WILO-SCP

en Installation and operating instructions

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Disclaimer

WILO Mather and Platt is very grateful for your interest in its products. The basic objective of this document is to provide instructions for maintaining and operating WILO Mather and Platt Horizontal Split Case pumps. Instructions are compiled for the person having a working knowledge of Horizontal Split case pumps and the pumps shall be installed under expert supervision and guidance.

With this document WILO Mather and Platt does not accept any liability for inaccurate installation, operation or maintenance of the product at site. The authorities that install and maintain the pump shall be responsible for hassle free installation operation or maintenance of the product.

This document is prepared with at most care to ensure correct and accurate information, enabling the user to have trouble free installation and operational support. However, there can be few areas for improvement to make this document error free.

We welcome your valuable suggestions to make this document complete in all respects.

Pump Type –
So. No. –
Q (m3/hr.) –
H (m) –
N (rpm) –
P kW –
Imp. Dia. –
Note: To be filled by the Customer

WILO Mather and Platt Pumps Private Ltd.
(Part of WILO SE Germany)
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Pune- 411 019, Maharashtra (India)
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Fax: +91 2027442111
service.in@wilo.com
www.wilo.in

Fig.1: Lifting of complete pump set (Page No. 9; Point no. 3, 3.1)

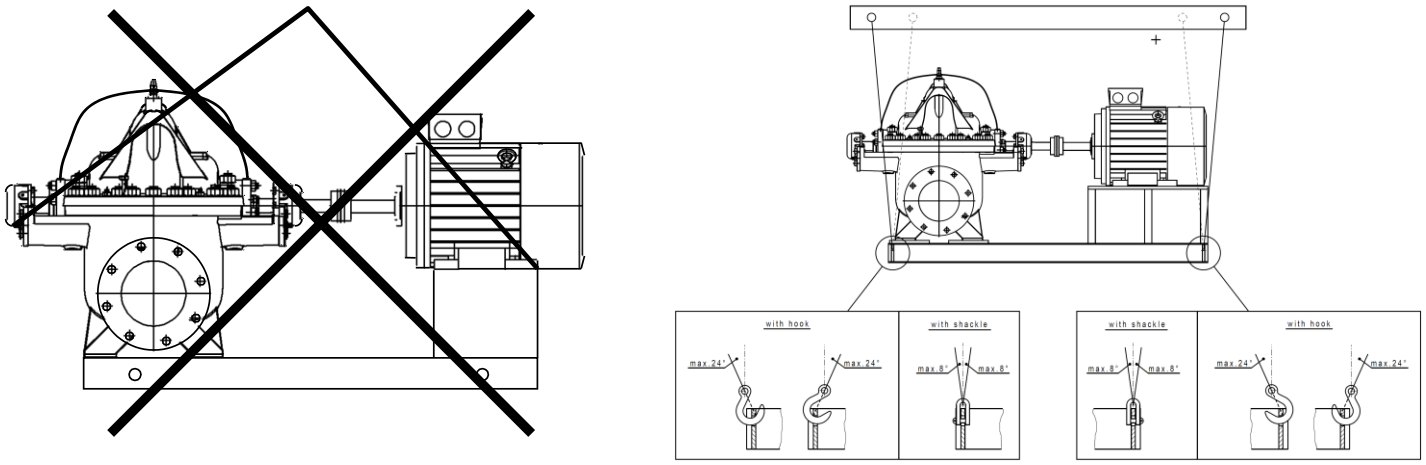


Fig.2: Lifting of complete pump (Page No. 9; Point no. 3, 3.1)

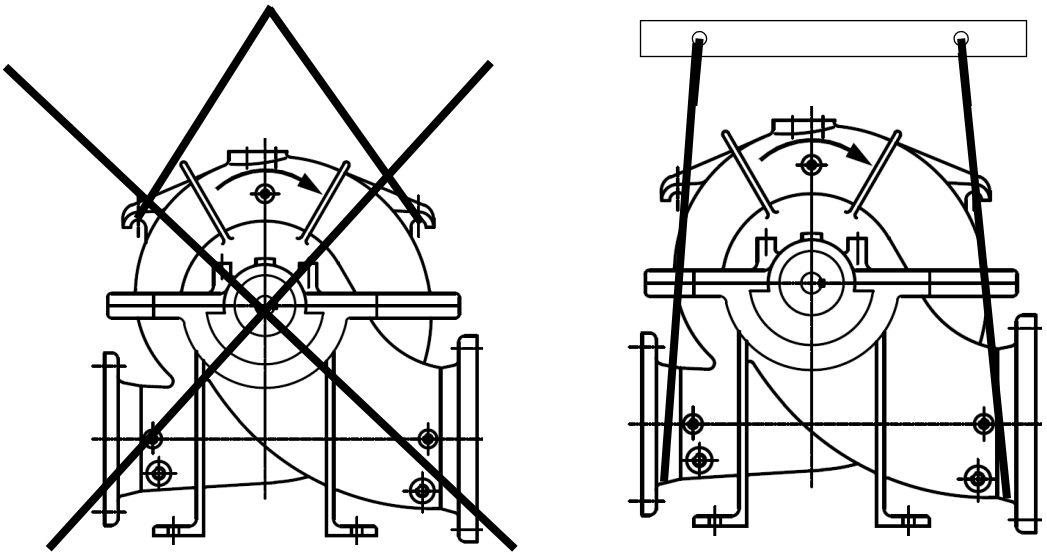


Fig. 3 Foundation pump set (Page No. 17; Point no. 7.2.1)

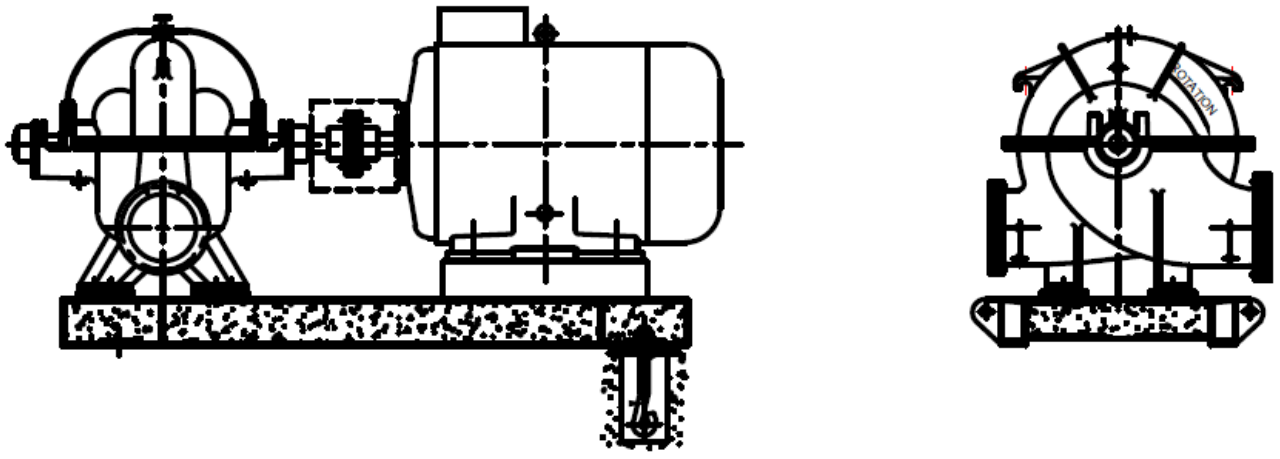


Fig.4: Foundation pump set (Page No. 17 ; Point no.7.2.1)

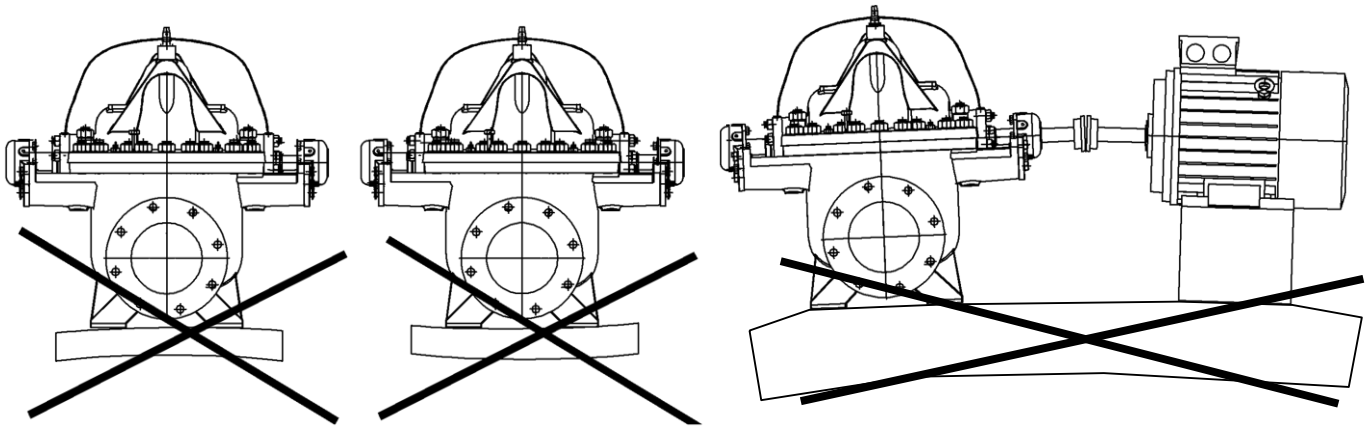


Fig.5: Angular & Radial Alignment (Page No. 18)

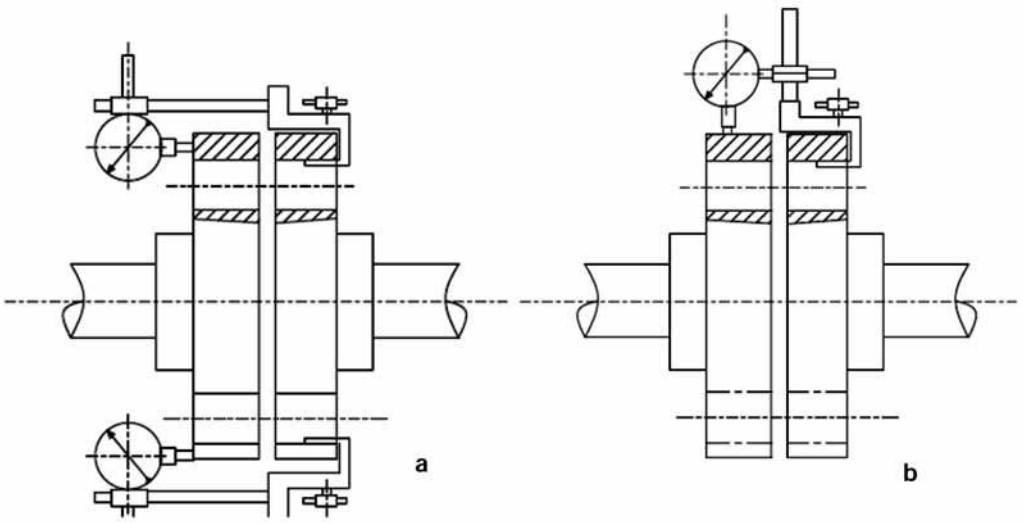


Fig.6: Maximum Allowable Forces & Moments for Cast Iron Flanges (Page No. 19)

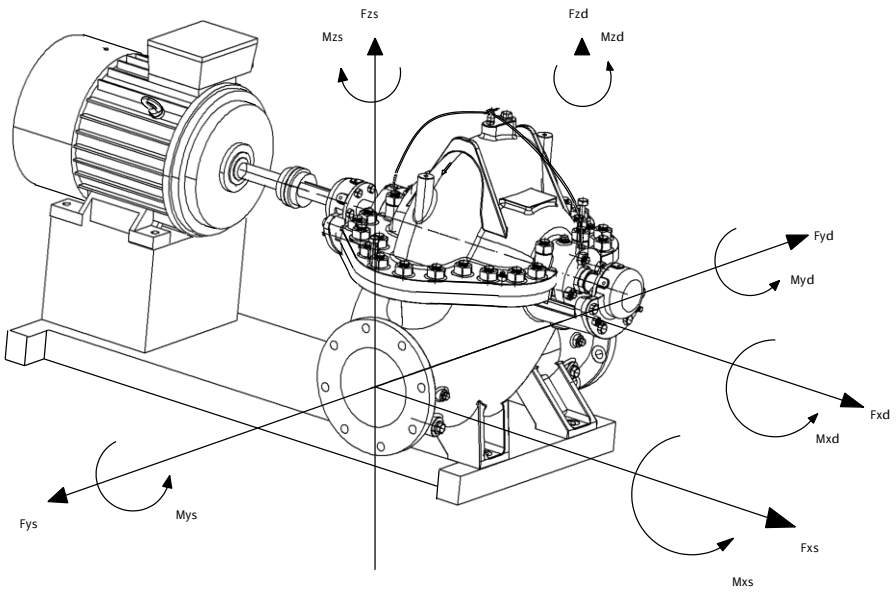


Fig.7: Suction Line (Page No. 20; Point no.7.2.5)

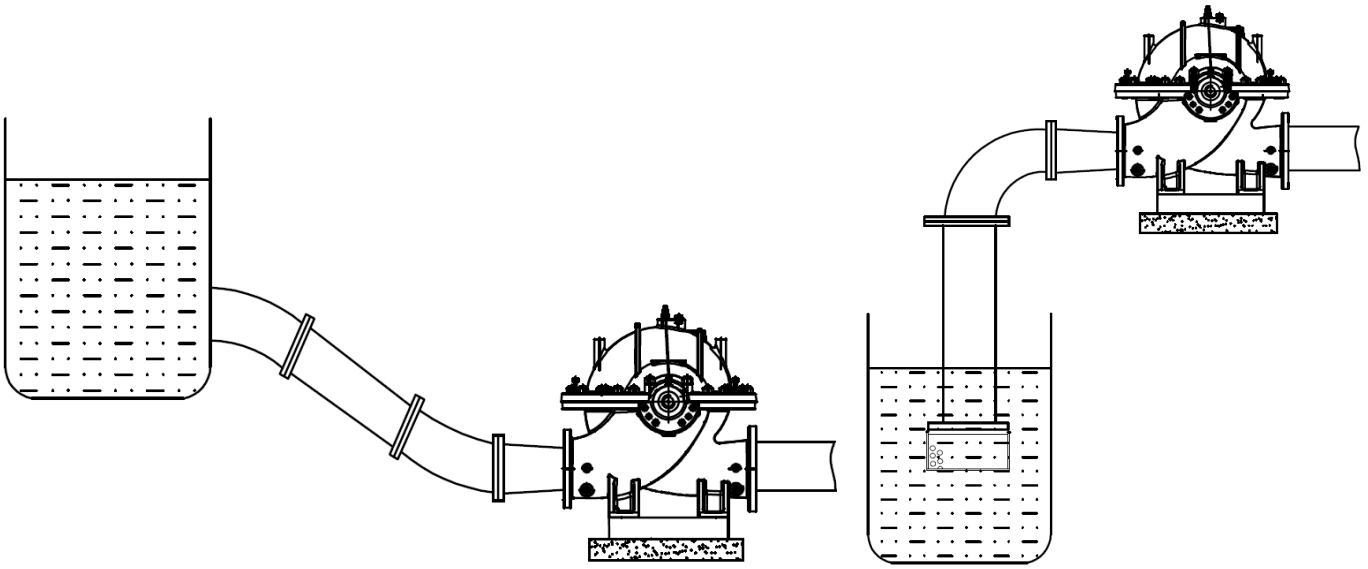


Fig.8.1: Suction Line (Page No. 20; Point no.7.2.5)

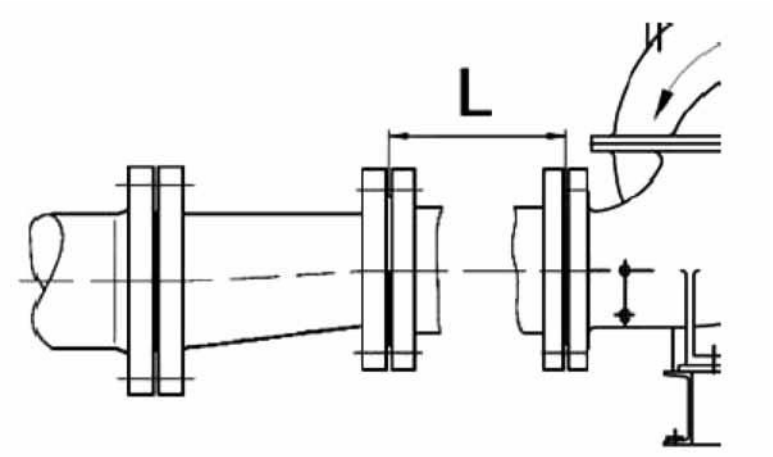


Fig.8.2: Suction Line (Page No. 20; Point no.7.2.5)

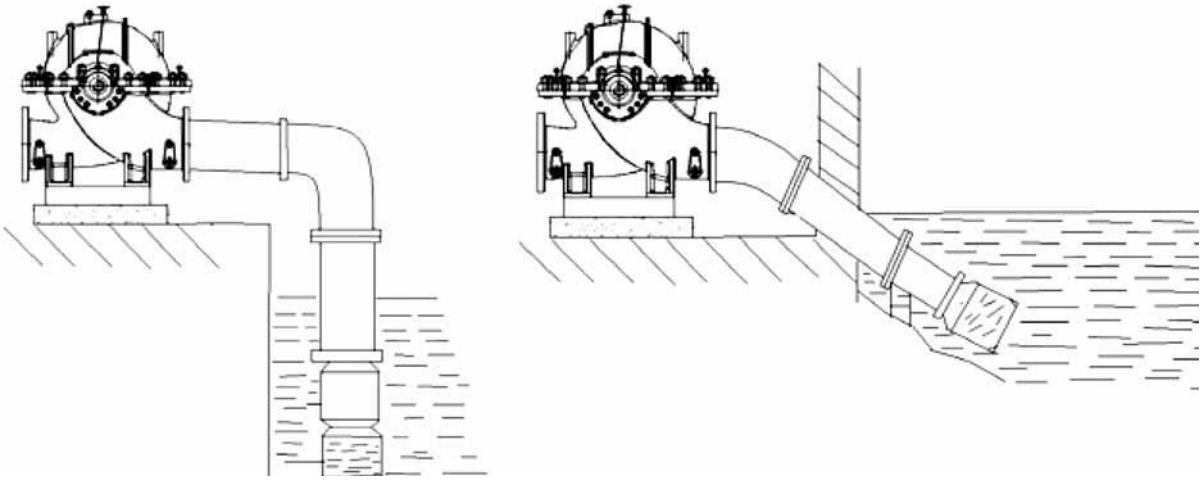


Fig.8.1: Good and Bad Suction Line Layouts (Page No. 20; Point no.7.2.5)

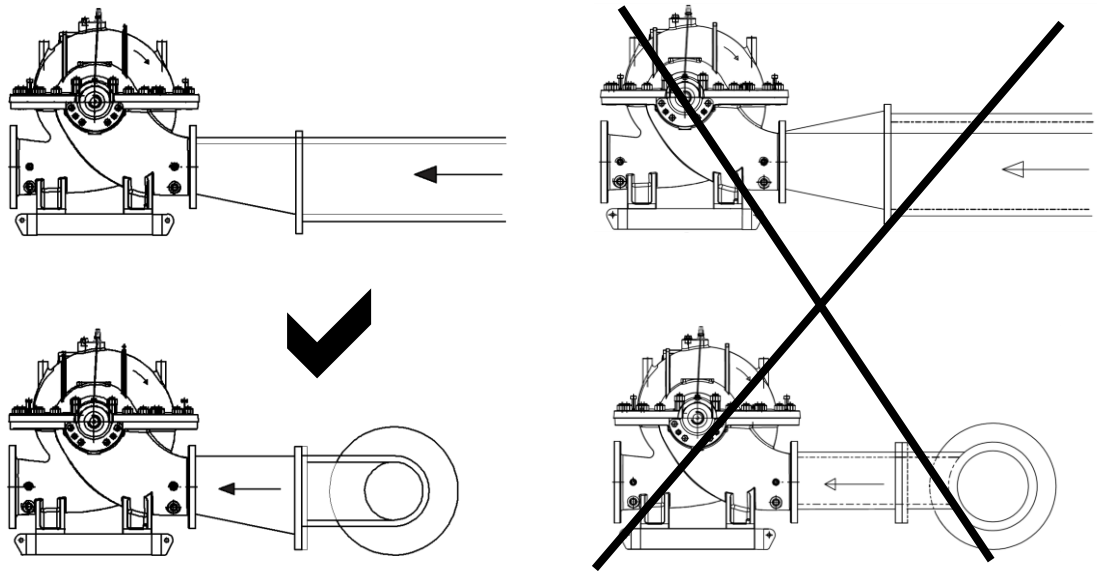


Fig.8.2: Good and Bad Suction Line Layouts (Page No. 20; Point no.7.2.5)

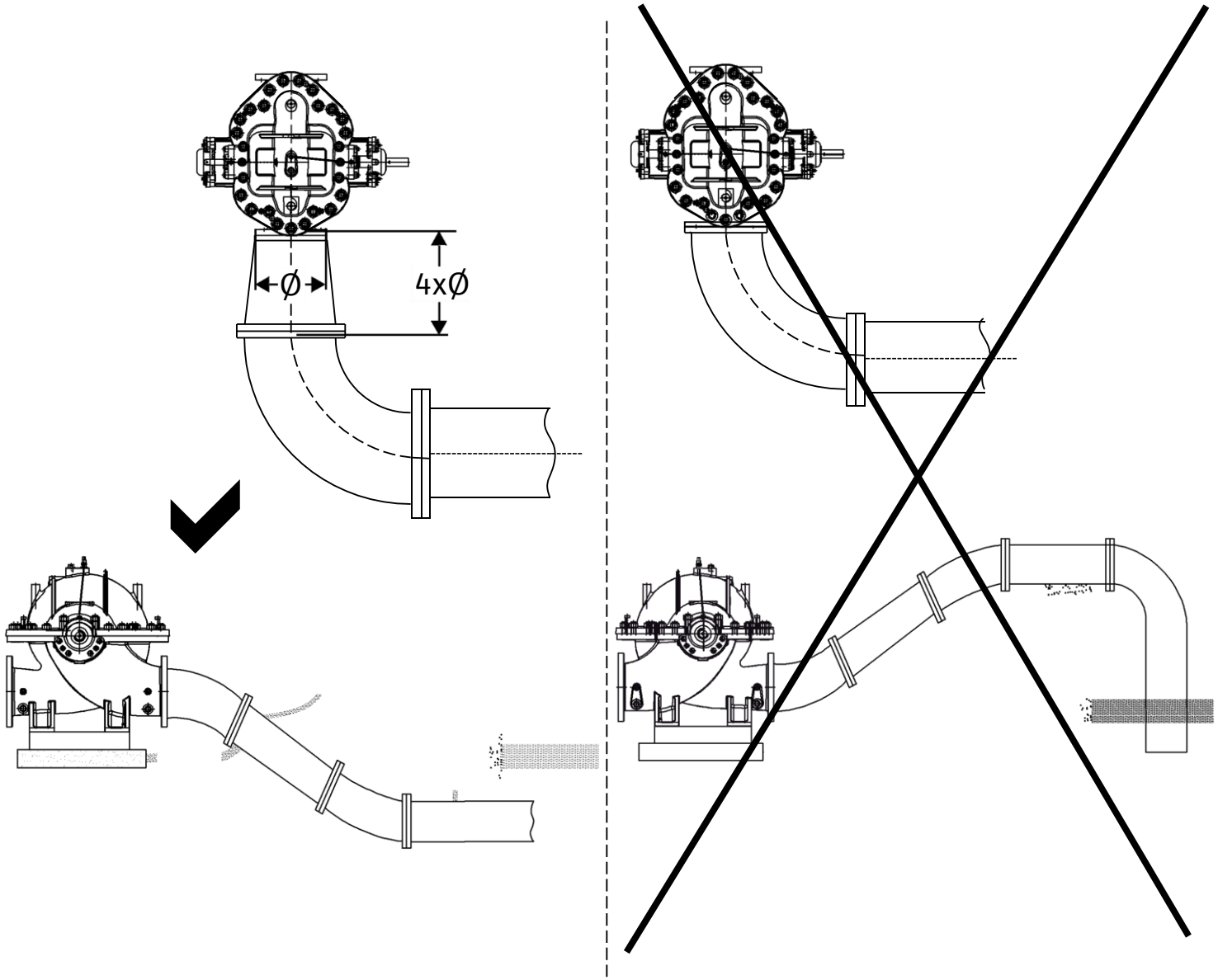


Fig.8.3: Good and Bad Suction Line Layouts (Page No. 20; Point no.7.2.5)

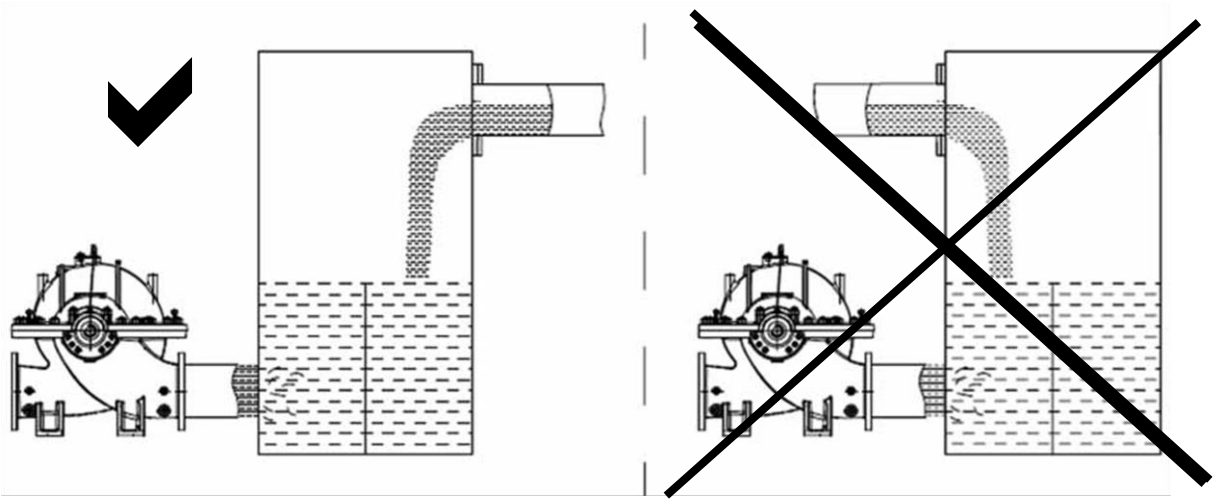


Fig. 9: Stuffing Box Packing (Page No. 20; Point no.7.2.7)

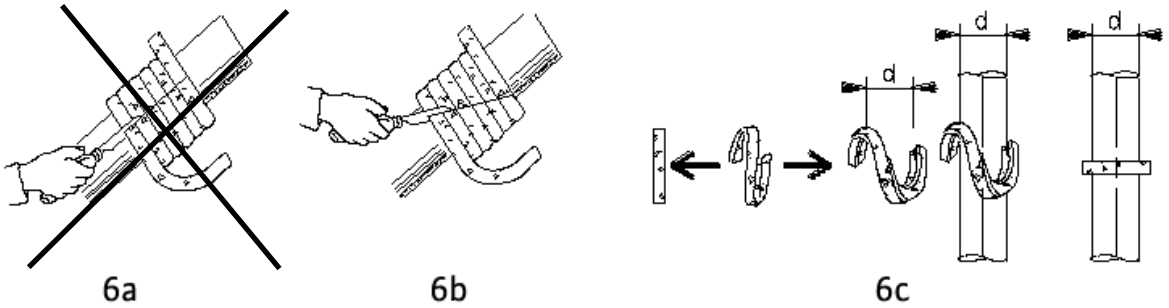
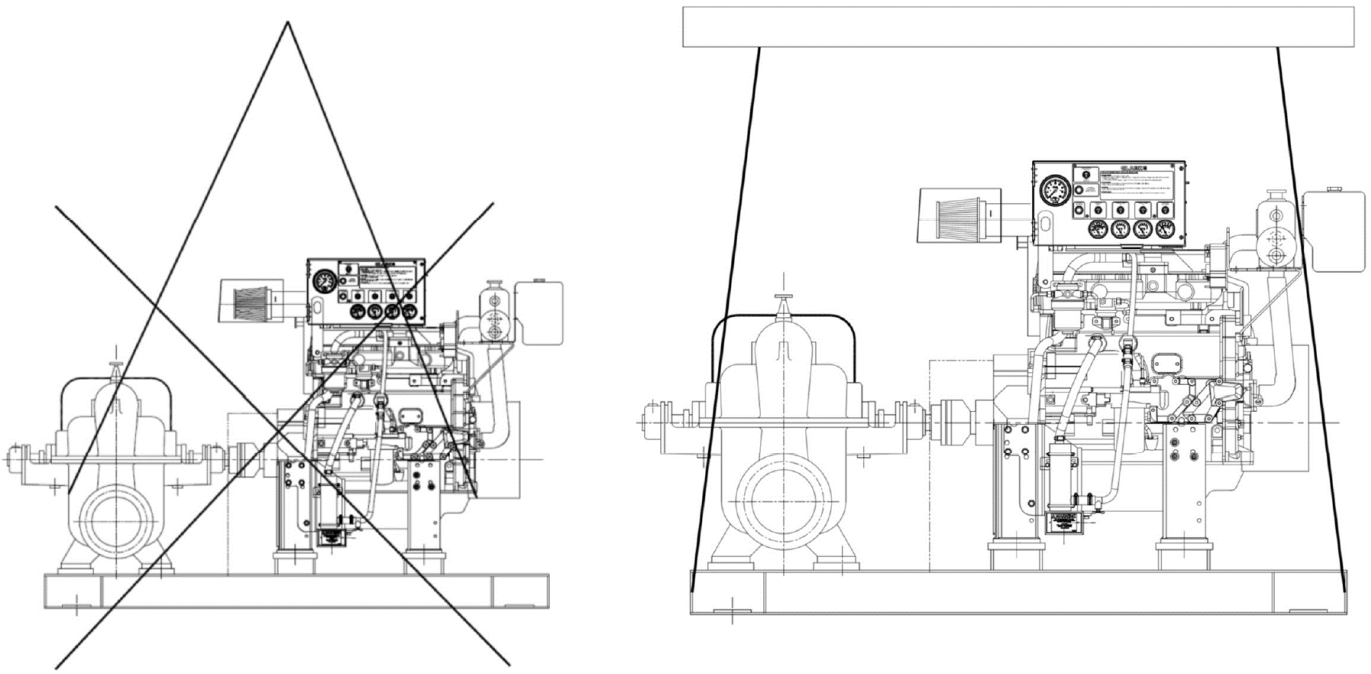
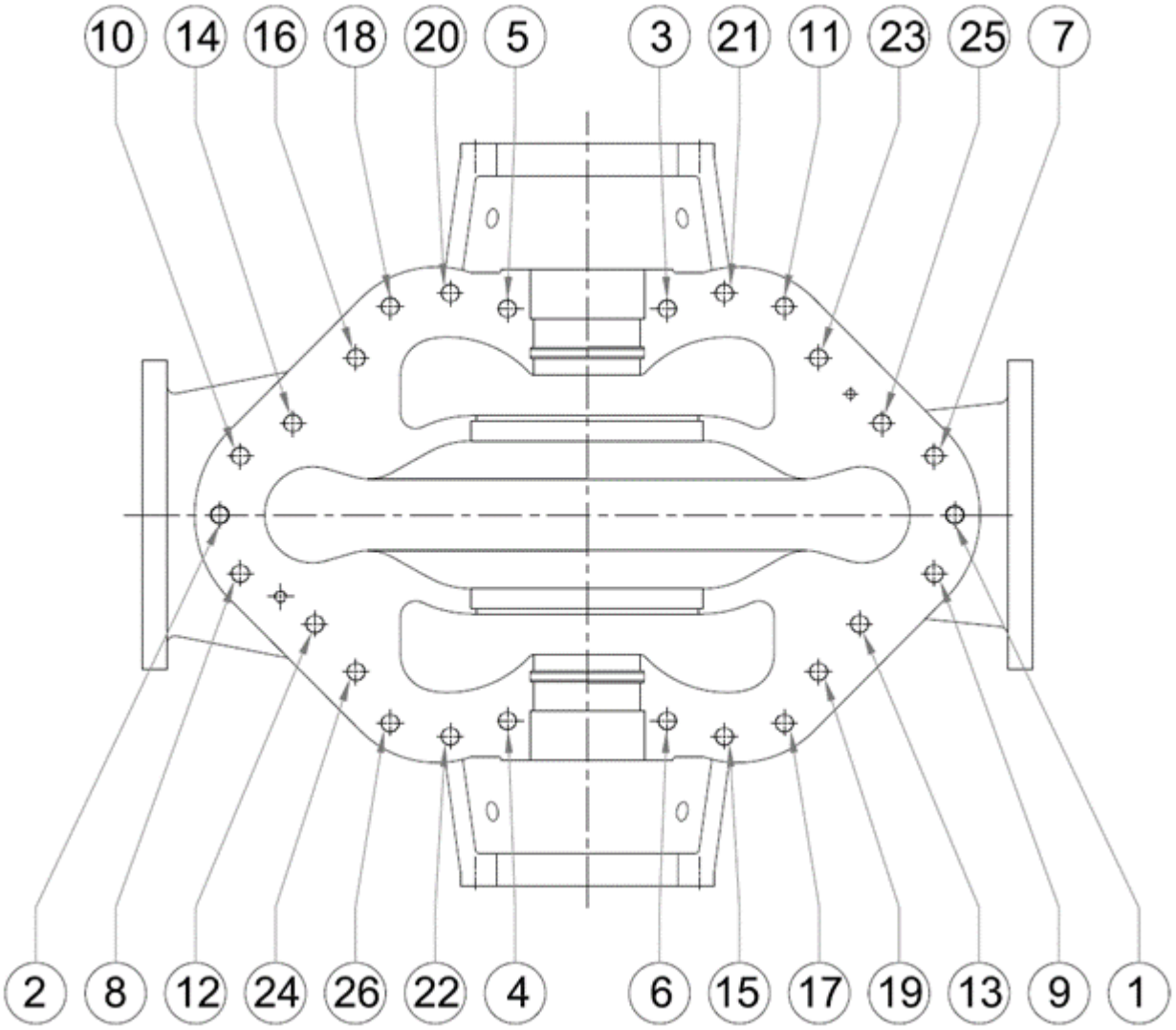


Fig. 10: Lifting of the pump with engine (Page No. 9; Point no. 3, 3.1)



Casing Bolt Tightening Sequence



NOTE:

*The above example shown is for pump with 26 bolts.

*This sequence of tightening the diagonally opposite bolts is to be followed for other pumps with different number of bolts.

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 pump 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.

Information that appears directly on the product such as,

- Rotation/direction of flow symbol,
- Identifiers for connections,
- Rating plate,
- Warning stickers must be strictly complied with and kept in a fully legible condition.

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
- Property damage
- WILO Mather and Platt does not accept any liability for damage, failures or losses arising due to improper installations, maintenance, repair works, modifications without our consultation and non-observance of safety instructions mentioned in this IOM.

2.4 Safety consciousness on the job

The safety instructions included in these installation and operating instructions, the existing national regulations for accident prevention together with any internal working, operating and safety regulations of the operator are to be complied with.

2.5 Safety instructions for the operator

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

- If hot or cold components on the product/the unit lead to hazards, local measures must be taken to guard them against touching.
- Guards protecting against touching moving components (such as the coupling) must not be removed whilst the product is in operation.
- Leakages (e.g. from the shaft seals) of hazardous fluids (which are explosive, toxic or hot) must be led away so that no danger to persons or to the environment arises. National statutory provisions are to be complied with.

- Highly flammable materials are always to be kept at a safe distance from the product.
- 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.
- Depending on the type, size and capacity (kW), the products produce a sound pressure up to 75 dB (A) to 110 dB (A).
- The actual sound pressure, however, depends on several factors. These include, for example, type of prime mover, installation type; fastening of accessories and pipeline, operating site condition, background noise, etc.
- Once the product has been installed, we recommend that the operator makes additional measurements under all operating conditions.

2.6 Safety instructions for installation and maintenance work

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

Work on the product/unit 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.

Immediately on conclusion of the work, all safety and protective devices must be put back in position and/or recommissioned.

2.7 Unauthorized modification and manufacture of spare parts

Unauthorized modification and manufacture of spare parts will impair the safety of the product/ personnel and will make void the manufacturer's declarations regarding safety.

Modifications to the product are only permissible after consultation with the manufacturer. Original spare parts and accessories authorized by the manufacturer ensure safety. The use of other parts will absolve us of liability for consequential events.

2.8 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.

2.9 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. 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&2 Pg.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.

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 (fig. 1&2 Pg.1)

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 base plate, the lifting tackle should be attached to the lifting lugs provided on the base plate side member. The angle of the lifting ropes should not exceed 8° if shackles are used and 24° if hooks are used. 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, chapter 2). These must have sufficient load bearing capacity to ensure that the product can be transported safely. (Refer figure 1 & 2 Pg.1)

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 (less than 3 month)

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

If the pump is not installed immediately after deli- very, it must be stored in a dry and clean place with sufficient ventilation, no vibration, no freezing and the temperature variations must be smooth. Bearings and couplings must be protected against sand, dust and foreign bodies. To avoid corrosion and jamming, please lubricate the pump and make turn the rotating elements for several turns at least once a week. Prepacked desiccants may be used to absorb moisture & keep the pump dry. It must be removed before putting the pump on operation.

3.3.2 Long-term storage (more than 3 month)

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.
- The pump set must be protected from direct sun light, 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!

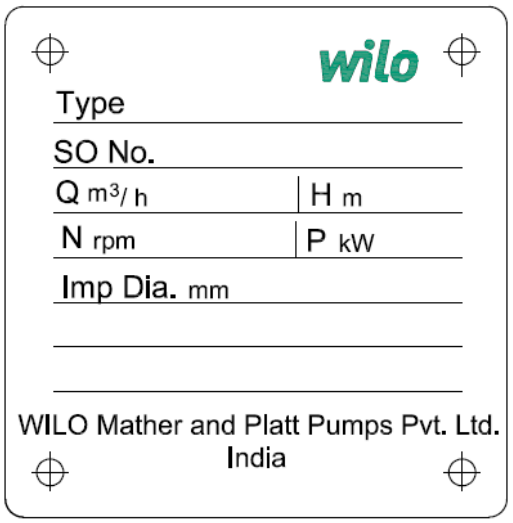
Products, which are not suitably packaged for delivery back, are no longer covered by guarantee!

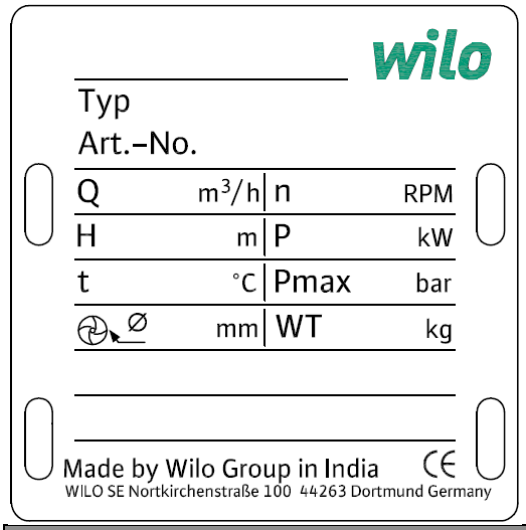
4 Intended use

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, firefighting, juices etc. If the operating conditions are different of the specifications given in the order, (i.e. type of liquid, temperature or duty point), the end user must ask a written agreement to WILO on the new operating conditions before starting the pump.

5 Product information

5.1 Data plate





5.2 Type key

SCP 200 – 320 HA	
SCP	Name of the range
200	Discharge flange nominal diameter in mm
320	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

5.3 General description

Limits of usage of the standard range

The technical features of the product have been described in the offer made for this product, especially the fluid compatibility. Please refer to this:

Property	Value	Remarks
Speed	2900, 1450, 980 1/min	Model dependent
Discharge nominal diameters DN	50 up to 400	Model dependent
Flange standard	PN 16/25	ISO 7005-2, as needed
Limit of fluid temperature (min./max.) – Mechanical seal version [°C] -Gland packing version [°C]	Ambient Temperature	
Limits of ambient temperature (min./max.) [°C]	-5 up to +60	
Ambient humidity	< 90 %	other on request
Motor insulation class	F	other on request
Motor protection level	IP 55	
Electrical protection for motor	—	required in place (in accordance with local regulation)
Acoustic pressure level, (In accordance with motor performances)	—	Refer to the data plate on the motor on in technical leaflets
Standard fluid allowed	Central heating liquid in accordance with VDI 2035, cooling water. Cold water Mixture water/glycol up to 40 % of volume. Temp ≤ 40 °C for concentrations between 20% and 40% vol. Contact WILO for all other fluids	Standard version Standard version Only for special version
Electrical connections	3~230V, 50Hz (≤4kW) 3~415V, 50Hz (≥5,5kW)	Other frequency, voltages, please contact WILO

5.4 Scope of delivery

Pump can be delivered,

- as a complete pump set including electrical motor, base plate, coupling and coupling guard;
- either without motor or
- as bare shaft pump without base plate.

5.5 Accessories

- Companion Flange
- Foundation bolts
- Shims

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. Holes are tapped on suction and delivery branches for connecting the pressure gauges and providing casing drain. Bores of bottom half casing are grooved to provide location for stuffing box bushes. The top half casing carries connections for liquid seal for both sides. Air vent cock is fitted on the top and also priming hole is also provided on the top of casing.

6.1.2 Neck ring

To prevent the entry of pump liquid from delivery side of impeller to suction side, neck ring is provided. Fine running clearance is provided between neck ring and impeller neck. Periodic restoration of this clearance is necessary for satisfactory performance of the pump (Table-6 pg. 14).

For two stage pumps these neckrings are located in the bottom half of the casing by half spigot (tung and groove) and its rotation is restricted by flat face of the top casing. For rest of the single stage pumps plain neck rings with neck ring pins in bottom casing for locking are used. The neck ring pin is press fitted in the neck ring.

6.1.3 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.

Gland Pack

For SCP pumps plaited cotton impregnated with oil and colloidal graphite is used.

Mechanical Seal

SCP pumps are supplied with mechanical seals from all leading manufacturers in India.

6.1.4 Rotating element

The rotating element of SCP pump consist of following parts. It consists of a shaft on to which an impeller is placed and arrested at its position with a key to avoid free rotation with respective of rotation of the shaft. Renewable shaft sleeves are provided on both sides to protect the shaft from corrosion and erosion. The impeller is locked at its position by sleeve and cowl nuts, which have threads left/right-handed as per the direction of rotation of shaft.

The pump rotor is supported on deep groove ball bearings on either side of the shaft. Bearings are located in the bearing housing, which are attached to the end of the pump casing. Stuffing box bushes are provided on either side of the shaft on the sleeve and is located in the bottom half of the casing in half-spigot. The purpose of stuffing box bush is to guide the liquid toward the impeller eye. Whereas the back face of the stuffing box provides support to gland packing. Water thrower is placed after gland plate on both side of shaft.

6.1.5 Connection Details

No.	Pump	CG	PG	PM	AC	CDS	CDD	C	GD	VG	TG
1	SCP 50-220 HA	1/4	1/4	1/4	1/4	1/4	1/4	–	1/4	M8	–
2	SCP 50-180 HA	1/4	1/4	3/8	3/8	1/4	1/4	–	3/4	M8	–
3	SCP 50-340 HA	3/8	3/8	1/2	3/8	1/2	1/2	–	3/4	M8	–
4	SCP 50-340 DS	3/8	3/8	1/2	3/8	3/8	3/8	3/8	3/4	M8	–
5	SCP 65-390 HS	3/8	3/8	1/2	3/8	1/2	1/2	–	3/4	M8	–
6	SCP 80-230 HA	3/8	3/8	1/2	3/8	1/2	1/2	–	3/4	M8	–
7	SCP 80-200 HA	3/8	3/8	1/2	3/8	1/2	1/2	–	3/4	M8	–
8	SCP 80-380 DS	3/8	3/8	1/2	3/8	3/8	3/8	1/2	3/4	M8	–
9	SCP 80-340 HA	3/8	3/8	1/2	3/8	1/2	1/2	–	3/4	M8	–
10	SCP 80-360 DS	3/8	3/8	3/4	3/8	1/2	1/2	–	1/2	M8	–
11	SCP 100-270 HA	3/8	3/8	1/2	3/8	1/2	1/2	–	3/4	M8	M8
12	SCP 100-280 HA	3/8	3/8	1/2	3/8	1/2	1/2	–	3/4	M8	M8
13	SCP 100-360 HA	3/8	3/8	1/2	3/8	1/2	1/2	–	3/4	M8	M8
14	SCP 100-400 HA	3/8	3/8	1/2	3/8	1/2	1/2	–	3/4	M8	M8
15	SCP 100-410 DS	3/8	3/8	3/4	3/8	1/2	1/2	1/2	1/2	M8	M8
16	SCP 125-290 HA	3/8	3/8	1/2	3/8	1/2	1/2	–	3/4	M8	M8
17	SCP 125-330 HA	3/8	3/8	1/2	3/8	1/2	1/2	–	3/4	M8	M8
18	SCP 125-440 HA	3/8	3/8	1/2	3/8	1/2	1/2	–	3/4	M8	M8
19	SCP 125-470 HA	3/8	3/8	3/4	3/8	3/4	3/4	–	3/4	M8	M8
20	SCP 125-460 DS	3/8	3/8	3/4	3/8	1/2	1/2	–	3/4	M8	M8
21	SCP 150-290 HA	3/8	3/8	1	3/8	1/2	1/2	–	3/4	M8	M8
22	SCP 150-390 HA	3/8	3/8	1/2	3/8	3/4	3/4	–	3/4	M8	M8
23	SCP 150-350 HA	3/8	3/8	3/4	3/8	3/4	3/4	–	3/4	M8	M8
24	SCP 150-450 HA	3/8	3/8	1/2	3/8	3/4	3/4	–	3/4	M8	M8
25	SCP 150-580 HA	3/8	3/8	1	3/8	1/2	1/2	–	3/4	M8	M8
26	SCP 150-530 HA	3/8	3/8	1	3/8	3/4	3/4	–	3/4	M8	M8
27	SCP 150-460 DS	1/2	1/2	3/4	3/8	1/2	1/2	1/2	1/2	M8	M8
28	SCP 200-310 HA	3/8	3/8	1/2	3/8	3/4	3/4	–	3/4	M8	M8
29	SCP 200-320 HA	3/8	3/8	3/4	3/8	3/4	3/4	–	3/4	M8	M8
30	SCP 200-370 HA	3/8	3/8	3/4	3/8	3/4	3/4	–	3/4	M8	M8
31	SCP 200-360 HB	3/8	3/8	3/4	3/8	3/4	3/4	–	3/4	M8	M8
32	SCP 200-390 HA	3/8	3/8	1	3/8	3/4	3/4	–	3/4	M8	M8
33	SCP 200-440 HA	3/8	3/8	1	3/8	3/4	3/4	–	3/4	M8	M8
34	SCP 200-460 HA	3/8	3/8	1	3/8	3/4	3/4	–	3/4	M8	M8
35	SCP 200-550 HA	3/8	3/8	1	3/8	1/2	1/2	–	3/4	M8	M8
36	SCP 200-480 HA	3/8	3/8	1	3/8	1/2	1/2	–	3/4	M8	M8
37	SCP 200-560 HA	3/8	3/8	1	3/8	1/2	1/2	–	3/4	M8	M8
38	SCP 200-660 DV	3/8	3/8	1	3/8	1	1	–	1	M8	M8
39	SCP 250-250 HA	3/8	3/8	1/2	3/8	1/2	1/2	–	3/4	M8	M8
40	SCP 250-390 HA	3/8	3/8	1	3/8	3/4	3/4	–	3/4	M8	M8
41	SCP 250-360 HA	3/8	3/8	1	3/8	3/4	3/4	–	3/4	M8	M8
42	SCP 250-450 HA	3/8	3/8	1	3/8	1/2	1/2	–	1	M8	M8
43	SCP 250-570 HA	3/8	3/8	1	3/8	1/2	1/2	–	1	M8	M8
44	SCP 250-700 DV	3/8	3/8	1	3/8	1	1	–	1- 1/4	M8	M8
45	SCP 250-740 DV	3/8	3/8	1	3/8	1	1	–	1- 1/4	M8	M8
46	SCP 300-330 HB	3/8	3/8	1	3/8	3/4	3/4	–	3/4	M8	M8
47	SCP 300-380 HA	3/8	3/8	1	3/8	1	1	–	3/4	M8	M8
48	SCP 300-400 HA	3/8	3/8	1	3/8	3/4	3/4	–	3/4	M8	M8
49	SCP 300-490 HA	3/8	3/8	1	3/8	1	1	–	1	M8	M8
50	SCP 300-570 HA	3/8	3/8	1	3/8	1	1	–	1	M8	M8
51	SCP 300-660 DV	3/8	3/8	1–1/2	3/8	1	1	–	1	M8	M8
52	SCP 350-500 HA	3/8	3/8	1	3/8	1	1	–	1	M8	M8
53	SCP 350-470 HA	3/8	3/8	1	3/8	1	1	–	1	M8	M8
54	SCP 400-540 HA	3/8	3/8	1	3/8	1	1	–	1	M8	M8
55	SCP 400-480 HA	3/8	3/8	1	3/8	1	1	–	1	M8	M8
56	SCP 400-550 HA	3/8	3/8	1	3/8	1	1	–	1	M8	M8
57	SCP 400-710 HA	3/8	3/8	1	3/8	1	1	–	1–1/4	M8	M8
58	SCP 400-660 DV	1/2	1/2	1	3/8	1	1	–	1	M8	M8

CG: Compound Ground; **PG**: Pressure Gauge; **PM**: Priming; **AC**: Air Cock; **CDS**: Casing Drain (Suction); **CDD**: Casing Drain (Delivery); **CD**: Casing Drain; **GD**: Gland Drain; **VG**: Vibration Gauge; **TG**: Temperature Gauge

6.1.6 Pump Technical Data

Sr. No.	Pump	Neck Ring & Impeller Clearance	Gland Packing Size				Ball Bearing Drive End	Ball Bearing Non Drive End
		Min.	mm^2	No. of Rings DE	No. of Rings NDE	Length in Mtr.		
1	SCP 50-220 HA	0.35	12	2	2	0.65	6204 2z	6202 2z
2	SCP 50-180 HA	0.35	14	3	3	1.1	6304 2z	6304 2z
3	SCP 50-340 HA	0.35	14	3	3	1.1	6304 2z	6304 2z
4	SCP 50-340 DS	0.38	14	3	4	1.3	6305 2z	6305 2z
5	SCP 65-390 HS	0.43	14	3	3	1.3	6305 2z	6305 2z
6	SCP 80-230 HA	0.38	14	3	3	1.3	6305 2z	6305 2z
7	SCP 80-200 HA	0.38	14	3	3	1.3	6305 2z	6305 2z
8	SCP 80-380 DS*	0.40	16	3	4	1.5	N206	6305 2z
9	SCP 80-340 HA	0.38	14	3	3	1.3	6305 2z	6305 2z
10	SCP 80-360 DS	0.45	10	4	6	1.3	6306 2z	6306 2z
11	SCP 100-270 HA	0.40	14	3	3	1.3	6305 2z	6305 2z
12	SCP 100-280 HA	0.43	14	3	3	1.3	6305 2z	6305 2z
13	SCP 100-360 HA	0.43	14	3	3	1.3	6305 2z	6305 2z
14	SCP 100-400 HA	0.43	14	3	3	1.3	6305 2z	6305 2z
15	SCP 100-410 DS	0.48	10	4	6	1.3	6307 2z	6307 2z
16	SCP 125-290 HA	0.45	16	3	3	1.5	6306 2z	6306 2z
17	SCP 125-330 HA	0.48	16	3	3	1.5	6306 2z	6306 2z
18	SCP 125-440 HA	0.48	16	3	3	1.5	6306 2z	6306 2z
19	SCP 125-470 HA	0.50	17.5	3	3	1.75	6308 2z	6308 2z
20	SCP 125-460 DS	0.50	12	4	6	1.3	6309 2z	6309 2z
21	SCP 150-290 HA	0.45	16	3	3	1.5	6306 2z	6306 2z
22	SCP 150-390 HA	0.50	17.5	3	3	1.75	6308 2z	6308 2z
23	SCP 150-350 HA	0.50	17.5	3	3	1.75	6308 2z	6308 2z
24	SCP 150-440 HA	0.50	17.5	3	3	1.75	6308 2z	6308 2z
25	SCP 150-580 HA	0.45	20	3	3	2.05	6311 2z	6311 2z
26	SCP 150-530 HA	0.50	20	3	3	2.05	6311 2z	6311 2z
27	SCP 150-460 DS	0.48	17.5	3	4	2.0	6309 2z	6309 2z
28	SCP 200-310 HA	0.50	17.5	3	3	1.75	6308 2z	6308 2z
29	SCP 200-320 HA	0.50	17.5	3	3	1.75	6308 2z	6308 2z
30	SCP 200-370 HA	0.50	17.5	3	3	1.75	6308 2z	6308 2z
31	SCP 200-360 HB	0.53	17.5	3	3	1.75	6308 2z	6308 2z
32	SCP 200-390 HA	0.53	20	3	3	2.05	6311 2z	6311 2z
33	SCP 200-440 HA	0.50	20	3	3	2.05	6311 2z	6311 2z
34	SCP 200-460 HA	0.53	20	3	3	2.05	6311 2z	6311 2z
35	SCP 200-550 HA	0.50	20	3	3	2.05	6311 2z	6311 2z
36	SCP 200-480 HA	0.50	20	3	3	2.05	6311 2z	6311 2z
37	SCP 200-560 HA	0.58	22	3	3	2.6	6314 2z	6314 2z
38	SCP 200-660 DV	0.53	22	3	3	2.6	6314 2z	6314 2z
39	SCP 250-250 HA	0.53	16	3	3	1.5	6306 2z	6306 2z
40	SCP 250-390 HA	0.55	20	3	3	2.05	6311 2z	6311 2z
41	SCP 250-360 HA	0.55	20	3	3	2.05	6311 2z	6311 2z
42	SCP 250-450 HA	0.58	22	3	3	2.6	6314 2z	6314 2z
43	SCP 250-570 HA	0.58	22	3	3	2.6	6314 2z	6314 2z
44	SCP 250-700 DV*	0.60	20	4	4	3.5	6316 2z	3316
45	SCP 250-740 DV*	0.60	20	4	5	3.5	6316 2z	3316
46	SCP 300-330 HB	0.55	20	3	3	2.05	6311 2z	6311 2z
47	SCP 300-380 HA	0.58	20	3	3	2.05	6311 2z	6311 2z
48	SCP 300-400 HA	0.60	20	3	3	2.05	6311 2z	6311 2z
49	SCP 300-490 HA	0.58	22	3	3	2.6	6314 2z	6314 2z
50	SCP 300-570 HA	0.60	22	3	3	2.6	6314 2z	6314 2z
51	SCP 300-660 DV	0.60	20	5	5	3.5	6318 2z	6318 2z
52	SCP 350-500 HA	0.65	22	3	3	2.6	6314 2z	6314 2z
53	SCP 350-470 HA	0.60	22	3	3	2.6	6314 2z	6314 2z
54	SCP 400-540 HA	0.65	22	3	3	2.6	6314 2z	6314 2z
55	SCP 400-480 HA	0.65	22	3	3	2.6	6314 2z	6314 2z
56	SCP 400-550 HA	0.70	20	4	4	3.5	6316 2z	6316 2z
57	SCP 400-710 HA	0.70	20	4	4	3.5	6316 2z	6316 2z
58	SCP 400-660 DV*	0.65	20	5	5	5.2	6316 2z	3319

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 of bare shaft pump

It is strongly recommended to use component such as coupling, guards, motors, base plates sup plied by WILO to install a bare shaft pump on a base plate.

It is mandatory that those components should be CE certified and the coupling guard must comply with the regulation EN 953.

7.1.1 Electrical motor selection

Select an electrical motor with sufficient power margin regarding the motor rating. The table below will guide you in this selection*.

*** Electrical motor selection**

Shaft power	$P_2 \leq 4$ KW	4 kW < $P_2 \leq$ 10 kW	10 kW < $P_2 \leq$ 40 kW	40 kW $\leq P_2$
Recommended power margin	25 %	20 %	15 %	10 %

Example:

- Duty point: 100 m3/h – 35 m – pump efficiency 78 %
- Pump shaft power : 12,5 kW
- Electrical motor rating (including margin): 12,5 * 1,15 = 14,3 kW
- IEC motor power rating available: 15 kW
- Use a foot mounted motor B3 (IM 1001) which comply with the IEC34-1 standard.

7.1.2 Coupling selection

Use a semi-flexible coupling to link the pump to the driver.

Select the size of the coupling in accordance with the recommendation of the coupling manufacturer. Strictly follow the coupling manufacturer's instructions for the fitting of the coupling between the pump and the motor. (The coupling must comply with the standard EN349). The alignment of the pumps and the motor must be checked after the installation of the pump set on its foundation and when the piping is connected. In addition an alignment control must take place when the system works at its nominal temperature. The coupling guard must comply with the EN 953 standard in order to avoid any contact with rotating parts during operations.

7.1.3 Selection of a base plate

Select a base plate in accordance with the local regulations, sufficiently large and strong to support the pump and motor.

7.1.4 Pumpset assembling

Fix the pump and motor equipped with their half coupling on the base plate and make the alignment of those elements. It is recommended to fit the coupling guard supplied as accessories by WILO.

NOTE:

If pump is supplied with coupling and motor mounted on the base plate, please ensure proper alignment of pump motor and coupling.

7.2 Installation of the complete pump set

- Before any installation work is carried out, the pumpset 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 pumpset.
- Avoid exposure of the pumpset 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.

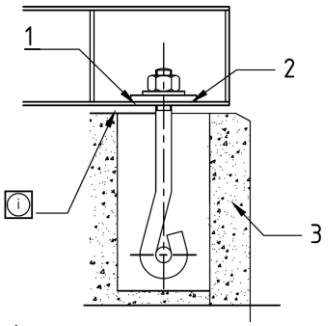
- Provide shut-off valves in front of and behind the pump.

7.2.1 Foundations (figures 2&3 Pg. 1&2)

The foundation should be sufficiently substantial to absorb any vibration and to form a permanent, rigid support for the base plate. The foundation must get large dimensions.

Generally, the weight of the foundation is around

2 to 3 time the pump set weight. This is important in maintaining the alignment of a direct connected unit. In building the foundation, the top surface level should be low by 1inch to accommodate packer plate thickness/height and surface should be rough for bonding of fresh grouting material. Foundation bolts of the proper size should be embedded in the concrete, located by template (refer figure 3 Pg. 1).



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.

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 inserted.

- It is insufficient to check level on the machined pads of base plate 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 figure 4 Pg.2. Therefore, it is necessary to use
- I-beam straight edge along with engineer's master level.

7.2.2 Levelling and installing the base plate

CAUTION! Risk of material damage!

Pumps and drivers that are received with both machines mounted on a common base plate are checked for alignment before shipment. However, during shipment, storage it may get disturbed.

- Use I-beam type straight edge and an engineer's master level (with accuracy of 0.05 mm / 250 meter) for levelling the base plate. I-beam should rest on the machined surfaces of the base plate, 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 base plate by inserting shims between the base 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, use I-beam type straight edge and an engineer's master level. Level should be achieved within 0.05 mm per 250 mm. There should two packer plates at each foundation bolt and additional packer to be provided intermittently if distance between two foundation bolts is more than 500 mm. Packer plates should be machined and of adequate size with minimum 25 mm thick.
- When the base plate 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 base plate or loosen the foundation bolts in the grout by excessive tightening.

7.2.3 Alignment of the pumps and its driving units

- When the base plate 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 base plate. Allow minimum seven days time for curing. Grout mix in the proportion specified earlier for foundation bolt grouting should be used. It is further recommended that all hollow pockets in the base plate 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 trueness 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 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°.

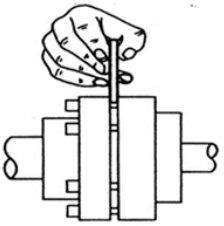
Radial alignment

- Clamp a dial gauge on one of the couplings or to the shaft as shown in figure 5 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. (Refer figure 5 Pg.2)

Alignment Tolerances

Pump Speed	Angular Alignment	Radial Alignment
< 1000 rpm	0.15 mm TIR	0.15 mm TIR
1000 rpm to 1800 rpm	0.1 mm TIR	0.15 mm TIR
1800 rpm to 3000 rpm	0.05 mm TIR	0.1 mm TIR
TIR= Total Indicated Reading		

Distance between coupling halves for SCP Pumps

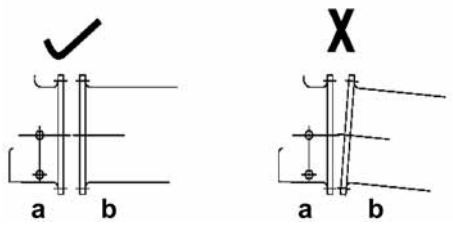


Rotational Speed			Gap
rpm			mm
990	1450	2900	
-	3-55 Kw	3-55 Kw	2 - 4
90-120 Kw	75-250 Kw	75-560 Kw	2 - 4
>120 Kw	>250 Kw	>560 Kw	3 - 8

7.2.4 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 (figure 6 Pg. 2).

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.



Avoid Stress on the pump casing,
a: pump flanges, b. pipe work

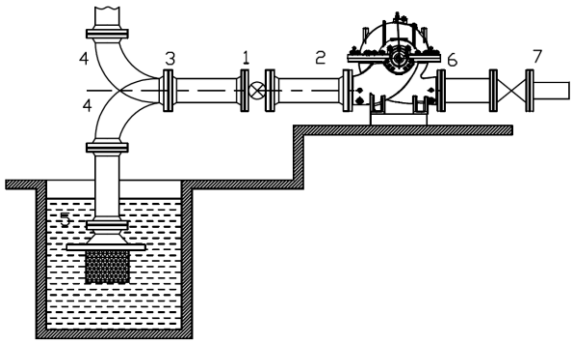
- The flow rate in the suction line or inflow line must not exceed 2 - 3 m/s.
- Pipe velocity may need to be reduced further to satisfy pump NPSH requirements and to control suction pipe losses (refer figure 6 Pg.2).

Flange size [mm]		50	65	80	100	150	200	250	300	350	400	450	500
Forces (N)	Fx	710	890	1070	1420	2490	3780	5340	6670	7120	8450	9335	10000
	Fy	890	1130	1330	1780	3110	4890	6670	8000	8900	10230	1115	7780
	Fz	580	710	890	1160	2050	3110	4450	5340	5780	6670	7335	7890
	Fr	1280	1640	1920	2560	4480	9620	9630	11700	12780	14850	16230	17650
Moments (Nm)	Mx	460	690	950	1330	2300	3530	5020	6100	6370	7320	7675	7945
	My	230	435	470	680	1180	1760	2440	2980	3120	3660	3905	4175
	Mz	350	530	720	1000	1760	2580	3800	4610	4750	5420	5725	6060
	Mr	620	970	1280	1800	3130	4710	6750	8210	8540	9820	10235	10775

7.2.5 Suction line

See the sketches (figure 7 Pg. 3) for the optimum layout of pump installation for flow and suction lift operation. Ensure that air pockets cannot be created. Unequal nominal widths of the suction branch and suction line must be compensated by eccentric transition pieces (refer figure 8.1-8.5, Pg. 3-5)

- It is recommended that a strainer is installed in front of the suction pipe 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.



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

7.2.6 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.

7.2.7 Stuffing box packing (fig. 9 Pg.5)

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 and 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 at 45 °. 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° from joints of its neighbor. A logging ring included in the 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.

7.2.8 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.

7.2.9 Pressure gauge connections

CAUTION! Risk of leakage of the fluid!

Never connect a pressure gauge onto the pump when the system is under pressure.

Pressure gauge connections are available on the pump casing close to the flanges. Then pressure gauge can be connected on suction and discharge side.

7.2.10 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 pumpset has been switched off by, a protective device, it must not be switched on again until the error has been corrected.
- The electrical system (pumpset 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 pumpset 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.

7.2.11 Operation with frequency converter

The rotation speed can be adjusted in the operating limits of the pump given in the technical data. The electrical motors can be driven by a frequency converter in order to adapt the pump performances, the duty point required. Please contact WILO before connecting the frequency converter to the motor to make sure that the electrical motor is compatible with this driver. In any case, please inform WILO at the quotation stage if the pump set will by driven by a frequency converter this might influence the motor selection.

- The converter should never generate voltages peaks to the motor connection higher than 850V and deliver voltages variations ΔU/Δt greater than 2500 V/µs.
- If the above conditions cannot be fulfilled, an appropriate filter should be place between the frequency converter and the motor. Please contact the frequency converter manufacturer for guidance in the selection of this filter.
- Strictly follow the Frequency converter manufacturer instructions.
- The minimum rotation speed of the pump should never go below 40% of the nominal speed.

8 Commissioning

WARNING! Danger of injury

The 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

SCP pumps are fitted with pre-lubricated, sealed bearings which do not require external lubrication for life. For Ball bearings which require external greasing (Ref. table Pg. 30&31) 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, through air cock. 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 suction head 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 filled 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 airtight 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.

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 1-2 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 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 Sealing system

Gland packing

⚠ CAUTION! Risk of damaging the pump!

If the gland plate is too tight, the packing stuff will be immediately damage.

At the beginning of the operation, the leak at the gland packing should be important. It should reduce progressively after several hours by a balanced and reasonable tightening the gland plate. The gland packing must operate without excessive temperature. The correct setting of the gland packing let a permanent leak around 1-2 drops per seconds.

If this leak is too much and cannot be adjusted with the gland plate, the packing stuff are worn and must be replaced.

Mechanical seal

⚠ CAUTION! Risk of damaging the pump!

A mechanical seal must never operate without fluid and lubrication even for a short period of time.

Ensure that the pump is completely full of water and vented before starting the pump. Small leakages can occur during the period of running-in, they should disappear after several hours of operation. If the leakages don't stop, shut down the pump disassemble the mechanical seal and control their condition.

8.3.5 Normal shutdown

⚠ WARNING! Risk of Burns!

If the fluid temperature and system pressure is high, close the isolation valves upstream and downstream of the pump. Initially let the pump cool.

- 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.

8.3.6 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

Maintenance and repair work should be 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 unauthorized switch-on prior to any maintenance or repair work.**
- **Any damage to the connection cable should always be rectified by a qualified electrician only.**

WARNING! Risk of scalding!

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

Routine maintenance

Parts	Action	Period	Remarks
Mechanical Seal	Check for Leakage	Daily	5.6 gm/hr. per pair of seal face
Gland Packing	Check for Leakage	Daily	40-60 drops/minute
	Check for Leakage	Half yearly	If required replace with new packings
Bearings	Check temperature	Weekly	If Bearing temperature exceeds 80^0 C, the fault needs to be rectified.
Suction Pressure	Check Pressure	Daily	
Discharge Pressure	Check Pressure	Daily	
Flushing	Check Flow	Weekly	Flow through the Flushing pipes must be clear and continuous
Vibration	Vibration	Weekly	Refer acceptable field vibration limit chart Pg. No. 23
Voltage and Current	Check for the rated values	Weekly	
Rotating element	Check the rotating for wear	Yearly	
Clearances	Check the clearances between neck ring and impeller	Yearly	If value of clearance is more, neck ring should be replaced, Ref. Technical Data Pg. No. 14
Total Dynamic Head	Check Suction and Discharge TDH	Yearly	
Alignment	Check the alignment of pump with motor	Half yearly	Refer table for alignment tolerances, Pg. No. 17

NOTE:

The above Routine Maintenance checklist is for pump only. Refer Motor / Engine manufacturers manual for the respective routine maintenance checks.

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.

NOTE:

The figures given in the table above are only valid if the wear rings and the impeller are made with in the same materials of low galling tendencies. For materials with higher galling tendencies (AISI 304/
316 etc...), higher clearance is provided (0.125 mm to be added to given values).

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 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 to be set for a particular size of screw is dependent upon:

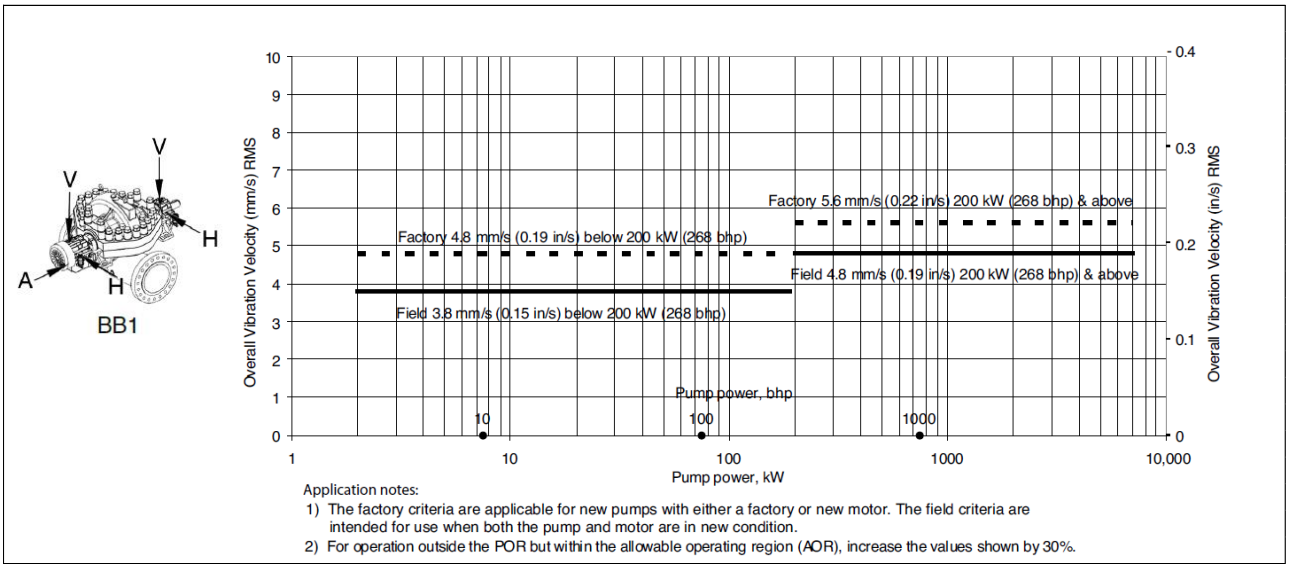
- Material of screw
- Parent metal
- Whether the screw is untreated or plated
- Whether the screw is dry or lubricated
- The depth of the thread

Tightening torques — Untreated Screw (black finish); Coefficient of Friction 0.14

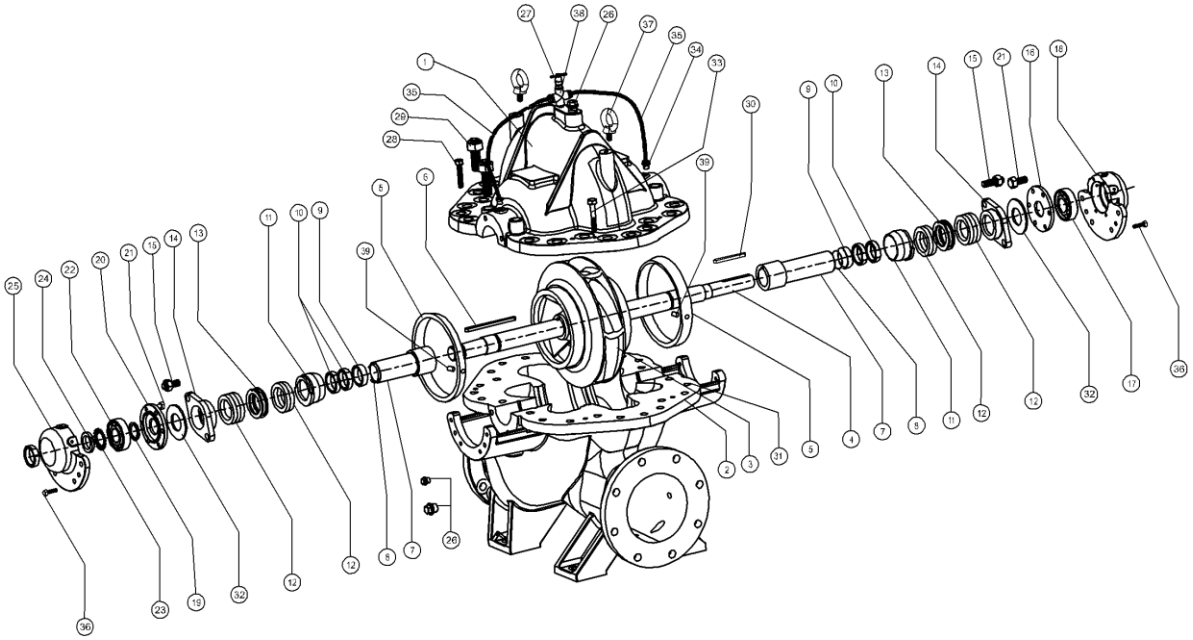
Property class	Torque	Nominal diameter — Coarse thread												
		M6	M8	M10	M12	M14	M16	M20	M22	M24	M27	M30	M33	M36
HTS	Nm	9.2	22	44	76	122	190	300	350	500	600	1450	1970	2530
8.8	Ft. lb	6.8	16	32.5	56	90	140	221	258	369	443	1069	1452	1865
SS304	Nm	4.1	9.8	19.5	34	54.1	84.4	164.7	224	285	416.5	565.6	1769.6	988.4
Class 50	Ft. lb	3	7. 3	14 4	25	39.9	62.3	121.4	165.2	209	307.1	417.1	1567.6	728.9

9.2.2. Hydraulic Institute Standard (ANSI/HI 9.6.4-2016)

Acceptable field vibration limit chart (9.6.4.2.5.1b)

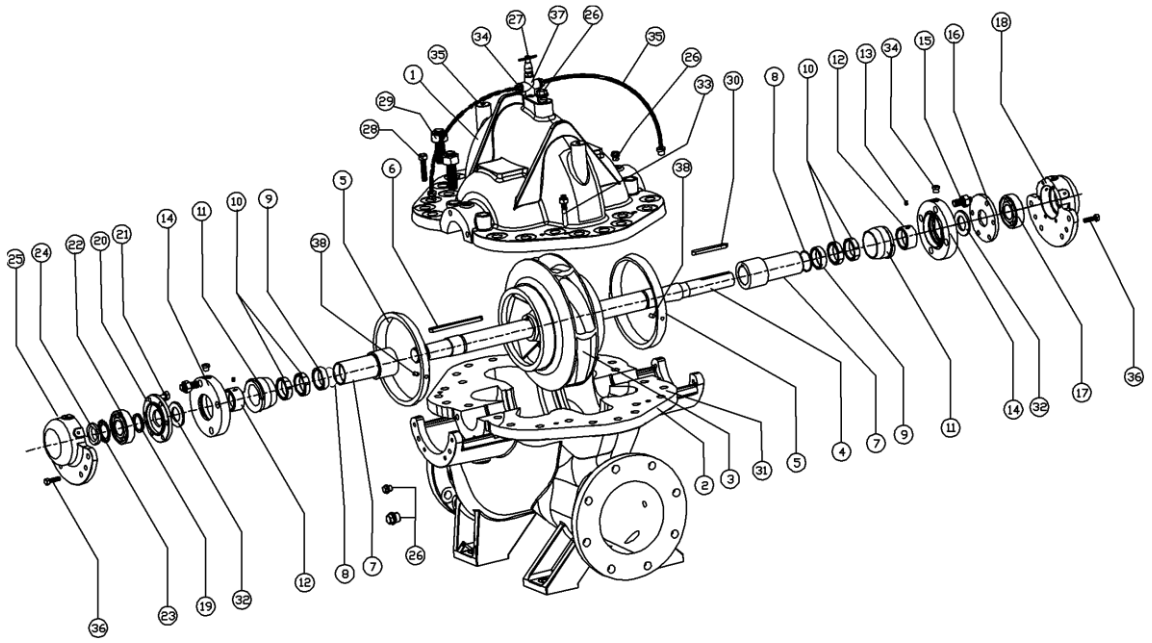


9.3 Disassembling the pump



Exploded view of SCP pump (Gland pack version)

Gland pack version			
No.	**Description**	**No.**	**Description**
1	Casing top half	**20**	Bearing end cover (Non-Drive End)
2	Casing bottom half	**21**	Stud for bearing end cover
3	Impeller	**22**	Bearing (Non-Drive End)
4	Shaft	**23**	Lock washer
5	Neck ring (Wear ring)	**24**	Lock nut
6	Impeller key	**25**	Bearing housing (Non-Drive End)
7	Shaft sleeve	**26**	Hex plug
8	O-ring	**27**	Air cock
9	Spacer Sleeve	**28**	Hex screw for jacking
10	Sleeve nut	**29**	Studs for split flange
11	Stuffing box bush	**30**	Coupling key
12	Gland packing	**31**	Gasket
13	Logging ring	**32**	Water thrower
14	Gland	**33**	Steady pin
15	Stud for gland	**34**	Stud coupling
16	Bearing end cover (Drive End)	**35**	Sealing connection (Flushing Pipe)
17	Bearing (Drive End)	**36**	Hex screw for bearing housing
18	Bearing housing (Drive End)	**37**	4-way valve
19	Thrust collar	**38**	Neck ring pin



Exploded view of SCP (Mechanical seal version)

Mechanical seal version			
No.	**Description**	**No.**	**Description**
1	Casing top half	**20**	Bearing end cover (Non-Drive End)
2	Casing bottom half	**21**	Stud for bearing end cover
3	Impeller	**22**	Bearing (Non-Drive End)
4	Shaft	**23**	Lock washer
5	Neck ring (Wear ring)	**24**	Lock nut
6	Impeller key	**25**	Bearing housing (Non-Drive End)
7	Shaft sleeve	**26**	Hex plug
8	O-ring	**27**	Air cock
9	Spacer Sleeve	**28**	Hex screw for jacking
10	Sleeve nut	**29**	Studs for split flange
11	Stuffing box bush	**30**	Coupling key
12	Mechanical seal	**31**	Gasket
13	Grab screw	**32**	Water thrower
14	Gland plate	**33**	Steady pin
15	Stud for gland	**34**	Stud coupling
16	Bearing end cover (Drive End)	**35**	Sealing connection (Flushing Pipe)
17	Bearing (Drive End)	**36**	Hex screw for bearing housing
18	Bearing housing (Drive End)	**37**	4-way valve
19	Thrust collar	**38**	Neck ring pin

9.3.1 Disassembling the top casing

- Isolate the pump system by closing suction and delivery valve.
- Drain the pump and open the upper air vent (27).
- Remove two steady pins (33) and the split flange nuts.
- For gland packing:
- Remove nuts of split gland (15) from both ends and slide away the gland (14). Remove gland packing (12) as well as logging ring (13)
- For mechanical seal:
- Disconnect the flushing tubes (35), loosen the nuts of the gland plate (14) and slide them away on the shaft (4).
- Remove all studs (29) joining top & bottom casing (1&2). Connect suitable lifting tackles to the eye bolts (37) provided on top half casing (1). Remove the casing gasket (31)
- Remove the paper gasket (31) placed in between the two casing halves

9.3.2 Dismantling the rotating element (Gland pack version pump)

- Remove the coupling screw/nut of the coupling
- Remove the screw of the bearing end cover (16 & 20)
- Remove the steady pin (33) and hex screw (36) of bearing housing (18 & 25)
- Lift the rotor element
- Remove the coupling and coupling key (30)
- Remove bearing housings of both driving and non-driving ends (18 & 25)
- Now remove the lock nut (24) and lock washer (23) from the shaft free end
- Remove the both driving and non-driving bearings (17 & 22) using puller (Never try to extract the bearing by applying force to the outer race)
- Now remove the thrust collar (19) from the non-driving end of the shaft
- Remove the water thrower (32) from both sides of the shaft (4)
- Remove the gland (14) and gland packing (12) from the shaft along with logging ring (13)
- Remove the stuffing box bush (11) from both side
- Now unscrew and remove the sleeve nuts (10) and spacer sleeves (9) on both side
- Carefully extract the O-ring (8) from the sleeve (7) with suitable tool without damaging it
- Now remove the neck rings (5) from the impeller (3)
- In order to remove the sleeves effortlessly, apply some molly cream or grease on the shaft and slide the sleeves over it (Also first clean the shaft prior to the removal of the sleeves). Mark the position of impeller (3) on the shaft (4) to ease the reposition it while reassembling.
- Now remove the impeller (3) carefully avoiding damage to the impeller key (6)
- If difficulty is observed in removal of the impeller, apply heat uniformly over the impeller shrouds inwards towards the hub

9.3.3 Dismantling the rotating element (Mechanical seal version pump)

The only difference between disassembly of gland pack and mechanical seat version pump is the disassembly of the mechanical seal

The procedure up to water thrower removal is same as per gland pack version.

Disassembly of mechanical seal is as follows:

- Slide out the gland plate carefully over the shaft.
- Now mark the position of mechanical seal (12) on the shaft (4) to ease the position while reassembling
- Unscrew the grub screw of the seal adjusting ring
- Pull the mechanical seal carefully over the shaft followed by removal of adjusting ring
- Rest procedure is same as explained for gland pack version pump

9.4 Examination of Internal Components

With the disassembled rotating element, the internal components and clearances can be checked

9.4.1 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.

9.4.2 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.

9.4.3 Impeller

Inspect the impeller as follows:

- Examine the impeller for damage.
- For corrosive /erosion pitting.
- Cavitation, pitting.
- Bent or cracked vanes, inlet and outlet vane end wear.
- If damage is extensive, impeller may need replacement.
- Further information should be sought from WILO before any decision on repair work is undertaken.
- 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.

NOTE:

Impeller wearing rings are an optional feature to enhance the protection for impeller eye. In standard case pump is supplied with neck ring only.

- 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.

9.4.4 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 (Total Indicated Reading), it should be replaced/repaired. Examine the shaft keys and keyways. Remove damaged or worn out keys.

9.4.5 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. As exceptions, the (*) marked models of SCP receive bearing which need re-greasing.
- The re-filling must take place each 1000 hours of operation and the grease fully replaced every 3000 hours or earlier if the local prescription requires it.

9.4.6 Stuffing box bush

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

9.4.7 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 blocks the spring action.

9.5 Reassembling the pump

9.5.1 Reassembly of rotating element (Gland pack version pump)

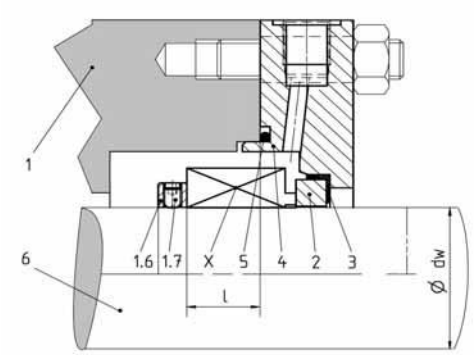
- Place the impeller key (6) at its seat on the shaft (4)
- Now slide the impeller (3) at its position on the shaft (4), matching the marked position done while disassembly
- Place the neck ring (5) on the impeller eye
- Slide the sleeve (7) on both side of the impeller over the shaft
- Insert the O-ring (8) in between the shaft (4) and sleeve (7)
- Now place the spacer sleeve (9); ensuring proper positioning of the O-ring (8)
- Screw the sleeve nut (10); but don't tight it now, keep it loose
- Now slide in the stuffing box bush (11) over the shaft on both sides
- Place the logging ring (13) next to the stuffing box bush (11)
- Side in the gland (14), followed by water thrower (32) n both side
- Now slide the bearing inner cover (16 & 20) on either side of the shaft (4)
- Now place the thrust collar (19) followed by thrust end bearing (22). To place the bearing at its position using proper mounting aid
- Now place the lock washer (23) and lock nut (24).
- Tight the lock nut completely with proper tightening tool and lock it with the lock washer (23). For tightening sequence refer figure 10
- Now place the bearing (17) at the driving end using proper mounting aid
- Press the bearing housing (18 & 25) over the bearings (17 & 22) using a mallet

9.5.2 Re-assembly of the pump (Gland pack version 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.
- Now lift the rotor assembly and place it on the bottom half casing (2)
- Put a gasket (31) from 0.25 mm thick black joint paper or similar gasket material and locate on split flange of bottom half casing.
- Make sure the neck ring pin (38) provided to the neck ring (5) and stuffing box bush (11) sits properly in their respective sit
- Now screw the bearing end cover (16 & 20) to the bearing housing (18 & 25) and bearing housing to the bottom casing (2)
- Pull the water thrower (32), gland (14) and logging ring (13) towards the bearings (17 & 22) on both side
- Now check the position of impeller; if adjustment is required, do it by losing / tightening the sleeve nut (10) on either side of the impeller
- After proper positioning of the impeller, tight the sleeve nut (10)
- Place all the studs for split flange (29) at their respective positions
- Now place the top half casing (1)
- Insert the steady pins (33) of casing (1 & 2) and bearing housing (18 & 25) at respective their position
- Tighten the bolts with a torsion bar with the proper sequence
- Check for the proper position of neck ring (5) and stuffing box bush (11)
- Now stuff in the stuffing box with the number of gland pack rings. For proper cutting procedure of packing rings refer figure 9.
- Press in the logging ring and stuff in remaining gland pack rings
- Now place the gland at its position and hand tight its studs (15)
- Check for free rotation of the shaft

9.5.3 Reassembly of rotating element (Mechanical seal version pump)

- Procedure for rotor assembly for mechanical seal pump is similar up to assembly of stuffing box bush (11)
- Reassembly of mechanical seal is as follows:
- Extreme cleanliness must be observed during installation, and damage to the seal faces and mounting rings must be avoided
- Place the adjusting ring of mechanical seal at its pre marked position
- Place the grub screw (13) at its position on the adjusting ring, but do not tight it yet
- 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 glycerin 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 stationery 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.
- Now check the distance of seal as shown in the figure and adjust its value as per the drawing
- For rest parts follow the above explained procedure as per gland pack version pump.



Location of mechanical seal of shaft

1) Pump casing
2) Stationary seat
3) Stationary seat
4) Gland plate
5) O-ring
6) Shaft
X. Mechanical seal
1.6 Abutment ring
1.7 Abutment ring fixing screw

9.5.4 Re-assembly of the pump (Mechanical seal version pump)

- For assembling mechanical seal version pump follow the same procedure as done for gland pack version pump. Difference in assembly of mechanical seal pump is as follows:
- Re-assembly of mechanical seal is as follows:
- After placing the top half casing (1) at its position and tightening the studs (29)
- Slide in the gland plate (15) at its position and tight its studs
- Now fix the flushing tubes (35) to the mechanical seal gland plate (15)
- Rest procedure is same as explained above for gland pack version pumps.

ⓘ NOTE:

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

ⓘ NOTE:

- Change the gasket each time when the pump is opened.

9.6 Recommended Spare parts

In case of standard operation, we recommend the following list of spare part regarding the period of functioning.

- The maintenance of the split case pumps is easier than other pump types. Then in order to facilitate this operation we strongly recommended purchasing a batch of part with the pump in order to reduce the shutdown timing.

- It is strongly recommended to purchase the original spares parts from <WILO>. In order to avoid any mistake, we invite you to supply with any spare parts demand, the information mentioned on the data plate of the pump and / or motor.

Recommended spare parts Per Pump (Gland pack version)					
			Recommended Spare Parts		
No.	Description	Quantity	2 Yrs (A)	3 Yrs (B)	5 Yrs. (C)
1	Casing top half	1			
2	Casing bottom half	1			
3	Impeller	1			✔
4	Shaft	1			✔
5	Neck ring (Wear ring)	2	✔	✔	✔
6	Impeller key	1	✔	✔	✔
7	Shaft sleeve	2	✔	✔	✔
8	O-ring	2	✔	✔	✔
9	Spacer sleeve	2			
10	Sleeve nut	4	✔	✔	✔
11	Stuffing box bush	2			
12	Gland packing	Set	✔	✔	✔
13	Logging ring	2	✔	✔	✔
14	Gland	2	✔	✔	✔
15	Stud for gland	2			
16	Bearing end cover (Drive End)	1			
17	Bearing (Drive End)	1	✔	✔	✔
18	Bearing housing (Drive End)	1			
19	Thrust collar	1	✔	✔	✔
20	Bearing end cover (Non Drive End)	1			
21	Stud for bearing end cover	1			
22	Bearing (Non Drive End)	1	✔	✔	✔
23	Lock washer	1	✔	✔	✔
24	Lock nut	1	✔	✔	✔
25	Bearing housing (Non Drive End)	1			
26	Hex plug	–			
27	Air Release Valve	1			
28	Hex screw for jacking	2			
29	Studs for split flange	–			
30	Coupling key	1	✔	✔	✔
31	Gasket	1	✔	✔	✔
32	Water thrower	1	✔	✔	✔
33	Steady pin	–			
34	Stud coupling	4			
35	Sealing connection (Flushing Pipe)	2		✔	✔
36	Hex screw for bearing housing	8			
37	4 way valve	2		✔	✔
38	Neck ring pin	2	✔	✔	✔
39	Coupling guard	1		✔	✔

10 Faults, causes and remedies (For Bare Pump Only)

	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 no bend 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	Position logging ring centrally under sealing holes of stuffing box. form Seal.
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 characteristics 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, 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.

11 Decommissioning and recycling

The disposal of all material or debris must be done in order to protect the environment.

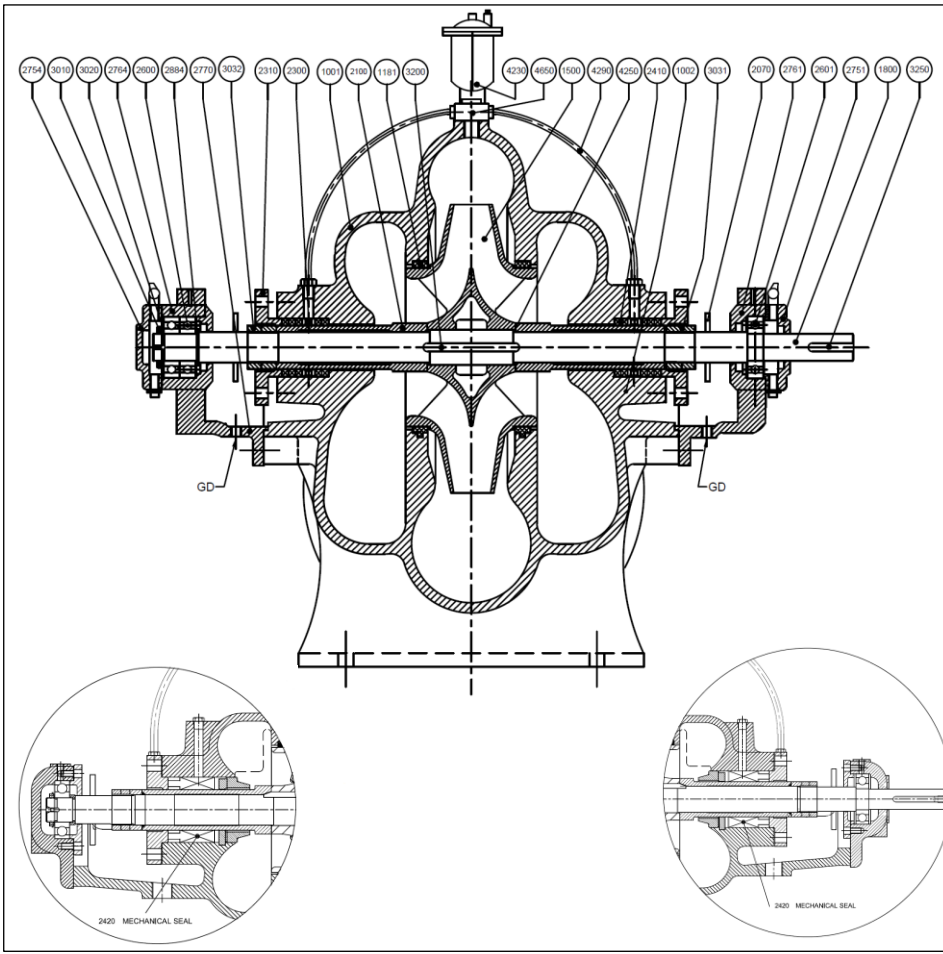
The Wilo's pumps do not contain any dangerous substances. The major part of the pump is recyclable. The disposal and recycling of the pump sets must be done in accordance with the local in force regulations.

The dismounting must be done by qualified personal.

Clean and decontamination must be achieved before any transportation or recycling

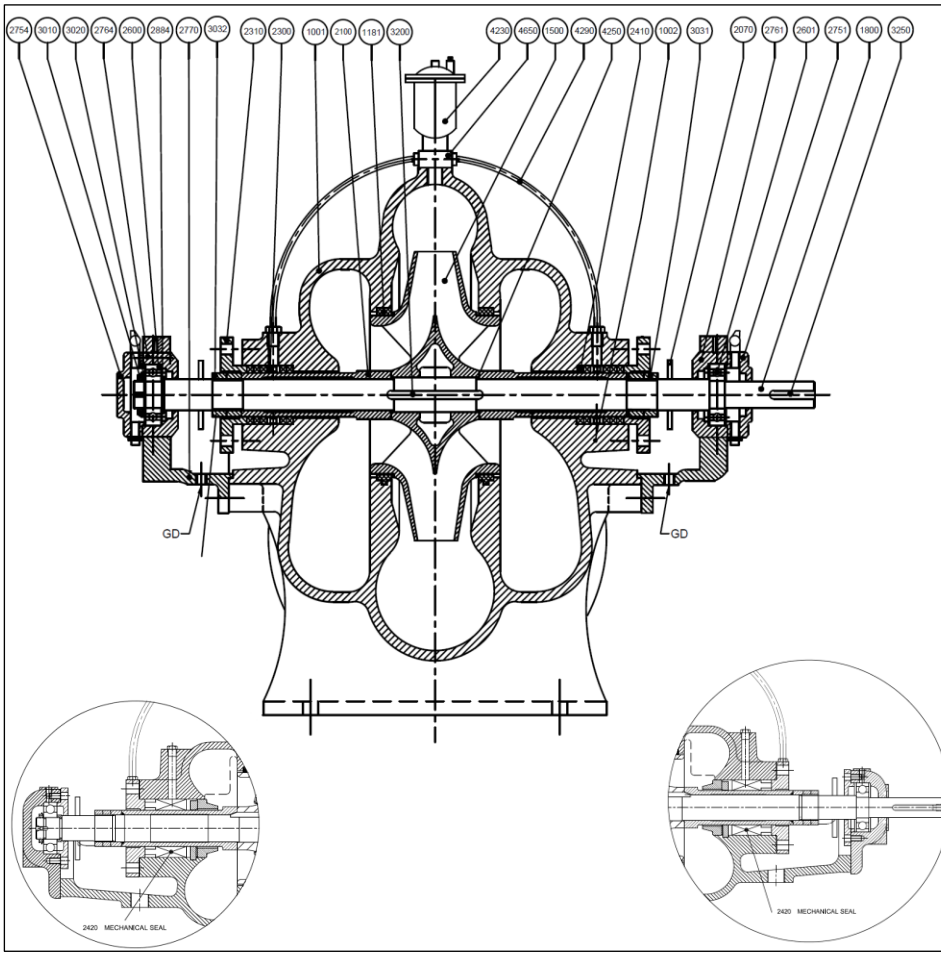
Annexure-1

A: Cross sectional Drawing of SCP HA (for ref. only)



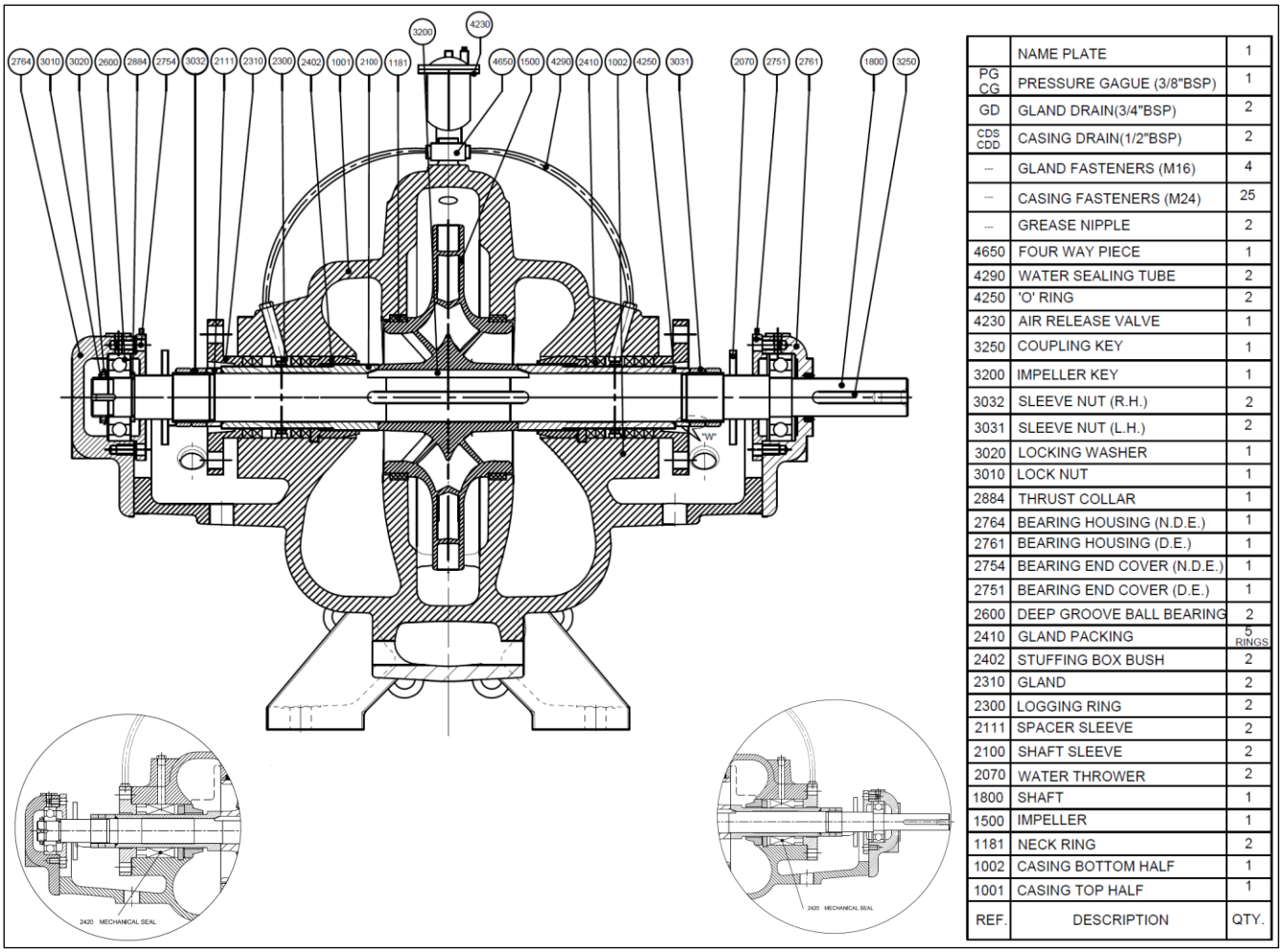
	NAMEPLATE	1
PG CG	PRESSURE GAGUE(3/8"NPT)	2
GD	GLAND DRAIN(1/2" NPT)	2
CDS CDD	CASING DRAIN(3/4"NPT)	2
---	GLAND FASTENERS(M16)	4
---	CASING FASTENERS(M20)	24
---	GREASE NIPPLE	2
4650	FOUR WAY PIECE	1
4290	WATER SEALING TUBE	2
*4250	'O' RING (SLEEVE)	2
4230	AIR RELEASE VALVE	1
*3250	COUPLING KEY	1
*3200	IMPELLER KEY	1
3032	SLEEVE NUT (R.H.)	2
3031	SLEEVE NUT (L.H.)	2
*3020	LOCKING WASHER	1
*3010	LOCK NUT	1
*2884	THRUST COLLAR	1
2770	BEARING BRACKET	2
2764	BEARING HOUSING (N.D.E.)	1
2761	BEARING HOUSING (D.E.)	1
2754	BEARING END COVER (N.D.E.)	1
2751	BEARING END COVER (D.E.)	1
*2601	DEEP GROOVE BALL BEARING	1
*2600	DEEP GROOVE BALL BEARING	2
*2410	GLAND PACKING	3.3 Mtrs.
2310	GLAND	2
2300	LOGGING RING	2
*2100	SHAFT SLEEVE	2
2070	WATER THROWER	2
*1800	SHAFT	1
*1500	IMPELLER	1
*1181	NECK RING	2
1002	CASING BOTTOM HALF	1
1001	CASING TOP HALF	1
REF.	DESCRIPTION	QTY.

B: Cross sectional Drawing of SCP HB (for ref. only)



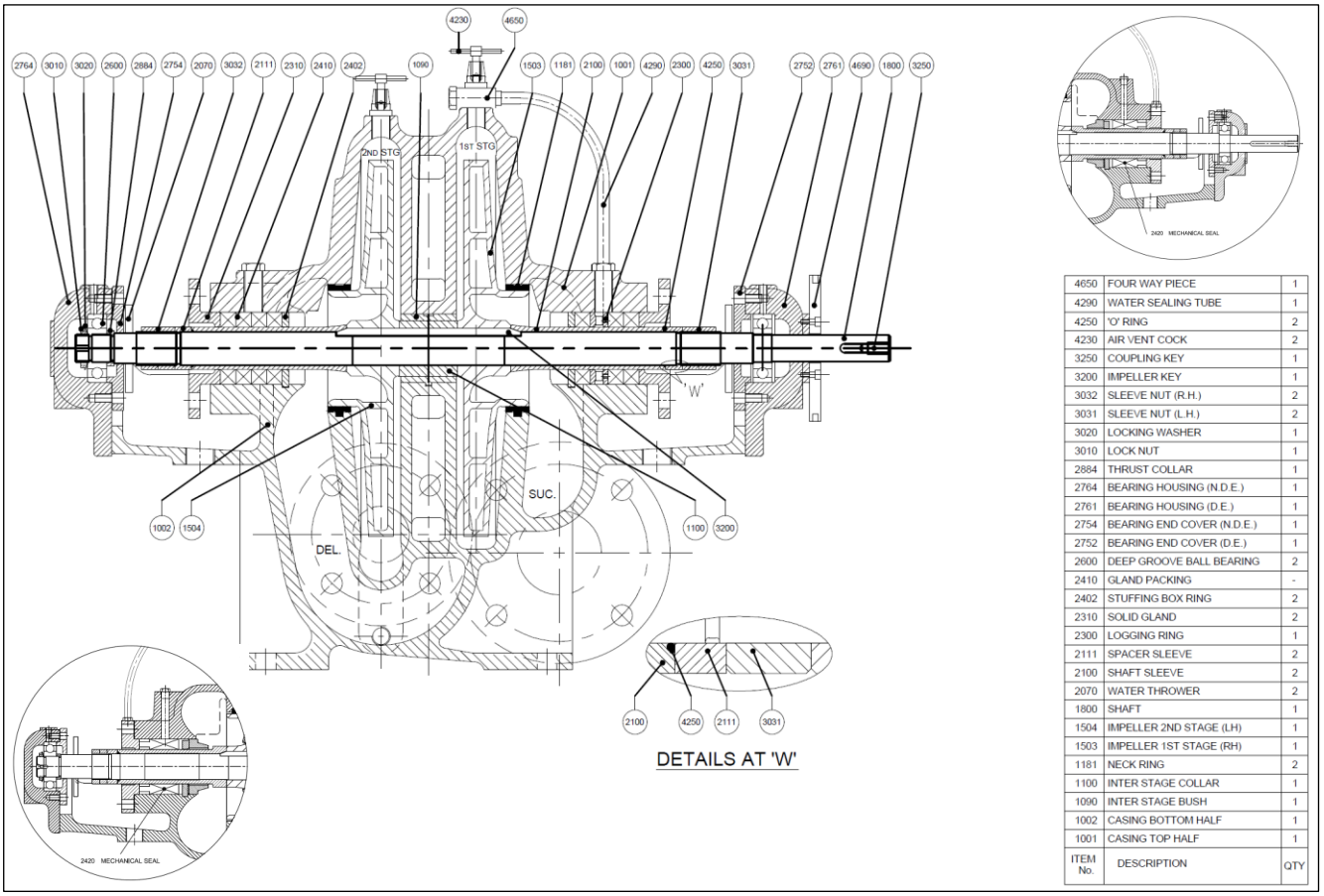
	NAMEPLATE	1
PG CG	PRESSURE GAGUE(3/8" NPT)	2
GD	GLAND DRAIN(1" NPT)	2
CDS CDD	CASING DRAIN(1" NPT)	2
---	GLAND FASTENERS(M20)	4
---	CASING FASTENERS(M24)	36
---	GREASE NIPPLE	2
4650	FOUR WAY PIECE	1
4290	WATER SEALING TUBE	2
*4250	'O' RING (SLEEVE)	2
4230	AIR RELEASE VALVE	1
*3250	COUPLING KEY	1
*3200	IMPELLER KEY	1
3032	SLEEVE NUT (R.H.)	2
3031	SLEEVE NUT (L.H.)	2
*3020	LOCKING WASHER	1
*3010	LOCK NUT	1
*2884	THRUST COLLAR	1
2770	BEARING BRACKET	2
2764	BEARING HOUSING (N.D.E.)	1
2761	BEARING HOUSING (D.E.)	1
2754	BEARING END COVER (N.D.E.)	1
2751	BEARING END COVER (D.E.)	1
*2601	DEEP GROOVE BALL BEARING	1
*2600	DEEP GROOVE BALL BEARING	1
*2410	GLAND PACKING	4 Mtrs.
2310	GLAND	2
2300	LOGGING RING	2
*2100	SHAFT SLEEVE	2
2070	WATER THROWER	2
*1800	SHAFT	1
*1500	IMPELLER	1
*1181	NECK RING	2
1002	CASING BOTTOM HALF	1
1001	CASING TOP HALF	1
REF.	DESCRIPTION	QTY.

C: Cross sectional Drawing of SCP DV (for ref. only)



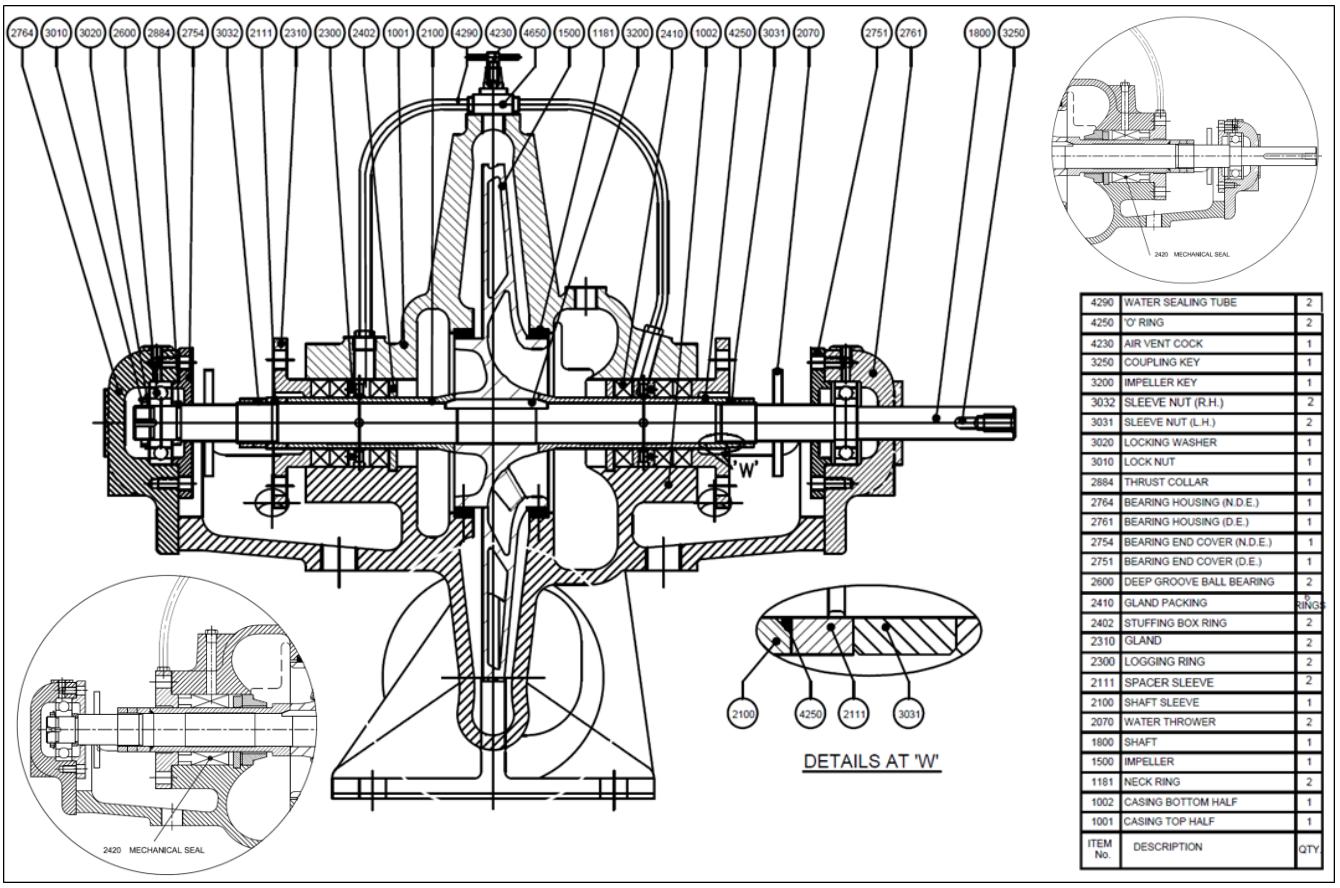
	NAME PLATE	1
PG CG	PRESSURE GAGUE (3/8"BSP)	1
GD	GLAND DRAIN(3/4"BSP)	2
CDS CDD	CASING DRAIN(1/2"BSP)	2
---	GLAND FASTENERS (M16)	4
---	CASING FASTENERS (M24)	25
---	GREASE NIPPLE	2
4650	FOUR WAY PIECE	1
4290	WATER SEALING TUBE	2
4250	'O' RING	2
4230	AIR RELEASE VALVE	1
3250	COUPLING KEY	1
3200	IMPELLER KEY	1
3032	SLEEVE NUT (R.H.)	2
3031	SLEEVE NUT (L.H.)	2
3020	LOCKING WASHER	1
3010	LOCK NUT	1
2884	THRUST COLLAR	1
2764	BEARING HOUSING (N.D.E.)	1
2761	BEARING HOUSING (D.E.)	1
2754	BEARING END COVER (N.D.E.)	1
2751	BEARING END COVER (D.E.)	1
2600	DEEP GROOVE BALL BEARING	2
2410	GLAND PACKING	5 RINGS
2402	STUFFING BOX BUSH	2
2310	GLAND	2
2300	LOGGING RING	2
2111	SPACER SLEEVE	2
2100	SHAFT SLEEVE	2
2070	WATER THROWER	2
1800	SHAFT	1
1500	IMPELLER	1
1181	NECK RING	2
1002	CASING BOTTOM HALF	1
1001	CASING TOP HALF	1
REF.	DESCRIPTION	QTY.

D: Cross sectional Drawing of SCP DS (for ref. only)



4650	FOUR WAY PIECE	1
4290	WATER SEALING TUBE	1
4250	'O' RING	2
4230	AIR VENT COCK	2
3250	COUPLING KEY	1
3200	IMPELLER KEY	1
3032	SLEEVE NUT (R.H.)	2
3031	SLEEVE NUT (L.H.)	2
3020	LOCKING WASHER	1
3010	LOCK NUT	1
2884	THRUST COLLAR	1
2764	BEARING HOUSING (N.D.E.)	1
2761	BEARING HOUSING (D.E.)	1
2754	BEARING END COVER (N.D.E.)	1
2752	BEARING END COVER (D.E.)	1
2600	DEEP GROOVE BALL BEARING	2
2410	GLAND PACKING	-
2402	STUFFING BOX RING	2
2310	SOLID GLAND	2
2300	LOGGING RING	1
2111	SPACER SLEEVE	2
2100	SHAFT SLEEVE	2
2070	WATER THROWER	2
1800	SHAFT	1
1504	IMPELLER 2ND STAGE (LH)	1
1503	IMPELLER 1ST STAGE (RH)	1
1181	NECK RING	2
1100	INTER STAGE COLLAR	1
1090	INTER STAGE BUSH	1
1002	CASING BOTTOM HALF	1
1001	CASING TOP HALF	1
ITEM No.	DESCRIPTION	QTY

E: Cross sectional Drawing of SCP HS (for ref. only)



4290	WATER SEALING TUBE	2
4250	'O' RING	2
4230	AIR VENT COCK	1
3250	COUPLING KEY	1
3200	IMPELLER KEY	1
3032	SLEEVE NUT (R.H.)	2
3031	SLEEVE NUT (L.H.)	2
3020	LOCKING WASHER	1
3010	LOCK NUT	1
2884	THRUST COLLAR	1
2764	BEARING HOUSING (N.D.E.)	1
2761	BEARING HOUSING (D.E.)	1
2754	BEARING END COVER (N.D.E.)	1
2751	BEARING END COVER (D.E.)	1
2600	DEEP GROOVE BALL BEARING	2
2410	GLAND PACKING	2 RINGS
2402	STUFFING BOX RING	2
2310	GLAND	2
2300	LOGGING RING	2
2111	SPACER SLEEVE	2
2100	SHAFT SLEEVE	1
2070	WATER THROWER	2
1800	SHAFT	1
1500	IMPELLER	1
1181	NECK RING	2
1002	CASING BOTTOM HALF	1
1001	CASING TOP HALF	1
ITEM No.	DESCRIPTION	QTY.

Annexure-2

Pre-commissioning checklist Pump with Motor			
Sr. No.	**Activities**	**Checked on**	**Remarks**
1	Levelling of Pump set		
2	Alignment with and without piping		
3	Flushing of pipelines and ensures no leakages		
4	Availability of sufficient liquid in sump/suction as per specifications		
5	Installation of all instruments		
	Suction and delivery pressure gauges		
	Pressure switches		
	Temperature gauges		
	Any other as supplied/specified		
6	Operation of suction, delivery and inline valves		
7	Proper supports for piping and other allied equipment		
8	Availability of flushing/sealing liquid for stuffing box		
9	Availability of sufficient cooling liquid for bearings as specified		
10	Free rotation of pump and drive shafts		
11	Lubrication of bearings		
12	Checking of insulation resistance of motor (if supplied by WILO M&P)		
13	Proper cable termination (Clients Scope)		
14	Motor Protection Relay Setting (Check with Clients)		
15	Check all interlocks as specified/provided		
16	No load trial operation of drive		
	Direction of rotation is ok		
	Noise and vibration are within limits		
	Bearing temperatures and winding temperatures are within limits		
	Overall operation is satisfactory		
17	Coupling of pump and drive and free rotation of shafts in coupled condition		
18	Suction valve is fully opened		
19	Pump is fully primed, and all air is vented		
20	Delivery valve is closed (if required)		
21	Emergency shutdown is possible		

Pre-commissioning checklist Pump with Engine

Sr. No.	Activities	Checked on	Remarks
1	Levelling of Pump set		
2	Alignment with and without piping		
3	Flushing of pipelines and ensures no leakages		
4	Availability of sufficient liquid in sump/suction as per specifications		
5	Installation of all instruments		
	Suction and delivery pressure gauges		
	Pressure switches		
	Temperature gauges		
	Any other as supplied/specified		
6	Operation of suction, delivery and inline valves		
7	Proper supports for piping and other allied equipment		
8	Engine is installed properly on foundation with AVM pads		
9	In case of HE cooled engine, all external water connections are done		
10	Availability of flushing/sealing liquid for stuffing box		
11	Availability of sufficient cooling liquid for bearings as specified		
12	Free rotation of pump and drive shafts		
13	Batteries are fully charged		
14	Battery cables and lead are available		
15	Exhaust silencer and all required exhaust piping is completed		
16	Fuel tank is supplied. Supply & return fuel lines connected to engine		
17	Engine coupled with water pump and all discharge piping is completed		
18	Lube oil, coolant and fuel is available at site		
19	Lubrication of bearings		
20	Checking of insulation resistance of motor (if supplied by WILO M&P)		
21	Proper cable termination (Clients Scope)		
22	Motor Protection Relay Setting (Check with Clients)		
22	Check all interlocks as specified/provided		
23	No load trial operation of drive		
	Direction of rotation is ok		
	Noise and vibration are within limits		
	Bearing temperatures and winding temperatures are within limits		
	Overall operation is satisfactory		
24	Coupling of pump and drive and free rotation of shafts in coupled condition		
25	Suction valve is fully opened		
26	Pump is fully primed, and all air is vented		
27	Delivery valve is closed (if required)		
28	Emergency shutdown is possible		

Pump Commissioning Report (Motor Driven Pumps)

Customer:	**Service Ref.:**
Sr. No.:	**Date:**

Details of Pump		**Details of Motor**	
Pump Sr. No.		Motor Make	
Type of Pump		Sr. No.	
Head		Frame Size	
Capacity		Kw / Hp.	
RPM		RPM	
Construction		Voltage	
		Current	

Details of System		**Piping Details**	
Application		Suction Pipe Size	
Liquid		Delivery Pipe Size	
pH Value		Valves	
Suction	Flooded / Lift	Expansion Joints	

Pump Operating Parameters		**Motor Operating Parameters**	
Suction Pressure		Current	
Discharge Pressure		Voltage	
RPM		RPM	
DE Bearing Temperature		DE Bearing Temperature	
NDE Bearing Temperature		NDE Bearing Temperature	
Duration of Trial Run		Winding Temperature (Max.)	

Observations and Remarks:

Customer Representative	**WILO M&P Representative**

Pump Commissioning Report (Engine Driven Pumps)

Customer:	**Service Ref.:**
Sr. No.:	**Date:**

Details of Pump		**Details of Engine**	
Pump Sr. No.		Engine Make	
Type of Pump		Sr. No.	
Head		Type / Model	
Capacity		BHP	
RPM		RPM	
Construction		Cooling System	

Details of System		**Piping Details**	
Application		Suction Pipe Size	
Liquid		Delivery Pipe Size	
pH Value		Valves	
Suction	Flooded / Lift	Expansion Joints	

Pump Operating Parameters		**Engine Operating Parameters**	
Suction Pressure		RPM	
Discharge Pressure		Oil Pressure	
RPM		Water Temperature	
DE Bearing Temperature		Lubricating Oil Temperature	
NDE Bearing Temperature		Gear Box Temperature	
Duration of Trial Run			

Observations and Remarks:

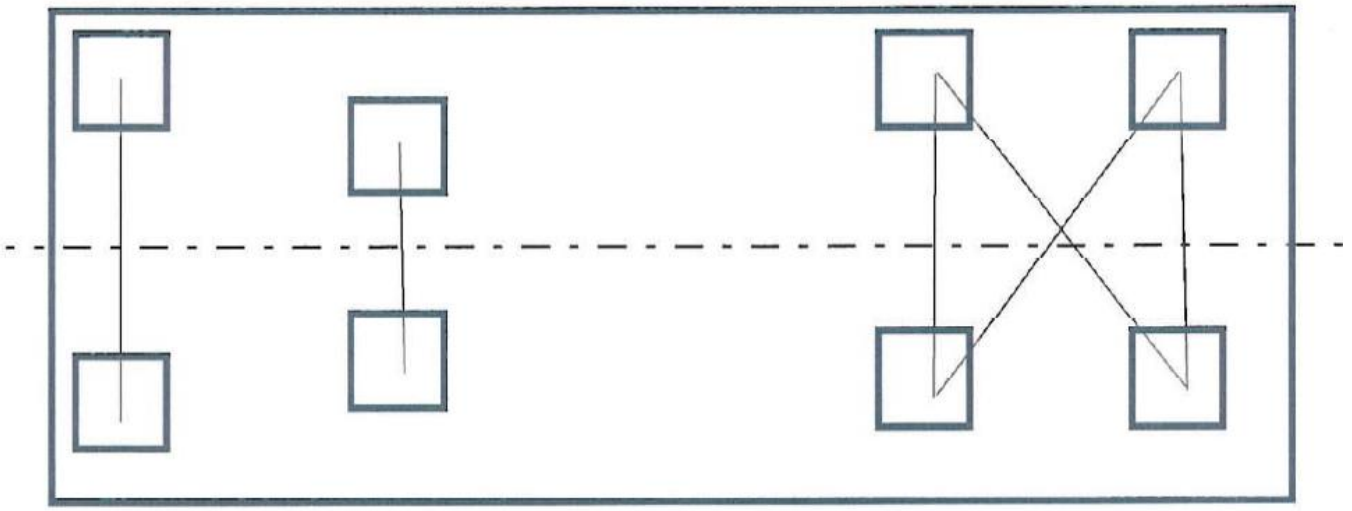
Auto Mode / Manual Mode

Customer Representative	**WILO M&P Representative**

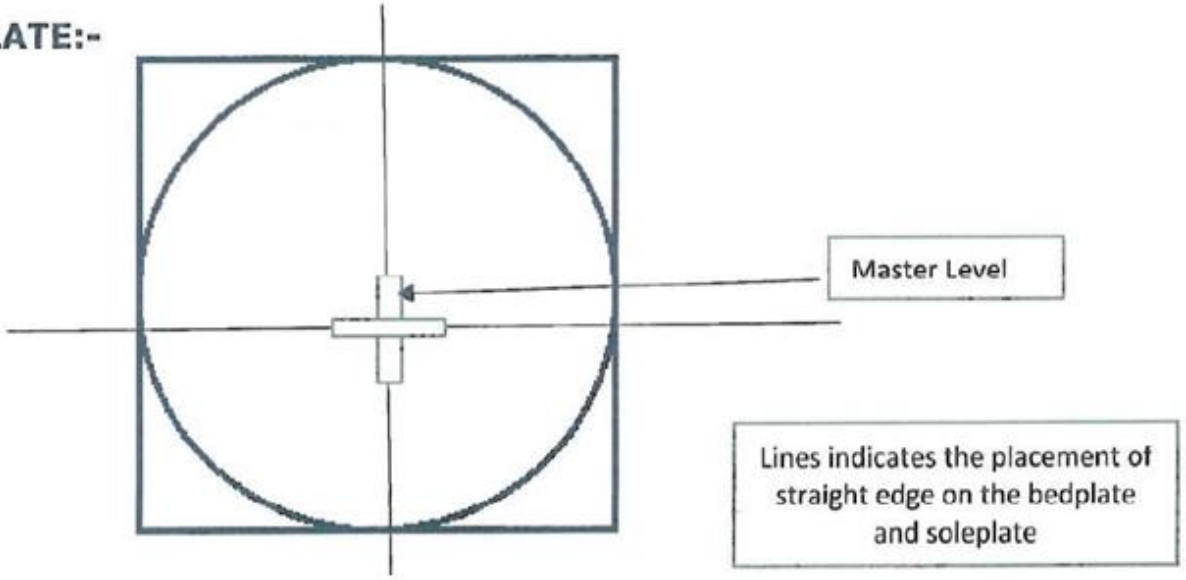
Pump set Levelling Record

Required accuracy of pump set levelling is 0.05 mm

A) BEDPLATE



SOLEPLATE:-



Result:

Customer Representative **WILO M&P Representative**

Pump and Motor / Engine / Turbine Alignment Record

A: Before Connecting Suction and Delivery Piping:

RADIAL

AXIAL

Gap Between Coupling Halves: _____ **mm**

Actual Gap: _____ **mm**

B: After Connecting Suction and Delivery Piping:

RADIAL

AXIAL

Gap Between Coupling Halves: _____ **mm**

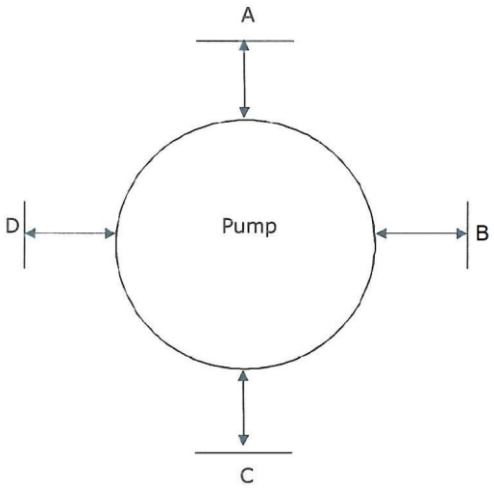
Actual Gap: _____ **mm**

Customer Representative

WILO M&P Representative

Pump set Noise Level Record

Noise level measurement at Pump House Floor



Noise Level in dBA:

A:	**B:**
C:	**D:**

Background Noise (dBA):
Instrument Details:
Distance –1 Mtr. from the Pump:
Make:
Model:
Sr. No.:

Customer Representative **WILO M&P Representative**

Pump set Vibration Measurement

Pump Set Details:

Date:

Pump Sr. No.	**Motor Sr. No.:**
Pump Type:	**Make:**
Project:	

Vibration Measurement: (Pk to Pk)

Sr. No.	Position	V		H		A	
		Displacement	Velocity (mm/sec.)	Displacement	Velocity (mm/sec.)	Displacement	Velocity (mm/sec.)
1	Pump DE						
2	Pump NDE						
3	Motor DE						
4	Motor NDE						

Instrument Details:

Make:
Model:
Sr. No:

Customer Representative **WILO M&P Representative**

Pump set Bearing Temperature Measurement

Pump Set Details:

Date:

Pump Sr. No.	**Motor Sr. No.:**
Pump Type:	**Make:**
Project:	

Bearing Temperature:

Sr. No.	Position	Temperature	Ambient Temperature	Remarks
1	Pump DE			
2	Pump NDE			
3	Motor DE			
4	Motor NDE			

Instrument Details:

Make:
Model:
Sr. No:

Customer Representative **WILO M&P Representative**

NOTES

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