spacer rings from the free end and side (Non-driving end)



NOTE :

Unnecessary removal of the bearings should be avoided because removal of the bearing can damage it and cause deterioration of the interference fit. Except where removal is necessary to give access to the other parts, bearing should be removed only if they need close inspection. Symptoms, which will indicate the state of bearing, are the bearing running temperature, noise level and vibration during operation.

- Take off the casing rings & (bearing bush & bearing carrier where applicable).
- Remove the water deflector and thrower from spindle from both sides.
- Unscrew and remove the sleeve nuts on both side and slide off the impeller & distance sleeve. If difficulty is experienced in withdrawing the sleeves, they may be drawn off with the impeller. It may be even advisable to apply some heat for easy withdrawal.
- Remove the impeller. It may be necessary to apply heat to the impeller for the removal. Apply heat uniformly from the shrouds inwards towards the hub. Before removing the impeller put a reference mark on the shaft for ease of reassembly at correct center position.

9.2.3 Examination of Internal Components

With the pump and rotating element dismantled, the internal components and clearances can be checked.

Casing neck ring

Use an internal micrometer to measure the bore of casing ring, taking measurements at intervals around the circumference to check for uneven wear. A comparison between this dimension and that of the impeller neck will indicate the amount of diametrical clearance between the casing neck ring and the impeller neck. If this clearance is 150% or more than the original design clearance, or if the deterioration in hydraulic performances has been such that no further deterioration can be

tolerated during the next operation period, the neck ring should be replaced.
The impeller-wearing ring to casing neck ring clearance must be restored to the original design value by fitting small-in-bore neck rings, bored out to suit the diameter of the impeller.

Shaft Sleeves

The shaft sleeve should be examined to see if it is grooved or generally worn. The outside diameter of the sleeve should be measured and a comparison made with the bore of the stuffing box bush through which the sleeve passes. The amount of clearance between the two can thus be checked to determine whether or not it is within acceptable limits.

Impeller

Inspect the impeller as follows:

- Examine the impeller for damage.
- For corrosive/erosion pitting.
- Cavitations pitting.
Bent or cracked vanes, inlet and outlet vane end wear.
Any of the above may be repaired, or if damage is extensive, impeller may need replacement. Further information should be sought from Wilo SE before any decision on repair work is taken.
- Around the eye, wearing rings protects the impeller. Examine around the eye at neck portion for grooving in alignment with spindle axis; slight grooving is acceptable but deep or profuse grooving must be remedied by machining the impeller by taking a polish cut on wearing ring. Spare wear rings are supplied with excess outside diameter to facilitate machining after fitting. The wear rings are shrink fitted on impeller neck and are screwed.
- To check wear around the impeller neck, use precision instruments such as outside micrometer to accurately measure the outside diameter. Measurements should be taken at intervals around the circumference to check the uneven wear. Differences between the neck OD and the neck ring ID measured will give us the clearance between the two. Clearance thus obtained should not be more than 150% of maximum designed clearance.

Shaft & keys

Shaft should be checked for the trueness, or any other mechanical damage and corrosion. If the shaft is not true within 0.1 mm TIR, it should be replaced/ repaired. Examine the shaft keys and keyways. Remove damaged or worn out keys.

Bearings

The ball bearings fitted on the SCP range are greased for life. Then no maintenance is required. Check that bearing rotates freely and smoothly, verify that the outer ring presents no abrasions or discoloration. If there is any doubt regarding the serviceability of the bearing it should be replaced.

Stuffing box bush

Check bore of stuffing box bush and compare with sleeve diameter. If clearance is excessive, the bush should be renewed.

Mechanical seal

Ensure that the sliding face do not present any scratches or abnormal wear. Verify that the driving collar is well screwed on the shaft at the right place. Check that no material block the spring action.

9.2.4 Reassembling the pump

With the pump and rotating element dismantled, the internal components and clearances can be checked.

Reassembly of rotating element

If rotating element has been completely dismantled, the correct position for the impeller must be established as marked on the shaft prior to dismantling. Then commence re-assembly as under.

- Fit the impeller key in the keyway of the spindle.
- Fit the impeller on the spindle in correct position.
- Fit the impeller distance sleeve on both sides of impeller to engage; with impeller key and tighten the sleeve nuts.
- Slide the neck ring on the spindle on both sides.
- Slide the stuffing box bushes on both sides. Slide the water thrower I deflector and inner bearing housing end covers on the shaft, one at each end.
- Put in place the mechanical seal and adjust the positioning on the shaft.
- Slide the thrust collar and fit the thrust ball bearing on the shaft at free end in the cage. Slide the inner and outer spacer rings. Warm the bearing for ease of fitment.
- Fit lock nut and lock washer on free end and tighten it fully.
- Bend back the tab of locking washer onto locknut.
- Slide the bearing on the D.E. side & locate the same in position.



NOTE :

While assembling stainless steel component, molybdenum-disulphide paste should be applied to prevent galling/seizure and also to facilitate easy removal in future.

Re-assembly of the pump

- Ensure that casing is clean, dry and free from foreign matter. Clean casing neck ring and stuffing box bush seating thoroughly and ensure they have no burrs.
- Carefully lower the element into the bottom half casing.
- Ensure that casing neck rings enter their half grooves in the bottom half casing.
- Ensure that stuffing box bushes enter their half grooves in bottom half casing.
- Fit the dowel pins of the both bearing housing and ensure that the spindle rotates freely and then tighten all the bearing fixing setscrews.

If the shaft does not rotate freely, the cause must be investigated and the fault rectified.

- Fix at the drive end and free end, water throwers, dust covers and outer end covers to bearing housing by their setscrews.
- Put a gasket from 0.25 mm thick black joint paper or similar gasket material and locate on flange of bottom half casing.
- Lower the top half casing by crane or chain pulley block on the bottom half casing.

Fit the split flange studs. Align dowel holes and fit dowel pins before tightening the nuts. The nuts must be tightened evenly in the diagonally opposite sequence following the tightening procedure described by numbers in figure 7.

During the tightening up procedure a careful check must be made to ensure that the rotating element continues to rotate freely. Any sign of stiffness or bending must be investigated immediately and the cause eliminated.

- For gland packing version :
 - Insert gland packing, logging ring in proper sequence. Fit studs and split gland on both sides.
 - Reconnect sealing water lines to stuffing boxes or mechanical seal housing.
- For mechanical seal :

Extreme cleanliness must be observed during installation, and damage to the seal faces and mounting rings must be avoided.

 - Observe the assembly dimensions.
 - The O-rings may be oiled to reduce friction, during installation of the seal. EP-rubber O-rings should not come into contact with oil or grease; In this case lubrication with glycerine or water is recommended.
 - Never cover the sliding faces with a lubricant as they must be assembled completely dry, clean and dust-free.
 - When pressing in stationary seals, make sure that the pressure distribution is uniform. The O-ring must be fitted using water or alcohol only.
 - Crowned drive pins must be replaced whenever the seal is dismantled. During insertion of the stationary seats, especially those of special carbon, care must be taken to exert pressure evenly.
 - Place the mechanical seal on the shaft in order to ensure a correct compression of the spring. Tight the lock screws to avoid any further displacement on the shaft.

9.2.5 Recommended spare parts

We recommend the following spares for various periods normally desired by pump users.

- For two years operation : Mechanical seal or gland packing and bearings.
- For three years operation : Mechanical seal or gland packing, bearings, neck rings, sleeves-nuts, glands and logging rings.
- For five years operation : One rotating element
Split casing pumps are easier for maintenance than other type of pumps. To take full advantage of this, it is recommended that a set of spare part and a spare rotating element be ordered with the pump. This will reduce shutdown period to negligible value, while existing rotating element is removed for repairs.

Final assembly

- Refit and reconnect pump half coupling.
- Prime the pump and return it to service.

10 Faults, causes and remedies



NOTE:

Please, check the fault in the first table then refer to the numbers in the second table.

Symptoms		Possible cause of trouble and remedies (Each number is defined in the table below)
--	Pump does not deliver water.	1, 2, 3, 4, 6, 11, 14, 16, 17, 22, 23
--	Insufficient capacity delivered.	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 17, 20, 22, 23, 29, 30, 31
--	Insufficient pressure developed	5, 14, 16, 17, 20, 22, 29, 30, 31
--	Pump loses prime after starting.	2, 3, 5, 6, 7, 8, 11, 12, 13
--	Pump requires excessive power.	15, 16, 17, 18, 19, 20, 23, 24, 26, 27, 29, 33, 34, 37
--	Stuffing box leaks excessively.	12, 13, 24, 26, 32, 33, 34, 35, 36, 38, 39, 40
--	Pump vibrates or it is noisy.	2, 3, 4, 9, 10, 11, 21, 23, 24, 25, 26, 27, 28, 30, 35, 41, 42, 43, 44, 45, 46, 47
--	Bearings have short life.	24, 26, 27, 28, 35, 36, 41, 42, 43, 44, 45, 46, 47
--	Pump overheats and seizes.	1, 4, 21, 22, 24, 27, 28, 35, 36, 41

Causes		Remedies
1	Pump not primed	Ensure that casing is fully filled and water comes out from air-cock.
2	Pump or suction pipe not completely filled with liquid	Check leaking foot valve in case of negative suction
3	Suction lift too high.	Reduce by lowering pump elevation or increase Water level.
4	Insufficient margin between pressure and vapor pressure.	Check that NPSH available is at least 1 meter more 1 meter more than NPSH required.
5	Excessive amount of air in liquid.	Check the reasons and eliminate. Gas gets entrapped in liquid. Air may be entering through suction joints.
6	Air pocket in suction line.	Ensure pipe fully filled and there is nobend for negative suction.
7	Air leaks into suction line	Tighten pipe joints with solution.
8	Air leaks into pump through stuffing boxes.	Ensure stuffing box sealing.
9	Foot valve too small or leaking.	Replace / Attend.
10	Foot valve partially clogged.	Clean
11	Inlet of suction pipe insufficiently submerged.	Ensure adequate submergence such that foot valve is not exposed.
12	Water seal pipe clogged.	Clean or change.
13	Logging ring is improperly located in stuffing box, preventing sealing fluid from entering to form seal.	Position logging ring centrally under sealing holes of stuffing box.
14	Speed too low.	Check motor RPM, supply frequency, Motor nameplate speed should be as specified on pump nameplate.
15	Speed too high.	Check motor RPM and supply frequency.
16	Direction of rotating wrong.	Check correct direction of rotation for motor before coupling to motor.
17	Total head of system higher than design head of pump.	Check the causes and refer to M&P. Measure with pressure gauge.
18	Total head of system lower than pump design head.	Check the causes and refer to M&P. Measure with pressure gauge.
19	Specific gravity of liquid different from design.	Refer to M&P.
20	Viscosity of liquid different from design.	Refer to M&P
21	Operation at very low capacity.	Check the causes and refer to M&P, Operate pump at rated duty.
22	Parallel operation of pumps unsuitable for such operation.	Refer to M&P with charact eristics curves of pump.
23	Foreign matter in impeller.	Open and clean.
24	Misalignment.	Check with Dial gauge should be within limits and without undue pipe stresses.
25	Foundations not rigid.	Check, vibration on Baseplate, check hollowness.
26	Shaft bent.	Dismantle and check, Replace shaft.

Causes	Remedies	
27	Rotating part rubbing on stationary part.	Incorrect assembly, correct the assembly.
28	Bearing worn.	Check lubrication, shaft run out, alignment, replace if required
29	Wearing rings worn.	Replace.
30	Impeller damaged.	Replace.
31	Casing gasket defective, permitting internal leakage.	Replace.
32	Shaft or shaft sleeves worn or scored at packing.	Replace.
33	Packing improperly installed.	Use correct grade and size of packing
34	Type of packing incorrect for operating condition.	Use correct grade and size of packing.
35	Shaft running 'out of center because of worn bearings or misalignment.	Rectify.
36	Rotor out of balance, causing vibration.	Balance the rotor.
37	Gland too tight, resulting in no flow of liquid to lubricate packing.	Adjust gland. Ensure sealing water flow
38	Cooling liquid not being provided to water-cooled stuffing boxes.	Provide.
39	Excessive clearance at bottom of stuffing box between shaft and casing, causing packing to be forced into the pump.	Check pumps assembly.
40	Dirt or grit in sealing, liquid leading to scoring of shaft or shaft sleeve.	Provide clean liquid for flushing
41	Excessive thrust caused by mechanical failure inside pump or by failure of hydraulic balancing device, if any (in case of multistage pump etc.)	Check pump operation and assembly
42	Excessive grease or oil in antifriction bearing housing or lack of cooling, causing excessive bearing temperature.	Attend.
43	Lack of lubrication.	Provide proper lubrication.
44	Improper installation of antifriction bearings (damage, incorrect assembly of stacked bearings, use of unmatched bearings as a pair I etc.)	Rectify or replace bearing.
45	Dirt in bearings	Investigate the cause and clean bearing.
46	Rusting of bearings from water in housing	Arrest water ingress.
47	Excessive cooling of water-cooled bearing, resulting in condensation of atmospheric moisture in bearing housing.	Reduce cooling water flow

**NOTE:**

For trouble shooting of prime mover, electrical panels, mechanical seals refer the respective manufacturer's instruction manual.

Maintenance planning

The prescribed maintenance and inspection work should be carried out regularly.

标题:

图. 1	吊装方式
图. 2	正确的地基示例
图. 3	错误的地基示例
图. 4	轴对中示意图
图. 5	受力分布示意图
图. 6	密封填料示意图
图. 7	装配顺序示意图

图. 8	带机械密封单级水泵截面图
1001	上泵体
1002	下泵体
1181	口环
1500	叶轮
1800	轴
2070	甩水环
2100	轴套
2402	支撑环
2420	机封（平衡型）
2421	机封压盖
2600	深沟球轴承
2751	轴承端盖（驱动端）
2754	轴承端盖（非驱动端）
2761	轴承座（驱动端）
2764	轴承座（非驱动端）
2884	止推环
3001	轴套螺母（左侧）
3002	轴套螺母（右侧）
3010	锁紧螺母
3020	轴承挡圈
3031	轴套锁紧螺母（左侧）
3032	轴套锁紧螺母（右侧）
3200	叶轮键
3250	联轴节键
4230	放气阀
4250	O型圈
4580	防护罩

图. 9	带填料密封单级水泵截面图
1001	上泵体
1002	下泵体
1181	口环
1500	叶轮
1800	轴
2070	甩水环
2100	轴套
2300	均压环
2310	填料压盖
2402	支撑环
2410	填料
2600	深沟球轴承
2751	轴承端盖（驱动端）
2754	轴承端盖（非驱动端）
2761	轴承座（驱动端）
2764	轴承座（非驱动端）
2884	止推环
3001	轴套螺母（左侧）
3002	轴套螺母（右侧）
3010	锁紧螺母
3020	轴承挡圈
3031	轴套锁紧螺母（左侧）
3032	轴套锁紧螺母（右侧）
3200	叶轮键
3250	联轴节键
4230	放气阀
4250	O型圈
4580	防护罩

图.10 带机械密封二级水泵截面图	
1001	上泵体
1002	下泵体
1100	定位环
1181	口环
1503	一级叶轮
1504	二级叶轮
1800	轴
2070	甩水环
2100	轴套
2311	机封压盖
2402	支撑环
2411	机械密封
2600	深沟球轴承
2751	轴承端盖（驱动端）
2754	轴承端盖（非驱动端）
2755	轴承压盖（驱动端和非驱动端）
2760	轴承座
2801	中间轴套
2884	止推环
3001	轴套螺母（左侧）
3002	轴套螺母（右侧）
3011	锁紧螺母
3020	轴承挡圈
3031	轴套锁紧螺母（左侧）
3032	轴套锁紧螺母（右侧）
3200	叶轮键
3250	联轴节键
4230	放气阀
4250	O型圈
4290	机封冲洗管
4580	防护罩

图.11 带填料密封二级水泵截面图	
1001	上泵体
1002	下泵体
1100	定位环
1181	口环
1503	一级叶轮
1504	二级叶轮
1800	轴
2070	甩水环
2100	轴套
2300	均压环
2310	填料压盖
2402	支撑环
2410	填料
2600	深沟球轴承
2751	轴承端盖（驱动端）
2754	轴承端盖（非去、驱动端）
2755	轴承压盖（驱动端和非驱动端）
2760	轴承座
2801	中间轴套
2884	止推环
3001	轴套螺母（左侧）
3002	轴套螺母（右侧）
3011	锁紧螺母
3020	轴承挡圈
3031	轴套锁紧螺母（左侧）
3032	轴套锁紧螺母（右侧）
3200	叶轮键
3250	联轴节键
4230	放气阀
4250	O型圈
4290	机封冲洗管
4580	防护罩

1 概述

前言

本操作章程的最初版本为英文，其它版本均按此文本为翻译原型。

本安装及维护说明书涵盖产品的重要信息，因此必须妥善保管，请在安装及调试前认真阅读此说明书，以便对产品正确使用以及保护您的人身安全。本版本安装及维护说明书符合有关产品事故防范标准。

本产品符合EC标准声明，属于安装于维护说明书的一部分。

不经过制造商允许，不能对说明书的技术数据、图表以及内容进行翻印和发放。

2 安全规范

此说明书涵盖了该水泵安装及运行时必须严格遵守的安全准则。因此，技术人员在安装和调试前必须认真阅读此说明书。本机器操作员列表需填写完整，通过签署这份表单，工作人员可以进行工作，或者去进行产品确认。请阅读并理解产品维护使用说明书手册。

它不仅仅是寻常的安全使用说明，重点在“安全”上必须要严格执行，一些安全防范表示符号如下。

2.1 说明书中使用的安全符号

符号：



危险符号



有电危险



注意：...

信号词：

危险!

特别危险的处境。

不遵守的结果是造成死亡或者重伤。

警告!

使用者会受到重伤，“警告”意味着忽视此信息将会对人体造成重大伤害。

小心!

在安装过程中可能会发生危险。“小心”意味着如果忽视此信息，产品可能会对人體造成伤害。

注意：

使用产品时请注意有用的信息，避免可能产生的问题。

2.2 操作员资质

安装水泵的人员必须有相应的资质。

2.3 不遵守安全准则的危害

不遵守安全准则会导致对人体的伤害和产品被损坏，不遵守安全准则会导致伤害。

不遵守安全准则会导致以下危害：

- 产品或设备失去其重要功能，
- 维护和维修过程造成的伤害，
- 通过电气、机械和微生物对人体造成伤害，
- 财产损失。

2.4 操作者的安全准则

发生事故必须遵守现场指示。

排除可能引起的电能伤害。必须遵守当地电气规范和VDE规范（德国电气工程师协会规范）。

对运动中的部件进行防护时（比如联轴器）必须远离运转中的机器，并且使用合适的保护装备来保护手、眼睛等等。

2.5 检查和安装的安全规范

操作者有责任确保检查和安装水泵必须由有资质的、授权批准的专业人员进行。

只有在水泵停止运行时，才能进行检修。必须按照安装和操作规程中描述步骤关闭运转机器。

2.6 自行改装设备和自制备件

自行改装设备必须经过制造商同意，使用原厂备件将确保安全。使用其他零件，制造商将不承担由此引起的任何后果和责任。

2.7 不恰当的使用

只有按照操作说明书内容进行操作，供应商才会对产品提供担保，数值不能高于，也不能低于数据表中的要求。

2.8 安全及控制装置

可直接控制与电机 / 面板连接的水泵，在最终供货范围内，建议使用CE认可的电机 / 面板。

2.9 环境安全

对于不需要的废料 / 碎片应用适当的方法处理，以免引起任何环境损害。威乐SCP系列水泵使用的是没有危害的材料。

注意



为了避免歧义在使用的词“替换”和“替代”在本手册中指下列内容：

替换-放回去，指其存在的状态，其中的一员或组件，曾被移除。

替代-用新的组件替代的原组件中磨损或损坏的部分。

3 运输和暂时储存(图1)

在运输前对水泵以及包装箱进行检查，防止运输途中发生损坏现象。对运输公司采取必要的规范避免在运输途中发生损坏造成不良结果。

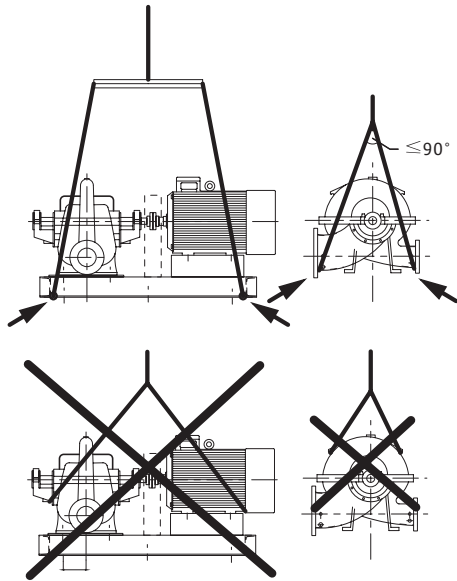


图1 水泵吊装方式



注意：有压碎的危险！

严禁独自一人安装和移动设备。应当采取措施防止人员站在悬挂物的下方。此外，禁止在有人区或其它额外区域移动悬挂物。扣紧的设备应当与周围的实际环境相适应（天气，挂钩系统，负载等），用合适的紧扣设备来承载设备的重量。



注意：水泵有毁坏的风险！

在运输和储藏中，如遇错误的操作会有毁坏的风险。

在运输和临时储存时，为保护水泵应避免将水泵放置在潮湿，霜冻的环境中，并避免错误操作。

3.1 操作



注意！水泵有毁坏的风险！有跌落的风险！

水泵的牵引绳索不能放在轴承室处。水泵上端的吊环螺栓仅用于提降维护中的水泵上泵体。

不要用吊环螺栓来提降整个水泵。安全电缆将会因包括角度变化等原因而减少安全性。禁止在无保护的状态下放下或取出设备。应避免产品的倾斜。

只有合适的起重齿轮和具有测试证书以及合理测试的设备(如吊缆，安全绳索等)才可用于设备的提降和运输。如果链条处于使用状态，必须防止滑落以避免设备的损坏和人员的伤害。为了提降水泵，绳索应当穿过水泵进出口法兰的下端（参见吊装图及安全信息，第2部分）。这些必须保证足够的轴承空间来保证产品可以安全的运输。

3.2 交付

到达后，应当确认设备部件是否完好，设备是否齐全。如果任何的部分有损坏或者缺失，运输公司或制造商必须在交付日得到通知。日后提出的任何要求将被视作无效。部件的损坏必须在交付或运输文件上标明。

3.3 储藏

3.3.1 短期储藏

设备在发货时有覆盖物来确保短期储藏。干燥通风的区域作为优先储存区域。

3.3.2 长期储藏

如果设备需要长期的储存，那么必须通知生产商以便其采取特殊的保护措施。

- 将SCP水泵水平放置于地基坚固处并确保不会滑落。
- 将水泵的进出口连接处密封，防止进入杂物。
- 水泵必须避免直接光照、炎热、灰尘以及霜冻环境。
- 经常转动转子或转动部件，防止轴承卡死，在更换轴承时涂上润滑油，保持润滑。
- 对于机械密封，我们推荐：空气湿度低于65%，温度在15℃到25℃之间。机封直接暴露在高温下，臭氧条件、紫外线照射等条件一定要避免。因为这样会使橡胶材料变硬变脆。

3.4 返回供应商

接收的设备在返回工厂时，必须清洁并有正确的包装。清洁的意思是应去除杂质的污物，那些污物可能影响身体健康。包装一定要确保产品不被损坏。



警告！当设备的包装在运回途中被损坏，我们对此不承担保障服务。

4 安装

水泵用于特殊介质时，应有技术参数表和订单确认，任何改动请与威乐公司联系。卧式中开泵用于供水，循环水系统，喷洒，喷淋，空调，水处理，灌溉，消防，液汁等领域。

如果所购买的水泵与说明书的类型不同（比如介质、温度和参数），在使用前请与威乐公司联系并进行书面的协议。

5 产品信息

5.1 水泵命名说明

SCP200/250HA-110/4/T4-C1/E0	
SCP	系列名称
200	出口公称直径(mm)
250	叶轮名义直径(mm)
HA	水力性能类型 -HA=标准类型 A -HB=标准类型 B -HS=单向吸入式叶轮 -DV=双蜗壳 -DS=两级叶轮
110	电机功率(kW)
4	电机极数
T4	三相电压380V
R1	可配置的水泵材质：铸铁泵体、青铜叶轮、不锈钢轴（符合RoHS认证）
EO	可配置的机械密封材质：碳/碳化硅 EPDM/AQ1EGG

5.2 技术参数

标准系列的操作范围

有关产品的技术特点，尤其是介质的兼容性-必须在该产品的订单中进行说明。

性能	数值	备注
转速	2900, 1450, 980 RPM	
公称直径DN	50~400	
管道连接	法兰PN16/PN25	EN 1092-2
允许温度范围		
-机械密封[°C]	-8~+120	
-填料密封[°C]	-8~+105	
环境温度	0~40 °C	
最大工作承压	16bar	25bar用于特殊符号
绝缘等级	F	
防护等级	IP55	
电机保护	-	根据现场要求
声压级（取决于电机）		
-1.1kW~	54 dB(A)	参见目录
630kW	90 dB(A)	
允许介质	热水符合VDI 2035 冷水/冷却水 水/乙二醇混合液: ≤40°C, 浓度 可达20%~40% 载热油 其它液体	标准型号 • 标准型号 • 标准型号 • 仅用于特殊型号 ◦ 仅用于特殊型号 ◦
电气连接	1~220V, 50Hz 3~380V, 50Hz 其它电压/频率, 根据要求	◦
转速控制	在使用相应的WILO控制柜时, 控制 设备(WILO控制系统); 外部变频控 制	◦
特殊电机类型	特殊电压/频率	◦

- 标准型号
- 特殊型号或可选设备（另需加价）

5.3 供货范围

按整泵组成品发货，包括电机、底座、联轴节和联轴节防护罩。

5.4 附件

附件应分别订购。

- 参见详细清单

6 功能和说明

6.1 产品说明

中开泵分为单级和两级，结构简单，壳体沿着泵轴的中心处分成两部分，对于日常维护时，不需要拆下水泵或者管道进行维修。

6.1.1 泵壳

壳体为蜗壳设计，由两半组成，沿泵轴线用螺栓连接，在上部和下部壳体的连接面之间设有纸垫。对于这种精确地设计，可以将上下泵体、轴承室上下托架用定位销连接。

水泵的进水和出水管与带有支脚的下部泵壳铸成一体。在水泵的进出水口处钻孔安装压力表和放水螺孔。在下部泵壳处开凹槽，易于口环和填料函衬套嵌入。

泵壳顶盖有螺纹孔，通过冲洗管与填料函上的水封连接。某些泵在上部泵壳内部钻孔，流体在水泵出口蜗壳和填料之间流过。对于其他情况，如图11所示，上部泵壳上的螺纹孔安装排气阀。

6.1.2 口环

防止水泵中的介质从叶轮出口流回泵体内部，在叶轮和泵体之间设计合理的运行间隙。口环是可更换的，在发生磨损后定期地修复运行间隙。这些口环通过一个定位销连接，安装在下半部泵壳内，并通过上半部泵壳的巾开法兰锁定，以免随叶轮一起转动。

6.1.3 转动部件

转动部件由轴和装在泵轴上的叶轮组成。可更换的轴套与叶轮轮毂相邻，保护泵轴减小腐蚀。叶轮通过轴套螺母固定，轴套螺母按轴转动方向确定螺纹的左/右方向，防止因轴的转动而松动。

转动部件由深沟球轴承或滑动轴承支撑，通过止推滚珠轴承或止推盘和螺母限制轴向位移。轴套上方两侧均有填料函衬套(固定部件)，位于下半部泵壳内。这有助于流体正确导入叶轮进口。填料函的背面起到支撑填料压盖的作用。

轴套上方两侧有填料环(固定部件)，夹在填料函内的填料密封中间。填料环提供适当的填料函密封。2级水泵不使用填料环，在2级填料函处提供漏失环。

某些型号的轴带有甩水环、甩油环，请参考剖面图。

6.1.4 密封系统

为防止从泵壳的突出点处沿泵轴出现泄漏，在填料函内安装填料密封或机械密封，填料函安装在泵体的两端。

机械密封

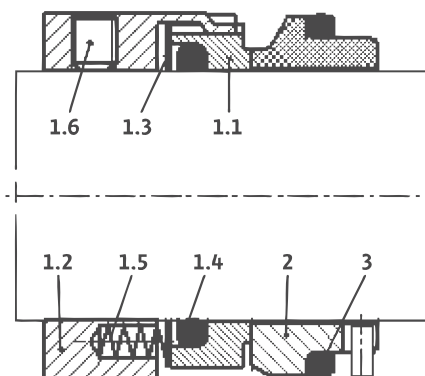


图12: 机械密封

- 1.1 动环
- 1.2 动环基座
- 1.3 止推环
- 1.4 O型圈
- 1.5 弹簧
- 1.6 定位螺钉
- 2 静环
- 3 O型圈

7 安装及电气连接(电机/水泵联轴节)



危险! 禁止压碎!

设备的安装与移动不允许由一个人单独完成。

禁止站在悬浮的设备下进行测量，禁止将悬吊的设备悬浮在人员工作的地方。卡紧装置应用在特殊的环境下(天气，吊装系统，货物等)。使用适当的卡紧装置，避免超载。



注意! 人员的危害!

只允许有资格的人员进行安装与电气连接，并遵循相关章程。此章节对如何把水泵设备安装在混凝土基础上予以介绍。在安装过程中，用户和安装承包商必须仔细核对安装图纸，确保水泵在正确的技术参数范围内进行准确安装。

必须遵守安全章程来预防危险。

7.1. 安装

- 在水泵安装前，必须对水泵是否在搬运、运输和储存过程中发生损坏进行检查。
- 室内安装：水泵的安装应在干燥、通风、防霜冻的室内。
- 水泵机械装置应当存在方便维护的房间。水泵上部必须留有足够的起重设施提升高度和移动空间。

- 户外安装(露天安装):
户外安装在下雨、大风和颗粒状物质等对电机、水泵有损害的环境下应有适当的保护

- 应避免水泵直接暴露在阳光下。
- 在霜冻环境下也应有解决方案。



警告! 物料的损害!

如果环境温度低于或高于许可极限值时, 需确保充分的空气流通/供暖。

- 水泵安装前需清理焊接杂物。



注意! 物料的损害!

操作不当引起管路系统中存在杂质可致使水泵损坏。在安装水泵前清洗管路。

- 水泵前后需安装阀门。

7.1.1 基础 (图2, 3和13)

基础应足够坚固, 以吸收任何震动同时为水泵底座提供一个永久性坚实支撑。基础尺寸必须足够大。(如图2):

- a 基础要比水泵底座长 / 宽15-20cm
- b 隔离振动的设备有软木层、橡胶垫等(5cm左右即可)

通常基础的重量为整泵的2-3倍, 这对于维护中直连设备的校准相当重要的。建造基础时, 基础顶部应留出约1英寸空间以浇筑混凝土。然后准备好合适的地脚螺栓埋入混凝土中, 位置如下图(见图13)。

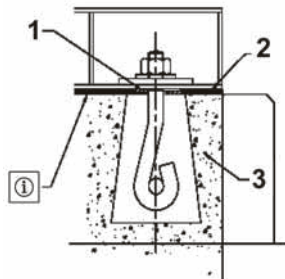


图13: 地脚螺栓

- 1 隔振垫
- 2 二次灌浆
- 3 混凝土



注意:

- 应使用尺寸大于螺栓且直径约为2 1/2英寸的管套, 确保螺栓在最终定位前可移动。安装过程的噪音应尽可能低, 基础应建造在一个内衬合适的隔振材料的基坑内, 以避免震动的传输。(见附图)



警告! 物料的损坏!

紧固螺纹连接时, 切勿通过电机/机芯稳固水泵。而应用扳手控制进/出口。

- 使用水平仪检查底座平面水平度尚属不足, 因为部分误差类型可能无法测得或可能被认为在可接受限度之内。这些变形显示如图3 a-c。因此, 有必要使用带有工程主水平仪的工字型直尺进行检查(见附图)。

7.1.2 底座的校准与安装



警告! 物料的损坏!

接收的水泵和驱动装置被连接在公共底板上时, 运行前需要对轴对中重新校核, 因为在卸载、储存过程中也可能产生轴对中的偏离。

- 使用“工字型”尺和工程水准仪(精度0.02mm/m)来校准底座水平, 工字尺应放在底座的加工面上, 或放在找水平的钢板条上(如果有的话)。用来检查的水泵加工面, 必须进行清洗, 除去油漆, 毛刺等。

- 检查水泵底座的位置按照给出的G. A. 通过调整底座和平垫之间的插块来调整底座水平, 使每个分支都受力。通过使用工字型尺和工程水准仪检查穿过两块垫块的水平度。水平度应达到每250mm误差在0.05mm以内。

- 当底座找好水平后, 才能对地脚螺栓处进行灌浆。注意不要使地脚螺栓移动歪斜, 灌浆的比例为水泥: 沙子: 砾石为1: 1: 2(12mm以下)。也可以使用速凝浆料。

- 当水泥灌浆已经凝固时, 小心地拧紧地脚螺栓。必须注意: 不要过分拧紧地脚螺栓上的螺母。

- 当底板已经水平, 并完成了校准, 接下来可以连接进出口管路, 重新检查管路安装后水泵的对中, 对底座下进行最后的水泥灌浆。允许最短的固化时间为7天, 相应的水泥砂浆要按此需求进行配制。建议在初期的水泥灌浆固化后, 填平底座上的所有孔洞。

- 泵送高温介质的水泵, 例如锅炉供水泵, 水泵地脚厂中心与转轴中心要成同一直线, 防止膨胀造成的轴不对中。横向和纵向销子可以使水泵在底座上定位。水泵地脚螺栓通过弹簧垫圈或锁紧螺母确保水泵在底座上的固定, 在膨胀过程中, 允许底脚滑动而不会弹跳。

7.1.3 水泵和电机的找正对中

- 建议根据BS3170-1972附录A推荐的数值, 按照下述方法检查轴对中。这种方法与轴或联轴节的实际尺寸无关, 不受联轴器端面不平行度或外圆跳动的影响。在进行轴对中前, 分别转动每根轴, 检查轴承是否能自由转动, 轴的径跳在0.1mm以内。在驱动轴转动时, 检查没有缺陷产生。联轴节的连接可以打开, 两个板块联轴节相对转动, 否则指示器读数可能会不准确。凡是用定位销或弹簧防松的, 拆掉弹簧或者定位销在两个半块联轴节上画一条十字线, 用于对中时进行

复位后的读数。

• 轴向对中

切断电源并隔离保护后，将百分表装夹在半联轴节直径上对称的点上，或者装夹在联轴节后面的轴上，并让测杆靠在另一半联轴节的背面（见图4）。转动联轴节，使百分表的指针竖直成直线，将百分表读数调零。转动联轴节180度，记录表上读数。表读数不一定为零，但应保持一致，读数为正或者负均可。如需要，可调整百分表的位置。使指针在水平方向为一条直线，将百分表调零。转动联轴节180°，重复上述测量步骤。（图4检验轴对中）

• 径向对中

将百分表装夹在一个联轴轴器上，或者如图4所示装夹在轴上，使测杆靠在另一联轴节的边缘。百分表读数调零。转动联轴节，每转动1/4圈读数，任何读数改变代表仍有误差，调整百分表的位置，直到百分表每转动1/4时的读数一致或在下表所示的公差范围之内。（如图4检验误差类型）

• 对中公差

运行范围		
< 1000rpm	0.15 mm TIR	0.15 mm TIR
> 1000rpm~1800rpm	0.10 mm TIR	0.15 mm TIR
> 1800rpm~3000rpm	0.05 mm TIR	0.1 mm TIR

7.1.4 管道

在进行管路安装时，不允许泵壳承担任何受力，不论是管路重量或管路连接时的拧紧力。

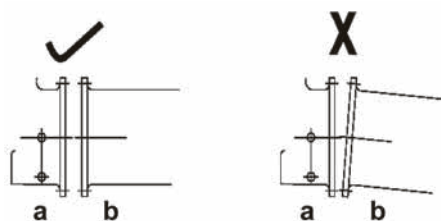


图14 避免泵壳承担任何受力

a: 水泵法兰; b: 管路

经验证明，这些受力可能会严重的影响水泵的找正对中。所有与水泵连接的管路，必须被充分支撑，管路法兰的贴合面必须平行，每个螺栓孔必须对齐（法兰最大受力值见下表）。在管路完全安装后，应对水泵和电机重新进行找正对中。重新安装和支撑管路时，在找正过程中修正偏差。

对吸入端抽吸困难的情况，为稳定液流，管路长度必须是水泵吸入端直径的15倍。

• 吸入端的流速不能超过2-3m/s。

• 为满足水泵的气蚀余量NPSH要求，需减小管路流速，控制进水管的管路损失。

许用受力和力矩（见图5）

法兰各个方向	法兰尺寸 受力 (N) 和力矩 (Nm)											
	50	65	80	100	150	200	250	300	350	400	450	500
Fx	712	890	1068	1423	2491	3781	5338	6672	7117	8452	9341	10008
Fy	578	712	890	1246	2046	3114	4448	5338	5783	6672	7340	7896
Fz	890	1134	1334	1779	3114	4893	6672	8007	8896	10231	11121	7784
Fr	1290	1646	1913	2535	4493	6939	9786	11565	12900	14679	16236	17659
每个法兰												
Mx	459	688,5	945	1323	2295	3510	4995	6075	6345	7290	7695	7965
My	351	526,5	715,5	999	1755	2565	3780	4590	4725	5400	5737,5	6075
Mz	229,5	438,75	472,5	675	1174,5	1755	2430	2970	3105	3645	3915	4185
Mr	621	972	1282,5	1795,5	3118,5	4725	6750	8235	8505	9720	10260	10800

7.1.5 进水管路

水泵进水管路布置，详见下图

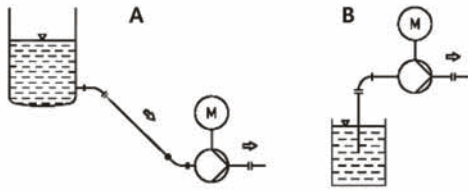


图15: 水泵安装布局
A: 自灌方式; B: 吸上方式

确保不发生气蚀。

吸水管道不同管径进行连接时必须使用偏心异径管。(见图16)

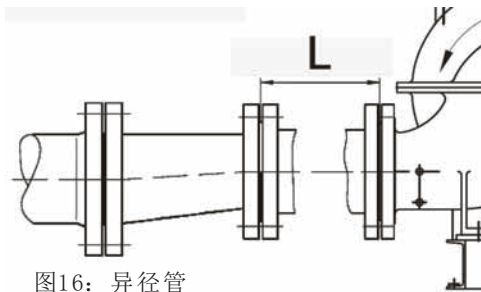


图16: 异径管
图16: 异径管

- 建议在进水管前安装过滤器，过滤器横截面积为进水管横截面的3倍（大约 100 目/cm²）。

- 进水管的吸入口要在液面以下，并安装过滤器。

过滤器必须与水箱底部保持一定距离，减小吸入损失、以免影响泵的性能。请检查吸入管道，保证无泄漏。

进水管路安装开关阀，当维修水泵时，必须关闭开关阀。安装开关阀是为了避免发生气蚀，在泵体内形成水平位置或者垂直向下的穴蚀。

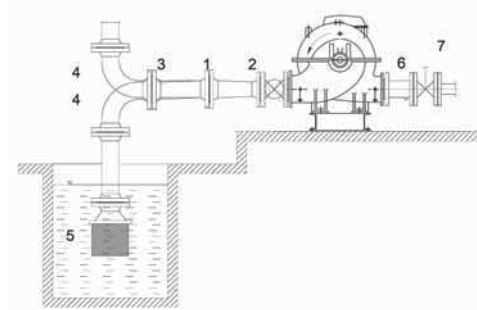


图.17: 水泵安装图

- 1 偏心异径管（吸入端）或同心异径管（出口端）
- 2 截止阀
- 3 吸入管路
- 4 弯头
- 5 带过滤器底阀
- 6 止回阀
- 7 调节阀

7.1.6 出水管路



注意!

在水泵的出水管上安装止回阀。如不安装止回阀，可能会引起水击，造成水泵泵壳破裂。流体回流会毁坏轴承和机封。

为调节流量，必须在泵的出水管安装调节阀。必须平稳的关闭止回阀，避免产生冲击压力。

7.1.7 填料密封(图 6)



警告! 易损或泄漏的危险!

对待填料应小心轻放，不放在地板或脏工作台致使沾上灰尘或研磨物。安装填料时禁止敲击安装。

水泵从工厂发出的时候填料函内不放入填料，否则填料容易老化。填料用防油纸包装随泵一起运输。大多情况下推荐使用软填料即南编织棉纱浸渍石墨润滑剂和润滑油。填料需要切割成合适的长度，每段长度应能正好围绕轴套一圈首尾相接，每段首末两端应呈矩形。清洗填料函和轴套后，将填料放入填料函。每个填料环应独自用填料函压盖推入到指定位置。两相邻填料环的接茬必须相隔180度。如果填料函中需放入冲洗环，按顺序安装填料和冲洗环，使其位置与冷却水接管对齐。最后将盘根压入，使其与泵体垂直，用比手拧紧稍大的力量拧紧压紧螺母。



警告! 物料损坏的危险!

螺栓长度应足够，螺栓最少要高出螺母1个螺纹。

- 用浸过汽油的抹布将水泵安装表面的防锈涂层彻底擦拭干净，不要使用任何含氯的溶剂如四氯化碳，三氯乙烯等。

- 在水泵和对接法兰间安装配对法兰平垫圈。

- 用规定的扭矩分两步交叉锁紧法兰螺栓（法兰螺栓力矩见7.1.4章节图表）。

- 第1步: 0.5x 许用扭矩

- 第2步: 1.0x 许用扭矩

- 检查法兰连接有无泄漏。

7.1.8 机械密封



警告! 水泵有损坏的危险!

严禁水泵干转，否则机械密封将瞬时烧坏。

在整泵组装时无特殊要求。在泵组启动前必须将泵体灌满水并排出泵体内的空气。

7.2 电气连接



警告！小心触电！

电气连接必须由当地电气公司根据本地相关规定授予操作资格的电工进行操作。

- 实际电流和电压必须与铭牌上的参数符合。

- 电机和控制板的安装和连接请参考安装手册。

电机和电气控制板接工业高压电源。

- 电气连接到预留的主线路上。

- 必须符合当地的相关法规。

- 确保配备切断并且隔离电源的安全装置。当泵组切断电源，安全装置要确保直到故障解决才能再度接通电源。

- 电气系统（水泵及其防护装置和工作区的电气系统）必须保持接地。根据泵的外形图和电机 / 电控板使用说明书的要求进行接地连接，符合电机功率以及相关标准和标准，包括接地片的尺寸和紧固件的要求。

- 在任何情况下连接电缆都不能接触到管路 / 泵或电机外壳。

- 为预防人碰触到泵组或者输送的流体，接地线必须加装过载保护装置。

- 为保证电缆连接不会受到滴水 and 溢流的影响，要采取相应的防护措施，使用适当外径的电缆，并拧紧电缆套管。另外，靠近输出管路螺纹连接处的电缆应弯曲，以躲开水泵的滴水。拧紧密封堵，堵上暂时不用的电缆接口。

8 充水试车



警告！

水泵运转的时候转动部件（例如联轴节）的保护罩禁止移开。使用适当的劳动保护装备保护操作人员的双手、眼睛等部位。

水泵 / 电机 / 电控操作板等的安全设备严禁失效，在使用前必须由有资质人员根据使用手册对其进行检查。



警告！

请勿在规定的工作范围外运转水泵。在规定的工况点之外启动水泵可能不会对操作人员造成危险，但是会降低水泵的工作效率或者损坏水泵。在阀门关闭的情况下水泵运转不能超过5分钟。对热流体严禁在阀门关闭的情况下运行水泵。

确保NPSH-A大于NPSH-R。

8.1 启动前清洗

8.1.1 管道清洗

水泵交付使用前，详细检查后初步调试和重新调试前，与水泵连接的管路必须进行彻底清洗。清洗管道内的沉积物或结垢，这些沉积物可能会损坏水泵的内部部件。

8.1.2 轴承清洗

预先涂有润滑脂，带密封的轴承属于免维护的，不需要进行外部润滑。

如果轴承是需要加油的，而且长时间储存后，应对滚珠轴承进行清洗和冲洗，并重新添加润滑脂。应使用洁净的石油溶剂油或优质石蜡，不得使用废油 / 废石蜡以及使用过的棉布，其上的杂质颗粒可能会对水泵轴承造成损坏。

在水泵出厂前，球轴承和辊子轴承均已填充润滑脂。润滑油脂列表详见手册后面的附件。

8.2 充水和排气

水泵和机械密封必须完全排气。哪怕是短时间的干转也将会损坏水泵。请注意本水泵不能自吸，因此水泵在使用之前，必须将水泵和进水管充满液体。



警告！

不要触摸水泵，可能会烫伤。运行中的水泵及其系统很可能非常热，禁止触摸。



警告！

水泵干转或者未充满介质运转将会损坏水泵的转动部件。

8.2.1 吸水口浸没安装的水泵运行

水泵在吸水口浸没安装运行时，水泵进行充水，打开位于泵盖顶部的放气螺塞和水泵的进水管处的截止阀。水将会把空气从放气口挤出。当充水完成后，启动水泵之前，关闭放气螺塞。

8.2.2 水泵吸水口在负压下的运行

有两种方法来解决抽水水位低于进水口时的水泵充水问题：

- 如果进水口处装有底部止回阀，可以加用外部水源向泵内注水，放气。加在水泵上的压力不允许高于设计的水泵最高承压。在特定情况下，水泵的充水可通过出水口倒灌满足。

- 从泵腔抽气。使用此方法，填料函必须密封良好或南外部提供液封。对于放气问题应参考制造商说明书。通常安装指示器来显示泵内是否已充满水。

8.2.3 输送高温流体时的水泵运行

水泵泵送高温流体通常是在有压情况下流体进入水泵。如果高温流体的饱和压力大于大气压，会造成流体从排气阀突然喷出。因此，在对热水循环泵充水时，缓慢地旋开水泵盖顶部的放气螺塞，直到所有的空气从泵腔内放出。

运行前先对水泵进行预热，温度要求均匀上升，并且每隔10分钟盘车半圈，开启入口阀及排气阀，排出泵内气体，预热到规定温度后再关闭排气阀。

8.3 水泵启动

8.3.1 高压电机第一次使用时，首先应进行空载运行2~3小时，确认运行正常后再进行加载运行，如出现不正常情况应及时停机，并联系我司售后人员。

8.3.2 旋转方向

断开联轴器，启动电机检验水泵的转动方向，要求电机转向与水泵上注明的转向保持一致。

8.3.3 启动前检查

- 检查进口阀门是否打开，出口阀门是否关闭。
- 检查进水管末端的过滤器是否堵塞。
- 检查联轴节的转动部件是否可以自由转动。
- 检查水泵的进、出口是否安装压力表。测试报警，信号，连锁系统以及保护装置辅助控制是否与水泵主控制系统组成一体。
- 检查进口阀门是否打开，出口阀门是否关闭。确保电机和控制面板的继电保护的所有电气检查与制造商的操作使用说明书一致。
- 确保填料函的水封连接，如图G.A所示。
- 检查充水试车步骤，详见8.2章。
- 检查水泵及电机铭牌信息，核对现场情况是否一致。
- 检查轴对中是否符合要求。
- 检查联轴器防护罩安装是否牢固。
- 检查油位计显示是否在标线范围内。
- 检查机械密封冷却水管路是否处于打开状态，冲洗系统是否齐全完备。
- 检查高压电机：空-空冷却器是否已经开启，风扇转向与标识是否相同；空-水冷电动机应检查进水水压、水量及水温是否符合要求，密封是否良好，通水正常后方能启动电动机。

8.3.4 一般的启动检查

- 在所有启动前的检查完成时，点动控制箱上的“开始”按钮，检查水泵的旋转方向（是否与泵壳上标注的箭头方向一致），检查旋转方向后，水泵在额定转速下运转。

- 检查电表的电流表读数，确保电机不过载。

- 保证填料函不过热，填料函允许有轻微的泄漏（约1滴/秒）。由于填料函中的高粘度润滑油，刚启动填料函可能发热。新填料在水泵运行开始的几分钟会有少量的粘性流体被挤出，当运行稳定时，漏出的流体就会减少。

- 检查机械密封是否泄露。在启动阶段（或者停机之后）会有少量的泄漏。定期进行机封泄露目视检查。如果目视检查发现明显的泄露需要替换机封。威乐可以为客户提供整套的备件。

- 对于滑动轴承，检查通过油环能否将润滑油带到轴承衬套中。

- 检查轴承不允许过热。通常轴承在高温于环境温度30℃~35℃之间运行。对于球轴承，理想的轴承运行温度为40℃~60℃，滑动轴承的运行温度在40℃~55℃。理想情况下温度稳定且不再升高，但是所有轴承的温度不应超过82℃，滑动轴承温度为75℃。如轴承过热，需要立刻对其原因进行分析。

- 如果预先的检查没有问题后，慢慢打开出水阀门，且通过读取压力表和电流表，使泵的运行工况逐渐接近水泵铭牌/技术参数的额定参数。如果水泵没有安装特殊的防漏装置，水泵不应该关闭出水阀门长时间运行。在阀门打开过程中，确保电机不过载。当水泵向一空系统充水时水泵出口扬程暂时低于水泵的设计扬程，可能会造成水泵过载，为此，小心调节出水阀门，直到系统完全充满水。如果水泵没有达到足够的额定出口压力，必须及时停止水泵的运行。查明原因，解决故障，在水泵重新启动前重新注水。

- 检查整泵的振动，确保振动等级符合在标准中规定的范围内，检查水泵噪声以在规定的范围内。

- 在第一次试运转时，水泵应该连续运行8小时并且定期记录所有数据，例如：出口压力，水流量，轴承温度等。应定期做好以下检查，我们建议每次值班换班的时候都进行检查。

- 检查流量和水泵进出口端压力，如果出现进出口端压力骤降的情况，那么很可能是水泵短水造成。这种情况下，应该立即关闭水泵并且排除水泵短水的原因。

- 检查机械密封或填料函是否过热。

8.3.5 正常关闭水泵

- 关闭出水阀门减小电机负荷。
- 停止电机。
- 当水泵渐渐停止下来时，关闭进水阀门。
- 关闭其他辅助设备。
- 当泵送介质为高温时，只有确认介质温度

冷却到80℃以下时，才能关闭冷却水和机封密封的冲洗系统阀门。

注意：不允许在运行中反接电源逆转或制动。高压电动机允许在实际冷状态下连续启动两次（两次启动之间应自然停机），在额定运行后仅允许热态启动一次（下次启动应在4小时之后）。电动机运行时不允许过载使用。（此条加重字体）

8.3.6 紧急关闭水泵

如果发生任何设备故障，停止水泵运行。当水泵停下时，关闭进出口阀门，切断电源，排除故障。

9 维护及保养

只允许具有资格的人员进行安装、维护、保养和维修。



警告！有触电危险！

防止一切电击危险。

- 维修过程中必须保证切断电源。
- 电缆线路的任何损坏，只限于专业电工维修。



警告！

输送高温高压液体时，最好水泵冷却后，再使系统压力降低。

9.1 日常保养及定期维护

离心泵只需要很少的周期保养。并且，严重的问题可以通过定期观察和对不同运行状态的分析予以避免。以下是一些日常检查的方法

- 对水泵日常工作状态进行记录，如：流量、进出口水压力、最大电流、轴承温度等等。这些数据应该每班记录两次，每个状态的突然变化都应该加以研究，并且将其记录到日常维修保养的记录中去。
- 检查泵轴承温度，详见8.3.3章。
- 噪声与振动情况每两周至少检查一次，并与上次记录情况进行对比。
- 检查填料函足足够的泄漏，以保障填料得到良好的冷却和润滑。若使用机械密封，检查机械密封应没有可看出的明显泄露。
- 如果从操作手册和维修保养记录中检查出任何不正常状况，应停止使用水泵，并检查原因。
- 故障诊断—离心泵运行中的许多通常性问题可以参照第10章的图表解决。

注意：

如果故障难以诊断，请填写反馈表格向威乐公司反馈。



9.2 大修

9.2.1 概述

在长期使用后，泵的某些部分会出现损坏，需要更换水泵零件。通常情况下，应经济的将损坏部件完全更换成新的，不过如果损坏不是太严重的情况下，大部分部件可以通过机械加工的方式得以修复。

我们不会制定水泵的大修周期，这是因为大修检查周期取决于水泵的泵送的流体情况，工作环境情况以及水泵的工作时间情况。由检测记录的参数变化可以观察出水泵的逐渐磨损。一旦发现零件磨损，水泵需要进行彻底检修。推荐每年停泵检查，并且对损坏部分维修。如果严重的磨损只是出现在一些部件上，那么只需要更换磨损最严重的部件。如果这种磨损出现在整个泵体上，那么就需要把所有的磨损部件都进行更换。

首先应该测量并记录下所有磨损部件的情况，并且每个周期都应如此。然后我们可以推算出一个准确的部件磨损速度，就可以据此得出一个比较精确合适的磨损部件更新周期。

我们会在样本中提供原始设计数据及参数，如果需要其他所需的资料可以向售后部门申请获得，在申请的时候请务必标注出所需水泵的型号或铭牌。

主要易损部件包括：

- 叶轮
- 机封
- 口环
- 轴套
- 填料函轴套
- 轴承
- 联轴节

在开始分解水泵之前，确保以下工具及固定装置已经就位：

- 需要一个可以承受泵体重量的起重机或链滑轮。
- 需要英制（美制）公称尺寸带测量的开口扳手。
- 需要一些英制（公制）尺寸的标准吊环螺栓。
- 需要一些钢丝绳、麻绳、吊带。
- 需要一些硬木块和金属块。
- 需要各种其他工具，比如一套内六角扳手，钻头，电钻，锉刀等。
- 需要轴承和联轴节的拔取装置。

对于特殊尺寸螺纹的扭矩值（见表）的设置由以下决定：

- 螺纹件材料
- 连接件材料
- 螺纹是否经过特殊处理
- 螺纹是否有润滑
- 螺纹长度

拧紧力矩- 未处理的螺纹；摩擦系数0.14

性能等级	扭矩	公称直径（粗牙）											
		M6	M8	M10	M12	M16	M20	M24	M27	M30	M33	M36	M39
	Nm	10.5	26	51	89	215	420	725	1070	1450	1970	2530	3290
	t. lby	7.7	19	37	65	158	309	534	789	1069	1452	1865	2426

9.2.2 水泵分解

上泵体分解

在分解水泵之前确认第9章要求的安全措施，由有资质的专业人员进行并按要求完成。

- 关闭水泵的进水阀和出水阀。
- 排出水泵中的介质，打开排气阀。
- 卸下两个定位销以及上下壳体螺母。
- 对填料密封：

卸下两头的盘根压盖，取出盘根及其冲洗环。

- 对于机械密封：

拆下冲洗管路，松开机封压盖的连接螺母，打开上盖后，从轴上取下机封。

• 去掉连接上下泵体的其他连接物，连接好合适的起重设备与上盖上的吊环螺钉并开始分离工作，然后再去掉连接处的密封垫。

分解转动部件

卸下联轴节上的螺栓 / 螺母，分开联轴节。在去掉固定螺丝和定位销之后，拿掉两侧轴承座上盖；此时转动部件（包括滚动轴承、口环等）可以从泵体内移出。

确保平稳的移出转动部件并避免碰撞及扭曲，否则会造成口环的损坏。将转子部分放置在水平的木托上面，泵端联轴节现在就可以从轴上分离出来了，如果需要的话还可以用合适的分离工具如拉马来进行操作。联轴节上有个平行的键槽，与键是过渡配合。去除联轴节键。

卸下联轴节后请参照以下进行：

- 拆除前后两端的轴承压盖。
- 去除锁紧螺母、锁紧垫圈等，从自由端（非驱动端）取出里外定位环；
- 利用拉拔装置取出轴承，应该直接给轴承内圈施力取出轴承，而不应该给外圈施力，那样会导致轴承损坏。



注意：

应极力予以避免轴承拆卸，因为这样会导致轴承损坏，会使它与其他部件配合出现问题。除非为了卸下其他部件非拆卸不可或需仔细检查轴承时。运行中的某些征兆可以反应出轴承的状态：轴承温度、噪声水平及振动等级等。

- 拆下外壳上的口环（包括轴衬，轴承座）。
- 拆下轴两边的甩水环和甩油环。
- 旋开并去除叶轮两边的螺母和定位轴套，如果操作困难可以连同叶轮一起取出，有时甚至可以通过稍微加热的方式来取出它。

• 去除叶轮。应该均匀的从中心到边缘的进行加热，在拆下叶轮之前，应该在轴上做好标记以便重新进行叶轮组装时准确定位。

9.2.3 内部零件的检查

泵壳和传动部件拆除后，内部部件和间隙就可以检查了。

泵体口环

用内径千分尺测量口环的内孔尺寸，每个间隔部分都需测量，用于确定其磨损的不均匀程度。对比叶轮外径和泵体口环的间隙可以得出磨损状况。如果磨损程度超过原设计150%或者磨损影响水泵性能已无法坚持到下一运行周期时，叶轮的耐磨环必须更换为能够符合原设计要求或满足叶轮的新耐磨环。

轴套

轴套应该仔细检查是否磨出沟槽还是均匀磨损，轴套的外径应该仔细对比是否能满足填料函上孔的要求，经过这种检查之后才能决定轴套磨损是否可以接受或需要更换。

叶轮

对叶轮进行如下检查：

- 检查叶轮损坏情况
- 检查腐蚀情况
- 气蚀情况
- 叶片的倾斜和破损情况，叶片水流进出口的末端磨损情况

上面所有的情况都必须检修，如果损坏严重，叶轮必须要更换。在决定维修叶轮前，其他的补充材料请向售后服务部门索要。

• 叶轮入水口周围，口环对叶轮起保护作用，应仔细检查孔轴结合部位。有微小的孔是可以接受的，但是如果有大或者密集的小孔则必须打磨叶轮或耐磨环，备用磨损环可以用于替换外径偏大的磨损环来匹配使用。

• 检查磨损的时候，应该使用类似千分尺的精密工具来精确的测量外直径，测量应该间隔得出不均匀的净磨损，几次测量的结果可以使我们得出需打磨的尺寸，但是尺寸不应该超过设计允许打磨尺寸的150%。

轴和键

轴应该检查其实际尺寸、任何的机械损伤及腐蚀程度。如果轴变形超过0.1mm，就得检修或更换。检查键和键槽的磨损情况，换掉磨损严重的键。

轴承

SCP泵使用的轴承为脂润滑球轴承，预装润滑油之后不需其他的保养维护。检查轴承旋转的平稳和自由度。如果检查到有任何不妥，应及时更换。检查轴承可以自由顺畅盘动，检查轴承外圈无损伤，无变色。如果轴承出现任何异状，应及时更换轴承。

填料函

检查填料函孔与轴套尺寸，如果间隙过大则应该进行更换。

机械密封

保证机械密封的密封面没有任何的划伤或者异常的磨损。检查动环锁紧在轴的正确位置上。确认无异物阻塞弹簧。

9.2.4 重装水泵

通过拆卸水泵和转动部件可以检查泵内部的零件和间隙。

重装转动部件

如果转动部件已经被完全拆下，轴上面的叶轮位置应该做好相应标记再进行组装，参考如下：

- 将叶轮键推入轴上的键位。
- 将叶轮装到轴上的正确位置上。
- 用预先做好的标记调整叶轮两边与轴套之间的距离，然后拧紧套筒螺母。
- 安装两边的口环。
- 安装两边的填料函衬。安装两边的甩水环，甩油环，机械密封，轴承座内端盖。
- 安装机械密封，调整轴的位置。
- 在轴的自由端安装轴的推力环和推力球轴承。安装内部和外部的隔离环，加热轴承便于安装。
- 在自由端安装锁紧螺母和锁紧垫圈，完全拧紧。
- 在螺母之上安装止退垫圈以防止脱落。
- 在驱动D、E端或相同的位置安装轴承。

注意：



在组装不锈钢部件时，使用二氧化钼粉可防止卡滞和卡死，也方便今后拆卸。

重新组装水泵

• 保证泵壳洁净、干燥、没有杂质。清理泵体口环和填料函，保证口环和填料函没有飞边毛刺。

- 仔细将转动部件放入下壳体。
- 将泵体口环放入泵体下半部的槽内。
- 将填料函放入泵体下半部的槽内。

• 安装轴承托架的定位销，确保主轴转动自如，最后锁紧螺栓。

如泵轴不能自南转动，必须查明原因并排除故障。

• 在驱动端和自由端安装甩水环，用固定螺丝将防尘盖和外端盖连接到轴承座。

• 从0.25mm厚的黑色垫纸剪下一个垫圈或相似垫圈的材料安装在下壳体的密封面上。

• 用起重机或链滑轮将上半部泵壳起吊至下半部泵壳上面。

安装密封连接面的螺栓。在拧紧螺母前调整定位销。

在对螺母拧紧过程中，必须认真进行检查，确保旋转部件连续地自由转动。任何刚度或弯曲变形必须立即进行检查，并且排除故障。

• 对使用填料密封的水泵：

按合适的顺序装入盘根、冲洗环。在两侧安装紧固螺栓和填料函压盖

重新在填料函 / 机械密封座上连接水密封管路。

• 对使用机械密封的水泵：

在安装机械密封前必须严格检查密封面的清洁度，避免损坏密封面和安装环。

严格按照组套尺寸进行组装。

安装机械密封时，O型圈必须用油脂润滑，以减小摩擦。对EP橡胶O型圈则推荐以甘油或者水来润滑，不能以油或油脂润滑。

组装时机械密封的密封面必须保持干燥、清洁、无尘，不能在密封面上涂任何润滑剂。

• 压装机械密封静环时，确保用力均匀一致。安装O型圈时只能使用水或者酒精。

• 如有定位销‘定要安装，安装静环时用力要均匀，尤其对于石墨材料的，避免静环损坏。

• 将机械密封安装到轴上，保证弹簧有适合的预紧力。锁紧紧固螺丝，避免在泵运行中发生窜动。

9.2.5 推荐零部件

我们对下列不同使用周期推荐备用零部件。

• 对运行2年的水泵：轴承，机械密封 / 填料函。

• 对运行3年的水泵：轴承，机械密封 / 填料函，口环，轴套螺母，填料，冲洗环。

• 对运行5年的水泵：一套转动部件。双吸泵比其他类型水泵更易维护。基于这个优点，我们建议可以随泵订购一套备用转动部件和一套备用易损件。以便存对现行的转动部件进行维修时，能及时进行更换，降低停泵期间的损失。

组装

- 重新安装和连接水泵半联轴节。
- 水泵调整后，可以重新使用。

10 故障、故障原因及排除



注意:

确认故障时请根据第一个表格, 排除故障时请参考第二个表格。

故障	故障原因及排除	
--	水泵不出水	1, 2, 3, 4, 6, 11, 14, 16, 17, 22, 23
--	水泵流量不足	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 17, 20, 22, 23, 29, 30, 31
--	压力不够	5, 14, 16, 17, 20, 22, 29, 30, 31
--	水泵启动后, 水泵中的水流失	2, 3, 5, 6, 7, 8, 11, 12, 13
--	水泵过载	15, 16, 17, 18, 19, 20, 23, 24, 26, 27, 29, 33, 34, 37
--	填料函严重漏水	12, 13, 24, 26, 32, 33, 34, 35, 36, 38, 39, 40
--	水泵振动或产生噪声	2, 3, 4, 9, 10, 11, 21, 23, 24, 25, 26, 27, 28, 30, 35, 41, 42, 43, 44, 45, 46, 47
--	轴承使用寿命短	24, 26, 27, 28, 35, 36, 41, 42, 43, 44, 45, 46, 47
--	水泵过热、卡死	1, 4, 21, 22, 24, 27, 28, 35, 36, 41

原因分析	故障排除	
1	水泵未注满水	确保水泵泵腔充满水, 水从排气阀排出
2	水泵或进水管没有完全充满流体	假设进水口负压, 检查底阀
3	吸程过高	降低水泵高程或提升液面
4	入口压力小于蒸汽压力	检查实际的NPSH比要求的NPSH至少多1米
5	流体中进入大量空气	检查原因和消除空气。气体可能由流体中分离出, 空气可能通过进水管接头进入
6	进水管发生气蚀	确保水泵完全注满水, 进水口负压, 无弯头
7	空气进入进水管	拧紧管接头
8	空气通过填料函进入水泵	确保填料函密封
9	底阀过小或泄漏	更换底阀
10	底阀部分被阻塞	清洗底阀
11	进水管的进口没足够浸没	确保进水口足够浸没, 底阀不被暴露在外
12	水封被阻塞	清洗或更换
13	填料函中的冲洗环安装不当	将在中心的冲洗环装在填料函的密封孔下面, 阻止密封管的液体进入冲洗环
14	转速过低	检查电机转速, 电源频率, 电机铭牌, 在电机铭牌上应标注转速
15	转速过高	检查电机转速和电源频率
16	电机的旋转方向错误	在联轴器与电机连接前, 检查电机的旋转方向
17	系统的扬程比设计扬程高	检查故障原因, 用压力表测试
18	系统的扬程比设计扬程低	检查故障原因, 用压力表测试
19	与设计流体的比重不同	来函咨询
20	与设计流体的粘度不同	来函咨询
21	低负荷下运行	检查故障原因, 来函咨询, 水泵在额定负载下运行
22	水泵并联运行不当	来函咨询, 可参照水泵的特性曲线
23	叶轮中有异物	打开泵壳, 进行清洗
24	轴未对中	用指示表检查轴对中应在允许范围内; 管道不应承受不当外力
25	基础没有固定	检查底座上的振动情况, 检查底板有无凹陷
26	轴弯曲变形	将轴拆下, 并进行检查, 更换轴

原因分析	故障排除
27 转动部件与固定部件相互摩擦	组装不当，正确的进行组装
28 轴承损坏	检查润滑油，轴向跳动，轴对中，如有必要，请更换轴承
29 磨损环损坏	请进行更换
30 叶轮损坏	请进行更换
31 泵壳密封垫不完善，存在一定的内漏	请进行更换
32 轴和轴套损坏，或填料损坏	请进行更换
33 填料安装不当	使用合适的填料的等级和尺寸
34 填料类型不适合于运行现状	使用合适的填料的等级和尺寸
35 因轴承磨损或轴不对中，轴在运行时偏离中心	进行调整
36 转子失去平衡，引起振动	平衡转子
37 填料太紧，导致填料函没有流体漏出	调整填料函，确保填料函有液体流过密封
38 冷却流体没有提供给填料函	提供冷却水
39 填料函底部轴与壳体间的间隙过大造成填料被迫压入水泵	检查水泵的组装
40 密封中的流体含有污垢或颗粒，会引起轴或轴套划伤	使用清洁液体冲洗
41 装配时用力过猛会导致水泵内部的机械损坏或水力部件的损坏，（例如在装配多级水泵时）	检查水泵的运转和装配
42 在滚动轴承座中过多涂抹润滑油或润滑油以及冷却不充分会引起轴承温度过高	引起注意
43 润滑油不足	加注适量的润滑油
44 滚动轴承安装不当（损坏，轴承的不正确安装，使用不配套轴承等）	调整或更换轴承
45 轴承上积污	调查原因以及清洗轴承
46 轴承座内的水使轴承生锈	阻止有水侵入
47 使用过多冷却水冷却轴承，导致轴承座中产生冷凝水	减少冷却水



注意：

对于电机、电控装置的故障查询请阅读相关使用说明书，或与我司售后部门联系解决。

检修：

应定期对水泵及电机进行维护和检查，具体要求请查看水泵使用说明书及电机使用说明书中的内容，如有疑问也请联系我司售后部门。

D ***EG – Konformitätserklärung***
GB ***EC – Declaration of conformity***
F ***Déclaration de conformité CE***

Hiermit erklären wir, dass die Bauarten der Baureihe : **SCP**

Herewith, we declare that this product:

Par le présent, nous déclarons que cet agrégat :

in der gelieferten Ausführung folgenden einschlägigen Bestimmungen entspricht:

in its delivered state comply with the following relevant provisions:

est conforme aux dispositions suivants dont il relève:

EG-Maschinenrichtlinie **98/37/EG**
EC-Machinery directive
Directives CEE relatives aux machines

Niederspannungsrichtlinie **2006/95/EG**
Low voltage directive
Direction basse-tension

und entsprechender nationaler Gesetzgebung.
and with the relevant national legislation.
et aux législations nationales les transposant.

Angewendete harmonisierte Normen, insbesondere: **EN 809**
Applied harmonized standards, in particular: **EN 60034-1**
Normes harmonisées, notamment: **EN 60204-1**
EN 60204-11

Bei einer mit uns nicht abgestimmten technischen Änderung der oben genannten Bauarten, verliert diese Erklärung ihre Gültigkeit.

If the above mentioned series are technically modified without our approval, this declaration shall no longer be applicable.

Si les gammes mentionnées ci-dessus sont modifiées sans notre approbation, cette déclaration perdra sa validité.

Dortmund, 06.10.2009

ppa. 
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 Quality Manager

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