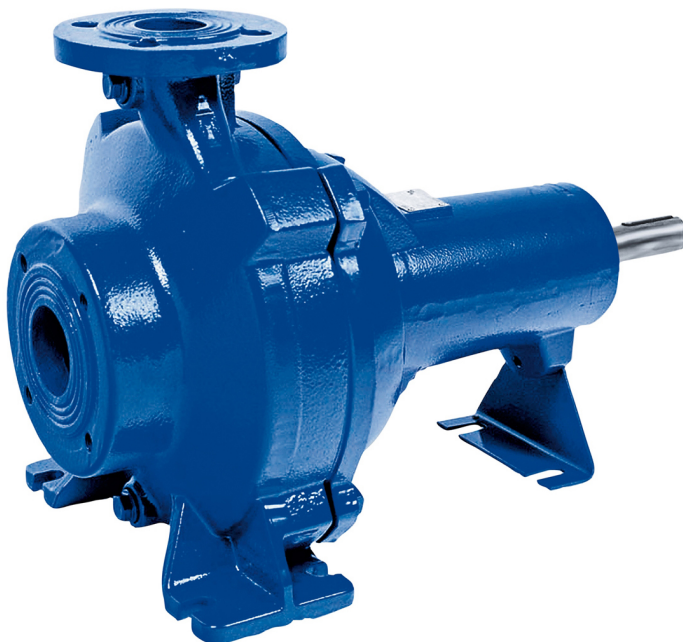


Sewatec (60 Hz)

60 Hz
ASME / NEMA Motors
Bearing Brackets S01, S02, S03, S04

Installation/Operating Manual



Legal information/Copyright

Installation/Operating Manual Sewatec (60 Hz)

Original operating manual

All rights reserved. The contents provided herein must neither be distributed, copied, reproduced, edited or processed for any other purpose, nor otherwise transmitted, published or made available to a third party without the manufacturer's express written consent.

Subject to technical modification without prior notice.

© KSB SE & Co. KGaA, Frankenthal 2025-08-21

Contents

	Glossary	6
1	General	7
1.1	Principles	7
1.2	Installation of partly completed machinery	7
1.3	Target group	7
1.4	Other applicable documents	7
1.5	Symbols	7
1.6	Key to safety symbols/markings	8
2	Safety	9
2.1	General	9
2.2	Intended use	9
2.3	Personnel qualification and personnel training	10
2.4	Consequences and risks caused by non-compliance with these operating instructions	10
2.5	Safety awareness	10
2.6	Safety information for the operator/user	11
2.7	Safety information for maintenance, inspection and installation	11
2.8	Unauthorized modes of operation	11
2.9	Explosion protection	11
3	Transport/Storage/Disposal	13
3.1	Checking the condition upon delivery	13
3.2	Transport	13
3.3	Storage/Preservation	14
3.4	Return to supplier	14
3.5	Disposal	15
4	Description of the Pump (Set)	16
4.1	General description	16
4.2	Product information as per Regulation No. 1907/2006 (REACH)	16
4.3	Designation	16
4.4	Name plate	16
4.5	Design details	17
4.6	Installation types	17
4.7	Configuration and function	18
4.8	Noise characteristics	18
4.9	Scope of supply	19
4.10	Dimensions and weights	19
5	Installation at Site	20
5.1	Safety regulations	20
5.2	Checks to be carried out prior to installation	20
5.3	Installing the pump set in a horizontal position	20
5.4	Piping	24
5.4.1	Connecting the piping	24
5.4.2	Permissible forces and moments at the pump nozzles	26
5.4.3	Vacuum balance line	29
5.5	Auxiliary connections	31
5.6	Checking the coupling alignment	32
5.7	Aligning the pump and motor	34
5.7.1	Aligning the pump set with adjusting screws	34
5.8	Checking the lubricant level	35
5.9	Electrical connection	35
5.10	Checking the direction of rotation	36

5.11	Priming and venting the pump	37
5.12	Protective equipment	37
5.13	Connecting the vibration sensor	37
5.14	Connecting temperature measuring devices	37
5.15	Warning values and cut-out values	39
6	Commissioning/Start-up/Shutdown	40
6.1	Commissioning/start-up	40
6.1.1	Prerequisites for commissioning/start-up	40
6.1.2	Start-up	40
6.1.3	Shutdown	41
6.2	Operating limits	42
6.2.1	Maximum operating pressure	42
6.2.2	Frequency of starts	43
6.2.3	Fluid handled	44
6.3	Shutdown/storage/preservation	44
6.4	Returning to service after storage	45
7	Servicing/Maintenance	46
7.1	Safety regulations	46
7.2	Maintenance/inspection	47
7.2.1	Supervision of operation	47
7.2.2	Inspection work	48
7.2.3	Visual inspection through the inspection hole	48
7.2.4	Lubrication and lubricant change	49
7.3	Drainage/disposal	52
7.4	Dismantling the pump set	52
7.4.1	General information/Safety regulations	52
7.4.2	Preparations for dismantling	53
7.4.3	Separating the pump from the piping	53
7.4.4	Removing the back pull-out unit	54
7.4.5	Removing the impeller	54
7.4.6	Removing the mechanical seals	56
7.4.7	Removing the shaft and rolling element bearings	58
7.4.8	Removing the wear plate (for D impeller only)	58
7.5	Reassembling the pump set	59
7.5.1	General information/Safety regulations	59
7.5.2	Re-installing shaft and rolling element bearings	59
7.5.3	Installing the mechanical seal	60
7.5.4	Fitting the impeller	67
7.5.5	Installing the back pull-out unit	69
7.5.6	Leak test	70
7.5.7	Mounting the motor	71
7.6	Tightening torques	71
7.7	Spare parts stock	71
7.7.1	Ordering spare parts	71
7.7.2	Recommended spare parts stock for 2 years' operation to DIN 24296	72
8	Trouble-shooting	73
9	Related Documents	75
9.1	General assembly drawing: Sewatec with bearing brackets S01, S02, S03, S04	75
9.2	Detailed views	76
9.2.1	Impeller types	76
9.2.2	Inspection hole, bearing brackets S01 to S04	77
9.3	Sectional drawings of the mechanical seal	78
9.3.1	Drive-end mechanical seal	78
9.3.2	Pump-end mechanical seal	78
9.3.3	Cartridge seal C022/O25M1-4STQ	79

9.3.4	Cartridge seal C033/055M1-4STQ	80
9.4	Exploded view: Sewatec with bearing brackets S01, S02, S03, S04.....	81
10	Certificate of Decontamination	82
	Index	83

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
Drawing of auxiliary connections	Description of auxiliary connections
Hydraulic characteristic curve	Characteristic curves showing head, NPSH required, efficiency and power input
General assembly drawing ¹⁾	Sectional drawing of the pump
Sub-supplier product literature ¹⁾	Operating manuals and other product literature describing accessories and integrated machinery components
Spare parts lists ¹⁾	Description of spare parts
Piping layout ¹⁾	Description of auxiliary piping
List of components ¹⁾	Description of all pump components
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.
(⇒ Section 7.3, Page 52)
- 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 40)

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

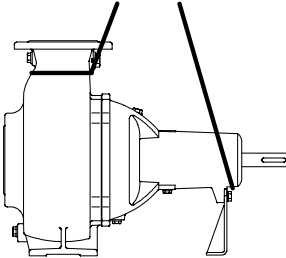
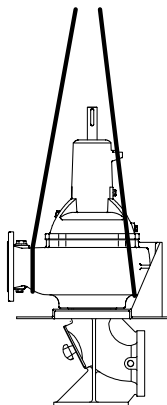
1. On transfer of goods, check each packaging unit for damage.
2. In the event of in-transit damage, assess the exact damage, document it and notify KSB or the distributor and the insurance company about the damage in writing immediately.

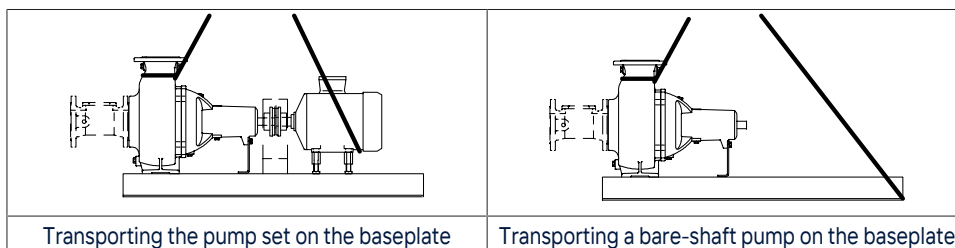
3.2 Transport

	⚠ 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.

Table 4: Transport options

	
Transporting a bare-shaft pump	Transporting the pump set in a vertical position



3.3 Storage/Preservation

If commissioning is to take place some time after delivery, we recommend that the following measures be taken:

	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
	Improper storage Damage to the electric cables! ▷ Support the electric cables at the cable entry to prevent permanent deformation. ▷ Only remove the protective caps from the electric cables at the time of installation.
	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 5: Ambient conditions for storage

Ambient condition	Value
Relative humidity	5 % to 85 % (non-condensing)
Ambient temperature	-4 °F to 158 °F [-20 °C to + 70 °C]

- Store the pump set under dry and vibration-free conditions, if possible in its original packaging.
- 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 or similar).

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

3.4 Return to supplier

- Drain the pump as per operating instructions. (⇒ Section 7.3, Page 52)
- 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 82)

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

3.5 Disposal

	 WARNING 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 universal-joint 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 6: 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

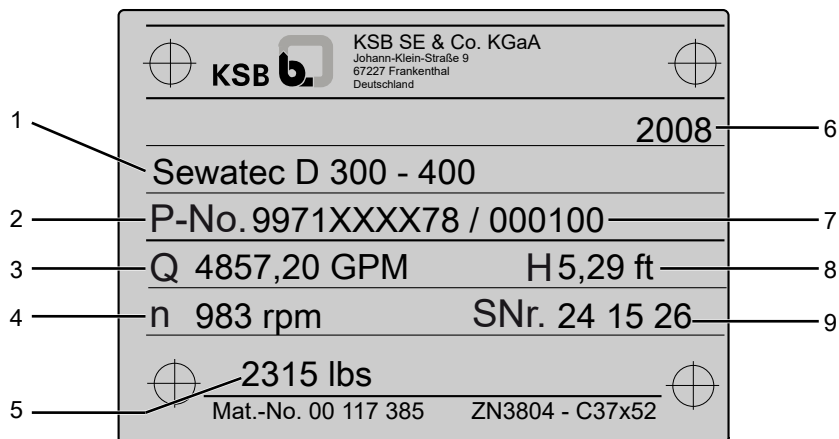


Fig. 1: Name plate (example)

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

Impeller type

- Various application-oriented impeller types

Bearings

- Maintenance-free deep groove ball bearings greased for life, pump end and drive end

4.6 Installation types

Horizontal installation

Sewatec - Fig. 0

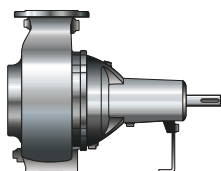


Fig. 2: Sewatec Fig. 0: Bare-shaft pump

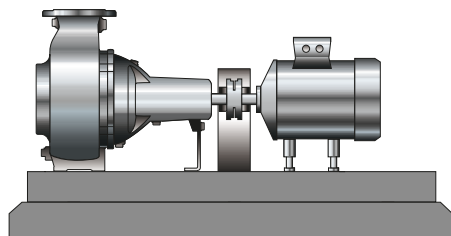


Fig. 3: Sewatec - 3E (3EN/3ENH): Pump set with directly coupled drive, baseplate, coupling (also with coupling spacer), coupling guard and height adjustment of the motor

Sewatec - vertical (V)

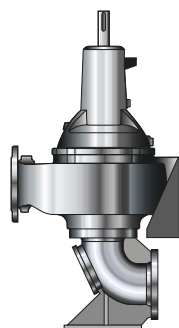


Fig. 4: Sewatec - vertical (V): Bare-shaft pump with soleplate and suction duckfoot bend

4.7 Configuration and function

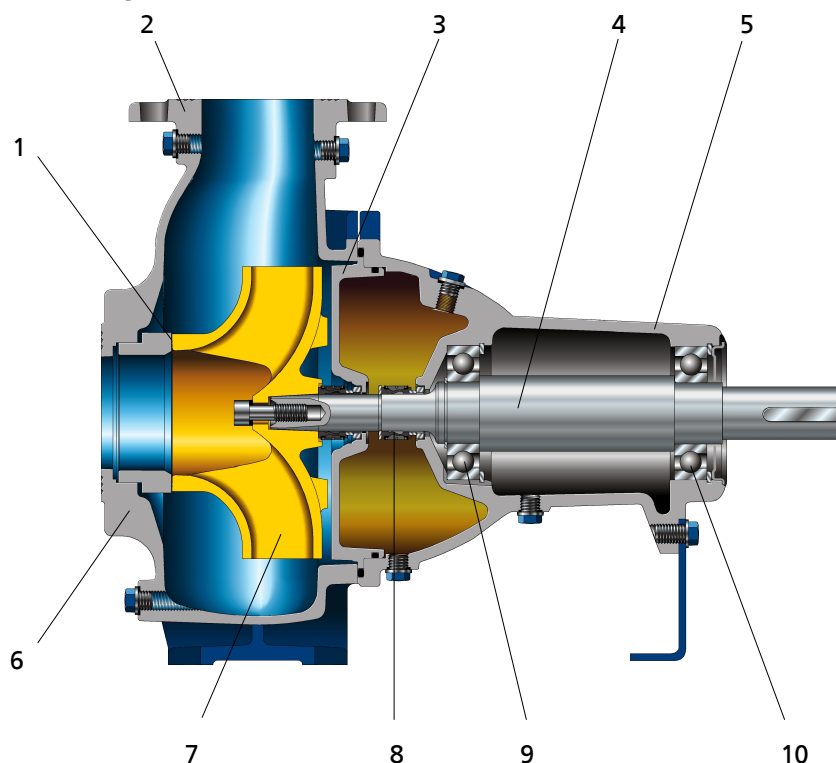


Fig. 5: Sectional drawing with K impeller

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-directional mechanical seals in tandem arrangement. A lubricant chamber in-between the seals ensures cooling and lubrication of the mechanical seals.

4.8 Noise characteristics

Table 7: 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]
2 hp (1,5 kW)	52,0	51,0	56,5	55,0
3 hp (2,2 kW)	53,0	52,0	58,5	57,5

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]
4 hp (3,0 kW)	55,0	53,5	60,5	59,0
5 hp (4,0 kW)	57,0	55,0	62,0	60,0
7,5 hp (5,5 kW)	57,5	57,0	63,5	63,0
10 hp (7,5 kW)	58,5	57,5	65,0	63,5
15 hp (11,0 kW)	60,5	59,5	67,0	65,5
20 hp (15,0 kW)	61,5	60,5	68,0	66,5
25 hp (18,5 kW)	62,5	61,5	68,5	67,5
30 hp (22,0 kW)	63,5	62,5	69,0	68,0
40 hp (30,0 kW)	65,0	63,5	70,5	69,0
50 hp (37,0 kW)	65,5	64,5	71,0	69,5

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.
--	--

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.
---	--

Using injection resin (e.g. FIS V Plus)

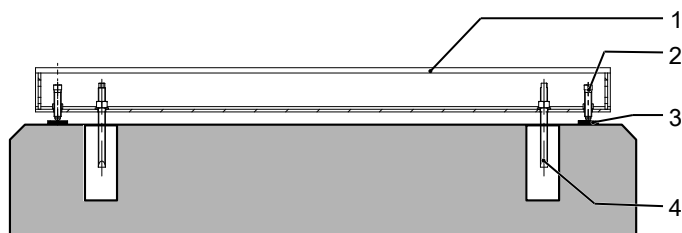


Fig. 6: Installation on a foundation using fully threaded studs and injection resin

1	Base frame	2	Adjusting screw
3	Shim	4	Fully threaded stud

- ✓ 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. Screw the adjusting screws (2) into the threaded holes provided in the base frame (1).
- 2. Place the base frame (1) with the screwed-in adjusting screws (2) on the shims (3). Roughly align the base frame with the piping.
- 3. Level the pump using the adjusting screws (2) and a suitable tool (e.g. spirit level) placed on the shaft and discharge nozzle.
Permissible deviation: 0.0079 inch/m (0.2 mm/m).
- 4. Drill the holes as specified in (⇒ Table 8) , (⇒ Table 9) . Then clean the holes.



WARNING

Improper handling of resin

Skin sensitization and/or irritation!

- ▷ Wear suitable protective clothing.

- 5. Fill the drill hole with injection resin. Extrude the resin from the drill hole base without producing any air bubbles. Injection resin quantity: (⇒ Table 8) , (⇒ Table 9)
- 6. Insert the fully threaded stud (4) with a slight twisting motion until it reaches the drill hole base.
- 7. The drill hole has been filled correctly when excess injection resin emerges from the drill hole mouth.
⇒ If no excess injection resin emerges from the drill hole mouth: Pull out the fully threaded stud immediately and fill the drill hole with injection resin again. Insert the fully threaded stud (3) with a slight twisting motion until it reaches the drill hole base.
- 8. **Observe the curing time of the injection resin!**
Curing time: See the manufacturer's product literature.
- 9. After the curing time, slightly tighten the fully threaded studs (4).
- 10. Grout the baseplate using low-shrinkage concrete. Allow the concrete to set.
- 11. Fill the annular gap between the fully threaded stud (4) and the base frame (1) with injection resin. Tighten the fully threaded stud (4) evenly and tightly.

Table 8: Quantity of FIS V Plus 300T injection resin per base frame, for through-fixture installation: drill hole 2/3 filled + annular gap fill [inch], [qt]

Fully threaded stud	Quantity per base frame	Drill hole diameter	Drill hole depth	Quantity per drill hole	Quantity of FIS V Plus 300T injection resin cartridges required
		[inch]	[inch]	[qt]	
M16×190	4	0.71	4.92	0.023	1
M16×190	6	0.71	4.92	0.023	1
M16×190	8	0.71	4.92	0.023	1
M16×190	10	0.71	4.92	0.023	2
M16×190	12	0.71	4.92	0.023	2
M16×190	14	0.71	4.92	0.023	2
M20×260	6	0.94	6.69	0.054	2
M20×260	8	0.94	6.69	0.054	2
M20×260	10	0.94	6.69	0.054	3
M20×260	12	0.94	6.69	0.054	3
M20×260	14	0.94	6.69	0.054	3
M24×300	8	1.1	8.26	0.091	3
M24×300	10	1.1	8.26	0.091	4
M24×300	12	1.1	8.26	0.091	4
M24×300	14	1.1	8.26	0.091	5

Table 9: Quantity of FIS V Plus 300T injection resin per base frame, for through-fixture installation: drill hole 2/3 filled + annular gap fill [mm], [ml]

Fully threaded stud	Quantity per base frame	Drill hole diameter	Drill hole depth	Quantity per drill hole	Quantity of FIS V Plus 300T injection resin cartridges required
		[mm]	[mm]	[ml]	
M16×190	4	18	125	22.0	1
M16×190	6	18	125	22.0	1
M16×190	8	18	125	22.0	1
M16×190	10	18	125	22.0	2
M16×190	12	18	125	22.0	2
M16×190	14	18	125	22.0	2
M20×260	6	24	170	51.2	2
M20×260	8	24	170	51.2	2
M20×260	10	24	170	51.2	3
M20×260	12	24	170	51.2	3
M20×260	14	24	170	51.2	3
M24×300	8	28	210	86.1	3
M24×300	10	28	210	86.1	4
M24×300	12	28	210	86.1	4
M24×300	14	28	210	86.1	5

Using resin capsules

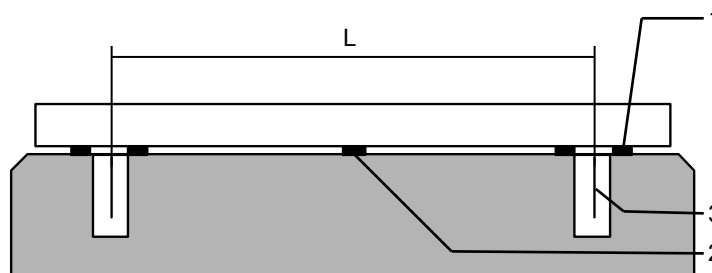


Fig. 7: Installation on a foundation with chemical anchors and resin capsules

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

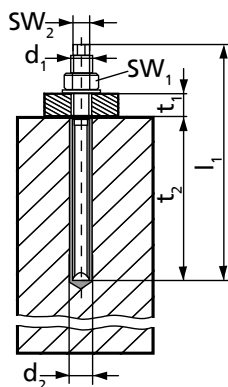


Fig. 8: Dimensions

Table 10: 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 11: 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 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.

5.4.1 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.

³ SW = Width across flats

⁴ Mounting accessories of the respective manufacturer are required.



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.
4. If the owner / operator supplies an expansion joint, it has to be braced with external tie rods to prevent impermissible nozzle loads.

5.4.2 Permissible forces and moments at the pump nozzles

Horizontal installation

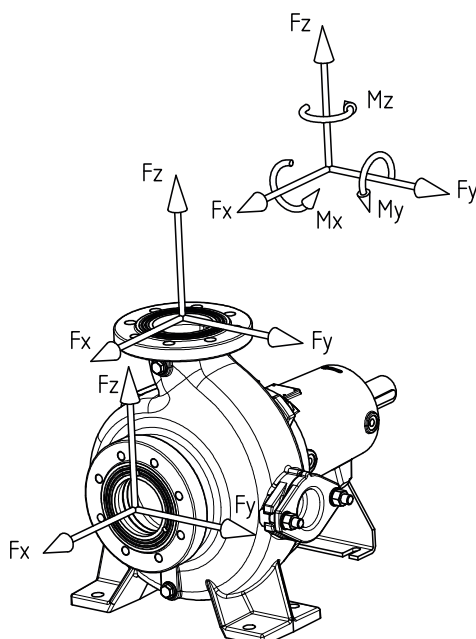


Fig. 9: Forces and moments at the pump nozzles for horizontal installation, bare-shaft pump (Figure O)

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.

The data on forces and moments apply to static piping loads only. If the limits are exceeded, they must be checked and verified.

If a computerized strength analysis is required, please contact KSB.

The values are only applicable if the pump is installed on a completely grouted baseplate and bolted to a rigid and level foundation.

Horizontal installation

Table 12: Forces and moments at the pump nozzles, horizontal installation, bare-shaft pump (Figure O)

Size	Impeller type	Flanges		Forces at suction nozzle				Moments at suction nozzle				Forces at discharge nozzle				Moments at discharge nozzle			
		DN1	DN2	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM
				[lbs]				[ft lbs]				[lbs]				[ft lbs]			
050-215	F	65	50	147	136	170	260	293	293	403	550	113	136	124	203	257	293	367	513
050-216	F	65	50	147	136	170	260	293	293	403	550	113	136	124	203	257	293	367	513
050-250	K	65	50	147	136	170	260	293	293	403	550	113	136	124	203	257	293	367	513
050-251	K	65	50	147	136	170	260	293	293	403	550	113	136	124	203	257	293	367	513
065-215	F	80	65	181	158	203	317	293	330	440	587	136	170	147	260	293	293	403	550
065-216	E	80	65	181	158	203	317	293	330	440	587	136	170	147	260	293	293	403	550
065-217	F	80	65	181	158	203	317	293	330	440	587	136	170	147	260	293	293	403	550
065-250	K	80	65	181	158	203	317	293	330	440	587	136	170	147	260	293	293	403	550
065-252	K	80	65	181	158	203	317	293	330	440	587	136	170	147	260	293	293	403	550
080-215	F	100	80	237	215	271	418	330	367	440	660	158	203	181	317	293	330	440	587
080-216	F	100	80	237	215	271	418	330	367	440	660	158	203	181	317	293	330	440	587
080-216	E	100	80	237	215	271	418	330	367	440	660	158	203	181	317	293	330	440	587
080-217	F	100	80	237	215	271	418	330	367	440	660	158	203	181	317	293	330	440	587
080-250	K	100	80	237	215	271	418	330	367	440	660	158	203	181	317	293	330	440	587
080-252	F	100	80	237	215	271	418	330	367	440	660	158	203	181	317	293	330	440	587
080-253	F	100	80	237	215	271	418	330	367	440	660	158	203	181	317	293	330	440	587
080-253	E	100	80	237	215	271	418	330	367	440	660	158	203	181	317	293	330	440	587
080-315	F	100	80	237	215	271	418	330	367	440	660	158	203	181	317	293	330	440	587

Size	Impeller type	Flanges		Forces at suction nozzle				Moments at suction nozzle				Forces at discharge nozzle				Moments at discharge nozzle			
		DN1	DN2	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM
				[lbs]				[ft lbs]				[lbs]				[ft lbs]			
080-315	K	100	80	237	215	271	418	330	367	440	660	158	203	181	317	293	330	440	587
080-315	D	100	80	237	215	271	418	330	367	440	660	158	203	181	317	293	330	440	587
080-316	D	125	80	283	249	317	486	403	477	550	770	158	203	181	317	293	330	440	587
080-317	F	100	80	237	215	271	418	330	367	440	660	158	203	181	317	293	330	440	587
080-317	D	100	80	237	215	271	418	330	367	440	660	158	203	181	317	293	330	440	587
100-215	F	100	100	237	215	271	418	330	367	440	660	215	271	237	418	330	367	440	660
100-250	E	100	100	237	215	271	418	330	367	440	660	215	271	237	418	330	367	440	660
100-251	F	100	100	237	215	271	418	330	367	440	660	215	271	237	418	330	367	440	660
100-252	F	100	100	237	215	271	418	330	367	440	660	215	271	237	418	330	367	440	660
100-253	F	100	100	237	215	271	418	330	367	440	660	215	271	237	418	330	367	440	660
100-253	E	100	100	237	215	271	418	330	367	440	660	215	271	237	418	330	367	440	660
100-253	K	100	100	237	215	271	418	330	367	440	660	215	271	237	418	330	367	440	660
100-253	D	150	100	362	317	396	622	440	513	660	953	215	271	237	418	330	367	440	660
100-254	F	100	100	237	215	271	418	330	367	440	660	215	271	237	418	330	367	440	660
100-254	K	100	100	237	215	271	418	330	367	440	660	215	271	237	418	330	367	440	660
100-316	F, K	150	100	362	317	396	622	440	513	660	953	215	271	237	418	330	367	440	660
100-316	D	150	100	362	317	396	622	440	513	660	953	215	271	237	418	330	367	440	660
100-317	E	125	100	283	249	317	486	403	477	550	770	215	271	237	418	330	367	440	660
100-400	K	150	100	362	317	396	622	440	513	660	953	215	271	237	418	330	367	440	660
100-401	E	125	100	283	249	317	486	403	477	550	770	215	271	237	418	330	367	440	660
100-401	F	125	100	283	249	317	486	403	477	550	770	215	271	237	418	330	367	440	660
100-401	K	125	100	283	249	317	486	403	477	550	770	215	271	237	418	330	367	440	660
100-403	D	200	100	362	317	396	622	440	513	660	953	215	271	237	418	330	367	440	660
125-315	F	125	125	283	249	317	486	403	477	550	770	249	317	283	486	403	477	550	770
125-315	K	125	125	283	249	317	486	403	477	550	770	249	317	283	486	403	477	550	770
125-317	E	125	125	283	249	317	486	403	477	550	770	249	317	283	486	403	477	550	770
150-253	D	150	150	362	317	396	622	440	513	660	953	317	396	362	622	440	513	660	953
150-315	F	150	150	362	317	396	622	440	513	660	953	317	396	362	622	440	513	660	953
150-315	K	150	150	362	317	396	622	440	513	660	953	317	396	362	622	440	513	660	953
150-315	D	150	150	362	317	396	622	440	513	660	953	317	396	362	622	440	513	660	953
150-317	E	150	150	362	317	396	622	440	513	660	953	317	396	362	622	440	513	660	953
150-317	D	200	150	475	430	531	825	587	697	843	1247	317	396	362	622	440	513	660	953
150-317	K	150	150	362	317	396	622	440	513	660	953	317	396	362	622	440	513	660	953
150-400	K	200	150	475	430	531	825	587	697	843	1247	317	396	362	622	440	513	660	953
150-401	E	150	150	362	317	396	622	440	513	660	953	317	396	362	622	440	513	660	953
150-401	F	150	150	362	317	396	622	440	513	660	953	317	396	362	622	440	513	660	953
150-401	K	150	150	362	317	396	622	440	513	660	953	317	396	362	622	440	513	660	953
150-403	K	200	150	475	430	531	825	587	697	843	1247	317	396	362	622	440	513	660	953
150-403	D	200	150	475	430	531	825	587	697	843	1247	317	396	362	622	440	513	660	953
151-403	K	200	150	475	430	531	825	587	697	843	1247	317	396	362	622	440	513	660	953
200-315	K	200	200	475	430	531	825	587	697	843	1247	430	531	475	825	587	697	843	1247
200-315	D	200	200	475	430	531	825	587	697	843	1247	430	531	475	825	587	697	843	1247
200-316	K	200	200	475	430	531	825	587	697	843	1247	430	531	475	825	587	697	843	1247
200-317	K	200	200	475	430	531	825	587	697	843	1247	430	531	475	825	587	697	843	1247
200-318	K	200	200	475	430	531	825	587	697	843	1247	430	531	475	825	587	697	843	1247
200-330	K	250	200	588	543	667	1029	807	953	1137	1687	430	531	475	825	587	697	843	1247
200-401	E	200	200	475	430	531	825	587	697	843	1247	430	531	475	825	587	697	843	1247
200-401	K	200	200	475	430	531	825	587	697	843	1247	430	531	475	825	587	697	843	1247
200-402	K	200	200	475	430	531	825	587	697	843	1247	430	531	475	825	587	697	843	1247
200-402	D	250	200	588	543	667	1029	807	953	1137	1687	430	531	475	825	587	697	843	1247
200-403	K	200	200	475	430	531	825	587	697	843	1247	430	531	475	825	587	697	843	1247
200-405	D	250	200	588	543	667	1029	807	953	1137	1687	430	531	475	825	587	697	843	1247
250-400	K	250	250	588	543	667	1029	807	953	1137	1687	543	667	588	1029	807	953	1137	1687

Size	Impeller type	Flanges		Forces at suction nozzle				Moments at suction nozzle				Forces at discharge nozzle				Moments at discharge nozzle			
		DN1	DN2	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM
				[lbs]				[ft lbs]				[lbs]				[ft lbs]			
250-401	K	250	250	588	543	667	1029	807	953	1137	1687	543	667	588	1029	807	953	1137	1687
250-402	D	250	250	588	543	667	1029	807	953	1137	1687	543	667	588	1029	807	953	1137	1687
250-403	K	250	250	588	543	667	1029	807	953	1137	1687	543	667	588	1029	807	953	1137	1687
300-400	K	300	300	712	633	791	1243	1100	1283	1540	2273	633	791	712	1243	1100	1283	1540	2273
300-401	K	300	300	712	633	791	1243	1100	1283	1540	2273	633	791	712	1243	1100	1283	1540	2273
300-402	D	300	300	712	633	791	1243	1100	1283	1540	2273	633	791	712	1243	1100	1283	1540	2273

Vertical installation



NOTE

For installation on the suction elbow the DN1 values shall be tripled for DNO.

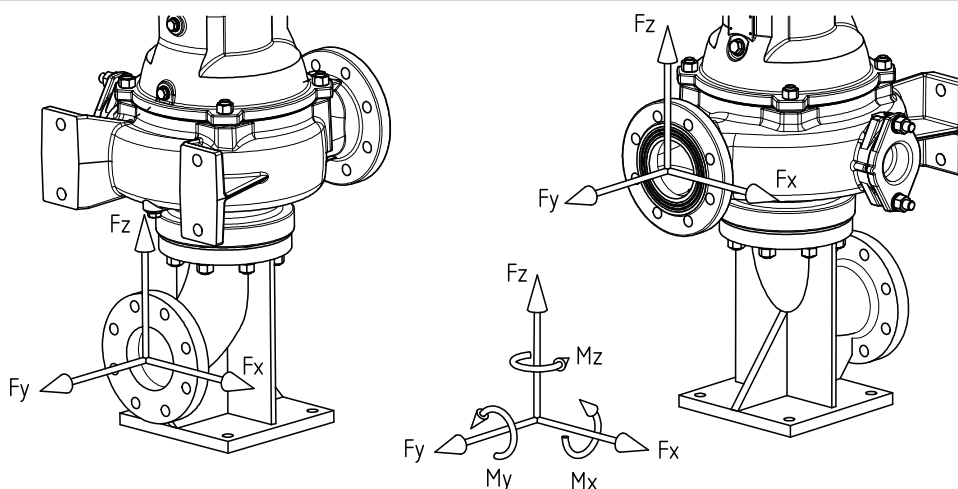


Fig. 10: Forces and moments at the pump nozzles, vertical installation, with suction elbow

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.

The data on forces and moments apply to static piping loads only. If the limits are exceeded, they must be checked and verified.

If a computerized strength analysis is required, please contact KSB.

The values are only applicable if the pump is installed on a completely grouted baseplate and bolted to a rigid and level foundation.

Table 13: Forces and moments at the pump nozzles, vertical installation, with suction elbow

Sizes	Impeller type	Flanges		Forces at suction nozzle				Moments at suction nozzle				Forces at discharge nozzle				Moments at discharge nozzle			
		DN1	DN2	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM
				[lbs]				[ft lbs]				[lbs]				[ft lbs]			
50-215	F	65	50	384	475	418	746	807	880	1100	1613	136	113	124	203	257	293	367	513
50-216	F	65	50	384	475	418	746	807	880	1100	1613	136	113	124	203	257	293	367	513
50-250	K	65	50	384	475	418	746	807	880	1100	1613	136	113	124	203	257	293	367	513
50-251	K	65	50	384	475	418	746	807	880	1100	1613	136	113	124	203	257	293	367	513
65-215	F	80	65	463	565	509	893	843	953	1173	1723	170	136	147	260	293	293	403	550
65-216	E	80	65	463	565	509	893	843	953	1173	1723	170	136	147	260	293	293	403	550
65-217	F	80	65	463	565	509	893	843	953	1173	1723	170	136	147	260	293	293	403	550
65-250	K	80	65	463	565	509	893	843	953	1173	1723	170	136	147	260	293	293	403	550
65-252	K	80	65	463	565	509	893	843	953	1173	1723	170	136	147	260	293	293	403	550
80-215	F	100	80	610	757	678	1187	917	1063	1283	1907	203	158	181	317	293	330	440	587
80-216	F	100	80	610	757	678	1187	917	1063	1283	1907	203	158	181	317	293	330	440	587
80-216	E	100	80	610	757	678	1187	917	1063	1283	1907	203	158	181	317	293	330	440	587

Sizes	Impeller type	Flanges		Forces at suction nozzle				Moments at suction nozzle				Forces at discharge nozzle				Moments at discharge nozzle			
		DN1	DN2	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM	Fy	Fz	Fx	ΣF	My	Mz	Mx	ΣM
				[lbs]				[ft lbs]				[lbs]				[ft lbs]			
80-217	F	100	80	610	757	678	1187	917	1063	1283	1907	203	158	181	317	293	330	440	587
80-250	K	100	80	610	757	678	1187	917	1063	1283	1907	203	158	181	317	293	330	440	587
80-252	F	100	80	610	757	678	1187	917	1063	1283	1907	203	158	181	317	293	330	440	587
80-253	F	100	80	610	757	678	1187	917	1063	1283	1907	203	158	181	317	293	330	440	587
80-253	E	100	80	610	757	678	1187	917	1063	1283	1907	203	158	181	317	293	330	440	587
80-315	K	100	80	610	757	678	1187	917	1063	1283	1907	203	158	181	317	293	330	440	587
80-315	D	100	80	610	757	678	1187	917	1063	1283	1907	203	158	181	317	293	330	440	587
80-316	D	125	80	723	893	803	1402	1100	1393	1540	2237	203	158	181	317	293	330	440	587
80-317	F	100	80	610	757	678	1187	917	1063	1283	1907	203	158	181	317	293	330	440	587
80-317	D	100	80	610	757	678	1187	917	1063	1283	1907	203	158	181	317	293	330	440	587
100-215	F	100	100	610	757	678	1187	917	1063	1283	1907	271	215	237	418	330	367	440	660
100-251	F	100	100	610	757	678	1187	917	1063	1283	1907	271	215	237	418	330	367	440	660
100-252	F	100	100	610	757	678	1187	917	1063	1283	1907	271	215	237	418	330	367	440	660
100-253	F	100	100	610	757	678	1187	917	1063	1283	1907	271	215	237	418	330	367	440	660
100-253	K	100	100	610	757	678	1187	917	1063	1283	1907	271	215	237	418	330	367	440	660
100-253	D	150	100	916	1130	1017	1775	1283	1503	1833	2677	271	215	237	418	330	367	440	660
100-254	F, K	100	100	916	1130	1017	1775	1283	1503	1833	2677	271	215	237	418	330	367	440	660
100-316	F, K	150	100	916	1130	1017	1775	1283	1503	1833	2677	271	215	237	418	330	367	440	660
100-316	D	150	100	916	1130	1017	1775	1283	1503	1833	2677	271	215	237	418	330	367	440	660
150-253	D	150	150	916	1130	1017	1775	1283	1503	1833	2677	396	317	362	622	440	513	660	953
150-315	F	150	150	916	1130	1017	1775	1283	1503	1833	2677	396	317	362	622	440	513	660	953
150-315	D	150	150	916	1130	1017	1775	1283	1503	1833	2677	396	317	362	622	440	513	660	953
150-317	D	200	150	1221	1515	1356	2363	1687	1943	2383	3520	396	317	362	622	440	513	660	953
150-317	K	150	150	916	1130	1017	1775	1283	1503	1833	2677	396	317	362	622	440	513	660	953
200-315	K	200	200	1221	1515	1356	2363	1687	1943	2383	3520	531	430	475	825	587	697	843	1247
200-315	D	200	200	1221	1515	1356	2363	1687	1943	2383	3520	531	430	475	825	587	697	843	1247
200-316	K	200	200	1221	1515	1356	2363	1687	1943	2383	3520	531	430	475	825	587	697	843	1247
200-317	K	200	200	1221	1515	1356	2363	1687	1943	2383	3520	531	430	475	825	587	697	843	1247
200-318	K	200	200	1221	1515	1356	2363	1687	1943	2383	3520	531	430	475	825	587	697	843	1247

5.4.3 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: 0.98 in. [25 mm].
- The line extends above the highest permissible fluid level in the tank.

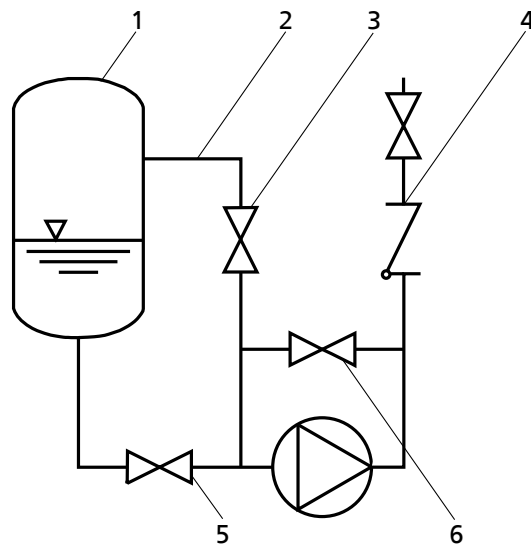


Fig. 11: Vacuum balance line

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.

5.5 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:

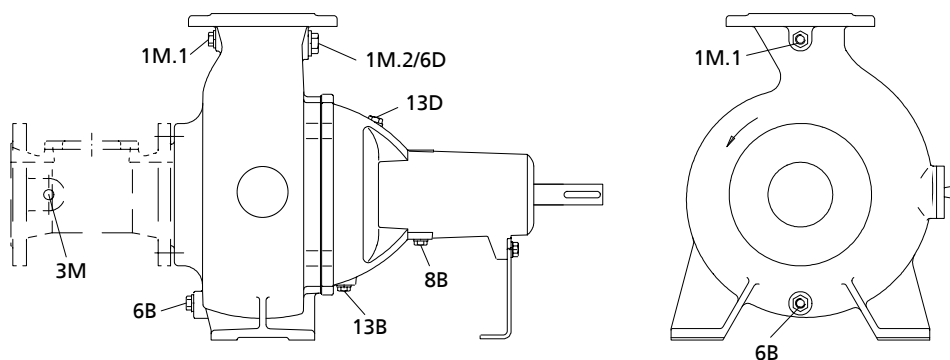


Fig. 12: Auxiliary connections

Table 14: Sizes of auxiliary connections

Connection	Description	Size						
		050-215	065-215	080-215	150-315	100-401	150-400	250-401
		050-216	065-216	080-216	150-317	K 100-400	150-403	250-403
		050-250	065-217	080-217	200-315	D 100-403	200-402	300-400
		050-251	065-250	080-250	200-316		200-403	300-401
			065-252	080-252	200-317		200-405	250-402
			065-253	080-253	200-318			300-402
				080-315				
				080-316				
				080-317				
				100-250				
				100-251				
				100-252				
				100-253				
				100-254				
				100-315				
				100-316				
	100-317							
	150-251							
1M.1	Pressure gage		G 1/2					
1M.2 ⁶⁾	Pressure gage	-				G 1/2		
6D	Vent	G 1/2	G 3/4	G 1			G 1 1/4	
3M	Pressure/vacuum gage	G 1/2						
6B	Casing drain	G 1/2			G 1			
8B	Leakage monitoring	G 3/8						
13D	Lubricant filler opening	G 1/2						
13B	Lubricant drain	G 3/8						

5.6 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.

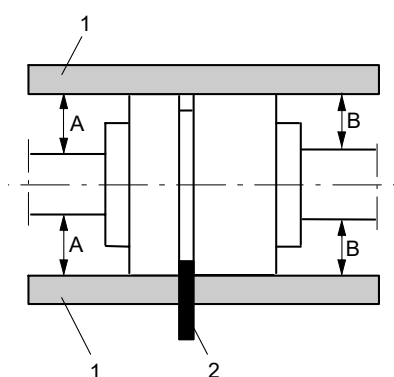


Fig. 13: Non-spacer-type coupling, checking the coupling alignment

1	Straight edge	2	Gage
---	---------------	---	------

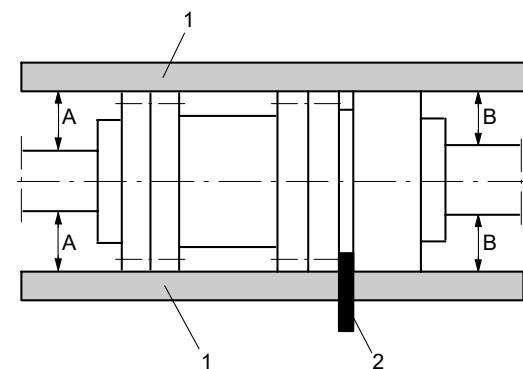


Fig. 14: Spacer-type coupling, checking the coupling alignment

1	Straight edge	2	Gage
---	---------------	---	------

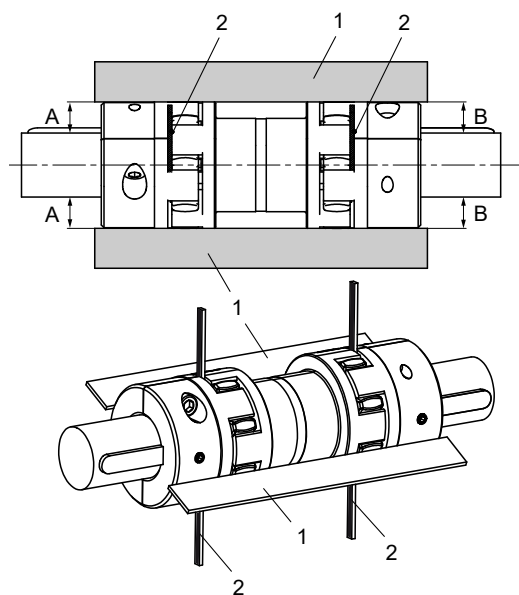


Fig. 15: Double Cardan spacer-type coupling, checking the coupling alignment

1	Straight edge	2	Gage
---	---------------	---	------

Table 15: Permissible alignment offset of coupling halves

Coupling type	Radial offset		Axial offset	
	[inch]	[mm]	[inch]	[mm]
Non-spacer-type coupling (⇒ Fig. 13)	≤ 0.0039	≤ 0,1	≤ 0.0039	≤ 0,1
Spacer-type coupling (⇒ Fig. 14)	≤ 0.0039	≤ 0,1	≤ 0.0039	≤ 0,1
Double Cardan coupling (⇒ Fig. 15)	≤ 0.0197	≤ 0,5	≤ 0.0197	≤ 0,5

- ✓ 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 15) 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 15) 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.

5.7 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).

5.7.1 Aligning the pump set with adjusting screws

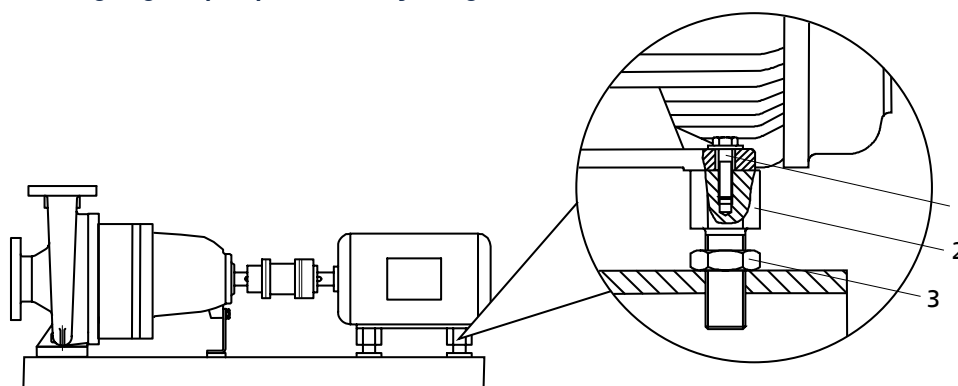


Fig. 16: Aligning the pump set with adjusting screws

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 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.

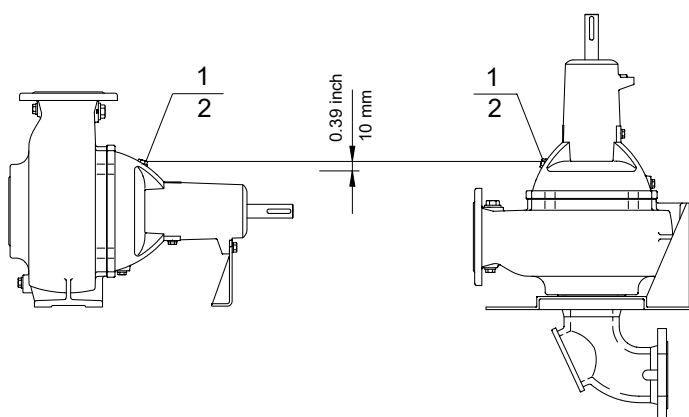


Fig. 17: Checking the lubricant level

- ✓ 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.

5.9 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 .

	⚠ DANGER Incorrect electrical installation Danger of death from electric shock! ▸ For electrical installation also observe the requirements of IEC 60079-14. ▸ Always connect explosion-proof motors via a motor protection switch.
	⚠ WARNING Incorrect connection to the mains Damage to the power supply network, short circuit! ▸ Observe the technical specifications of the local energy supply companies.
	NOTE Installing a motor protection device is recommended.

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

5.10 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.

5.11 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).

5.12 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.

5.13 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.

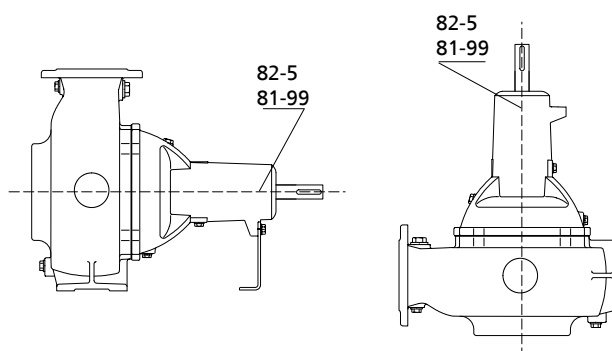


Fig. 18: Position of vibration sensor

82-5	Adapter	81-99	Electrical part
------	---------	-------	-----------------

5.14 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.

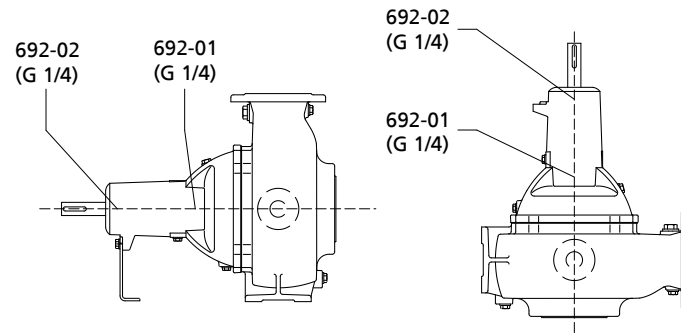


Fig. 19: Positions of resistance thermometers

692-01	Temperature measuring device No. 1	692-02	Temperature measuring device No. 2
--------	------------------------------------	--------	------------------------------------

5.15 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 16: 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

- 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).

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. Explosion hazard! Hot or toxic 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 discharge side gate valve 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 slurp 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.

	WARNING
	Abnormal noises, vibrations, temperatures or leakage Damage to the pump! Risk of personal injury! ▷ Switch off the pump (set) immediately. ▷ Eliminate the causes before returning the pump set to service.

	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.

- ✓ 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.

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.

6.1.3 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.

6.2 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 17: Maximum operating pressure, maximum test pressure

Size	Maximum operating pressure		Maximum test pressure	
	[psi]	[bar]	[psi]	[bar]
050-215	145	10	217	15
050-216	145	10	217	15
050-250	145	10	217	15
050-251	145	10	217	15
065-215	87	6	130	9
065-216	87	6	130	9
065-217	101	7	152	10,5
065-250	87	6	130	9
065-252	87	6	130	9
065-253	87	6	130	9
080-215	87	6	123	8,5
080-216	101	7	152	10,5
080-217	87	6	130	9
080-250	87	6	130	9
080-252	87	6	130	9
080-253	87	6	130	9
080-315	145	10	217	15
080-316	145	10	217	15
080-317	145	10	217	15

Size	Maximum operating pressure		Maximum test pressure	
	[psi]	[bar]	[psi]	[bar]
100-215	87	6	130	9
100-250	87	6	130	9
100-251	87	6	130	9
D 100-251	87	6	130	9
100-252	87	6	130	9
100-253	87	6	130	9
D 100-253	87	6	130	9
100-254	87	6	130	9
100-315	145	10	217	15
100-316	87	6	130	9
D 100-316	145	10	217	15
100-317	101	7	152	10,5
K 100-400	145	10	217	13
100-401	145	10	217	15
100-403	145	10	217	15
150-251	87	6	130	9
150-253	87	6	130	9
150-315	87	6	130	9
150-317	87	6	130	9
150-400	145	10	217	15
150-401	145	10	217	15
150-403	145	10	217	15
200-315	87	6	130	9
200-316	87	6	130	9
200-317	58	4	87	6
200-318	58	4	87	6
200-402	145	10	217	15
200-403	145	10	217	15
200-405	145	10	217	15
250-401	145	10	217	15
250-402	145	10	217	15
250-403	145	10	217	15
300-400	145	10	217	15
300-401	145	10	217	15
300-402	145	10	217	15

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 loads on the pump, motor, seal elements and bearings, the following number of starts per hour shall not be exceeded.

Table 18: Frequency of starts

Motor rating		Maximum number of starts
[hp]	[kW]	[Starts per hour]
≤ 15	≤ 11	25
≤ 50	≤ 37	20

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 52)
 - ✓ The safety instructions for dismantling the pump have been observed.
(⇒ Section 7.4.1, Page 52)
 - ✓ The permissible ambient temperature for storing the pump is observed.
(⇒ Section 3.3, Page 14)
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.

6.4 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 40) and the operating limits.

In addition, carry out all servicing/maintenance operations before returning the pump (set) to service. (⇒ Section 7, Page 46)

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 5.15, Page 39)

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:

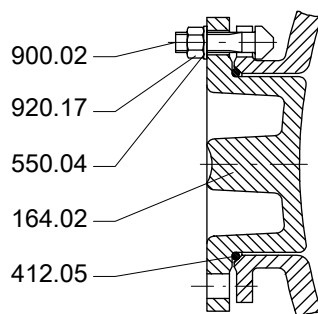


Fig. 20: Inspection hole in the casing

Opening the inspection hole

- Close the shut-off element on the suction side.
- Switch off the drive and make sure it cannot be re-started unintentionally.
- Close the shut-off element on the discharge side.
- Open the drain plug (auxiliary connection 6B). (⇒ Section 5.5, Page 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 40)

7.2.4 Lubrication and lubricant change

	 DANGER Excessive temperatures as a result of bearings running hot or defective bearing seals Explosion hazard! Fire hazard! Damage to the pump set! ▷ Regularly check the rolling element bearings for running noises.
---	---

7.2.4.1 Lubricating the rolling element bearings

The rolling element bearings of the pump sets are grease-packed and maintenance-free.

7.2.4.2 Changing the lubricant of the shaft seal

	 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.

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

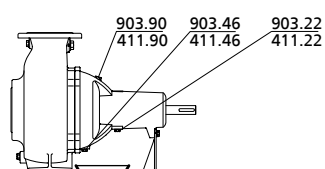


Fig. 21: Draining the lubricant

Draining the lubricant

- ✓ 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.

	CAUTION Contamination of liquid lubricant Damage to the pump set! ▷ Replace the mechanical seal.
--	---

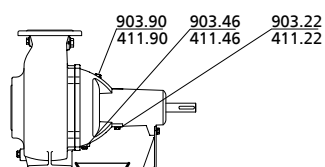


Fig. 22: Filling in the lubricant

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.

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

7.2.4.3 Lubricant quantity

Table 19: Lubricant quantity

Size	Bearing bracket	Lubricant quantity	
		[quart]	[l]
050-215	S01	2,6	2,5
050-216	S01	2,6	2,5
050-250	S01	3,4	3,2
050-251	S02	4,2	4,0
065-215	S01	2,6	2,5

Size	Bearing bracket	Lubricant quantity	
		[quart]	[l]
065-216	S01	2,6	2,5
065-217	S01	2,6	2,5
065-250	S01	3,4	3,2
065-252	S01	3,4	3,2
065-252	S02	4,2	4,0
065-253	S01	3,4	3,2
065-253	S02	4,2	4,0
080-215	S01	2,6	2,5
080-216	S01	2,6	2,5
080-217	S01	2,6	2,5
080-250	S01	3,4	3,2
080-252	S01	3,4	3,2
080-253	S02	4,2	4,0
080-315	S03	6,3	6,0
080-316	S03	6,3	6,0
080-317	S03	6,3	6,0
100-215	S01	2,6	2,5
100-250	S01	3,4	3,2
100-251	S02	4,2	4,0
100-252	S01	3,4	3,2
100-253	S02	4,2	4,0
100-254	S01	3,4	3,2
100-315	S03	6,3	6,0
100-316	S03	6,3	6,0
100-317	S03	6,3	6,0
100-400	S04	8,5	8,0
100-401	S04	8,5	8,0
150-251	S02	4,2	4,0
150-253	S02	4,2	4,0
150-315	S03	6,3	6,0
150-317	S03	6,3	6,0
150-400	S04	8,5	8,0
150-401	S04	8,5	8,0
150-403	S04	8,5	8,0
200-315	S03	6,3	6,0
200-316	S03	6,3	6,0
200-317	S03	6,3	6,0
200-318	S03	6,3	6,0
200-402	S04	8,5	8,0
200-403	S04	8,5	8,0
250-401	S04	8,5	8,0
250-403	S04	8,5	8,0
300-400	S04	8,5	8,0
300-401	S04	8,5	8,0

7.2.4.4 Lubricant quality

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

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 be neutralized, and anhydrous inert gas must be blown through the pump to ensure drying.

Use connection 6B to drain the fluid handled (see auxiliary connections).

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. (⇒ Section 7.3, Page 52) ▷ 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. (⇒ Section 7.3, Page 52) ▷ 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. (⇒ Section 7.3, Page 52) ▷ 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.

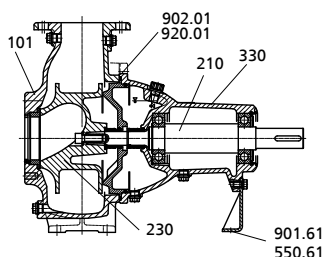


Fig. 23: Removing the back pull-out unit

7.4.4 Removing the back pull-out unit

- ✓ The lubricant chamber 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 and secure it against tipping over or rolling off.

7.4.5 Removing the impeller

7.4.5.1 Removing an impeller with tapered interference fit

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.

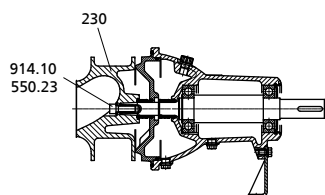


Fig. 24: Removing the impeller

	NOTE The forcing screw is not included in the scope of supply. The forcing screw can be ordered separately from KSB.
---	--

Table 20: Forcing screws for pulling off the impeller

Size	Impeller type	Forcing screw (ADS)	
		Thread	Code
050-215	F	M 10	ADS 0
050-216	F	M 10	ADS 0
050-250	F, K	M 16	ADS 1
050-251	F, K	M 20	ADS 2
065-215	F	M 10	ADS 6
065-216	E	M 12	ADS 7
065-217	F	M 10	ADS 6
065-250	F, K	M 16	ADS 1
065-253	F	M 20	ADS 2
080-215	F	M 10	ADS 6
080-216	F	M 10	ADS 6
080-216	E	M 12	ADS 7
080-217	F	M 10	ADS 6
080-250	F, K	M 16	ADS 1
080-252	F	M 16	ADS 1
080-253	F, E	M 20	ADS 2
080-315	K	M 20	ADS 2
080-315	D	M 20	ADS 4
080-316	D	M 20	ADS 4
080-317	F	M 20	ADS 2
080-317	D	M 20	ADS 4
100-215	F	M 10	ADS 6
100-250	E	M 16	ADS 1
100-251	F	M 20	ADS 2
100-251	D	M 16	ADS 3
100-252	F	M 16	ADS 1
100-253	E, F, K	M 20	ADS 2
100-253	D	M 16	ADS 3
100-254	F, K	M 16	ADS 1
100-315	D	M 20	ADS 4
100-316	F, K	M 20	ADS 2
100-316	D	M 20	ADS 4
100-317	E	M 20	ADS 2
100-400	K	M 20	ADS 5
100-401	E, F, K	M 20	ADS 5
100-403	D	M 24	ADS 5
150-251	D	M 16	ADS 3
150-253	D	M 16	ADS 3
150-315	F	M 20	ADS 2
150-315	D	M 20	ADS 4
150-317	E, K	M 20	ADS 2
150-317	D	M 20	ADS 4
150-400	D	M 24	ADS 5
150-400	K	M 20	ADS 5
150-401	D	M 24	ADS 5
150-401	E, F	M 20	ADS 5

Size	Impeller type	Forcing screw (ADS)	
		Thread	Code
150-403	K	M 24	ADS 5
150-403	D	M 24	ADS 5
151-403	K	M 24	ADS 5
200-315	K	M 20	ADS 2
200-315	D	M 20	ADS 4
200-316	K	M 20	ADS 2
200-317	K	M 20	ADS 2
200-318	K	M 20	ADS 2
200-400	D	M 24	ADS 5
200-402	K	M 20	ADS 5
200-402	D	M 24	ADS 5
200-403	K	M 20	ADS 5
200-405	D	M 24	ADS 5
250-400	D	M 24	ADS 5
250-401	K	M 20	ADS 5
250-402	D	M 24	ADS 5
250-403	K	M 20	ADS 5
300-400	D	M 24	ADS 5
300-400	K	M 20	ADS 5
300-401	K	M 20	ADS 5
300-402	D	M 24	ADS 5

7.4.6 Removing the mechanical seals

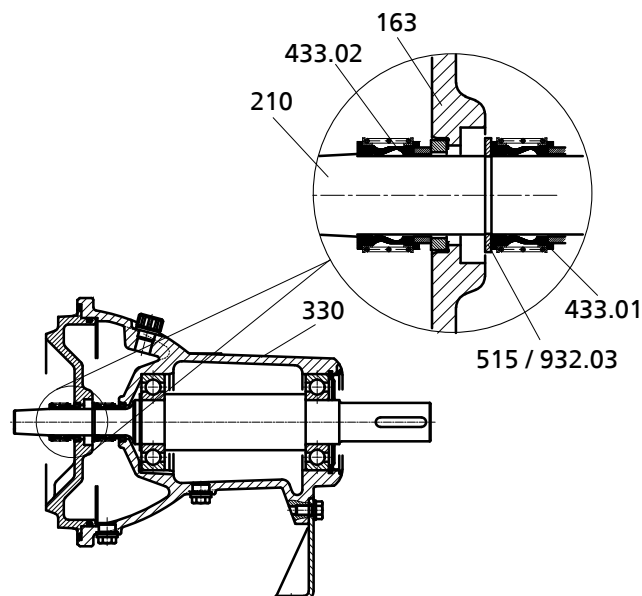


Fig. 25: Removing the mechanical seals

7.4.6.1 Removing the pump-end mechanical seal

- ✓ The back pull-out unit and the impeller have been removed as described above.
 1. Pull the rotating assembly of mechanical seal 433.01 off shaft 210.
 2. Remove discharge cover 163 from bearing bracket 330.
 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

- ✓ The back pull-out unit and the impeller have been removed as described above.
 1. Remove locking ring 515 or circlip 932.03.
 2. Pull the rotating assembly of mechanical seal 433.01 off shaft 210.

7.4.6.3 Removing the C022/025/11-4STQ double cartridge seal

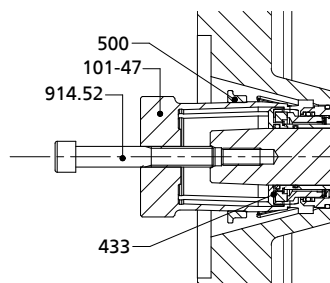


Fig. 26: Removing the C022/025/11-4STQ double cartridge seal

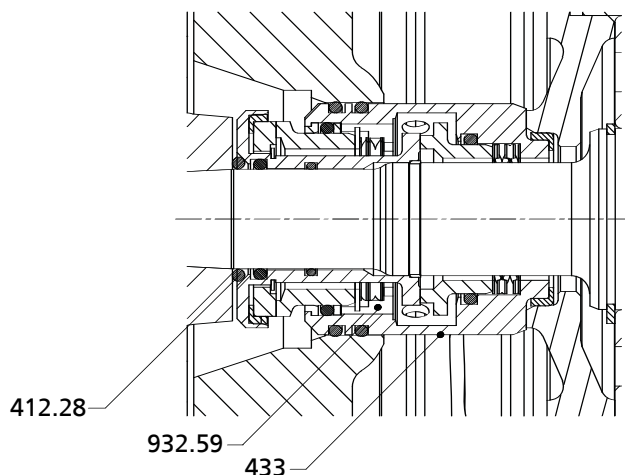


Fig. 27: Removing the mechanical seal

- ✓ The back pull-out unit and the impeller have been removed as described above.
 1. Fix discharge cover 163 to bearing bracket 330 using suitable bolts/screws and washers.
 2. Remove O-ring 412.28 from the shaft.
 3. Slide puller 101-47 over the shoulder of mechanical seal 433 and lock it with ring 500.
 4. Press forcing screw 914.52 against shaft 210 and pull mechanical seal 433 out of discharge cover 163.

7.4.6.4 Removing the C033/055M1-4STQ 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 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. Use the radial groove in shaft sleeve 523 to remove the mechanical seal cartridge. Remove evenly, using a suitable extraction tool.
 3. Carefully pull the complete cartridge seal off the shaft.
 4. 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 Removing the shaft and rolling element bearings

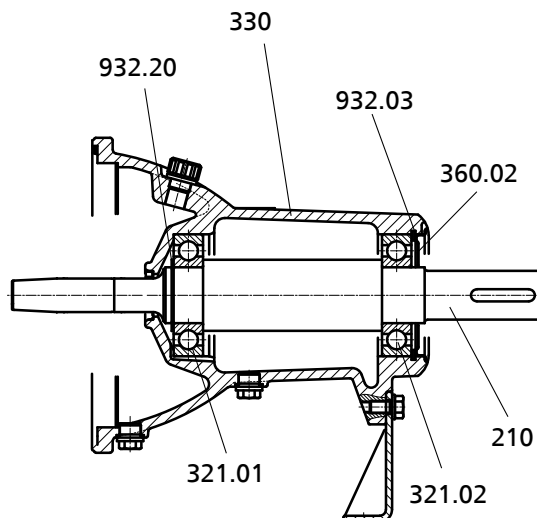


Fig. 28: Removing the shaft and rolling element bearings

- ✓ The back pull-out unit, impeller and mechanical seal have been removed as described.
- 1. Remove cover 360.02 and circlip 932.02.
- 2. Push shaft 210 with deep groove ball bearings 321.01/02 out of the bearing bracket towards the drive end.
- 3. Remove circlip 932.20.
- 4. Pull deep groove ball bearings 321.01/02 off the shaft.
- 5. Remove the stationary seat of drive-end mechanical seal 433.01 from bearing bracket 330.
- 6. Clean all components and inspect them for signs of wear.



CAUTION

Re-installing damaged components

Damage to the machine!

- ▷ Re-work damaged components or replace by new ones.

7.4.8 Removing the wear plate (for D impeller only)

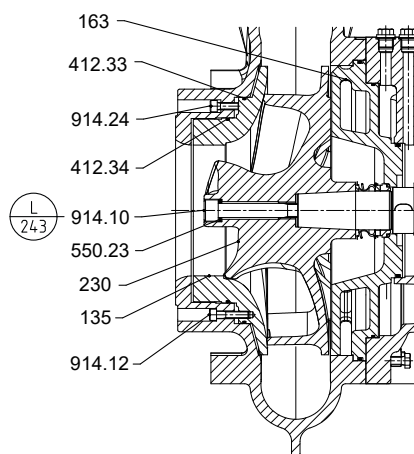


Fig. 29: Removing the wear plate

- ✓ 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. (Also see general assembly drawing and data sheet.)

Bearings Only use specified bearings to DIN 625 (part Nos. 320.01/.02).

Table 21: Bearing assembly

Bearing bracket size	Grease-packed deep groove ball bearings, sealed for life
S01	6307 - 2 Z - C3
S02	6311 - 2 Z - C3
S03	6314 - 2 Z - C3
S04	6314 - 2 Z - C3

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

7.5.2 Re-installing shaft and rolling element bearings

When re-installing the shaft, replace deep groove ball bearings 321.01/02 if required.
(⇒ Section 7.5.1, Page 59)

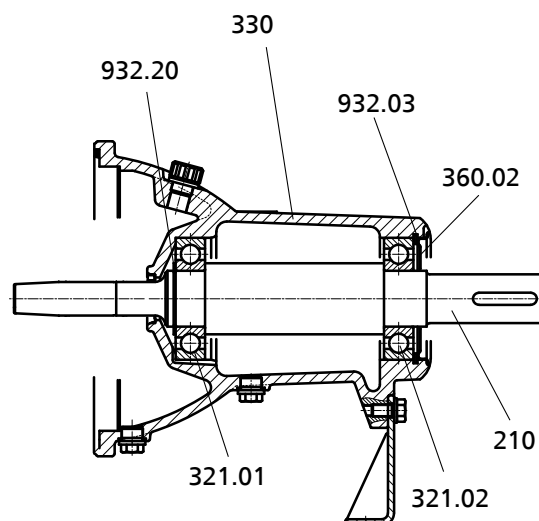


Fig. 30: Re-installing shaft and rolling element bearings

1. Slide deep groove ball bearings 321.01/02 onto shaft 210 until they abut against the shaft shoulder.
2. Insert circlip 932.20 into shaft 210.
3. Insert pre-assembled shaft 210 into bearing bracket 330 from the drive end.
4. Press cover 360.02 into the bearing bracket.

7.5.3 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 contact 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 oil.
- For easier installation of bellows-type mechanical seals, wet the inside diameter of the bellows with soapy water (not oil).
- 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. Slip the rotating assembly over the foil into its installation position. Then remove the foil.

7.5.3.1 Installing the bellows-type mechanical seal

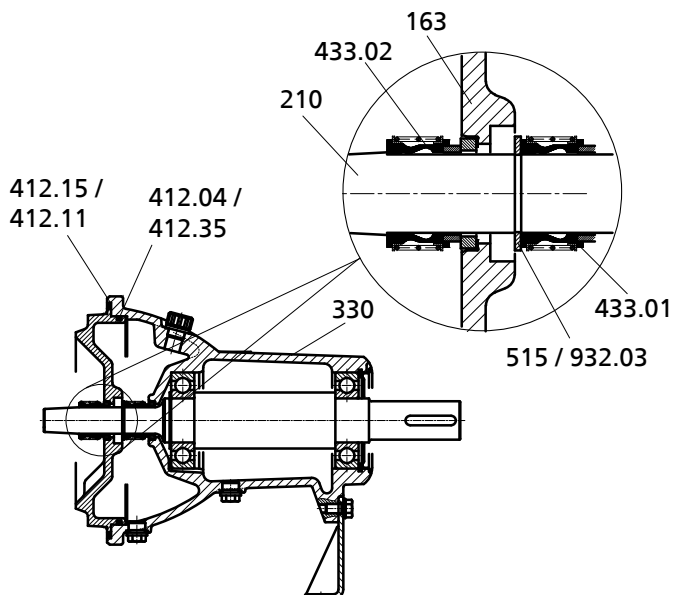


Fig. 31: Installing the mechanical seals

✓ 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 and secure it with locking ring 515 or circlip 932.03.
2. Insert O-rings 412.04/412.35 and 412.15/412.11 into discharge cover 163, and press them into bearing bracket 330 as far as they will go.
3. Slide pump-end 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".

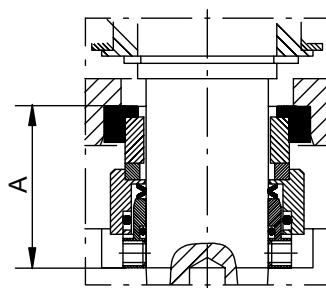


Fig. 32: Installation dimension "A"

Table 22: Installation dimension "A"

Size	Impeller type	Installation dimension "A"	
		[inch]	[mm]
050-215	F	1 ¹ / ₈	29,0
050-216	F	1 ¹ / ₈	29,0
050-250	F, K	1 ¹ / ₈	29,0
050-251	F, K	1 ³ / ₁₆	38,5
065-215	F	1 ¹ / ₈	29,0
065-216	E	1 ³ / ₁₆	38,5
065-217	F	1 ¹ / ₈	29,0
065-250	F, K	1 ¹ / ₈	29,0
065-253	F	1 ³ / ₁₆	38,5
080-215	F	1 ¹ / ₈	29,0

Size	Impeller type	Installation dimension "A"	
		[inch]	[mm]
080-216	F	1 1/8	29,0
080-216	E	1 3/16	38,5
080-217	F	1 1/8	29,0
080-250	F, K	1 1/8	29,0
080-252	F	1 1/8	29,0
080-253	E, F	1 3/16	38,5
080-315	K	1 3/16	38,5
080-315	D	1 3/16	38,5
080-316	D	1 3/16	38,5
080-317	D, F	1 3/16	38,5
100-215	F	1 1/8	29,0
100-250	E	1 1/8	29,0
100-251	F	1 3/16	38,5
100-251	D	1 3/16	38,5
100-252	F	1 1/8	29,0
100-253	D, E, F, K	1 3/16	38,5
100-254	F, K	1 1/8	29,0
100-315	D	1 3/16	38,5
100-316	F, K, D	1 3/16	38,5
100-317	E	1 3/16	38,5
100-400	K	1 7/8	48,3
100-401	K	1 7/8	48,3
100-403	D	1 7/8	48,3
150-251	D	1 3/16	38,5
150-253	D	1 3/16	38,5
150-315	F, D	1 3/16	38,5
150-317	E, D, K	1 3/16	38,5
150-400	K	1 7/8	48,3
150-401	F, E	1 7/8	48,3
150-403	D, K	1 7/8	48,3
200-315	D, K	1 3/16	38,5
200-316	K	1 3/16	38,5
200-317	K	1 3/16	38,5
200-318	K	1 3/16	38,5
200-402	D, K	1 7/8	48,3
200-403	K	1 7/8	48,3
200-405	D	1 7/8	48,3
250-401	K	1 7/8	48,3
250-402	D	1 7/8	48,3
250-403	K	1 7/8	48,3
300-400	K	1 7/8	48,3
300-401	K	1 7/8	48,3
300-402	D	1 7/8	48,3

2580.8151/07-EN-US

7.5.3.2 Installing the C022/025M1-4STQ double cartridge seal

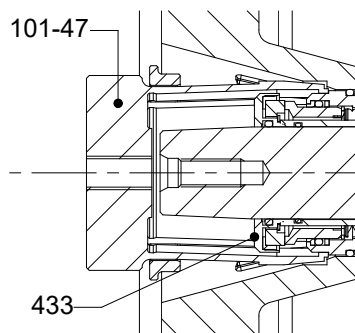


Fig. 33: Installing the KSB double cartridge seal

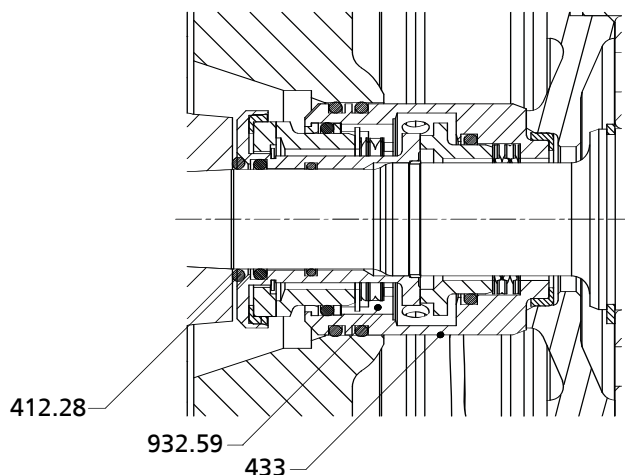


Fig. 34: Installing the mechanical seal

- ✓ The installation of the mechanical seal is carried out in accordance with the installation drawing.
 - ✓ The back pull-out unit of the pump has been placed in a clean and level assembly area.
 - ✓ The KSB 4STQ double cartridge seal is fully assembled and undamaged.
1. Insert circlip 932.59 in the shaft groove and make sure that circlip 932.59 is positioned correctly in the shaft groove. When fitting the circlip take care to prevent damage to the shaft.

	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.
	CAUTION Improper installation of the mechanical seal Damage to the seal faces! ▷ Install the mechanical seal using the supplied mounting device 101-47. ▷ Prevent sudden forces acting on the mounting device and mechanical seal.

2. Prior to assembly, wet the external elastomers (O-rings and joint ring) and the seats of the mechanical seal at the shaft, discharge cover 163 and seal housing with a suitable lubricant (e.g. soap suds).
3. Press mechanical seal 433 into discharge cover 163 by hand as far as possible.
4. Fit mechanical seal 433 using mounting device 101-47. Check the mechanical seal position against reference dimensions "K" (see table: Reference dimension "K") and adjust the installation position if required.
5. Slide O-ring 412.28 onto the shaft until it abuts against the mechanical seal.

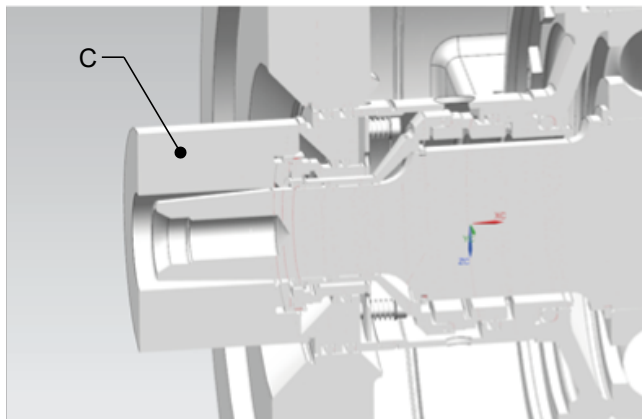


Fig. 35: Mounting device 101-47

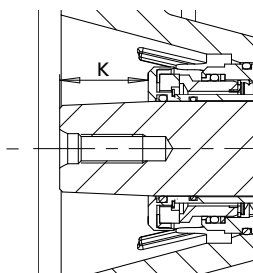


Fig. 36: Reference dimension "K" from shaft end to KSB double cartridge seal

Table 23: Reference dimension "K"

Size	Reference dimension "K"	
	[inch]	[mm]
50-215/216 65-215/217 80-215/217, F 80-216 100-215	$1\frac{5}{16} \pm 0,02$	25+/- 0,5
65-216 E 80-216	$1\frac{5}{16} \pm 0,02$	33+/- 0,5
50-250 65-250/252 80-250/252 100-250/252/254	$1\frac{9}{16} \pm 0,02$	39+/- 0,5
50-251 65-253 80-253/315/316/317 100-251/253/315/316/317 150-315/317 200-315/316/317/318	$1\frac{11}{16} \pm 0,02$	43+/- 0,5

2580.8151/07-EN-US

7.5.3.3 Installing the C033/055M1-4STQ double cartridge seal

	WARNING Components with sharp edges Risk of cutting or shearing injuries! ▷ Always use appropriate caution for installation and dismantling work. ▷ Wear work gloves.
	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.
	CAUTION Improper installation of the mechanical seal Damage to the seal faces! ▷ Install the mechanical seal using the supplied mounting device C. ▷ Prevent sudden forces acting on the mounting device and mechanical seal.

- ✓ 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 mechanical seal is fully assembled and undamaged.
 - ✓ Mounting device C is available.
1. Fit the circlip in the shaft groove.

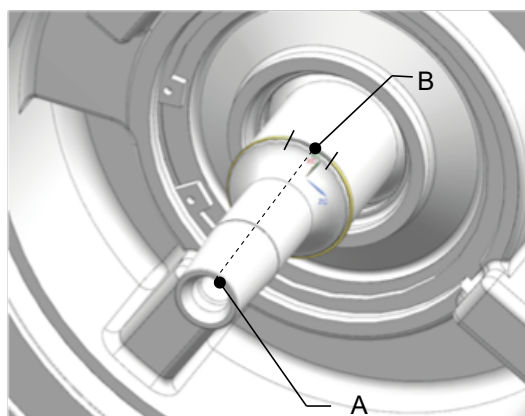


Fig. 37: Marking the shaft end

2. Mark the front face of shaft end A. To do so extend the central position of ring opening B in the axial direction.

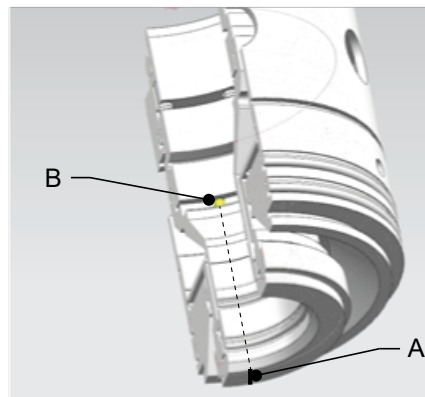


Fig. 38: Marking the mechanical seal

3. Mark the front face of mechanical seal A. To do so extend the central position of the anti-rotation pin B in the axial direction.
4. Fit the external O-rings and wet them with a suitable lubricant (e.g. soap solution).

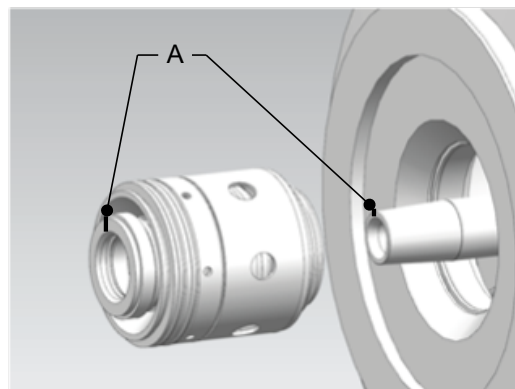


Fig. 39: Aligning the markings

5. Place the mechanical seal on the shaft. Guide it as far into the discharge cover as possible. Verify that the markings A are aligned with each other.

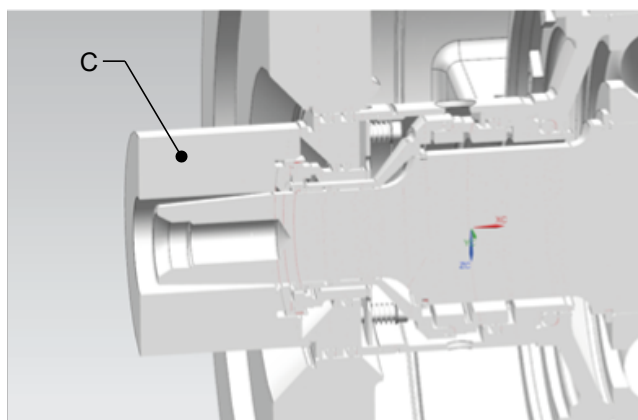


Fig. 40: Mounting device C

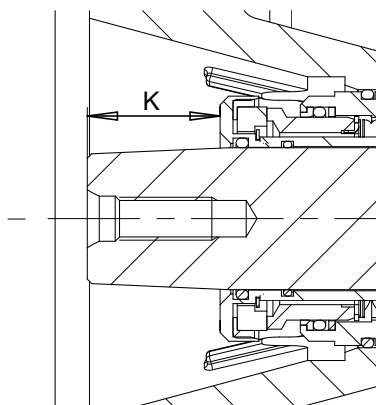


Fig. 41: Reference dimension "K" from shaft end to mechanical seal

6. Position mounting device C on the front face of the mechanical seal. Fit the mechanical seal. Verify the position of the mechanical seal with reference dimension "K" = 43 +/- 0.5 mm; adjust the position if necessary.

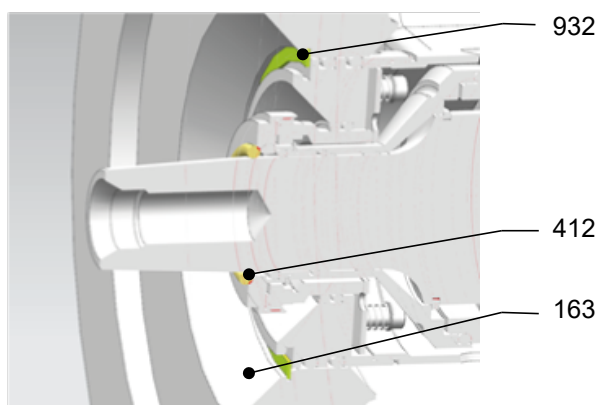


Fig. 42: Final assembly

7. Fit circlip 932 in the groove of discharge cover 163. Make sure it is correctly seated.
8. Slide O-ring 412 over the shaft until it abuts against the mechanical seal.

7.5.4 Fitting the impeller

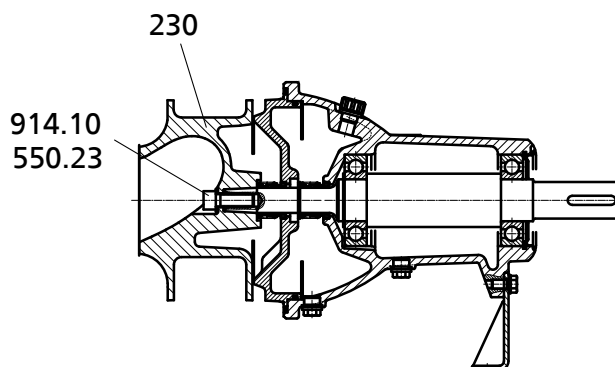


Fig. 43: Fitting the impeller

- ✓ The shaft and rolling element bearings have been properly installed.
 - ✓ The mechanical seals have been properly installed.
1. Slide impeller 230 onto the shaft end.

2. Screw in impeller screw 914.10 and disc 550.23. Tighten them with a torque wrench.



NOTE

On shafts without a Helicoil thread insert secure the impeller screw with Loctite 243.

Table 24: Tightening torque for impeller screw

Size	Impeller type	Thread	Tightening torque	
			[ft lbs]	[Nm]
050-215	F	M 8	19,17	26
050-216	F	M 8	19,17	26
050-250	F, K	M 10	25,82	35
050-251	F, K	M 16	110,64	150
065-215	F	M 8	19,17	26
065-216	E	M 10	25,82	35
065-217	F	M 8	19,17	26
065-250	F, K	M 10	25,82	35
065-253	F	M 16	110,64	150
080-215	F	M 8	19,17	26
080-216	F	M 8	19,17	26
080-216	E	M 10	25,82	35
080-217	F	M 8	19,17	26
080-250	F, K	M 10	25,82	35
080-252	F	M 10	25,82	35
080-253	E, F	M 16	110,64	150
080-315	D, K	M 16	110,64	150
080-316	D	M 16	110,64	150
080-317	D, F	M 16	110,64	150
100-215	F	M 8	19,17	26
100-250	E	M 10	25,82	35
100-251	F	M 16	110,64	150
100-251	D	M 10	25,82	35
100-252	F	M 10	25,82	35
100-253	F, E, D, K	M 10	25,82	35
100-254	F, K	M 10	25,82	35
100-315	D	M 16	110,64	150
100-316	F, D, K	M 16	110,64	150
100-317	E	M 16	110,64	150
100-317	E	M 16	110,64	150
100-400	K	M 20	213,90	290
100-401	K	M 20	213,90	290
100-403	D	M 20	213,90	290
150-251	D	M 16	110,64	150
150-253	D	M 16	110,64	150
150-315	F	M 16	110,64	150
150-317	E, D, K	M 16	110,64	150
150-400	K	M 20	213,90	290
150-401	F, E, K	M 20	213,90	290
150-403	K	M 20	213,90	290
200-315	D, K	M 16	110,64	150

2580.8151/07-EN-US

Size	Impeller type	Thread	Tightening torque	
			[ft lbs]	[Nm]
200-316	K	M 16	110,64	150
200-317	K	M 16	110,64	150
200-318	K	M 16	110,64	150
200-402	K	M 20	213,90	290
200-403	K	M 20	213,90	290
200-405	D	M 20	213,90	290
250-401	K	M 20	213,90	290
250-402	D	M 20	213,90	290
250-403	K	M 20	213,90	290
300-400	K	M 20	213,90	290
300-401	K	M 20	213,90	290
300-402	D	M 20	213,90	290

Please note:

Make sure that the tapered fit of impeller and shaft is undamaged and assembled free from grease.

For pump size Sewatec D 150-251 screwed coupling 852 must be screwed into the shaft first.

7.5.5 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 adjustable casing wear ring (for sizes K 100-253, K 100-254, K 100-316)

- ✓ The shaft, rolling element bearings, mechanical seal and impeller have been assembled properly.

1. Insert casing wear ring 502 into pump casing 101.
2. Glue 3 pieces of cardboard⁹⁾ of approximately 0.079 in. (2 mm) in thickness and 0.59 in. (15 mm) in length to the front face of the impeller.
 - ⇒ In assembled condition, this will result in a clearance of 0.012 in. (0.3 mm) between impeller and casing wear ring.
3. Insert the complete back pull-out unit into the pump casing.
4. Screw in grub screws 904.01, adjust the position of the casing wear ring.
5. Secure grub screws 904.01 with Loctite.
6. Evenly tighten screwed connection 920.01 between pump casing and bearing bracket.

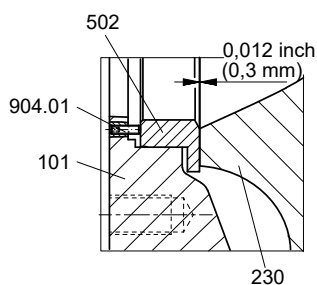


Fig. 44: Fitting the casing wear ring

	NOTE
	Only adjust the clearances for bearing bracket versions S01, S02 and S03. Bearing bracket S04 has a diametral clearance.

Version with wear plate (for D impellers only)

- ✓ The shaft, rolling element bearings, mechanical seal and impeller have been assembled properly.

⁹ Use cardboard which easily dissolves in water.

- ✓ The pump casing is not connected to the piping.

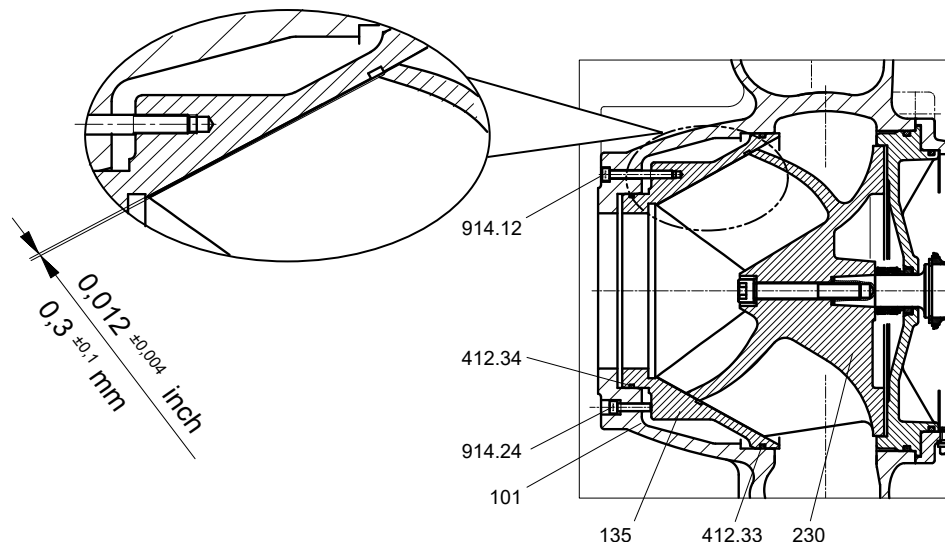


Fig. 45: Fitting the wear plate

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.

7.5.6 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).
(⇒ Section 5.5, Page 31)
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.

7.5.7 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. (⇒ Section 5.7, Page 34)
4. Connect the motor to the power supply (refer to manufacturer's product literature).

7.6 Tightening torques

Table 25: Tightening torques

Thread	316 SS/duplex	A4-70/1.4462
	[ft lbs]	[Nm]
M6	5,16	7
M8	12,54	17
M10	25,82	35
M12	44,25	60
M16	110,64	150
M20	213,90	290
M24	205,05 / 368,8	278 / 500
M27	301,67 / 542,8	409 / 736
M30	408,62 / 737,6	554 / 1000

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
- 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 26: 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 %	-	-	X
163	Discharge cover	1	2	2	2	3	3	4	50 %	X	-	-
210	Shaft	1	1	1	2	2	2	3	30 %	X	-	-
230	Impeller	1	1	1	2	2	2	3	30 %	-	X	-
321.01/02	Rolling element bearing (set)	1	1	1	2	2	3	4	50 %	-	-	X
330	Bearing bracket, complete	-	-	-	-	-	-	1	2 pcs.	X	-	-
433.01/02	Mechanical seal, complete (set)	1	2	3	4	4	4	6	90 %	-	-	X
502.01	Casing wear ring	1	2	2	2	3	3	4	50 %	-	-	X
503	Impeller wear ring	1	2	2	2	3	3	4	50 %	-	-	X
	Assembly for gland packing consisting of: ▪ Neck bush ▪ Shaft protecting sleeve ▪ Lantern ring	1	1	1	2	2	2	3	40 %	-	X	-
	Packing cord (4 rings)	4	4	6	8	8	9	12	100 %	-	-	X
	Sealing elements (set)	2	4	6	8	8	9	12	150 %	-	-	X

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 27: 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 drawing: Sewatec with bearing brackets S01, S02, S03, S04

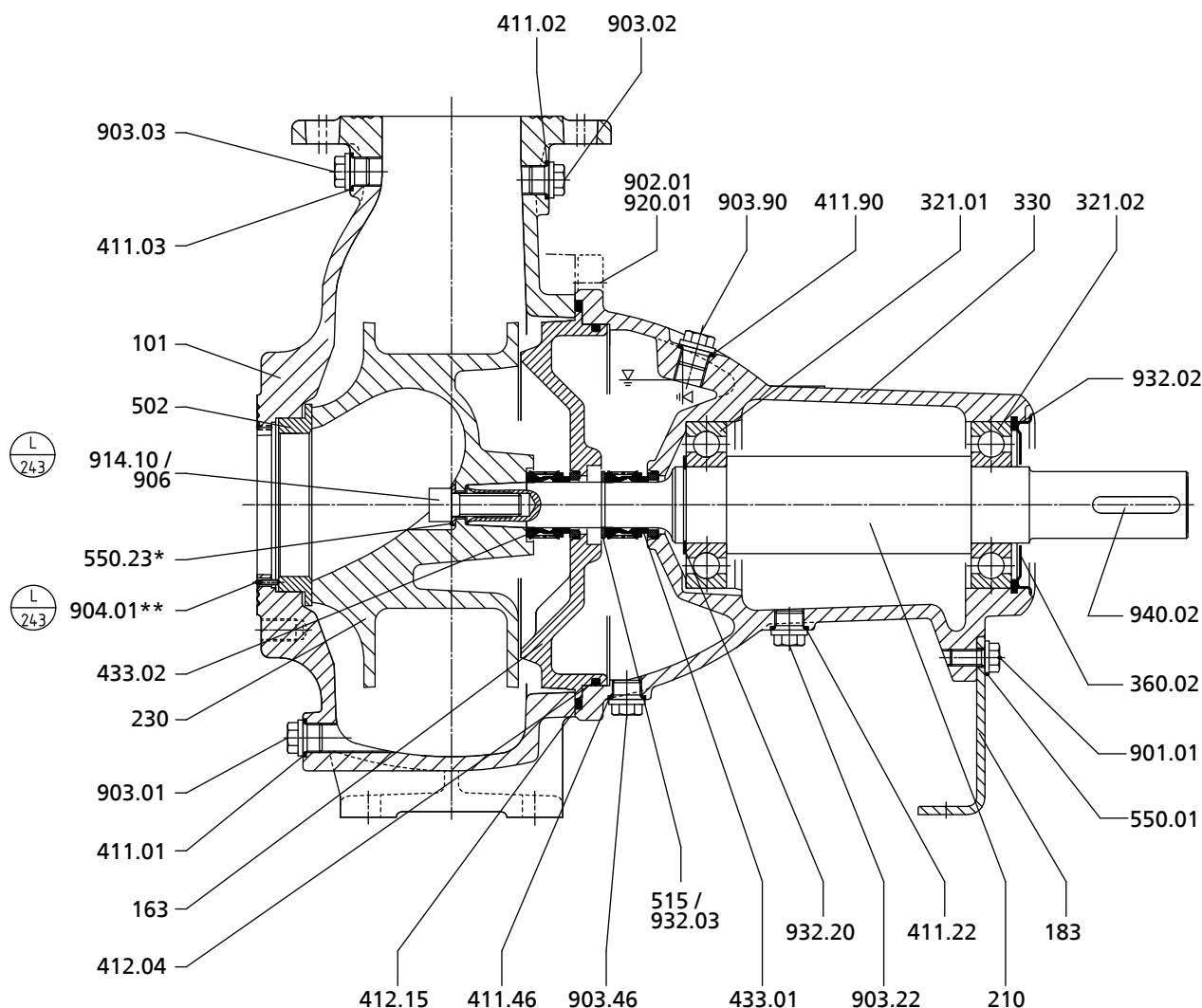


Fig. 46: General assembly drawing of Sewatec - with bearing brackets S01, S02, S03, S04, impeller type E; * if any, ** only for sizes E 100-250, E 100-253, E 100-317, E 150-317, K 100-253, K 100-254, K 100-316

Table 28: List of components

Part number	Description	Part number	Description
101	Pump casing	502	Casing wear ring
135	Wear plate	515	Locking ring
163	Discharge cover	550.01/.04/.23	Disc
164.02	Inspection cover	900.02	Bolt/screw
183	Support foot	901.01	Hexagon head bolt
210	Shaft	902.01	Stud
230	Impeller	903.01/.02/.03/.22/.46/.90	Screw plug
321.01/.02	Radial ball bearing	904.01	Grub screw
330	Bearing bracket	906	Impeller screw
360.02	Bearing cover	914.10/.12/.24	Hexagon socket head cap screw
411.01/.02/.03/.22/.46/.90	Joint ring	920.01/.17	Nut

Part number	Description	Part number	Description
412.04/.05/.15/.34	O-ring	932.02/.03/.20	Circlip
433.01/.02	Mechanical seal		

9.2 Detailed views

9.2.1 Impeller types

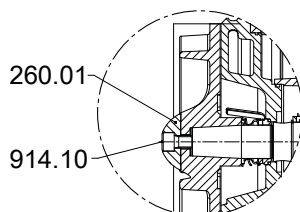


Fig. 47: F impeller

Table 29: List of components

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

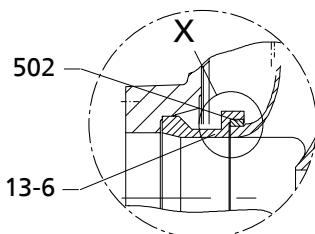


Fig. 48: K impeller

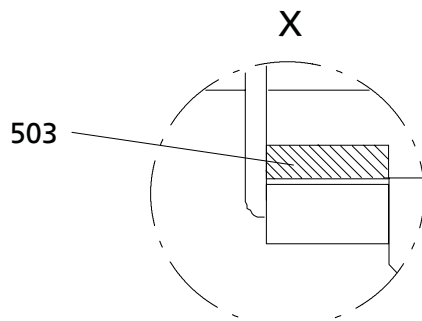


Fig. 49: Detail X: impeller wear ring for K impeller

Table 30: 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

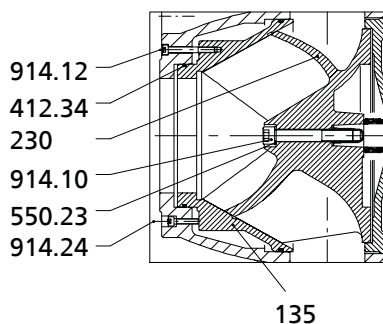


Fig. 50: D impeller (single-vane impeller)

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

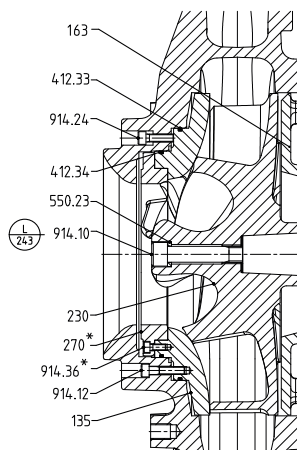


Fig. 51: D impeller (multi-vane impeller)

*: On specific designs only

Table 32: 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		

9.2.2 Inspection hole, bearing brackets S01 to S04

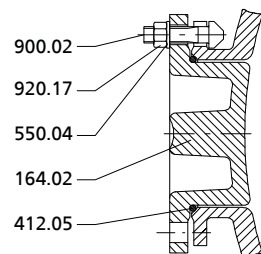


Fig. 52: Inspection hole, bearing brackets S01 to S04

Table 33: 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		

9.3 Sectional drawings of the mechanical seal

9.3.1 Drive-end mechanical seal

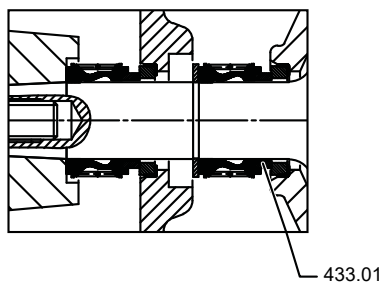


Fig. 53: Drive-end mechanical seal

Table 34: List of components

Part No.	Description
433.01	Mechanical seal

9.3.2 Pump-end mechanical seal

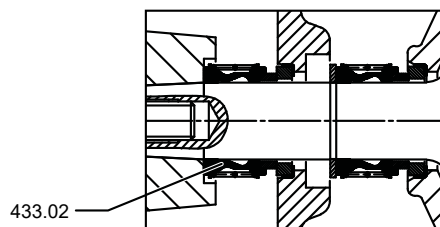


Fig. 54: Pump-end mechanical seal

Table 35: List of components

Part No.	Description
433.02	Mechanical seal

9.3.3 Cartridge seal C022/025M1-4STQ

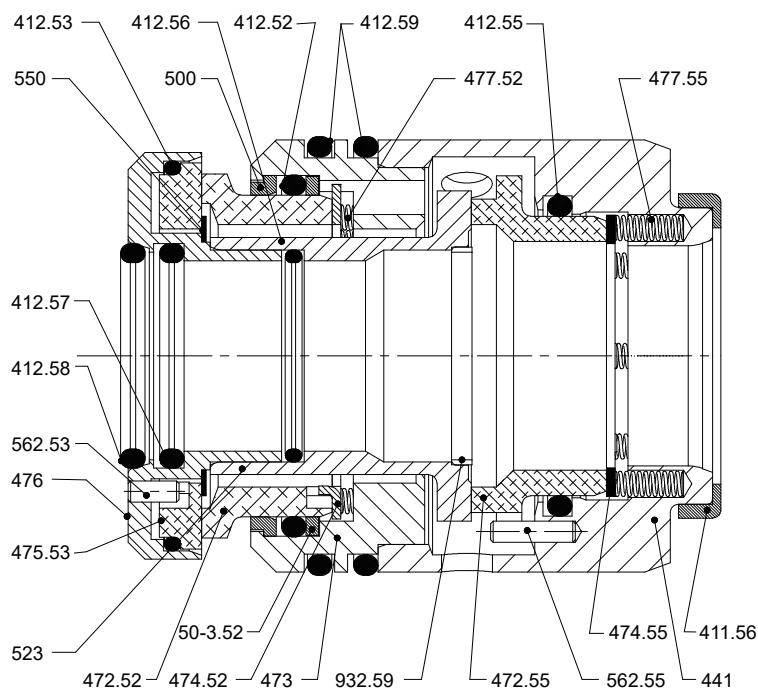


Fig. 55: Sectional drawing

Table 36: List of components

Part No.	Description	Part No.	Description
411.56	Joint ring	487	Mating ring carrier
412.52/.53/.55/.56/.57/.58/.59	O-ring	50-3.52	Backing ring
441	Shaft seal housing	500	Ring
472.53/.55	Primary ring	550	Disc
473	Primary ring carrier	562.52/.55	Parallel pin
474.53/.55	Thrust ring	904.53	Grub screw
475.52	Mating ring	914.52	Hexagon socket head cap screw
476	Mating ring carrier	932.52/.53/.59	Circlip
477.53/.55	Spring for mechanical seal	940	Key

9.3.4 Cartridge seal C033/055M1-4STQ

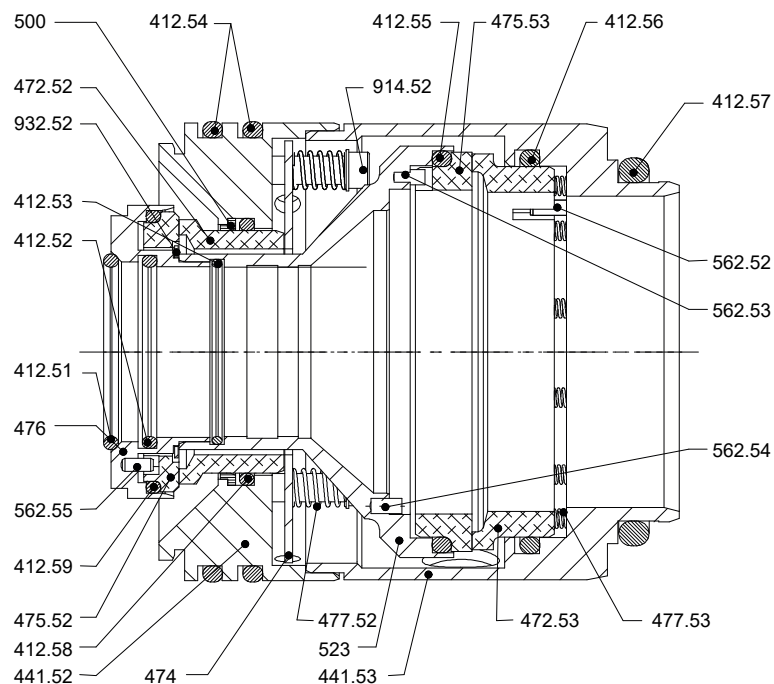


Fig. 56: Sectional drawing

Table 37: List of components

Part No.	Description	Part No.	Description
412.51/.52/.53/.54/.55/.56/.57/.58/.59	O-ring	477.52/.53	Spring for mechanical seal
441.52/.53	Shaft seal housing	500	Ring
472.52/.53	Primary ring	523	Shaft sleeve
474	Thrust ring	562.52/.53/.54/.55	Parallel pin
475.52/.53	Mating ring	914.52	Hexagon socket head cap screw
476	Mating ring carrier	932.52	Circlip

9.4 Exploded view: Sewatec with bearing brackets S01, S02, S03, S04

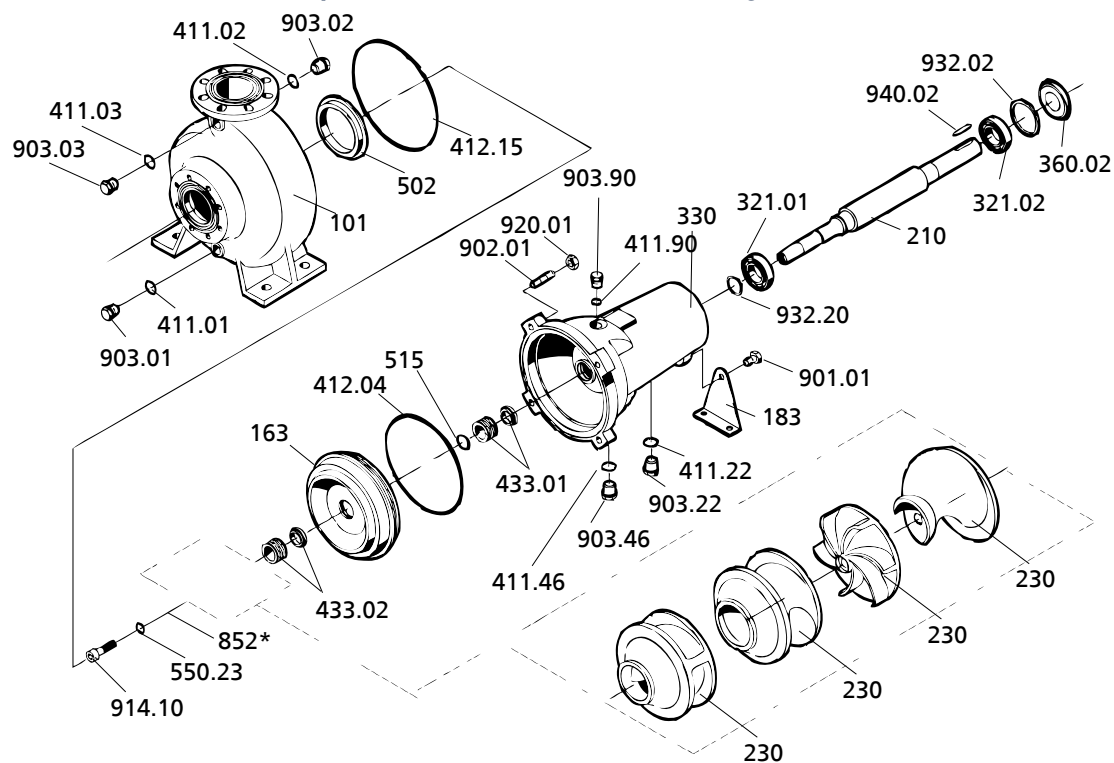


Fig. 57: Exploded view of the pump

* Screwed coupling 852 for Sewatec D 150-251 only

Table 38: List of components

Part No.	Description	Part No.	Description
101	Pump casing	502	Casing wear ring
163	Discharge cover	515	Locking ring
183	Support foot	550.23	Disc
210	Shaft	852 ⁽¹³⁾	Screwed coupling
230	Impeller	901.01	Hexagon head bolt
321.01/.02	Radial ball bearing	902.01	Stud
330	Bearing bracket	903.01/.02/.03/.22/.46/.90	Screw plug
360.02	Bearing cover	914.10	Hexagon socket head cap screw
411.01/.02/.03/.22/.46/.90	Joint ring	920.01	Nut
412.04/.15	O-ring	932.02/.20	Circlip
433.01/.02	Mechanical seal	940.02	Key

10 Certificate of Decontamination

Type:

Order number/

Order item number¹⁴⁾:

Delivery date:

Field of application:

Fluid handled¹⁴⁾:

Please check where applicable¹⁴⁾:


☐

Corrosive


☐

Oxidizing


☐

Flammable


☐

Explosive


☐

Hazardous to health


☐

Seriously hazardous to health


☐

Toxic


☐

Radioactive


☐

Hazardous to the environment


☐

Safe

Reason for return¹⁴⁾:

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

Index

B

Bearings 14, 17

C

Certificate of decontamination 82

Commissioning/start-up 40

Coupling alignment 32, 33

D

Design 17

Designation 16

Direction of rotation 36

Dismantling 52

Disposal 15

E

Event of damage 7

Ordering spare parts 71

Explosion protection 20, 32, 33, 34, 40, 46, 47, 48

F

Fluid handled

Density 44

I

Impeller type 17

Installation

Installation on a foundation 21, 23

Installation at site 20

Intended use 9

K

Key to safety symbols/markings 8

L

Lubricant

Quantity 50

M

Maintenance 47

O

Operating limits 9, 42, 47

Order number 7

Other applicable documents 7

P

Partly completed machinery 7

Permissible forces and moments at the pump nozzles 26, 28

Piping 25

Preservation 14

Priming and venting 37

Product description 16

R

Reassembly 52, 59

Return to supplier 14

Returning to service 45

S

Safety 9

Safety awareness 10

Scope of supply 19

Shaft seal 17

Spare part

Ordering spare parts 71

Spare parts stock 72

T

Tightening torques 71

Transport 13

Trouble-shooting

Causes and remedies 73

W

Warnings 8

Warranty claims 7



Simply scan
the QR code
and find your
regional contact.
ksb.com/en-global/contact



KSB SE & Co. KGaA

Johann-Klein-Straße 9 • 67227 Frankenthal
(Germany)

Tel. +49 6233 86-0

www.ksb.com

(01482072)

2580.8151/07-EN-US