

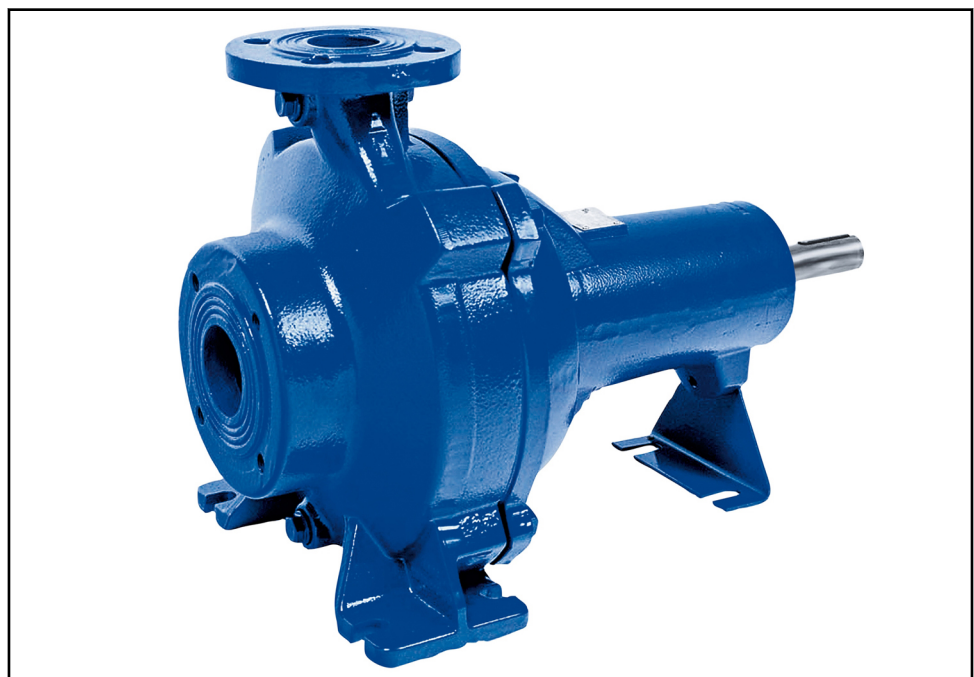
Dry-installed Volute Casing Pump

Sewatec

Bearing brackets S05, S06, S07, S08

50 / 60 Hz
DIN / IEC motors

Installation/Operating Manual



Mat. No.: 01104332

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Installation/Operating Manual Sewatec

Original operating manual

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Glossary

Back pull-out design

The complete back pull-out unit can be pulled out without having to remove the pump casing from the piping.

Certificate of decontamination

A certificate of decontamination is enclosed by the customer when returning the product to the manufacturer to certify that the product has been properly drained to eliminate any environmental and health hazards arising from components in contact with the fluid handled.

Discharge line

The line which is connected to the discharge nozzle

Hydraulic system

The part of the pump in which the kinetic energy is converted into pressure energy

Pump

Machine without drive, additional components or accessories

Pump set

Complete pump set consisting of pump, drive, additional components and accessories

Suction lift line/suction head line

The line which is connected to the suction nozzle

1 General

1.1 Principles

This operating manual is supplied as an integral part of the type series and variants indicated on the front cover. The manual describes the proper and safe use of this equipment in all phases of operation.

The name plate indicates the type series and size, the main operating data, the order number and the order item number. The order number and order item number uniquely identify the pump (set) and serve as identification for all further business processes.

In the event of damage, immediately contact your nearest KSB service centre to maintain the right to claim under warranty.

Noise characteristics see (⇒ Section 4.6 Page 18)

1.2 Installation of partly completed machinery

To install KSBpartly completed machinery supplied refer to the sub-sections under Servicing/Maintenance. (⇒ Section 7.5.7 Page 61)

1.3 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel. (⇒ Section 2.4 Page 10)

1.4 Other applicable documents

Table 1: Overview of other applicable documents

Document	Contents
Data sheet	Description of the technical data of the pump (set)
General arrangement drawing/ outline drawing	Description of mating and installation dimensions for the pump (set), weights
Drawing of auxiliary connections	Description of auxiliary connections
Hydraulic characteristic curve	Characteristic curves showing head, NPSH required, efficiency and power input
General assembly drawing ¹⁾	Sectional drawing of the pump
Sub-supplier product literature ¹⁾	Operating manuals and other product literature describing accessories and integrated machinery components
Spare parts lists ¹⁾	Description of spare parts
Piping layout ¹⁾	Description of auxiliary piping
List of components ¹⁾	Description of all pump components
Drawing for assembly	Sectional drawing for fitting the shaft seal


For accessories and/or integrated machinery components observe the relevant manufacturer's product literature.

1.5 Symbols

Table 2: Symbols used in this manual

Symbol	Description
✓	Conditions which need to be fulfilled before proceeding with the step-by-step instructions
▷	Safety instructions
↪	Result of an action
↔	Cross-references

¹⁾ If agreed to be included in the scope of supply

Symbol	Description
1. 2.	Step-by-step instructions
	Note Recommendations and important information on how to handle the product








2 Safety



All the information contained in this section refers to hazardous situations.

2.1 Key to safety symbols/markings

Table 3: Definition of safety symbols/markings

Symbol	Description
 DANGER	DANGER This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury.
 WARNING	WARNING This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.
 CAUTION	CAUTION This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.
	Explosion protection This symbol identifies information about avoiding explosions in potentially explosive atmospheres in accordance with EC Directive 94/9/EC (ATEX).
	General hazard In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury.
	Electrical hazard In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage.
	Machine damage In conjunction with the signal word CAUTION this symbol indicates a hazard for the machine and its functions.

2.2 General

This manual contains general installation, operating and maintenance instructions that must be observed to ensure safe pump operation and prevent personal injury and damage to property.

The safety information in all sections of this manual must be complied with.

This manual must be read and completely understood by the specialist personnel/operators responsible prior to installation and commissioning.

The contents of this manual must be available to the specialist personnel at the site at all times.

Information attached directly to the pump must always be complied with and be kept in a perfectly legible condition at all times. This applies to, for example:

- Arrow indicating the direction of rotation
- Markings for connections
- Name plate

The operator is responsible for ensuring compliance with all local regulations not taken into account in this manual.




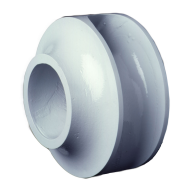
2.3 Intended use

The pump (set) must only be operated within the operating limits described in the other applicable documents.

- Only operate pump sets which are in perfect technical condition.
- Do not operate partially assembled pump sets.
- Only use the pump set to handle the fluids described in the data sheet or product literature of the pump model.

- Never operate the pump set without the fluid to be handled.
- Observe the limits for continuous operation specified in the data sheet or product literature ($Q_{min}^{2)}$ and $Q_{max}^{3)}$) (to prevent damage such as shaft fracture, bearing failure, mechanical seal damage, etc).
- When untreated waste water is handled the duty points in continuous operation lie within 0.7 to $1.2 \times Q_{opt}^{4)}$ to minimise the risk of clogging/hardening.
- Avoid duty points for continuous operation at very low speeds and small flow rates ($<0.7 \times Q_{opt}^{4)}$).
- Observe the maximum flow rates indicated in the data sheet or product literature (to prevent overheating, mechanical seal damage, cavitation damage, bearing damage, etc).
- Do not throttle the flow rate on the suction side of the pump set (to prevent cavitation damage).
- Consult the manufacturer about any use or mode of operation not described in the data sheet or product literature.
- Only use the different impeller types in combination with the fluids described below.

Table 4: Applications of impeller types

Impeller type		Suitable for the following fluids
	Free flow impeller (F impeller)	Fluids containing solids and stringy material as well as fluids with entrapped air or gas
	Closed single vane impeller (E impeller)	Fluids containing solids and stringy material
	Open, diagonal single vane impeller (D impeller)	Fluids containing solid substances and long fibres
	Closed multi-vane impeller (K impeller)	Solids-laden, non-gaseous fluids not containing stringy material

2) Minimum permissible flow rate
 3) Maximum permissible flow rate
 4) Best efficiency point

Prevention of foreseeable misuse

- Observe the minimum flow velocities required to fully open the swing check valves to prevent the reduction of pressure and risk of clogging. (Contact the manufacturer for the required minimum flow velocities/loss coefficients.)
- Never exceed the permissible operating limits specified in the data sheet and in the product literature regarding pressure, temperature, etc.
- Observe all safety information and instructions in this manual.

2.4 Personnel qualification and training

All personnel involved must be fully qualified to transport, install, operate, maintain and inspect the machinery this manual refers to.

The responsibilities, competence and supervision of all personnel involved in transport, installation, operation, maintenance and inspection must be clearly defined by the operator.

Deficits in knowledge must be rectified by means of training and instruction provided by sufficiently trained specialist personnel. If required, the operator can commission the manufacturer/supplier to train the personnel.

Training on the pump (set) must always be supervised by technical specialist personnel.

2.5 Consequences and risks caused by non-compliance with this manual

- Non-compliance with this operating manual will lead to forfeiture of warranty cover and of any and all rights to claims for damages.
- Non-compliance can, for example, have the following consequences:
 - Hazards to persons due to electrical, thermal, mechanical and chemical effects and explosions
 - Failure of important product functions
 - Failure of prescribed maintenance and servicing practices
 - Hazard to the environment due to leakage of hazardous substances

2.6 Safety awareness

In addition to the safety information contained in this manual and the intended use, the following safety regulations shall be complied with:

- Accident prevention, health and safety regulations
- Explosion protection regulations
- Safety regulations for handling hazardous substances
- Applicable standards and laws

2.7 Safety information for the operator/user

- The operator shall fit contact guards for hot, cold and moving parts and check that the guards function properly.
- Do not remove any contact guards while the pump is running. The only exception is the guard of the packing chamber.
- Provide the personnel with protective equipment and make sure it is used.
- Contain leakages (e.g. at the shaft seal) of hazardous fluids handled (e.g. explosive, toxic, hot) so as to avoid any danger to persons and the environment. Adhere to all relevant laws.
- Eliminate all electrical hazards. (In this respect refer to the applicable national safety regulations and/or regulations issued by the local energy supply companies.)

- Provided that switching off the pump does not increase potential risk, fit an emergency-stop control device in the immediate vicinity of the pump (set) during pump set installation.

2.8 Safety information for maintenance, inspection and installation work

- Modifications or alterations of the pump are only permitted with the manufacturer's prior consent.
- Use only original spare parts or parts authorised by the manufacturer. The use of other parts can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that all maintenance, inspection and installation work is performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
- Only carry out work on the pump (set) during standstill of the pump.
- The pump casing must have cooled down to ambient temperature.
- Pump pressure must have been released and the pump must have been drained.
- When taking the pump set out of service always adhere to the procedure described in the manual.
- Decontaminate pumps which handle fluids posing a health hazard.
- As soon as the work has been completed, re-install and/or re-activate any safety-relevant and protective devices. Before returning the product to service, observe all instructions on commissioning. (⇒ Section 6.1 Page 34)

2.9 Unauthorised modes of operation

Never operate the pump (set) outside the limits stated in the data sheet and in this manual.

The warranty relating to the operating reliability and safety of the supplied pump (set) is only valid if the equipment is used in accordance with its intended use.

2.10 Explosion protection



Always observe the information on explosion protection given in this section when operating an explosion-proof pump set.

Sections of the manual marked by the Ex symbol apply to explosion-proof pump sets also when temporarily operated outside potentially explosive atmospheres. Only pumps/pump sets marked as explosion-proof **and** identified as such in the data sheet must be used in potentially explosive atmospheres.

Special conditions apply to the operation of explosion-proof pump sets in accordance with EC Directive 94/9/EC (ATEX).

Especially adhere to the sections in this manual marked with the Ex symbol.

The explosion-proof status of the pump set is only assured if the pump set is used in accordance with its intended use.

Never operate the pump (set) outside the limits stated in the data sheet and on the name plate.

Prevent impermissible modes of operation at all times.

3 Transport/Temporary Storage/Disposal

3.1 Checking the condition upon delivery

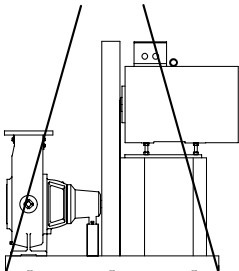
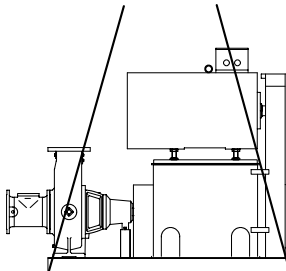
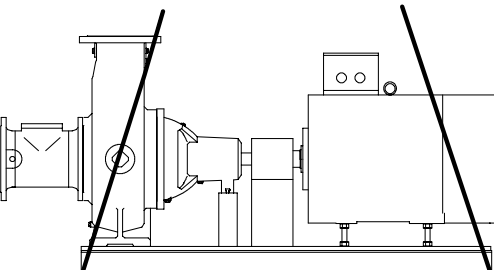
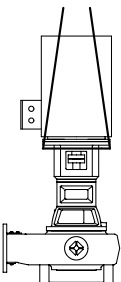
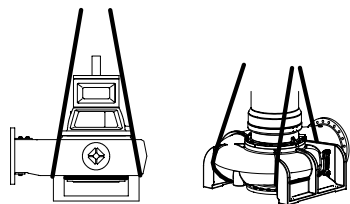
1. On transfer of goods, check each packaging unit for damage.
2. In the event of in-transit damage, assess the exact damage, document it and notify KSB or the supplying dealer (as applicable) and the insurer about the damage in writing immediately.

3.2 Transport

	<p>⚠ DANGER</p>
	<p>The pump (set) could slip out of the suspension arrangement Danger to life from falling parts!</p> <ul style="list-style-type: none"> ▶ Always transport the pump (set) in the specified position. ▶ Never attach the suspension arrangement to the free shaft end or the motor eyebolt. ▶ Give due attention to the weight data and the centre of gravity. ▶ Observe the applicable local health and safety regulations. ▶ Use suitable, permitted lifting accessories, e.g. self-tightening lifting tongs.
	<p>⚠ WARNING</p>
	<p>Uncontrolled lifting of the pump (set) or drive Risk of injury!</p> <ul style="list-style-type: none"> ▶ Maintain adequate safety distance during lifting operations (load may swing when being lifted).

To transport the pump/pump set suspend it from the lifting tackle as shown below. For configurations as shown in figures e, f and g attach hoisting chains to the hooks welded to the baseplate. Use 2 rope loops each for configurations as shown in figures h and i.

<p>Fig. a)</p>	<p>Fig. b)</p>
<p>Transporting the pump</p>	<p>Transporting the pump set on the baseplate</p>
<p>Fig. c)</p>	<p>Fig. d)</p>
<p>Transporting the pump on the baseplate</p>	<p>Transporting the pump set with belt drive and flanged motor</p>

<p>Fig. e)</p> 	<p>Fig. f)</p> 
<p>Transporting the pump set with belt drive and foot-mounted motor Use the hooks welded to the baseplate!</p>	<p>Transporting the pump set with belt drive, counter shaft and foot-mounted motor Use the hooks welded to the baseplate!</p>
<p>Fig. g)</p> 	
<p>Transporting the pump set on the baseplate Use the hooks welded to the baseplate!</p>	
<p>Fig. h)</p> 	<p>Fig. i)</p> 
<p>Transporting the pump set in vertical position Loop two ropes around to the motor stool/drive lantern.</p>	<p>Transporting the pump in vertical position Loop two ropes around the integrally cast feet of the pump casing.</p>

3.3 Storage/Preservation

If commissioning is to take place some time after delivery, we recommend that the following measures be taken for pump (set) storage.




	<p>CAUTION</p> <p>Damage during storage by humidity, dirt, or vermin Corrosion/contamination of the pump (set)!</p> <ul style="list-style-type: none"> ▸ For outdoor storage cover the packed or unpacked pump (set) and accessories with waterproof material.
	<p>CAUTION</p> <p>Wet, contaminated or damaged openings and connections Leakage or damage to the pump set!</p> <ul style="list-style-type: none"> ▸ Only remove caps/covers from the openings of the pump set at the time of installation.

Table 5: Ambient conditions for storage

Ambient conditions	Value
Relative humidity	5 % to 85 % (non-condensing)
Ambient temperature	- 10 °C to + 70 °C

- Store the pump set under dry and vibration-free conditions, if possible in its original packaging. (⇒ Section 6.3 Page 36)
 - Rotate the shaft once a week.
1. Spray-coat the inside wall of the pump casing, and in particular the impeller clearance areas, with a preservative.
 2. Spray the preservative through the suction and discharge nozzles. It is advisable to then close the pump nozzles (e.g. with plastic caps or similar).


	NOTE
	Observe the manufacturer's instructions for application/removal of the preservative.

3.4 Return to supplier

1. Drain the pump as per operating instructions. (⇒ Section 7.3 Page 44)
2. Always flush and clean the pump, particularly if it has been used for handling noxious, explosive, hot or other hazardous fluids.
3. If the pump set has handled fluids whose residues could lead to corrosion in the presence of atmospheric humidity or could ignite upon contact with oxygen, the pump set must also be neutralised, and anhydrous inert gas must be blown through the pump to ensure drying.
4. Always complete and enclose a certificate of decontamination when returning the pump (set).
Always indicate any safety and decontamination measures taken. (⇒ Section 11 Page 82)

	NOTE
	If required, a blank certificate of decontamination can be downloaded from the KSB web site at: www.ksb.com/certificate_of_decontamination

3.5 Disposal

	⚠ WARNING
	<p>Fluids, consumables and supplies which are hot and/or pose a health hazard Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▸ Collect and properly dispose of flushing fluid and any residues of the fluid handled. ▸ Wear safety clothing and a protective mask, if required. ▸ Observe all legal regulations on the disposal of fluids posing a health hazard.

1. Dismantle the pump (set).
Collect greases and other lubricants during dismantling.
2. Separate and sort the pump materials, e.g. by:
 - Metals
 - Plastics
 - Electronic waste
 - Greases and other lubricants
3. Dispose of materials in accordance with local regulations or in another controlled manner.

4 Description of the Pump (Set)

4.1 General description

Pump for handling untreated sewage and all types of waste water.

- Volute casing pump with single vane impeller, multi-vane impeller, free flow impeller or open diagonal single vane impeller.
- Electric motor connected to the pump via a coupling, belt drive or cardan shaft.

Table 6: Horizontal installation

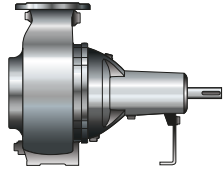
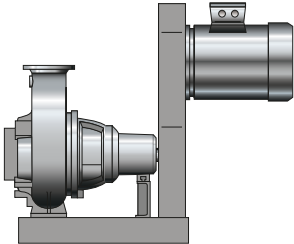
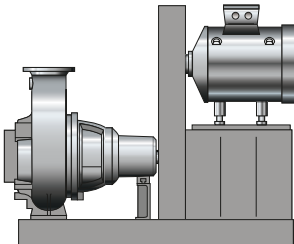
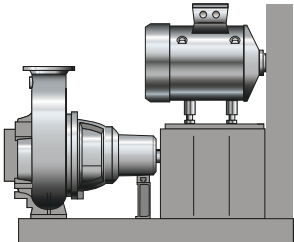
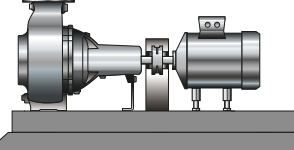
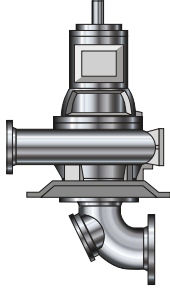
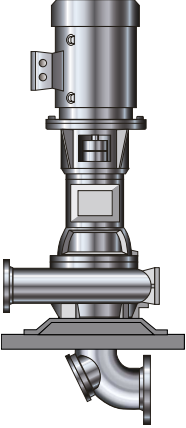
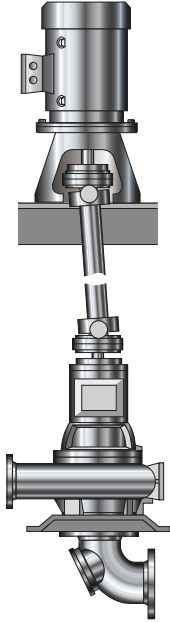
Installation type	Drawing	Description
Figure 0		Bare shaft pump
Figure 3 HZ		Pump set with baseplate, belt drive and belt guard
Figure 3 HM		Pump set with baseplate, belt drive, belt guard and motor stand
Figure 3 HVG		Pump set with baseplate, coupling (also with coupling spacer), coupling guard, counter shaft stand, counter shaft, motor stand, belt drive and belt guard
Figure 3 EN Figure 3 ENH		Pump set with baseplate, coupling (also with coupling spacer) and coupling guard

Table 7: Vertical installation

Installation type	Drawing	Description
Figure V		Bare shaft pump, sole plate and suction elbow
Figure VU		Pump set with sole plate and foundation, coupling, coupling guard and suction elbow
Figure VGG		Pump set with sole plate for pump and motor, supporting frame, motor stool/drive lantern, suction elbow and Cardan shaft

4.2 Designation

Example: Sewatec F 100 - 250 / G V

Table 8: Key to the designation

Code	Description
Sewatec	Type series
F	Impeller type
100	Nominal discharge nozzle diameter [mm]
250	Nominal impeller diameter [mm]
G	Material variant
V	Type of installation

4.3 Name plate



Fig. 1: Name plate (example)

1	Designation of the pump set	2	Order number
3	Flow rate	4	Speed
5	Weight of Fig. 0 pump	6	Year of supply
7	Order item number	8	Head
9	Series number		

4.4 Design details

Design

- Volute casing pump
- Back pull-out design
- Single-stage
- Various, application-oriented installation types (⇒ Section 4.1 Page 15)

Impeller types

- Various, application-based impeller types (⇒ Section 2.3 Page 8)

Bearings

- Grease-packed rolling element bearings with re-lubrication system on pump and drive end

Shaft seal

- Two bi-directional mechanical seals in tandem arrangement, with liquid reservoir
- Gland packing

4.5 Design and function

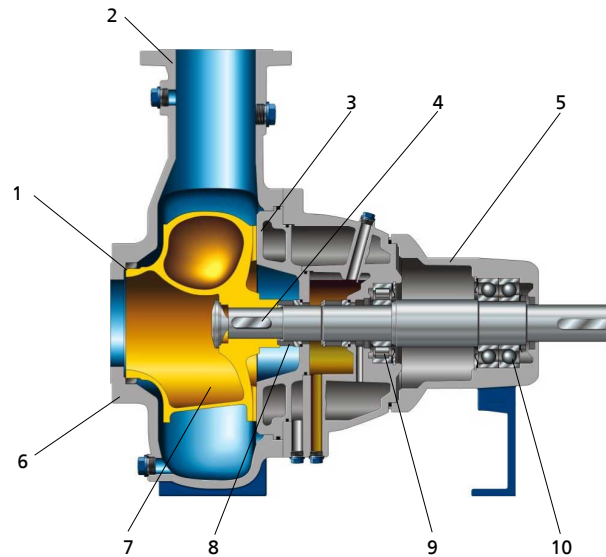


Fig. 2: Sectional drawing with single vane impeller

1	Clearance gap	2	Discharge nozzle
3	Discharge cover	4	Shaft
5	Bearing bracket	6	Suction nozzle
7	Impeller	8	Shaft seal
9	Rolling element bearing	10	Rolling element bearing

- Design** The pump is designed with an axial fluid inlet and a radial or tangential outlet. The hydraulic system runs on its own bearings and is connected to the motor by a shaft coupling or belt drive.
- Function** The fluid enters the pump axially via the suction nozzle (6) and is accelerated outward by the rotating impeller (7). In the flow passage of the pump casing the kinetic energy of the fluid is converted into pressure energy. The fluid is pumped to the discharge nozzle (2), where it leaves the pump. The clearance gap (1) prevents any fluid from flowing back from the casing to the suction nozzle. At the rear side of the impeller, the shaft (4) enters the casing via the casing cover (3). The shaft passage through the cover is sealed towards the atmosphere with a shaft seal (8). The shaft runs in rolling element bearings (9 and 10), which are supported by a bearing bracket (5) linked with the pump casing and/or casing cover.
- Sealing** The pump is sealed by two bi-rotational mechanical seals in tandem arrangement or with a gland packing.

4.6 Noise characteristics

Table 9: Surface sound pressure level L_{pA} ⁵⁾

Rated power input P_N	Pump			Pump set		
	2900 rpm (3500 rpm)	1450 rpm (1750 rpm)	960/760 rpm (1160/875 rpm)	2900 rpm (3500 rpm)	1450 rpm (1750 rpm)	960/760 rpm (1160/875 rpm)
[kW]	dB	dB	dB	dB	dB	dB
11,0	62,5	60,5	59,5	72,5	67,0	65,5
15,0	64,0	61,5	60,5	73,5	68,0	66,5
18,5	64,5	62,5	61,5	74,0	68,5	67,5
22,0	65,5	63,5	62,5	74,5	69,0	68,0
30,0	67,0	65,0	63,5	75,0	70,5	69,0
37,0	68,0	65,5	64,5	75,5	71,0	69,5
45,0	68,5	66,5	65,5	77,0	71,5	70,5

⁵⁾ Measured at a distance of 1 m from the pump outline (as per DIN 45635 Part 1 and 24)

Rated power input P_N	Pump			Pump set		
	2900 rpm (3500 rpm)	1450 rpm (1750 rpm)	960/760 rpm (1160/875 rpm)	2900 rpm (3500 rpm)	1450 rpm (1750 rpm)	960/760 rpm (1160/875 rpm)
[kW]	dB	dB	dB	dB	dB	dB
55,0	69,5	67,5	66,5	77,5	72,5	71,0
75,0	71,0	68,5	67,5	78,0	73,5	72,0
90,0	71,5	69,5	68,5	78,5	74,0	72,5
110,0	73,0	70,5	69,5	79,0	74,5	73,0
132,0	--	72,0	71,0	--	75,0	73,5
160,0	--	73,0	72,0	--	75,5	74,0
200,0	--	75,0	73,5	--	76,0	74,5
250,0	--	76,0	75,0	--	80,0	79,0
315,0	--	78,5	77,0	--	81,0	79,5
355,0	--	79,0	78,0	--	81,5	80,0
400,0	--	79,5	78,5	--	82,0	80,5
500,0	--	81,5	80,0	--	82,5	81,5



NOTE

For belt-driven pump sets add 2 dB.

4.7 Scope of supply

Depending on the model, the following items are included in the scope of supply:

- Pump
- Drive
- Baseplate or sole plate
- Coupling and coupling guard
- Belt drive and belt guard
- Suction-side flanged taper piece or suction elbow with inspection hole
- Cardan shaft

4.8 Dimensions and weights

For dimensions and weights please refer to the data sheet of the pump (set).

- Pump weight: See name plate of the pump.
- Motor weight: See motor product literature.
- Weight of the shipping unit base frame with pump: See weight indicated on the base frame.
- Weight of the shipping unit base frame with pump and motor: See weight indicated on the base frame.



NOTE

Some individual components weigh more than 25 kg. Observe the weights indicated.

5 Installation at Site

5.1 Checks to be carried out prior to installation

Place of installation

	⚠ WARNING
	<p>Installation on mounting surface which is unsecured and cannot support the load Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Use a concrete of compressive strength class C12/15 which meets the requirements of exposure class XC1 to EN 206-1. ▷ The mounting surface must have set and must be completely horizontal and even. ▷ Observe the weights indicated.

1. Check the structural requirements.
All structural work required must have been prepared in accordance with the dimensions stated in the outline drawing/general arrangement drawing.

5.2 Installing the pump set in horizontal position

For installation types 3E and 3H

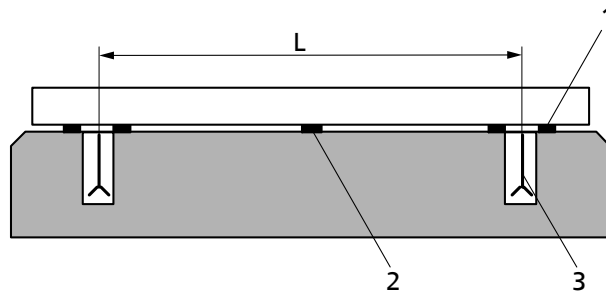


Fig. 3: Installation on a foundation with chemical anchors

L	Bolt-to-bolt distance	1	Shim
2	Shim if (1) > 800 mm	3	Chemical anchors

- ✓ The foundation has the required strength and characteristics.
 - ✓ The foundation has been prepared in accordance with the dimensions given in the outline drawing/general arrangement drawing.
1. Position the pump set on the foundation and level it with the help of a spirit level placed on the shaft and discharge nozzle.
Permissible deviation 0.2 mm/m.
 2. Use shims (2) for height compensation, if necessary.
Always fit shims, if any, immediately to the left and right of the chemical anchors (4) between the baseplate/foundation frame and the foundation.
For a bolt-to-bolt distance ($L \geq 800$ mm) fit additional shims (2) halfway between the adjoining holes.
All shims must lie perfectly flush.
 3. Drill the holes as specified in the table "Chemical anchor bolt dimensions". Then clean the holes.

	⚠ WARNING
	<p>Improper handling of mortar cartridges Skin sensitisation or irritation!</p> <ul style="list-style-type: none"> ▷ Wear suitable protective clothing.

4. Insert the mortar cartridges into the drilled holes.
Observe the curing times of the mortar cartridges!

5. Insert threaded rods into the corresponding drilled holes with an electric tool (e.g. impact drill, hammer drill).
6. After the curing time (see table), tighten the chemical anchors (4) evenly and tightly.
7. Grout the baseplate using low-shrinkage concrete.

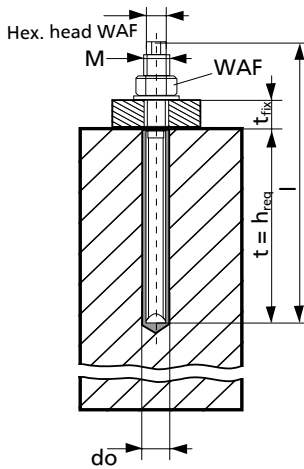


Fig. 4: Dimensions

Table 10: Chemical anchor bolt dimensions

Bolt size	d _o [mm]	t=h _{req} [mm]	t _{fix} [mm]	WAF [mm]	M [mm]	Hex. head WAF [mm]	Torque [Nm]
M 10x130	12	90	20	17	10	7	20
M 12x160	14	110	25	19	12	8	40
M 16x190	18	125	35	24	16	12	60
M 20x260	25	170	65	30	20	12	120
M 24x300 ⁶⁾	28	210	65	36	24	-	150
M 30x380 ⁶⁾	35	280	65	46	30	-	300

Table 11: Curing times of resin capsule

Floor temperature	Curing time [min]
-5 °C to 0 °C	240
0 °C to +10 °C	45
+10 °C to +20 °C	20
> +20 °C	10

5.3 Installing the pump set in vertical position

The pump (set) is installed on horizontally aligned foundation rails. Depending on the pump size, the pump (set) is either mounted on a separate sole plate or on integrally cast feet.

- ✓ The foundation has been prepared in accordance with the dimensions given in the outline drawing/general arrangement drawing.
1. Lift the pump set with the hoisting tackle and lower it down onto the prepared foundation.
 2. Insert hexagon head bolts 901.16 with discs 550.16 into the drilled holes provided and tighten the bolts.

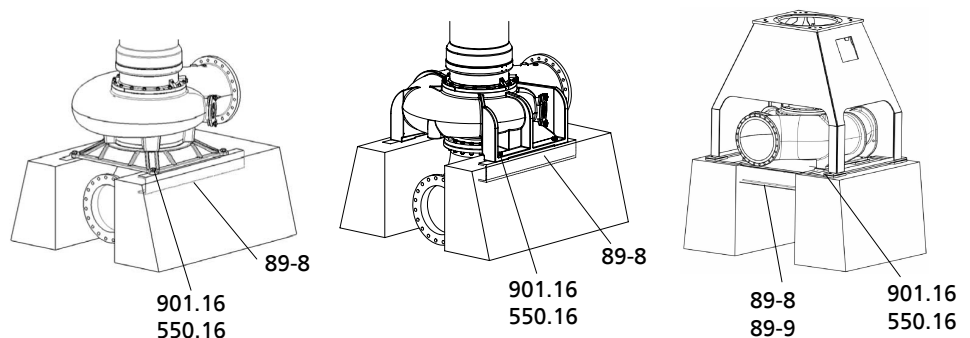


Fig. 5: Vertical installation


89-8	Foundation rail	89-9	Foundation frame
550.16	Disc	901.16	Hexagon head bolt

The following instructions apply to installation with motor pedestal:


⁶⁾ Mounting accessories of respective manufacturer required.


1. After fastening the pump, use lifting tackle to lift the motor pedestal and lower it down onto the prepared foundation.
2. Insert hexagon head bolts 901.16 with discs 550.16 into the drilled holes provided in the foundation frame or foundation rails. Tighten the bolts.

5.4 Piping

	NOTE
<p>When installing pumps in piping systems make sure to avoid any resonances at the usual excitation frequencies (e.g. 1x or 2x rotational frequency or rotational noise) in the connected piping and in the foundation. See DIN ISO 10816-3.</p>	

5.4.1 Connecting the piping

	⚠ DANGER
<p>Impermissible loads acting on the pump nozzles Danger to life from leakage of hot, toxic, corrosive or flammable fluids!</p> <ul style="list-style-type: none"> ▷ Do not use the pump as an anchorage point for the piping. ▷ The pipelines have been anchored in close proximity to the pump and connected without transmitting any stresses or strains. ▷ Observe permissible forces and moments at the pump nozzles. ▷ Take appropriate measures to compensate thermal expansion of the piping. 	

	NOTE
<p>It is recommended to install check and shut-off elements in the system, depending on the type of plant and pump. However, such elements must not obstruct proper drainage or hinder disassembly of the pump.</p>	

- ✓ The suction lift line has been laid with a rising slope, the suction head line with a downward slope towards the pump.
 - ✓ A flow stabilisation section having a length equivalent to at least twice the diameter of the suction flange has been provided upstream of the suction flange.
 - ✓ The nominal diameters of the pipelines are equal to or greater than the nominal diameters of the pump nozzles.
 - ✓ Adapters to larger nominal diameters are designed with a diffuser angle of approx. 8° to avoid excessive pressure losses.
 - ✓ The pipelines have been anchored in close proximity to the pump and connected without transmitting any stresses or strains.
1. Before installing the pump in the piping, remove the flange covers on the suction and discharge nozzles of the pump.
 2. Connect the pump nozzles to the piping.

5.4.2 Permissible forces and moments at the pump nozzles

The nozzle forces and moments are taken from ISO 9905. They apply to every pump nozzle, taking into account the markings for the three axes of the respective flange.

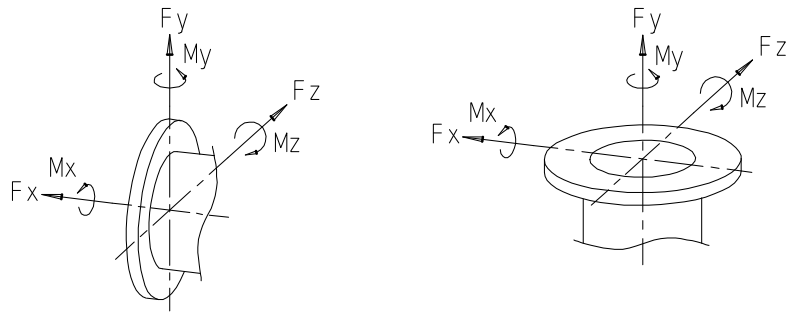


Fig. 6: Forces and moments at the pump nozzles for horizontal installation

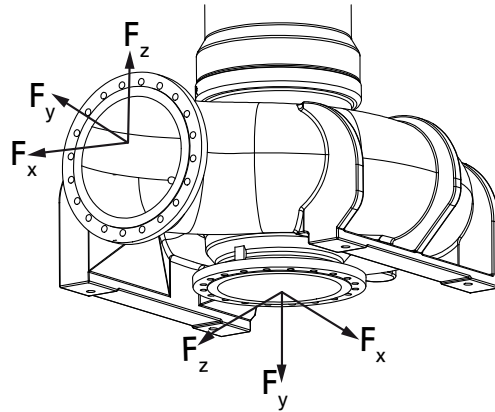


Fig. 7: Forces and moments at the pump nozzles for horizontal installation

Table 12: Forces and moments at the pump nozzles

	DN	Forces [N]				Moments [Nm]			
	[mm]	F _y	F _z	F _x	Σ F	M _y	M _z	M _x	Σ M
Horizontally installed pump • Nozzle on top • Z-axis	100	2700	3350	3000	5250	1250	1450	1750	2600
	125	3400	4200	3750	6600	1500	1750	2100	3150
	150	4050	5000	4500	7850	1750	2050	2500	3650
	200	5400	6700	6000	10450	2300	2650	3250	4800
	250	6750	8350	7450	13050	3150	3650	4450	6550
	300	8050	10000	8950	15650	4300	4950	6050	8900
	350	9400	11650	10450	18250	5500	6350	7750	11400
	400	10750	13300	11950	20850	6900	7950	9700	14300
	500	13450	16600	14950	26050	10250	11800	14450	21300
	600	16150	19900	17950	31250	14400	16600	20200	29900
Vertically installed pump • Discharge nozzle arranged laterally, at a right angle to the shaft • Y-axis	100	3350	2700	3000	5250	1250	1450	1750	2600
	125	4200	3400	3750	6600	1500	1750	2100	3150
	150	5000	4050	4500	7850	1750	2050	2500	3650
	200	6700	5400	6000	10450	2300	2650	3250	4800
	250	8350	6750	7450	13050	3150	3650	4450	6550
	300	10000	8050	8950	15650	4300	4950	6050	8900
	350	11650	9400	10450	18250	5500	6350	7750	11400
	400	13300	10750	11950	20850	6900	7950	9700	14300
	500	16600	13450	14950	26050	10250	11800	14450	21300
	600	19900	16150	17950	31250	14400	16600	20200	29900
700	22500	19100	20800	36600	17200	21000	25700	37300	

5.4.3 Vacuum balance line

	NOTE
	Where fluid has to be pumped out of a vessel under vacuum, it is recommended to install a vacuum balance line.

The following rules apply to vacuum balance lines:

- Minimum nominal line diameter 25 mm.
- The line extends above the highest permissible fluid level in the vessel.

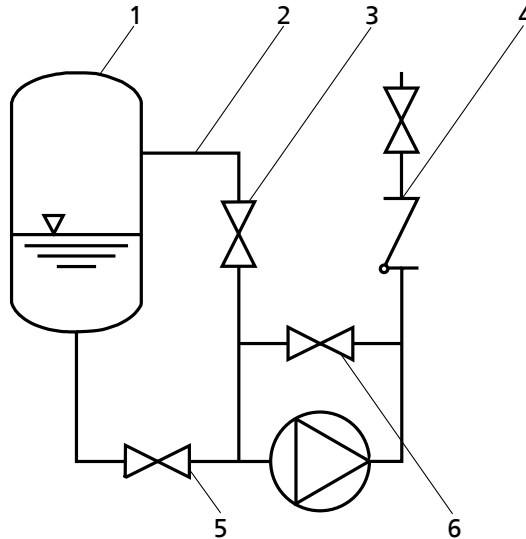


Fig. 8: Vacuum balance system

1	Vessel under vacuum	2	Vacuum balance line
3	Shut-off element	4	Swing check valve
5	Main shut-off element	6	Vacuum-tight shut-off element

	NOTE
	An additional line (from the pump discharge nozzle to the balance line) fitted with a shut-off element facilitates venting of the pump before start-up.

5.5 Auxiliary connections

	⚠ WARNING
	Screw plugs subjected to pressure Risk of injuries by parts flying off and escaping fluid!
	<ul style="list-style-type: none"> ▸ Never use screw plugs for releasing pressure from the pump casing. ▸ Always use suitable venting devices (e.g. vent valve).

The following auxiliary connections are available:

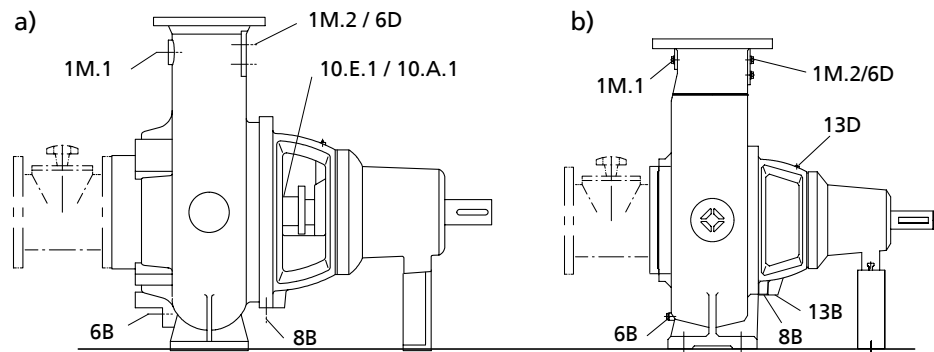


Fig. 9: Auxiliary connections: **a)** Pump with gland packing, **b)** Pump with mechanical seal

Table 13: Auxiliary connections part 1

Connection	Description	Size				
		D 80 - 315 100 - 401 D 100 - 315	150 - 400 150 - 401 151 - 401 200 - 400 200 - 501	200 - 330 250 - 400 250 - 401 300 - 400 300 - 401	K 150 - 500 E 200 - 500 K 200 - 500 E 250 - 500 E 250 - 630	K 200 - 631 K 350 - 710 K 400 - 500 K 600 - 710 K 700 - 900
1 M.1	Pressure gauge (for horizontal installation only)	G 1/2		G 1	G 1/2	
1 M.2	Pressure gauge (for vertical installation only)	G 1/2				
6 D	Venting	G 1	G 1 1/4			
3 M	Pressure/vacuum gauge	G 1/2				
6 B	Casing drain	G 1 ⁷⁾				
8 B	Leakage check/drain	G 1/2				
For variants with mechanical seal						
13 D	Lubricant filler opening	G 1/2				
13 B	Lubricant drain	G 1/2				
Variants with gland packing						
10.E.1	Filler opening for barrier fluid	G 3/8				
10.A.1	Drain hole for barrier fluid	G 3/8				

Table 14: Auxiliary connections part 2

Connection	Description	Size				
		K 300 - 500 K 350 - 500 K 350 - 501 K 250 - 630 K 350 - 630 E 300 - 630	K 400 - 630 K 500 - 630 K 500 - 632	E 350 - 710	K 600 - 520	
1 M.1	Pressure gauge (for horizontal installation only)	G 1/2		G 1	G 1/2	
1 M.2	Pressure gauge (for vertical installation only)	G 1/2				
6 D	Venting	G 1 1/4	G 1 1/2	G 1	G 2	
3 M	Pressure/vacuum gauge	G 1/2				
6 B	Casing drain	G 1		G 1 1/2		
8 B	Leakage check/drain	G 1/2				
For variants with mechanical seal						
13 D	Lubricant filler opening	G 1/2				
13 B	Lubricant drain	G 1/2				
Variants with gland packing						

⁷⁾ At D 80 - 315 = G 1/2

Connection	Description	Size			
		K 300 - 500 K 350 - 500 K 350 - 501 K 250 - 630 K 350 - 630 E 300 - 630	K 400 - 630 K 500 - 630 K 500 - 632	E 350 - 710	K 600 - 520
10.E.1	Filler opening for barrier fluid			G ³ / ₈	
10.A.1	Drain hole for barrier fluid			G ³ / ₈	

5.6 Checking the coupling alignment

⚠ DANGER

Inadmissible temperatures at the coupling or bearings due to misalignment of the coupling
 Explosion hazard!
 Risk of burns!

- ▶ Make sure that the coupling is correctly aligned at all times.

CAUTION

Misalignment of pump and motor shafts
 Damage to pump, motor and coupling!

- ▶ Always check the coupling after the pump has been installed and connected to the piping.
- ▶ Also check the coupling of pump sets supplied with pump and motor mounted on the same baseplate.

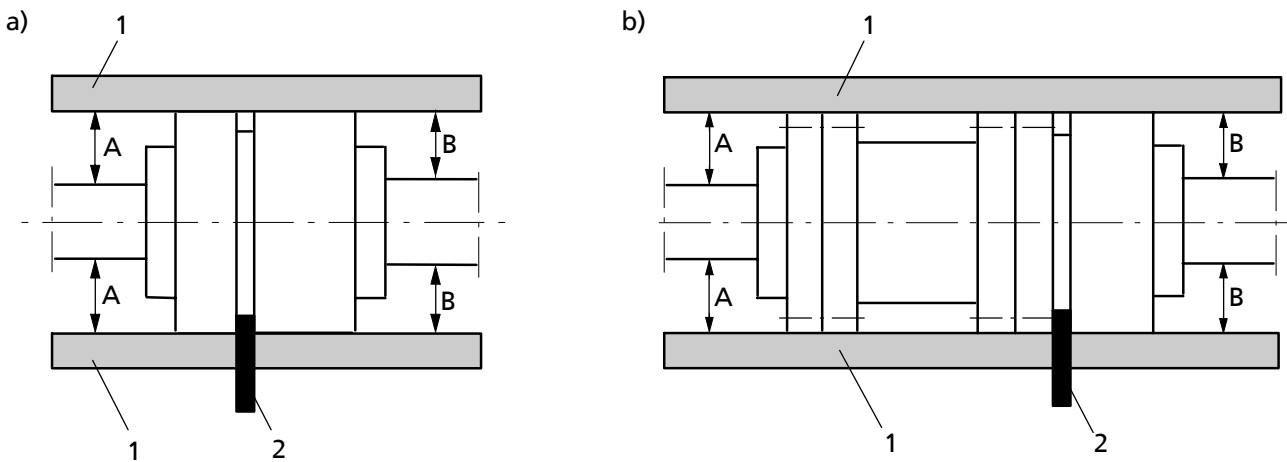


Fig. 10: Checking the coupling alignment: Coupling without spacer sleeve (a) or Coupling with spacer sleeve (b)

1	2
Straight-edge	Gauge

- ✓ The coupling guard and its footboard, if any, have been removed.
- 1. Loosen the support foot and re-tighten it without transmitting any stresses and strains.
- 2. Place the straight-edge axially on both coupling halves.
- 3. Leave the straight-edge in this position and turn the coupling by hand.
 The coupling is aligned correctly if the distances A and B to the respective shafts are the same at all points around the circumference.
 The radial and axial deviation between the two coupling halves must not exceed 0.1 mm, during standstill as well as at operating temperature and under inlet pressure.

4. Check the distance (dimension see general arrangement drawing) between the two coupling halves around the circumference.
The coupling is correctly aligned if the distance between the two coupling halves is the same at all points around the circumference.
The radial and axial deviation between the two coupling halves must not exceed 0.1 mm, during standstill as well as at operating temperature and under inlet pressure.
5. If alignment is correct, re-install the coupling guard and its footboard, if any.

5.7 Checking the belt drive

5.7.1 Checking the pulley alignment

- ✓ The belt guard has been removed.
 - ✓ Required tools: wedge gauge, straight-edge
1. Place the straight-edge (1) vertically on both pulleys.
 2. Leave the straight-edge (1) in this position and turn the measuring point by hand.
 3. Adjust the alignment, if required. (⇒ Section 7.5.10 Page 64)
 4. Re-fit the belt guard.

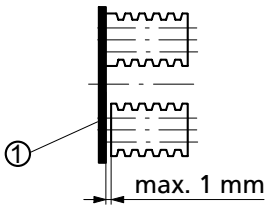


Fig. 11: Checking the pulley alignment

5.7.2 Tensioning the belts

	<p>CAUTION</p>
	<p>Lack of tension Insufficient power transmission! Wear resulting from excessive slip!</p> <ul style="list-style-type: none"> ▸ Check the tension forces.
	<p>CAUTION</p>
	<p>Excessive tension Service life reduced by excessive stretching, unnecessary flexing work or excessive temperatures!</p> <ul style="list-style-type: none"> ▸ Check the tension forces.

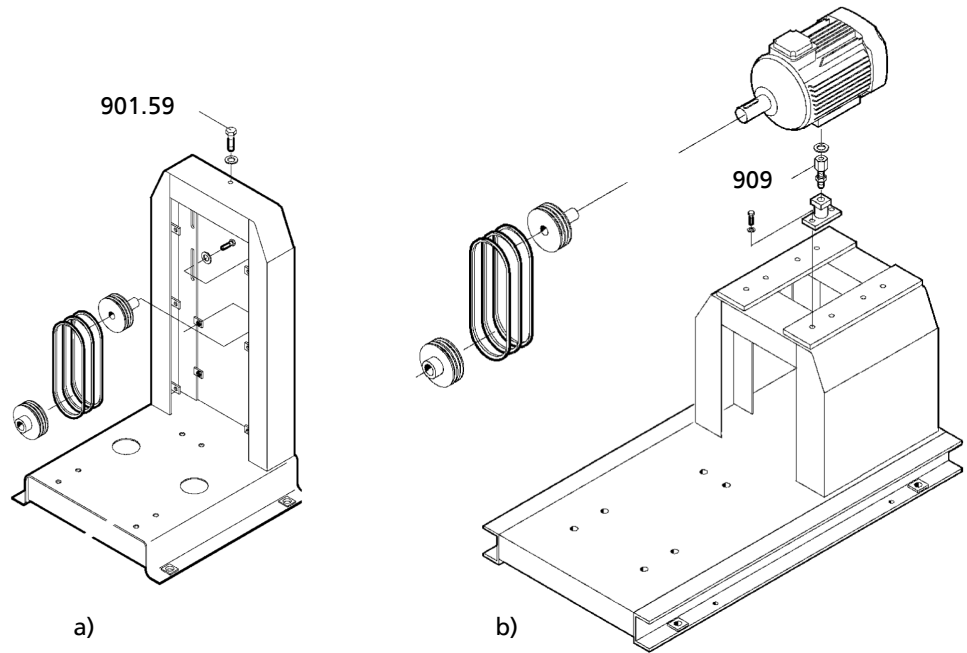


Fig. 12: Tensioning the belts, a) installation type 3 HZ, b) installation type 3 HM

1. Adjust the tension by tightening and loosening bolt 901.59 or adjusting screw 909.
2. Check the tension again between ½ hour and 1 hour after initial tensioning.
3. Check the V-belt forces and deflection with a suitable measuring device. The profile and diameter of the smaller pulley are required to determine the correct V-belt tension.

	<p>⚠ WARNING</p>
	<p>Failure to re-install or re-activate protective devices Risk of personal injury from moving parts or escaping fluid!</p> <ul style="list-style-type: none"> ▸ As soon as the work is complete, re-install and/or re-activate any safety-relevant and protective devices.

5.8 Installing pump sets with Cardan shaft

	<p>⚠ WARNING</p>
	<p>Exposed rotating coupling or Cardan shaft Risk of injury by rotating shafts!</p> <ul style="list-style-type: none"> ▸ Always operate the pump set with a coupling guard. If the customer specifically requests not to include a coupling guard in KSB's delivery, then the operator must supply one! ▸ Observe all relevant regulations for selecting a coupling guard.

	<p>NOTE</p>
	<p>If the customer specifically requests not to include a Cardan shaft guard in our delivery, then the operator must supply one.</p>

For installing and aligning the Cardan shaft refer to the technical product literature of the Cardan shaft manufacturer.

5.9 Aligning the pump and motor

After having installed the pump set and connected the piping, check the coupling alignment and, if required, re-align the pump set (at the motor).

5.9.1 Motors with levelling screw

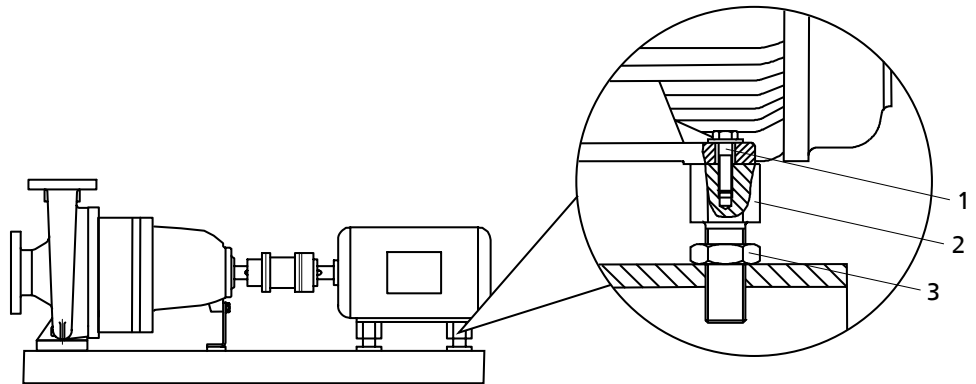


Fig. 13: Motor with levelling screw

1	Hexagon head bolt	2	Levelling screw
3	Locknut		

- ✓ The coupling guard and the footboard for the coupling guard, if any, have been removed.
- 1. Check the coupling alignment.
- 2. Unscrew the hexagon head bolts (1) at the motor and the locknuts (3) at the baseplate.
- 3. Turn the levelling screws (2) by hand or by means of an open-jawed wrench until the coupling alignment is correct and all motor feet rest squarely on the baseplate.
- 4. Re-tighten the hexagon head bolts (1) at the motor and the locknuts (3) at the baseplate.
- 5. Check that the coupling and shaft can easily be rotated by hand.

	<p>⚠ WARNING</p>
	<p>Unprotected rotating coupling Risk of injury by rotating shafts!</p> <ul style="list-style-type: none"> ▸ Always operate the pump set with a coupling guard. If the customer specifically requests not to include a coupling guard in KSB's delivery, then the operator must supply one! ▸ Observe all relevant regulations for selecting a coupling guard.

	<p>⚠ DANGER</p>
	<p>Risk of ignition by frictional sparks Explosion hazard!</p> <ul style="list-style-type: none"> ▸ Choose a coupling guard material that is non-sparking in the event of mechanical contact (see DIN EN 13463-1).

- 6. Re-install the coupling guard and the footboard for the coupling guard, if any.
- 7. Check the distance between coupling and coupling guard.
The coupling and coupling guard must not come into contact.

5.9.2 Motors without levelling screw

Any differences in the centreline heights of the pump and motor shafts are compensated by means of shims.

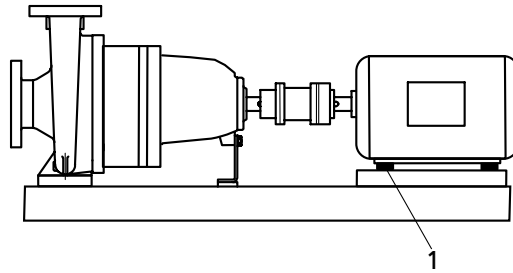


Fig. 14: Pump set with shim

1	Shim
---	------

✓ The coupling guard and the footboard for the coupling guard, if any, have been removed.

1. Check the coupling alignment.
2. Unscrew the hexagon head bolts at the motor.
3. Insert shims underneath the motor feet until the difference in shaft centreline height has been compensated.
4. Re-tighten the hexagon head bolts.
5. Check that the coupling and shaft can easily be rotated by hand.

	<p>⚠ WARNING</p>
	<p>Unprotected rotating coupling Risk of injury by rotating shafts!</p> <ul style="list-style-type: none"> ▷ Always operate the pump set with a coupling guard. If the customer specifically requests not to include a coupling guard in KSB's delivery, then the operator must supply one! ▷ Observe all relevant regulations for selecting a coupling guard.
	<p>⚠ DANGER</p>
	<p>Risk of ignition by frictional sparks Explosion hazard!</p> <ul style="list-style-type: none"> ▷ Choose a coupling guard material that is non-sparking in the event of mechanical contact (see DIN EN 13463-1).

6. Re-install the coupling guard and the footboard for the coupling guard, if any.
7. Check the distance between coupling and coupling guard.
The coupling and coupling guard must not come into contact.

5.10 Checking the lubricants

Grease-lubricated bearings

Grease-lubricated bearings have been packed with grease at the factory.

Lubricant supply for mechanical seals

The lubricant reservoirs have been filled at the factory.
Check the lubricant level before commissioning the pump set.

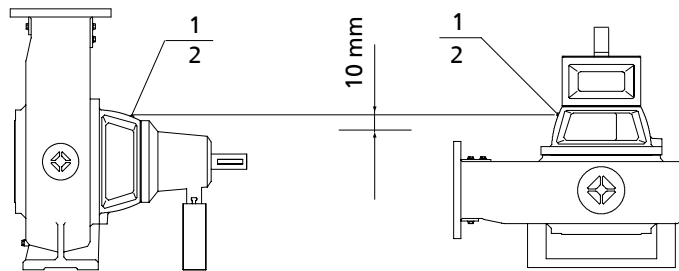


Fig. 15: Checking the lubricant level

✓ The pump set has been installed as specified.

1. Unscrew and remove screwed plug (1) with joint ring (2).
2. If the lubricant level is within the 10 mm tolerance range below the opening, re-insert and fasten screwed plug (1) with joint ring (2).
3. If the lubricant level is below the tolerance range, fill in more lubricant. (⇒ Section 7.2.3.3 Page 42)

5.11 Barrier fluid connection





Suitable barrier or flushing liquids are the fluid handled, which has been cleaned or cooled if required, or a cleaned external liquid of which small quantities may mix with the fluid handled. If no barrier fluid is available, grease can be pressed in as a substitute.

Install the correct connection for the type of barrier fluid used. (⇒ Section 5.5 Page 24)

5.12 Electrical connection

	<p>⚠ DANGER</p>
	<p>Incorrect electrical installation Explosion hazard!</p> <ul style="list-style-type: none"> ▶ For electrical installation, also observe the requirements of IEC 60079-14. ▶ Always connect explosion-proof motors via a motor protection switch.
	<p>⚠ DANGER</p>
	<p>Work on the pump set by unqualified personnel Danger of death from electric shock!</p> <ul style="list-style-type: none"> ▶ Always have the electrical connections installed by a trained and qualified electrician. ▶ Observe regulations IEC 60364 and, for explosion-proof models, EN 60079.
	<p>⚠ WARNING</p>
	<p>Incorrect connection to the mains Damage to the mains network, short circuit!</p> <ul style="list-style-type: none"> ▶ Observe the technical specifications of the local energy supply companies. <ol style="list-style-type: none"> 1. Check the available mains voltage against the data on the motor name plate. 2. Select an appropriate start-up method.
	<p>NOTE</p>
	<p>A motor protection device is recommended.</p>


5.13 Checking the direction of rotation

	<p>⚠ DANGER</p> <p>Temperature increase resulting from contact between rotating and stationary components Explosion hazard! Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Never check the direction of rotation by starting up the unfilled pump set. ▷ Separate the pump from the motor to check the direction of rotation.
	<p>⚠ WARNING</p> <p>Hands inside the pump casing Risk of injuries, damage to the pump!</p> <ul style="list-style-type: none"> ▷ Always disconnect the pump set from the power supply and secure it against unintentional start-up before inserting your hands or other objects into the pump.
	<p>CAUTION</p> <p>Incorrect direction of rotation with non-reversible mechanical seal Damage to the mechanical seal and leakage!</p> <ul style="list-style-type: none"> ▷ Separate the pump from the motor to check the direction of rotation.
	<p>CAUTION</p> <p>Drive and pump running in the wrong direction of rotation Damage to the pump!</p> <ul style="list-style-type: none"> ▷ Refer to the arrow indicating the direction of rotation on the pump. ▷ Check the direction of rotation. If required, check the electrical connection and correct the direction of rotation.

The correct direction of rotation of the motor and pump is clockwise (seen from the drive end).


1. Start the motor and stop it again immediately to determine the motor's direction of rotation.
2. Check the direction of rotation.
The motor's direction of rotation must match the arrow indicating the direction of rotation on the pump.
3. If the motor is running in the wrong direction of rotation, check the electrical connection of the motor and switchgear, if any.

5.14 Priming and venting the pump

	<p>⚠ DANGER</p> <p>Shaft seal failure caused by insufficient lubrication Hot or toxic fluid could escape! Damage to the pump!</p> <ul style="list-style-type: none"> ▷ Before starting up the pump set, vent the pump and suction line and prime both with the fluid to be handled.
---	--

1. Vent the pump and suction line and prime both with the fluid to be handled.
2. Fully open the shut-off valve in the suction line.
3. Fully open all auxiliary connections (barrier fluid, flushing liquid, etc).

5.15 Protective devices

	<p>⚠ WARNING</p>
	<p>Failure to re-install or re-activate protective devices Risk of personal injury from moving parts or escaping fluid!</p> <ul style="list-style-type: none"> ▷ As soon as the work is complete, re-install and/or re-activate any safety-relevant and protective devices.

5.16

5.17

5.18

6 Commissioning/Start-up/Shutdown





6.1 Commissioning/start-up

6.1.1 Prerequisites for commissioning/start-up

Also see

- Checking the direction of rotation [⇒ 32]

6.1.2 Start-up

	<p>⚠ DANGER</p> <p>Non-compliance with the permissible pressure and temperature limits if the pump is operated with the suction and/or discharge line closed. Explosion hazard! Leakage of hot or toxic fluids!</p> <ul style="list-style-type: none"> ▷ Never operate the pump with the shut-off elements in the suction line and/or discharge line closed. ▷ Only start up the pump set with the discharge-side shut-off element slightly or fully open.
	<p>⚠ DANGER</p> <p>Excessive temperatures due to dry running or excessive gas content in the fluid handled Explosion hazard! Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Never operate the pump set without liquid fill. ▷ Prime the pump as specified. ▷ Always operate the pump within the permissible operating range.
	<p>⚠ WARNING</p> <p>Pump sets with high noise levels Damage to hearing!</p> <ul style="list-style-type: none"> ▷ Persons must only enter the vicinity of the running pump set if they are wearing protective clothing/ear protection. ▷ See noise characteristics. (⇒ Section 4.6 Page 18)
	<p>CAUTION</p> <p>Abnormal noises, vibrations, temperatures or leakage Damage to the pump!</p> <ul style="list-style-type: none"> ▷ Switch off the pump (set) immediately. ▷ Eliminate the causes before returning the pump set to service.

✓ The pump, suction line and discharge line have been vented and primed with the fluid to be handled.

1. Fully open the shut-off element in the suction head/suction lift line.
2. Close/slightly open the shut-off element in the discharge line; fully open the shut-off element if a check valve is installed.
3. Start up the motor.
4. Immediately after the pump has reached full rotational speed, swiftly open the shut-off element in the discharge line and adjust it to comply with the duty point.

- On pump sets with gland packing, check the leakage at the gland packing and re-adjust it, if required. (⇒ Section 7.5.8.2 Page 63)

Frequency inverter

When the pump is started up via frequency inverter, ensure short start ramps (approximately 3-5 s).

	NOTE
	Speed controlled operation shall only start after approximately 3 to 5 minutes. Pump start-up with long start ramps and low frequency may cause clogging.

6.2 Operating limits

	⚠ DANGER
	<p>Non-compliance with operating limits for pressure, temperature, fluid handled and speed Explosion hazard! Hot or toxic fluid could escape!</p> <ul style="list-style-type: none"> ▷ Comply with the operating data indicated in the data sheet. ▷ Never use the pump for handling fluids it is not designed for. ▷ Avoid prolonged operation against a closed shut-off element. ▷ Never operate the pump at temperatures, pressures or rotational speeds exceeding those specified in the data sheet or on the name plate unless the written consent of the manufacturer has been obtained.

6.2.1 Maximum operating pressure

	CAUTION
	<p>Permissible operating pressure exceeded Damage to connections and seals!</p> <ul style="list-style-type: none"> ▷ Never exceed the operating pressure specified in the data sheet.

Table 15: Maximum operating pressure

Pump size	Maximum operating pressure
80 - 315, 100 - 315, 100 - 401, 150 - 400/- 401, 150 - 500, 151 - 401, 200 - 330, 200 - 400, 200 - 500, 200 - 501, 200 - 631, 250 - 400/- 401, 250 - 500, 250 - 630, 300 - 400/- 401, 300 - 630, 350 - 630, K 350 - 710	10 bar
300 - 500, 350 - 500/- 501, E 350 - 710, 400 - 500, 400 - 630	6 bar
500 - 630/- 632, 600 - 520, 600 - 710	4 bar
700 - 900	3 bar

6.2.2 Switching frequency


To prevent high temperature increases in the motor and excessive loads on the pump, coupling, V-belts, motor, seals and bearings, the switching frequency shall not exceed the following number of start-ups per hour.

Table 16: Switching frequency

Motor rating [kW]	Maximum switching frequency [start-ups/hour]
≤ 11	25
≤ 100	20
> 100	10


6.2.3 Fluid handled

6.2.3.1 Temperature of the fluid handled

	CAUTION
	<p>Impermissibly high temperature of fluid handled Damage to the pump!</p> <ul style="list-style-type: none"> ▷ Prolonged operation against a closed shut-off element is not permitted (heating up of the fluid). ▷ Observe the temperature limits in the data sheet and in the section on operating limits. (⇒ Section 6.2 Page 35)

6.2.3.2 Density of the fluid handled

The pump input power changes in proportion to the density of the fluid handled.

	CAUTION
	<p>Impermissibly high density of the fluid handled Motor overload!</p> <ul style="list-style-type: none"> ▷ Observe the information on fluid density indicated in the data sheet. ▷ Make sure the motor has sufficient power reserves.

6.2.3.3 Abrasive fluids

Do not exceed the maximum permissible solids content specified in the data sheet. When the pump handles fluids containing abrasive substances, increased wear of the hydraulic system and the shaft seal are to be expected. In this case, halve the intervals commonly recommended for servicing and maintenance.

6.3 Shutdown/storage/preservation

Storing a new pump set

If commissioning is to take place some time after delivery, we recommend that the following measures be taken for pump (set) storage:

- Store the pump (set) in a dry and protected location.
- If properly stored indoors, the pump set is protected for a maximum of 12 months.
New pumps are supplied by our factory duly prepared for storage.
- Rotate the shaft of the pump by hand once a month.

The pump (set) remains installed

✓ Sufficient fluid is supplied for the operation check run of the pump.

1. Start up the pump (set) regularly between once a month and once every three months for approximately five minutes during prolonged shutdown periods. This will prevent the formation of deposits within the pump and the pump intake area.

The pump (set) is removed from the pipe and stored

✓ The pump has been properly drained (⇒ Section 7.3 Page 44) and the safety instructions for dismantling the pump have been observed. (⇒ Section 7.4.1 Page 44)

1. Spray-coat the inside wall of the pump casing, and in particular the impeller clearance areas, with a preservative.
2. Spray the preservative through the suction and discharge nozzles. It is advisable to close the pump nozzles (e.g. with plastic caps or similar).

3. Oil or grease all exposed machined parts and surfaces of the pump (with silicone-free oil and grease, food-approved if required) to protect them against corrosion.
Also observe.

6.3.1 Shutdown

1. Close the shut-off element in the discharge line.
If the discharge line is equipped with a non-return or check valve, the shut-off element may remain open as long as there is back pressure.
2. Switch off the motor, making sure that the unit runs down smoothly to a standstill.

**Prolonged shutdown periods
Danger of frost/freezing**



For prolonged shutdown, close the shut-off element in the suction line.

If there is any danger of frost/freezing, drain the pump and protect it against freezing.

6.4 Returning to service

For returning the pump to service observe the sections on commissioning/start-up (⇒ Section 6.1 Page 34) and the operating limits (⇒ Section 6.2 Page 35) .

In addition, carry out all servicing/maintenance operations before returning the pump (set) to service. (⇒ Section 7 Page 38)

	<p>⚠ WARNING</p> <p>Failure to re-install or re-activate protective devices Risk of personal injury from moving parts or escaping fluid!</p> <ul style="list-style-type: none"> ▷ As soon as the work is complete, re-install and/or re-activate any safety-relevant and protective devices.
	<p>NOTE</p> <p>On pumps/pump sets older than 5 years we recommend replacing all elastomer seals.</p>

7 Servicing/Maintenance

7.1 Safety regulations

	DANGER
	<p>Sparks produced during servicing work Explosion hazard!</p> <ul style="list-style-type: none"> ▷ Observe the safety regulations in force at the place of installation! ▷ Always perform maintenance work at an explosion-proof pump (set) outside of potentially explosive atmospheres.

 	DANGER
	<p>Improperly serviced pump set Explosion hazard! Damage to the pump set!</p> <ul style="list-style-type: none"> ▷ Service the pump set regularly. ▷ Prepare a maintenance schedule with special emphasis on lubricants, shaft seal and coupling.

The operator ensures that all maintenance, inspection and installation work is performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.

	WARNING
	<p>Unintentional starting of pump set Risk of injury by moving parts!</p> <ul style="list-style-type: none"> ▷ Make sure that the pump set cannot be started up unintentionally. ▷ Always make sure the electrical connections are disconnected before carrying out work on the pump set.

	WARNING
	<p>Fluids and supplies posing a health hazard and/or hot fluids or supplies Risk of injury!</p> <ul style="list-style-type: none"> ▷ Observe all relevant laws. ▷ When draining the fluid take appropriate measures to protect persons and the environment. ▷ Decontaminate pumps which handle fluids posing a health hazard.

	WARNING
	<p>Insufficient stability Risk of crushing hands and feet!</p> <ul style="list-style-type: none"> ▷ During assembly/dismantling, secure the pump (set)/pump parts to prevent tipping or falling over.




A regular maintenance schedule will help avoid expensive repairs and contribute to trouble-free, reliable operation of the pump, pump set and pump parts with a minimum of servicing/maintenance expenditure and work.

	NOTE
	<p>All maintenance, service and installation work can be carried out by KSB Service or authorised workshops. Find your contact in the attached "Addresses" booklet or on the Internet at "www.ksb.com/contact".</p>

Never use force when dismantling and reassembling the pump set.

7.2 Maintenance/inspection

7.2.1 Supervision of operation


	<p>⚠ DANGER</p> <p>Risk of potentially explosive atmosphere inside the pump Explosion hazard!</p> <ul style="list-style-type: none"> ▶ The pump internals in contact with the fluid to be handled, including the seal chamber and auxiliary systems must be filled with the fluid to be handled at all times. ▶ Provide sufficient inlet pressure. ▶ Provide an appropriate monitoring system.
	<p>CAUTION</p> <p>Increased wear due to dry running Damage to the pump set!</p> <ul style="list-style-type: none"> ▶ Never operate the pump set without liquid fill. ▶ Never close the shut-off element in the suction line and/or supply line during pump operation.
	<p>CAUTION</p> <p>Impermissibly high temperature of fluid handled Damage to the pump!</p> <ul style="list-style-type: none"> ▶ Prolonged operation against a closed shut-off element is not permitted (heating up of the fluid). ▶ Observe the temperature limits in the data sheet and in the section on operating limits. (⇒ Section 6.2 Page 35)

While the pump is in operation, observe and check the following points:

- The pump must run quietly and free from vibrations at all times.
- Check the correct functioning of any auxiliary connections.
- Monitor the stand-by pump.
To make sure that the stand-by pumps are ready for operation, start them up once a week.
- Check the flexible elements of the coupling or belts and replace them, if required.

7.2.2 Visual inspection through the inspection hole

If there are problems with clogging, the inside of the casing and the impeller can be checked via the inspection hole.

	<p>⚠ WARNING</p> <p>Fluids, consumables and supplies which are hot and/or pose a health hazard Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▶ Collect and properly dispose of flushing fluid and any residues of the fluid handled. ▶ Wear safety clothing and a protective mask, if required. ▶ Observe all legal regulations on the disposal of fluids posing a health hazard.
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	<p>⚠ WARNING</p>
	<p>Hands or foreign objects inside the pump casing Risk of injuries, damage to the pump!</p> <ul style="list-style-type: none"> ▸ Check that the inside of the pump is free from any foreign objects. Remove any foreign objects. ▸ Never insert your hands or any other objects into the pump, if the pump set has not been disconnected from the power supply and secured against unintentional start-up.

If a problem has occurred which requires visual inspection, observe the following instructions:

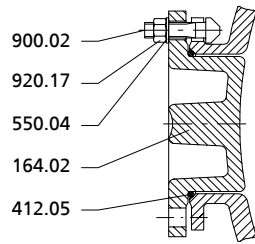


Fig. 16: Inspection hole in the casing

Opening the inspection hole

- Close the shut-off element on the suction side.
- Switch off the drive and make sure it cannot be re-started unintentionally.
- Close the shut-off element on the discharge side.
- Open the drain plug (auxiliary connection 6B). (⇒ Section 5.5 Page 24)
- Collect and dispose of any liquid residues.
- Unscrew nuts 920.17 at the inspection hole and remove inspection cover 164.02.
- Perform a visual inspection with a lamp or similar.

Closing the inspection hole

- Fit new O-ring 412.05.
- Fit inspection cover 164.02.
- Place discs 550.04 and nuts 920.17 on screws 900.02 and tighten.
- Observe the instructions on commissioning/start-up. (⇒ Section 6.1.1 Page 34)

7.2.3 Lubrication and lubricant change

 	<p>⚠ DANGER</p>
	<p>Excessive temperatures as a result of bearings running hot or defective bearing seals Explosion hazard! Fire hazard! Damage to the pump set!</p> <ul style="list-style-type: none"> ▸ Regularly check the condition of the lubricant.

7.2.3.1 Changing the grease

Lubricating nipples at the bearing bracket allow re-lubrication of the rolling element bearings without opening the pump.

	⚠ DANGER
	Dry running Explosion hazard! ▶ Re-lubricate explosion-proof pump sets outside potentially explosive atmospheres.
	⚠ WARNING
	Hands or foreign objects inside the pump casing Risk of injuries, damage to the pump! ▶ Check that the inside of the pump is free from any foreign objects. Remove any foreign objects. ▶ Never insert your hands or any other objects into the pump, if the pump set has not been disconnected from the power supply and secured against unintentional start-up.
	CAUTION
	Incomplete re-lubrication Bearing damage! ▶ Always re-lubricate the bearings with the pump set in operation.
	NOTE
	Prior to the first re-lubrication, fill the cavities of the bearing bracket in the area to be re-lubricated with grease.

✓ The pump set remains installed in the piping.

1. Press the grease through lubricating nipples 636.02 / 636.03.

Grease quality

The rolling element bearings are packed with lithium-soap grease at the factory. For re-lubrication use grease of the following properties:

- Lithium soap
- Free of resin and acid
- Not liable to crumble
- The grease should have a penetration number between two and three, corresponding to a worked penetration between 220 and 295 mm/10.
- Its drop point must be below 175 °C.

Grease quantity

For the first re-lubrication, the grease quantity is larger as the cavities need to be filled too.

Refer to the table below for the grease quantities.

Table 17: Grease quantity

Bearing bracket size	Re-lubrication quantity [g]	Additional grease quantity for first re-lubrication [g]	
		Radial bearing (cylindrical roller bearing 322.01)	Fixed bearing (angular contact ball bearing 320.02)
S05	25	75	200
S06	50	150	500
S07 / S08	70	350	700

Completely pack the bearings with grease; both side gaps should be $\frac{2}{3}$ filled.

Re-lubrication intervals

Table 18: Re-lubrication intervals

Bearing bracket size	Re-lubrication intervals in operating hours [h]
S05 / S06	3000
S07 / S08	2000

7.2.3.2 Checking the leakage chamber

	<p>⚠ WARNING</p>
	<p>Fluids, consumables and supplies which are hot and/or pose a health hazard Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ Collect and properly dispose of flushing fluid and any residues of the fluid handled. ▷ Wear safety clothing and a protective mask, if required. ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.

Checking the leakage chamber serves to check the function of the drive-end mechanical seal.

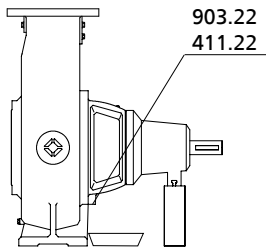


Fig. 17: Checking the leakage chamber

- ✓ A suitable container for the leakage is on hand.
- ✓ The pump set is placed horizontally on a level surface.
- 1. Place the container underneath screw plug 903.22.
- 2. Remove screw plug 903.22 with joint ring 411.22.
 - ⇒ If there is no leakage or only a small amount (less than 0.2 litre) after several years of operation, the mechanical seals are working properly. If the leakage exceeds 0.2 litres, the mechanical seals are defective and must be replaced.
- 3. Close screw plug 903.22 with joint ring 411.22 again.

7.2.3.3 Changing the lubricant

	<p>⚠ WARNING</p>
	<p>Lubricants posing a health hazard and/or hot lubricants Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ When draining the lubricant take appropriate measures to protect persons and the environment. ▷ Wear safety clothing and a protective mask, if required. ▷ Collect and dispose of any lubricants. ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.

	<p>⚠ WARNING</p>
	<p>Screw plugs subjected to pressure When opening screw plugs, liquid might spurt out!</p> <ul style="list-style-type: none"> ▷ Wear safety goggles and protective clothing, if required. ▷ Open the screw plug slowly.

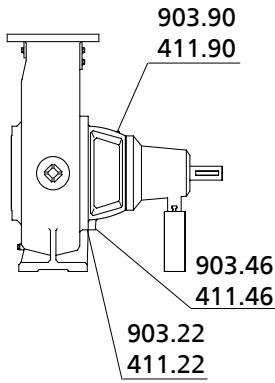


Fig. 18: Draining the lubricant

Draining lubricants in horizontal position

- ✓ Have a suitable container on hand for the used old lubricant.
- 1. Place the container underneath screwed plug 903.46.
- 2. Remove screwed plug 903.46 and joint ring 411.46 at the bottom side of the bearing bracket and drain off the lubricant.
- 3. Close screwed plug 903.46 with joint ring 411.46 again.

Draining lubricants in vertical position

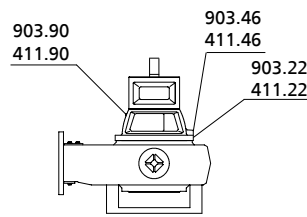


Fig. 19: Draining the lubricant

- ✓ Have a suitable container on hand for the used old lubricant.
- 1. Hold the container underneath screwed plug 903.46.
- 2. Remove screwed plug 903.46 and joint ring 411.46. Then drain off the lubricant.
 - ⇒ Due to the geometry of the discharge cover a small amount of lubricant will remain in the oil reservoir.
- 3. Close screwed plug 903.46 with joint ring 411.46 again.

	NOTE
Paraffin oil is bright and transparent in appearance. If the oil fill is severely contaminated, this will suggest a defective mechanical seal. Replace the mechanical seal.	

Filling in the lubricant

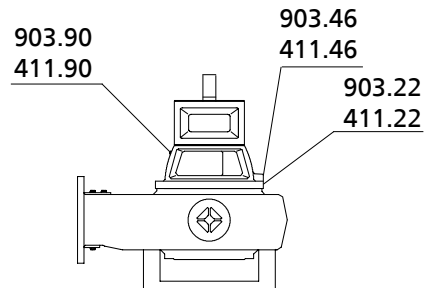
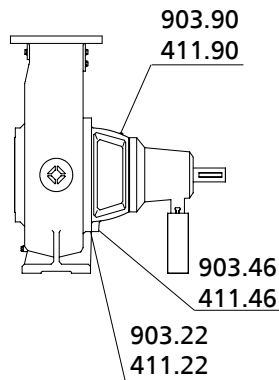


Fig. 20: Filling in the lubricant

1. Unscrew and remove screwed plug 903.90 with joint ring 411.90.
2. Fill the lubricant reservoir up to the filler opening.
3. Close screwed plug 903.90 with joint ring 411.90 again.

Recommended quality of lubricant

The lubricant reservoir of the pump set is filled at the factory with environmentally-friendly, non-toxic lubricant of medical quality.

- Merkur white oil Pharma 40 made by DEA
- Thin-bodied paraffin oil made by company Merck, No.: 7174
- or an equivalent brand of medical quality, non-toxic
- All non-doped and doped motor oils of classes SAE 10W to SAE 20W

Alternative:

	NOTE
	Only use motor oil if there is no risk of the lubricant contaminating the fluid handled and if the motor oil can be disposed of properly.

Quantity of lubricant **Table 19:** Quantity of lubricant

Bearing bracket size	Pump size	Lubricant quantity [l]
S05	all	2.0
S06	all	4.3
S07	-500	4.6
	-630, -710	5.8
S08	all	6.0

Intervals **Change the lubricant every 10,000 operating hours, but at least every three years.**

7.3 Drainage/cleaning

	⚠ WARNING
	<p>Fluids, consumables and supplies which are hot and/or pose a health hazard Hazard to persons and the environment!</p> <ul style="list-style-type: none"> ▷ Collect and properly dispose of flushing fluid and any residues of the fluid handled. ▷ Wear safety clothing and a protective mask, if required. ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.

If the fluids handled by the pump (set) leave residues which might lead to corrosion when coming into contact with atmospheric humidity, or which might ignite when coming into contact with oxygen, the pump (set) must be flushed through, neutralised, and blown through with anhydrous inert gas for drying purposes.

Use connection 6B to drain the pump set. (⇒ Section 5.5 Page 24)

7.4 Dismantling the pump set

7.4.1 General information/Safety regulations

	⚠ WARNING
	<p>Unqualified personnel performing work on the pump (set) Risk of injury!</p> <ul style="list-style-type: none"> ▷ Always have repair and maintenance work performed by specially trained, qualified personnel.


	⚠ WARNING
	<p>Improper lifting/moving of heavy assemblies or components Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.


Observe the general safety instructions and information (⇒ Section 7 Page 38) .

For any work on the motor, observe the instructions of the relevant motor manufacturer.


For dismantling and reassembly observe the exploded view and the general assembly drawing.


In case of damage you can always contact our service departments.


	⚠ DANGER
	<p>Insufficient preparation of work on the pump (set) Risk of injury!</p> <ul style="list-style-type: none"> ▷ Properly shut down the pump set. ▷ Close the shut-off elements in suction and discharge line. ▷ Drain the pump and release the pump pressure. ▷ Close any auxiliary connections. ▷ Allow the pump set to cool down to ambient temperature.

	NOTE
	<p>An impeller removal device is required to remove the impeller.</p>

7.4.2 Preparations for dismantling

	⚠ DANGER
	<p>Insufficient preparation of work on the pump (set) Risk of injury!</p> <ul style="list-style-type: none"> ▷ Properly shut down the pump set. ▷ Close the shut-off elements in suction and discharge line. ▷ Drain the pump and release the pump pressure. ▷ Close any auxiliary connections. ▷ Allow the pump set to cool down to ambient temperature.



	⚠ WARNING
	<p>Components with sharp edges Risk of cutting or shearing injuries!</p> <ul style="list-style-type: none"> ▷ Always use appropriate caution for installation and dismantling work. ▷ Wear work gloves.

	NOTE
	<p>The pump casing can remain installed in the piping for further dismantling.</p>

1. Disconnect the power supply (e.g. at the motor).
2. Disconnect and remove all auxiliary pipework.
3. Remove coupling guard 681.
4. Remove the coupling spacer of coupling 848, if any.
5. Drain the oil (⇒ Section 7.2.3.3 Page 42) .



7.4.3 Separating the pump from the piping

The pump can be dismantled without removing the pump casing from the pipeline.
Exception: When removing or re-fitting a casing wear ring or wear plate.

	<p>⚠ DANGER</p> <p>Insufficient preparation of work on the pump (set) Risk of injury!</p> <ul style="list-style-type: none"> ▷ Properly shut down the pump set. ▷ Close the shut-off elements in suction and discharge line. ▷ Drain the pump and release the pump pressure. ▷ Close any auxiliary connections. ▷ Allow the pump set to cool down to ambient temperature.
	<p>NOTE</p> <p>After the pump set has been dismantled, the suction casing should be cleaned with water. Suitable protective clothing is recommended.</p>

7.4.4 Removing the belt drive

7.4.4.1 Removing the belt drive for installation type 3HZ

	<p>⚠ DANGER</p> <p>Work in the area of the V-belts Injury by moving parts!</p> <ul style="list-style-type: none"> ▷ Make sure that the pump set cannot be switched on.
	<p>⚠ DANGER</p> <p>Unsecured dismantled components Injury by falling parts!</p> <ul style="list-style-type: none"> ▷ Secure all dismantled components or assemblies against moving or tipping over.

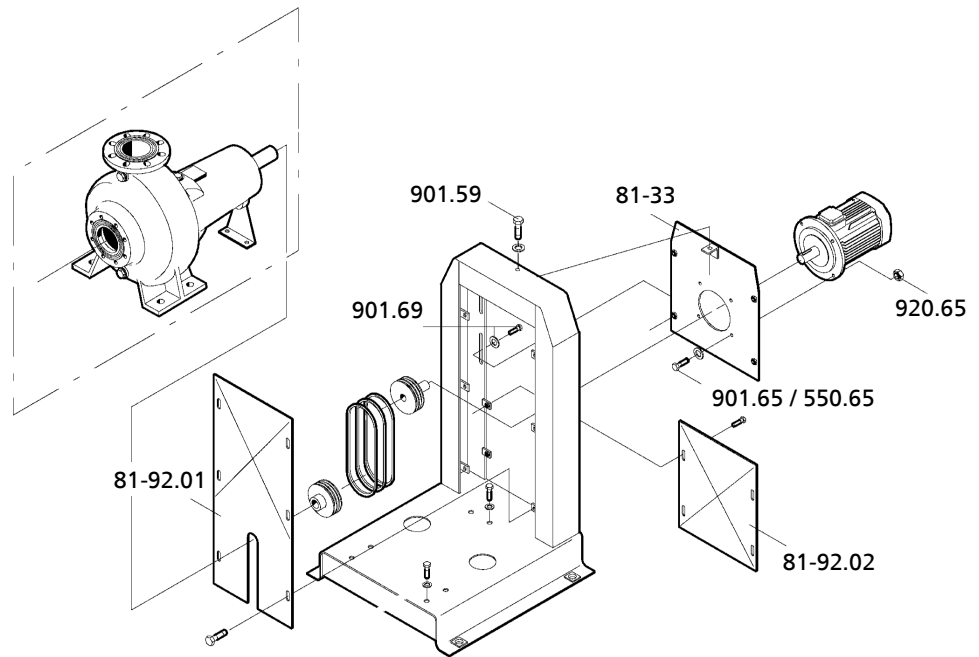


Fig. 21: Removing the belt drive

1. Loosen and remove pump-end and motor-end cover plates 81.92-01 and 81.92-02 from the pulley.
2. Slightly loosen bolt 901.69 at motor plate 81-33.
3. Lower the motor including the motor plate via adjusting screw 901.59 until the V-belt can be removed by hand.
4. If required, remove the pulley.
5. Secure the motor with a lifting rope. Use the lifting lug.
6. Completely undo bolts 901.69 and 901.59 at motor plate 81.33 and remove the motor plate with the motor.
7. Undo screwed connections 901.65, 550.65 and 920.65 and remove the motor from the motor plate.

7.4.4.1.1 Using taper clamping bushes

✓ Dismantling steps 1 to 3 have been completed.

1. Loosen all screws.
2. Completely undo one or two screws, depending on the bush size. Oil the screw(s) and screw them into the jacking threads.
3. Tighten the screw(s) evenly until the bush separates from the hub and the disc can be moved freely on the shaft.
4. Remove the pulley from the shaft together with the bush.

7.4.4.1.2 Using pulleys to DIN 2211

✓ Dismantling steps 1 to 3 have been completed.

1. Use a puller to remove the pulleys from the shaft.

	NOTE
	The puller is not included in the scope of supply.

7.4.4.2 Removing the belt drive for installation type 3HM

	⚠ WARNING
	Work in the area of the V-belts Personal injury! ▶ Make sure that the pump set cannot be switched on.

	⚠ WARNING
	Unsecured dismantled components Personal injury! ▶ Secure all dismantled components or assemblies against moving or tipping over.

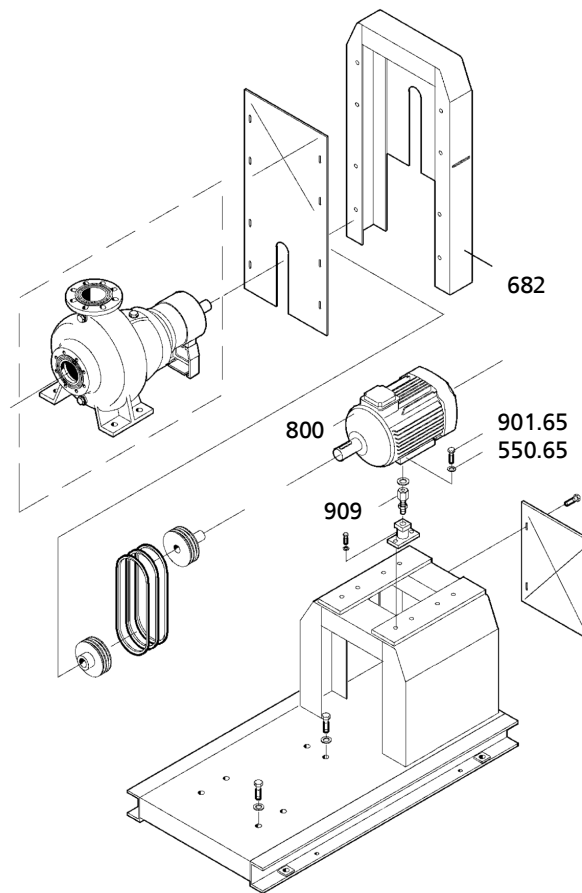


Fig. 22: Removing the belts

1. Unscrew and remove belt guard 682.
2. Lower motor 800 via adjusting screw 909 until the V-belts can be removed by hand.
3. If required, remove the pulley.
4. Secure motor 800 with a lifting rope. Use the lifting lug.
5. Completely undo bolt 901.65 and remove motor 800.

7.4.4.2.1 Using taper clamping bushes

- ✓ Dismantling steps 1 to 3 have been completed.

 1. Loosen all screws.
 2. Completely undo one or two screws, depending on the bush size. Oil the screw(s) and screw them into the jacking threads.
 3. Tighten the screw(s) evenly until the bush separates from the hub and the disc can be moved freely on the shaft.
 4. Remove the pulley from the shaft together with the bush.

7.4.4.2.2 Using pulleys to DIN 2211

- ✓ Dismantling steps 1 to 3 have been completed.

 1. Use a puller to remove the pulleys from the shaft.



NOTE

The puller is not included in the scope of supply.

7.4.5 Removing the back pull-out unit

The steps for dismantling vary depending on the installation type (3E or 3H):

For installation type 3E:

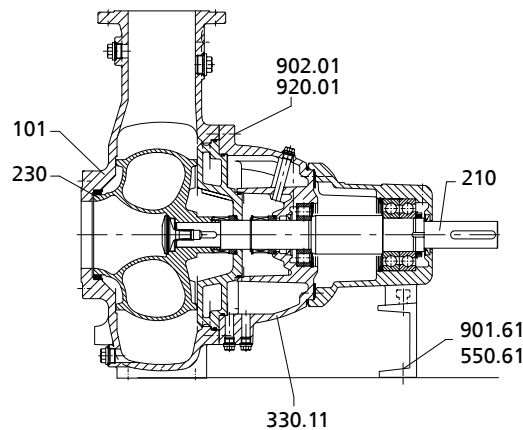


Fig. 23: Removing the back pull-out unit

- ✓ The lubricant chamber has been drained of all lubricant.
- ✓ Transport equipment and lifting tackle are available.
- ✓ An area for the back pull-out unit has been prepared.

 1. Remove the coupling guard.
 2. Remove the coupling spacer, if any.
 3. Remove the drive, if required.
 4. Loop a rope tightly around the bearing carrier.
 5. Undo bolts 901.61 and discs 550.61 fastening the support foot.
 6. Undo screwed connections 902.01 and 920.01 and pull the complete back pull-out unit consisting of bearing bracket 330, shaft 210 and impeller 230 out of pump casing 101.
 7. Place the back pull-out unit in a safe and dry installation area and secure it against tipping over or rolling off.

For installation type 3H:

- ✓ The lubricant chamber has been drained of all lubricant.
 - ✓ Transport equipment and lifting tackle are available.
 - ✓ The belt drive has been removed.
 - ✓ An area for the back pull-out unit has been prepared.
1. Loop a rope tightly around the bearing carrier.
 2. Remove the drive and motor stand, if required.
 3. Undo bolts 901.61 and discs 550.61 fastening the support foot.
 4. Undo screwed connections 902.01 and 920.01 and pull the complete back pull-out unit consisting of bearing bracket 330, shaft 210 and impeller 230 out of pump casing 101.
 5. Place the back pull-out unit in a safe and dry installation area and secure it against tipping over or rolling off.

7.4.6 Removing the impeller

7.4.6.1 Removing K and E impellers with impeller screw M75

- ✓ The back pull-out unit is kept in a clean and dry installation area.
1. Unscrew impeller screw 906 (right-hand thread).
 2. Remove O-ring 412.03.
 3. Pull off impeller 230 with a special impeller removal device.
 4. Remove key 940.01.

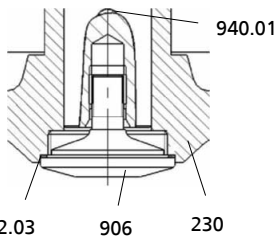


Fig. 24: Removing the impeller

	NOTE
	The impeller removal device is not included in the scope of supply. It can be ordered separately from KSB.

7.4.6.2 Removing K and E impellers with impeller screws M85, M100 or M125

- ✓ The back pull-out unit is kept in a clean and dry installation area.
1. Unscrew impeller cap 260.01 using a special wrench (right-hand thread).
 2. Remove O-ring 412.03.
 3. Bend open lockwasher 931.02, undo hexagon head bolt 901.87 and remove together with disc 550.87.
 4. Pull off impeller 230 with a special impeller removal device.
 5. Remove key 940.01.

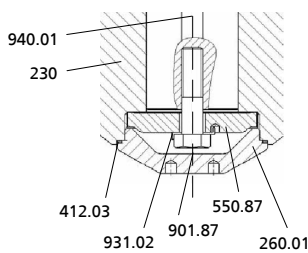


Fig. 25: Removing the impeller

	NOTE
	The impeller removal device is not included in the scope of supply. It can be ordered separately from KSB.

7.4.6.3 Impeller for Sewatec K 500-632

- ✓ The back pull-out unit is kept in a clean and dry installation area.
- 1. Unscrew impeller screw 906.01 using a special wrench (right-hand thread).
- 2. Remove O-ring 412.03.
- 3. Pull off impeller 230 with a special impeller removal device.
- 4. Remove key 940.01.

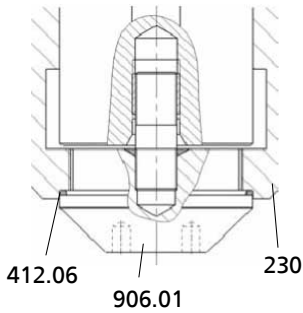


Fig. 26: Removing the impeller

	NOTE
	The impeller removal device is not included in the scope of supply. It can be ordered separately from KSB.

7.4.6.4 Using a special impeller removal device

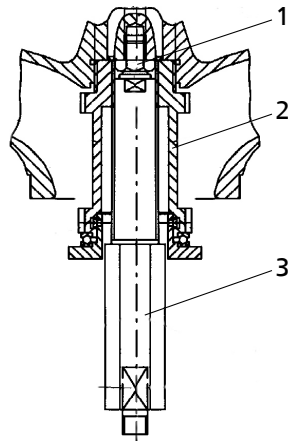


Fig. 27: Special fitting and removal tool

- 1. Screw hexagon head bolt 1 into the shaft end to prevent any damage to the shaft thread.
- 2. Screw part 2 into the impeller.
- 3. Screw threaded bolt 3 into part 2 and pull off the impeller.

Table 20: Special puller for removing the impeller

Size	Impeller type	Bearing bracket size	Puller	
			Thread	Description
100 - 401	K, E	S05	M 75 x 2	AV1
150 - 401	K, E	S05	M 75 x 2	AV1
	E (Ø 407/388)	S06	M 85 x 2	AV3
150 - 500	K	S05	M 75 x 2	AV1
		S06	M 85 x 2	AV3
151 - 401	K	S05	M 75 x 2	AV1
200 - 330	K	S05	M 75 x 2	AV1
200 - 400	K	S05	M 75 x 2	AV1
	E	S05	M 75 x 2	AV2
	K, E (Ø 400)	S06	M 85 x 2	AV3
	E (Ø 373)	S06	M 75 x 2	AV1
200 - 500	K	S06	M 125 x 2	AV4
		S07	M 125 x 2	AV4
	E	S05	M 75 x 2	AV1

Size	Impeller type	Bearing bracket size	Puller	
			Thread	Description
200 - 501	K	S06	M 100 x 2	AV5
200 - 631	K	S07	M 125 x 2	AV4
		S08	M 125 x 2	AV4
250 - 400	K	S05	M 75 x 2	AV1
250 - 401	K	S05	M 75 x 2	AV1
250 - 500	E	S06	M 125 x 2	AV4
		S07	M 125 x 2	AV4
250 - 630	K	S07	M 125 x 2	AV4
		S08	M 125 x 2	AV4
300 - 400	K	S05	M 75 x 2	AV1
300 - 401	K	S05	M 75 x 2	AV1
300 - 500	K	S06	M 125 x 2	AV4
		S07	M 125 x 2	AV4
300 - 630	E	S07	M 125 x 2	AV4
		S08	M 125 x 2	AV4
350 - 500	K	S06	M 125 x 2	AV4
		S07	M 125 x 2	AV4
350 - 501	K	S06	M 125 x 2	AV4
		S07	M 125 x 2	AV4
350 - 630	E	S07	M 125 x 2	AV4
		S08	M 125 x 2	AV4
350 - 710	K	S08	M 100 x 2	AV5
400 - 500	K	S06	M 100 x 2	AV5
		S07	M 100 x 2	AV5
400 - 630	K	S08	M 125 x 2	AV4
500 - 630	K	S07	M 125 x 2	AV4
		S08	M 125 x 2	AV4
500 - 632	K	S08	M 100 x 2	AV5
600 - 520	K	S07	M 100 x 2	AV5
600 - 710	K	S08	M 125 x 2	AV4
700 - 900	K	S08	M 125 x 2	AV4

7.4.6.5 Removing an impeller with tapered interference fit

1. Unscrew socket head cap screw 914.10 with disc 550.23.
2. Completely screw the grub screw into the shaft thread.
3. Use a forcing screw to pull off impeller 230.

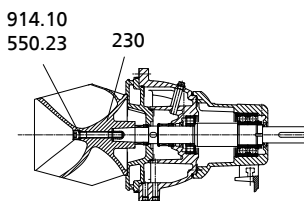


Fig. 28: Removing the impeller



NOTE

A forcing screw is required to remove the impeller. The forcing screw is not included in the scope of supply. It can be ordered separately from KSB.

Table 21: Forcing screws for pulling off the impeller

Size	Impeller type	Forcing screw	
		Thread	Description
80 - 315	D	M 24	ADS 5
100 - 315	D	M 24	ADS 5
150 - 400	D	M 24	ADS 5
150 - 401	D	M 24	ADS 5
200 - 400	D	M 24	ADS 5
250 - 400	D	M 24	ADS 5
300 - 400	D	M 24	ADS 5

7.4.7 Dismantling the mechanical seal

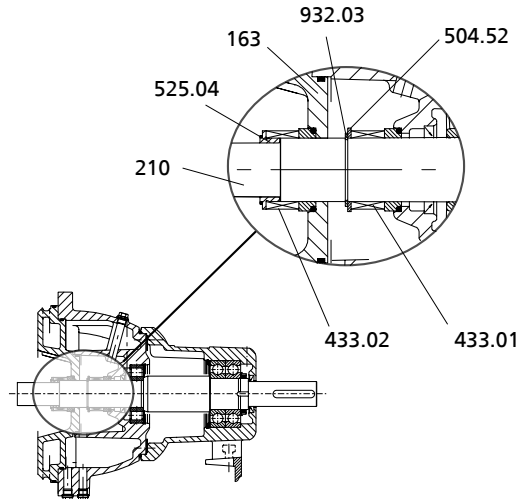


Fig. 29: Dismantling the mechanical seal

7.4.7.1 Dismantling the pump-end mechanical seal

✓ The back pull-out unit and the impeller have been removed as described above.

1. Pull the rotating assembly of mechanical seal 433.02 and spacer sleeve 525.04 off shaft 210.
2. Remove discharge cover 163 from bearing bracket 330.11.
3. Push the stationary seat of mechanical seal 433.02 out of discharge cover 163.

7.4.7.2 Dismantling the motor-end mechanical seal

✓ The back pull-out unit and the impeller have been removed as described above.

1. Remove circlip 932.03 and disc 504.52.
2. Pull the rotating assembly of mechanical seal 433.01 off shaft 210.

7.4.8 Dismantling the packed gland

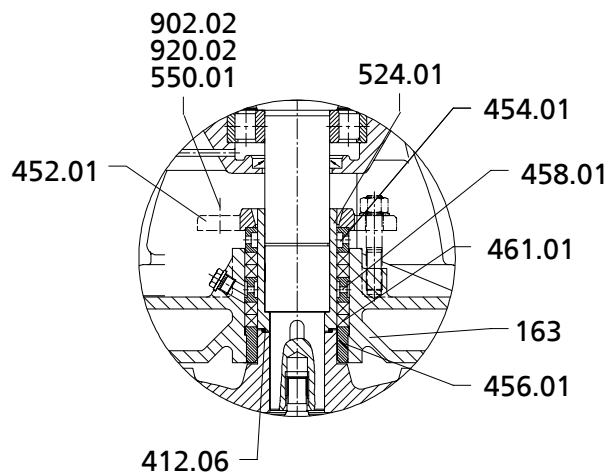


Fig. 30: Dismantling the packed gland

✓ The back pull-out unit and the impeller have been removed as specified.

1. Unscrew hexagon nuts 920.02.
2. Remove gland follower 452.01 and stuffing box ring 454.01.
3. Remove discharge cover 163 with packed gland.

4. Remove packing ring 461.01 and lantern ring 458.01 from the packing chamber.
5. Push neck bush 456.01 out of the discharge cover.
6. Pull shaft protecting sleeve 524.01 with O-ring 412.06 off the shaft.

7.4.9 Removing shaft and rolling element bearings

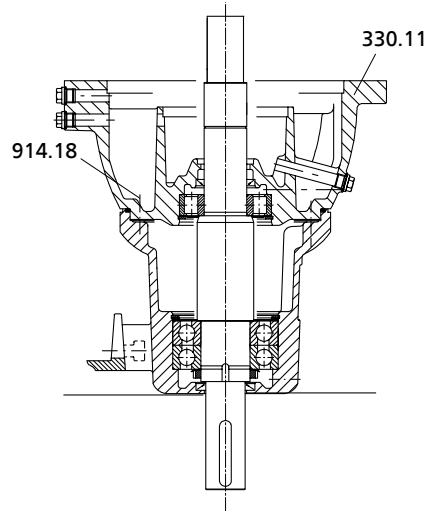


Fig. 31: Dismantling the bearing bracket

- ✓ The back pull-out unit is located in a suitable assembly area.
 - ✓ The mechanical seal or packed gland have been removed as described above.
1. Undo and remove socket head cap screws 914.18.
 2. Suspend bearing bracket 330.11 from the lifting tackle and lift it up.
 3. Place bearing bracket 330.11 in a suitable assembly area with the pump-end flange down.

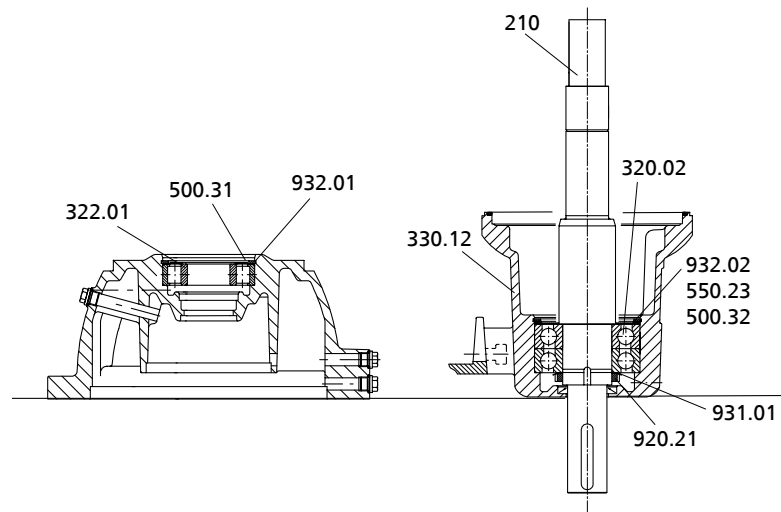


Fig. 32: Removing the shaft

4. Remove circlip 932.01, ring 500.31 and cylindrical roller bearing 322.01 from pump-end bearing bracket 330.11.
5. Remove circlip 932.02, support disc 550.23 and ring 500.32 from motor-end bearing bracket 330.12.
6. Use lifting tackle to lift shaft 210 and carefully pull it out of motor-end bearing bracket 330.12 together with angular contact ball bearings 320.02.
7. Bend open lockwasher 931.01, unscrew keywayed nut 920.21 (right-hand thread) and remove the lockwasher.

8. Heat up angular contact ball bearing 320.02 and pull it off shaft 210.
9. Clean all the components and examine them for signs of wear. If required, replace them.

7.4.10 Removing the wear plate (for D type impellers only)

- ✓ The back pull-out unit, the belt drive (if any) and the motor have been properly removed from the pump casing.
 - ✓ The inside of the casing has been cleaned.
 - ✓ A visual inspection has revealed: The wear plate needs to be replaced.
1. Separate the pump set from the piping.
 2. Undo socket head cap screws 914.12.
 3. Remove wear plate 135.01 and O-rings 412.34.

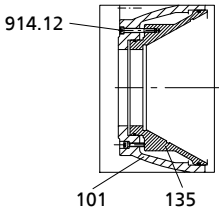


Fig. 33: Removing the wear plate

7.5 Reassembling the pump set

7.5.1 General information/Safety regulations

	<p>⚠ WARNING</p>
	<p>Improper lifting/moving of heavy assemblies or components Personal injury and damage to property!</p> <ul style="list-style-type: none"> ▸ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.
	<p>CAUTION</p>
	<p>Improper reassembly Damage to the pump!</p> <ul style="list-style-type: none"> ▸ Reassemble the pump (set) in accordance with the general rules of sound engineering practice. ▸ Use original spare parts only.

Sequence Always reassemble the pump in accordance with the corresponding general assembly drawing or exploded view.

Sealing elements Check O-rings for any damage and replace by new O-rings, if required. **Never use O-rings that have been glued together from material sold by the metre.** Make sure that the seal elements and contact faces are clean.

Assembly adhesives Coat the locating surfaces of the individual components and screwed connections with graphite or similar before reassembly.

Tightening torques For reassembly, tighten all screws and bolts as specified in this manual.

Bearings Only use specified bearings to DIN 628 (320.02) and DIN 5412 (322.01).

Table 22: Bearings

Bearing bracket size	Angular contact ball bearing DIN 628 (320.02)	Cylindrical roller bearing DIN 5412 (322.01)
S05	2x 7315 BG 8	NU 313
S06	2x 7319 BUA	NU 416
S07 / S08	2x 7324 BUA	NU 324

Checking the alignment After assembly with the pump casing that has remained in the piping, check the coupling alignment.

7.5.2 Re-installing the shaft and rolling element bearings

	<p>⚠ WARNING</p>
	<p>Components heated up for installation Risk of burns to hands!</p> <ul style="list-style-type: none"> ▷ Wear protective gloves suitable for installation work. ▷ Let components cool down after installation.

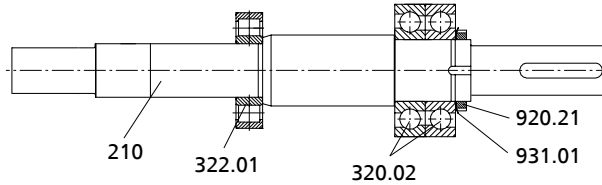


Fig. 34: Mounting the rolling element bearings on the shaft

- ✓ When re-installing the shaft, replace angular contact ball bearings 320.02 or cylindrical roller bearing 322.02, if required.
1. Place shaft 210 in horizontal position. Debur keyway and ring joints, if required.
 2. Clean the shaft and coat the bearing seats with a preservative.
 3. Heat the inner ring of cylindrical roller bearing 322.01 up to 100 °C and push it onto the shaft from the pump end until it abuts against the shaft shoulder.
 4. Heat the first angular contact ball bearing 320.02 up to 100 °C and push it onto the shaft from the drive end until it abuts against the shaft shoulder.
 5. Heat the second angular contact ball bearing 320.02 up to 100 °C and push it onto the shaft from the drive end until it abuts against the first bearing. Push them back in as they cool down!

	<p>NOTE</p>
	<p>Install angular contact ball bearings 320.02 in "O" arrangement.</p>

6. Once the angular contact ball bearings have cooled down, coat the shaft thread with an assembly paste (e.g. ALTEMP Q NB 50).
7. Slip on lockwasher 931.01. Screw on, tighten and lock locknut 920.21.
8. Completely pack the angular contact ball bearings with lubricating grease. (⇒ Section 7.2.3.1 Page 40)

7.5.3 Preparing and reassembling the bearing brackets

Pre-assembly of bearing bracket 330.11

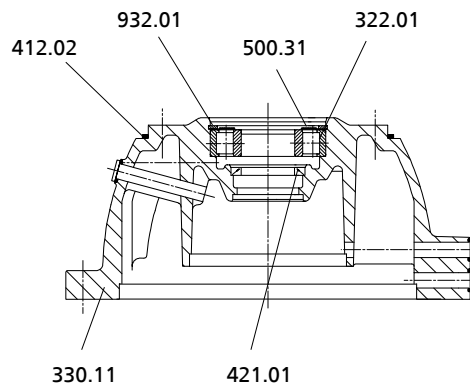


Fig. 35: Preparing the bearing bracket

- ✓ The bearings have been fitted on the shaft.
- ✓ Lifting tackle and equipment are available.

1. Insert shaft seal ring 421.01 into the specified drilled hole.
2. Grease or pack the annular section with lubricating grease. (⇒ Section 7.2.3.1 Page 40)
3. Coat the bearing seat (drilled hole seat) with a preservative.
4. Press cylindrical roller bearing 322.1 (without inner race) into the bearing bracket and fill all cavities with lubricating grease.
5. Insert ring 500.31 and circlip 932.01 into the drilled hole.
6. Completely fill the cylindrical roller bearing with lubricating grease.
7. Fit O-ring 412.02.

Pre-assembly of bearing bracket 330.12

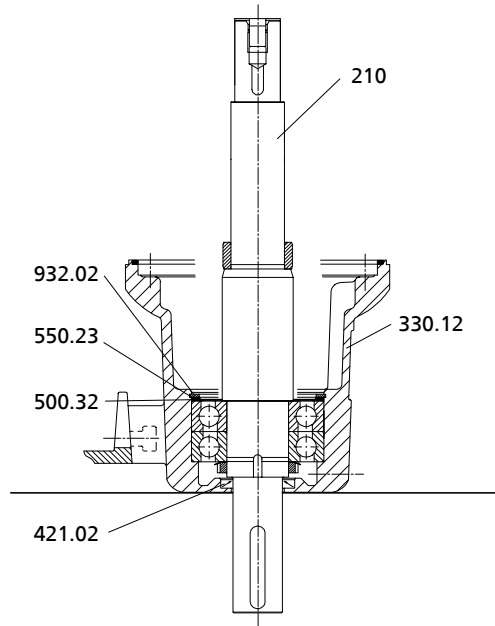
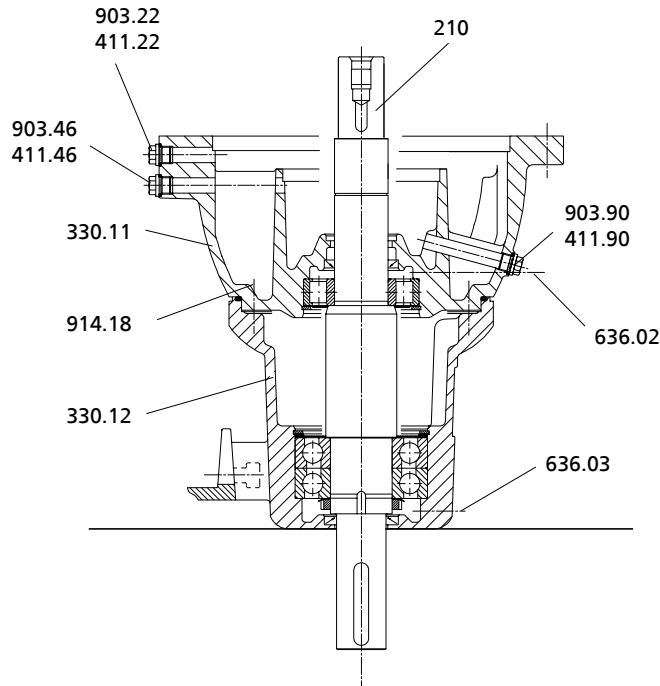


Fig. 36: Installing the shaft

- ✓ A suitable assembly area has been prepared.
 - ✓ All preparatory work has been completed.
 - ✓ Lifting tackle and equipment are available.
1. Place bearing bracket 330.12 in the assembly area with the flange up.
 2. Coat the drilled hole for the shaft seal ring and the bearing seat with a preservative.
 3. Press in shaft seal ring 421.02.
 4. Grease the annular section with lubricating grease. (⇒ Section 7.2.3.1 Page 40)
 5. Use lifting tackle to lift the pre-assembled shaft suspended at the pump end and lower it down into the bearing bracket.
 6. Fit ring 500.32 and disc 550.23.
 7. Fasten circlip 932.02.

Final assembly of bearing bracket

Fig. 37: Reassembling the bearing bracket

- ✓ All preparatory work at the bearing brackets has been completed.
 - ✓ Lifting tackle and equipment are available.
1. Use lifting tackle to lift bearing bracket 330.11 suspended at the pump-end flange and position it in the centre of bearing bracket 330.12 with shaft 210.
 2. Slowly lower bearing bracket 330.11. Using a hand to guide the bearing bracket makes the assembly easier.
 3. Coat the drilled holes for socket head cap screws 914.18 with an assembly paste.
 4. Screw in socket head cap screws 914.18 and use a torque wrench to apply the required tightening torque. (⇒ Section 7.6 Page 65)
 5. Screw in screw plugs 903.22, 903.46 and 903.90 including joint rings 411.22, 411.46 and 411.90.
 6. Screw in lubricating nipples 636.02 and 636.03.

7.5.4 Installing the mechanical seal

We recommend using new original mechanical seals for reassembly.

Observe the following points to ensure trouble-free operation of the mechanical seal:

- Only remove the protective wrapping of the contact faces immediately before assembly takes place.
- Make sure the surface of the shaft is absolutely clean and undamaged.
- Before the actual installation of the mechanical seal, wet the contact faces with a drop of oil.
- For easier installation of bellows-type mechanical seals, wet the inside diameter of the bellows with soapy water (no oil).
- To prevent any damage to the rubber bellows, place a thin foil (thickness approximately 0.1 to 0.3 mm) around the free shaft stub. Slip the rotating assembly over the foil into its installation position. Then remove the foil.

Drive-end mechanical seal

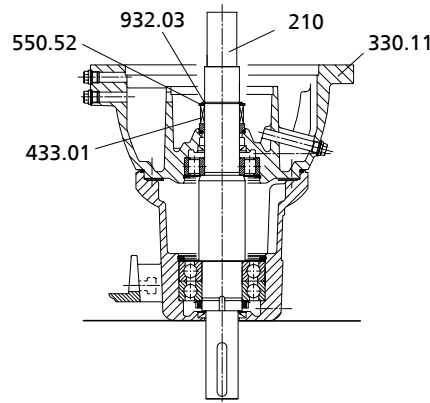


Fig. 38: Drive-end mechanical seal

- ✓ The shaft and rolling element bearings have been properly installed in the bearing bracket.
- 1. Push pump-end mechanical seal 433.01 onto shaft 210.
- 2. Insert spacer disc 550.52 and secure it with circlip 932.03.

Pump-end mechanical seal

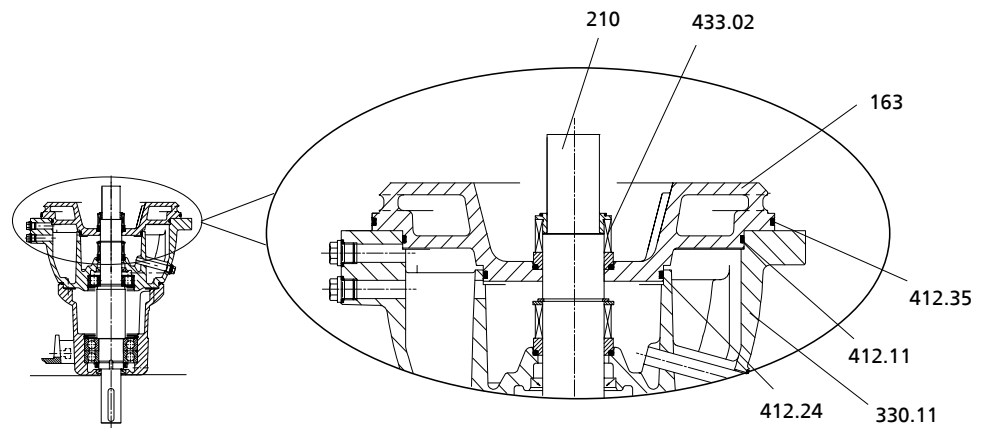


Fig. 39: Pump-end mechanical seal

- 1. Insert O-rings 412.11, 412.24 and 412.35.
- 2. Press discharge cover 163 into bearing bracket 330.11 until it will not go any further.
- 3. Push mechanical seal 433.02 onto shaft 210.

For special mechanical seals with covered springs, tighten the socket head cap screw at the rotating assembly before fitting the impeller. Observe installation dimension "A".

Table 23: Installation dimension "A"

Bearing bracket size	Installation dimension "A" [mm]
S05	51
S06	54

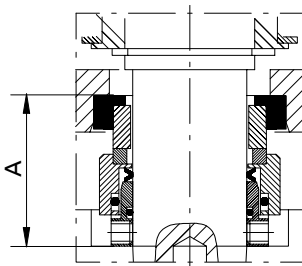


Fig. 40: Installation dimension "A"

7.5.5 Packing the gland

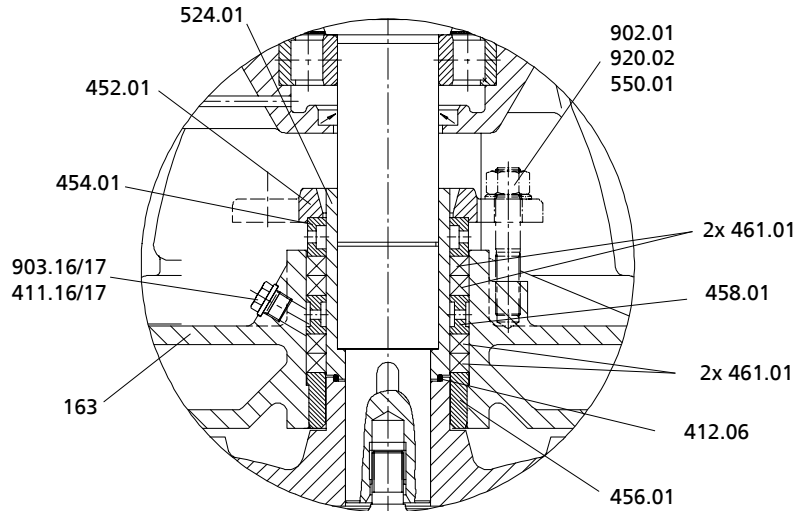


Fig. 41: Packing the gland

1. Place discharge cover 163 in the assembly area with the drive end up.
2. Press neck bush 456.01 into the discharge cover.
3. Insert two packing rings 461.01 with their cut edges offset by 90°.



NOTE

The packing rings can be expanded slightly by moving the shaft protecting sleeve back and forth.

4. Slip on lantern ring 458.01.
5. Insert further packing rings 461.01, each offset by 90° to the previous one.
6. Fit shaft protecting sleeve 524.01.
7. Insert stuffing box ring 454.01.
8. Push on gland follower 452.01 and fasten it with two studs 902.02, two discs 550.01 and two nuts 920.02.
Only lightly tighten both nuts by hand.
9. Insert O-rings 412.11 and 412.35 in discharge cover 163.
10. Insert O-ring 412.06 in shaft protecting sleeve 524.01.
11. Push completely packed discharge cover 163 onto shaft 210 and press it to bearing bracket 330.11.

7.5.6 Fitting the impeller

Observe the instructions for your type of impeller fastening.

7.5.6.1 K and E impellers with impeller screw M75

- ✓ The pre-assembly has been completed.
 - ✓ The assembled bearing bracket is placed in a suitable assembly area with the pump end up.
 - ✓ Lifting tackle is provided.
1. Insert key 940.01 into the keyway.
 2. Slip impeller 230 onto shaft 210.
 3. Insert O-ring 412.03.
 4. Screw in and tighten impeller screw 906.

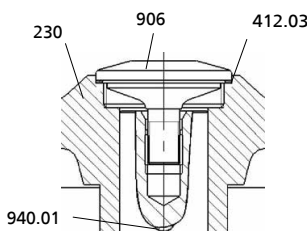


Fig. 42: Fitting the impeller

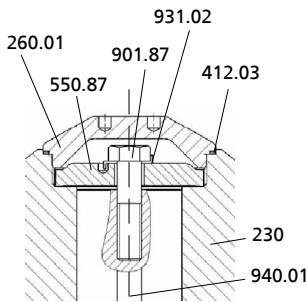


Fig. 43: Fitting the impeller

7.5.6.2 K and E impellers with impeller screws M85, M100 or M125

- ✓ The pre-assembly has been completed.
- ✓ The assembled bearing bracket is placed in a suitable assembly area with the pump end up.
- ✓ Lifting tackle is provided.
- 1. Insert key 940.01 into the keyway.
- 2. Slip impeller 230 onto shaft 210.
- 3. Insert disc 550.87, position lockwasher 931.02.
- 4. Screw in hexagon head bolt 901.87.
- 5. Insert O-ring 412.03. Fit impeller hub cap 260.01, screw it in and tighten it with a special wrench.

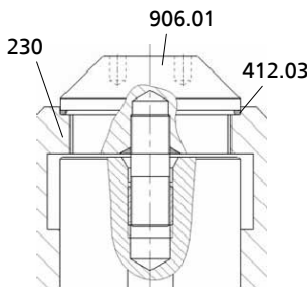


Fig. 44: Fitting the impeller

7.5.6.3 Impeller for Sewatec K 500-632

- ✓ The pre-assembly has been completed.
- ✓ The assembled bearing bracket is placed in a suitable assembly area with the pump end up.
- ✓ Lifting tackle is provided.
- 1. Insert key 940.01 into the keyway.
- 2. Slip impeller 230 onto shaft 210.
- 3. Insert O-ring 412.03.
- 4. Screw in and tighten impeller screw 906.01.

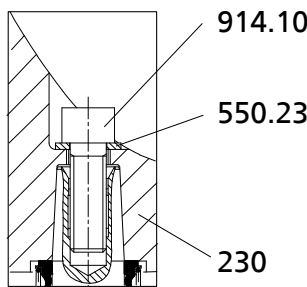


Fig. 45: Fitting the impeller

7.5.6.4 Impeller with tapered interference fit

- ✓ The pre-assembly has been completed.
- ✓ The assembled bearing bracket is placed in a suitable assembly area with the pump end up.
- ✓ Lifting tackle is provided.
- 1. Slip impeller 230 onto shaft 210.
- 2. Insert socket head cap screw 914.10 and disc 550.23, and tighten the screw.

7.5.7 Installing the back pull-out unit

	⚠ WARNING
	<p>Back pull-out unit tipping over Risk of crushing hands and feet!</p> <ul style="list-style-type: none"> ▸ Suspend or support the bearing bracket at the pump end.

Version with wear plate (for D type impellers only)

- ✓ The shaft, rolling element bearings, mechanical seal and impeller have been assembled properly.
- ✓ The pump casing is not connected to the piping.

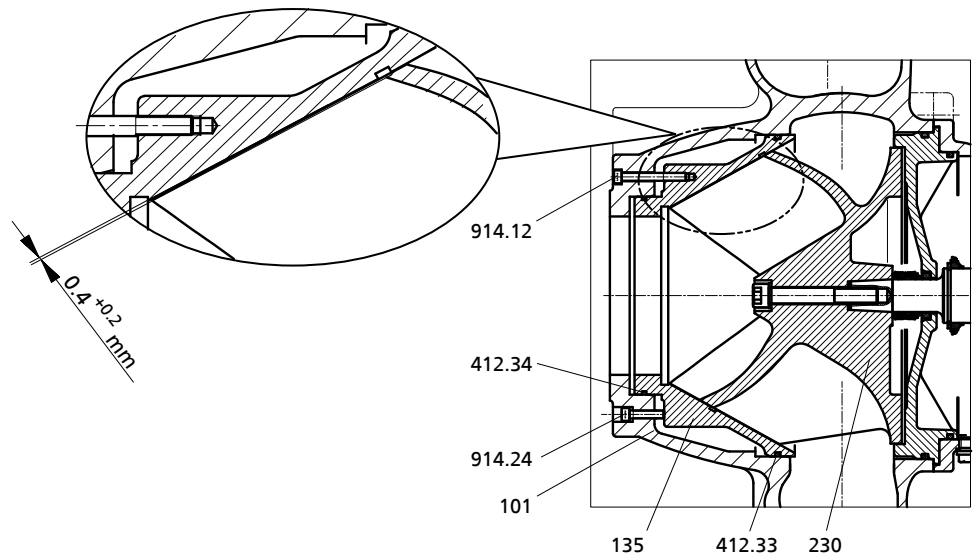


Fig. 46: Fitting the wear plate

1. Equip wear plate 135 with two new O-rings 412.33 and 412.34.
2. Insert wear plate 135 into pump casing 101.
3. Fasten wear plate 135 to pump casing 101 with socket head cap screws 914.12.
4. Adjust the clearance between impeller 230 and wear plate 135 by loosening and tightening screws 914.12 and 914.24.
 - ⇒ Screw 914.24 pushes the wear plate in the direction of the impeller.
 - ⇒ The clearance equals $0.4^{+0.2}$ mm (measured on the suction side from the outer surface of the impeller vane to the wear plate).
5. Insert the complete back pull-out unit into the pump casing.
6. Evenly tighten screwed connection 920.01 between pump casing and bearing bracket.
7. Fasten the support foot to the baseplate with bolts 901.61 and discs 550.61.



7.5.8 Leak test

7.5.8.1 Checking the mechanical seal for leakage

After reassembly of the pump, subject the mechanical seal area/lubricant reservoir to a leak test.

1. Tightly screw the testing device into the filler opening (auxiliary connection 13D).
2. Test medium: compressed air
 Test pressure: max. 0.8 bar
 Test period: 2 min
 - ⇒ The pressure must not drop during the test period.
 - ⇒ If the pressure does drop, check the seals and screwed connections. Then perform another leak test.
3. Once the leak test has been successful, fill in the lubricant.

7.5.8.2 Checking and adjusting the packed gland

	 DANGER
	<p>The temperatures at the gland packing have risen above the permissible limits Explosion hazard!</p> <ul style="list-style-type: none"> ▷ Gland packings are not approved for use in potentially explosive atmospheres. ▷ Immediately switch off the pump set!

Check the gland packing during commissioning. Adjust the gland packing, if required.

The gland packing must leak slightly during operation.

Prior to commissioning

1. Only lightly tighten the nuts of the gland follower by hand.
 2. Use a feeler gauge to verify that the gland follower is mounted centred and at a right angle to the shaft.
- ⇒ The gland must leak after the pump has been primed.

After five minutes of operation

The leakage can be reduced.

1. Tighten the nuts of the gland follower by 1/6 turn.
2. Monitor the leakage for another five minutes.

Excessive leakage:

Repeat steps 1 and 2 until the minimum value has been reached.

Not enough leakage:

Slightly loosen the nuts at the gland follower.

No leakage:

Switch off the pump set immediately!

Loosen the gland follower and repeat start-up.


Checking for leakage

After the leakage has been adjusted, monitor the leakage for about two hours at maximum fluid temperature.

Check that enough leakage occurs at the gland at minimum inlet pressure.



7.5.9 Mounting the motor

Version with coupling

	NOTE
	<p>Steps 1 and 2 do not apply to versions with spacer-type coupling.</p>

1. Shift the motor to connect it to the pump via the coupling.
2. Fasten the motor to the baseplate.
3. Align pump and motor (⇒ Section 5.9 Page 29)
4. Connect the motor to the power supply (refer to manufacturer's literature).




Version with belt drive

	 WARNING
	<p>Motor tipping over Risk of squashing hands and feet!</p> <ul style="list-style-type: none"> ▷ Suspend or support the motor to prevent it from tipping over.

1. Fasten the motor to motor plate 81-33 with bolts 901.65, discs 550.65 and nuts 920.65.
2. Screw motor plate 81-33 including motor to motor bracket 890.

3. Screw in height-adjusting elements 901.59 / 550.59.
4. Mount motor bracket 890 on baseplate.

7.5.10 Mounting the belt drive

	<p style="background-color: yellow; margin: 0;">CAUTION</p> <p>V-belts pulled on with force Damage to the V-belts! Reduced service life of V-belts!</p> <ul style="list-style-type: none"> ▸ Only pull on V-belts if this is possible without using any force. ▸ Only pull on V-belts by hand. Do not use any tools (e.g. levers).
	<p style="background-color: yellow; margin: 0;">CAUTION</p> <p>Multiple V-belt drives Reduced service life of the V-belts!</p> <ul style="list-style-type: none"> ▸ Always replace the complete set of V-belts if individual belts are worn. ▸ Use V-belts of the same length.
<ul style="list-style-type: none"> ✓ The V-belts are free from burs, rust and dirt. ✓ The motor has been mounted on the motor plate or motor bracket as specified. ✓ The pump has been assembled as specified. <ol style="list-style-type: none"> 1. Use bushing 540.03 to fit pulley 882.02 on the motor shaft. 2. Fit bushing 540.02 on pump shaft 210. 3. Place pulley 882.01 on bushing 540.02. 4. Pull V-belts on pulleys 882.01/882.02. 5. Check the alignment of the pulleys. 6. Tension the V-belts. 	
	<p style="background-color: yellow; margin: 0;">CAUTION</p> <p>Swelling of V-belts due to aggressive ambient conditions Reduced service life of V-belts!</p> <ul style="list-style-type: none"> ▸ Protect V-belts suitably from oil mist, dripping oil and other chemical influences.

7.5.10.1 Using taper clamping bushes

- ✓ All blank surfaces, such as the drilled holes and the tapered sleeve of the taper clamping bush as well as the tapered drilled hole in the pulley have been cleaned and degreased.
1. Insert the taper clamping bush into the hub and align all connection holes.
 - ⇒ Make sure all half threaded holes are matched with half unthreaded holes.
 2. Lightly oil grub screws (sizes 1008 - 3030) or socket head cap screws (sizes 3535 - 5050) and screw them in. Do not tighten the screws at this stage.
 3. Clean and degrease the shaft. Push the pulley with the taper clamping bush onto the shaft until it reaches the required position.
 4. If using a key, first insert this key into the keyway of the shaft. Make sure there is a clearance gap between the key and the drilled keyway.
 5. Evenly tighten the grub screws or socket head cap screws.
 6. Check the tightening torque of the screws after 1/2 to 1 hour. Re-adjust the tightening torque, if required.

Table 24: Tightening torque for taper clamping bushes

Bush	Tightening torque	Screws	
	[Nm]	Quantity	Size
1004 / 1108	5.6	2	1/4" BSW
1310 / 1315	20	2	3/8" BSW
1210 / 1215	20	2	3/8" BSW
1610 / 1615	20	2	3/8" BSW
2012	31	2	7/16" BSW
2517	48	2	1/2" BSW
3020 / 3030	90	2	5/8" BSW
3535	112	3	1/2" BSW
4040	170	3	5/8" BSW
4545	192	3	3/4" BSW
5050	271	3	7/8" BSW


NOTE

Fill any open connection holes with grease to prevent the ingress of foreign matter.

7.5.10.2 Using pulleys to DIN 221

Use a pneumatic or hydraulic puller to fit the pulleys.
 Watch the position of the key.
 Secure the pulley axially with a grub screw.

7.6 Tightening torques
Table 25: Tightening torques

Thread	Torque [Nm]		
	Property class: 8.8	Property class: A4-70	Property class: 1.4462
M 6	10	7	7
M 8	25	17	17
M 10	50	35	35
M 12	85	60	60
M 16	210	150	150
M20	410	290	290
M24	710	278	500
M 27	1050	409	736
M 30	1420	554	1000

7.7 Spare parts stock
7.7.1 Ordering spare parts

Always quote the following data when ordering replacement or spare parts:

- Type series
- Material variant
- Size
- Seal code
- KSB order number
- Order item number
- Consecutive number
- Year of construction

Refer to the name plate for all data.

Also specify the following data:

- Description
- Part No.
- Quantity of spare parts
- Shipping address
- Mode of dispatch (freight, mail, express freight, air freight)

Refer to the exploded view or general assembly drawing for part numbers and descriptions.

7.7.2 Recommended spare parts stock for 2 years' operation to DIN 24296

Table 26: Quantity of spare parts for recommended spare parts stock

Part No.	Description	Number of pumps (including stand-by pumps)								Type
		1	2	3	4	5	6	8	10 and more	
163	Discharge cover	1	2	2	2	3	3	4	50 %	S
210	Shaft	1	1	1	2	2	2	3	30 %	S
230	Impeller	1	1	1	2	2	2	3	30 %	R
321.01/02	Rolling element bearing (set)	1	1	1	2	2	3	4	50 %	W
330	Bearing bracket, complete	–	–	–	–	–	–	1	2	S
433.01/02	Mechanical seal, complete (set)	1	2	3	4	4	4	6	90 %	W
	Assembly for gland packing consisting of:	1	1	1	2	2	2	3	40 %	R
	▪ Neck bush									
	▪ Shaft protecting sleeve									
	▪ Lantern ring									
	Packing cord (4 rings)	4	4	6	8	8	9	12	100 %	W
502.01	Casing wear ring	1	2	2	2	3	3	4	50 %	W
503	Impeller wear ring	1	2	2	2	3	3	4	50 %	W
135	Wear plate	1	2	2	2	3	3	4	50 %	W
	Seal elements (set)	2	4	6	8	8	9	12	150 %	W

S = spare part

R = replacement part

W = wear part

It is recommended to keep a stock of wear and replacement parts also during the warranty period.

8 Trouble-shooting

- A Pump delivers insufficient flow rate
- B Motor is overloaded
- C Excessive pump discharge pressure
- D Increased bearing temperature
- E Leakage at the pump
- F Excessive leakage at the shaft seal
- G Vibrations during pump operation
- H Impermissible rise of temperature inside the pump

Table 27: Trouble-shooting

A	B	C	D	E	F	G	H	Possible cause	Remedy ⁸⁾
X								Pump delivers against an excessively high pressure.	Re-adjust to duty point. Check system for impurities. Increase speed.
X						X	X	Pump and/or piping are not completely vented or primed.	Vent and/or prime.
X								Supply line or impeller clogged	Remove deposits in the pump and/or piping.
X								Formation of air pockets in the piping	Alter piping layout. Fit vent valve.
			X		X	X		Pump is warped or sympathetic vibrations in the piping.	Check the piping connections and secure fixing of pump; if required, reduce distances between the pipe clamps. Fix the pipelines using anti-vibration material.
X						X	X	Suction head is too high/NPSH _{available} (positive suction head) is too low.	Check/alter fluid level. Fully open the shut-off element in the supply line. Change suction line, if the friction losses in the suction line are too high. Check any strainers installed/suction opening. Observe permissible speed of pressure fall.
			X					Increased axial thrust	Contact KSB.
X								Air intake at the shaft seal.	Fit new shaft seal.
X								Wrong direction of rotation	Interchange two of the phases of the power cable.
X	X							Motor is running on 2 phases only.	Replace the defective fuse. Check the electric cable connections.
X								Speed is too low.	Increase speed, request particulars.
						X		Defective bearing(s)	Replace bearing(s).
			X			X	X	Insufficient flow rate	Increase the minimum flow rate.
X						X		Wear of internal components	Replace worn components by new ones.
	X					X		Pump back pressure is lower than specified in the purchase order.	Re-adjust to duty point.
	X							Density or viscosity of the fluid pumped is higher than stated in the purchase order.	Please contact KSB.
	X	X						Speed is too high.	Reduce speed, request particulars.
				X				Assembly bolts/sealing elements	Re-tighten bolts. Fit new sealing elements.
					X			Worn shaft seal	Fit new shaft seal.
						X		Vibrations during pump operation	Correct the suction conditions. Re-align the pump. Re-balance the impeller. Increase pressure at the pump suction nozzle.

⁸⁾ Pump pressure must be released before attempting to remedy faults on parts which are subjected to pressure.

A	B	C	D	E	F	G	H	Possible cause	Remedy ⁸⁾
			X		X	X		The pump set is misaligned.	Check the coupling/belt drive. Re-align, if required.
			X					Non-compliance with specified coupling distance	Correct distance according to general arrangement drawing.
	X							Operating voltage too low.	Increase the voltage.

⁸⁾ Pump pressure must be released before attempting to remedy faults on parts which are subjected to pressure.

9 Related Documents

9.1 Speed adjustment

If the speed needs to be adjusted, the pulleys may only be changed within the limits specified below for the pulley dimensions and the centre distances between pump and motor shaft. If the moment of inertia needs to be increased, a flywheel can be fitted to the motor as an addition. In this case, select a motor with reinforced bearings.

Speed adjustment for bearing bracket S05 up to IEC 200L

Table 28: Pulley dimensions

Base frame size	Size	Maximum pulley diameter [mm]		Maximum pulley width [mm]	Number of belts [quantity]	Distance between pulleys [mm]	
		Pump	Motor			Max.	Min.
3 (IEC 132-200)	K, E, F 100 - 401	400	400	100	5	560	440
	K, E, F 150 - 401					520	400
	K 200 - 330					520	400
	K E 200 - 400					520	400
	K 250 - 400					450	330
	K 250 - 401					450	330
	K 300 - 400					425	305
	K 300 - 401					425	305
3 (IEC 132-200)	D 100 - 315	400	400	100	5	585	465
	D 150 - 400					560	440
	D 150 - 401					520	400
	D 200 - 400					425	305
	D 250 - 400					420	300
	D 300 - 400					425	305
4 5 (IEC 132-200)	K 150 - 500	400	400	100	5	500	380
	E 200 - 500					500	380

Speed adjustment for motors IEC 225 S and above

Table 29: Pulley dimensions

Base frame size	Size	Maximum pulley diameter [mm]		Maximum pulley width [mm]	Number of belts [quantity]
		Pump	Motor		
4 (IEC 225 S - 250 M)	D 80 - 315	450	400	100	5
	100 - 401				
	D 150 - 400				
	150 - 401 with S05				
	200 - 330				
	200 - 400				
5 (IEC 225 S - 250 M)	250 - 400	450	400	100	5
	250 - 401				
	300 - 400				
	300 - 401				
5 (IEC 280 S - 315 M)	D 80 - 315	450	400	156	8
	100 - 401				
	150 - 401 with S05				
	200 - 330				
	200 - 400				
	250 - 400				
	250 - 401				

Base frame size	Size	Maximum pulley diameter [mm]		Maximum pulley width [mm]	Number of belts [quantity]
		Pump	Motor		
	300 - 400				
	300 - 401				
6 (IEC 225 S - 250 M)	K 150 - 500 with S05 E 200 - 500 with S05	450	400	156	8
7 (IEC 225 S - 315 M)	K 200 - 500 with S07 E 250 - 500 with S06 E 250 - 500 with S07 E 250 - 630 with S07	500	400	156	8
8 (IEC 225 S - 315 M)	E 250 - 630 with S07 E 300 - 630 with S07	500	400	156	8
9 (IEC 250 M - 315 M)	K 500 - 630 with S07	560	400	156	8
19 (IEC 225 S - 315 M)	K 300 - 500 with S06 K 350 - 500 with S06 K 350 - 500 with S07 K 350 - 501 with S06	500	400	156	8
20 (IEC 225 S - 250 M)	D, E 150 - 401 with S06 D, E 200 - 401 with S06 D 250 - 400 with S06 D 300 - 400 with S06	450	400	100	5
20 (IEC 225 S - 315 M)	D, E 150 - 401 with S06 D, E 200 - 401 with S06 D 250 - 400 with S06 D 300 - 400 with S06	450	400	156	8

9.2 Mass moments of inertia

Table 30: Mass moments of inertia and mass details of pulleys in GG

Pulley width						Pulley diameter	n _{max. dyn. balanced} [rpm]
50 mm		80 mm		100 mm			
I [kgm ²]	m [kg]	I [kgm ²]	m [kg]	I [kgm ²]	m [kg]	d [mm]	
0.012	5	0.022	9	0.027	11	140	3000
0.017	6	0.028	10	0.034	12	150	3000
0.022	7	0.035	11	0.045	14	160	3000
0.036	9	0.057	14	0.073	18	180	3000
0.055	11	0.09	18	0.11	22	200	3000
0.088	14	0.14	22	0.18	28	224	3000
0.13	17	0.22	28	0.28	36	250	3000
0.22	22	0.35	36	0.44	45	280	2700
0.35	28	0.56	45	0.69	56	315	2700
0.57	36	0.89	57	1.13	72	355	2200
0.92	46	1.46	73	1.82	91	400	1900
1.46	58	2.34	92.8	2.92	116	450	1700
2.23	72	3.56	115	4.45	143	500	1500
3.5	90	5.61	144	7.01	180	560	1350

Table 31: Mass moments of inertia and mass details of pulleys with taper clamping bushes

Pulley width				Pulley diameter	n _{max. dyn. balanced} [rpm]
50 mm (SPA - 3 grooves)		100 mm (SPA - 5 grooves)			
I [kgm ²] ⁹⁾	m [kg] ⁹⁾	I [kgm ²] ⁹⁾	m [kg] ⁹⁾	d [mm]	
0.0024	1.4	--	--	100	3000
0.0029	1.6	--	--	106	3000
0.0038	1.6	--	--	112	3000
0.0048	1.9	--	--	118	3000
0.0059	2.3	--	--	125	3000
0.0075	2.6	0.014	4.0	132	3000
0.0097	2.9	0.017	5.2	140	3000
0.013	3.6	0.021	5.9	150	3000
0.018	4.4	0.028	6.8	160	3000
--	--	0.034	7	170	3000
0.030	6.1	0.044	8	180	3000
--	--	0.055	9.3	190	3000
0.034	5.5	0.07	10.5	200	3000
--	--	0.089	12.2	212	3000
0.048	6.2	0.11	14	224	3000
--	--	0.17	19.5	236	3000
0.068	6.8	0.21	22.5	250	3000
0.097	7.6	0.23	21	280	2700
0.16	11	0.34	24	315	2700
0.163	12	0.48	25.5	335	2200
0.244	13	0.57	31.5	400	1900

⁹⁾ Without locking sleeve

9.3 General assembly drawing Sewatec — bearing brackets S05, 06, 07, 08

9.3.1 Horizontal installation

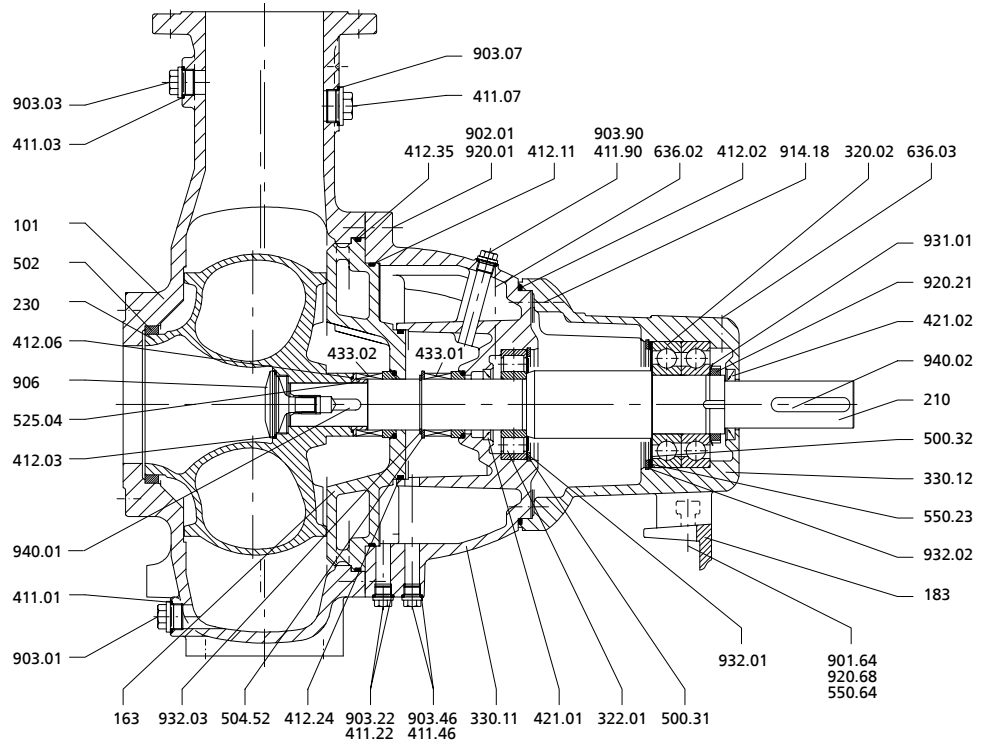


Fig. 47: Sewatec with E impeller — horizontal installation, shaft sealed by mechanical seal

Table 32: Impeller types

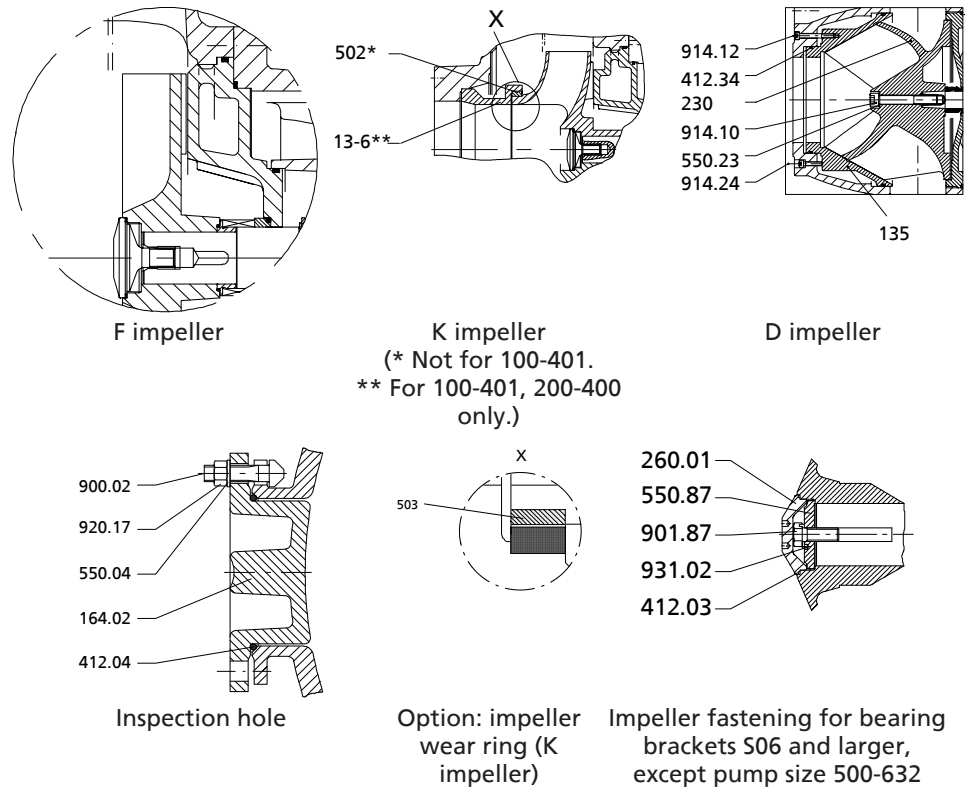


Table 33: List of components

Part No.	Description	Part No.	Description
13-6	Casing insert	502	Casing wear ring
101	Pump casing	503	Impeller wear ring ¹⁰⁾
135	Wear plate	504	Spacer ring
163	Discharge cover	525	Spacer sleeve
164	Inspection cover	550	Disc
183	Support foot	636	Lubricating nipple
210	Shaft	900	Screw
230	Impeller	901	Hexagon head bolt
320	Rolling element bearing	902	Stud
322	Radial roller bearing	903	Screw plug
330	Bearing bracket	906	Impeller screw
411	Joint ring	914	Hexagon socket head cap screw
412	O-ring	920	Nut
421	Lip seal	931	Lock washer
432	Auxiliary seal	932	Circlip
433	Mechanical seal	940	Key
500	Ring		

¹⁰⁾ For K impeller only

9.3.2 Vertical underfloor installation

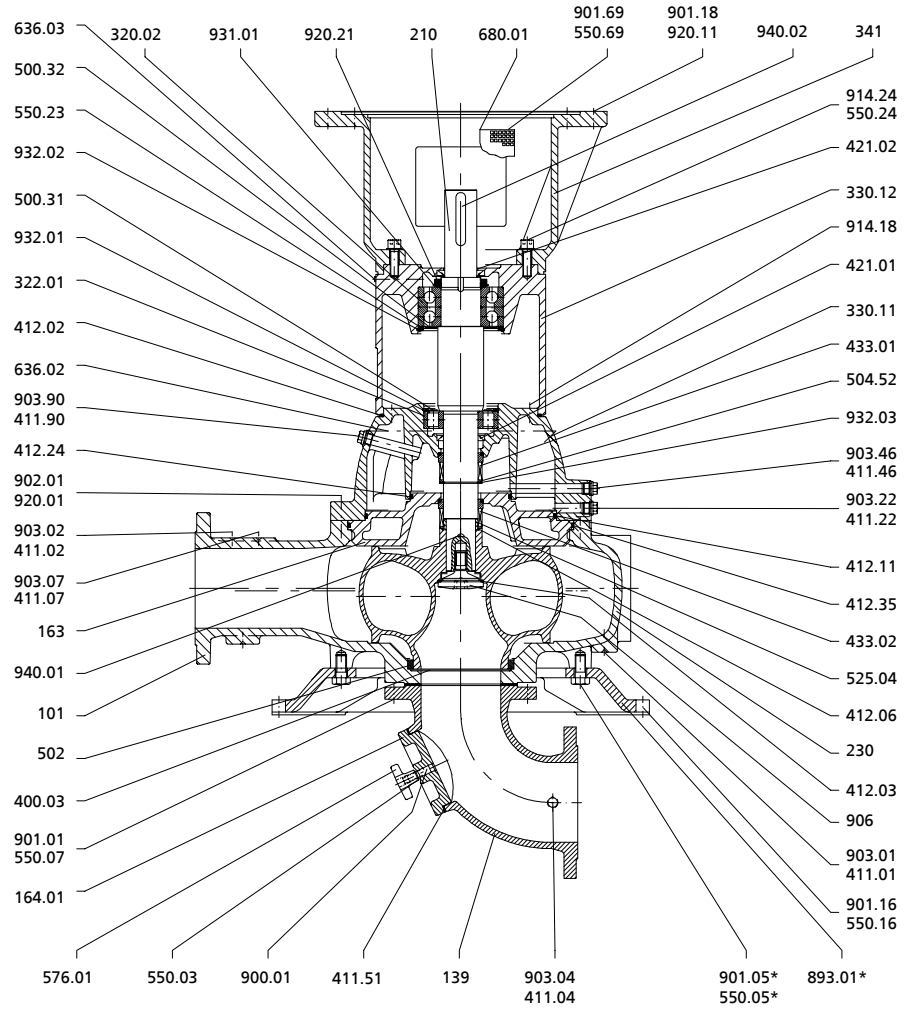
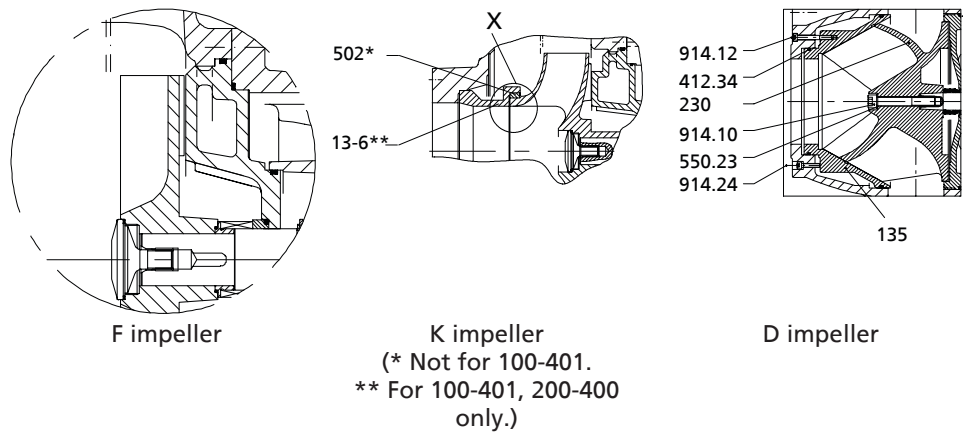
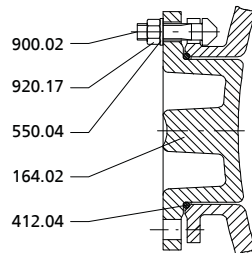


Fig. 48: Sewatec with E impeller – pump for underfloor installation, shaft sealed by mechanical seal

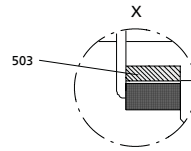
* If applicable

Table 34: Impeller types

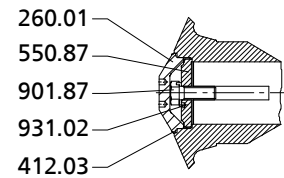




Inspection hole



Option: impeller wear ring (K impeller)



Impeller fastening for bearing brackets 506 and larger, except pump size 500-632

Table 35: List of components

Part No.	Description	Part No.	Description
101	Pump casing	504	Spacer ring
139	Suction elbow	525	Spacer sleeve
163	Discharge cover	550	Disc
164	Inspection cover	576	Handle
210	Shaft	636	Lubricating nipple
230	Impeller	680	Guard
322	Radial roller bearing	893	Sole plate
320	Rolling element bearing	900	Bolt/screw
330	Bearing bracket	901	Hexagon head bolt
341	Motor stool	902	Stud
400	Gasket	903	Screw plug
411	Joint ring	906	Impeller screw
412	O-ring	914	Hexagon socket head cap screw
421	Lip seal	920	Nut
433	Mechanical seal	931	Lock washer
500	Ring	932	Circlip
502	Casing wear ring	940	Key
503	Impeller wear ring ¹¹⁾		

¹¹⁾ For K impeller only

9.3.3 Cardan shaft design

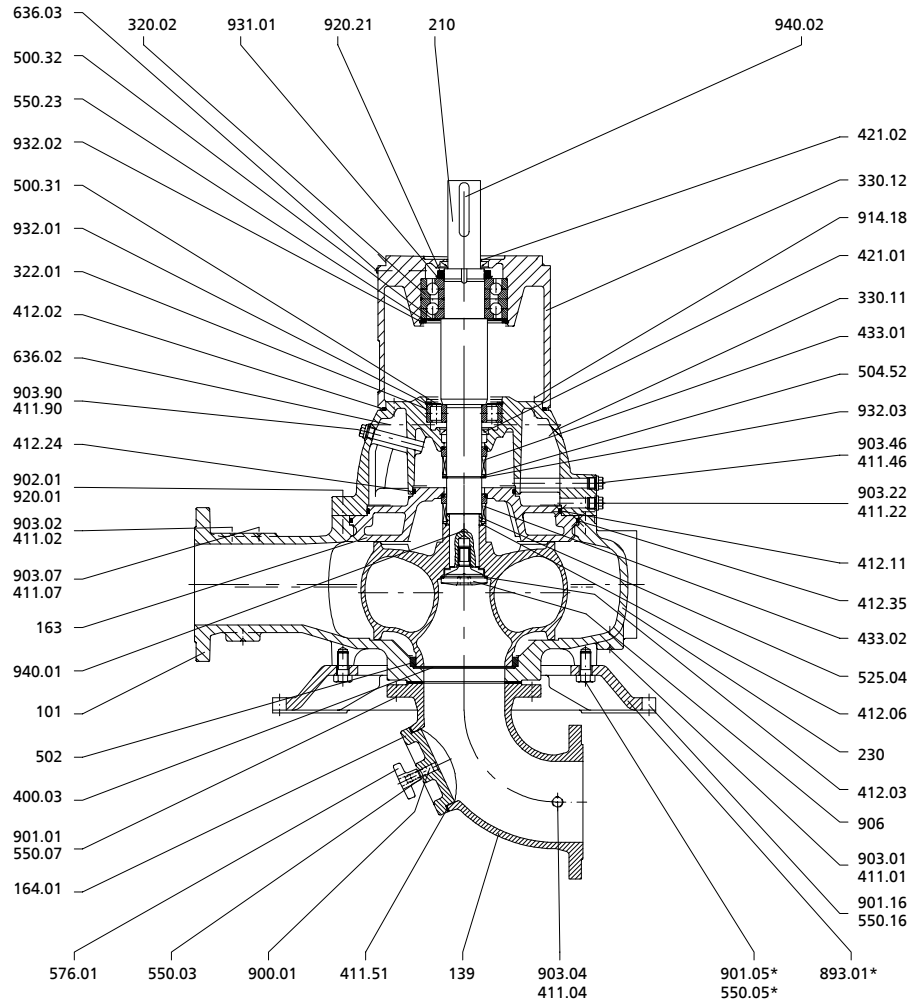
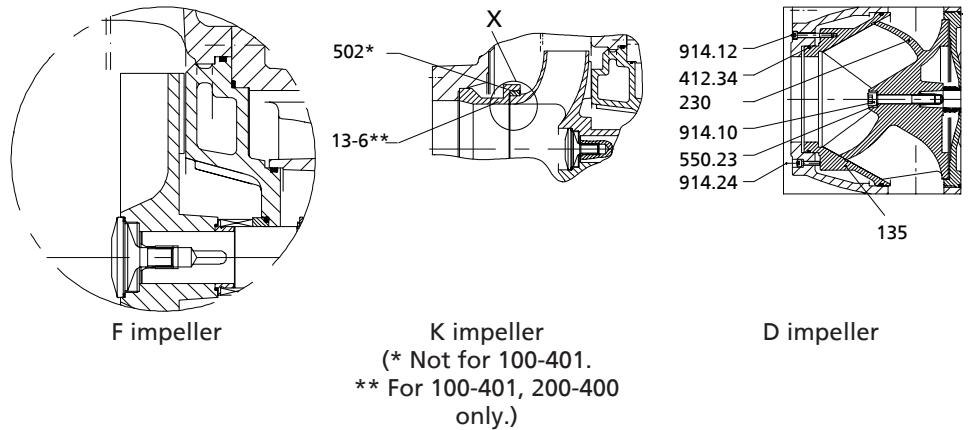
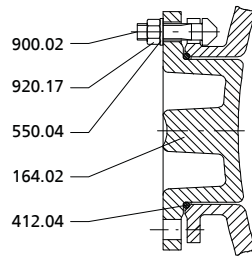


Fig. 49: Sewatec with E impeller – pump with cardan shaft, shaft sealed by mechanical seal

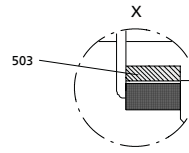
* If applicable

Table 36: Impeller types

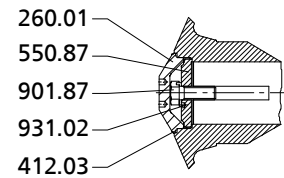




Inspection hole



Option: impeller wear ring (K impeller)



Impeller fastening for bearing brackets 506 and larger, except pump size 500-632

Table 37: List of components

Part No.	Description	Part No.	Description
101	Pump casing	504	Spacer ring
139	Suction elbow	525	Spacer sleeve
163	Discharge cover	550	Disc
164	Inspection cover	576	Handle
210	Shaft	636	Lubricating nipple
230	Impeller	680	Guard
320	Rolling element bearing	893	Sole plate
322	Radial roller bearing	900	Bolt/screw
330	Bearing bracket	901	Hexagon head bolt
341	Motor stool	902	Stud
400	Gasket	903	Screw plug
411	Joint ring	906	Impeller screw
412	O-ring	914	Hexagon socket head cap screw
421	Lip seal	920	Nut
433	Mechanical seal	931	Lock washer
500	Ring	932	Circlip
502	Casing wear ring	940	Key
503	Impeller wear ring ¹²⁾		

¹²⁾ For K impeller only

9.4 Exploded view

9.4.1 Exploded view of pump with mechanical seal

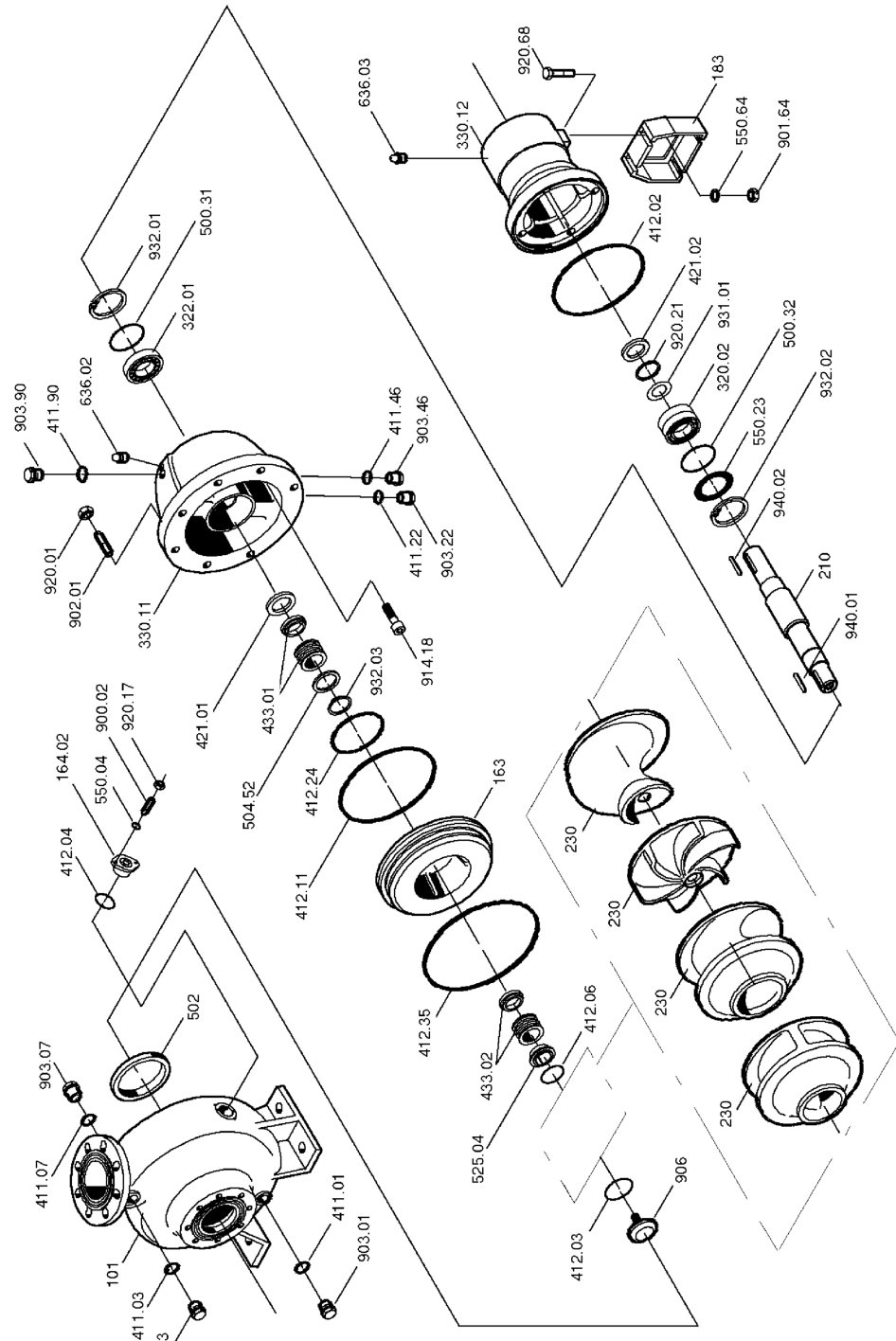


Fig. 50: Sewatec with mechanical seal

9.4.2 Exploded view of pump with packed gland

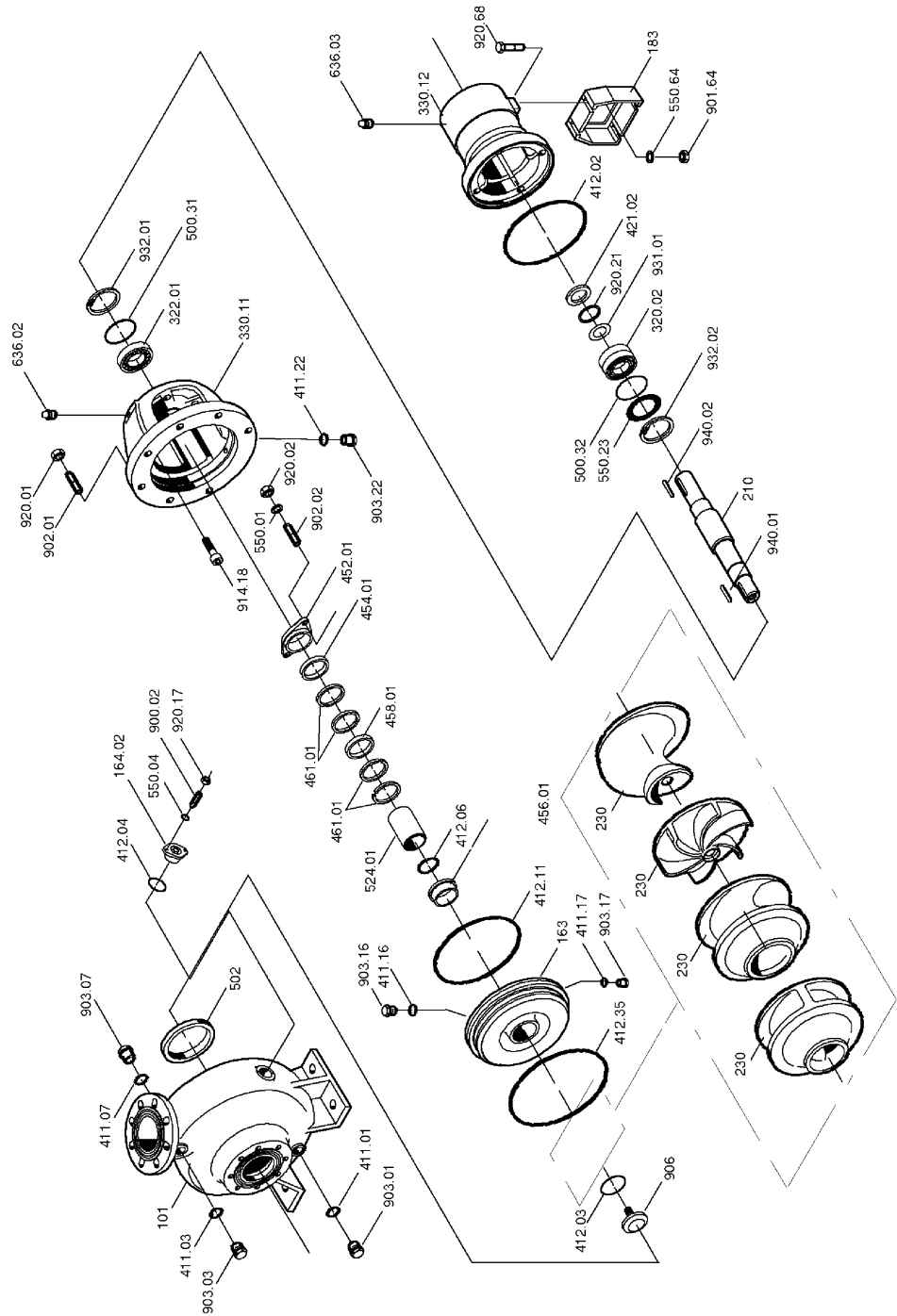


Fig. 51: Sewatec with packed gland

9.5 Complete list of components

Table 38: List of components

Part No.	Description	Part No.	Description
101	Pump casing	461	Gland packing
135	Wear plate	500	Ring
139	Intake elbow	502	Casing wear ring
163	Discharge cover	504	Spacer ring
164	Inspection cover	524	Shaft protecting sleeve

Part No.	Description	Part No.	Description
183	Support foot	525	Spacer sleeve
210	Shaft	550	Disc
230	Impeller	576	Handle
260	Impeller hub cap	636	Lubricating nipple
320	Angular contact ball bearing	680	Guard
322	Cylindrical roller bearing	893	Sole plate
330	Bearing bracket	900	Screw
341	Motor stool	901	Hexagon head bolt
400	Gasket	902	Stud
411	Joint ring	903	Screw plug
412	O-ring	906	Impeller screw
421	Shaft seal ring	914	Socket head cap screw
433	Mechanical seal	920	Nut
452	Gland follower	931	Lockwasher
454	Stuffing box ring	932	Circlip
456	Neck bush	940	Key
458	Lantern ring		

10 EC Declaration of Conformity

Manufacturer: **KSB Aktiengesellschaft
Johann-Klein-Straße 9
67227 Frankenthal (Germany)**

The manufacturer herewith declares that the product:

Sewabloc, Sewatec

KSB order number:

- is in conformity with the provisions of the following Directives as amended from time to time:
 - Pump (set): Machinery Directive 2006/42/EC

The manufacturer also declares that

- the following harmonised international standards have been applied:
 - ISO 12100
 - EN 809

Person authorised to compile the technical file:

Name
Function
Address (company)
Address (Street, No.)
Address (post or ZIP code, city) (country)

The EC Declaration of Conformity was issued in/on:

Place, date

.....¹³⁾.....

Name
Function
Company
Address

¹³⁾ A signed, legally binding declaration of conformity is supplied with the product.

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