



## Non Clog Pumps

**en** Installation and operating instructions

### Disclaimer

WILO Middle East FZE is very grateful for your interest in its products. The basic objective of this document is to provide instructions for maintaining and operating WILO Middle East FZE Non Clog Pumps. Instructions are compiled for the person having a working knowledge of End suction pumps and the pumps shall be installed under expert supervision and guidance.

With this document Wilo WILO Middle East FZE 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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[www.wilo.com/ae/en/](http://www.wilo.com/ae/en/)

Fig.1: Pump Handling [3.1]

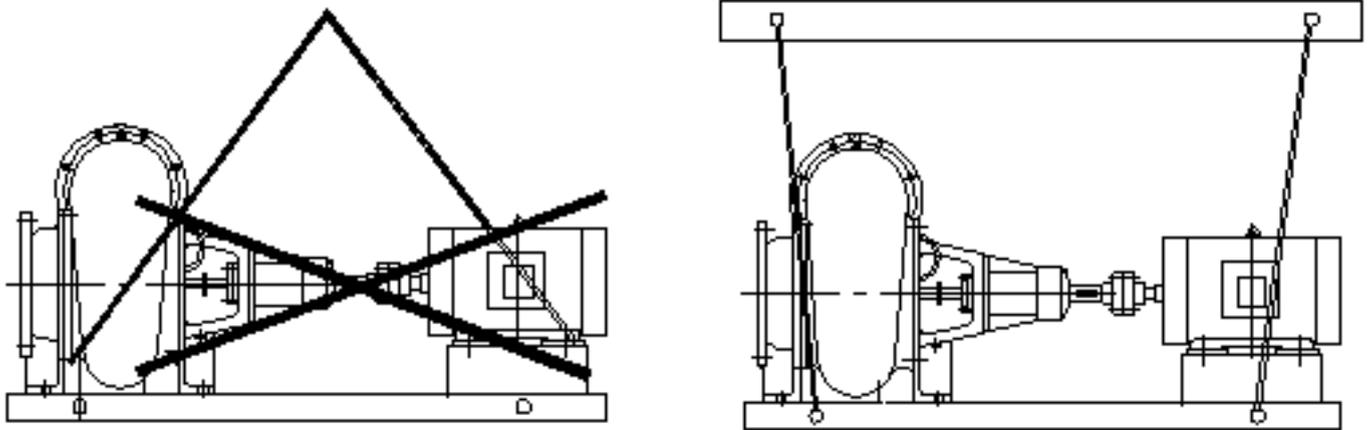


Fig.2: Engine driven pump [6.1.2]

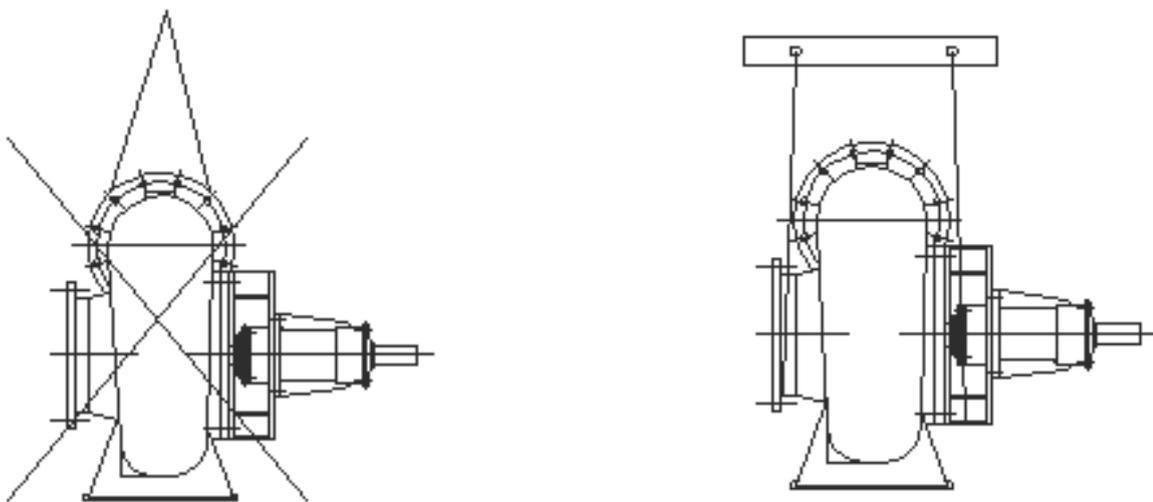


Fig.3: Pump Foundation [7.2.1]

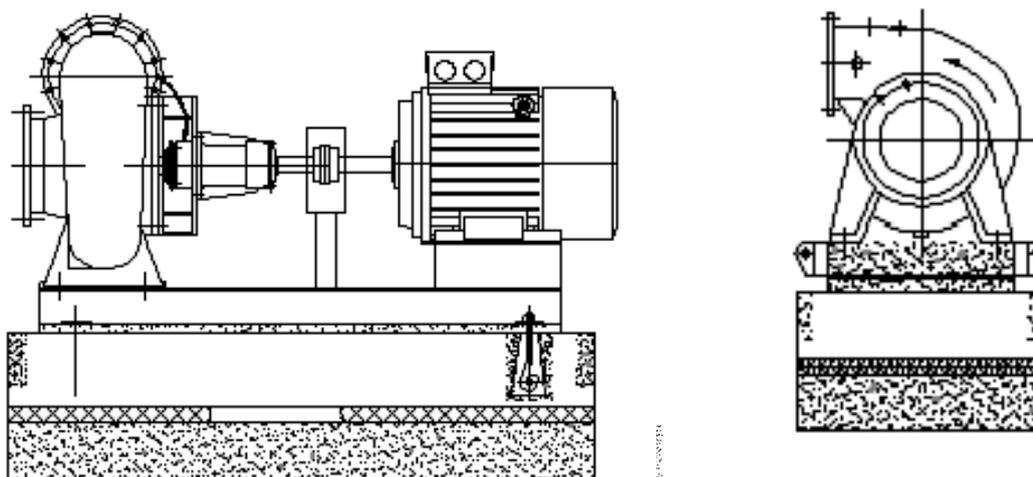


Fig.4: Leveling of Base-plate [7.2.2]

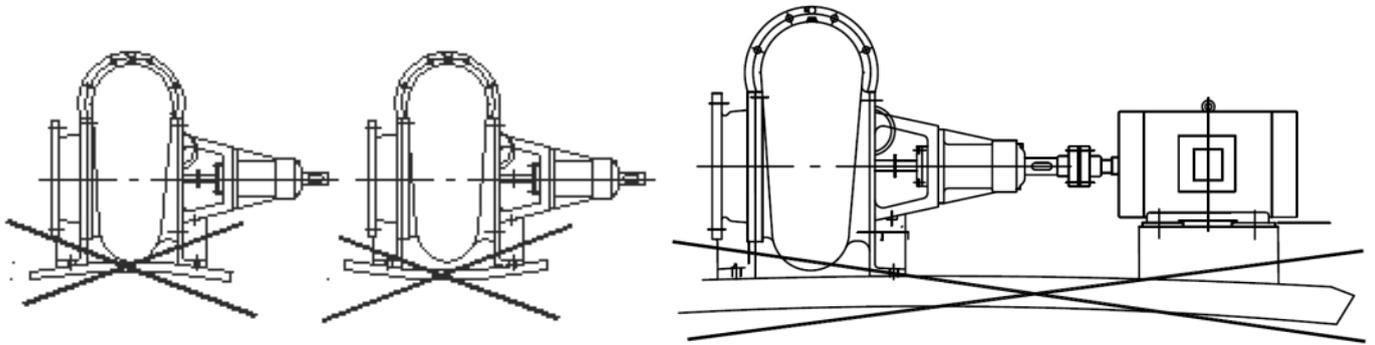


Fig.5: Coupling assembly [7.2.3]

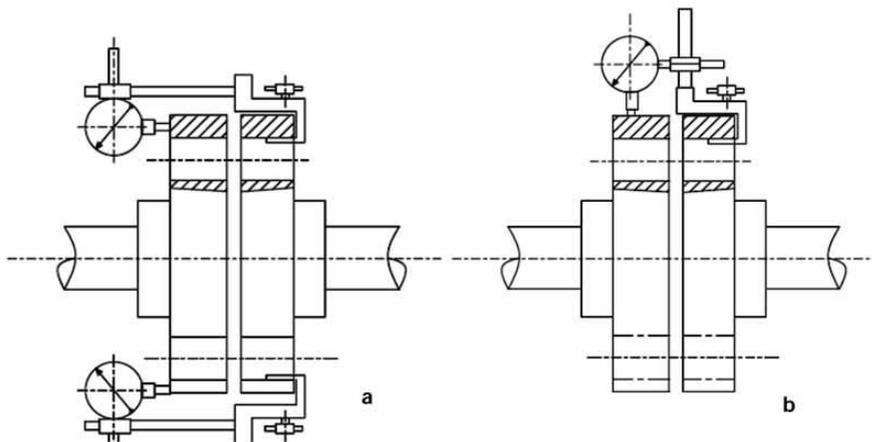


Fig.6: Forces and Moments [7.2.4]

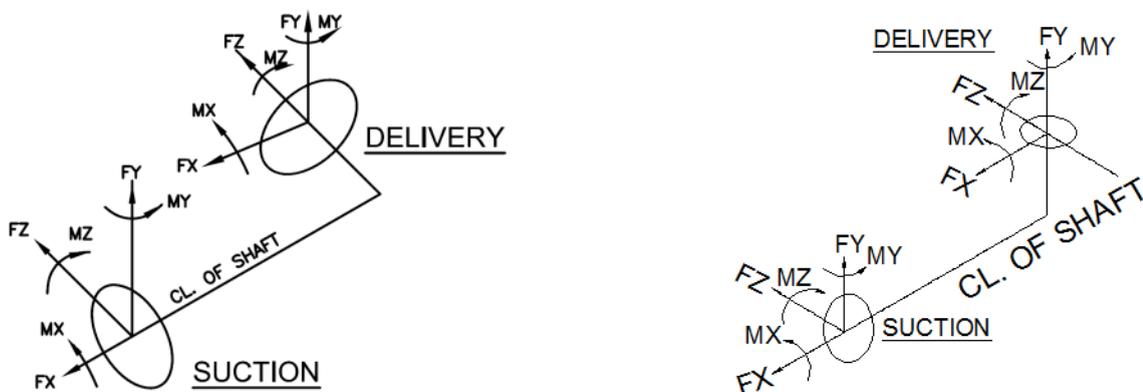


Fig.7: Suction line [7.2.5]

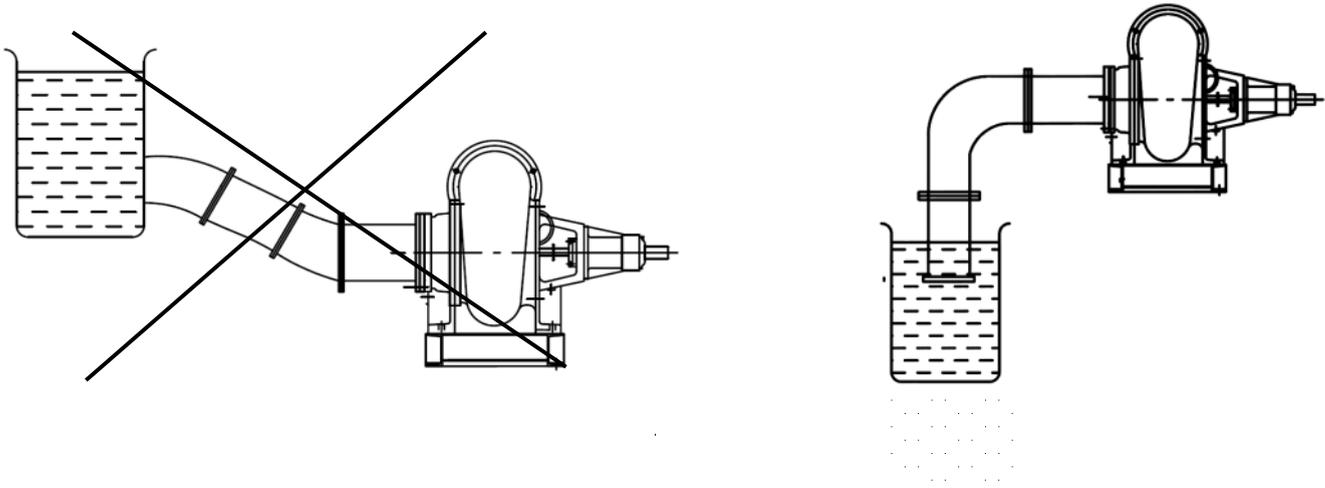


Fig.8: Suction line [7.2.5]

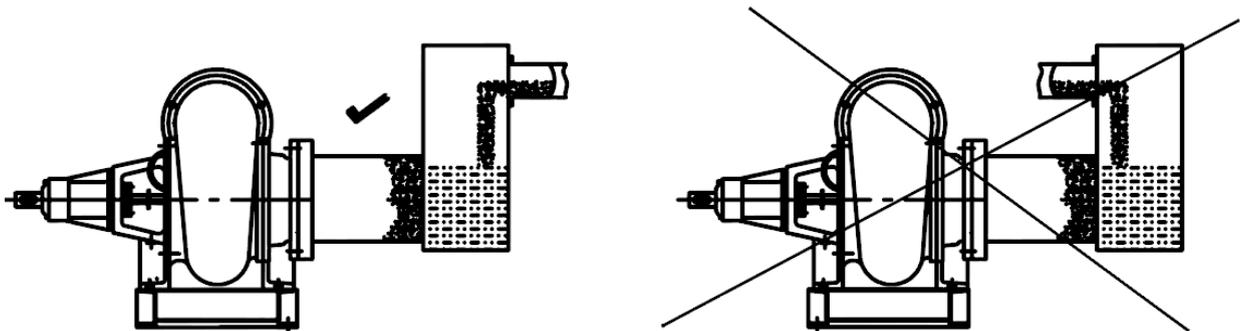


Fig.9: Suction line [7.2.5]

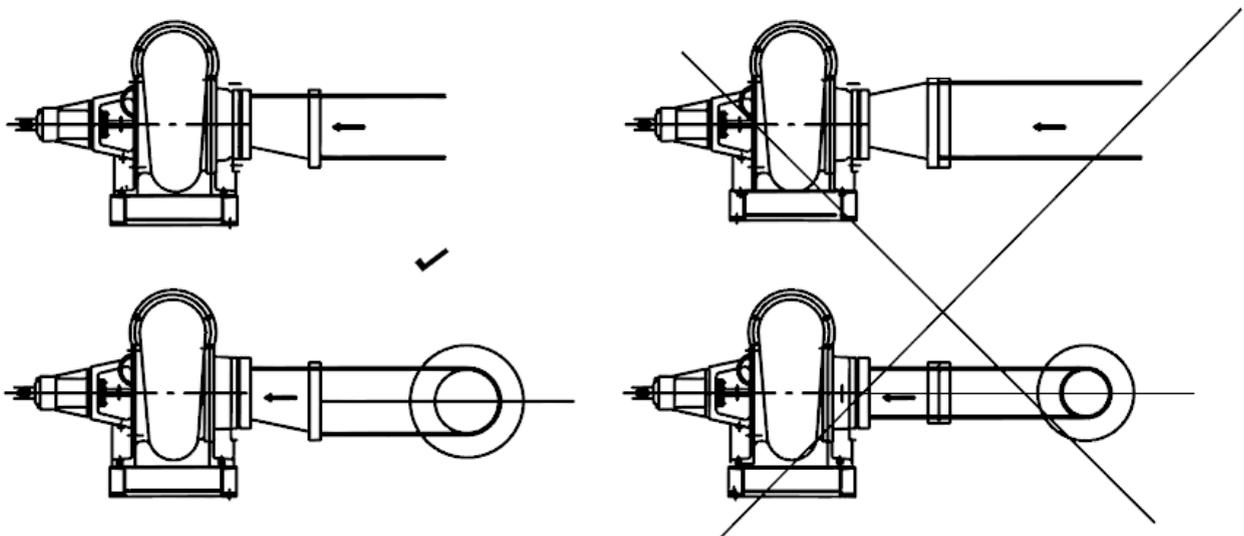
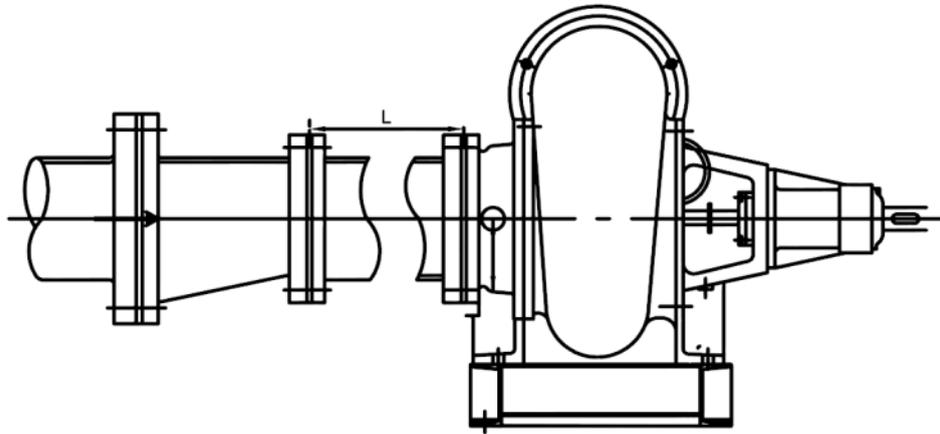
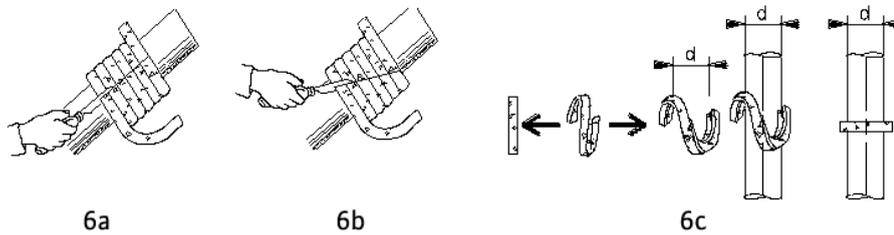


Fig.10: Suction line [7.2.5]



$$L = 4 \times D$$

Fig.11: Stuffing box packing [7.2.7]



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## 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."

"CE Certification" is available on request.

## 2 Safety

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

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

### 2.1 Designation of information in the operating instructions



**Symbols:**  
**General danger symbol**



**Danger due to electrical voltage**



NOTE: ...

**Signal words: DANGER!**

**Acutely dangerous situation.**

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

### WARNING!

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

### CAUTION!

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

### NOTE:

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

### 2.2 Personnel qualifications

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

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

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

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

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

### 2.4 Safety 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.



#### **CAUTION!**

**In accordance with the laws in effect, guidelines, standards and regulations, ear protection must be worn if the sound pressure is greater than 80dB (A). The operator is responsible for ensuring that this is observed!**

### **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 limits 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 Middle East FZE Non Clog 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.**

Only suitable lifting gear and load carrying equipment with valid test certificates and adequate lifting capacity for the loads involved (such as belts/ wire ropes/slings) should be used for lifting & transporting the product. If chains are used, they

should be secured against slipping along with protective cover to prevent damage to the product, paint and/or injury to personnel. When lifting the pump in combination with the bedplate, the lifting tackle should be attached to the lifting lugs provided on the base plate side member. To lift the pump the lifting slings should pass beneath the pump body at suction and delivery flanges (see lifting diagrams – see also general safety Information, chapter 2). These must have sufficient load bearing capacity to ensure that the product can be transported safely. Refer figure 1 and 2

### 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 Non Clog 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 guarantee!**

### 4 Intended uses

The pump supplied is intended for specific fluid. Refer pump data sheet and order confirmation. For any change in pumped fluid refer Wilo Middle East FZE beforehand Non Clog pumps are used in water supply, water-circulating systems, water treatment, sewage handling 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 Middle East FZE on the new operating conditions before starting the pump.

## 5 Product information

### 5.1 Data plate

Type			
Art.-No.			
Q	m <sup>3</sup> /h	n	RPM
H	m	P	kW
t	°C	Pmax	bar
	mm	WT	kg
Made by Wilo Group in UAE			
WILO SE Nortkirchenstraße 100 · 44263 Dortmund Germany			

### 5.2 Type key

Pump	Description
8/10 AKN	8 – Discharge Nominal Dia. [in] 10 – Suction Nominal Dia. [in] A- Type A Hydraulic, KN series
8/8 MF SW	8- Discharge Nominal Dia. [in] 8 – Suction Nominal Dia. [in] MF SW series
14 MFV	14- Discharge Nominal Dia. [in] MFV series
20/24 SW	20- Discharge Nominal Dia. [in] 24- Suction Nominal Dia. [in] MFV series
3/2 SK	3- Discharge Nominal Dia. [in] 2- Suction Nominal Dia. [in] SK series

### 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	490,590,740,980,1480 /min	Model dependent
Discharge nominal diameters DN	200 up to 900	
Limit of fluid temperature (min./max.)		
– Gland packing version [°C]	-20 up to +80	
Limits of ambient temperature (min./max.) [°C]	-16 up to +50	other on request
Ambient humidity	< 90 %	other on request
Max. operating pressure	16 bar, generally	10 bar 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 or in technical leaflets
Electrical connections	3~400V, 50Hz (≥5,5kW)	Other frequency, voltages, please contact manufacturer
Solid size	Up to max. 200 mm	Pump model specific

## 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

## Gland Pack

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

For correct operation of the pack gland as light leakage (20–40 drops per minute) is essential. If the leakage is reduced too much by re-tightening the packing, the packing rings will be destroyed.

## 6 Description and function

### 6.1 Description of the product

The pumps are manufactured with great care and are subject to constant quality controls. Trouble-free operation is guaranteed if it is installed & maintained correctly. These pumps include KN, MFV, SW, SK series.

MFV pumps is mixed flow end suction pumps, back pull-out right hand horizontal delivery as a standard construction pump viewing from drive end .

Optionally pumps are offered with vertical delivery. Sometimes for MFV series supporting feet as a integral part of casing therefore discharge flange has only in two position.

#### 6.1.1 Casing

Volute type casing is designed in such a way that rotating element, stuffing box cover, bearing housing can be withdrawn as a single unit without disturbing suction & discharge pipes.

A hand hole cover is provided in casing for cleaning & inspection purpose.

#### 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.

#### 6.1.3 Stuffing box cover

Part between bearing housing & casing. To control the leakage along the shaft at it point of emergence from pump casing, stuffing box is provided in stuffing box cover.

#### 6.1.4 Stuffing Box

It is fitted with logging ring ,is of grease packed type to prevent abrasive particles from coming into contact with the renewable shaft sleeve. This arrangement gives maximum seal life thus reducing cost of maintenance.

**Connection Details**

No.	Pump	CG	PG	PM	AC	CD	GD
1	8/10 AKN	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
2	12/12 AKN	1/2"	1/2"	3/4"	3/8"	3/4"	1/2"
3	8/10 BKN	1/2"	1/2"	1/2"	-	1/2"	1/2"
4	8/10 BKN-TB-MK-1	-	1/2"	1	-	1	3/8"
5	10/12 BKN	1/2"	1/2"	1/2"	-	1	3/4"
6	12/16 BKN	1/2"	1/2"	1	-	1	3/4"
7	12/16 BKN-TA-MK-1	1/2"	1/2"	1	-	1	3/4"
8	14/16 BKN	1/2"	1/2"	1	-	1	3/4"
9	15/16 BKN	1/2"	1/2"	1	1/2"	1	1
10	8/10 CKN	3/8"	3/8"	1	-	3/4"	3/4"
11	10/12 CKN	1/2"	1/2"	-	-	3/4"	3/4"
12	14/16 CKN	3/8"	1/2"	-	-	1	3/4"
13	10/12 CKN_6P	-	-	-	-	-	-
14	8/8 MF SW & 8/8 MFV	-	3/8"	1	3/8"	1/2"	3/8"
15	10/10 MF SW & 10/10 MFV	-	3/8"	-	3/8"	1/2"	3/8"
16	10/10 MF SW & 10/10 MFV 1	-	3/8"	-	3/8"	1/2"	3/8"
17	10/10 MF SW & 10/10 MFV 3	-	3/8"	-	1/2"	1/2"	3/8"
18	12/12 MF SW & 12/12 MFV	-	3/8"	3/4"	3/8"	3/4"	3/4"
19	14 MF SW & 14 MFV	-	3/8"	3/8"	3/8"	3/4"	3/4"
20	15/15 MF SW & 15/15 MFV	-	3/8"	3/4"	3/8"	3/4"	3/8"
21	18 MF SW & 18 MFV	-	3/8"	3/4"	3/8"	3/4"	3/4"
22	500 MF SW & 500 MFV	-	3/8"	1	3/8"	1	1
23	150/200-400 SWS	3/8"	3/8"	3/4"	3/8"	3/4"	3/4"
24	400/450 SW	1/2"	1/2"	1	3/8"	1	1
25	400/450 SW-TA-MK-1	1/2"	1/2"	1	-	1	1
26	500/500 SW	1/2"	1/2"	1	3/8"	1	3/4"
27	600/675 SW	1/2"	1/2"	1	3/8"	1	3/4"
28	20/24 SW	1/2"	1/2"	1	3/8"	1	3/4"
29	24/30 SW-T1	1/2"	1/2"	3/4"	3/8"	1	1
30	24/30 SW-T2	1/2"	1/2"	1	3/8"	1	1/2"
31	24/30 SW-T3	1/2"	1/2"	1	-	1	1/4"
32	32/32 SW	1/2"	1/2"	1	3/8"	1	1
33	30/36 SW	-	1/2"	1	3/8"	1	1
34	3/2 SK	-	1/2"	-	-	3/8"	1/2"
35	4/3 SK	-	3/8"	-	-	3/8"	1/2"
36	5/4 SK	-	3/8"	-	-	3/8"	1/2"
37	5/5SKM	-	3/8"	-	-	3/8"	1/2"
38	6/5 SK	-	3/8"	-	-	3/8"	1/2"
40	6/6 SK	-	3/8"	-	-	3/8"	1/2"
41	50/26 SK	-	3/8"	-	-	3/8"	1/2"
42	65/32 SK	-	3/8"	-	-	3/8"	1/2"
43	100/26 SK	-	3/8"	-	-	3/8"	1/2"
44	100/32 SK	-	3/8"	-	-	3/8"	1/2"
45	150/26 SK	-	3/8"	-	-	3/8"	1/2"

CG: Compound Ground; PG: Pressure Gauge; PM: Priming; AC: Air Cock; CD: Casing Drain; GD: Gland Drain;

## 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 supplied by Wilo Middle East FZE 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 below will guide you in this selection.

#### 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 Pump set 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 Middle East FZE.



**Note:**  
If coupling guard is supplied loose, then kindly drill and fit it on the base plate at proper location.  
And if pump is supplied with coupling and motor mounted on the base-plate, please ensure proper alignment of pump motor and coupling

Example:

- Duty point: 100 m<sup>3</sup>/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 standards in order to avoid any contact with rotating parts during operations.

## 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.

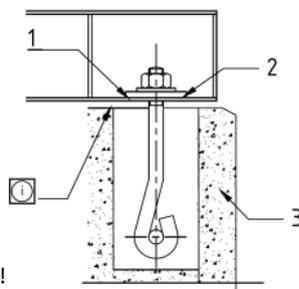
### 7.2.1 Foundations

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

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. Therefore it is necessary to use I-beam straight edge along with engineer's master level.



### 7.2.2 Leveling 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 straight edge and an engineer's master level (with accuracy of 0.02 mm / meter) for leveling the base plate. I-beam should rest on the machined surfaces of the base plate, or on the leveling 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 bed plate and the packer plate until the bed plate is leveled and supported on all the packing plates at the height required for the connection of suction and discharge branches. For checking the levels across two pads, I-beam type straight edge should be used extensively in conjunction with engineer's master level. Level should be achieved within 0.05 mm per 250 mm.
- When the base plate is leveled, 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.
- 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 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 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 back of the other half of the coupling. Rotate the coupling unit. The gauges are to be in line vertically and set the dial to read zero. Rotate the coupling by 180° and record the readings on each gauge. The readings should be identical, though not necessarily zero. Either positive or negative readings are acceptable provided they are equally positive or negative. Adjust the position of one of the units if necessary. Rotate the coupling unit. The gauges are to be in the line horizontally and adjust the dial to zero. Repeat the operation outlined above by rotating the coupling by 180°

#### Radial alignment

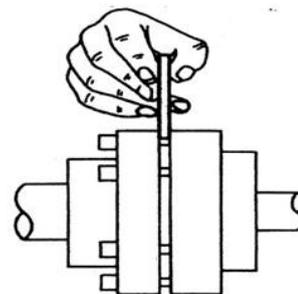
Clamp a dial gauge on one of the couplings or to the shaft as shown in figure 5 with the plunger resting on the rim of the other half coupling. Set the dial zero. Rotate the coupling and note the reading at each quarter revolution. Any variation in the readings indicates the deviation from alignment 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.

Alignment Tolerances

Speed (rpm)	Parallel tolerance	Angular tolerance
<1000	0.15 mm TIR	0.15 mm TIR
From 1000 to 1800	0.15 mm TIR	0.10 mm TIR
From 1800 to 3600	0.10 mm TIR	0.05 mm TIR

TIR: Total Indicated reading

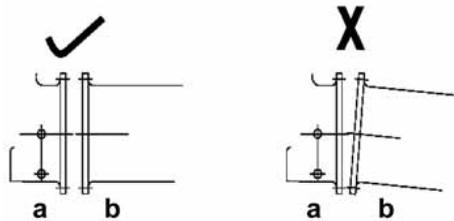
#### Distance between coupling halves for Non Clog pumps



Rotational Speed			Gap [mm]
990 rpm	1450 rpm	2900 rpm	
-	3-55 kW	3-55 kW	2-4
90-120 kW	75-250 kW	75-560 kW	2-6
> 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). 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 rechecked 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.

#### MAXIMUM ALLOWABLE FORCES & MOMENTS ON NON CLOG PUMPS, FLANGES IN CAST IRON Forces [N] and moments [Nm]

##### For Horizontal suction and Vertical delivery pumps

Flange size [mm]	150	200	250	300	350	375	400	450	500	600	650	700	800	900	
Delivery Flange Forces [N]	Fx	2497	3790	5351	6689	7135	8026	8472	9364	10033	11371	11928	12374	12820	13154
	Fy	3121	4905	6689	8026	8918	9810	10256	11148	12263	13823	14715	15161	16053	16387
	Fz	2051	3121	4459	5351	5797	6243	6689	7358	7915	9030	9476	9810	10256	10702
Suction Flange Forces [N]	Fx	3121	4905	6689	8026	8918	9810	10256	11148	12263	13823	14715	15161	16053	16387
	Fy	2051	3121	4459	5351	5797	6243	6689	7358	7915	9030	9476	9810	10256	10702
	Fz	2497	3790	5351	6689	7135	8026	8472	9364	10033	11371	11928	12374	12820	13154

##### For Horizontal suction and Side delivery pumps

Flange size [mm]	150	200	250	300	350	375	400	450	500	600	650	700	800	900	
Delivery Flange Forces [N]	Fx	2497	3790	5351	6689	7135	8026	8472	9364	10033	11371	11928	12374	12820	13154
	Fy	2051	3121	4459	5351	5797	6243	6689	7358	7915	9030	9476	9810	10256	10702
	Fz	3121	4905	6689	8026	8918	9810	10256	11148	12263	13823	14715	15161	16053	16387
Suction Flange Forces [N]	Fx	3121	4905	6689	8026	8918	9810	10256	11148	12263	13823	14715	15161	16053	16387
	Fy	2051	3121	4459	5351	5797	6243	6689	7358	7915	9030	9476	9810	10256	10702
	Fz	2497	3790	5351	6689	7135	8026	8472	9364	10033	11371	11928	12374	12820	13154

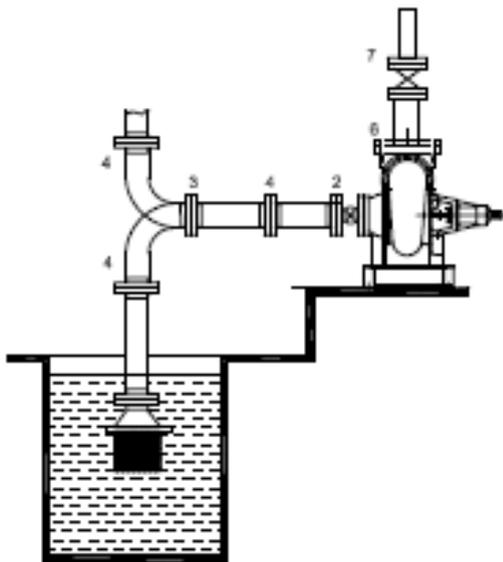
##### Common for both Installations

Flange size [mm]	150	200	250	300	350	375	400	450	500	600	650	700	800	900	
Moments [Nm]	Fx	2497	3790	5351	6689	7135	8026	8472	9364	10033	11371	11928	12374	12820	13154
	Fy	2051	3121	4459	5351	5797	6243	6689	7358	7915	9030	9476	9810	10256	10702
	Fz	3121	4905	6689	8026	8918	9810	10256	11148	12263	13823	14715	15161	16053	16387

### 7.2.5 Suction line

See the sketches figure 8 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).

- 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/cm<sup>2</sup>).
- 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.



- 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 (figure 11)



#### 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 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.

## 7.2.10 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 Middle East FZE 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 Middle East FZE at the quotation stage if the pump set will be 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  $\Delta U/\Delta t$  greater than 2500 V/ $\mu$ s.
- If the above conditions cannot be fulfilled, an appropriate filter should be placed 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.

## 8.2 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 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 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.

Pre-start Check up			
	Activities	Checked on	Remarks
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 <ul style="list-style-type: none"> <li>• Suction and delivery pressure gauges</li> <li>• Pressure switches</li> <li>• Temperature gauges</li> <li>• Any other as supplied/specified</li> </ul>		
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	Check all interlocks as specified/provided		
15	No load trial operation of drive <ul style="list-style-type: none"> <li>• Direction of rotation is ok</li> <li>• Noise and vibration within limits</li> <li>• Bearing temperatures and winding temperatures are within limits</li> <li>• Overall operation is satisfactory</li> </ul>		
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, start the pump and check the direction of rotation (indicated by a direction arrow on the pump casing) otherwise stop the pump immediately for correction of direction of rotation. Then run the pump at its rated speed.
- Check the ammeter reading to ensure that the motor is not being overloaded.

- If applicable, ensure that the stuffing box is not overheating and that there is slight leakage from the gland (about 1 drop per second). There may be at first a tendency for the stuffing boxes to run warm because of the high viscosity lubricant in the packing. During the first few minutes of running with new packing, a small quantity of very viscous fluid will be extruded, but the flow should reduce when the packing has settled down.

- Check the mechanical seal for leak. In the start phase (and also after downtimes) slight leakage can be expected. Visual leakage checks are however required from time to time. Distinctly visible leakage will require an exchange of the seal. Wilo Middle East FZE 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 or 2 drops per seconds.

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

### 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 pressure, allow the pump to cool down first and then depressurise the system.**

### 9.1 Routine maintenance and

frequency of inspection

Centrifugal pump requires very little routine maintenance; however, serious troubles can be often avoided by regular observation and analysis of various working parameters. Some of the routine

maintenance checks for this purpose are as under:

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

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 impeller	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

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.

Internal nominal diameter of the wear ring in (mm)	Nominal gap at the diameter in (mm)
65	0.38
100	0.46
150	0.58 - 0.55
200	0.62
250	0.68
300	0.74
350	0.84 - 0.80



#### 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 Middle East FZE. Such request must quote name plate number and type of the pump in question.

The parts most likely to be affected are:

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

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

- A crane / chain pulley block suitable for handling the weight of pumping unit.
- A selection of ring and open-ended spanners in

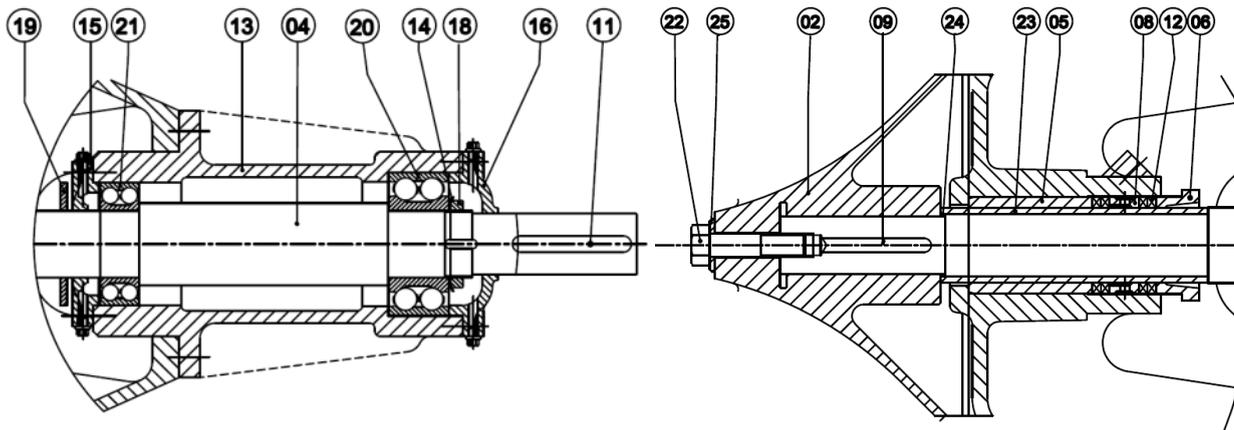
British and Metric sizes.

- 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

#### 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
8.8	Nm	9.2	22	44	76	122	190	350	500	600	1450	1970	2530	300
	Ft. lb	6.8	16.2	32.5	56	90	140	258	369	443	1069	1452	1865	221

### 9.3 Disassembling the pump



**Bearing Housing assembly**

**Impeller and Stuffing box arrangement**

Gland pack version			
No.	Description	No.	Description
01	Casing	14	Lock washer
02	Impeller	15	Bearing End Cover (NDE)
03	Neck Ring	16	Bering End cover (DE)
04	Shaft	17	Grease shield
05	Bearing Bush	18	Lock Nut
06	Gland	19	Water Thrower
07	Suction cover	20	Bearing(DE)
08	Logging ring	21	Bearing(NDE)
09	Impeller Key	22	Impeller Lock screw
10	Pump housing	23	Shaft Sleeve
11	Coupling Key	24	'O' Ring
12	Gland packing	25	Impeller Locking Washer
13	Bearing housing		

#### 9.3.1 Disassembling the casing

- Isolate the pump system by closing suction and delivery valve.
- Drain the pump and open the upper air vent
- Remove pump half coupling.
- Un-screw splitting flange stud between stuffing box cover & casing.
- Carefully pullback the stuffing box cover & bearing housing completely with rotating element and put it aside for further dismantling.

#### 9.3.2 Dismantling the rotating element

- Remove the coupling screw/nut of the coupling
- Remove the gland, packing ,logging ring etc.
- Remove the impeller nut, locking screw & unscrew impeller locknut
- Draw the impeller of shaft. It may necessary to apply the heat to the impeller for removal. Apply the heat uniformly from shroud inwards towards the hub.
- Remove the impeller key and shaft sleeve.
- Unscrew the studs between stuffing box cover and bearing housing and remove the cover of shaft.

#### 9.3.3 Dismantling of pump bearing Assembly

- Remove the set screw securing the bearing end covers to the bearing housing and pass end cover of shaft.
- Remove the lock nut and lock washer.
- By jacking take out the bearing housing along with thrust bearing and pump shaft. As inner race of roller cylindrical roller bearing (far end bearing)
- Is shrink fitted on pump shaft ,it comes out along with shaft.

Note: Unnecessary removal of bearing should be avoided because removal can damage bearing and cause deterioration of the interference fit .Except where removal is necessary to give access to other parts, bearing should be removed only if they need close inspection. Symptoms which will act as guide are the condition of lubricant, the bearing running temperature and noise level during operation.

## 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 wearing 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-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.
- 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 Middle East FZE 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 bearings fitted on Non Clog pump are non-shielded grease lubricated. 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.

Visually inspect the bearing. The balls, the inner and outer tracks must all be free from chipping cracks, abrasions or discoloration.

- 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 replaced.
  - Inspect the Bearing Cage 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.

Bearing and Gland packing details				
Pump	Bearing Drive End	Bearing Non-Drive End	Gland Packing Size [mm <sup>2</sup> ]	Number of Gland packing rings
8/8 MF SEW	3310	3210	10	4
8/10 AKN	6313	NU314EC	16	6
8/10 BKN	6313	NU314	20	4
8/10 BKN TB MK-1	6312	6213	10	6
8/10 CKN	22315 E	NU218EC	20	4
10/10MFV	3310	3210	10	4
10MFV3	3310	3210	10	4
10 MFV3 SEW	3310	3210	10	4
10/10 MF SEW	3310	3210	10	4
10/12 BKN	22315 E	NU 218EC	20	4
10/12 CKN	22320 E	NU222EC	16	6
12/12 AKN	22313 E	NU214EC	15	5
12/12MFV	3313	3213	10	4
12/12 MF SEW	3313	3213	10	4
12/16 BKN	22315 E	NU218EC	20	4
14MF SW	22315	NU218EC	20	5
14 MFV	22315	NU218EC	20	5
14/16 BKN	22315 E	NU218EC	20	4
14/16 CKN	22322 E	NU326EC	20	5
15/15MFV	3313	3213	10	4
15/15 MF SEW	3313	3213	10	4
15/16 BKN	22320 E	NU222EC	16	6
18 MF SW	22320	NU222EC	16	5
18 MFV	22320	NU222EC	16	5
200/250 CKN	22315 E	NU218EC	20	4
400/450 SW	22320 E	NU222EC	25	4
400/450 SW TA MK1	22320 E	NU222EC	25	4
500 MFV	22315 E	NU218EC	20	4
500 MFV -H	3315	NU218EC	20	4
150/200-400 SWS	6312	6213	10	6
150/200-400 SWS	3312	6213	10	6
500/500 SW	22320 E	NU222EC	16	5
500/600 SW	22320 E	NU222 EC	25	4
20/24 SW	22320 E	NU222EC	16	5
600/600 SW	2 x 7226 BCB	NU326EC	25	4
600/675 SW	2 x 7226 BCB	NU324EC	25	4
24/30 SWT1	2 x 7224 BCB	NU324EC	25	4
24/30 SWT2	2 x 7224 BCB	NU324EC	25	4
24/30 SWT3	22320	NU222EC	16	5
30/36 SW	2 x 7330 BG	NU330E	25	4
32/32 SW	2 x 7330 BG	NU330E	25	4
3/2 SK	6310	6310	10	4
4/3 SK	6211	6311	10	4
5/4 SK	6211	6311	10	4
5/5SKM	6310NR	6310	10	4
6/5 SK	6211	6311	10	4
6/6 SK	6310NR	6310	10	4
50/26 SK	6310NR	6310	10	5
65/32 SK	6310NR	6310	10	5
100/26 SK	6310	6310	10	4
100/32 SK	6310	6310	10	5
150/26 SK	6313	6313	10	5

#### 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

#### 9.5 Reassembling the pump

- Mount the bearing on the shaft .Tighten the bearing lock nut.
- Mount the bearing housing along with bearing covers and grease shield.
- Mount the bearing housing on stuffing box cover fit the stuffing box sleeve
- Mount the impeller key ,impeller, impeller nut & stuffing box assembly lift the rotating assembly & mount the casing.

#### 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 dismantling of the pump.

**For 3 years of normal operation:**

- Mechanical seal or Packing, ball bearings and the different gasket required for the dismantling 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:**

- The maintenance of the Non Clog 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 Middle East FZE. 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	1	
2	Impeller	1	
3	Pump Shaft	1	
4	Shaft sleeves	1	‡
5	Stuffing box cover	1	
6	Bearing housing	1	
7	Neck-ring	1	
8	Split gland	1	
9	Support foot	1	‡
10	Impeller lock nut/Nose Cap	1	
11	Logging ring	1	
12	Bearing end cover (F E)	1	
13	Bearing end cover (D E)	1	
14	Water thrower	1	‡
15	Hand hole cover(suction pipe)	1	
16	Hand hole cover(casing)	1	
17	Grease shield	1	
18	Thrust collar	1	
19	Setting pin	1	‡
20	Key (Impeller)	1	‡
21	Key coupling	1	‡
22	Locking screw	1	
23	Lock washer	—	
24	Lock nut	1	‡
25	Bearing DE + NDE	1+1	
26	Air cock	—	
27	Gland packing	1	
28	Gasket	1	‡
29	Stud for gland	1	
30	Stud for bearing end cover	—	
31	'O' ring	2	
32	'V' ring	1	‡
33	Inspection port cover	1	
34	Suction cover	1	‡
35	Fastener	SET	‡

## 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		
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	Position logging ring centrally under sealing holes of stuffing box. form
14	Speed too low.	Check motor RPM, supply frequency, Motor nameplate speed
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 Wilo Middle East FZE. Measure with pressure gauge.
18	Total head of system lower than pump design head.	Check the causes and refer to Wilo Middle East FZE. Measure with pressure gauge.
19	Specific gravity of liquid different from design.	Refer to Wilo Middle East FZE.
20	Viscosity of liquid different from design.	Refer to Wilo Middle East FZE.
21	Operation at very low capacity.	Check the causes and refer to Wilo Middle East FZE. Operate pump at rated duty.
22	Parallel operation of pumps unsuitable for such operation.	Refer to Wilo Middle East FZE 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.

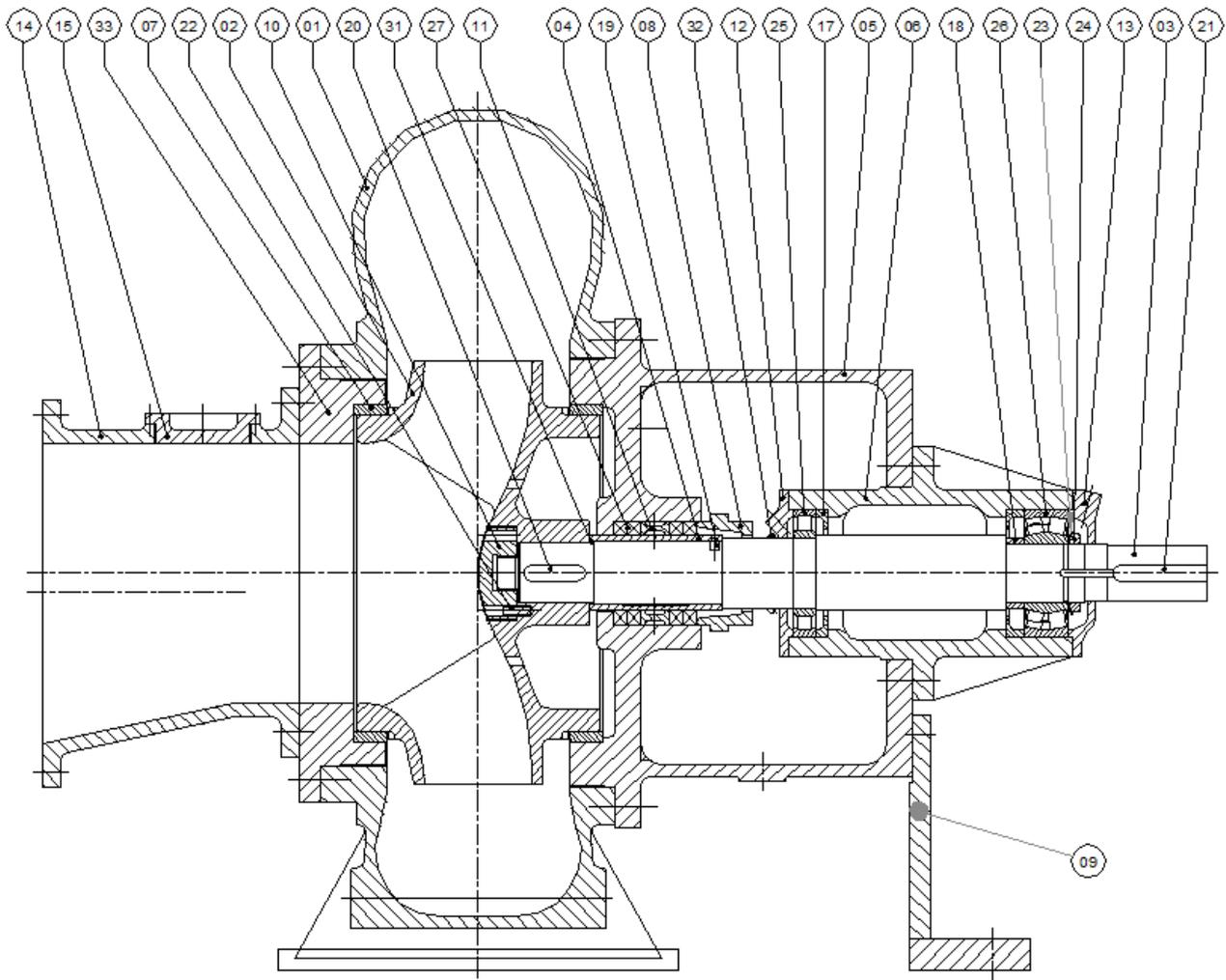
The Wilo Middle East FZE pumps do not contain any dangerous substances. The major part of the pump is recyclable. The disposal and recycling of the pump sets must be done in accordance with the local in force regulations.

The dismantling must be done by qualified personal.

Clean and decontamination must be achieved before any transportation or recycling

## Annexure

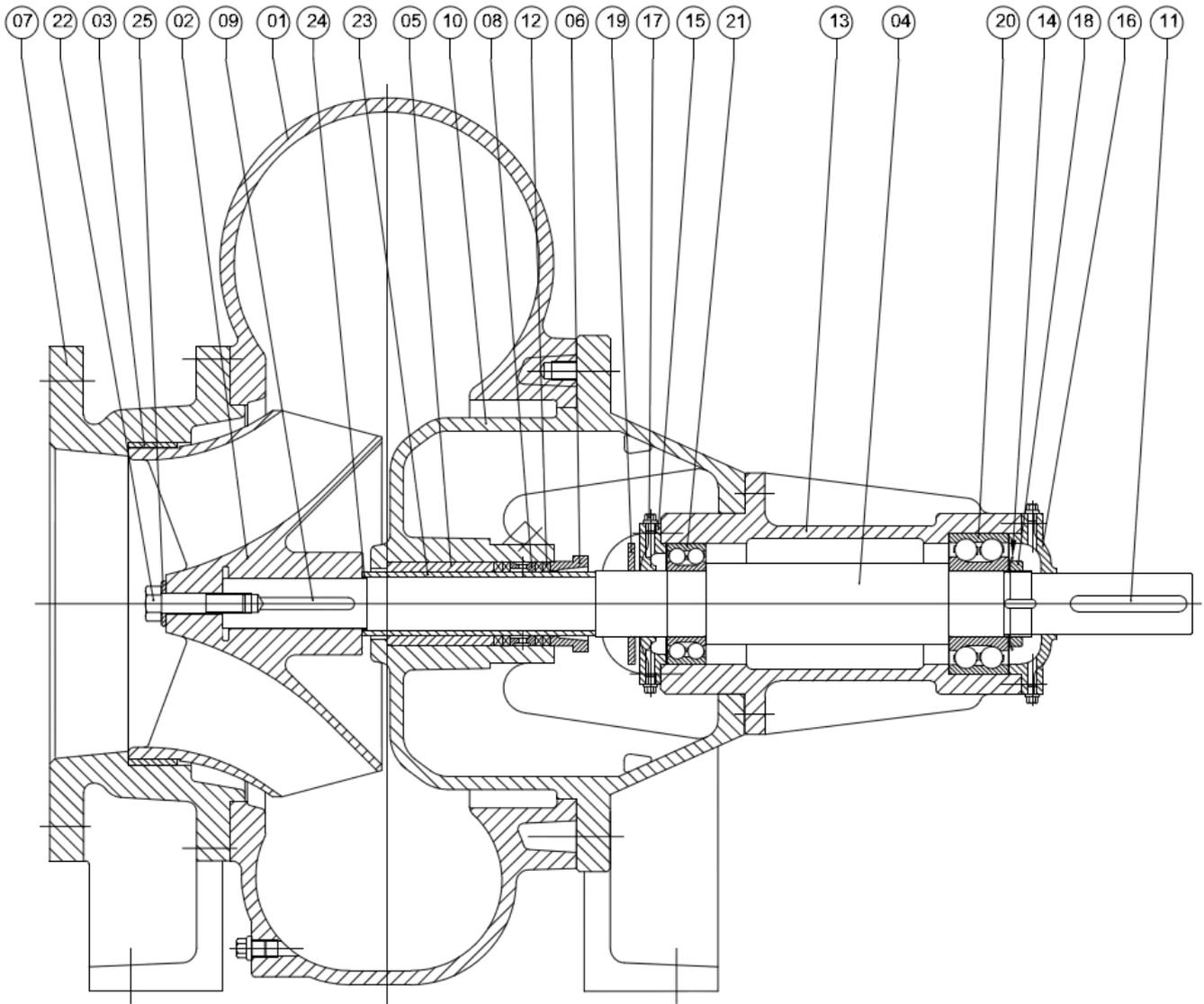
### Cross sectional Drawing of KN pump



No.	Part No.	Part Name	No.	Part No.	Part Name
1	01	Casing	18	18	Thrust collar
2	02	Impeller	19	19	Setting pin
3	03	Pump shaft	20	20	Key (Impeller)
4	04	Shaft sleeves	21	21	Key coupling
5	05	Stuffing box cover	22	22	Locking screw
6	06	Bearing house	23	23	Lock washer (SKF)
7	07	Neck ring	24	24	Lock nut (SKF)
8	08	Gland	25	25	Bearing NDE (SKF)
9	09	Support foot	26	26	Bearing DE (SKF)
10	10	Impeller lock nut	27	27	Gland packing
11	11	Logging ring	28	28	Gasket*
12	12	Bearing end cover (FE)	31	31	'O' ring
13	13	Bearing end cover	32	32	'V' ring
14	14	Suction pipe	33	33	Suction Cover
15	15	Hand hole cover (suction pipe)			
16	16	Hand hole cover (casing)*			
17	17	Grease shield			

\*Not shown in cross sectional view

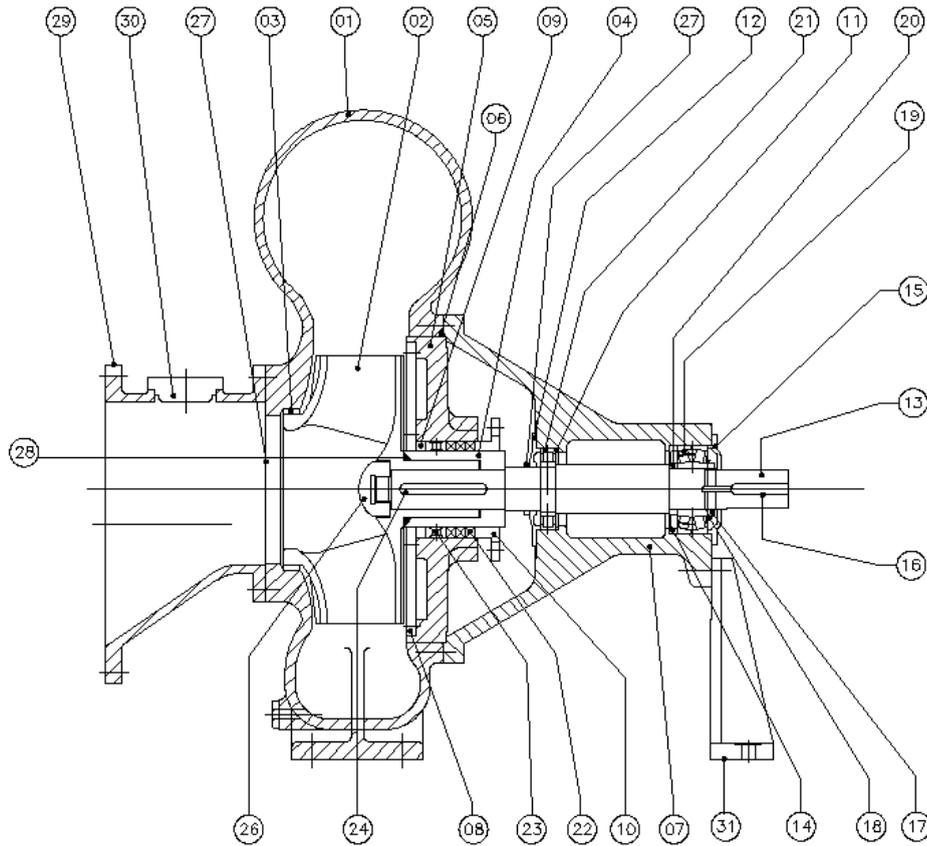
Cross sectional Drawing of MFV pump



No.	Part No.	Part Name	No.	Part No.	Part Name
1	01	Casing	15	15	Bearing End Cover (NDE)
2	02	Impeller	16	16	Bering End cover (DE)
3	03	Neck Ring	17	17	Grease shield
4	04	Shaft	18	18	Lock Nut
5	05	Bearing Bush	19	19	Water Thrower
6	06	Gland	20	20	Bearing(DE)
7	07	Suction cover	21	21	Bearing(NDE)
8	08	Logging ring	22	22	Impeller Lock screw
9	09	Impeller Key	23	23	Shaft Sleeve
10	10	Pump housing	24	24	'O' Ring
11	11	Coupling Key	25	25	Impeller Locking Washer
12	12	Gland packing	26	26	Hand hole cover (casing)*
13	13	Bearing housing	27	27	Gasket*
14	14	Lock washer			

\*Not shown in cross sectional view

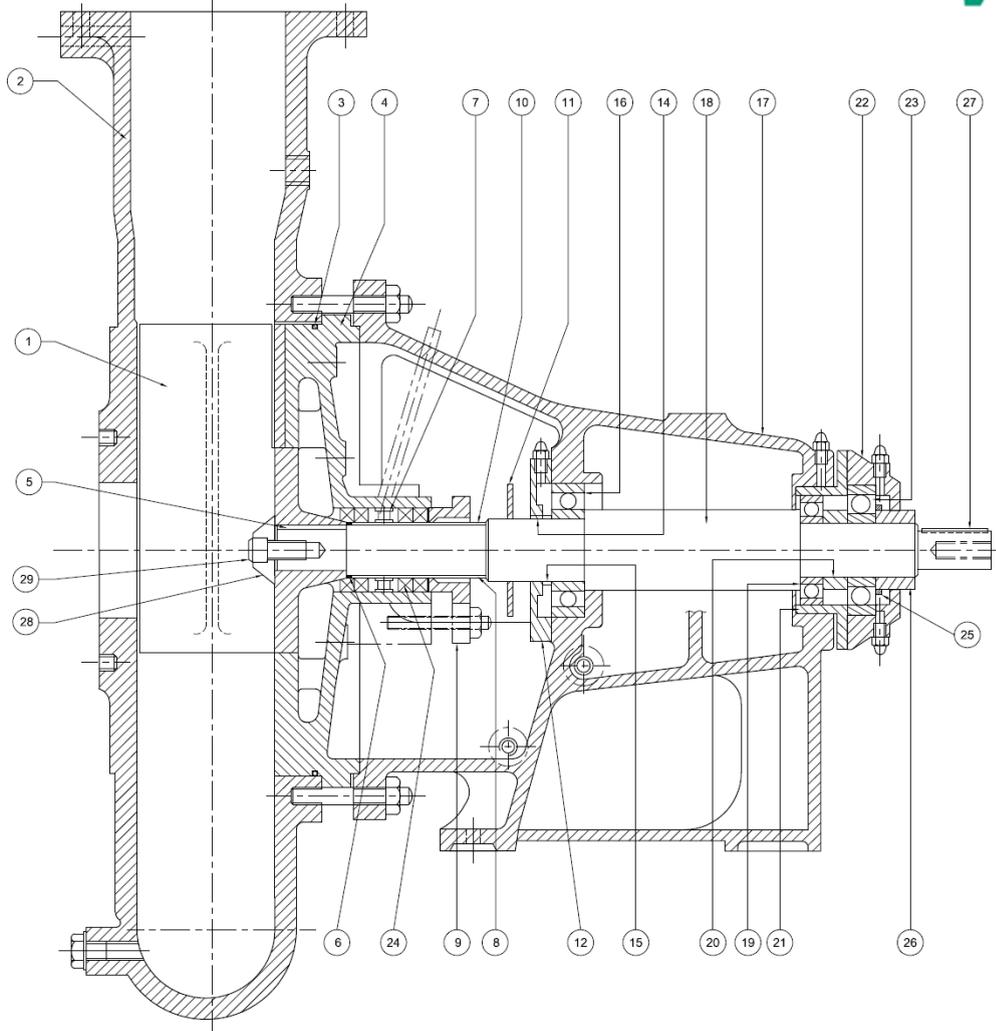
**Cross sectional Drawing of SW pump**



No.	Part No.	Part Name	No.	Part No.	Part Name
1	01	Casing	17	17	Lock nut (SKF)
2	02	Impeller	18	18	Locking Washer (SKF)
3	03	Neck Ring	19	19	Bearing DE. (SKF)
4	04	Shaft sleeves	20	20	Bearing Spacer
5	05	Back plate	21	21	Bearing NDE (SKF)
6	06	O ring	22	22	Gland Pack
7	07	Bearing housing	23	23	Logging Ring
8	08	Wearing plate	24	24	Impeller Key
9	09	Stuffing Box Bush	25	25	Gasket*
10	10	Gland	26	26	Impeller Cap Nut
11	11	Grease shield (FE)	27	27	V ring
12	12	Bearing end cover (FE)	28	28	O Ring
13	13	Pump shaft	29	29	Suction Taper Pipe
14	14	Grease shield (DE)	30	30	Hand hole Cover (suction pipe)
15	15	Bearing End Cover (DE)	31	31	Support Foot
16	16	Coupling Key			

\*Not shown in cross sectional view

Cross sectional Drawing of SK pump



No.	Part No.	Part Name	No.	Part No.	Part Name
1	01	Impeller	17	18	Shaft
2	02	Casing	18	19	Deep groove ball bearing
3	03	Casing seal ring	19	20	Bearing distance sleeve (inner)
4	04	Back plate	20	21	Thrust sleeve
5	05	Impeller Key	21	22	Thrust bearing cover
6	06	O ring	22	23	Deep groove ball bearing
7	07	Logging ring	23	24	Gland packing
8	08	Gland Sleeve	24	25	'V' ring seal (coupling end)
9	09	Gland	25	26	Bearing distance sleeve (outer)
10	10	Sleeve setting pin	26	27	Coupling key
11	11	Water thrower	27	28	Impeller nose cap
12	12	Bearing end cover	28	29	Impeller securing screw
13	14	'V' ring seal (impeller end)	29	30	Spacer sleeve
14	15	Setting piece			
15	16	Deep groove ball bearing			
16	17	Bearing pedestal			

**Pre-Starting Checks for Pump set**

<b>SI No</b>	<b>Activities</b>	<b>Checked on</b>	<b>Remarks</b>
1	Alignment with and without piping		
2	Flushing of pipe lines and ensure 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	Check all interlocks as specified / provided		
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.		



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