

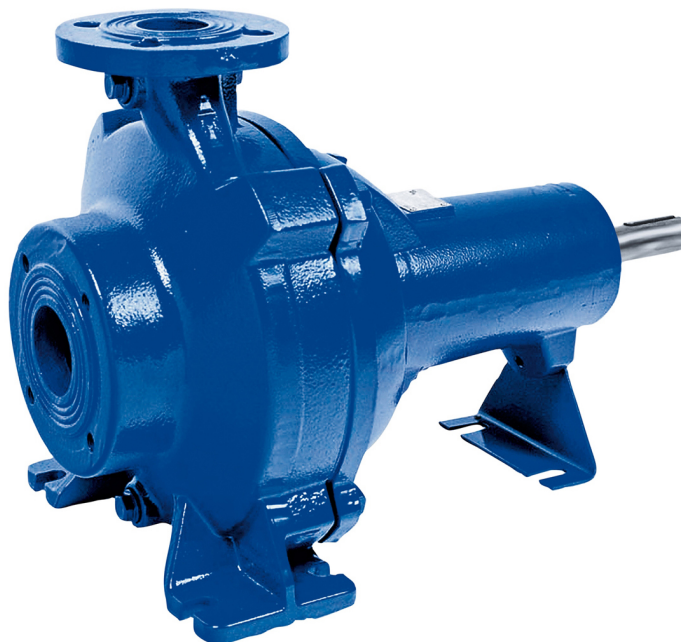
Sewatec (60 Hz)

60 Hz

ASME / NEMA Motors

Bearing Brackets S05, S06, S07, S08, S09, S10

Installation/Operating Manual



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Installation/Operating Manual Sewatec (60 Hz)

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

If a product is to be returned to the manufacturer, the customer declares in a certificate of decontamination 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 pipeline 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 pipeline which is connected to the suction nozzle

1 General

1.1 Principles

This operating manual is valid for 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 clearly identify the pump set and serve as identification for all further business processes.

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

1.2 Installation of partly completed machinery

To install partly completed machinery supplied by KSB refer to the sub-sections under Servicing/Maintenance.

1.3 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel. (⇒ Section 2.3, 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 dimensions and installation dimensions for the pump (set), weights
Wiring diagram	Description of electrical 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
Assembly drawing ¹⁾	Sectional drawing of the installed shaft seal

For accessories and/or integrated machinery components observe the product literature of the corresponding manufacturer.

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 included in agreed scope of supply

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

1.6 Key to safety symbols/markings

Table 3: Definition of safety symbols/markings

Symbol	Description
	DANGER This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury.
	WARNING This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.
	CAUTION This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.
	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 Safety

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

In addition to the present general safety information the action-related safety information given in the other sections must be observed.

2.1 General

- This operating manual contains general installation, operating and maintenance instructions that must be observed to ensure safe operation of the system and prevent personal injury and damage to property.
- Comply with all the safety instructions given in the individual sections of this operating manual.
- The operating manual must be read and understood by the responsible specialist personnel/operators prior to installation and commissioning.
- The contents of this operating manual must be available to the specialist personnel at the site at all times.
- Information and markings attached directly to the product must always be complied with and 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 which are not taken into account.

2.2 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 variant.
- Never operate the pump set without the fluid to be handled.
- Observe the limits for continuous duty specified in the data sheet or product literature (Q_{min} and Q_{max}) (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 $1.2 \times Q_{opt}$ to minimize the risk of clogging/hardening.
- Avoid duty points for continuous operation at very low speeds and small flow rates ($< 0.7 \times Q_{opt}$).
- Observe the minimum flow rate and maximum flow rate indicated in the data sheet or product literature (to prevent overheating, mechanical seal damage, cavitation damage, bearing damage).
- 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 respective impeller types in combination with the fluids described below.

	Free-flow impeller (impeller type F/F-max)
	Closed single-channel impeller (impeller type E/E-max)
	Open, diagonal single-vane impeller (impeller type D)
	Open, radial multi-vane impeller (impeller type D-max)
	Closed multi-channel impeller (impeller type K/K-max)

2.3 Personnel qualification and personnel 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 sufficiently trained specialist personnel training and instructing the personnel who will carry out the respective tasks. 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.

2.4 Consequences and risks caused by non-compliance with these operating instructions

- Non-compliance with these operating instructions 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

2.5 Safety awareness

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

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

2.6 Safety information for the operator/user

- Fit protective equipment (e.g. contact guards) supplied by the operator for hot, cold or moving parts, and check that the equipment functions properly.
- Do not remove any protective equipment (e.g. contact guards) while the pump is in operation. The only exception is the guard of the gland 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.)
- If stopping 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.

2.7 Safety information for maintenance, inspection and installation

- Modifications or alterations of the pump (set) are only permitted with the manufacturer's prior consent.
- Use only original spare parts or parts/components authorized by the manufacturer. The use of other parts/components can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that maintenance, inspection and installation is performed by authorized, qualified specialist personnel who are thoroughly familiar with the manual.
- Only carry out work on the pump (set) during standstill of the pump.
- Only perform work on the pump set when it has been disconnected from the power supply (de-energized).
- The pump (set) 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 re-activate any safety-relevant devices and protective devices. Before returning the product to service, observe all instructions on commissioning. (⇒ Section 6.1, Page 42)

2.8 Unauthorized modes of operation

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

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

2.9 Explosion protection

Special conditions apply to the operation of explosion-proof pumps.

- The explosion-proof status of the pump set is only assured if the pump set is used in accordance with its intended use.
- The limits stated in the data sheet and on the name plate must not be exceeded under any circumstances.
- Correct monitoring of the motor temperature is imperative to ensure explosion protection.
- Observe the wiring diagrams.

- Never operate an explosion-proof pump set without temperature monitoring.
- Modifications or alteration of the pump set could affect explosion protection and are only permitted after consultation with the manufacturer.
- Only original spare parts and accessories authorized by the manufacturer must be used for explosion-proof pumps.

3 Transport/Storage/Disposal

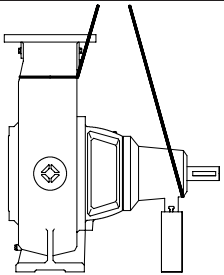
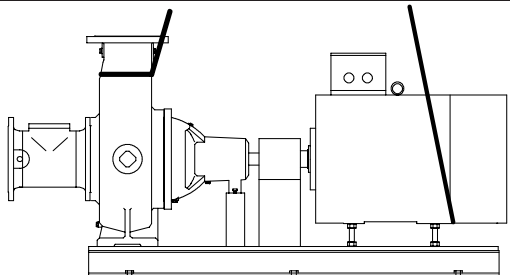
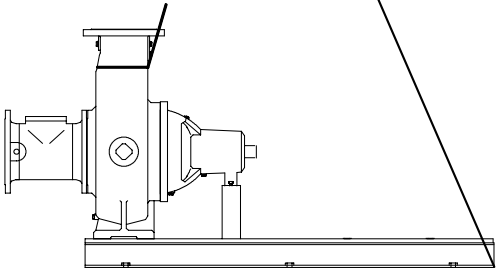
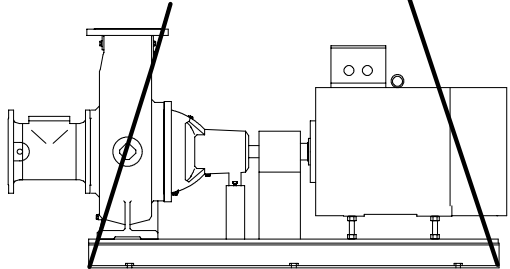
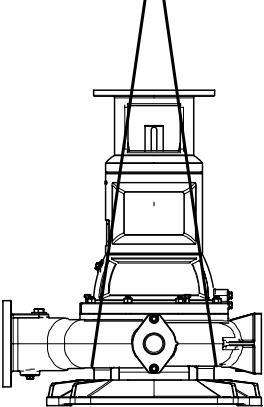
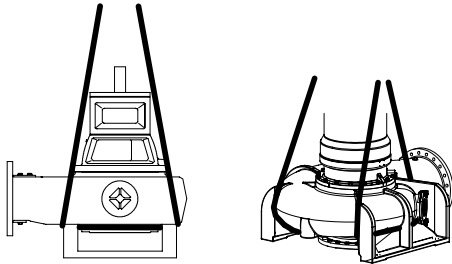
3.1 Checking the condition upon delivery

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 distributor and the insurance company about the damage in writing immediately.

3.2 Transport

	 DANGER The pump (set) could slip out of the suspension arrangement Danger to life from falling parts! ▷ Only transport the pump (set) in the position indicated. ▷ Never attach the suspension arrangement to the free shaft end or the motor eyebolt. ▷ Pay attention to the weight data, center of gravity and fastening points. ▷ Comply with the applicable local accident prevention regulations. ▷ Use suitable, permitted lifting accessories, e.g. self-tightening lifting tongs.
	 WARNING Uncontrolled lifting of pump/drive/pump set Risk of personal injury! ▷ Maintain sufficient safety distance when lifting the pump set (which may swing when pulled upright).
	 WARNING Placing the pump / pump set / packaging unit on unsecured and uneven surfaces Personal injury and damage to property! ▷ Only place the pump / pump set / packaging unit on a surface of sufficient load-carrying capacity. ▷ Use appropriate means to secure the pump / pump set / packaging unit against tilting or tipping over.

To transport the pump/pump set suspend it as illustrated.

 Bare-shaft pump	 Pump set on baseplate
 Bare-shaft pump on baseplate	 Pump set on baseplate Use the hooks welded to the baseplate!
 Vertical pump Attach two loops of rope around the pump casing or to the integrally cast feet of the pump casing!	 Vertical pump Attach two loops of rope around the pump casing or to the integrally cast feet of the pump casing!

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:

	CAUTION Damage during storage due to humidity, dirt or vermin Corrosion/contamination of the pump (set)! ► For outdoor storage cover the pump (set) or the packaged pump (set) and accessories with waterproof material.
	CAUTION Wet, contaminated or damaged openings and connections Leakage or damage to the pump! ► Clean and cover pump openings and connections as required prior to putting the pump into storage.

Table 4: Ambient conditions for storage

Ambient condition	Value
Relative humidity	5 % to 85 % (non-condensing)
Ambient temperature	14 °F to 158 °F [-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 46)
- Rotate the shaft by hand 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 56)
2. Flush and clean the pump, particularly if it has been used for handling noxious, explosive, hot or other hazardous fluids.
3. If the pump has handled fluids whose residues could lead to corrosion damage in the presence of atmospheric humidity or could ignite upon contact with oxygen, the pump must also be neutralized, 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.
Indicate any safety measures and decontamination measures taken.
(⇒ Section 10, Page 102)


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

Fluids handled, consumables and operating supplies which are hot or pose a health hazard

Hazard to persons and the environment!

- ▷ Collect and properly dispose of the flushing fluid and of any residues of the fluid handled.
- ▷ Wear protective 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, multi-channel, free flow or open diagonal single-vane impeller
- Electric motor connected to the pump via a coupling or cardan shaft

4.2 Product information as per Regulation No. 1907/2006 (REACH)

For information as per European chemicals regulation (EC) No. 1907/2006 (REACH) see <https://www.ksb.com/en-global/company/corporate-responsibility/reach>.

4.3 Designation

Example: Sewatec F 100-250G V

Table 5: Designation key

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

4.4 Name plate

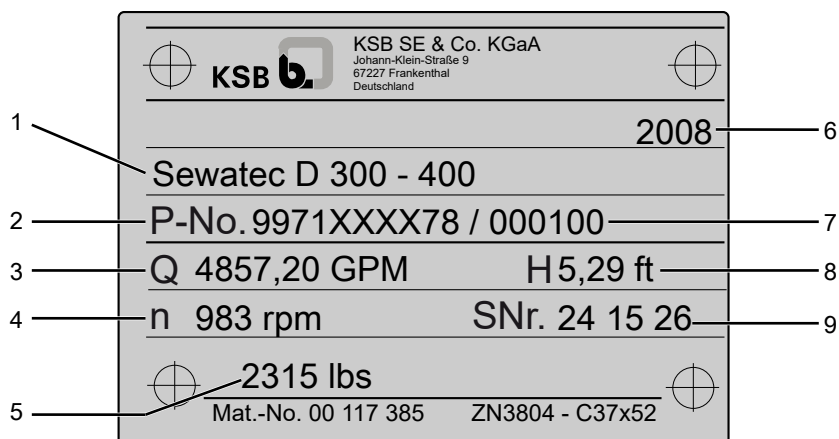


Fig. 1: Name plate (example)

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

4.5 Design details

Design

- Volute casing pump
- Back pull-out design
- Single-stage
- Various, application-oriented installation types

Shaft seal

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

Impeller type

- Various application-oriented impeller types

Bearings

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

4.6 Installation types

Horizontal installation

Sewatec - Fig. 0

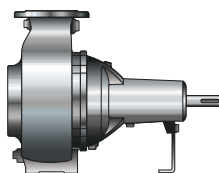


Fig. 2: Sewatec Fig. 0: Bare-shaft pump

Sewatec - 3E (3EN/3ENH)

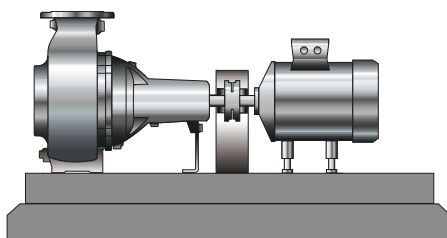


Fig. 3: Sewatec - 3E (3EN/3ENH): Pump set with directly coupled drive, baseplate, coupling (also with coupling spacer), coupling guard and height adjustment of the motor

Vertical installation

Sewatec - vertical (V)

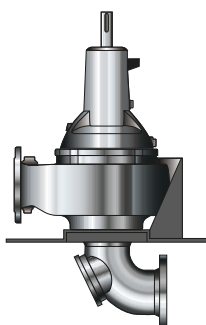


Fig. 4: Sewatec - vertical (V): Bare-shaft pump with soleplate or suction duckfoot bend

Sewatec - vertical (VU)

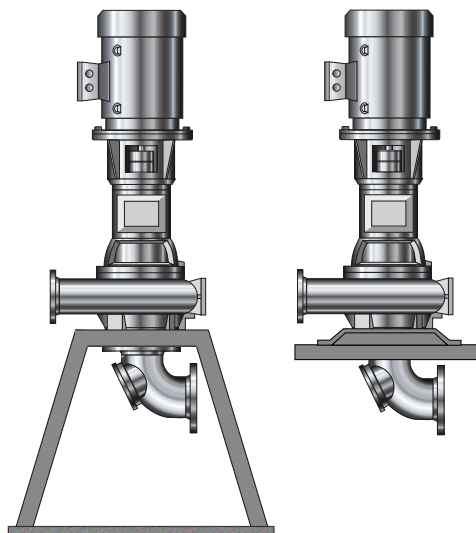


Fig. 5: Sewatec - vertical (VU): Pump set, C-face configuration, with motor pedestal, drive lantern, coupling, coupling guard and suction elbow

Sewatec - vertical (VGW)

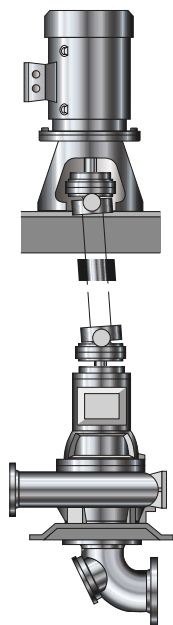


Fig. 6: Sewatec - vertical (VGW): Pump set with soleplate for pump and motor, support frame, drive lantern, suction elbow and universal-joint shaft

4.7 Configuration and function

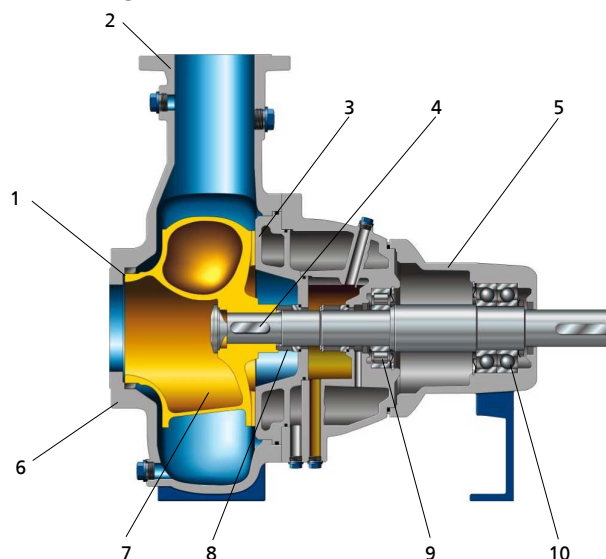


Fig. 7: Sectional drawing of pump set with single-vane impeller

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 in 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 into 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 to atmosphere by 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 by a gland packing.

4.8 Noise characteristics

Table 6: Surface sound pressure level $L_{pA}^{2)}$

Rated power input P_N	Pump		Pump set	
	1750 rpm	1160 / 875 rpm	1750 rpm	1160 / 875 rpm
	[dB]	[dB]	[dB]	[dB]
50 hp (37,0 kW)	65,5	64,5	71,0	69,5
60 hp (45,0 kW)	66,5	65,5	71,5	70,5
74 hp (55,0 kW)	67,5	66,5	72,5	71,0
100 hp (75,0 kW)	68,5	67,5	73,5	72,0
120 hp (90,0 kW)	69,5	68,5	74,0	72,5
147 hp (110,0 kW)	70,5	69,5	74,5	73,0
177 hp (132,0 kW)	72,0	71,0	75,0	73,5

² Measured at a distance of 3.28 ft [1 m] from the pump outline

Rated power input P_N	Pump		Pump set	
	1750 rpm	1160 / 875 rpm	1750 rpm	1160 / 875 rpm
	[dB]	[dB]	[dB]	[dB]
214 hp (160,0 kW)	73,0	72,0	75,5	74,0
268 hp (200,0 kW)	75,0	73,5	76,0	74,5
335 hp (250,0 kW)	76,0	75,0	80,0	79,0
422 hp (315,0 kW)	78,5	77,0	81,0	79,5
476 hp (355,0 kW)	79,0	78,0	81,5	80,0
536 hp (400,0 kW)	79,5	78,5	82,0	80,5
670 hp (500,0 kW)	81,5	80,0	82,5	81,5

4.9 Scope of supply

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

- Pump
- Drive
- Baseplate or soleplate
- Coupling
- Coupling guard
- Suction-side flanged spacer or suction elbow with inspection hole
- Universal-joint shaft

4.10 Dimensions and weights

For dimensions and weights refer to the general arrangement drawing/outline drawing or data sheet of the pump set.

- Pump weight: see pump name plate.
- Motor weight: see motor documentation.
- 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 55 lbs (25 kg). Refer to the weights indicated.

5 Installation at Site

5.1 Safety regulations

	⚠ DANGER Excessive temperatures in the shaft seal area Explosion hazard! Damage to the pump set! ▸ Regularly check the lubricant level.
	NOTE Operating pump sets with gland packings in combination with a frequency inverter / variable speed system is not recommended.

5.2 Checks to be carried out prior to installation

Place of installation

	⚠ WARNING Installation on mounting surfaces which are unsecured and cannot support the load Personal injury and damage to property! ▸ Use a concrete of compressive strength class C25/30 which meets the requirements of exposure class XC1 to EN 206 . ▸ The mounting surface must be set, even, and level. ▸ Observe the weights indicated.
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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.

5.3 Installing the pump set in a horizontal position

	⚠ DANGER Electrostatic charging Explosion hazard! Damage to the pump set! ▸ Connect the potential equalization conductor to the grounding terminal provided. ▸ Make sure that the connection between pump and baseplate is electrically conductive. ▸ Screws, bolts, nuts and shims must not be coated or the coating must be removed. ▸ Provide potential equalization between the pump set and the foundation.
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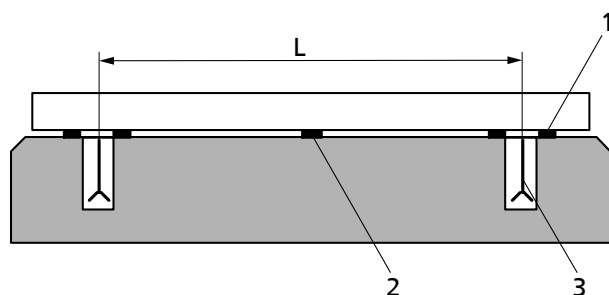


Fig. 8: Installation on a foundation with chemical anchors

L	Anchor-to-anchor distance	1	Shim
2	Shim for anchor-to-anchor distance ≥ 31.5 inches (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 align it with the help of a spirit level placed on the shaft and discharge nozzle.
Permissible deviation: 0.0079 inch/m (0.2 mm/m).
 2. Use shims (1) for height compensation if necessary.
Always fit shims immediately to the left and right of the chemical anchors (3) between the baseplate/foundation frame and the foundation.
For an anchor-to-anchor distance (L) ≥ 31.5 inches (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 Chemical anchor dimensions table. Then clean the holes.



WARNING

Improper handling of resin

Skin sensitization and/or irritation!

- Wear suitable protective clothing.

4. Insert the mortar cartridges into the drilled holes.
Observe the curing time of the resin capsule! Curing time: See the manufacturer's product literature.
5. Insert the threaded rods into the corresponding drilled holes with a rotary action power tool (e.g. impact drill, hammer drill).
6. After the curing time, tighten the chemical anchors (3) evenly and tightly.
7. Grout the baseplate using low-shrinkage concrete.

Chemical anchor dimensions

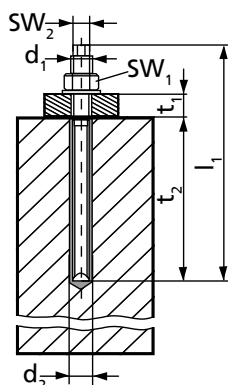


Fig. 9: Dimensions

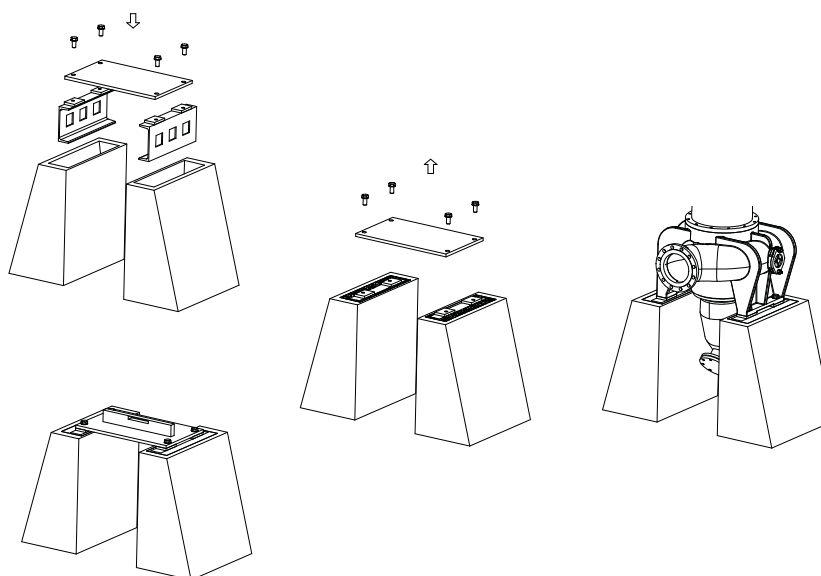
Table 7: Chemical anchor dimensions [inch], [ft lb]

Size (d ₁ × l ₁)	d ₂ [inch]	t ₁ [inch]	t ₂ [inch]	WAF ₁ ³⁾ [inch]	SW ₂ ³⁾ [inch]	M _{d1} [ft lb]
M10 × 130	7/16	7/8	3 9/16	11/16	1/4	14.75
M12 × 160	9/16	1	4 5/16	3/4	5/16	29.50
M16 × 190	11/16	1 3/8	4 15/16	15/16	7/16	44.25
M20 × 260	1	2 9/16	6 11/16	1 3/16	9/16	88.50
M24 × 300 ⁴⁾	1 1/8	2 9/16	8 1/4	1 7/16	1 1/16	132.76
M30 × 380 ⁴⁾	1 3/8	2 9/16	11	1 13/16	-	295.02

Table 8: Chemical anchor dimensions [mm], [Nm]

Size (d ₁ × l ₁)	d ₂ [mm]	t ₁ [mm]	t ₂ [mm]	SW ₁ ³⁾ [mm]	SW ₂ ³⁾ [mm]	M _{d1} [Nm]
M10 × 130	12	22	90	17	6	20
M12 × 160	14	25	110	19	8	40
M16 × 190	18	35	125	24	12	60
M20 × 260	25	65	170	30	14	120
M24 × 300 ⁴⁾	28	65	210	36	17	180
M30 × 380 ⁴⁾	35	65	280	46	-	400

5.4 Installing the pump set in a vertical position


Fig. 10: Preparing the foundation

The pump (set) is installed on horizontally aligned foundation rails.

Depending on the pump size, the pump (set) is either mounted on a separate soleplate or on integrally cast feet.

- ✓ The foundation has been prepared in accordance with the dimensions given in the outline drawing / general arrangement drawing. The foundation rails have been grouted with concrete.

1. Lift the pump set with the lifting equipment and lower it down onto the prepared foundation.

3 SW = Width across flats

4 Mounting accessories of the respective manufacturer are required.

2. Insert hexagon head bolts 901.16 with discs 550.16 into the drilled holes provided. Tighten the bolts.
3. Mount the motor on the drive lantern as described in the motor manufacturer's operating manual.
4. Align the coupling as described in the coupling manufacturer's operating manual.

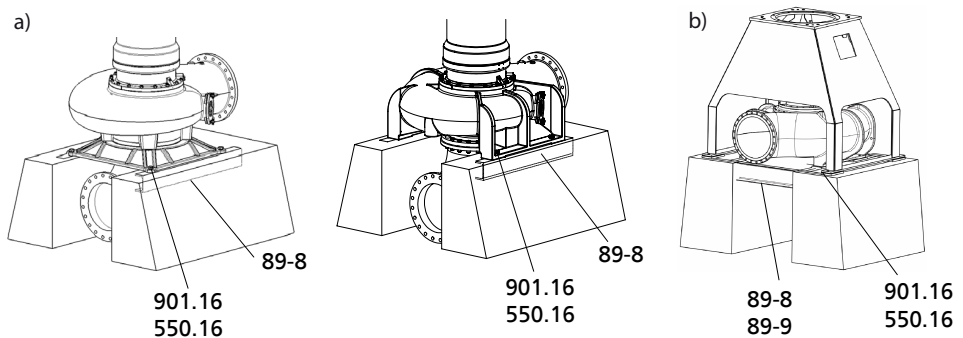


Fig. 11: a) Vertical installation on foundation rails b) Vertical installation with motor pedestal

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:

1. After installing the pump, attach the motor pedestal to the lifting equipment 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.
3. Mount the motor on the drive lantern as described in the motor manufacturer's operating manual.
4. Align the coupling as described in the coupling manufacturer's operating manual.

5.5 Piping

	NOTE
	When installing pumps in a piping system prevent any resonances at the usual excitation frequencies (1x and 2x rotational frequency, rotational noise) in the foundation and in the connected piping. See DIN ISO 10816-3.

5.5.1 Connecting the piping

	DANGER
	Impermissible loads acting on the pump nozzles Danger to life from leakage of hot, toxic, corrosive or flammable fluids! ▷ Do not use the pump as an anchorage point for the piping. ▷ Anchor the pipelines in close proximity to the pump and connect them properly without transmitting any stresses or strains. ▷ Observe the permissible forces and moments at the pump nozzles. ▷ Take appropriate measures to compensate for thermal expansion of the piping.

	CAUTION Incorrect grounding during welding work on the piping Destruction of rolling element bearings (pitting effect)! ▷ Never ground the electric welding equipment on the pump or baseplate. ▷ Prevent current flowing through the rolling element bearings.
	NOTE Installing check valves and shut-off elements in the system is recommended, depending on the type of plant and pump. Install the pump without any obstructions to its drainage or removal.

- ✓ The suction lift line has been laid with a rising slope, the suction head line with a downward slope towards the pump.⁵⁾
 - ✓ A flow stabilization section having a length equivalent to at least five times the diameter of the suction flange has been provided upstream of the suction flange.⁵⁾
 - ✓ The nominal diameters of the pipelines are equal to or greater than the nominal diameters of the pump nozzles.⁵⁾
 - ✓ To prevent excessive pressure losses, adapters to larger nominal diameters are designed with a diffuser angle of approx. 8°.⁵⁾
 - ✓ The pipelines have been anchored in close proximity to the pump or, for vertical installation, in close proximity to the suction elbow and connected without transmitting any stresses or strains.⁵⁾
1. Thoroughly clean, flush and blow through all vessels, pipes and connections (especially of new installations).
 2. Before installation in the piping, remove the flange covers on the suction nozzle and the discharge nozzle.
 3. Connect the pump nozzles to the piping.

	CAUTION Pumps connected with unbraced expansion joints Damage to the pump! ▷ To prevent impermissible nozzle loads, never connect the pump with unbraced expansion joints.
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4. If the owner / operator supplies an expansion joint, it has to be braced with external tie rods to prevent impermissible nozzle loads.

5.5.2 Permissible forces and moments at the pump nozzles

The loads are taken from ISO 5199. The values are applicable to each of the pump nozzles, taking into account the markings for the three axes of the respective flange.

⁵ If suction line requirements cannot be met, contact KSB Service.

Forces and moments at the pump nozzles, horizontal installation

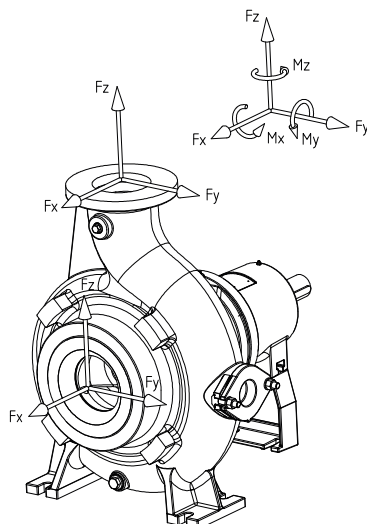


Fig. 12: Forces and moments at the pump nozzles for horizontal installation

Table 9: Forces and moments at the pump nozzles, horizontal installation

Sizes	Impeller type	Forces at suction nozzle				Moments at suction nozzle				Forces at discharge nozzle				Moments at discharge nozzle			
		Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM
		[lbs]				[ft lbs]				[lbs]				[ft lbs]			
80-315	D	237	215	271	418	330	367	440	660	158	203	181	317	293	330	440	587
100-315	D	283	249	317	486	403	477	550	770	215	271	237	418	330	367	440	660
100-400	K	362	317	396	622	440	513	660	953	215	271	237	418	330	367	440	660
100-401	E	283	249	317	486	403	477	550	770	215	271	237	418	330	367	440	660
100-401	F	283	249	317	486	403	477	550	770	215	271	237	418	330	367	440	660
100-401	K	283	249	317	486	403	477	550	770	215	271	237	418	330	367	440	660
100-403	D	475	430	531	825	587	697	843	1247	215	271	237	418	330	367	440	660
150-317	K	362	317	396	622	440	513	660	953	317	396	362	622	440	513	660	953
150-400	D	475	430	531	825	587	697	843	1247	317	396	362	622	440	513	660	953
150-400	K	475	430	531	825	587	697	843	1247	317	396	362	622	440	513	660	953
150-401	E	362	317	396	622	440	513	660	953	317	396	362	622	440	513	660	953
150-401	F	362	317	396	622	440	513	660	953	317	396	362	622	440	513	660	953
150-401	K	362	317	396	622	440	513	660	953	317	396	362	622	440	513	660	953
150-401	D	588	543	667	1029	807	953	1137	1687	317	396	362	622	440	513	660	953
150-403	K	475	430	531	825	587	697	843	1247	317	396	362	622	440	513	660	953
150-403	D	475	430	531	825	587	697	843	1247	317	396	362	622	440	513	660	953
151-401	K	362	317	396	622	440	513	660	953	317	396	362	622	440	513	660	953
151-403	K	475	430	531	825	587	697	843	1247	317	396	362	622	440	513	660	953
150-503	D	475	430	531	825	587	697	843	1247	317	396	362	622	440	513	660	953
150-503	K	362	317	396	622	440	513	660	953	317	396	362	622	440	513	660	953
200-317	K	475	430	531	825	587	697	843	1247	430	531	475	825	587	697	843	1247
200-330	K	588	543	667	1029	807	953	1137	1687	430	531	475	825	587	697	843	1247
200-401	E	475	430	531	825	587	697	843	1247	430	531	475	825	587	697	843	1247
200-401	K	475	430	531	825	587	697	843	1247	430	531	475	825	587	697	843	1247
200-400	D	588	543	667	1029	807	953	1137	1687	430	531	475	825	587	697	843	1247
200-402	K	475	430	531	825	587	697	843	1247	430	531	475	825	587	697	843	1247
200-402	D	588	543	667	1029	807	953	1137	1687	430	531	475	825	587	697	843	1247
200-403	K	475	430	531	825	587	697	843	1247	430	531	475	825	587	697	843	1247
200-405	D	588	543	667	1029	807	953	1137	1687	430	531	475	825	587	697	843	1247
200-500	E	475	430	531	825	587	697	843	1247	430	531	475	825	587	697	843	1247
200-501	K	588	543	667	1029	807	953	1137	1687	430	531	475	825	587	697	843	1247
200-502	K	475	430	531	825	587	697	843	1247	430	531	475	825	587	697	843	1247
200-503	D	588	543	667	1029	807	953	1137	1687	430	531	475	825	587	697	843	1247

Sizes	Impeller type	Forces at suction nozzle				Moments at suction nozzle				Forces at discharge nozzle				Moments at discharge nozzle			
		Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM
		[lbs]				[ft lbs]				[lbs]				[ft lbs]			
200-503	K	475	430	531	825	587	697	843	1247	430	531	475	825	587	697	843	1247
200-504	K	588	543	667	1029	807	953	1137	1687	430	531	475	825	587	697	843	1247
200-505	K	588	543	667	1029	807	953	1137	1687	430	531	475	825	587	697	843	1247
200-631	K	588	543	667	1029	807	953	1137	1687	430	531	475	825	587	697	843	1247
250-400	K	588	543	667	1029	807	953	1137	1687	543	667	588	1029	807	953	1137	1687
250-400	D	588	543	667	1029	807	953	1137	1687	543	667	588	1029	807	953	1137	1687
250-401	K	588	543	667	1029	807	953	1137	1687	543	667	588	1029	807	953	1137	1687
250-402	D	588	543	667	1029	807	953	1137	1687	543	667	588	1029	807	953	1137	1687
250-403	K	588	543	667	1029	807	953	1137	1687	543	667	588	1029	807	953	1137	1687
250-500	E	588	543	667	1029	807	953	1137	1687	543	667	588	1029	807	953	1137	1687
250-630	K	588	543	667	1029	807	953	1137	1687	543	667	588	1029	807	953	1137	1687
250-632	K	588	543	667	1029	807	953	1137	1687	543	667	588	1029	807	953	1137	1687
250-630	E	588	543	667	1029	807	953	1137	1687	543	667	588	1029	807	953	1137	1687
300-400	K	712	633	791	1243	1100	1283	1540	2273	633	791	712	1243	1100	1283	1540	2273
300-400	D	712	633	791	1243	1100	1283	1540	2273	633	791	712	1243	1100	1283	1540	2273
300-401	K	712	633	791	1243	1100	1283	1540	2273	633	791	712	1243	1100	1283	1540	2273
300-402	D	712	633	791	1243	1100	1283	1540	2273	633	791	712	1243	1100	1283	1540	2273
300-403	K	712	633	791	1243	1100	1283	1540	2273	633	791	712	1243	1100	1283	1540	2273
300-500	K	712	633	791	1243	1100	1283	1540	2273	633	791	712	1243	1100	1283	1540	2273
300-502	D	712	633	791	1243	1100	1283	1540	2273	633	791	712	1243	1100	1283	1540	2273
300-505	D	712	633	791	1243	1100	1283	1540	2273	633	791	712	1243	1100	1283	1540	2273
300-505	K	712	633	791	1243	1100	1283	1540	2273	633	791	712	1243	1100	1283	1540	2273
300-630	E	712	633	791	1243	1100	1283	1540	2273	633	791	712	1243	1100	1283	1540	2273
350-500	K	825	746	927	1447	1430	1613	1980	2933	746	927	825	1447	1430	1613	1980	2933
350-501	K	825	746	927	1447	1430	1613	1980	2933	746	927	825	1447	1430	1613	1980	2933
350-502	D	825	746	927	1447	1430	1613	1980	2933	746	927	825	1447	1430	1613	1980	2933
350-503	D	825	746	927	1447	1430	1613	1980	2933	746	927	825	1447	1430	1613	1980	2933
350-503	K	825	746	927	1447	1430	1613	1980	2933	746	927	825	1447	1430	1613	1980	2933
350-632	K	825	746	927	1447	1430	1613	1980	2933	746	927	825	1447	1430	1613	1980	2933
350-633	K	825	746	927	1447	1430	1613	1980	2933	746	927	825	1447	1430	1613	1980	2933
350-710	E	950	859	1051	1650	1760	2053	2493	3667	746	927	825	1447	1430	1613	1980	2933
350-710	K	825	746	927	1447	1430	1613	1980	2933	746	927	825	1447	1430	1613	1980	2933
350-713	K	825	746	927	1447	1430	1613	1980	2933	746	927	825	1447	1430	1613	1980	2933
400-500	K	950	859	1051	1650	1760	2053	2493	3667	859	1051	950	1650	1760	2053	2493	3667
400-632	K	1187	1063	1311	2057	2640	3043	3703	5463	859	1051	950	1650	1760	2053	2493	3667
500-632	K	1187	1063	1311	2057	2640	3043	3703	5463	1063	1311	1187	2057	2640	3043	3703	5463
500-634	K	1187	1063	1311	2057	2640	3043	3703	5463	1063	1311	1187	2057	2640	3043	3703	5463
600-520	K	1424	1277	1583	2476	3703	4253	5170	7663	1277	1583	1424	2476	3703	4253	5170	7663
600-710	K	1424	1277	1583	2476	3703	4253	5170	7663	1277	1583	1424	2476	3703	4253	5170	7663
700-902	K	1876	1730	2023	3312	4803	5867	733	10377	1515	1786	1650	2894	4400	5390	6600	9570

Forces and moments at the pump nozzles, vertical installation

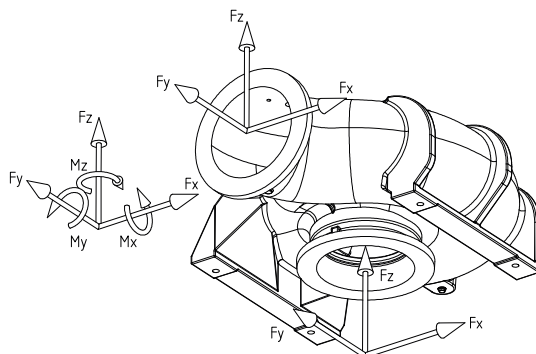


Fig. 13: Forces and moments at the pump nozzles for vertical installation

Table 10: Forces and moments at the pump nozzles, vertical installation

Sizes	Impeller type	Forces at suction nozzle				Moments at suction nozzle				Forces at discharge nozzle				Moments at discharge nozzle			
		Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM
		[lbs]				[ft lbs]				[lbs]				[ft lbs]			
100-315	D	723	893	803	1402	1100	1393	1540	2237	610	757	678	1187	917	1063	1283	1907
100-400	K	916	1130	1017	1775	1283	1503	1833	2677	610	757	678	1187	917	1063	1283	1907
100-401	E	723	893	803	1402	1100	1393	1540	2237	610	757	678	1187	917	1063	1283	1907
100-401	F	723	893	803	1402	1100	1393	1540	2237	610	757	678	1187	917	1063	1283	1907
100-401	K	723	893	803	1402	1100	1393	1540	2237	610	757	678	1187	917	1063	1283	1907
100-403	D	1221	1515	1356	2363	1687	1943	2383	3520	610	757	678	1187	917	1063	1283	1907
150-400	D	1221	1515	1356	2363	1687	1943	2383	3520	916	1130	1017	1775	1283	1503	1833	2677
150-400	K	1221	1515	1356	2363	1687	1943	2383	3520	916	1130	1017	1775	1283	1503	1833	2677
150-401	E	916	1130	1017	1775	1283	1503	1833	2677	916	1130	1017	1775	1283	1503	1833	2677
150-401	F	916	1130	1017	1775	1283	1503	1833	2677	916	1130	1017	1775	1283	1503	1833	2677
150-401	K	916	1130	1017	1775	1283	1503	1833	2677	916	1130	1017	1775	1283	1503	1833	2677
150-401	D	1526	1888	1684	2950	2310	2677	3263	4803	916	1130	1017	1775	1283	1503	1833	2677
150-403	K	1221	1515	1356	2363	1687	1943	2383	3520	916	1130	1017	1775	1283	1503	1833	2677
150-403	D	1221	1515	1356	2363	1687	1943	2383	3520	916	1130	1017	1775	1283	1503	1833	2677
151-401	K	916	1130	1017	1775	1283	1503	1833	2677	916	1130	1017	1775	1283	1503	1833	2677
151-403	K	1221	1515	1356	2363	1687	1943	2383	3520	916	1130	1017	1775	1283	1503	1833	2677
150-503	D	1221	1515	1356	2363	1687	1943	2383	3520	916	1130	1017	1775	1283	1503	1833	2677
150-503	K	916	1130	1017	1775	1283	1503	1833	2677	916	1130	1017	1775	1283	1503	1833	2677
200-330	K	1526	1888	1684	2950	2310	2677	3263	4803	1221	1515	1356	2363	1687	1943	2383	3520
200-400	D	1526	1888	1684	2950	2310	2677	3263	4803	1221	1515	1356	2363	1687	1943	2383	3520
200-401	E	1221	1515	1356	2363	1687	1943	2383	3520	1221	1515	1356	2363	1687	1943	2383	3520
200-401	K	1221	1515	1356	2363	1687	1943	2383	3520	1221	1515	1356	2363	1687	1943	2383	3520
200-402	K	1221	1515	1356	2363	1687	1943	2383	3520	1221	1515	1356	2363	1687	1943	2383	3520
200-402	D	1526	1888	1684	2950	2310	2677	3263	4803	1221	1515	1356	2363	1687	1943	2383	3520
200-403	K	1221	1515	1356	2363	1687	1943	2383	3520	1221	1515	1356	2363	1687	1943	2383	3520
200-405	D	1526	1888	1684	2950	2310	2677	3263	4803	1221	1515	1356	2363	1687	1943	2383	3520
200-500	E	1221	1515	1356	2363	1687	1943	2383	3520	1221	1515	1356	2363	1687	1943	2383	3520
200-501	K	1526	1888	1684	2950	2310	2677	3263	4803	1221	1515	1356	2363	1687	1943	2383	3520
200-502	K	1221	1515	1356	2363	1687	1943	2383	3520	1221	1515	1356	2363	1687	1943	2383	3520
200-503	D	1526	1888	1684	2950	2310	2677	3263	4803	1221	1515	1356	2363	1687	1943	2383	3520
200-503	K	1221	1515	1356	2363	1687	1943	2383	3520	1221	1515	1356	2363	1687	1943	2383	3520
200-504	K	1526	1888	1684	2950	2310	2677	3263	4803	1221	1515	1356	2363	1687	1943	2383	3520
200-505	K	1526	1888	1684	2950	2310	2677	3263	4803	1221	1515	1356	2363	1687	1943	2383	3520
200-631	K	1526	1888	1684	2950	2310	2677	3263	4803	1221	1515	1356	2363	1687	1943	2383	3520
250-400	K	1526	1888	1684	2950	2310	2677	3263	4803	1526	1888	1684	2950	2310	2677	3263	4803
250-400	D	1526	1888	1684	2950	2310	2677	3263	4803	1526	1888	1684	2950	2310	2677	3263	4803
250-401	K	1526	1888	1684	2950	2310	2677	3263	4803	1526	1888	1684	2950	2310	2677	3263	4803
250-402	D	1526	1888	1684	2950	2310	2677	3263	4803	1526	1888	1684	2950	2310	2677	3263	4803
250-403	K	1526	1888	1684	2950	2310	2677	3263	4803	1526	1888	1684	2950	2310	2677	3263	4803
250-500	E	1526	1888	1684	2950	2310	2677	3263	4803	1526	1888	1684	2950	2310	2677	3263	4803
250-630	K	1526	1888	1684	2950	2310	2677	3263	4803	1526	1888	1684	2950	2310	2677	3263	4803

Sizes	Impeller type	Forces at suction nozzle				Moments at suction nozzle				Forces at discharge nozzle				Moments at discharge nozzle			
		Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM
		[lbs]				[ft lbs]				[lbs]				[ft lbs]			
250-630	E	1526	1888	1684	2950	2310	2677	3263	4803	1526	1888	1684	2950	2310	2677	3263	4803
250-632	K	1526	1888	1684	2950	2310	2677	3263	4803	1526	1888	1684	2950	2310	2677	3263	4803
250-900	K	2125	2634	2363	4126	4033	4657	5683	8360	1526	1888	1684	2950	2310	2677	3263	4803
300-400	K	1820	2261	2023	3538	3153	3630	4437	6527	1820	2261	2023	3538	3153	3630	4436	6526
300-400	D	1820	2261	2023	3538	3153	3630	4437	6527	1820	2261	2023	3538	3153	3630	4436	6526
300-401	K	1820	2261	2023	3538	3153	3630	4437	6527	1820	2261	2023	3538	3153	3630	4436	6526
300-402	D	1820	2261	2023	3538	3153	3630	4437	6527	1820	2261	2023	3538	3153	3630	4436	6526
300-403	K	1820	2261	2023	3538	3153	3630	4437	6527	1820	2261	2023	3538	3153	3630	4436	6526
300-500	K	1820	2261	2023	3538	3153	3630	4437	6527	1820	2261	2023	3538	3153	3630	4436	6526
300-502	D	1820	2261	2023	3538	3153	3630	4437	6527	1820	2261	2023	3538	3153	3630	4436	6526
300-505	D	1820	2261	2023	3538	3153	3630	4437	6527	1820	2261	2023	3538	3153	3630	4436	6526
300-505	K	1820	2261	2023	3538	3153	3630	4437	6527	1820	2261	2023	3538	3153	3630	4436	6526
300-630	E	1820	2261	2023	3538	3153	3630	4437	6527	1820	2261	2023	3538	3153	3630	4436	6526
350-500	K	2125	2634	2363	4126	4033	4657	5683	8360	2125	2634	2363	4126	4033	4656	5683	8360
350-501	K	2125	2634	2363	4126	4033	4657	5683	8360	2125	2634	2363	4126	4033	4656	5683	8360
350-502	D	2125	2634	2363	4126	4033	4657	5683	8360	2125	2634	2363	4126	4033	4656	5683	8360
350-503	D	2125	2634	2363	4126	4033	4657	5683	8360	2125	2634	2363	4126	4033	4656	5683	8360
350-503	K	2125	2634	2363	4126	4033	4657	5683	8360	2125	2634	2363	4126	4033	4656	5683	8360
350-632	K	2125	2634	2363	4126	4033	4657	5683	8360	2125	2634	2363	4126	4033	4656	5683	8360
350-633	K	2125	2634	2363	4126	4033	4657	5683	8360	2125	2634	2363	4126	4033	4656	5683	8360
350-710	E	2430	3007	2702	4714	5060	5830	7113	10487	2125	2634	2363	4126	4033	4656	5683	8360
350-710	K	2125	2634	2363	4126	4033	4657	5683	8360	2125	2634	2363	4126	4033	4656	5683	8360
350-713	K	2125	2634	2363	4126	4033	4657	5683	8360	2125	2634	2363	4126	4033	4656	5683	8360
400-500	K	2430	3007	2702	4714	5060	5830	7113	10487	2430	3007	2702	4714	5060	5830	7113	10486
400-632	K	3041	3753	3380	5889	7517	8653	10597	15620	2430	3007	2702	4714	5060	5830	7113	10486
400-710	K	3041	3753	3380	5889	7517	8653	10597	15620	2430	3007	2702	4714	5060	5830	7113	10486
400-713	K	3041	3753	3380	5889	7517	8653	10597	15620	2430	3007	2702	4714	5060	5830	7113	10486
400-820	K	3041	3753	3380	5889	7517	8653	10597	15620	2430	3007	2702	4714	5060	5830	7113	10486
500-632	K	3041	3753	3380	5889	7517	8653	10597	15620	3041	3753	3380	5889	7516	8653	10596	15619
500-634	K	3041	3753	3380	5889	7517	8653	10597	15620	3041	3753	3380	5889	7516	8653	10596	15619
500-710	K	3041	3753	3380	5889	7517	8653	10597	15620	3041	3753	3380	5889	7516	8653	10596	15619
500-900	K	3651	4499	4058	7065	10560	12173	14813	21927	3041	3753	3380	5889	7516	8653	10596	15619
600-520	K	3651	4499	4058	7065	10560	12173	14813	21927	3651	4499	4058	7065	10560	12173	14813	21926
600-710	K	3651	4499	4058	7065	10560	12173	14813	21927	3651	4499	4058	7065	10560	12173	14813	21926
600-900	K	4544	5358	4951	8681	13200	16170	19800	28710	3651	4499	4058	7065	10560	12173	14813	21926
700-902	K	5189	5358	4951	8681	14410	17600	22000	31130	4544	5358	4951	8681	13199	16169	19799	28709

5.5.3 Vacuum balance line



NOTE

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

The following rules apply to vacuum balance lines:

- Minimum nominal line diameter 25 mm [0.98 in]
- The line extends above the highest permissible fluid level in the tank.

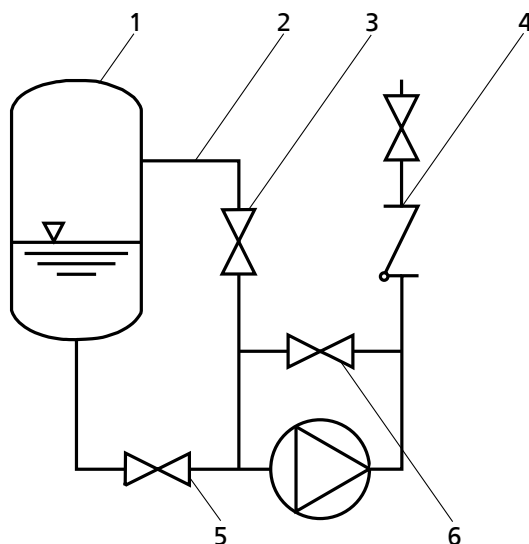


Fig. 14: Vacuum balance line

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

5.6 Auxiliary connections



WARNING

Screw plugs subjected to pressure

Risk of injuries by parts flying off and escaping fluid!

- ▷ Never use screw plugs for releasing pressure from the pump casing.
- ▷ Always use a suitable venting device (e.g. vent valve).

The following auxiliary connections are available:

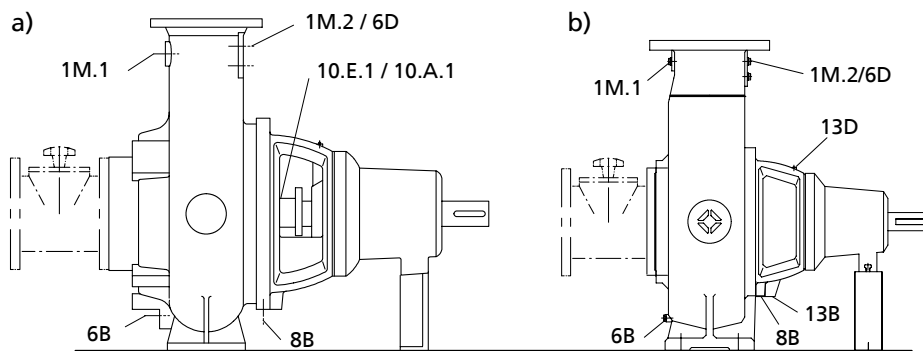


Fig. 15: Auxiliary connections: a) Pump with gland packing, b) Pump with mechanical seal

Table 11: Auxiliary connections, part 1

Connection	Description	Size				
		D 080-315	150-400	200-330	D 150-503	K 200-631
		D 080-317	150-401	250-400	K 150-503	K 250-900
		100-401	150-403	250-401	K 200-401	K 350-710
		D 100-315	151-401	250-402	K 200-402	K 350-713
		K 100-400	151-403	250-403	E 200-500	K 400-500
		D 100-403	200-400	300-400	D 200-503	K 400-710
			200-401	300-401	K 200-503	K 400-713
			200-402	300-402	K 200-504	K 400-820
			200-403	300-403	K 200-505	K 500-710
			200-405		E 250-500	K 500-900
			200-501		E 250-630	K 600-710
						K 600-900
				K 700-902		
1 M.1	Pressure gage (horizontal installation)	G 1/2			G 1	G 1/2
1 M.2	Pressure gage (vertical installation)	G 1/2				
6 D	Vent	G 1	G 1 1/4			
3 M	Pressure/vacuum gage	G 1/2				
6 B	Casing drain	G 1 ⁶⁾				
8 B	Leakage check / leakage drain	G 1/2				
For versions with mechanical seal						
13 D	Lubricant filler opening	G 1/2				
13 B	Lubricant drain	G 1/2				
For versions with gland packing						
10.E.1	Barrier fluid filler opening	G 3/8				
10.A.1	Barrier fluid drain	G 3/8				

Table 12: Auxiliary connections, part 2

Connection	Description	Size							
		K 250-630 K 300-500 D 300-502 D 300-505 E 300-630 K 350-500 K 350-501 D 350-502 D 350-503 K 350-632	K 250-632 K 300-505 K 350-633 K 400-632 K 500-632 K 500-634	E 300-710	E 350-710	K 600-520			
		1 M.1		Pressure gage (horizontal installation)	G 1/2		-	G 1	G 1/2
		1 M.2		Pressure gage (vertical installation)	G 1/2				
		6 D		Vent	G 1 1/4	G 1 1/2	G 2	G 1	G 2
		3 M		Pressure/vacuum gage	G 1/2				
		6 B		Casing drain	G 1		G 2	G 1 1/2	
		8 B		Leakage check / leakage drain	G 1/2				
		For versions with mechanical seal							
		13 D		Lubricant filler opening	G 1/2				
13 B		Lubricant drain	G 1/2						
For versions with gland packing									
10.E.1		Barrier fluid filler opening	G 3/8						
10.A.1		Barrier fluid drain	G 3/8						

⁶ Size D 80-315 = G 1/2

5.7 Checking the coupling alignment

	! DANGER
	Inadmissible temperatures at the coupling or bearings due to misalignment Explosion hazard! ▷ 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 if pump sets are supplied with pump and motor mounted on the same baseplate.

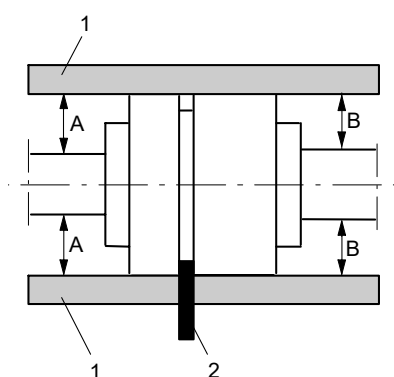


Fig. 16: Non-spacer-type coupling, checking the coupling alignment

1	Straight edge	2	Gage
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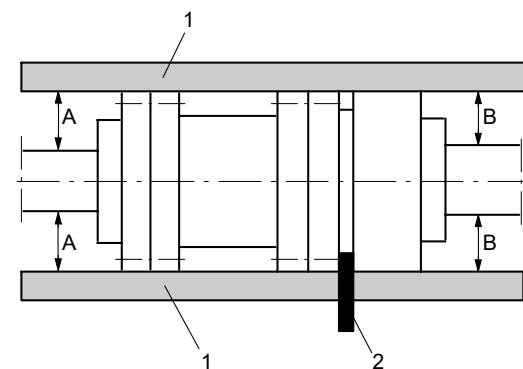


Fig. 17: Spacer-type coupling, checking the coupling alignment

1	Straight edge	2	Gage
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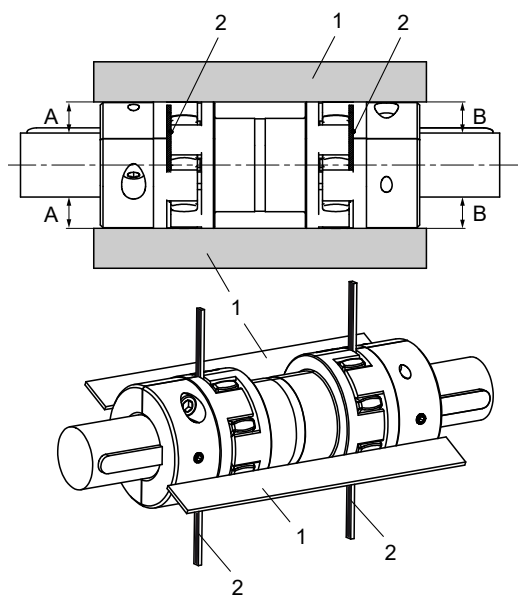


Fig. 18: Double Cardan spacer-type coupling, checking the coupling alignment

1	Straight edge	2	Gage
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Table 13: Permissible alignment offset of coupling halves

Coupling type	Radial offset		Axial offset	
	[mm]	[inch]	[mm]	[inch]
Non-spacer-type coupling (⇒ Fig. 16)	≤ 0.1	≤ 0.0039	≤ 0.1	≤ 0.0039
Spacer-type coupling (⇒ Fig. 17)	≤ 0.1	≤ 0.0039	≤ 0.1	≤ 0.0039
Double Cardan coupling (⇒ Fig. 18)	≤ 0.5	≤ 0.0197	≤ 0.5	≤ 0.0197

- ✓ The coupling guard and footboard for coupling guard, 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.
Observe the permissible radial offset in coupling half alignment (⇒ Table 13) both during standstill and at operating temperature as well as under inlet pressure.
 4. Check the distance between the two coupling halves around the circumference; refer to the general arrangement drawing for the dimensions.
The coupling is correctly aligned if the distance between the two coupling halves is the same at all points around the circumference.
Observe the permissible axial offset in coupling half alignment (⇒ Table 13) both during standstill and at operating temperature as well as under inlet pressure.

	DANGER
	Risk of ignition by frictional sparks Explosion hazard ▷ Choose a coupling guard material that is non-sparking in the event of mechanical contact.

	WARNING
	Unprotected rotating coupling Risk of injury by rotating shafts! ▷ 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.

5. If alignment is correct, re-install the coupling guard and footboard for coupling guard, if any.

Checking the coupling alignment with a laser tool

Coupling alignment may also be checked with a laser tool. Observe the documentation provided by the manufacturer of the measuring instrument.

5.8 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).

5.8.1 Aligning the pump set with adjusting screws

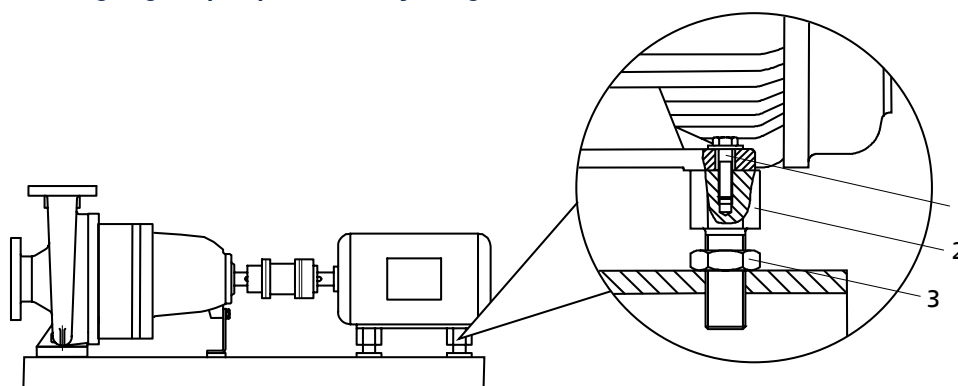


Fig. 19: Aligning the pump set with adjusting screws

1	Hexagon head bolt	3	Locknut
2	Adjusting screw		

✓ The coupling guard and its footboard, if fitted, 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 adjusting screws (2) by hand or by means of an open-end 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 proper functioning of coupling/shaft.
Check that coupling/shaft can easily be rotated by hand.

	DANGER
	Risk of ignition by frictional sparks Explosion hazard ▷ Choose a coupling guard material that is non-sparking in the event of mechanical contact.

	! WARNING
	Unprotected rotating coupling Risk of injury by rotating shafts! ▶ 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.

6. Fit the coupling guard and its footboard if applicable.
7. Check the distance between coupling and coupling guard.
The coupling guard must not touch the coupling.

5.8.2 Aligning the pump set without adjusting screws

Compensate any differences in shaft centreline heights of pump and motor by means of shims.

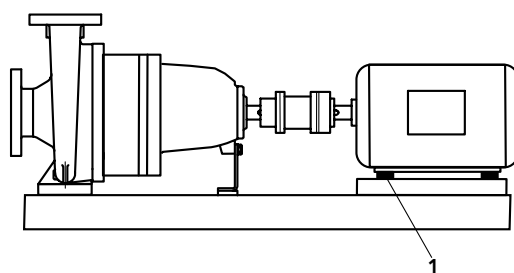


Fig. 20: Aligning the pump set without adjusting screws

1 Shim

- ✓ The coupling guard and its footboard, if fitted, 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 centerline height has been compensated.
 4. Re-tighten the hexagon head bolts.
 5. Check proper functioning of coupling/shaft.
Check that coupling/shaft can easily be rotated by hand.

	! DANGER
	Risk of ignition by frictional sparks Explosion hazard ▶ Choose a coupling guard material that is non-sparking in the event of mechanical contact.

	! WARNING
	Unprotected rotating coupling Risk of injury by rotating shafts! ▶ 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.

6. Fit the coupling guard and its footboard if applicable.

7. Check the distance between coupling and coupling guard.
The coupling guard must not touch the coupling.

5.9 Checking the lubricant level

- Grease-packed bearings
 - Grease-lubricated bearings have been packed with grease at the factory.
 - Lubricant supply for mechanical seals
 - The lubricant chambers have been filled at the factory.
1. Before commissioning the pump set, check the lubricant level.

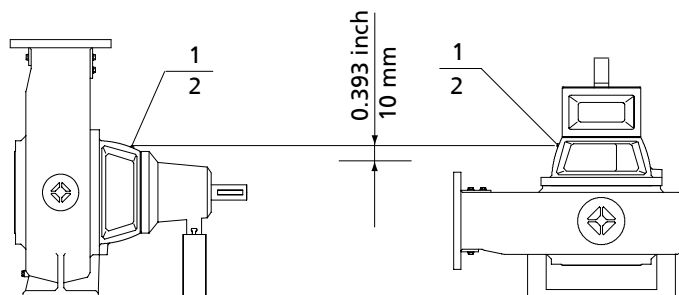


Fig. 21: Checking the lubricant level

- ✓ The pump set has been installed as described in this manual.
1. Unscrew and remove screw plug (1) with joint ring (2).
 2. If the lubricant level is within the tolerance range of 0.393 in. (10 mm) below the opening, re-insert and fasten screw plug (1) with joint ring (2).
 3. If the lubricant level is below the tolerance range, fill in more lubricant.

5.10 Barrier fluid connection for version with gland packing

The fluid handled can be used as a barrier fluid or flushing liquid, provided that:

- It has been filtered.
- It has been cooled.
- An external fluid can be used, provided it has been filtered and small amounts of the external fluid may mix with the fluid handled.

If no barrier fluid is available, grease can be pressed in instead.

1. Install the correct connection for the type of barrier fluid used.
(⇒ Section 5.6, Page 31)

5.11 Electrical connection

	⚠ DANGER Electrical connection work by unqualified personnel Danger of death from electric shock and explosion! ▸ Always have the electrical connections installed by an electrically qualified person. ▸ Observe regulations IEC 60364 and, for explosion-proof versions, EN 60079 .
	⚠ WARNING Incorrect connection to the mains Damage to the power supply network, short circuit! ▸ Observe the technical specifications of the local energy supply companies.

1. Check the available mains voltage against the data on the name plate.
2. Select an appropriate starting method.

	<table><tr><th>NOTE</th></tr><tr><td>Installing a motor protection device is recommended.</td></tr></table>	NOTE	Installing a motor protection device is recommended.
NOTE			
Installing a motor protection device is recommended.			

5.12 Checking the direction of rotation

	 DANGER Temperature increase resulting from contact between rotating and stationary components Damage to the pump set! ▶ 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.
	 WARNING Hands inside the pump casing Risk of injuries, damage to the pump! ▶ Never insert your hands or any other objects into the pump if the pump has not been de-energized and secured against unintentional start-up.
	CAUTION Incorrect direction of rotation of pump with non-reversible mechanical seal Damage to the mechanical seal and leakage! ▶ Separate the pump from the motor to check the direction of rotation.
	CAUTION Drive and pump running in the wrong direction of rotation Damage to the pump! ▶ 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 or rotation of the motor and pump is clockwise (seen from the motor 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 impeller rotates in the wrong direction of rotation, check and correct the electrical connection of the motor and the control system, if applicable.

5.13 Priming and venting the pump

	 DANGER
	Shaft seal failure caused by insufficient lubrication Hot or toxic fluid could escape! Damage to the pump! ► 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 element in the suction line.
3. Fully open all auxiliary connections (barrier fluid, flushing liquid, etc).

5.14 Protective equipment

	 WARNING
	Failure to re-install or re-activate protective equipment/devices Risk of personal injury from moving parts or escaping fluid! ► As soon as the work is completed, re-install and/or re-activate any safety-relevant devices and protective devices.

5.15 Connecting the vibration sensor

The pump is supplied prepared for the connection of a vibration sensor as an option. Fasten the vibration sensor at the point indicated at the bearing bracket. For fastening the sensor and connecting it to the power supply observe the sensor product literature.

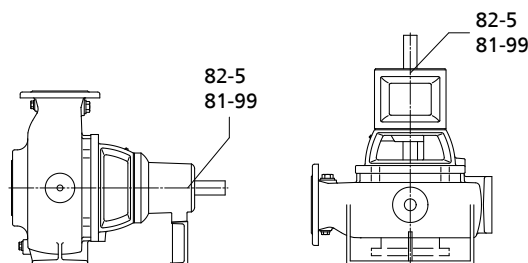
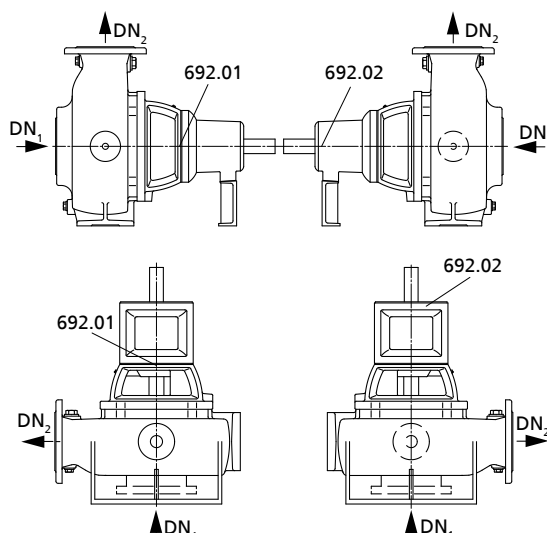


Fig. 22: Position of vibration sensor

82-5	Adapter	81-99	Electrical part
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5.16 Connecting temperature measuring devices

The pump is supplied prepared for the connection of resistance thermometers as an option. Fasten the resistance thermometers at the points indicated at the bearing bracket. For fastening the sensors and connecting them to the power supply observe the sensor product literature.


Fig. 23: Positions of temperature sensors

692-1	Temperature measuring device No. 1	692-2	Temperature measuring device No. 2
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5.17 Warning values and cut-out values

As an option, the pump can be fitted with various sensors. If such sensors are fitted, observe the following warning values and cut-out values:

Table 14: Warning values and cut-out values

Sensors		Warning value	Cut-out value
Vibrations ⁷⁾ For pumps of input power < 200 kW	[in/s - rms]	0,252	0,417
	[mm/s - rms]	6,4 ⁸⁾	10,6
Vibrations ⁷⁾ For pumps of input power > 200 kW	[in/s - rms]	0,299	0,469
	[mm/s - rms]	7,6 ⁸⁾	11,9
Bearing temperature at the outer bearing ring	[°F]	185	194
	[°C]	85	90

5.18 Connecting a leakage monitor

The pump features a leakage chamber between the discharge cover and the bearing bracket, which can be equipped with a leakage monitor. A leakage monitor detects when the leakage chamber is filled due to defective mechanical seals. The leakage monitor has a separate connection cable and is intended for connection to an electrode relay. Tripping of the electrode relay must result in the submersible pump cutting out.

The electrode relay (K1) must meet the following requirements:

- Sensor circuit 10 to 30 V ~
- Tripping current 0.5 to 3 mA
(equivalent to a tripping resistance of 3 to 60 kΩ)

⁷ To DIN ISO 10816-7, category II. For D and E impellers: An additional 3 mm/s are permitted in accordance with DIN ISO 10816-3.

⁸ Within the preferred operating range of $0.7 \leq Q/Q_{BEP} \leq 1.2$ the vibration values of newly commissioned pumps with good system conditions (piping layout, approach flow at the pump, etc.) are below the limits of zone A to DIN ISO 10816-7, i.e. below 3.2 mm/s rms ($P_2 \leq 200$ kW) and 4.2 mm/s rms ($P_2 > 200$ kW).

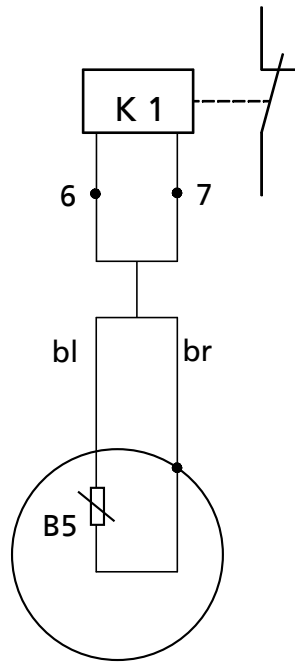


Fig. 24: Connecting the electrode relay

6 Commissioning/Start-up/Shutdown

6.1 Commissioning/start-up

6.1.1 Prerequisites for commissioning/start-up

Prior to commissioning, make sure that the following conditions are met:

- The pump set has been properly connected to the power supply and is equipped with all protection devices.
- The pump has been primed with the fluid to be handled. The pump has been vented.
- The direction of rotation has been checked.
- All auxiliary feed lines required are connected and operational.
- The lubricant has been checked.
- After prolonged shutdown of the pump (set), the activities required for returning the equipment to service have been carried out.

6.1.2 Start-up

	! DANGER Non-compliance with the permissible pressure and temperature limits due to pump being operated with the suction and discharge lines closed. Hot fluids escaping! ▸ 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 shut-off element slightly or fully open.
	! DANGER Excessive temperatures due to dry running or excessive gas content in the fluid handled Explosion hazard! Damage to the pump set! ▸ Never operate the pump set without liquid fill. ▸ Prime the pump as per operating instructions. ▸ Always operate the pump within the permissible operating range. ▸ If the pump is in slurr mode, stop the pump immediately.
	! WARNING Pump sets with high noise characteristics Damage to hearing! ▸ Persons must only enter the vicinity of the running pump set if they are wearing protective clothing/ear protection. ▸ See noise characteristics.
	CAUTION Re-starting while motor is still running down Damage to the pump set! ▸ Do not re-start the pump set before it has come to a standstill. ▸ Never start the pump set while the pump is running in reverse.

	CAUTION
	Abnormal noises, vibrations, temperatures or leakage Damage to the pump! ▷ 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.
5. On pump sets with a gland packing check the leakage at the gland packing and re-adjust it, if required.

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

	NOTE
	Only start speed-controlled operation after 3-5 minutes at the earliest. Pump start-up with long start ramps and low frequency may cause clogging.

6.2 Operating limits

	 DANGER
	Non-compliance with operating limits for pressure, temperature, fluid handled and speed Hot fluid may escape! Explosion hazard! ▷ Comply with the operating data specified 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 exceeding those specified in the data sheet or on the name plate unless the written consent of the manufacturer has been obtained.

	 DANGER
	Formation of a potentially explosive atmosphere inside the pump Explosion hazard! ▷ When draining tanks take suitable measures to prevent dry running of the pump (e.g. fill level monitoring).

6.2.1 Maximum operating pressure

	CAUTION
	Non-compliance with permissible operating pressure
	Damage to connections and seals! ► Never exceed the operating pressure specified in the data sheet.

Table 15: Maximum operating pressure, maximum test pressure

Size	Maximum operating pressure		Maximum test pressure	
	[psi]	[bar]	[psi]	[bar]
080-315	145	10	217,5	15
080-317	145	10	217,5	15
100-315	145	10	217,5	15
K 100-400	145	10	188,5	13
100-401	145	10	188,5	13
100-403	145	10	188,5	13
150-400	145	10	217,5	15
150-401	145	10	217,5	15
150-403	145	10	217,5	15
D 150-503	200,2	13,8	300,2	20,7
150-503	145	10	217,5	15
151-401	145	10	217,5	15
151-403	145	10	217,5	15
200-330	145	10	217,5	15
200-401	145	10	217,5	15
200-402	145	10	217,5	15
200-403	145	10	217,5	15
200-405	145	10	217,5	15
200-501	145	10	217,5	15
200-502	145	10	217,5	15
200-503	145	10	217,5	15
200-504	145	10	217,5	15
200-505	145	10	217,5	15
200-631	145	10	217,5	15
250-400	145	10	217,5	15
250-401	145	10	217,5	15
250-402	145	10	217,5	15
250-403	145	10	217,5	15
250-500	145	10	217,5	15
250-630	145	10	217,5	15
250-632	145	10	217,5	15
250-900	188	13	282,0	19,5
300-400	145	10	217,5	15
300-401	145	10	217,5	15
300-402	145	10	217,5	15
300-403	145	10	217,5	15
300-500	87	6	130,5	9
300-502	145	10	217,5	15
300-505	145	10	217,5	15

Size	Maximum operating pressure		Maximum test pressure	
	[psi]	[bar]	[psi]	[bar]
300-630	145	10	217,5	15
350-500	87	6	130,5	9
350-501	87	6	130,5	9
350-502	87	6	130,5	9
350-503	145	10	217,5	15
D 350-503	87	6	130,5	9
350-632	145	10	217,5	15
350-633	145	10	217,5	15
E 350-710	87	6	130,5	9
K 350-710	145	10	217,5	15
350-713	188	13	282,0	19,5
400-500	87	6	130,5	9
400-632	87	6	130,5	9
400-710	145	10	217,5	15
400-713	188	13	282,0	19,5
400-820	188	13	282,0	19,5
500-634	58	4	87,0	6
500-632	58	4	87,0	6
500-710	100	6,9	150,0	10,35
500-900	130	9	195,0	13,5
600-520	58	4	87,0	6
600-710	58	4	87,0	6
600-900	130	9	195,0	13,5
700-902	43,5	3	62,25	4,5

6.2.2 Frequency of starts

	CAUTION
	Re-starting while motor is still running down Damage to the pump set! ▷ Do not re-start the pump set before it has come to a standstill. ▷ Never start the pump set while the pump is running in reverse.

To prevent high temperature increases in the motor and excessive load on the pump, coupling, belts, motor, sealing elements and bearings, the following number of starts per hour shall not be exceeded.

Table 16: Frequency of starts

Motor rating		Maximum number of starts
[hp]	[kW]	[Starts per hour]
≤ 15	≤ 11	25
≤ 134	≤ 100	20
> 134	> 100	10

6.2.3 Fluid handled

6.2.3.1 Temperature of the fluid handled

	CAUTION
	Impermissibly high temperature of fluid handled Damage to the pump! ▷ 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.

6.2.3.2 Density of the fluid handled

	CAUTION
	Impermissibly high density of fluid handled Motor overload! ▷ Observe the information on fluid density in the data sheet. ▷ Make sure the motor has sufficient power reserves.

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

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 is 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/pump sets are supplied by our factory duly prepared for storage.
- Rotate the pump shaft by hand once a month.

The pump (set) remains installed

- ✓ Sufficient fluid is supplied for the operation check run of the pump.
 1. For prolonged shutdown periods, start up the pump set regularly between once a month and once every three months for approximately five minutes.
 - ⇒ 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 56)
- ✓ The safety instructions for dismantling the pump have been observed. (⇒ Section 7.4.1, Page 57)
- ✓ The permissible ambient temperature for storing the pump is observed.
 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 nozzle and discharge nozzle.
It is advisable to then close the pump nozzles (e.g. with plastic caps)
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.
Observe the additional instructions on preservation.

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 if there is back pressure.
2. Switch off the motor.
Make sure that the pump set runs down smoothly to a standstill.

Prolonged shutdown periods

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

Danger of frost/freezing

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

6.4 Returning to service after storage

	WARNING
	Failure to re-install or re-activate protective equipment/devices Risk of personal injury from moving parts or escaping fluid! ▶ As soon as the work is completed, re-install and/or re-activate any safety-relevant devices and protective devices.
	NOTE
	On pumps/pump sets older than 5 years we recommend replacing all elastomer seals.

For returning the equipment to service observe the sections on commissioning/start-up (⇒ Section 6.1, Page 42) and the operating limits.

In addition, carry out all servicing/maintenance operations before returning the pump (set) to service. (⇒ Section 7, Page 48)

7 Servicing/Maintenance

7.1 Safety regulations

	 DANGER Improper cleaning of coated pump surfaces Explosion hazard by electrostatic discharge! ▷ When cleaning coated pump surfaces in atmospheres of Explosion group IIC, use suitable anti-static equipment.
	 DANGER Sparks produced during maintenance work Explosion hazard! ▷ Observe the safety regulations in force at the place of installation. ▷ Never open a pump set that is connected to the power supply. ▷ Always perform maintenance work on pump sets outside potentially explosive atmospheres.
	 DANGER Improperly serviced pump set Explosion hazard! Damage to the pump set! ▷ Service the pump set regularly. ▷ Prepare a maintenance schedule with special emphasis on lubricants, power cable, bearing assembly and shaft seal.
The operator ensures that all maintenance, all inspections and all installation work is performed by authorized, qualified specialist personnel who are thoroughly familiar with the manual.	
	 WARNING Unintentional starting of pump set Risk of injury by moving components and shock currents! ▷ 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 Fluids handled, consumables and operating supplies which are hot or pose a health hazard Risk of personal injury! ▷ 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
	Insufficient stability Risk of crushing hands and feet! ▷ During assembly/dismantling, secure the pump (set)/pump parts against tilting or tipping over.

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

	NOTE
	All maintenance work, service work and installation work can be carried out by KSB Service or authorized workshops. Find your contact in the attached Addresses booklet or visit https://www.ksb.com/en-global/contact .

Never use force when dismantling and reassembling the pump set.

7.2 Maintenance/inspection

7.2.1 Supervision of operation

	! DANGER
	Formation of a potentially explosive atmosphere inside the pump Explosion hazard! ▷ 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.

	CAUTION
	Increased wear due to dry running Damage to the pump set! ▷ 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.

	! DANGER
	Non-compliance with operating limits for pressure, temperature, fluid handled and speed Hot fluid may escape! Explosion hazard! ▷ Comply with the operating data specified 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 exceeding those specified in the data sheet or on the name plate unless the written consent of the manufacturer has been obtained.

While the system is in operation, observe and check the following:

- The pump must run quietly and free from vibrations at all times.
- Monitor the correct functioning of any auxiliary connections.
- Monitor the stand-by pump.
To make sure that stand-by pumps are ready for operation, start them up once a week.
- Check the flexible elements of the coupling or belts. Replace them if required.
- For bearing temperature monitoring, set the temperatures as follows: alert at 185 °F (85 °C), pump cut-out at 194 °F (90 °C).
- For vibration monitoring, set the values as follows: alert at 0.248 in/s (6.3 mm/s) , pump cut-out at 0.374 in/s (9.5 mm/s).
- Vibration monitoring (⇒ Section 5.17, Page 40)

7.2.2 Inspection work

	 DANGER
	Electrostatic charging Explosion hazard! Damage to the pump set! ▷ Connect the potential equalization conductor to the grounding terminal provided. ▷ Make sure that the connection between pump and baseplate is electrically conductive. ▷ Screws, bolts, nuts and shims must not be coated or the coating must be removed. ▷ Provide potential equalization between the pump set and the foundation.

7.2.3 Visual inspection through the inspection hole

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

	 WARNING
	Fluids handled, consumables and operating supplies which are hot or pose a health hazard Hazard to persons and the environment! ▷ Collect and properly dispose of the flushing fluid and of any residues of the fluid handled. ▷ Wear protective clothing and a protective mask if required. ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.
	 WARNING
	Hands and/or foreign objects in 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.

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

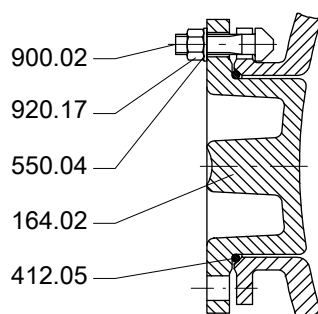


Fig. 25: Inspection hole in the casing

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 5.6, Page 31)
- Collect and dispose of any liquid residues.
- Loosen 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 42)

7.2.4 Lubrication and lubricant change

7.2.4.1 Lubricating the mechanical seal

7.2.4.1.1 Checking the leakage chamber

	 WARNING Fluids handled, consumables and operating supplies which are hot or pose a health hazard Hazard to persons and the environment! ▷ Collect and properly dispose of the flushing fluid and of any residues of the fluid handled. ▷ Wear protective clothing and a protective mask if required. ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.
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Checking the leakage chamber serves to assess the function of the drive-end mechanical seal.

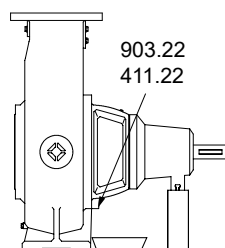


Fig. 26: Checking the leakage chamber

- ✓ A suitable container for the leakage is available.
- ✓ The pump is positioned on a level/even surface as illustrated.
 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 0.19 quarts (0.2 liters)) after several years of operation, the mechanical seals are working properly.
 - ⇒ If the leakage exceeds 0.19 quarts (0.2 liters), the mechanical seals are defective and must be replaced.
 3. Re-insert and tighten screw plug 903.22 with joint ring 411.22.

7.2.4.1.2 Checking the leakage chamber

	! WARNING Fluids handled, consumables and operating supplies which are hot or pose a health hazard Hazard to persons and the environment! ▷ Collect and properly dispose of the flushing fluid and of any residues of the fluid handled. ▷ Wear protective clothing and a protective mask if required. ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.
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Checking the leakage chamber serves to assess the function of the drive-end mechanical seal.

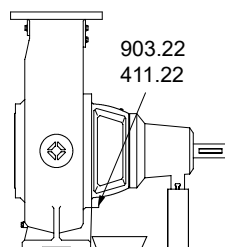


Fig. 27: Checking the leakage chamber

- ✓ A suitable container for the leakage is available.
- ✓ The pump is positioned on a level/even surface as illustrated.
 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 liters) after several years of operation, the mechanical seals are working properly.
 - ⇒ If the leakage exceeds 0.2 liters, the mechanical seals are defective and must be replaced.
 3. Re-insert and tighten screw plug 903.22 with joint ring 411.22.

7.2.4.1.3 Changing the lubricant

	! DANGER Excessive temperatures in the shaft seal area Explosion hazard! Damage to the pump set! ▷ Regularly check the lubricant level.
	! WARNING Lubricants posing a health hazard and/or hot lubricants Hazard to persons and the environment! ▷ 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.

	! WARNING
	Screw plugs subjected to pressure Risk of injury! ▷ Wear safety goggles and protective clothing. ▷ Open screw plugs slowly.

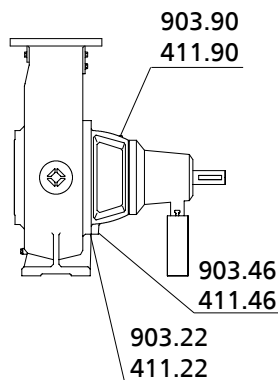


Fig. 28: Draining the lubricant

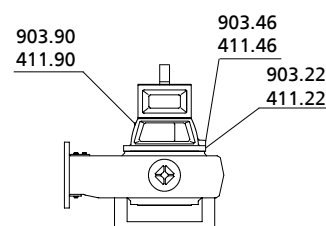


Fig. 29: Draining the lubricant

Draining the lubricant, horizontal installation

- ✓ A suitable container for the old lubricant is on hand.
- 1. Place the container underneath screw plug 903.46.
- 2. Remove screw plug 903.46 and joint ring 411.46 at the bottom of the bearing bracket and drain off the lubricant.
- 3. Fit screw plug 903.46 with joint ring 411.46.

Draining the lubricant, vertical installation

- ✓ A suitable container for the old lubricant is on hand.
- 1. Hold the container underneath screw plug 903.46.
- 2. Remove screw 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 chamber.
- 3. Fit screw plug 903.46 with joint ring 411.46.

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

Filling in the lubricant, horizontal installation

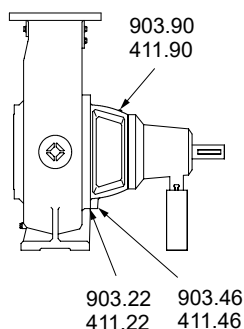


Fig. 30: Filling in the lubricant

- 1. Unscrew and remove screw plug 903.90 with joint ring 411.90.
- 2. Fill the lubricant chamber up to the filler opening.
- 3. Re-insert and tighten screw plug 903.90 with joint ring 411.90.

Filling in the lubricant, vertical installation

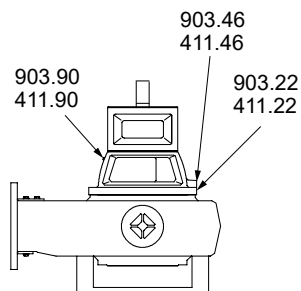


Fig. 31: Filling in the lubricant

1. Unscrew and remove screw plug 903.90 with joint ring 411.90.
2. Fill the lubricant chamber up to the filler opening.
3. Re-insert and tighten screw plug 903.90 with joint ring 411.90.

Recommended lubricant quality

Alternative

- Environmentally friendly, non-toxic white oil of medical quality
- Thin-bodied paraffin oil, non-toxic
- Water/propylene glycol mixture with corrosion inhibitors for frost protection down to -20°C



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.

Lubricant quantity **Table 17:** Lubricant quantity

Bearing bracket size	Size	Lubricant quantity	
		[quart]	[liter]
S05	All	2,1	2,0
S06	All	4,5	4,3
S07	- 500	4,8	4,6
	- 630, - 710	6,1	5,8
S08	All	6,3	6,0
S09	All	12,1	11,5
S10	All	9,5	9,0

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

7.2.4.2 Lubricating the rolling element bearings



DANGER

Excessive temperatures as a result of bearings running hot or defective bearing seals

Fire hazard!

Damage to the pump set!

- Regularly check the lubricant condition.
- Regularly check the rolling element bearings for running noises.

	! WARNING
	Shaft seal ring overheating Explosion hazard! Bearings overheating! ▶ When fitting new shaft seal rings, apply grease to the sealing lip.

7.2.4.2.1 Changing the grease

Lubricating nipples at the bearing brackets 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 and/or foreign objects in 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.

✓ A sufficient grease quantity is available.

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

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

7.2.4.2.2 Grease quality

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
- Resin-free and acid-free
- Not liable to become brittle
- The grease should have a penetration number between two and three, corresponding to a worked penetration between 8.66 and 11.61 inches/10 (220 and 295 mm/10).
- Its drop point must be above 347 °F (175 °C).

7.2.4.2.3 Grease quantity

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 18: Grease quantity

Bearing bracket size	Re-lubrication quantity	Additional grease quantity for first re-lubrication	
		Radial bearing (cylindrical roller bearing 322.01)	Fixed bearing (angular contact ball bearing 320.02)
S05	0,9 oz (25 g)	2,5 oz (75 g)	7,1 oz (200 g)
S06	1,8 oz (50 g)	5,3 oz (150 g)	17,8 oz (500 g)
S07 / S08	2,5 oz (70 g)	12,5 oz (350 g)	25,0 oz (700 g)
S09	7,0 oz (200 g)	9,2 oz (260 g)	30,0 oz (850 g)
S10	Re-lubrication by automatic grease pump		

7.2.4.2.4 Intervals

Table 19: Re-lubrication intervals

Bearing bracket size	Re-lubrication interval in operating hours [h]
S05 / S06	3000
S07 / S08	2000
S09	3000
S10	Re-lubrication by automatic grease pump ⁹⁾

7.3 Drainage/disposal

	 WARNING
	Fluids handled, consumables and operating supplies which are hot or pose a health hazard Hazard to persons and the environment! ▷ Collect and properly dispose of the flushing fluid and of any residues of the fluid handled. ▷ Wear protective clothing and a protective mask if required. ▷ Observe all legal regulations on the disposal of fluids posing a health hazard.

If the pump set has handled fluids whose residues could lead to corrosion damage in the presence of atmospheric humidity or could ignite upon contact with oxygen, the pump set must also be neutralized, and anhydrous inert gas must be blown through the pump to ensure drying.

Use connection 6B to drain the fluid handled. (⇒ Section 5.6, Page 31)

⁹ Set the periods of operation and standstill as per the supplementary operating manual of the grease pump.

7.4 Dismantling the pump set

7.4.1 General information/Safety regulations

	⚠ WARNING Unqualified personnel performing work on the pump (set) Risk of personal injury! ▷ Always have repair work and maintenance work performed by specially trained, qualified personnel.
	⚠ WARNING Improper lifting/moving of heavy assemblies or components Personal injury and damage to property! ▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.

Observe the general safety instructions and information in section.

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

For dismantling and reassembly observe the general assembly drawing.

In the event of damage you can always contact our service departments.

	⚠ DANGER Insufficient preparation of work on the pump (set) Risk of injury! ▷ Properly shut down the pump set. ▷ Close the shut-off elements in the suction line and discharge line. ▷ Drain the pump and release the pump pressure. ▷ Shut off any auxiliary feed lines. ▷ Allow the pump set to cool down to ambient temperature.
	NOTE An impeller removal tool is required to remove the impeller.

7.4.2 Preparations for dismantling

	⚠ DANGER Insufficient preparation of work on the pump (set) Risk of injury! ▷ Properly shut down the pump set. ▷ Close the shut-off elements in the suction line and discharge line. ▷ Drain the pump and release the pump pressure. ▷ Shut off any auxiliary feed lines. ▷ Allow the pump set to cool down to ambient temperature.
---	---

	! WARNING Components with sharp edges Risk of cutting or shearing injuries! ▷ Always use appropriate caution for installation and dismantling work. ▷ Wear work gloves.
	NOTE For further dismantling the pump casing may remain installed in the piping.

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.

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.

	! DANGER Insufficient preparation of work on the pump (set) Risk of injury! ▷ Properly shut down the pump set. ▷ Close the shut-off elements in the suction line and discharge line. ▷ Drain the pump and release the pump pressure. ▷ Shut off any auxiliary feed lines. ▷ Allow the pump set to cool down to ambient temperature.
	NOTE After the pump set has been removed from the piping, the suction casing should be cleaned with water. Suitable protective clothing is recommended.

7.4.4 Removing the back pull-out unit

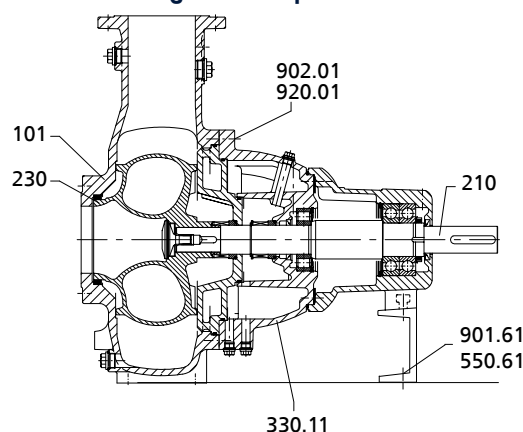


Fig. 32: Removing the back pull-out unit

- ✓ The lubricant reservoir has been drained of all lubricant.

- ✓ Transport and lifting equipment 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 bracket.
 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 assembly area. Secure it against tipping over or rolling off.

7.4.5 Removing the impeller

7.4.5.1 Removing K and E impellers with impeller screw M20

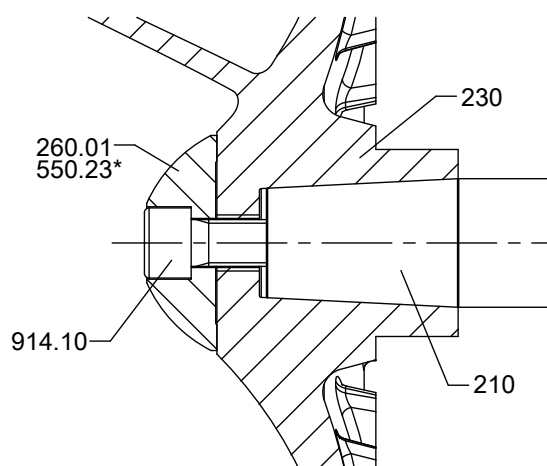


Fig. 33: Removing K and E impellers with impeller screw M20

1. Undo and remove impeller fastening screw 914.10.
 - ⇒ The impeller/shaft connection is a tapered fit.
2. Remove impeller hub cap 260.01 or disc 550.23.
 - ⇒ For dismantling the impeller, a jacking thread is provided at the impeller hub.
3. Screw in the forcing screw and remove impeller 230.

7.4.5.2 Removing K and E impellers with impeller screws M100, M125 or M160

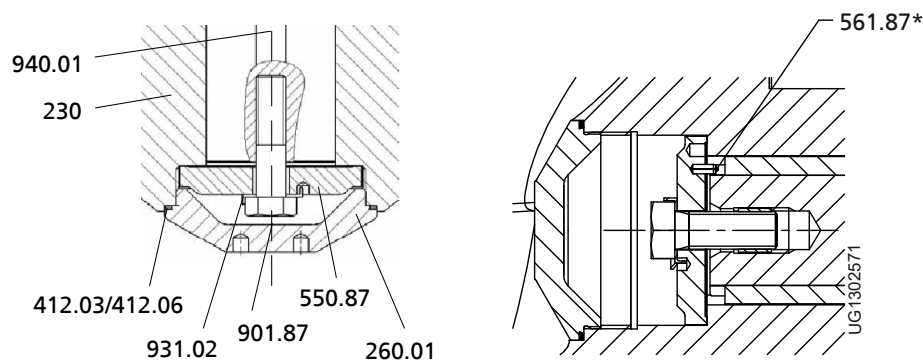


Fig. 34: Removing K and E impellers with impeller screws M100, M125 or M160

*: On specific designs only

- ✓ The back pull-out unit is securely positioned in a clean and dry installation area.

1. Unscrew impeller hub cap 260.01 using a special wrench (right-hand thread).
2. Remove O-ring 412.03/412.06.
3. Unbend lock washer 931.02. Undo hexagon head bolt 901.87. Remove them together with disc 550.87.
4. Pull off impeller 230 with a special impeller removal tool.
5. Remove key 940.01.



NOTE

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

7.4.5.3 Removing D impeller from pump with bearing bracket S05/S06

914.10
550.23 230

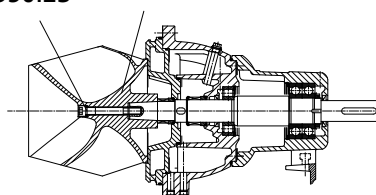


Fig. 35: Removing D impeller from pump with bearing bracket S05/S06

1. Unscrew socket head cap screw 914.10 with disc 550.23.
2. Screw the grub screw fully into the shaft thread.
3. Pull off impeller 230 with a forcing screw.



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 20: Forcing screws for pulling off the impeller

Size	Bearing bracket	Forcing screw (ADS)	
		Thread	Code
All	S05, S06	M 24	ADS 5

7.4.5.4 Removing K impeller from pump with bearing bracket S09/S10

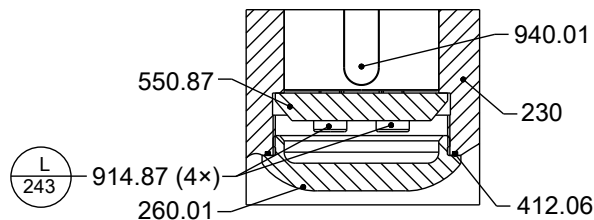


Fig. 36: Removing K impeller from pump with bearing bracket S09/S10

Table 21: Key to the symbols

Symbol	Key
	Always secure screwed connections marked with this symbol with Loctite 243 .

1. Unscrew impeller hub cap 260.01 using a special wrench (right-hand thread).
2. Remove O-ring 412.06.

3. Undo (four) hexagon socket head cap screws 914.87. Remove them together with disc 550.87.
4. Pull off impeller 230 with a special impeller fitting and removal tool.
5. Remove key 940.01.



NOTE

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

7.4.5.5 Removing the impeller of Sewatec E 200-401 (Ø 373 mm, bearing bracket S06), K 350-710, K 500-632 and K 500-640

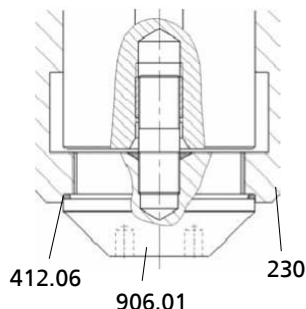


Fig. 37: Removing the impeller of Sewatec E 200-401 (Ø 373 mm, bearing bracket S06), K 350-710, K 500-632 and K 500-640

- ✓ The back pull-out unit is securely positioned 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 tool.
 4. Remove key 940.01.



NOTE

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

7.4.5.6 Removing D impeller with cylindrical fit from pump with bearing bracket S07

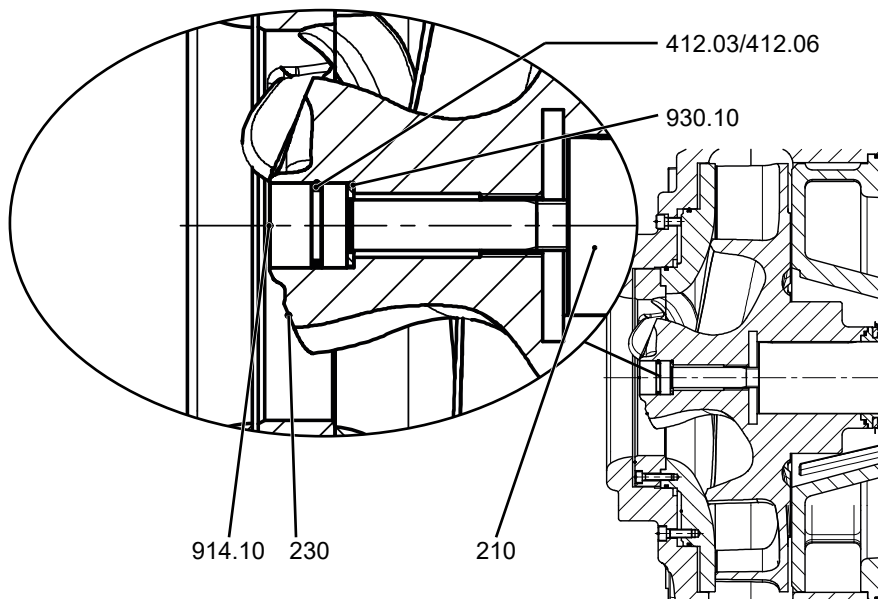


Fig. 38: Removing D impeller with cylindrical fit from pump with bearing bracket S07

1. Undo and remove hexagon socket head cap screw 914.10.
2. Remove O-ring 412.06 and safety device 930.10.
3. Pull impeller 230 off shaft 210 using the special impeller fitting/removal tool or forcing screw.

7.4.5.7 Using the special impeller removal tool

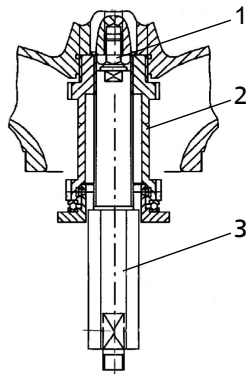


Fig. 39: Special impeller fitting and removal tool

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 fully threaded stud 3 into part 2 and pull off the impeller.

Table 22: Impeller removal tool / forcing screws for pulling off the impeller

Size	Impeller type	Bearing bracket	Impeller removal tool (=AV) / forcing screw (=ADS)	
			Thread	Code
150-503	D	S06	M 24	ADS9
		S07	M 30	ADS6
	K	S06	M 24	ADS5
		S07	M100 × 2	AV5
200-500	E	S05	M 24	ADS5
200-502	K	S06	M 24	ADS5
		S07	M100 × 2	AV5
200-503	D	S06	M 24	ADS9
		S07	M 30	ADS6
	K	S06	M 24	ADS5
		S07	M 100 × 2	AV5
200-504	K	S06	M 24	ADS5
		S07	M 100 × 2	AV5
200-505	K	S06	M 24	ADS5
		S07	M 100 × 2	AV5
200-631	K	S07	M 125 × 2	AV4
		S08	M 125 × 2	AV4
250-500	E	S06	M 24	ADS5
	E	S07	M 125 × 2	AV4
250-630	K	S07	M 125 × 2	AV4
		S08	M 125 × 2	AV4
250-632	K	S07	M 125 × 2	AV4
		S08	M 125 × 2	AV4
250-900	K	S09	M 160 × 3	AV6

Size	Impeller type	Bearing bracket	Impeller removal tool (=AV) / forcing screw (=ADS)	
			Thread	Code
300-500	K	S06	M 24	ADS5
		S07	M 125 × 2	AV4
300-502	D	S06	M 24	ADS10
		S07	M 30	ADS11
300-505	D	S06	M 24	ADS10
		S07	M 30	ADS11
	K	S06	M 24	ADS5
		S07	M 100 × 2	AV5
300-630	E	S06	M 125 × 2	AV4
		S07	M 125 × 2	AV4
300-710	E	S09	M 190 × 3	AV6
350-500	K	S06	M 24	ADS5
		S07	M 125 × 2	AV4
350-501	K	S06	M 24	ADS5
		S07	M 125 × 2	AV4
350-502	D	S06	M 24	ADS10
		S07	M 30	ADS11
350-503	D	S06	M 24	ADS10
		S07	M 30	ADS11
	K	S06	M 24	ADS5
		S07	M 100 × 2	AV5
350-630	E, K	S07	M 125 × 2	AV4
		S08	M 125 × 2	AV4
350-632	K	S07	M 125 × 2	AV4
		S08	M 125 × 2	AV4
350-633	K	S07	M 125 × 2	AV4
		S08	M 125 × 2	AV4
350-710	E	S07	M 125 × 2	AV4
		S08	M 125 × 2	AV4
	K	S08	M 100 × 2	AV5
350-713	K	S08	M 125 × 2	AV4
400-500	K	S06	M 24	ADS5
		S07	M 100 × 2	AV5
400-632	K	S07	M 125 × 2	AV4
		S08	M 125 × 2	AV4
400-710	K	S09	M 160 × 3	AV6
400-713	K	S09	M 160 × 3	AV6
400-820	K	S09	M 160 × 3	AV6
500-630	K	S07	M 125 × 2	AV4
		S08	M 125 × 2	AV4
500-632	K	S08	M 100 × 2	AV5
500-710	K	S09	M 160 × 3	AV6
500-900	K	S09	M 160 × 3	AV6
		S10	-	AV9
600-520	K	S07	M 100 × 2	AV5
600-710	K	S08	M 125 × 2	AV4

Size	Impeller type	Bearing bracket	Impeller removal tool (=AV) / forcing screw (=ADS)	
			Thread	Code
600-900	K	S10	-	AV9
700-902	K	S08	M 160 × 3	AV9
		S09	M 160 × 3	AV6

7.4.6 Removing the mechanical seal

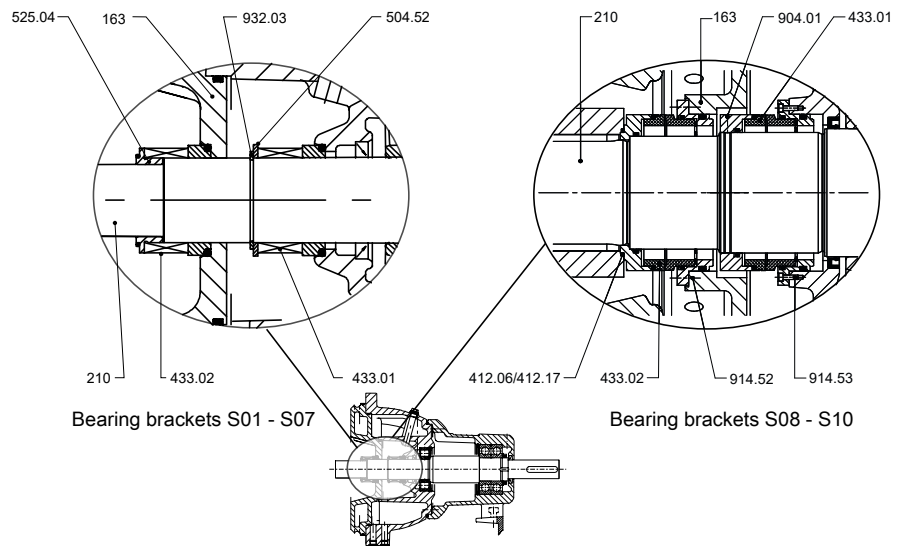


Fig. 40: Removing the mechanical seal

7.4.6.1 Removing the pump-end mechanical seal (bearing brackets S01 - S07)

- ✓ 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. Press the stationary seat of mechanical seal 433.02 out of discharge cover 163.

7.4.6.2 Removing the drive-end mechanical seal (bearing brackets S01 - S07)

- ✓ 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.

7.4.6.3 Removing the pump-end 4STC mechanical seal (bearing brackets S08 - S10)

- ✓ The back pull-out unit and the impeller have been removed as described above.
- 1. Undo grub screws 904. Pull mating ring carrier 476 and mating ring 475 off shaft 210. For the version with clamped mating ring carrier, pull the mating ring carrier together with the mating ring directly off the shaft.
- 2. On mechanical seals with axially secured primary ring carrier 473 undo screws 914.55.
- 3. Use the jacking threads to remove the primary ring carrier.
- 4. On mechanical seals without axially secured primary ring carrier, use assembly aids to remove the primary ring carrier. Another option of removing the primary ring carrier is to remove the discharge cover and apply pressure to the rear side of the primary ring carrier.

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7.4.6.4 Removing the drive-end 4STC mechanical seal (bearing brackets S08 - S10)

- ✓ The back pull-out unit and the impeller have been removed as described above.
- 1. Undo grub screws 904. Pull mating ring carrier 476 and mating ring 475 off shaft 210. For the version with clamped mating ring carrier, pull the mating ring carrier together with the mating ring directly off the shaft.
- 2. On mechanical seals with axially secured primary ring carrier 473 undo screws 914.55.
- 3. Use the jacking threads to remove the primary ring carrier.
- 4. On mechanical seals without axially secured primary ring carrier, use assembly aids to remove the primary ring carrier. Another option of removing the primary ring carrier is to remove the discharge cover and apply pressure to the rear side of the primary ring carrier.

7.4.6.5 Removing the C120/120M1-4STQ double cartridge seal

The rules of sound engineering practice and the pump manufacturer's general provisions apply. Tidiness and cleanliness are essential for proper execution of the installation work.

- ✓ The operating manual for the pump is available.
- ✓ The back pull-out unit of the pump has been removed from the pump casing and safely positioned and secured in a horizontal position.
- ✓ The impeller and keys have been removed from the pump shaft.
- 1. Remove circlip 932.53 from discharge cover 163.
- 2. Screw two M8 eyebolts into the front face of the shaft sleeve.
- 3. Carefully pull the complete cartridge seal off the shaft by the eyebolts. Then remove the eyebolts again.
- 4. Remove O-rings 412.54/.55 from discharge cover 163 and, if necessary, remove O-ring 412.59 from bearing bracket 330.
- 5. Tighten the hexagon head bolts 901 (3 pcs.) that make up the transport lock to a low torque (hand-tight).
- 6. Clean the pump components in the area of the mechanical seal, pump shaft 210, discharge cover 163 and bearing bracket 330. Check for any damage.

Further dismantling of the mechanical seal is carried out at KSB.

7.4.7 Dismantling the gland packing

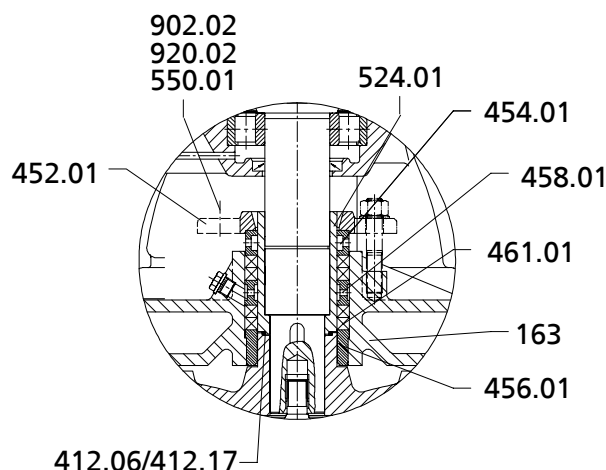


Fig. 41: Dismantling the gland packing

- ✓ The back pull-out unit and the impeller have been removed as specified.
- 1. Undo hexagon nuts 920.02.
- 2. Remove gland follower 452.01 and stuffing box ring 454.01.
- 3. Remove discharge cover 163 with the gland packing.
- 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 412.06/412.17 off the shaft.

7.4.8 Removing shaft and rolling element bearing

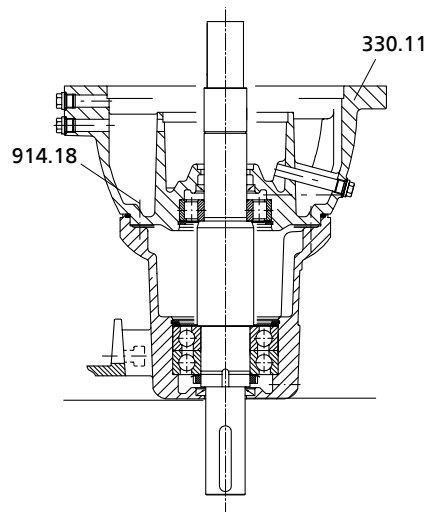


Fig. 42: Removing the bearing bracket

- ✓ The back pull-out unit has been placed in a suitable assembly area.
 - ✓ The mechanical seal or gland packing have been removed as described above.
1. Undo and remove hexagon socket head cap screws 914.18.
 2. Attach bearing bracket 330.11 to the lifting equipment and lift it up.
 3. Place bearing bracket 330.11 in a suitable assembly area with the pump-end flange down.

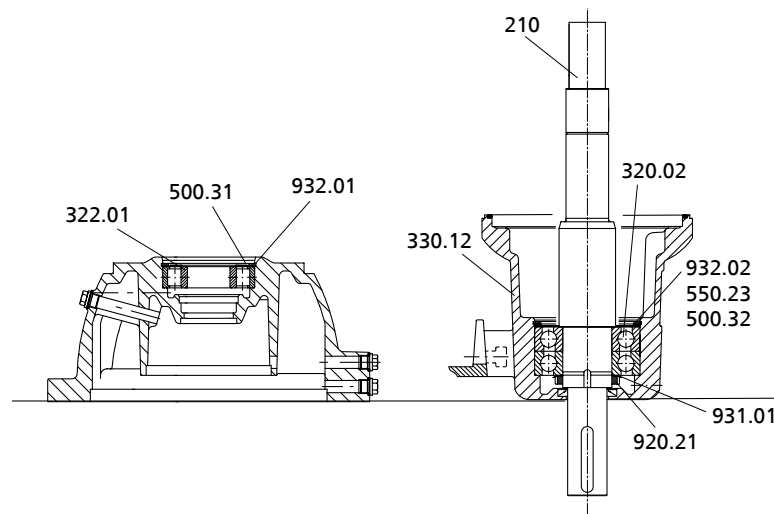


Fig. 43: Removing the shaft

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. Attach shaft 210 to the lifting equipment and carefully pull it out of motor-end bearing bracket 330.12 together with angular contact ball bearings 320.02.
7. Unbend lock washer 931.01. Unscrew and remove keywayed nut 920.21 (right-hand thread). Remove the lock washer.
8. Heat up angular contact ball bearing 320.02 and pull it off shaft 210.
9. Clean all parts and examine them for signs of wear. If required, replace them.

7.4.9 Removing the wear plate (for D impeller only)

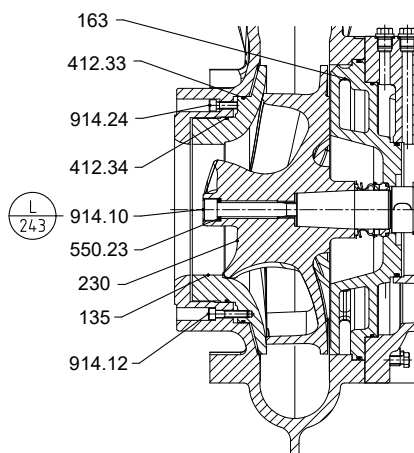


Fig. 44: Removing the wear plate

- ✓ 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.
- ✓ The wear plate needs to be replaced as a result of visual inspection.
 1. Disconnect the pump casing from the piping.
 2. Undo hexagon socket head cap screws 914.12.
 3. Remove wear plate 135.01 and O-rings 412.34.

7.5 Reassembling the pump set

7.5.1 General information/Safety regulations

	WARNING
	Improper lifting/moving of heavy assemblies or components Personal injury and damage to property! ▷ Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.
	CAUTION
	Improper reassembly Damage to the pump! ▷ Reassemble the pump (set) in accordance with the general rules of sound engineering practice. ▷ Use original spare parts only.

Sequence Always re-assemble the pump (set) in accordance with the corresponding general assembly drawing and/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 made by cutting an O-ring cord to size and gluing the ends together.

Assembly aids 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 indicated. (⇒ Section 7.6, Page 81) (Also see general assembly drawing and data sheet.)

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

Table 23: 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
S09	2x 7230 BCBM	NU 234 ECM
S10	2x 7334 BCBM	NU 240

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

7.5.2 Installing the shaft and rolling element bearings

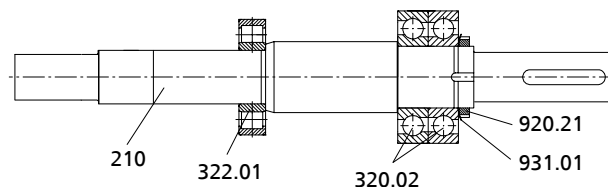


WARNING

Components heated up for assembly

Risk of burns!

- ▷ Wear protective clothing and protective gloves suitable for assembly work.
- ▷ Allow components to cool down after assembly.


Fig. 45: Fitting the rolling element bearings on the shaft

- ✓ When re-installing the shaft, replace angular contact ball bearings 320.02 and/or cylindrical roller bearing 322.01, if required.
1. Place shaft 210 in a horizontal position. Deburr 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 212 °F (100 °C) and guide 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 212 °F (100 °C) and guide 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 212 °F (100 °C) and guide it onto the shaft from the drive end until it abuts against the first bearing. Move it back into this position as it cools down!



NOTE

Install angular contact ball bearings 320.02 in "O" arrangement.

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 lock washer 931.01. Screw on, tighten and lock locknut 920.21.
8. Completely pack the angular contact ball bearings with lubricating grease.

7.5.3 Preparing and reassembling the bearing brackets

Pre-assembling bearing bracket 330.11

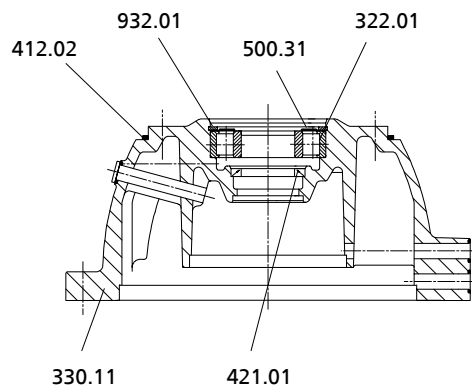


Fig. 46: Preparing the bearing brackets

- ✓ The bearings have been fitted on the shaft.
 - ✓ Lifting equipment and lifting tackle are available.
1. Insert shaft seal ring 421.01 into the specified drilled hole.
 2. Grease or pack the annular section with lubricating grease.
 3. Coat the bearing seat (drilled hole seat) with a preservative.
 4. Press cylindrical roller bearing 322.1 (without inner ring) into the bearing bracket. Fill all cavities with lubricating grease.
 5. Insert ring 500.31 and circlip 932.01 into the drilled hole.
 6. Completely pack the cylindrical roller bearing with lubricating grease.
 7. Fit O-ring 412.02.

Pre-assembling bearing bracket 330.12

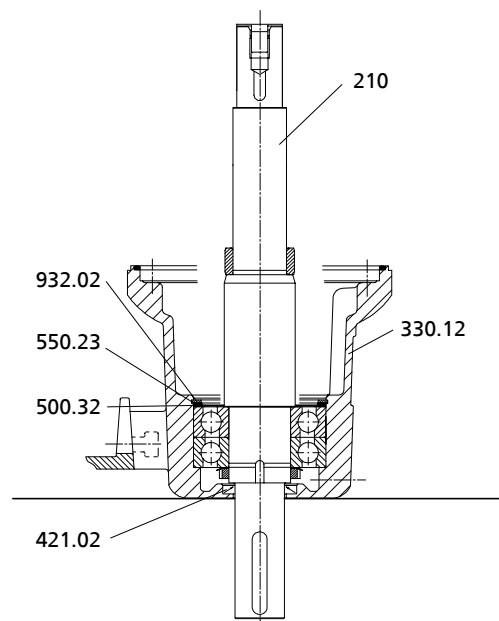


Fig. 47: Fitting the shaft

- ✓ A suitable assembly area has been prepared.
 - ✓ All preparatory work has been completed.
 - ✓ Lifting equipment and lifting tackle are available.
1. Place bearing bracket 330.12 with the flange up in the assembly area.
 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.
 5. Use lifting tackle to lift the pre-assembled shaft suspended at the pump end and lower it down into the bearing bracket.

Final assembly of the bearing bracket

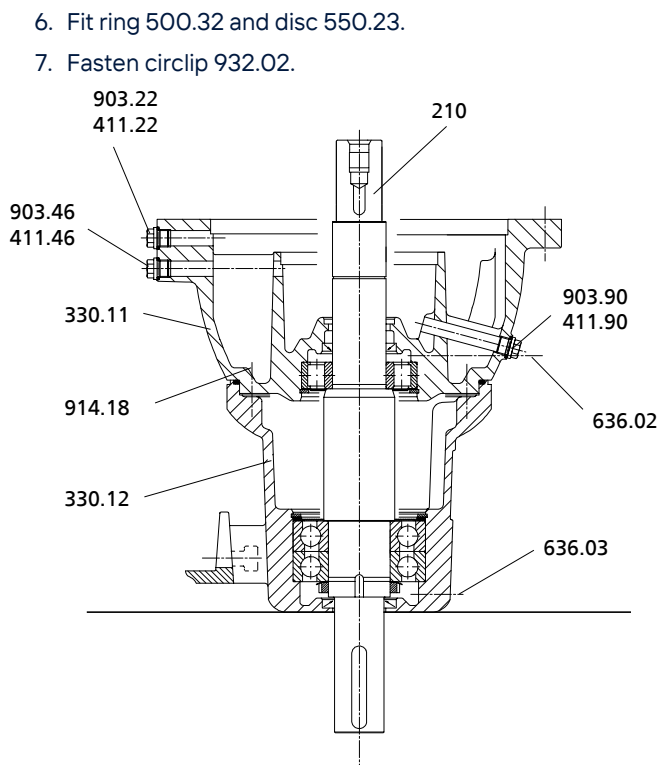


Fig. 48: Assembling the bearing bracket

- ✓ All preparatory work at the bearing brackets has been completed.
- ✓ Lifting equipment and lifting tackle are available.
- 1. Attach lifting tackle to the pump-end flange of bearing bracket 330.11. Position the flange above the center of bearing bracket 330.12 with shaft 210.
- 2. Slowly lower bearing bracket 330.11. Guiding the bearing bracket by hand helps with the assembly.
- 3. Coat the drilled holes for socket head cap screws 914.18 with an assembly paste.
- 4. Screw in hexagon socket head cap screws 914.18. Use a torque wrench to apply the required tightening torque.
- 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 always using new original mechanical seals for re-assembly.

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

- Only remove the protective wrapping of the seal faces immediately before assembly takes place.
- Make sure the surface of the shaft is absolutely clean and undamaged.
- Immediately before installing the mechanical seal, wet the contact faces with a drop of lubricant.
- For easier installation of bellows-type mechanical seals, wet the inside diameter of the bellows with soapy water (not lubricant).
- To prevent any damage to the rubber bellows, place a thin foil of approximately 0.0039 to 0.0118 inch (0.1 to 0.3 mm) thickness around the free shaft stub. Slide the rotating assembly over the foil into its installation position. Then remove the foil.

7.5.4.1 Installing the drive-end mechanical seal (bearing brackets S01 - S07)

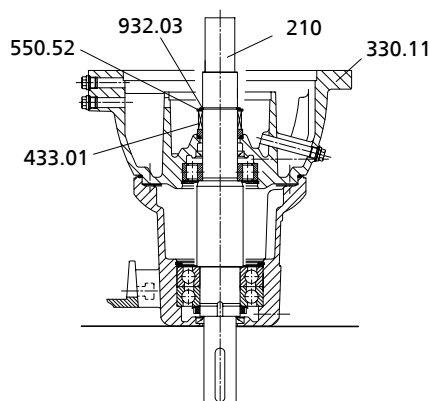


Fig. 49: Drive-end mechanical seal (bearing brackets S01 - S07)

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

7.5.4.2 Installing the drive-end 4STC mechanical seal (bearing brackets S08 - S10)

	CAUTION Use of grease or other permanent lubricants Torque transmission impeded / overheating of and damage to the pump! ▷ Never use grease or other permanent lubricants for fitting the torque-transmitting elements of a mechanical seal. ▷ Use soft soap to reduce any friction caused during assembly. ▷ Never coat the mechanical seal faces with grease or oil.
--	--

- ✓ The relevant documentation for installing the mechanical seal is observed.
(⇒ Section 9.1.5.5, Page 97) .
- ✓ The back pull-out unit has been removed from the pump casing and safely positioned and secured in a horizontal position.
- ✓ The original KSB 4STC cartridge seal is fully assembled and undamaged.
- ✓ Assembly aids are available.
 1. Properly remove any corrosion or wear.
 2. Clean the seal faces with a suitable paper tissue and, if required, ethyl alcohol.
 3. Wet O-ring 412.54 and discharge cover 163 with a non-permanent lubricant (e.g. a water/soap mixture).
 4. Press the assembly consisting of primary ring carrier 473, primary ring 472, thrust ring 474, springs and O-rings 412 into the seat at discharge cover 163. If necessary, use a spacer sleeve and elastic intermediate element to protect the seal faces.

	NOTE The seal faces must not be damaged (score mark, etc). The assembly must not be pressed into the seat by pressing on the primary ring (risk of fracture). The force for mounting it must be applied via the primary ring carrier.
---	---

5. Fasten primary ring carrier 473 to discharge cover 163 with screws 914.55. Tighten the screws crosswise in several increments. Observe the tightening torques. This step does not apply to the version without axially secured primary ring carrier.
6. Check the seal face for any damage. Clean it again if required.

7. Check that primary ring 472 is correctly seated.
8. Wet O-ring 412.55 and the corresponding surface on shaft 210 with a suitable, non-permanent lubricant.
9. Slide the rotating assembly of the seal, comprising mating ring carrier 476, mating ring 475 and O-rings 412 onto shaft 210 as far as it will go.
10. Preload the rotating assembly with an assembly aid to match the installation dimension. This step does not apply to the version with clamped mating ring carrier. In this case, the installation dimension and torque transmission is ensured by mounting impeller 230.
11. Tighten grub screws 904, observing the installation dimension and tightening torques.



NOTE

Do not re-use cup point grub screws!
Used grub screws must be replaced by new cup point grub screws.

⇒ Cup point grub screws must not be re-used. Repeated tightening can impair the reliability of force transmission.

7.5.4.3 Installing the pump-end mechanical seal (bearing brackets S01 - S07)

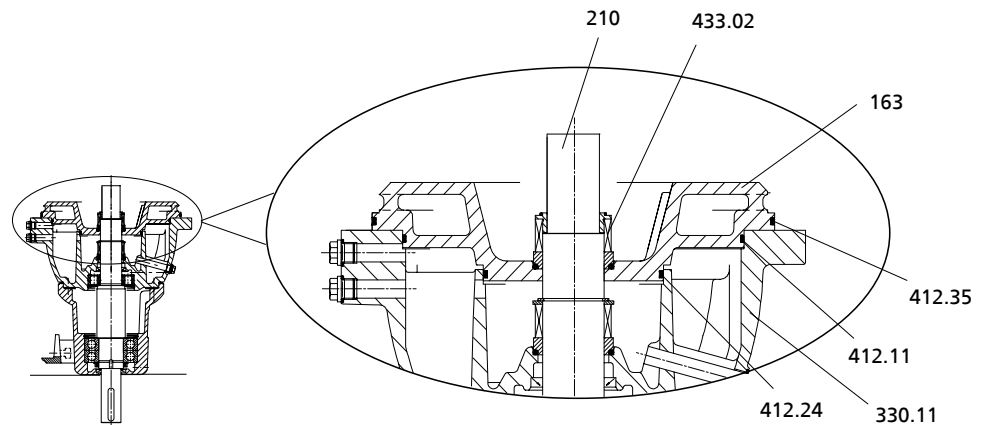


Fig. 50: Pump-end mechanical seal (bearing brackets S01 - S07)

1. Fit 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. Slide mechanical seal 433.02 onto shaft 210.

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

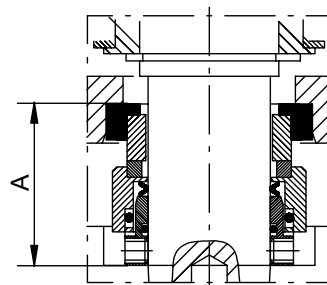


Fig. 51: Installation dimension "A"

Table 24: Installation dimension "A"

Bearing bracket size	Installation dimension "A"	
	[inch]	[mm]
S05	2	51
S06	2 ¹ / ₈	54

7.5.4.4 Installing the pump-end 4STC mechanical seal (bearing brackets S08 - S10)

	CAUTION Use of grease or other permanent lubricants Torque transmission impeded / overheating of and damage to the pump! ▷ Never use grease or other permanent lubricants for fitting the torque-transmitting elements of a mechanical seal. ▷ Use soft soap to reduce any friction caused during assembly. ▷ Never coat the mechanical seal faces with grease or oil.
---	--

- ✓ The relevant documentation for installing the mechanical seal is observed.
(⇒ Section 9.1.5.2, Page 95) (⇒ Section 9.1.5.3, Page 96) .
- ✓ The back pull-out unit has been removed from the pump casing and safely positioned and secured in a horizontal position.
- ✓ The original KSB 4STC cartridge seal is fully assembled and undamaged.
- ✓ Assembly aids are available.
 1. Properly remove any corrosion or wear.
 2. Clean the seal faces with a suitable paper tissue and, if required, ethyl alcohol.
 3. Wet O-ring 412.54 and discharge cover 163 with a non-permanent lubricant (e.g. a water/soap mixture).
 4. Press the assembly consisting of primary ring carrier 473, primary ring 472, thrust ring 474, springs and O-rings 412 into the seat at discharge cover 163. If necessary, use a spacer sleeve and elastic intermediate element to protect the seal faces.

	NOTE The seal faces must not be damaged (score mark, etc). The assembly must not be pressed into the seat by pressing on the primary ring (risk of fracture). The force for mounting it must be applied via the primary ring carrier.
---	---

5. Fasten primary ring carrier 473 to discharge cover 163 with screws 914.55. Tighten the screws crosswise in several increments. Observe the tightening torques. This step does not apply to the version without axially secured primary ring carrier.
6. Check the seal face for any damage. Clean it again if required.
7. Check that primary ring 472 is correctly seated.
8. Wet O-ring 412.55 and the corresponding surface on shaft 210 with a suitable, non-permanent lubricant.
9. Slide the rotating assembly of the seal, comprising mating ring carrier 476, mating ring 475 and O-rings 412 onto shaft 210 as far as it will go.
10. Preload the rotating assembly with an assembly aid to match the installation dimension. This step does not apply to the version with clamped mating ring carrier. In this case, the installation dimension and torque transmission is ensured by mounting impeller 230.
11. Tighten grub screws 904, observing the installation dimension and tightening torques.



NOTE

Do not re-use cup point grub screws!
Used grub screws must be replaced by new cup point grub screws.

⇒ Cup point grub screws must not be re-used. Repeated tightening can impair the reliability of force transmission.

7.5.4.5 Installing the C120/120M1-4STQ double cartridge seal



CAUTION

Use of grease or other permanent lubricants

Torque transmission impeded / overheating of and damage to the pump!

- ▷ Never use grease or other permanent lubricants for fitting the torque-transmitting elements of a mechanical seal.
- ▷ Use soft soap to reduce any friction caused during assembly.
- ▷ Never coat the mechanical seal faces with grease or oil.

- ✓ The relevant documentation for installing the mechanical seal is observed. .
 - ✓ The back pull-out unit has been removed from the pump casing and safely positioned and secured in a horizontal position.
 - ✓ The original 4STQ cartridge seal is fully assembled and undamaged.
1. Apply a suitable lubricant to the O-rings. Ensure that no permanent lubricant comes into contact with the O-rings, in order to establish reliable torque transmission.
 2. Insert O-rings 412.54 and 412.55 in discharge cover 163. Ensure that no permanent lubricant is used.
 3. Fit O-ring 412.59 on the shoulder of shaft seal housing 441.

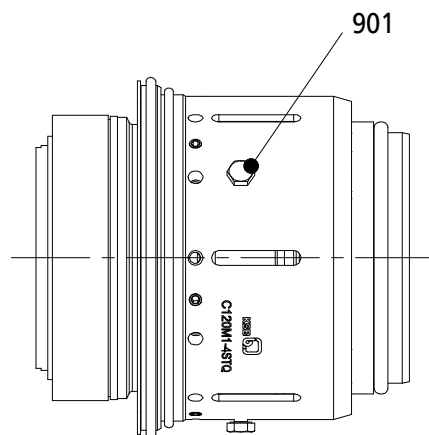


Fig. 52: Illustration of hexagon head bolt

4. Completely remove the hexagon head bolts 901 (3 pcs.) that make up the transport lock and store them.
5. Apply a coat of a suitable grease to shaft 210 in the area of the mechanical seal and the impeller hub.
6. Align the groove in shaft sleeve 523 with the groove in shaft 210.
7. Carefully slide the entire 4STQ cartridge seal onto the shaft until seal cover 471 abuts discharge cover 163. Apply the axial force required for insertion into the discharge cover via the seal cover only. Ensure that primary ring 472.52 and mating ring 475.52 are not damaged. A tube with an inside diameter larger than 170 mm and outside diameter smaller than 190 mm can be used to press the stationary seal cover into the discharge cover of the pump.

8. Fit circlip 932.53 in the groove of discharge cover 163. Make sure it is correctly seated.

7.5.5 Fitting the gland packing

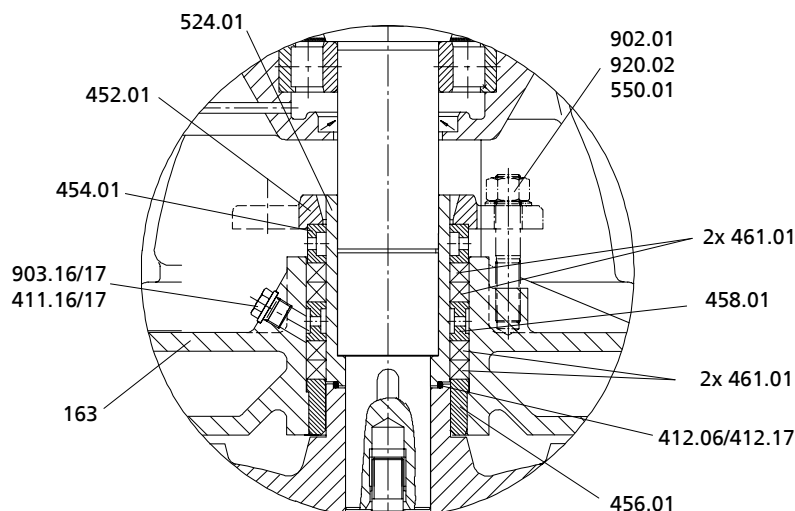


Fig. 53: Fitting the gland packing

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 one at a time, with their cut edges staggered at 90°.



NOTE

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

4. Slide on lantern ring 458.01.
5. Insert subsequent packing rings 461.01 one at a time, with their cut edges staggered at 90°.
6. Fit shaft protecting sleeve 524.01.
7. Insert stuffing box ring 454.01.
8. Slide on gland follower 452.01 and fasten it with two studs 902.02, two disc 550.01 and two nuts 920.02.
Only lightly tighten both nuts by hand.
9. Insert O-rings 412.11 and 412.35 into discharge cover 163.
10. Insert O-ring 412.06/412.17 in shaft protecting sleeve 524.01.
11. Slide 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 Fitting K and E impellers with impeller screw M20

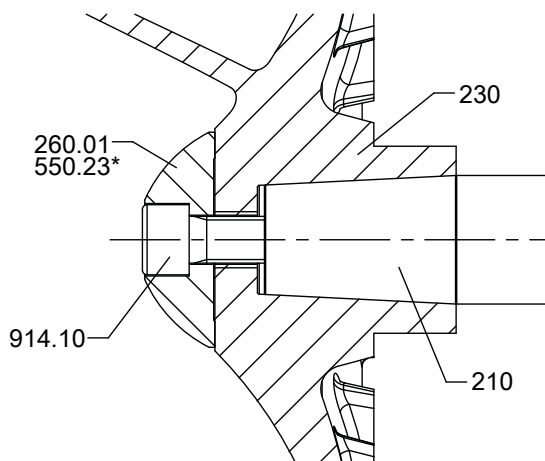


Fig. 54: Fitting K and E impellers with impeller screw M20

1. Slide impeller 230 onto the shaft end.
2. Apply thread-locking agent Loctite 243 to the thread of the impeller screw.
3. Screw in impeller screw 914.10 with impeller hub cap 260.01 or disc 550.23*. Tighten with a torque wrench. Observe the tightening torques.

7.5.6.2 Fitting K and E impellers with impeller screws M100, M125 or M160

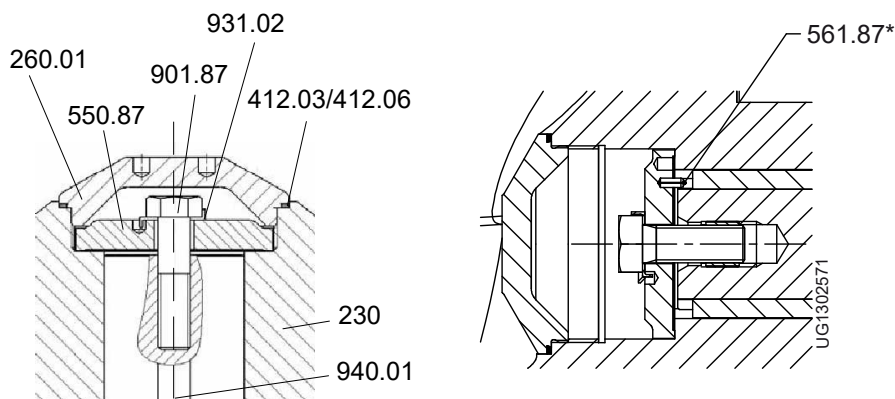


Fig. 55: Fitting K and E impellers with impeller screws M100, M125 or M160

*: On specific designs only

- ✓ The pre-assembly has been completed.
 - ✓ The assembled bearing bracket has been placed in a suitable assembly area with the pump end up.
 - ✓ Suitable lifting equipment is provided.
1. Insert key 940.01 into the keyway.
 2. Slide impeller 230 onto shaft 210.
 3. Insert grooved pin 561.87 into the drilled hole in disc 550.87.
 4. Engage grooved pin 561.87, fitted in disc 550.87, in the groove of the shaft. Ensure that the disc sits flush on the impeller.
 5. Screw in hexagon head bolt 901.87 with disc 550.87. Bend over lock washer 931.02.
 6. Insert O-ring 412.03/412.06. Then fit impeller hub cap 260.01, screw it in and tighten it with a special wrench.

7.5.6.3 Fitting K impeller on pump with bearing bracket S09/S10

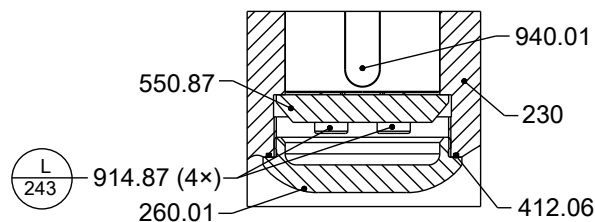


Fig. 56: Fitting K impeller on pump with bearing bracket S09/S10

Table 25: Key to the symbols

Symbol	Key
	Always secure screwed connections marked with this symbol with Loctite 243 .

1. Insert keys 940.01.
2. Fit impeller 230 using a special impeller fitting and removal tool.
3. Screw in hexagon socket head cap screws 914.87 with disc 550.87. Secure the hexagon socket head cap screws with a thread-locking agent (Loctite, type 243).
4. Insert O-ring 412.06.
5. Screw in impeller hub cap 260.01 using a special wrench (right-hand thread).

7.5.6.4 Fitting the impeller of Sewatec E 200-401 (Ø 373 mm, bearing bracket S06), K 350-710, K 500-632 and K 500-640

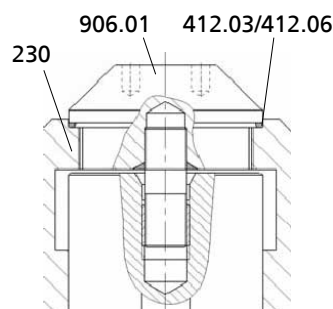


Fig. 57: Fitting the impeller of Sewatec E 200-401 (Ø 373 mm, bearing bracket S06), K 350-710, K 500-632 and K 500-640

- ✓ The pre-assembly has been completed.
 - ✓ The assembled bearing bracket has been placed in a suitable assembly area with the pump end up.
 - ✓ Suitable lifting equipment is provided.
1. Insert key 940.01 into the keyway.
 2. Slide impeller 230 onto shaft 210.
 3. Insert O-ring 412.03/412.06.
 4. Screw in and tighten impeller screw 906.01.

7.5.6.5 Fitting impeller with tapered interference fit on pumps with bearing brackets S05/S06

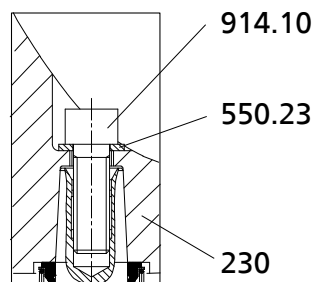


Fig. 58: Fitting impeller with tapered interference fit on pumps with bearing brackets S05/S06

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

7.5.6.6 Fitting D impeller with cylindrical fit on pump with bearing bracket S07

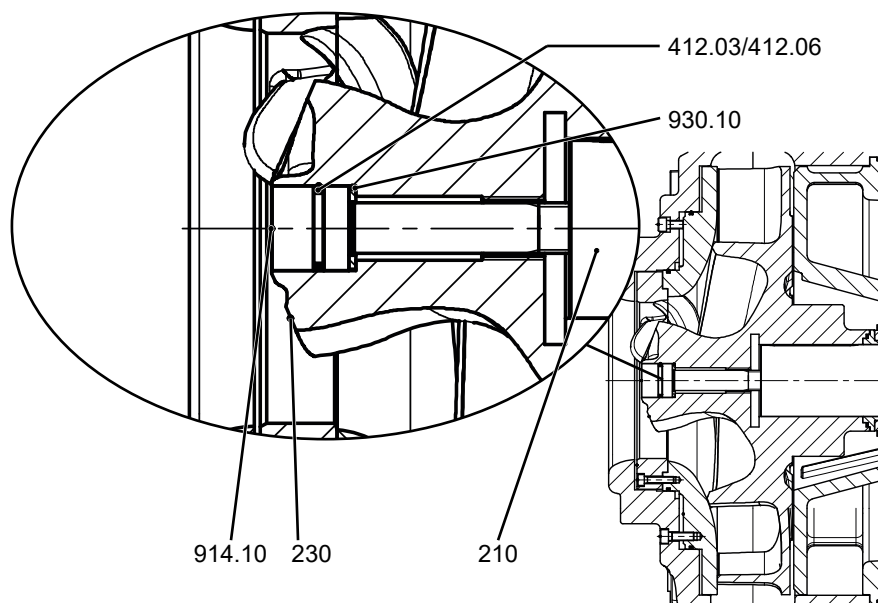


Fig. 59: Fitting D impeller with cylindrical fit on pump with bearing bracket S07

- ✓ The pre-assembly has been completed.
 - ✓ The assembled bearing bracket has been placed in a suitable assembly area with the pump end up.
 - ✓ Suitable lifting equipment is provided.
1. Slide impeller 230 onto shaft 210.
 2. Insert hexagon socket head cap screw 914.10 with O-ring 412.06 and safety device 930.10. Tighten the screw.

7.5.7 Installing the back pull-out unit



WARNING

Back pull-out unit tipping over

Risk of squashing hands and feet!

- ▷ Suspend or support the bearing bracket at the pump end.

Version with wear plate (for D impellers only)

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

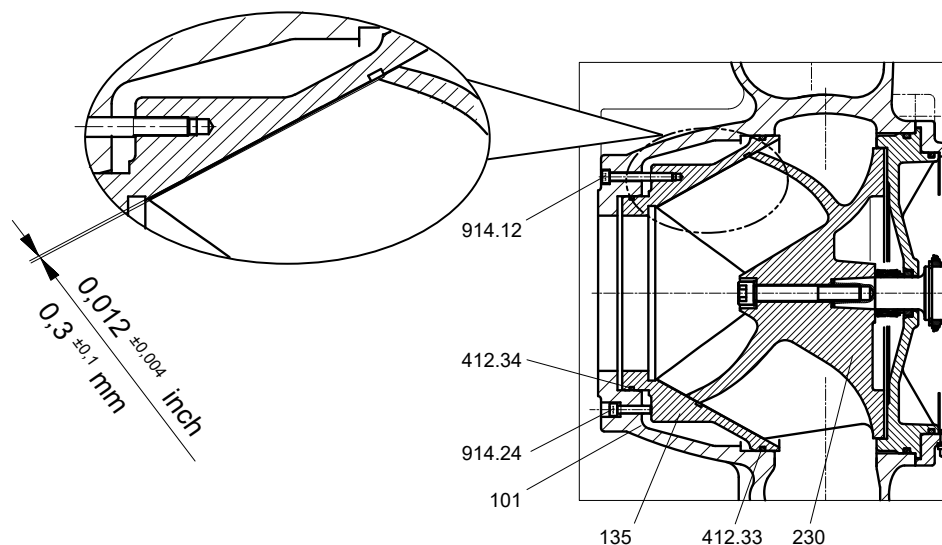


Fig. 60: Fitting the wear plate

1. Fit wear plate 135 with two new O-rings 412.33/34.
2. Insert wear plate 135 into pump casing 101.
3. Fasten wear plate 135 to pump casing 101 with hexagon socket head cap screws 914.12.
4. Adjust the clearance between impeller 230 and wear plate 135 by tightening and loosening screws 914.12 and 914.24.
 - ⇒ Screw 914.24 pushes the wear plate in the direction of the impeller.
 - ⇒ For D impeller (single-vane impeller), the clearance equals $0.012^{±0.004}$ in [$0.3^{±0.1}$ mm] (measured on the suction side from the outer surface of the impeller vane to the wear plate).
 - ⇒ For D impeller (multi-vane impeller), the clearance equals $0.012^{±0.004}$ in [$0.3^{±0.1}$ 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 Leak test

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

1. Tightly screw the testing device into the filler opening (auxiliary connection 13D).
2. Test medium: compressed air
Test pressure: 11.6 psi (0.8 bar) max.
Test period: 2 minutes
⇒ 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. If the test has been successful, fill in the lubricant.

7.5.8.2 Checking and re-adjusting the gland packing

	! WARNING Unprotected rotating parts Risk of injury! ▷ Do not touch rotating parts. ▷ When the pump is running, perform all work with utmost caution. ▷ Use appropriate personal protective equipment.
	! DANGER Excessive temperatures on pump sets with gland packings Explosion hazard! ▷ Gland packings are not approved for use in potentially explosive atmospheres. ▷ Switch off the pump set immediately.

Check the gland packing during commissioning. Adjust the gland packing, if required.
The gland packing must leak slightly during operation.

Before pump start-up

1. Tighten the nuts of the gland follower only lightly by hand.
 2. Use a feeler gage to verify that the gland follower is centered and mounted 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 nut 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 the 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 packing at minimum inlet pressure.

7.5.9 Mounting the motor



NOTE

Steps 1 and 2 do not apply to versions with spacer-type coupling.

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

7.6 Tightening torques

7.6.1 Tightening torques for the pump set

Table 26: Tightening torques for the pump set

Thread	Property class: 8.8/3C-80		Property class: A4-70		Property class: 1.4462	
	[ft lbs]	[Nm]	[ft lbs]	[Nm]	[ft lbs]	[Nm]
M6	7.38	10	5.16	7	5.16	7
M8	18.44	25	12.54	17	12.54	17
M10	36.88	50	25.82	35	25.82	35
M12	62.69	85	44.25	60	44.25	60
M16	154.88	210	110.63	150	110.63	150
M20	302.4	410	214	290	214	290
M24	523.7	710	205	278	368.8	500
M27	774.5	1050	301.7	409	542.8	736
M30	1047.4	1420	408.6	554	737.6	1000

7.6.2 Tightening torques for the mechanical seal

Table 27: Tightening torques for grub screws with cup point to ISO 4029 in KSB mechanical seals

Thread	[ft lbs]	[Nm]
M5	3.12	4
M6	5.46	7
M8	11.7	15
M10	23.4	30
M12	31.2	40

7.7 Spare parts stock

7.7.1 Ordering spare parts

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

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

Refer to the name plate for all data.

Also supply the following data:

- Part No. and description (⇒ Section 9.1, Page 85)
- Quantity of spare parts
- Shipping address
- Mode of dispatch (freight, mail, express freight, air freight)

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

Table 28: Quantity of spare parts for recommended spare parts stock

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

Keeping a stock of wear parts and replacement parts is recommended also during the warranty period.

8 Trouble-shooting

	⚠ WARNING
	Improper remedial work Risk of personal injury! ► For any work performed in order to remedy faults observe the relevant information given in this operating manual and/or the product literature provided by the accessories manufacturers.

If problems occur that are not described in the following table, consultation with KSB Service is required.

- A** Pump delivers insufficient flow rate
- B** Motor overload
- C** Excessive discharge pressure
- D** Increase in bearing temperature
- E** Leakage at the pump
- F** Excessive leakage at the shaft seal
- G** Vibration during pump operation
- H** Impermissible temperature increase in the pump

Table 29: Trouble-shooting

A	B	C	D	E	F	G	H	Possible cause	Remedy ¹⁰⁾
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 a 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 lift 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 Service.
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 two phases only.	Replace the defective fuse. Check power 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 parts	Replace worn parts by new ones.
-	X	-	-	-	-	X	-	Pump back pressure is lower than specified in the purchase order.	Re-adjust to duty point.

¹⁰ 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 ¹⁰⁾
-	X	-	-	-	-	-	-	Density or viscosity of the fluid pumped is higher than stated in the purchase order.	Contact KSB.
-	X	X	-	-	-	-	-	Speed is too high.	Reduce speed, request particulars.
-	-	-	-	X	-	-	-	Tie bolts/sealing elements	Tighten the bolts. Replace sealing elements.
-	-	-	-	-	X	-	-	Worn shaft seal	Fit new shaft seal.
-	-	-	-	-	-	X	-	Vibrations during pump operation	Correct suction conditions. Re-align the pump. Re-balance the impeller. Increase pressure at the pump suction nozzle.
-	-	-	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 the general arrangement drawing.
-	X	-	-	-	-	-	-	Insufficient operating voltage	Increase the voltage.

9 Related Documents

9.1 General assembly drawings / exploded views with list of components

9.1.1 General assembly drawing: Sewatec with bearing brackets S05, S06, S07, S08

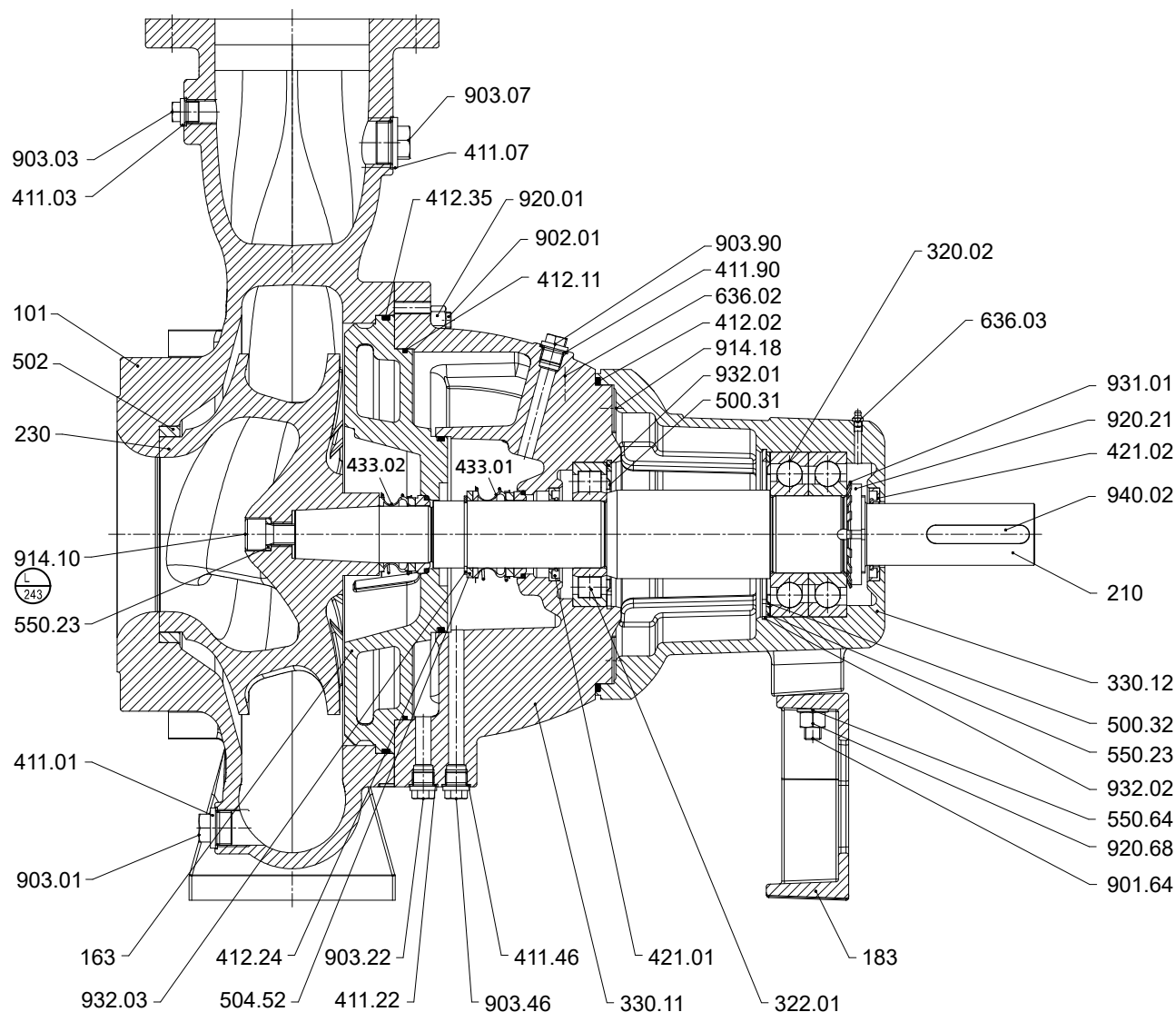


Fig. 61: Sewatec with bearing brackets S05 to S08

Table 30: Key to the symbols

Symbol	Key
	Always secure screwed connections marked with this symbol with Loctite 243 .

Table 31: List of components

Part No.	Description	Part No.	Description
101	Pump casing	502	Casing wear ring
163	Discharge cover	504.52	Spacer ring
183	Support foot	550.23/.64	Disc
210	Shaft	636.02/.03	Lubricating nipple
230	Impeller	901.64	Hexagon head bolt
320.02	Rolling element bearing	902.01	Stud
322.01	Radial roller bearing	903.01/.03/.07/.22/.46/.90	Screw plug

Part No.	Description	Part No.	Description
330.11/.12	Bearing bracket	914.10/.18	Hexagon socket head cap screw
411.01/.03/.07/.22/.46/.90	Joint ring	920.01/.21/.68	Nut
412.02/.11/.24/.35	O-ring	931.01	Lock washer
421.01/.02	Lip seal	932.01/.02/.03	Circlip
433.01/.02	Mechanical seal	940.02	Key
500.31/.32	Ring		

9.1.2 General assembly drawing: Sewatec with bearing brackets S05, S06, S07, underfloor installation and installation with universal-joint shaft

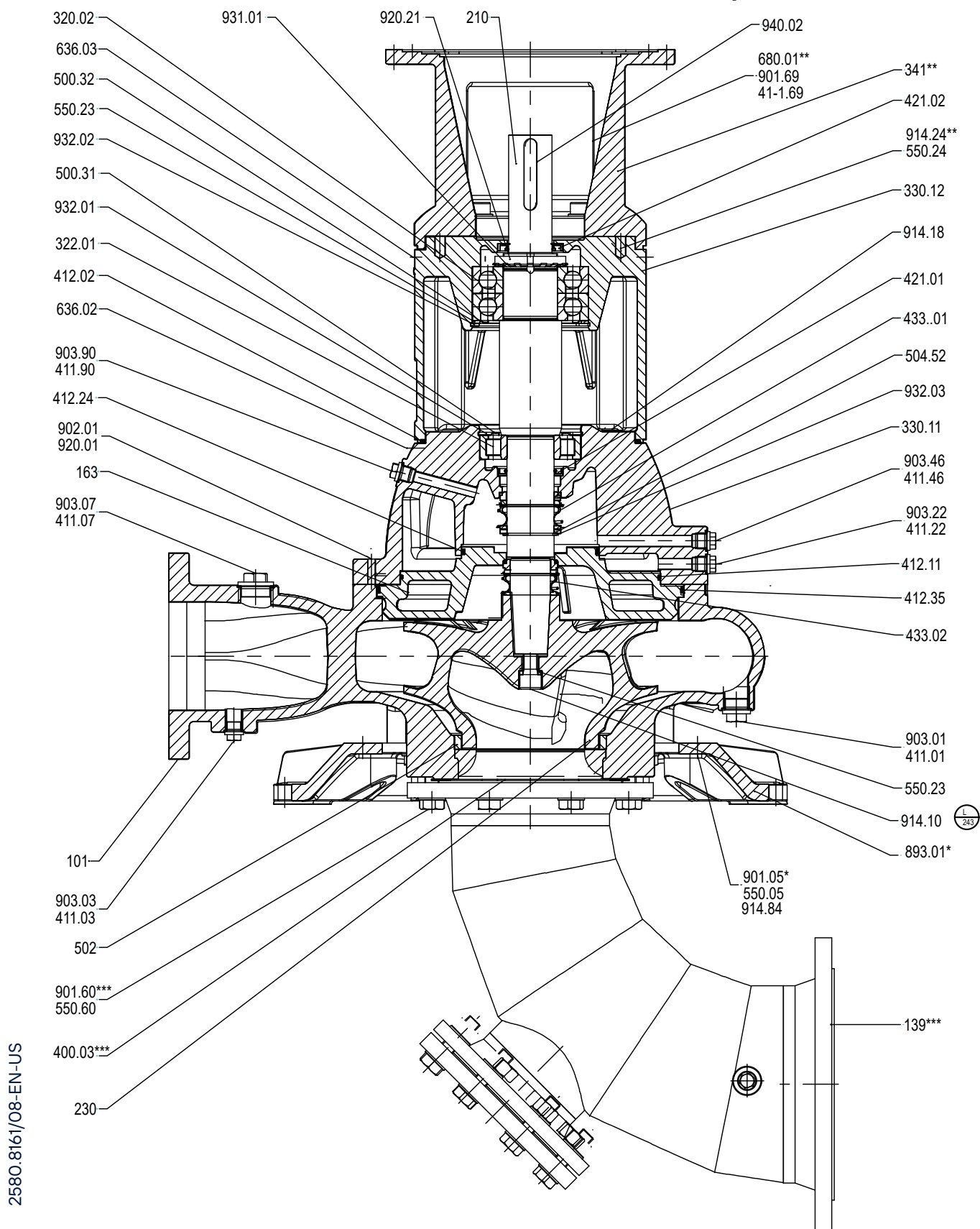


Fig. 62: Sewatec with E impeller – pump for underfloor installation and installation with universal-joint shaft

Table 32: Key to the symbols

Symbol	Key
	Always secure screwed connections marked with this symbol with Loctite 243 .
*	Only for Sewatec K 100-400, F/K 100-401, D 100-403, D/K 150-400, D 150-401, D/K 150-403, D 150-503, K 150-503, K 151-403, D 200-400, D/K 200-402, K 200-403, D 200-405, D 200-503, K 200-504, K 200-505, D 250-402, D 300-402
**	If any
***	Not for universal-joint shaft

Table 33: List of components

Part No.	Designation	Part No.	Description
41-1.69	Sealing washer	502	Casing wear ring
101	Pump casing	504.52	Spacer ring
139	Suction elbow	525.04	Spacer sleeve
163	Discharge cover	550.05/.16/.23/.24/.60	Disc
210	Shaft	636.02/.03	Lubricating nipple
230	Impeller	680.01**	Guard
320.02	Rolling element bearing	893.01*	Soleplate
322	Radial roller bearing	901.05*/.16/.18/.60***	Hexagon head bolt
330.11/.12	Bearing bracket	902.01	Stud
341**	Drive lantern	903.01/.03/.07/.22/.46/.90	Screw plug
400.03***	Gasket	906	Impeller screw
411.01/.03/.07/.22/.46/.90	Joint ring	914.18/.10/24***	Hexagon socket head cap screw
412.02/.11/.24/.35	O-ring	920.01/.11/.21	Nut
421.01/.02	Lip seal	931.01	Lock washer
433.01/.02	Mechanical seal	932.01/.02/.03	Circlip
500.31/.32	Ring	940.02	Key

9.1.3 General assembly drawing: Sewatec with bearing brackets S09, S10

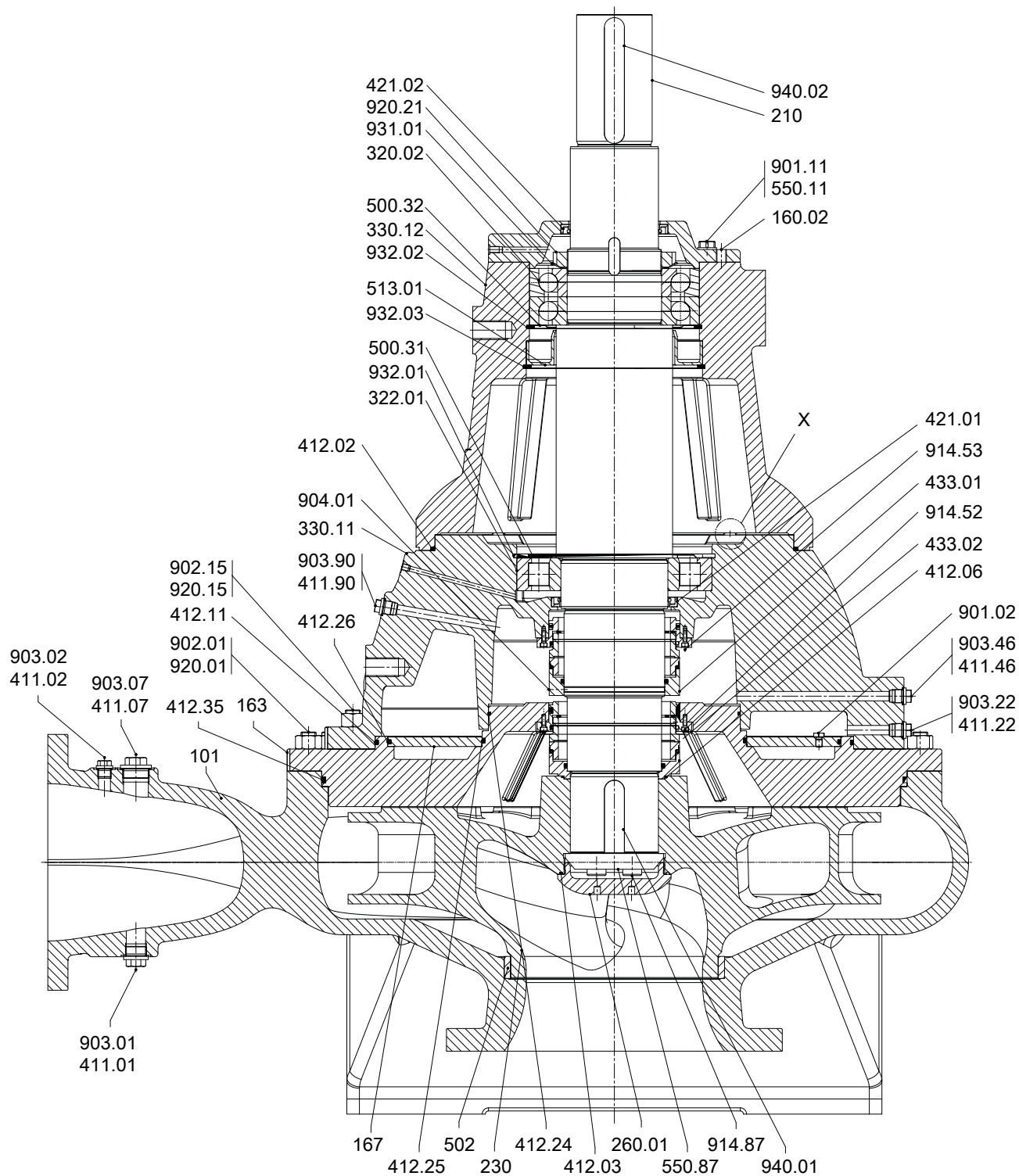


Fig. 63: Sewatec with bearing brackets S09, S10

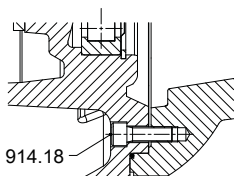


Fig. 64: Detail X

Table 34: List of components

Part No.	Description	Part No.	Description
101	Pump casing	500.31/.32	Ring
160.02	Cover	502	Casing wear ring
163	Discharge cover	513.01	Insert ring
167	Cover insert	550.04/.11/.87	Disc
210	Shaft	901.02/.11	Hexagon head bolt
230	Impeller	902.01/.02/.15	Stud
260.01	Impeller hub cap	903.01/.02/.07/.22/.46/.90	Screw plug
320.02	Rolling element bearing	904.01	Grub screw
322.01	Radial roller bearing	914.18/.52/.53/.87	Hexagon socket head cap screw
330.11/.12	Bearing bracket	920.01/.15/.17/.21	Nut
411.01/.02/.07/.22/.46/.90	Joint ring	931.01	Lock washer
412.02/.03/.05/.06/.11/.24/.25/.26/.35	O-ring	932.01/.02/.03	Circlip
421.01/.02	Lip seal	940.01/.02	Key
433.01/.02	Mechanical seal		

9.1.4 Detailed views

9.1.4.1 Impeller types

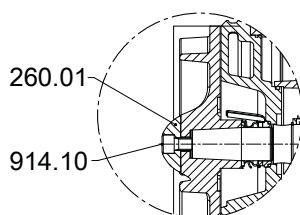


Fig. 65: F impeller

Table 35: List of components

Part No.	Description	Part No.	Description
260.01	Impeller hub cap	914.10	Hexagon socket head cap screw

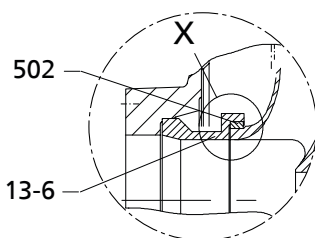


Fig. 66: K impeller

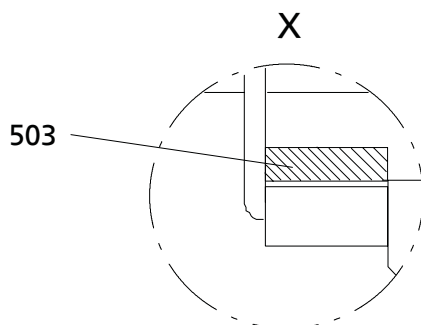


Fig. 67: Detail X: impeller wear ring for K impeller

Table 36: List of components

Part No.	Description	Part No.	Description
13-6 ¹¹⁾	Casing insert	502 ¹²⁾	Casing wear ring
503	Impeller wear ring		

¹¹ Only for Sewatec 100-401 and 200-400

¹² Not for Sewatec 100-401

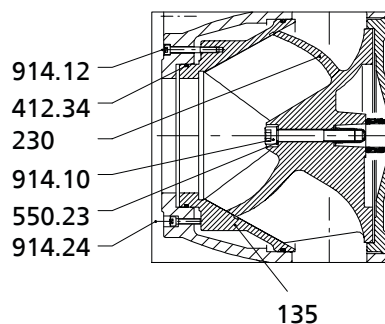


Fig. 68: D impeller (single-vane impeller)

Part No.	Description	Part No.	Description
230	Impeller	550.23	Disc
412.34	O-ring	914.10/.12/.24	Hexagon socket head cap screw

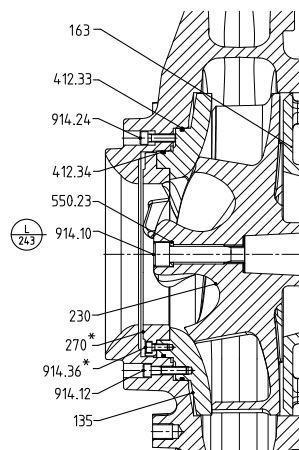


Fig. 69: D impeller (multi-vane impeller)

*: On specific designs only

Table 38: Impeller type D

Part No.	Description	Part No.	Description
135	Wear plate	412	O-ring
163	Discharge cover	550	Disc
230	Impeller	914	Hexagon socket head cap screw
270	Deflector		

9.1.4.2 Impeller fastening elements

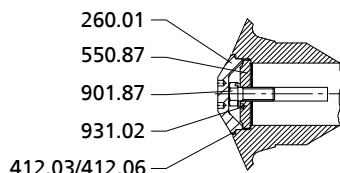


Fig. 70: Impeller fastening for bearing brackets S07 and S08 (impeller types E and K), except Sewatec size 500-632

Table 39: List of components

Part No.	Description	Part No.	Description
260.01	Impeller hub cap	901.87	Hexagon head bolt
412.03/412.06	O-ring	931.02	Lock washer
550.87	Disc		

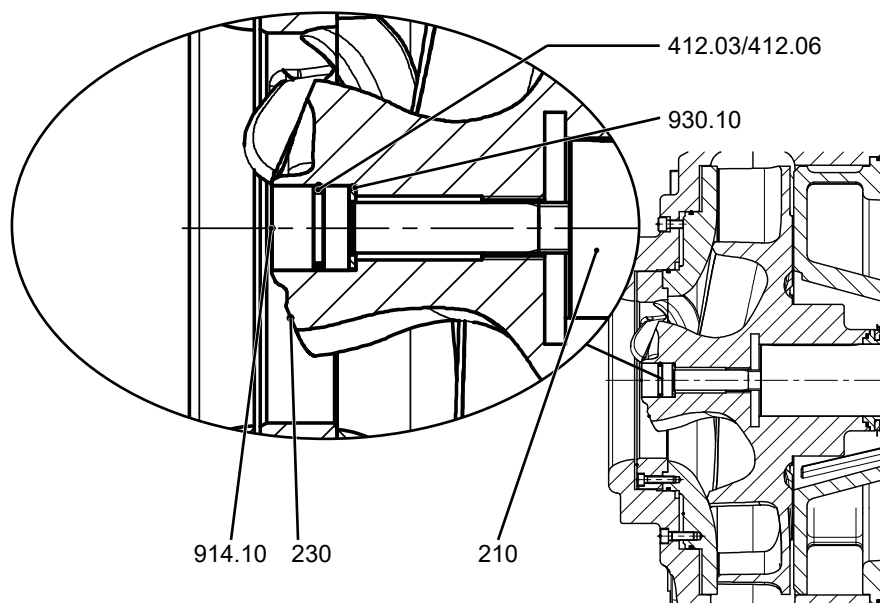


Fig. 71: Impeller fastening for bearing bracket S07 (impeller type D)

Table 40: List of components

Part No.	Description	Part No.	Description
210	Shaft	914.10	Hexagon socket head cap screw
230	Impeller	930.10	Safety device
412.03/412.06	O-ring		

9.1.4.3 Inspection hole, bearing brackets S05 to S08

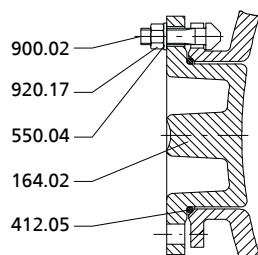


Fig. 72: Inspection hole, bearing brackets S05 to S08

Table 41: List of components

Part No.	Description	Part No.	Description
164.02	Inspection cover	900.02	Bolt/screw
412.05	O-ring	920.17	Nut
550.04	Disc		

9.1.4.4 Inspection hole, bearing brackets S09 and S10

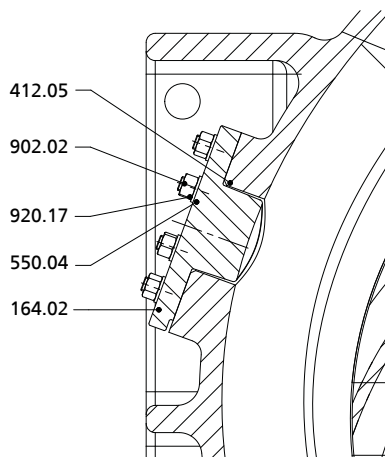


Fig. 73: Inspection hole, bearing brackets S09 and S10

Table 42: List of components

Part No.	Description	Part No.	Description
164.02	Inspection cover	902.17	Stud
412.05	O-ring	920.17	Nut
550.04	Disc		

9.1.4.5 Drilled hole required during manufacturing, bearing brackets S09 and S10

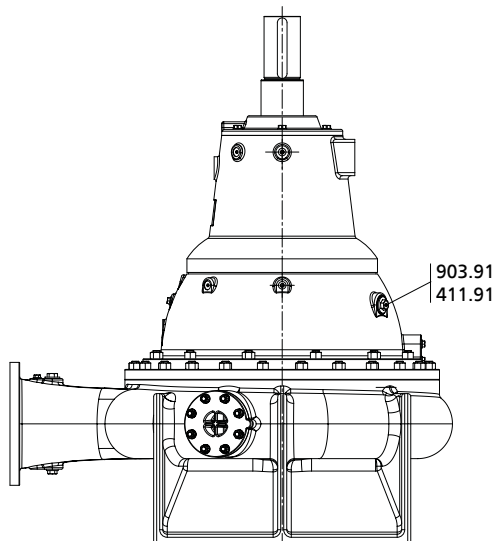


Fig. 74: Drilled hole required during manufacturing, bearing brackets S09 and S10

Table 43: List of components

Part No.	Description	Part No.	Description
411.91	Joint ring	903.91	Screw plug

9.1.5 Sectional drawings of the mechanical seal

9.1.5.1 Pump-end mechanical seal (bearing brackets S01 - S07)

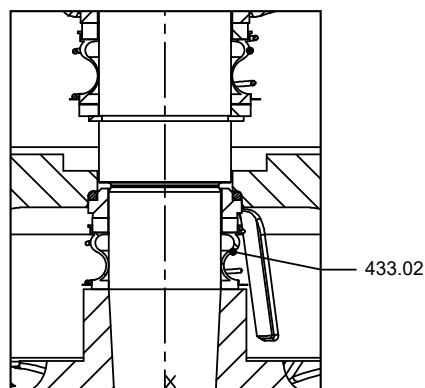


Fig. 75: Pump-end mechanical seal (bearing brackets S01 - S07)

Table 44: List of components

Part No.	Description
433.02	Mechanical seal

9.1.5.2 Pump-end mechanical seal (bearing bracket S08): 4STC, version with clamped mating ring carrier

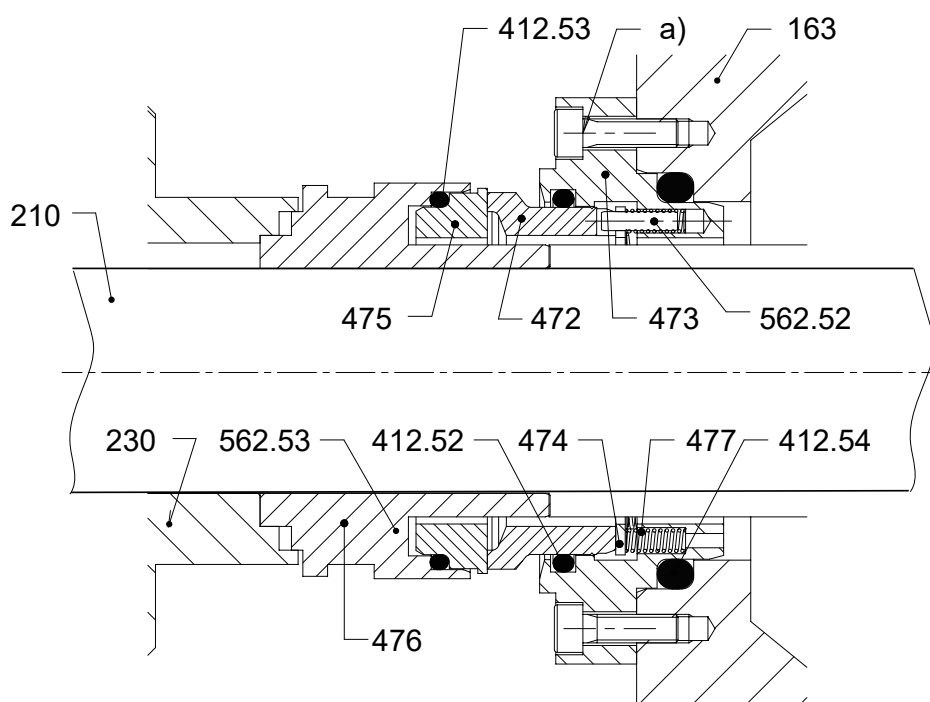


Fig. 76: 4STC, version with clamped mating ring carrier

a)	Screws ISO 4762-M6
----	--------------------

Table 45: List of components

Part No.	Description	Part No.	Description
163	Discharge cover	474	Thrust ring
210	Shaft ¹³⁾	475	Mating ring
230	Impeller	476	Mating ring carrier

13 Illustration not to scale

Part No.	Description	Part No.	Description
412.52/.53/.54	O-ring	477	Spring for mechanical seal
472	Primary ring	562.52/.53	Parallel pin
473	Primary ring carrier		

9.1.5.3 Pump-end mechanical seal (bearing brackets S09 - S10): 4STC, version with clamped mating ring carrier and secured primary ring carrier

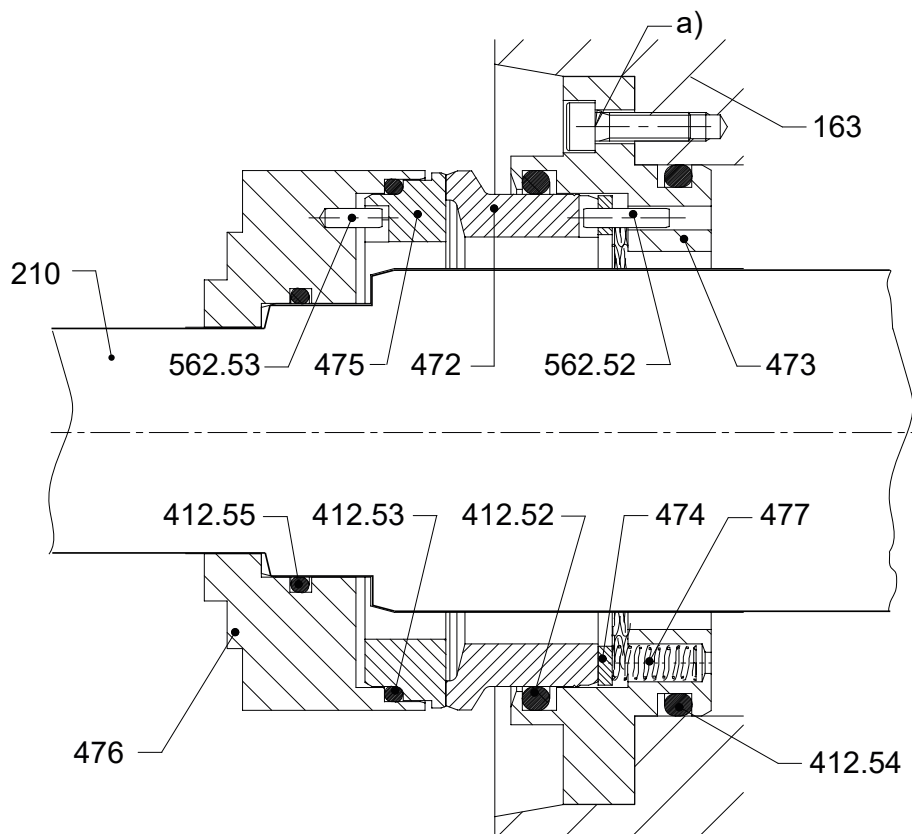


Fig. 77: 4STC, version with clamped mating ring carrier and secured primary ring carrier

a)	Screws ISO 4762-M6
----	--------------------

Table 46: List of components

Part No.	Description	Part No.	Description
163	Discharge cover	474	Thrust ring
210	Shaft ¹⁴⁾	475	Mating ring
412.52/.53/.54/.55	O-ring	476	Mating ring carrier
472	Primary ring	477	Spring for mechanical seal
473	Primary ring carrier	562.52/.53	Parallel pin

¹⁴ Illustration not to scale

9.1.5.4 Drive-end mechanical seal (bearing brackets S01 - S07)

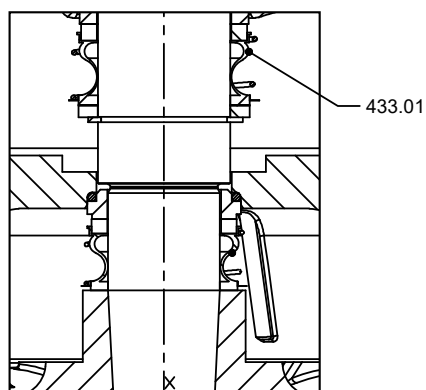


Fig. 78: Drive-end mechanical seal (bearing brackets S01 - S07)

Table 47: List of components

Part No.	Description
433.01	Mechanical seal

9.1.5.5 Drive-end mechanical seal (bearing brackets S08 - S10): 4STC, version with axially secured primary ring carrier

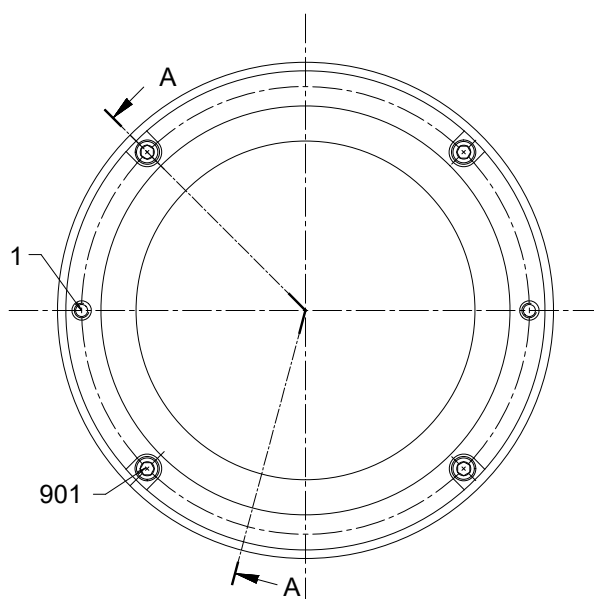


Fig. 79: Cross-section axis

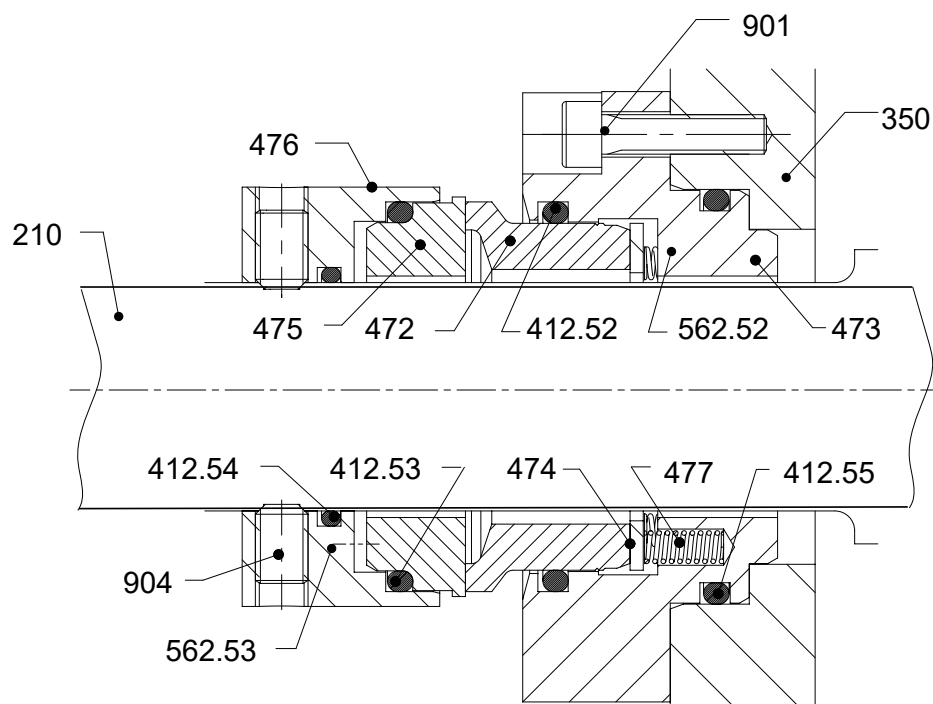


Fig. 80: 4STC, version with axially secured primary ring carrier

Table 48: List of components

Part No.	Description	Part No.	Description
1	Jacking thread	475	Mating ring
210	Shaft ¹⁵⁾	476	Mating ring carrier
350	Bearing housing	477	Spring for mechanical seal
412.52/.53/.54/.55	O-ring	562	Parallel pin
472	Primary ring	901	Hexagon head bolt
473	Primary ring carrier	904	Grub screw
474	Thrust ring		

9.1.5.6 Cartridge seal C120/120M1-4STQ

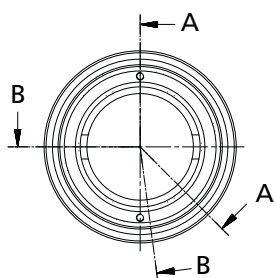


Fig. 81: Cross-section axes

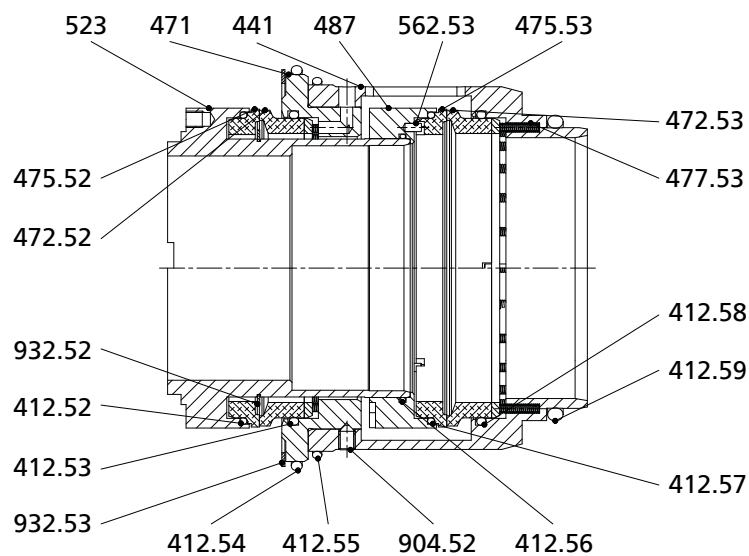
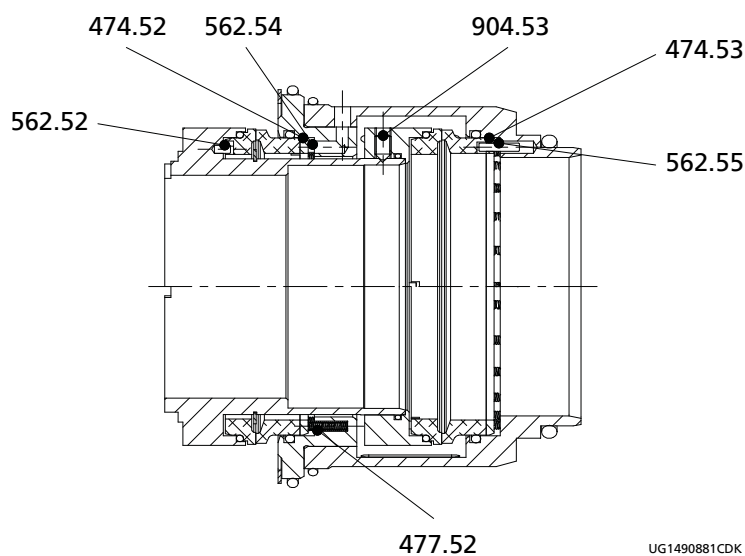


Fig. 82: View A

¹⁵ Illustration not to scale



UG1490881CDK

Fig. 83: View B

Table 49: List of components

Part No.	Description	Part No.	Description
412.52/.53/.54/.55/.56/.57/.58/.59	O-ring	487	Mating ring carrier
441	Shaft seal housing	523	Shaft sleeve
471	Seal cover	562.52/.53/.54/.55	Parallel pin
472.52/.53	Primary ring	901	Hexagon head bolt
474.52/.53	Thrust ring	904.52/.53	Grub screw
475.52/.53	Mating ring	932.52/.53	Circlip
477.52/.53	Spring for mechanical seal		

9.1.6 Exploded view of Sewatec with mechanical seal

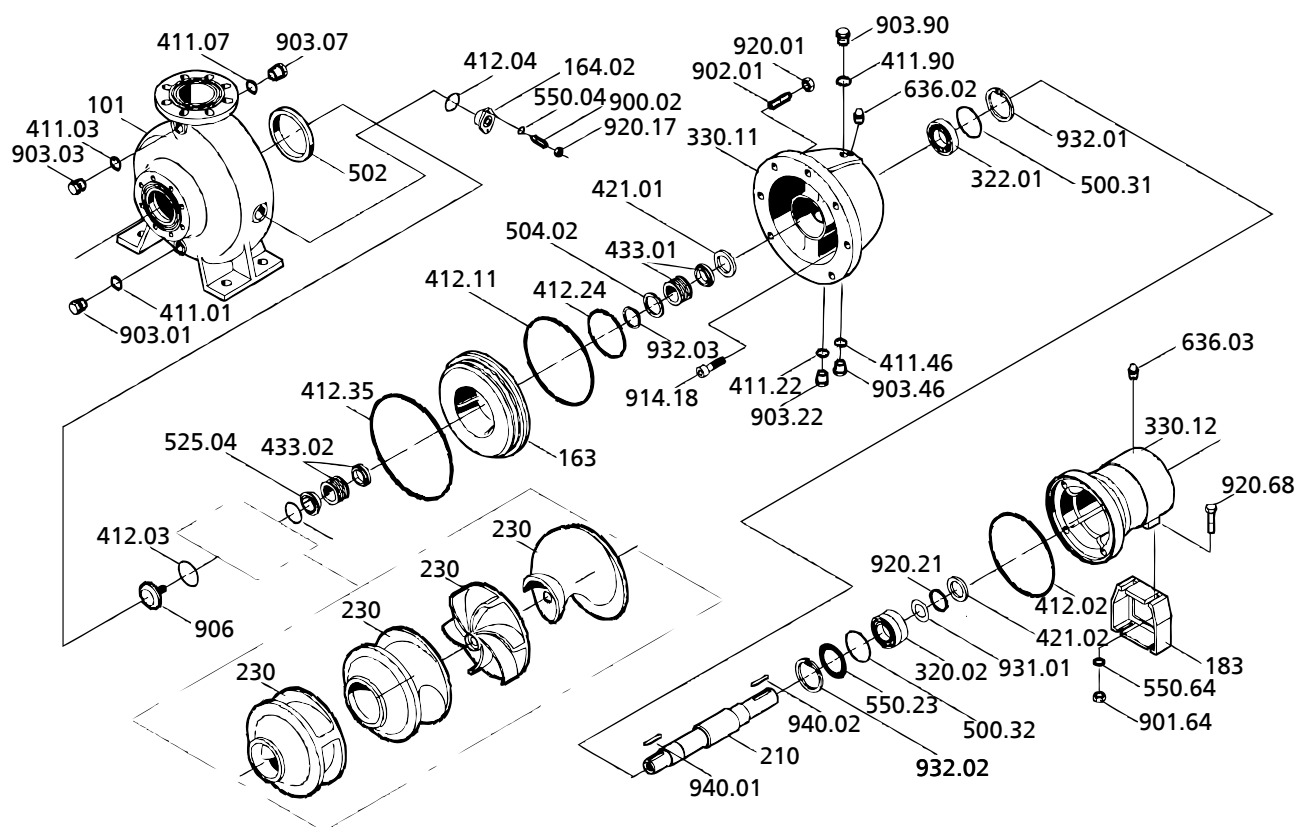


Fig. 84: Exploded view of Sewatec with mechanical seal

Table 50: List of components

Part No.	Description	Part No.	Description
101	Pump casing	504.02	Spacer ring
163	Discharge cover	525.04	Spacer sleeve
164.02	Inspection cover	550.04/.23/.64	Disc
183	Support foot	636.02/.03	Lubricating nipple
210	Shaft	900.02	Bolt/screw
230	Impeller	901.64	Hexagon head bolt
320.02	Rolling element bearing	902.01	Stud
322.01	Radial roller bearing	903.01/.03/.07/.22/.46/.90	Screw plug
330.11/.12	Bearing bracket	906	Impeller screw
411.01/.03/.07/.22/.46/.90	Joint ring	914.18	Hexagon socket head cap screw
412.02/.03/.04/.11/.24/.35	O-ring	920.01/.17/.21/.68	Nut
421.01/.02	Lip seal	931.01	Lock washer
433.01/.02	Mechanical seal	932.01/.02/.03	Circlip
500.31/.32	Ring	940.01/.02	Key
502	Casing wear ring		

9.1.7 Exploded view of Sewatec with gland packing

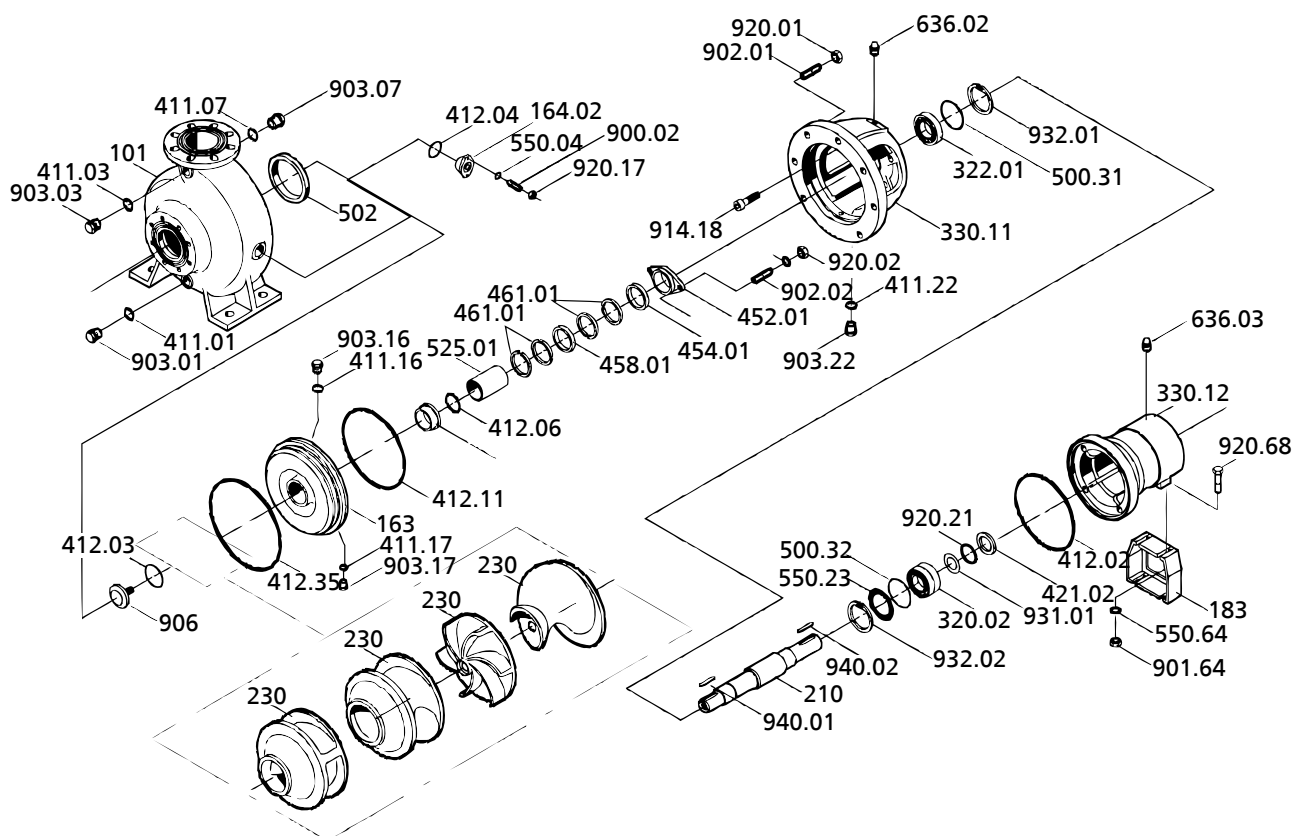


Fig. 85: Exploded view of Sewatec with gland packing

Table 51: List of components

Part No.	Description	Part No.	Description
101	Pump casing	500.31/.32	Ring
163	Discharge cover	502	Casing wear ring
164.02	Inspection cover	525.01	Spacer sleeve
183	Support foot	550.04/.23/.64	Disc
210	Shaft	636.02/.03	Lubricating nipple
230	Impeller	900.02	Bolt/screw
320.02	Rolling element bearing	901.64	Hexagon head bolt
322.01	Radial roller bearing	902.01/.02	Stud
330.11/.12	Bearing bracket	903.01/.03/.07/.16/.17/.22	Screw plug
411.01/.03/.07/.16/.17/.22	Joint ring	906	Impeller screw
412.02/.03/.04/.06/.11/.35	O-ring	914.18	Hexagon socket head cap screw
421.02	Lip seal	920.01/.02/.17/.21/.68	Nut
452.01	Gland follower	931.01	Lock washer
454.01	Stuffing box ring	932.01/.02	Circlip
458.01	Lantern ring	940.01/.02	Key
461.01	Gland packing		

10 Certificate of Decontamination

Type:

Order number/

Order item number¹⁶⁾:

Delivery date:

Field of application:

Fluid handled¹⁶⁾:

Please check where applicable¹⁶⁾:


☐

Corrosive


☐

Oxidizing


☐

Flammable


☐

Explosive


☐

Hazardous to health


☐

Seriously hazardous to health


☐

Toxic


☐

Radioactive


☐

Hazardous to the environment


☐

Safe

Reason for return¹⁶⁾:

Comments:

.....

The product/accessories have been carefully drained, cleaned and decontaminated inside and outside prior to dispatch/placing at your disposal.

We herewith declare that this product is free from hazardous chemicals, biological and radioactive substances.

For mag-drive pumps, the inner rotor unit (impeller, casing cover, bearing ring carrier, plain bearing, inner rotor) has been removed from the pump and cleaned. In cases of leakage at the stator can, the stator space has been examined for fluid leakage; if fluid handled has penetrated the stator space, it has been removed.

For canned motor pumps, the rotor and plain bearing have been removed from the pump for cleaning. In cases of leakage at the stator can, the stator space has been examined for fluid leakage; if fluid handled has penetrated the stator space, it has been removed.

- ☐ No special safety precautions are required for further handling.
- ☐ The following safety precautions are required for flushing fluids, fluid residues and disposal:

.....

.....

We confirm that the above data and information are correct and complete and that shipping is effected in accordance with the relevant legal provisions.

.....

Place, date and signature

.....

Address

.....

Company stamp

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