Wilo – SCPV pumps

en Installation and operating instructions

Wilo SCPV_20131010_E03

Disclaimer

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

With this document Wilo 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.

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Fig.1: Pump Handling [3.1]

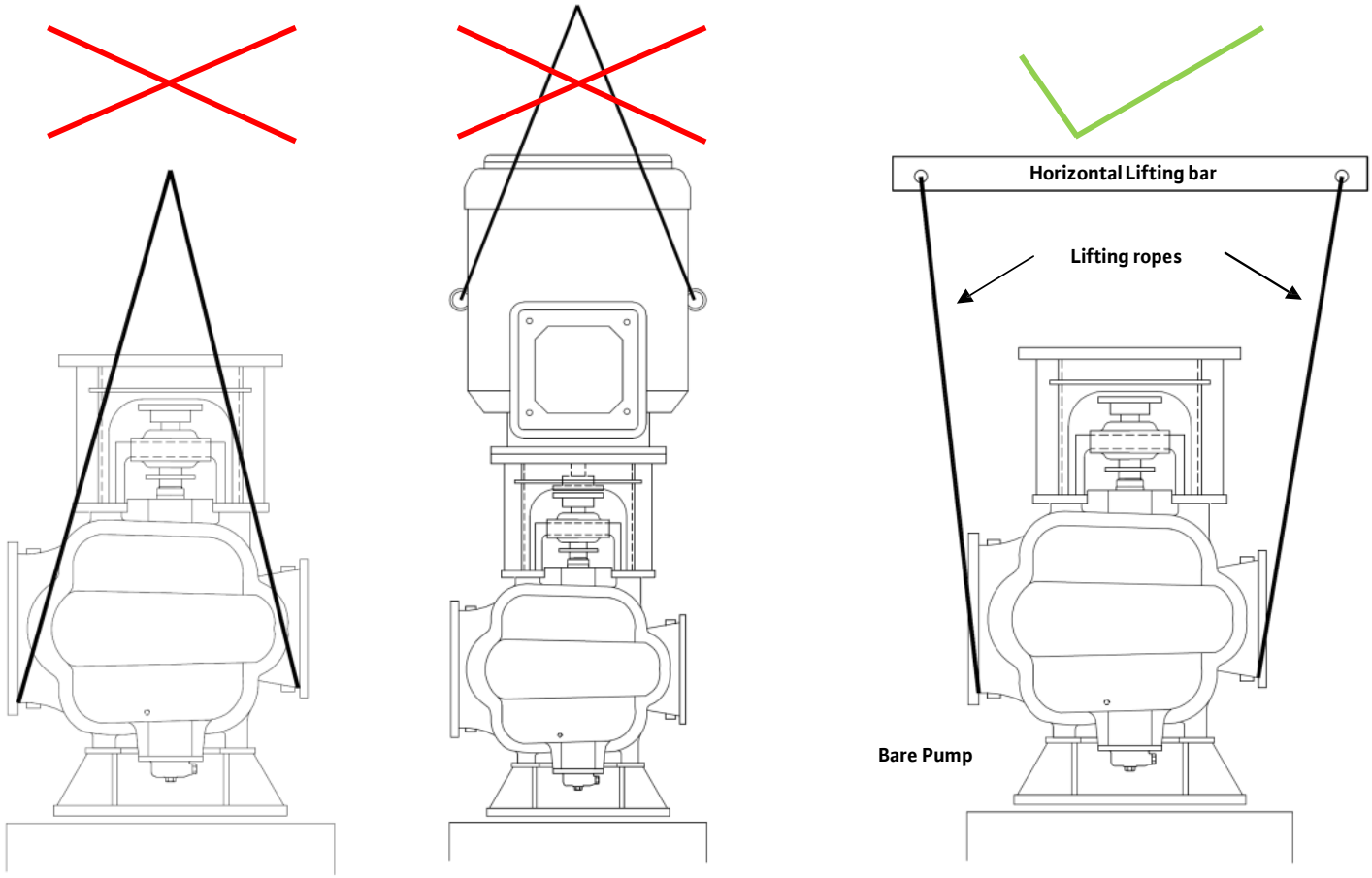


Fig.2:Pump Foundation [7.2.1]

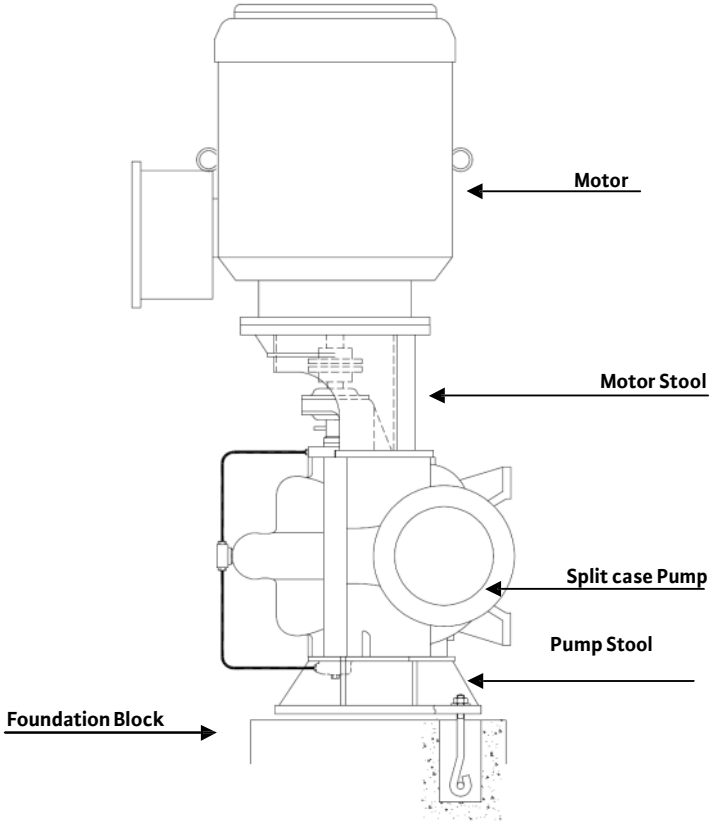


Fig.3:Coupling assembly [7.2.3]

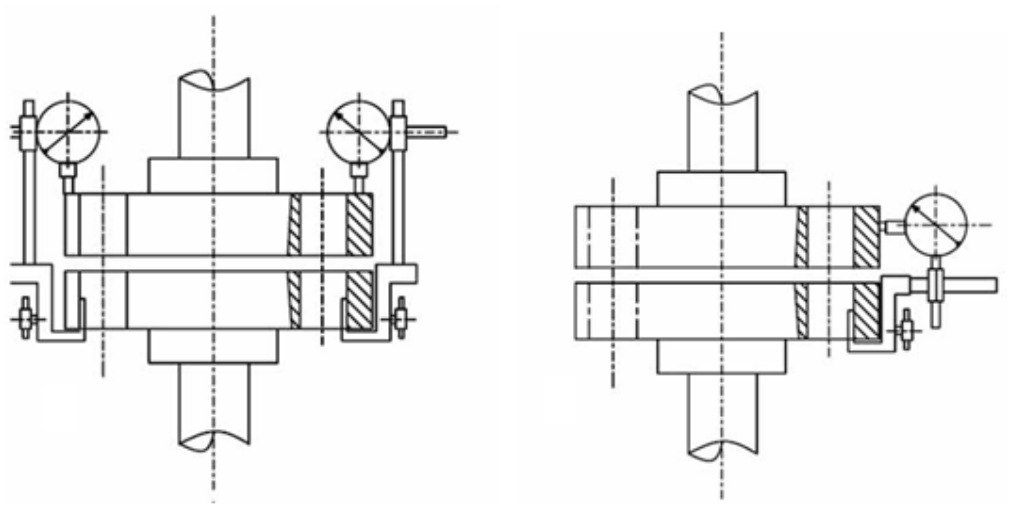


Fig. 4: Suction Layout [7.2.5]

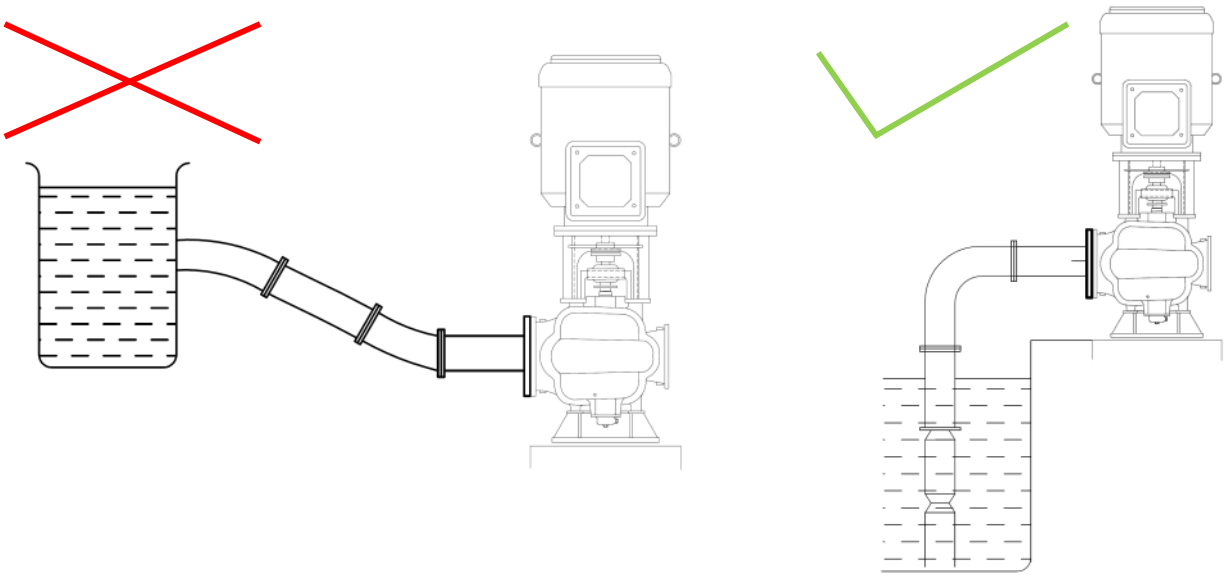


Fig.5: Suction Layout [7.2.5]

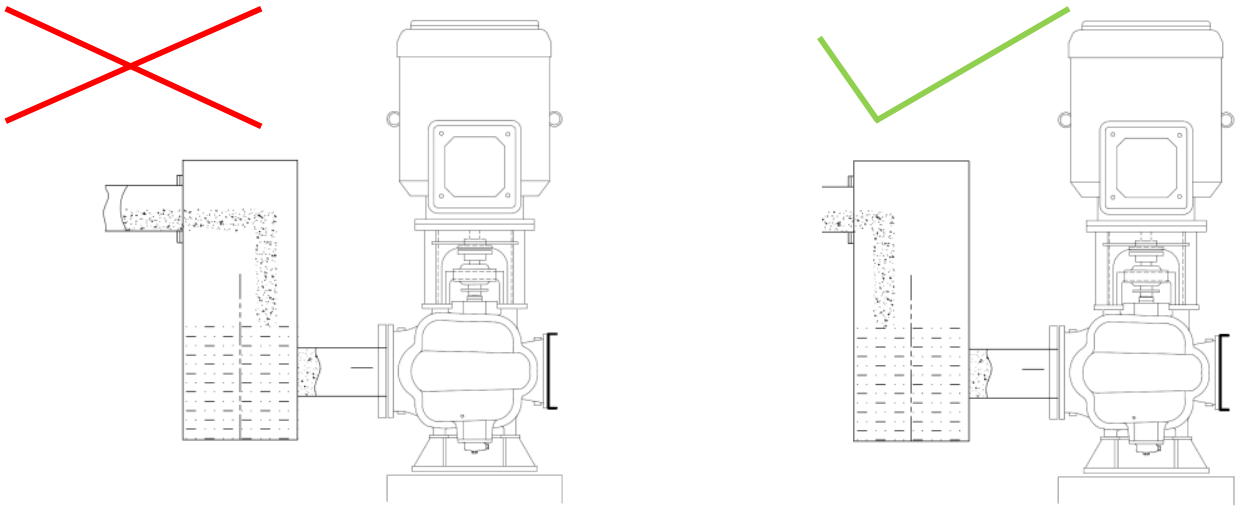


Fig.6:Discharge Layout [7.2.6]

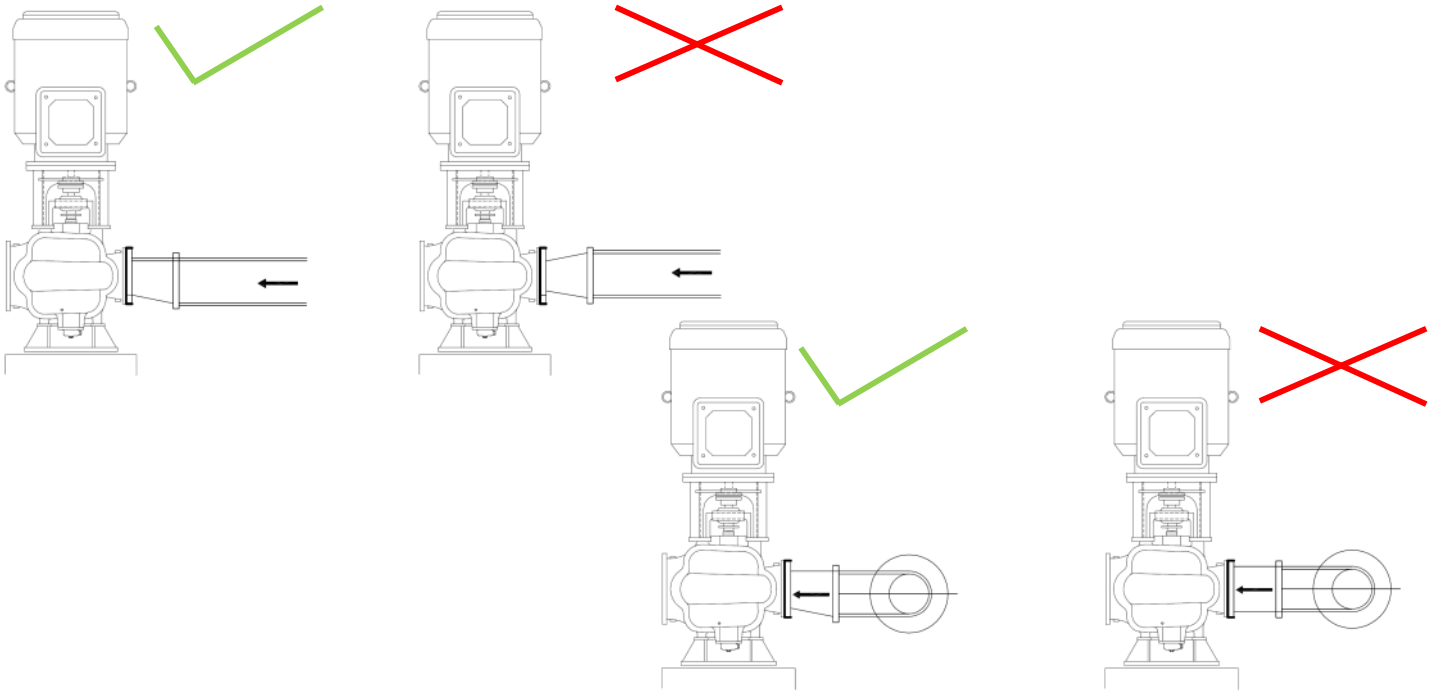


Fig.7:Discharge Layout [7.2.6]

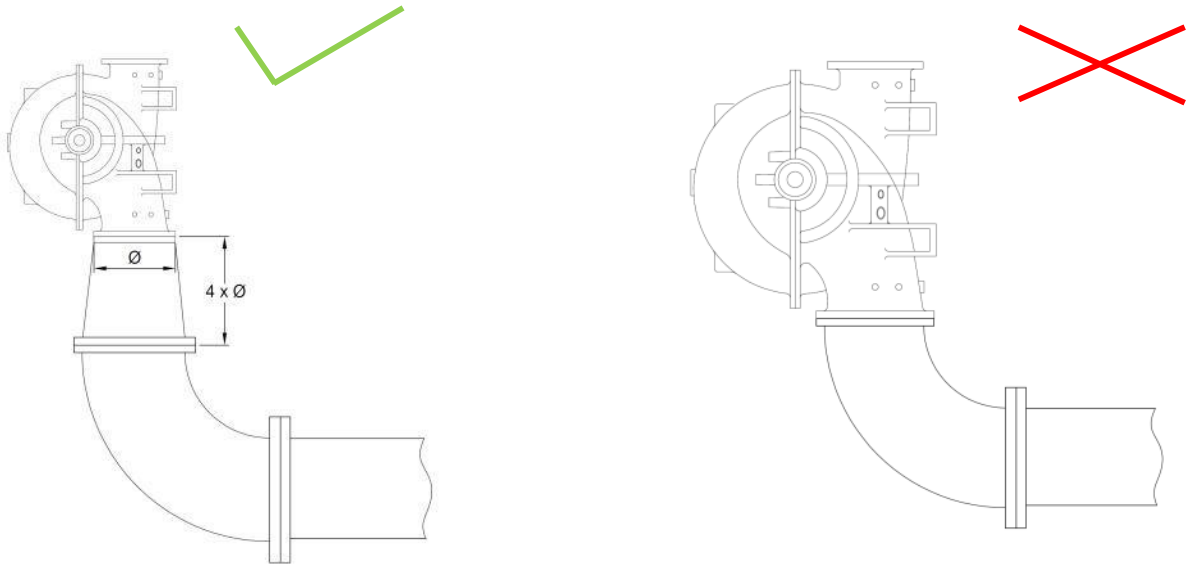


Fig 8:Gland Packing Details [7.2.7]

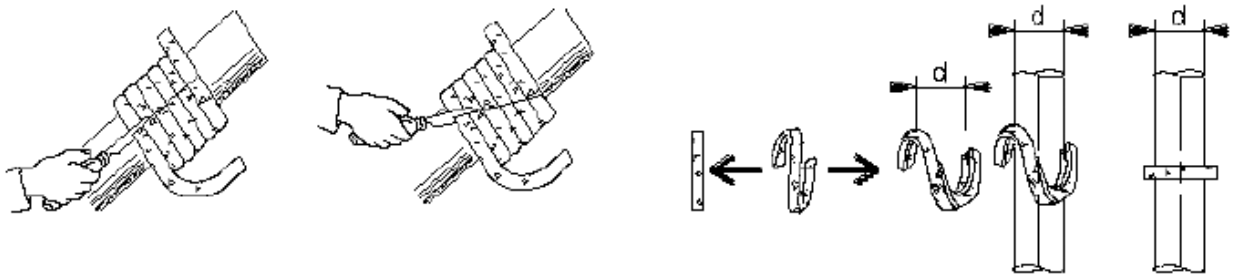
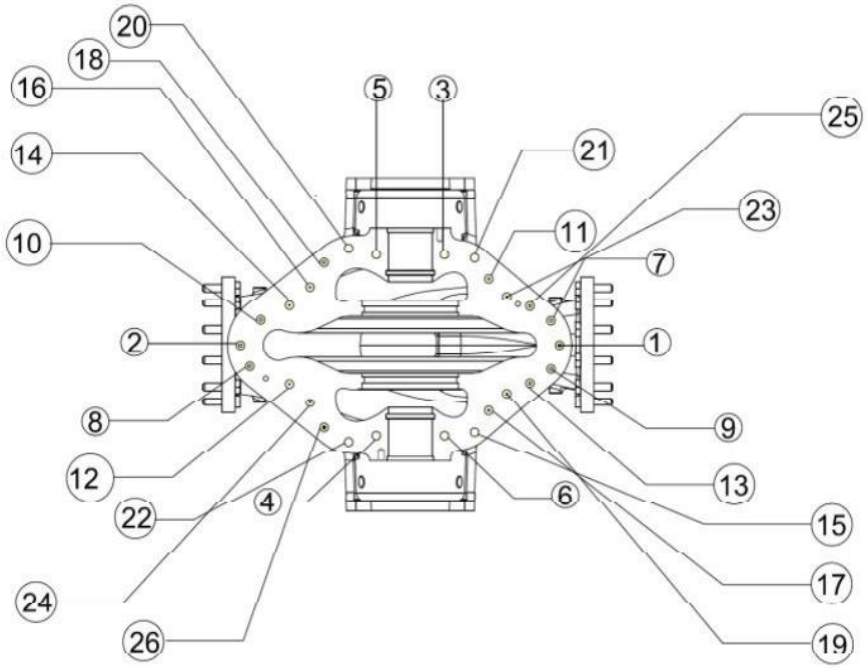


Fig.9:Bolt tighting sequence [9.5.2]



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.

Supplied pump will operate trouble free and satisfactorily on the condition that, it is installed with due care and maintained properly.

For hassle free operating life, it is recommended that the pump should operate under specified "Operating conditions". Pump operating conditions are mentioned on the "Nameplate" affixed to the pump.

If operating parameters deviate from the specified parameters as on the "Nameplate", please contact manufacturer."

2 Safety

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

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

2.1 Designation of information in the operating instructions

Symbols:
General danger symbol

Danger due to electrical voltage
NOTE: ...

Signal words:
DANGER!
Acutely dangerous situation
Non-observance results in death or the most serious of injuries.
WARNING!
The user can suffer (serious) injuries. "Warning" implies that (serious) injury to persons is probable if this information is disregarded.
CAUTION!
There is a risk of damaging the pump/installation. "Caution" implies that damage to the pro- duct is likely if the information is disregarded.
Useful information on using the product. It also draws attention to possible problems.

2.2 NOTE:

Personnel qualifications

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

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

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

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

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

2.4 Safety 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) up to 1 m distance.
- 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 re-commissioned.

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 SCPV 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

Immediately check the pump and transport packaging for damage in transit upon receipt. Take the necessary steps within the period's 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

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. Also do not lift the pump along with motor
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 pump stool and motor stool, the lifting tackle should be attached to the lifting lugs provided on the base plate side member. To lift the pump the lifting slings should pass beneath the pump body at suction and delivery flanges (see lifting diagrams – see also general safety Information, chapter 2). These must have sufficient load bearing capacity to ensure that the product can be transported safely.(Refer Figure 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 equipments 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 delivery, 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. Pre-packed 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 SCPV pumps horizontally on firm foundation and secure it against falling.
- The machine must be protected from direct sunlight, heat, dust, and frost.
- The rotors or propellers must be turned at regular intervals. This prevents the bearing from locking and the film of lubricant on the mechanical shaft seal is renewed.
- For mechanical seal, we recommend: relative air humidity below 65%, temperature between 15°C and 25°C. Direct exposure of the mechanical seal to heat (sun, heating) as well as to ozone, present or produced by ultraviolet light (halogen or fluorescent lamps), must be avoided because of the risk of embrittlement of elastomeric materials.

3.4 Pump returning back to the supplier

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

CAUTION! Guarantee not applicable!

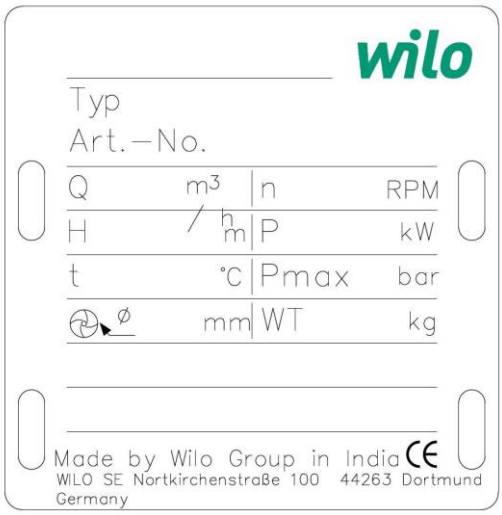
Products, which are not suitably packaged for delivery back, are no longer covered by guaran–tee!

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. Vertical Split Case pumps are used in water supply, water-circulating systems, injection water, spray pond, air-conditioning, water treatment, Sprinkler & drip irrigation, fire fighting, juices etc. If the 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

SCPV 200-360 HB-75/4/T4-C1/P0	
SCPV	Name of the range
200	Discharge flange nominal diameter in mm
360	Nominal diameter of the impeller in mm
HB	Type of Hydraulic : – HA = Standard type version A – HB = Standard type version B – HS = Single suction impeller – DV = Double volute – DS = Double stage
75	Motor power rating in kW
4	Number of poles
T4	Voltage Three phases 400V
C1	Material configuration : Casing in cast iron, Bronze impeller, Stainless steel shaft
P0 **E1**	Gland Packed pump Mechanical Seal

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	
Flange standard	PN 16/25	ISO 7005-2, as needed
Limit of fluid temperature (min. /max.) – Mechanical seal version [°C] - Gland packing version [°C]	 -8 up to +120 -8 up to +105	
Limits of ambient temperature (min. /max.) [°C]	-16 up to +40	other on request
Ambient humidity	< 90 %	other on request
Max. operating pressure	16 bar, generally	25 for some models
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) 3~400V, 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

SCPV pumps are single stage pumps. 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 single volute form, cast in halves, which are bolted together along the pump axis. Gaskets are provided between the split flanges of top and bottom casing. The suction and delivery branches of the pump are cast integral with bottom half casing, which is connected to pump stool. Tapings are drilled in suction and delivery branches for connecting the pressure gauges and providing casing drain. Bores of bottom half casing are grooved to provide location for neck rings. Tapings are provided in top half casing for taking water seal/flushing connection to the stuffing box. Tapings are also provided on top of casing for mounting air cock for venting. The top frame can be mounted directly on the vertical frame and the goal post arrangement.

6.1.2 Neck ring

To prevent the entry of pump liquid from delivery side of impeller to suction side, neck ring is provi-deed. Fine running clearance is provided between neck ring and impeller neck. Periodic restoration of this clearance is necessary for satisfactory performance of the pump. 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 SCPV pumps plaited cotton impregnated with oil and colloidal graphite is used.

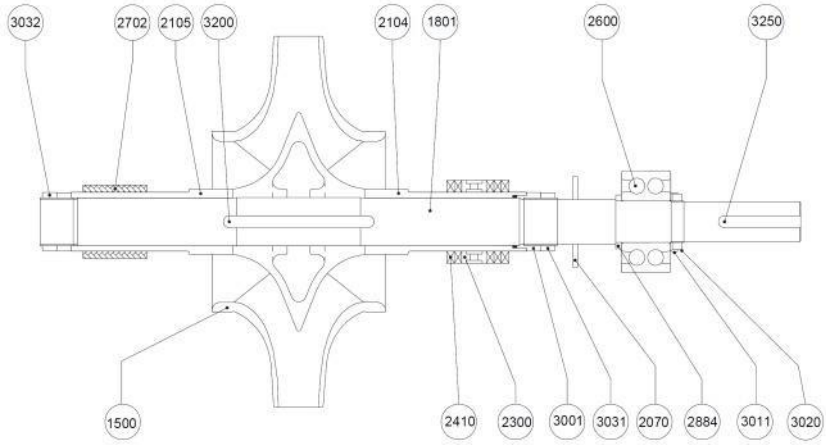
Mechanical Seal

For SCP pumps Burgmann made MG1 or M7 mechanical seals are used

6.1.4 Rotating element

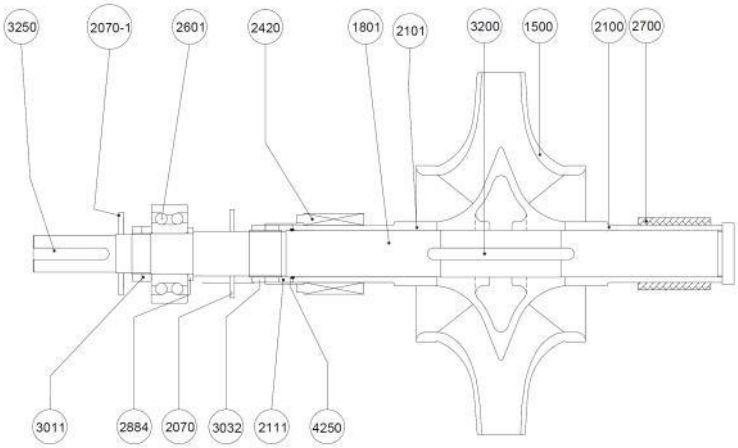
The rotating element of SCPV pump consist of following parts

For Gland Pack



No.	Part description	No.	Part description
1500	Impeller	2600	Bearing
1801	Shaft	2702	Bush Bearing
3200	Impeller key	3011	Lock Nut
2104	Drive end shaft sleeve	3020	Lock washer
2105	Non drive end shaft sleeve	2410	Gland packing
3001	Cowl Nut(L.H)	2300	Lantern ring
3031	Sleeve nut(L.H)	2070	Water Thrower
3032	Sleeve nut(R.H)	3250	Coupling key

For Mechanical Seal



No.	Part description	No.	Part description
1500	Impeller	2884	Thrust Collar
1801	Shaft	2601	Bearing
3200	Impeller key	2700	Bush Bearing
2101	Drive end shaft sleeve	3011	Lock Nut
2100	Non drive end shaft sleeve	2420	Mechanical Seal
2111	Spacer Sleeve	2070	Water Thrower
3032	Sleeve nut(R.H)	2070-1	Water Thrower
4250	O-ring	3250	Coupling key

The rotating element consists of a shaft on to which are keyed the two double entry impellers. Renewable shaft sleeves, which abut the impeller hub, protect the shaft from corrosion and erosion. The impellers are locked by sleeve nuts, which have their threads handed to prevent them from unscrewing by the rotation of the shaft.

The rotating element is carried by ball bearings at driving end and Finocot 'B' bush bearing at non-driving i.e. bottom end.

The Bearings are located in housings, which is attached to the end of the pump casing. Lubrication of the bearings is by grease contained within the housing. The rotating element is axially located by means of the ball bearing at driving end, which also takes residual axial thrust during operation along with dead weight of rotor.

The motor stool is mounted on pump/Vert. frame and goal post(if applicable) and fixed by bolted flange. The flanged motor is connected to top flange of motor stool.

For sealing pumps are equipped with either Gland pack or Mechanical seal.

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. Further- more, 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 con- crete foundations. Careful attention must be paid to the customer and contractor's installa- tion 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 elec- tricity 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 supplied by Wilo to install a bare shaft pump on a base plate.

7.1.1 Electrical motor selection

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

Shaft power	$P_2 \leq 4$ KW	4 kW < $P_2 \leq 10$ kW	10 kW < $P_2 \leq 40$ kW	40 kW ≤ 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 flange mounted motor B5 (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 manufacture. Strictly follow the coupling manufacturer's instructions for the fitting of the coupling between the pump and the motor. 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.

7.1.3 Pumpset assembling

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

7.2 Installation of the complete pump set

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

CAUTION! Risk of material damage!

Ensure sufficient ventilation/heating if the ambient temperature exceeds/falls below the permitted limit values.

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

CAUTION! Risk of material damage!

Dirt from the pipe system can destroy the pump during operation. Flush the pipe system prior to the installation of the pump.

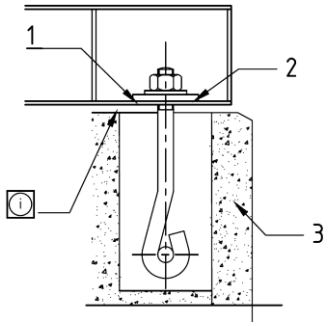
- Provide shut-off valves in front of and behind the pump.

7.2.1 Foundations (Figure2)

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 of the foundation should be left approximately one inch low to allow for grouting. Foundation bolts of the proper size should be embedded in the concrete, located by template (refer figure 3).

Foundation bolt
1 Erection packers
2 Finish grout
3 Concrete



- 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.

NOTE:

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

- The top surface over which the sole plate rests must be left rough to assist in keying of the final grout and sufficient allowance must be made for the thickness of the steel pickings and leveling shims beneath the sole plate, the requirement being approximately 25 mm.

7.2.2 Leveling and installing the sole plate

- Sole plates have machined surfaces on top and bottom. Therefore no distortion of the sole plate can be caused by the weight of the unit when supported on a leveled surface. But initially the foundation surface will be rough to key the final grout and the motor stool could distort if mounted directly on this uneven surface. To avoid this distortion and to provide a suitable base for leveling, steel packing blocks must be positioned at suitable spacing on the foundation surface, a minimum requirement being one on each side of every foundation bolt. Ensure the surface beneath each packing block is solid by crushing any protrusion or alternatively each block may be placed on a thin screed of cement.
- Lift the sole plate and lower it on the foundation. Insert the foundation bolts through the holes in the sole plate and screw a nut on to each bolt until the bolt protrudes through the nut by a length, which is sufficient to accommodate a locknut.

Level the sole plate as follows:

- Place an engineer's level (sensitive to an error of 0.05 mm per 250 mm) on the machined top surfaces of the sole plate. The leveling pads if provided.

NOTE:
These machined surfaces where level is being checked must be clean and free from paint, burrs etc

- Adjust the level of the sole plate by inserting shims between the sole plate and the packer plate until the sole plate is leveled and supported on all the packing blocks at the height required for the connection of suction and discharge branches. For checking the levels across two pads, I-beam type straight edge should be used extensively in conjunctions with engineer's level. Level should be achieved within 0.05 mm per 250 mm.
- When the sole plate is leveled, grout in the foundation bolts. 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.
- When the grout has set, gently but firmly tighten the foundation bolts; then screw on and tighten the lock nuts. Care must be taken not to distort the sole plate or loosen the foundation bolts in the grout by excessive tightening.
- Carefully re-check the level of the top surface of sole plate and make adjustments that are necessary by fine shimming.
- Position the pump on the sole plate. Place the motor on motor stool, which is fixed to pump casing previously.
- When the sole plate is leveled and the pump and motor are in proper position, run the final grout beneath the motor stool. Allow minimum seven days time for curing before commencing the pipe work. Grout mix in the proportion specified earlier for foundation bolt grouting should be used.

7.2.3 Alignment of the pumps and its driving units

- When the sole plate is leveled 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 recommend 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 truth of the coupling or shaft and is therefore not affected by canted coupling faces or eccentricity of the outside diameter of the coupling. Before commencing the alignment, rotate each shaft independently to check that the bearings run freely and that the shaft is true to 0.1mm or better. Check that no damage can be caused when the shaft of the driven unit is turned. Coupling should be loosely coupled and the halves must be free to move relative to each other, otherwise gauge Indicators can be incorrect. Where, tightly fitting pins or spring prevent loose coupling, the springs or pins should be removed, a line scribed across both half couplings and readings taken only when the two marks are aligned.

Angular alignment (Refer Figure: 3)

- After isolating the driven unit from its power supply, clamp two dial indicators are dramatically opposite points on one half coupling or to the shaft behind it with the plunger resting on the back of the other half coupling. Rotate the coupling unit the gauges are in line vertically and set the dial to read zero. Rotate the coupling by 180° and record the readings on each gauge. The readings should be identical, though not necessarily zero. Either positive or negative readings are acceptable provided they are equally positive or negative. Adjust the position of one of the units if necessary. Rotate the couplings unit the gauges are in the line horizontally and adjust the dial to zero. Repeat the operation outlined above by rotating the coupling by 180°. In case where fitment of dial gauge is not feasible check gap between two coupling half with the help of filler gauge.

Radial alignment (Refer Figure: 3)

- Clamp a dial gauge on one of the couplings or to the shaft 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.

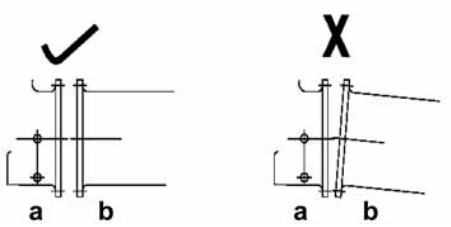
Alignment Tolerances:

Pump Speed	Angular Alignment	Radial Alignment
A<1000 rpm	0.15 mm TIR	0.15 mm TIR
B 1000 rpm to 1800 rpm	0.1 mm TIR	0.15 mm TIR
C 1800 rpm to 3000 rpm	0.1 mm TIR	0.1 mm TIR

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). All pipe worked 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 flange;
b: Pipe work

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

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

7.2.5 Suction line (Refer Figure: 4&5)

The suction pipe should be as short as possible. An arrangement of suction pipe work, which is common to two or more pumps operating on suction lift, is not recommended. If such an arrangement is unavoidable, any points of possible air ingress, such as valve and glands, should be liquid sealed and isolating valves should be fitted at appropriate points.

The diameter of the suction pipe required, depends upon its length and bears no fixed relation to the diameter of the suction branch of the pump. The size of the pipe must be such that friction losses are kept to a minimum. For example a long suction pipe (or one with numerous bends) which passes a given quantity of liquid must be of larger bore than a short straight one passing the same quantity of liquid. When the suction pipe is increased to a size larger than the bore of the pump suction branch, the form of taper pipe used must not allow the formation of air pockets.

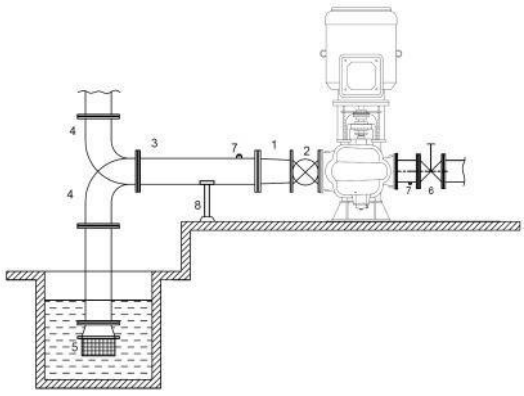
To avoid the formation of air pockets, the installation of the suction pipe work must be arranged under the following conditions:

- With as few bends as possible.
- It must be completely airtight.
- There must be a gradual rise towards the pump.

The inlet of the suction pipe must lie well below the lowest possible water level and it must be fitted with the strainer. The strainer must be clear off the bottom and sides of well or sump so that deposits of sediment or grit are not drawn into the pump. The strainer must be of rugged construction with holes in the side, suitable for type of liquid to be passed. For clean liquid the cumulative area of these holes must not be less than twice the area of the bore of the pump suction branch.

Where the liquid is known to contain a high percentage of solids, the cumulative area of the holes must be much greater; it may even be necessary to provide special apparatus, such as travelling screens, to ensure that the pump is kept free of solid foreign matter.

As these pumps are generally expected to operate on positive head, foot valve is not necessary. However, at site, if liquid level falls below the minimum water level mentioned in the drawing, the pump should not be started.



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
8) Pipe Support

7.2.6 Discharge line (Refer Figure: 6&7)

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.

A suitable valve should be fitted in the delivery pipe as near to the pump as possible. Unless the pump is to deal with only small quantities of liquid at a low delivery head, or where back surge is likely to occur, a non-return valve must be fitted in the delivery line as close to the pump delivery branch as possible. A by-pass valve fitted to non-return valves is often an advantage, although this is not always required. Pressure gauges should be fitted to the tapings provided in the pump suction and discharge branches. These will give useful indication of the pump behavior.

7.2.7 Stuffing box packing (Refer Figure: 8)

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 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

7.2.9 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.

7.2.10 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 machine has been switched off by, a protective device, it must not be switched on again until the error has been corrected.
- The electrical system (machine including protective devices and operating position) must always be grounded. Refer pump GA drawing & respective manuals of motor/electrical control panel for connecting earthing suitable as per motor rating and relevant regulations and standards including proper earthing lug size and fasteners.

- Under no circumstances may any connecting cables touch the pipeline or the pump or motor housing.
- If there is a possibility that people can come into contact with the machine and the pumped liquid (e.g. at construction sites), the grounded connection must be additionally equipped with a fault current protection device.
- To ensure drip water protection and strain relief of the cable connections, use cables with an appropriate outer diameter and screw the cable glands tight. Furthermore any cables nearby screwed connections for outlet loops should be bent in order to divert any accumulating drip water. Close any unassigned cable glands with the existing sealing discs and screw them tight.

7.2.11 Operation with frequency converter

The rotation speed can be adjusted in the opera ting 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

Where possible, especially 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 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. No need to clean ZZ bearings.

Bearings should be then filled with recommended grade and quality of fresh lubricant.

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 positive suction head, all that is required to prime them is to 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 air-tight or it should be liquid sealed from an external supply. For operation details of gas exhausts reference should be made to the manufacturer's instructions. Some form of priming indicator is usually fitted to indicate when the priming operation is complete.

8.2.3 Pumps operating on hot liquids

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

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

8.3 Starting the pump

8.3.1 Direction of rotation

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

8.3.2 Pre-starting checks

- Ensure that sufficient fluid is available at the pump suction for satisfactory operation of the pump. Minimum water level as specified in General Arrangement Drawing/Technical Data Sheet must be available during start up and entire operation of the pump. Efficient operation of the pump depends upon the running clearance, which are lubricated by pumped liquid. Any attempt to run the pumps dry or partially full will result in seizure of internal rotating components.
- Check that the inlet isolating valve is open and that the delivery valve is closed.
- Ensure that bearings have been filled with proper grade of lubricant .
- 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.
- Check 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 mechanical seal connection is provided as shown in GA Drg.

Per-Start Check ups

	Activity	Checked on	Remark
1	Alignment with and without piping		
2	Flushing of pipe lines and ensures no leakages		
3	Availability of sufficient liquid in sump/suction as per specifications		
4	Installation of all instruments • Suction and delivery pressure gauges • Pressure switches • Temperature gauges • Any other as supplied/specified		
5	Operation of suction, delivery and inline valves		
6	Proper supports for piping and other allied equipments		
7	Availability of flushing/sealing liquid for stuffing box		
8	Availability of sufficient cooling liquid for bearings as specified		
9	Free rotation of pump and drive shafts		
10	Lubrication of bearings		
11	Checking of insulation resistance of motor		
12	Proper cable termination		
13	Motor protection relay settings		
14	Motor protection relay settings		
15	No load trial operation of drive • Direction of rotation is ok • Noise and vibration within limits • Bearing temperatures and winding temperatures are within limits • Overall operation is satisfactory		
16	Coupling of pump and drive and free rotation of shafts in coupled condition		
17	Suction valve is fully opened		
18	Pump is fully primed and all air is vented		
19	Delivery valve is closed (if required)		
20	Emergency shutdown is possible		

8.3.3 Normal starting and running checks

- When all the foregoing pre-start checks are satisfactory, depress the appropriate `START' button on the control panel and run the pump at its rated speed.

- Check that the pump is rotating in the correct direction. This is indicated by a direction arrow on the pump casing.
- Check the ammeter reading to ensure that the motor is not being overloaded.
- Check that the pumping unit is generating not less than its rated delivery pressure indicated in the data sheet/name plate.

CAUTION! If the pumping unit fails to generate at least its rated delivery pressure it must be stopped immediately, the cause ascertained, the fault rectified and the pumping unit re-primed before restarting.

- Ensure that the stuffing box is not overheating and that there is slight leakage from the gland.
- Check that the bearing is not overheating.
- If the foregoing checks are satisfactory, open the delivery valve slowly and bring the pump gradually up to its rated parameters based on pressure gauge and ammeter readings
- Check that the driving unit is not being overloaded during valve opening.
- Check vibration of pump set and ensure that vibration level is within limits specified in Hydraulic Institute Standard of America. Check that noise level is within stipulated limits

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 or 2 drops per seconds.

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

Insure 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	10 to 120 drops/min
	Check for Leakage	Half yearly	If required replace with new pickings
Bearings	Check temperature	Weekly	Bearings are greased for life and are maintenance free
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	
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	Yearly	If value of clearance is more, neck ring should be replaced
Total Dynamic Head	Check Suction and Discharge TDH	Yearly	
Alignment	Check the alignment of pump with motor	Half yearly	For reference use pump motor GA Drawing

9.2 Overhaul maintenance

9.2.1 General information

It is inevitable after long service that certain components will become worn. Frequently it is more economical to renew the worn components completely, but where site machining and engineering facilities are available most components can be restored if wear is not too far advanced.

It is impossible to be mandatory regarding the periods at which major overhauls should be undertaken as this will be dependent upon the fluid being pumped, the site operating conditions, and the length of operational availability required.

The determination of when major overhaul should be carried out will depend upon the performance of the pump, i.e. its rate of deterioration by reference to instrumentation, during the current operational period. If the hydraulic or mechanical performance has deteriorated to such an extent that no further deterioration can be tolerated during the next operational period, wearable components should be renewed.

If related pair of components show a marked degree of wear in relation to the rest of the unit, then it may be sufficient to renew only the heavily worn components. If the wear is uniform throughout the pump, then all wearable components may require renewal.

Measurements should be taken and recorded of all wearable components at the first, and every subsequent overhaul period. Reference to these records will enable an accurate assessment of the rate of wear to be made, and a reasonably accurate forecast regarding when a particular component may require renewal can be made. Information regarding original design dimensions and clearances is furnished in data sheet. Any other information if needed can be obtained on application from Wilo Mather & Platt Pumps Ltd., Service Department, Chinchwad, Pune 19. Such request must quote nameplate number and type of the pump in question.

The parts most likely to be affected are:

1. Impeller Necks/Impeller.
2. Ball Bearings.
3. Neck Rings.
4. Bush Bush

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

A crane / chain pulley block suitable for handling the weight of pumping unit.

- A selection of ring and open-ended spanners in British and Metric sizes.
- Eyebolts in British and Metric sizes.
- Cotton rope, wire rope and slings.
- Hardwood and metal packing blocks.
- Miscellaneous tools including a set of Allen keys, drills, pin drivers, files etc.
- Extractor / puller for bearing and coupling.

The torque value 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

9.3 Disassembling the pump

9.3.1 Disassembling the top casing (Refer Annexure-1)

- Isolate the pump system by closing suction and delivery valve.
- Drain the pump and open the upper air vent.
- Remove the Bottom Bearing
- Isolate the top and bottom half casing
- Hold the top casing to the trolley / crane by fixing screws and rest the top half.
- Remove nuts of split gland from both ends and slide away the gland. Remove gland packing as well as logging ring.
- Remove all split flange nuts and the two dowel pins.
- Connect suitable lifting tackle to the eyebolts provided on the top half casing. Remove the casing joint gasket. Withdraw the casing top.

Note:

If the pump set is installed with a goal post arrangement please refer Annexure 4

9.3.2 Dismantling the rotating element (Gland pack version pump)

To completely dismantle the rotating element proceed as follows :

- Remove the coupling screws /nuts, for coupling dismantling procedure refers
- Support the rotor on jackscrew and clamps. Stripping of rotating element
- Take off the neck rings.
- Remove sleeve nut & sleeve from Non-driving end.
- Remove the impellers. It may be necessary to apply heat to the impeller for removal. Apply heat uniformly from the shrouds inwards towards the hub. Before removing the impeller put a reference mark on the shaft for ease of reassembly at correct centre position.
- Remove the drive end ball bearing using some form of extractor or puller. This must act directly on the inner race of the bearing to be removed. Never try to remove the inner race of the bearing by applying force to the outer race.

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(2421) carefully over the shaft.
- Now mark the position of mechanical seal on the shaft 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 neck 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.

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.
- Cavitations 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

The 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 bearing 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.

9.4.5 Bearings

9.4.5.1 Bush Bearing

Under normal conditions the outside dia. of shaft sleeve are uniformly loaded and provided that an adequate supply of pumped liquid is maintained through Flushing line, the bearing will usually operate until wear is approximately 150% the original design clearance without detriment to mechanical performance of the pump. The most positive indication of the loss in bearing efficiency will be given by an increase in level of vibration. This increase may be gradual and difficult to detect or sudden and prominent. But when an increase is detected the reason must be investigated because it is a symptom that the bearings may require renewal even if the allowable degree of wear previously indicated has not been reached.

The Finocot 'B' bearing bush should be inspected for:

- Excessive clearance by measuring clearance between O/D of shaft sleeve and bush bearing. If clearance has become excessive or if bearing is not usable the same must be renewed. After renewing the bushes, check clearances and maintain the record

NOTE:

An incorrect fit can allow one or both of the bearing tracks to creep, which will affect the running accuracy and the assembly and dismantling of a pump. Creep is the slow rotation of one track relative to its seating, it is undesirable since the spindle and the bore of the bearing or the housing and the outside diameter of the bearing may become worn. Creep is not due to friction within a bearing but is generally caused due to radial loads rotating or oscillating in respect to fixed point on the track.

If creep has occurred the interference fit of the bearing must be restored, either by metal spraying or chromium plating and regrinding the seating to the correct diameter; interference fits must not be simulated by knurling, scoring or distortion of the seating on which creep has occurred because such practices are ineffective and creep will quickly reoccur. Even if the bearing is prevented from creeping it will usually be distorted by the seating, and failure will result caused by local overloading and high frequency vibration.

- Examine the abutment. Abutment for ball bearings must be flat and square with the axis of rotation. The radius at the root of an abutment must be smaller than the corner radius of the track located against the abutment. The edge of the abutment must be reduced or chamfered; a burred edge can tilt or distort a bearing track.
- If after inspection, the bearing is re-usable, completely coat all parts with rust preventive oil, working it well into the internal parts of the bearing. Wrap in clean greaseproof paper and store until required for replacement or refit on to the spindle if needed. In case of immediate use, coating of rust preventive oil is not necessary.

9.4.5.2 Thrust Ball Bearing

Clean all the components using clean white spirit. Do not use chlorinated solvents such as trichloroethylene and carbon tetrachloride because they introduce a corrosion risk when used on ferrous materials. If these chemicals are present for any reason a `No Smoking' rule must be strictly enforced. Inspect the bearing as follows

- Visually inspect the bearing. The balls, the inner and outer tracks must all be free from chipping, cracks, abrasions or discolouration.
- Check that the parts of the cage are firmly fixed together.
- Visually inspect the bore for any sign of damage. Burrs or any scratches caused during bearing withdrawal should be carefully removed by hand application of a fine oilstone, the treatment being confined to the minimum possible area.
- Visually inspect the outside diameter for signs of fretting, any stains may be carefully polished off, but abrasion must be kept to the absolute minimum that is required, followed by cleaning.
- Check that bearing rotates freely and smoothly. If there is any doubt regarding the serviceability of the bearing it should be renewed.
- Inspect the Bearing Housing as follows
- Visually inspect the bore for any signs of fretting, any stains may be carefully polished off, but abrasion must be kept to the absolute minimum that is required, followed by cleaning.
- Where fretting has occurred, bearing and housing should be clean and dry, and trial assembled. It is a transitional fit and may be described as a sucking fit without any detectable clearance or play between the outer race and the housing bore. Any assembly that achieves this may be considered as being acceptable, provided the bearing is serviceable. Assemblies that do not achieve this degree of fitting may improve if a new bearing is fitted, or Wilo Mather & Platt may be consulted.
- Examine the abutment. Abutment for ball bearings must be flat and square with the axis of rotation. The radius at the root of an abutment must be smaller than the corner radius of the track located against the abutment. The edge of the abutment must be reduced or chamfered; a burred edge can tilt or distort a bearing track.
- If after inspection, the bearing is re-usable, completely coat all parts with rust preventive oil, working it well into the internal parts of the bearing. Wrap in clean greaseproof paper and store

until required for replacement or refit on to the spindle if needed. In case of immediate use, coating of rust preventive oil is not necessary.(See Annexure 2)

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 Shaft

Check the shaft for trueness. Since sleeves protect shaft and very little portion is exposed, no wear is expected. However in case of aggressive liquid, the exposed portion should be inspected for corrosion attack

9.4.8 Mechanical seal

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

9.5 Reassembling the pump

9.5.1 Reassembly of rotating element

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

- Fit the Intermediate Shaft Sleeves.
- Fit the impeller keys in the keyway of the spindle.
- Fit the Impellers along with Neck rings on the spindle in correct position.

Note:

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

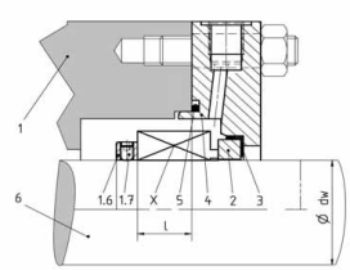
9.5.2 Re-assembly of the pump (Gland pack version pump)

- Ensure that casing is clean, dry and free from foreign matter. Clean casing neck ring seating thoroughly and ensure they have no burrs
- Carefully insert the element into the bottom half casing, with the help of withdrawal gear trolley / crane.
- Fix water throwers, dust covers and outer end covers to bearing housing by their setscrews.
- Cut a gasket from 0.25 mm thick black joint paper or similar gasket material and locate on split flange of bottom half casing.
- Position the top half casing by crane / chain pulley block with respect bottom half casing so that split faces match. Use withdrawal gear trolley / crane to support the top of casing.
- Fit the split flange studs. Align dowel holes and fit dowel pins before tightening the nuts. The nuts must be tightened evenly in the diagonally opposite sequence. (Refer Figure: 9)

9.5.3 Reassembly of pump (Mechanical seal version)

- Ensure that casing is clean, dry and free from foreign matter. Clean casing neck ring seating thoroughly and ensure they have no burrs
- Carefully place the adjusting ring of mechanical seal at its premarked position
- Place the grub screw at its position on the adjusting ring
- The O-ring may be oiled to reduce friction during installation of the seal. But the EP- rubber O-ring should not come in contact with oil or grease. In this casse lubrication with glycrol or water is recommended
- Never cover the sliding faces with lubricants , they should be assembled completely dry clean and dust free
- When pressuring staionary seal make sure that the pressure distrubition is unifor. The O-ring must be fitted using water or glycerolonly
- 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 values given table
- 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 Final Assembly

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

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.

For 2 years of normal operation:

- Mechanical seal or Packing, ball bearings and the different gasket required for the dismounting of the pump.

For 3 years of normal operation:

- Mechanical seal or Packing, ball bearings and the different gasket required for the dismounting of the pump, wear rings and their nuts. For the pumps equipped with Gland packing, include the gland plate and lubrication spacer.

For 5 years of normal operation:

- Take the same lot of part as for 3 years and add the shaft and impeller.
- 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 shut down 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 (Gland pack version)			
No.	**Description**	**Quantity**	**Recommended Spare Parts**
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	Cowl sleeve	2	
10	Sleeve nut	4	
11	Stuffing box bush	2	
12	Gland packing	Set	‡
13	Logging ring	1	‡
14	Gland	1	
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	Bush 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 cock	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	Pump Stool	1	
39	Motor Stool	1	

Recommended spare parts (Mechanical version)			
No.	**Description**	**Quantity**	**Recommended Spare Parts**
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	Cowl sleeve	2	
10	Sleeve nut	4	
11	Stuffing box bush	2	
12	Mechanical Seal	2	‡
13	Mechanical Seal Gland Plate	2	‡
14	Stud for gland	2	
15	Bearing end cover (Drive End)	1	
16	Bearing (Drive End)	1	‡
17	Bearing housing (Drive End)	1	
18	Thrust collar	1	
19	Bearing end cover (Non Drive End)	1	
20	Stud for bearing end cover	1	
21	Bush Bearing (Non Drive End)	1	‡
22	Lock washer	1	‡
23	Lock nut	1	‡
24	Bearing housing (Non Drive End)	1	
25	Hex plug	–	
26	Air cock	1	‡
27	Hex screw for jacking	2	
28	Studs for split flange	–	
29	Coupling key	1	
30	Gasket	1	‡
31	Water thrower	1	
32	Steady pin	–	
33	Stud coupling	4	
34	Sealing connection (Flushing Pipe)	2	‡
35	Hex screw for bearing housing	8	
36	4 way valve	2	‡
37	Pump Stool	1	
38	Motor Stool	1	

10 Faults, causes and remedies

	Symptoms	Possible cause of trouble and remedies (Each number is defined in the table below)
– –	Pump does not deliver water.	1,2,3,4,6,11,14,16,17,22,23
– –	Insufficient capacity delivered.	2,3,4,5,6,7,8,9,10.11.14.17,20,22,23.29,30,31
– –	Insufficient pressure developed	5,14,16,17,20,22,29,30,31
– –	Pump loses prime after starting.	2,3,5,6,7,8,11,12,13
– –	Pump requires excessive power.	15,16,17,18,19,20,23,24.26,27,29,33,34,37
– –	Stuffing box leaks excessively.	12,13,24,26,32,33,34,35,36,38.39,40
– –	Pump vibrates or it is noisy.	2,3,4,9,10,11,21.23,24,25.26.27,28,30,35,41,42,43, 44, 45,46,47
– –	Bearings have short life.	24,26,27,28,35,36,41,42,43,44,45,46,47
– –	Pump overheats and seizes.	1,4,21,22,24.27,28,35,36,41

Causes		Remedies
1	Pump not primed	Ensure that casing is fully filled and water comes out from air–cock.
2	Pump or suction pipe not completely filled with liquid	Check leaking foot valve in case of negative suction
3	Suction lift too high.	Reduce by lowering pump elevation or increase Water level.
4	Insufficient margin between pressure and vapor pressure.	Check that NPSH available is at least 1 meter more 1 meter more than NPSH required.
5	Excessive amount of air in liquid.	Check the reasons and eliminate. Gas gets entrapped in liquid. Air may be entering through suction joints.
6	Air pocket in suction line.	Ensure pipe fully filled and there is nobend for negative suction.
7	Air leaks into suction line	Tighten pipe joints with solution.
8	Air leaks into pump through stuffing boxes.	Ensure stuffing box sealing.
9	Foot valve too small or leaking.	Replace / Attend.
10	Foot valve partially clogged.	Clean
11	Inlet of suction pipe insufficiently submerged.	Ensure adequate submergence such that foot valve is not exposed.
12	Water seal pipe clogged.	Clean or change.
13	Logging ring is improperly located in stuffing box, preventing sealing fluid from entering to form seal.	Position logging ring centrally under sealing holes of stuffing box.
14	Speed too low.	Check motor RPM, supply frequency, Motor nameplate speed should be as specified on pump nameplate.
15	Speed too high.	Check motor RPM and supply frequency.
16	Direction of rotating wrong.	Check correct direction of rotation for motor before coupling to motor.
17	Total head of system higher than design head of pump.	Check the causes and refer to M&P. Measure with pressure gauge.
18	Total head of system lower than pump design head.	Check the causes and refer to M&P. Measure with pressure gauge.
19	Specific gravity of liquid different from design.	Refer to M&P.
20	Viscosity of liquid different from design.	Refer to M&P
21	Operation at very low capacity.	Check the causes and refer to M&P, Operate pump at rated duty.
22	Parallel operation of pumps unsuitable for such operation.	Refer to M&P with 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 pump stool, 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.

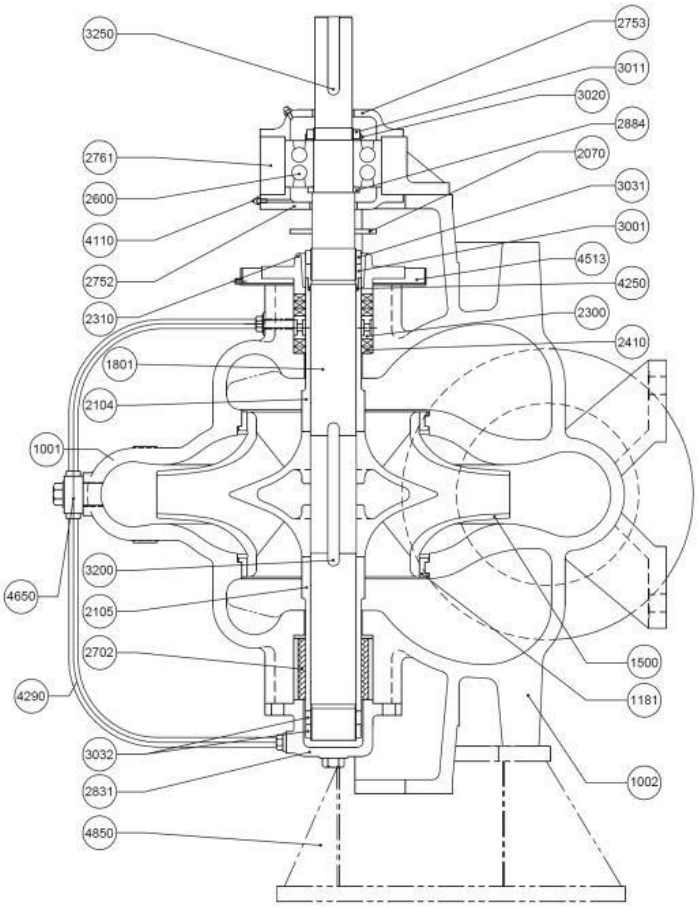
11 Decommissioning and Recycling

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

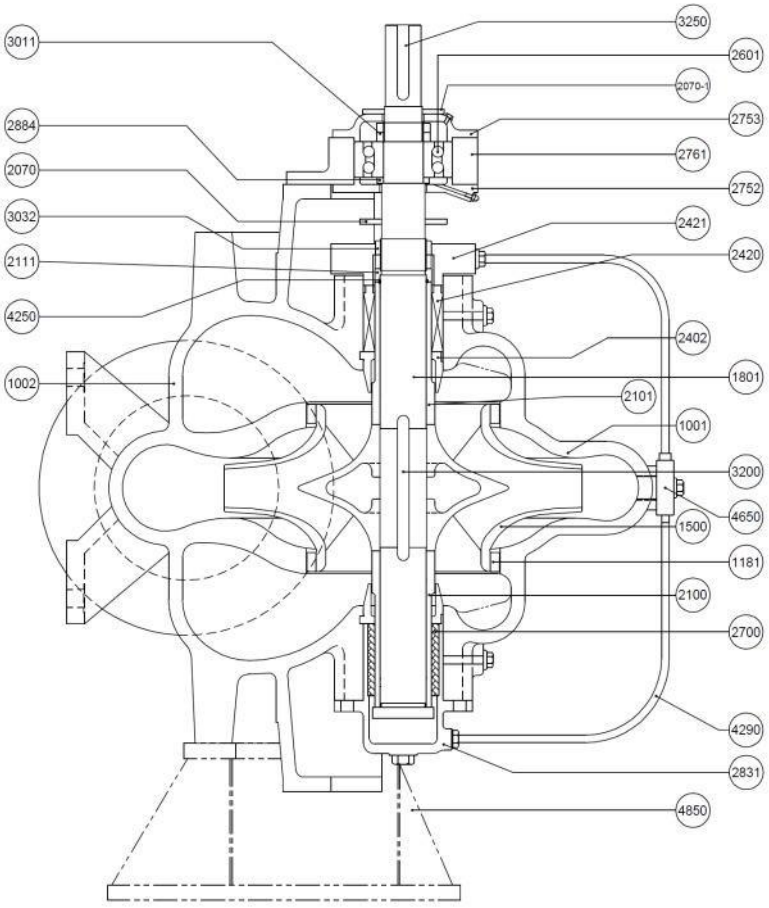
Cross Sectional Drwaings

Gland Pack



No.	Description
1001	Casing top half
1002	Casing bottom half
1181	Neckring
1500	Impeller
1801	Shaft
2070	Water deflector
2104	Shaft sleeve (D.E)
2105	Shaft sleeve (N.D.E)
2300	Lantern ring
2310	Gland
2410	Gland packing
2600	Ball bearing
2702	Baering bush
2752	Bearing end cover(D.E) inner
2753	Bearing end cover(D.E) outer
2761	Bearing housing(D.E)
2831	Bearing bush carrier
2884	Thrust collar
3001	Cowl nut(L.H)
3011	Lock nut
3020	Lock washer
3031	Sleeve nut.(L.H)
3032	Sleeve nut (R.H)
3200	Impeller key
3250	Coupling key
4110	Grease nipple
4250	O Ring
4290	Sealing tube
4513	Gland drain tray
4850	Pump stool
4650	Four way piece

Mechanical Seal



No.	Description
1001	Casing top half
1002	Casing bottom half
1181	Neckring
1500	Impeller
1801	Shaft
2070	Water deflector
2070–1	Water deflector
2101	Shaft sleeve (D.E)
2100	Shaft sleeve (N.D.E)
2111	Spacer sleeve
2420	Mechanical seal
2421	Gland Plate
2402	Stuffing box bush
2601	Bearing
2700	Baering bush
2752	Bearing end cover(D.E) inner
2753	Bearing end cover(D.E) outer
2761	Bearing housing(D.E)
2831	Bearing bush carrier
2884	Thrust collar
3001	Cowl nut(L.H)
3011	Lock nut
3020	Lock washer
3032	Sleeve nut (R.H)
3200	Impeller key
3250	Coupling key
4110	Grease nipple
4250	O Ring
4290	Sealing tube
4850	Pump stool
4650	Four way piece

Annexure 2

Bearing Details

Sr. No.	Model	Bearings		Lubrication for D.E Bearings
		Drive end	Non-drive end	
1	SCPV 65-390 HS	6305 ZZ	Finocot B	N.A
2	SCPV 80-230 HA	6305 ZZ	Finocot B	N.A
3	SCPV 80-200 HA	6305 ZZ	Finocot B	N.A
4	SCPV 80-340 HA	6305 ZZ	Finocot B	N.A
5	SCPV 100-270 HA	6305 ZZ	Finocot B	N.A
6	SCPV 100-280 HA	6305 ZZ	Finocot B	N.A
7	SCPV 100-360 HA	6305 ZZ	Finocot B	N.A
8	SCPV 100-400 HA	6305 ZZ	Finocot B	N.A
9	SCPV 125-290 HA	6311 ZZ	Finocot B	N.A
10	SCPV 125-330 HA	6311 ZZ	Finocot B	N.A
11	SCPV 125-440 HA	6311 ZZ	Finocot B	N.A
12	SCPV 125-470 HA	3380 A	Finocot B	Grease
13	SCPV 150-290 HA	6311 ZZ	Finocot B	N.A
14	SCPV 150-390 HA	3380 A	Finocot B	Grease
15	SCPV 150-350 HA	3380 A	Finocot B	Grease
16	SCPV 150-440 HA	3380 A	Finocot B	Grease
17	SCPV 150-580 HA	6311 ZZ	Finocot B	N.A
18	SCPV 150-530 HA	6311 ZZ	Finocot B	N.A
19	SCPV 200-310 HA	3380 A	Finocot B	Grease
20	SCPV 200-320 HA	3380 A	Finocot B	Grease
21	SCPV 200-370 HA	3380 A	Finocot B	Grease
22	SCPV 200-360 HB	3380 A	Finocot B	Grease
23	SCPV 200-390 HA	6311 ZZ	Finocot B	N.A
24	SCPV 200-440 HA	6311 ZZ	Finocot B	N.A
25	SCPV 200-460 HA	6311 ZZ	Finocot B	N.A
26	SCPV 200-550 HA	6311 ZZ	Finocot B	N.A
27	SCPV 200-480 HA	6311 ZZ	Finocot B	N.A
28	SCPV 250-250 HA	6311 ZZ	Finocot B	N.A
29	SCPV 250-360 HA	6311 ZZ	Finocot B	N.A
30	SCPV 250-700 DV	7316	Finocot B	Oil
31	SCPV 300-330 HB	6311 ZZ	Finocot B	N.A
32	SCPEV 300-340 HA	6311 ZZ	Finocot B	N.A
33	SCPV 300-400 HA	6311 ZZ	Finocot B	N.A
34	SCPV 400-480 HA	7314	Finocot B	Oil
35	SCPV 400-660 DV	7320	Finocot B	Oil
36	SCPV 80-360 DS	3306A	CIP131A	Grease

For Grease Lubrication:

Manufacturer	Grease Lubricated Bearing
Indian Oil Corporation	Servogem-2/3
Hindustan Petroleum	Lithon-2/3
Bharat Petroleum	Multipurpose Grease-3

- Only lithium base Grease to be used
- Numbers mentioned stands for consistency
- Grease of two different grades should not be used

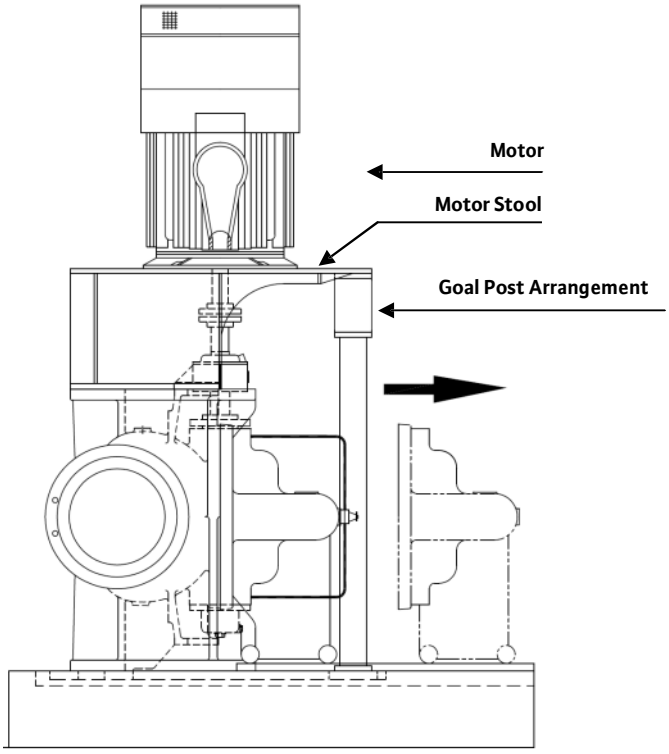
Annexure 3

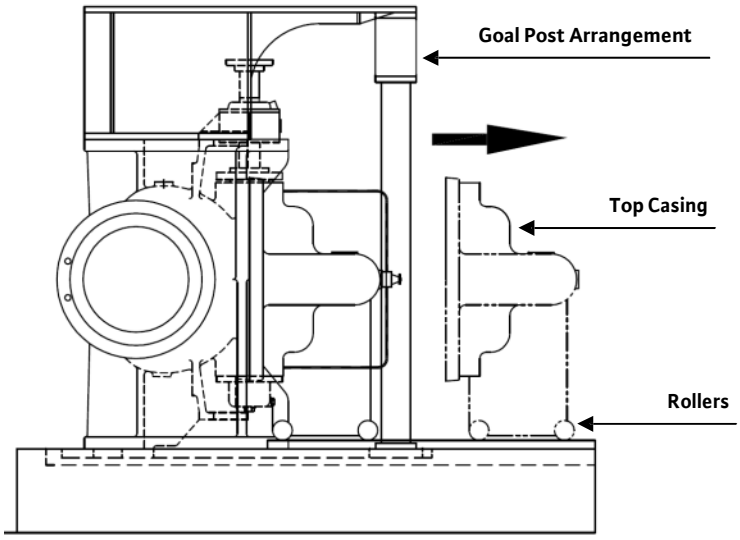
Gland Packing Details

Sr. No.	Pump	Gland Packing Size (mm^2)	Packing Rings Quantity	Length of one ring	Stuffing Box ID (mm)
1	SCPV 65-390 HS	14	3	185	65
2	SCPV 80-230 HA	14	3	185	65
3	SCPV 80-200 HA	14	3	185	65
4	SCPV 80-340 HA	14	3	185	65
5	SCPV 100-270 HA	14	3	185	65
6	SCPV 100-280 HA	14	3	185	65
7	SCPV 100-360 HA	14	3	185	65
8	SCPV 100-400 HA	14	3	185	65
9	SCPV 125-290 HA	16	3	230	81
10	SCPV 125-330 HA	16	3	230	81
11	SCPV 125-440 HA	16	3	230	81
12	SCPV 125-470 HA	17.5	3	275	95
13	SCPV 150-290 HA	16	3	230	81
14	SCPV 150-390 HA	17.5	3	275	95
15	SCPV 150-350 HA	17.5	3	275	95
16	SCPV 150-440 HA	17.5	3	275	95
17	SCPV 150-580 HA	20	3	330	114
18	SCPV 150-530 HA	20	3	330	114
19	SCPV 200-310 HA	17.5	3	275	95
20	SCPV 200-320 HA	17.5	3	275	95
21	SCPV 200-370 HA	17.5	3	275	95
22	SCPV 200-360 HB	17.5	3	275	95
23	SCPV 200-390 HA	20	3	330	114
24	SCPV 200-440 HA	20	3	330	114
25	SCPV 200-460 HA	20	3	330	114
26	SCPV 200-550 HA	20	3	330	114
27	SCPV 200-480 HA	20	3	330	114
28	SCPV 250-250 HA	16	3	230	81
29	SCPV 250-360 HA	20	3	330	114
30	SCPV 250-700 DV	20	4	425	145
31	SCPV 300-330 HB	20	3	330	114
32	SCPEV 300-340 HA	20	3	330	114
33	SCPV 300-400 HA	20	3	330	114
34	SCPV 400-480 HA	22	3	410	140
35	SCPV 400-660 DV	20	5	505	170
36	SCPV 80-360 DS	14	3	185	65

Annexure 4

Goal Post Arrangement





Maintenance of Pump with Goal Post Arrangement

If the pump is supplied with goal post arrangement, then follow bellow procedure to do the maintenance of the pump

Removal of Top Casing

- Isolate the pump system by closing suction and delivery valve.
- Drain the pump and open the upper air vent.
- Remove the Bottom Bearing
- Isolate the top and bottom half casing
- Remove nuts of split gland from both ends and slide away the gland. Remove gland packing as well as logging ring.
- In case of Mechanical seal, remove the nuts of seal gland plate
- Remove all split flange nuts and the two dowel pins.
- Withdraw the casing top by sliding over the rails. Remove the casing joint gasket.

Note:
Dismantling of the rotating element for Gland pack / Mechanical seal version pumps is same as explained in section 9.3.2 and 9.3.4

Reassembling the pump

Reassembly of rotating element

Follow the same procedure for reassembly of rotating element as explained in section 9.51/2/3 up to placement of gasket paper then slide in the top casing at its position. Fit the split flange studs. Align the dowel holes and fit the dowel pins before tightening the nuts.

Final Assembly

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

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