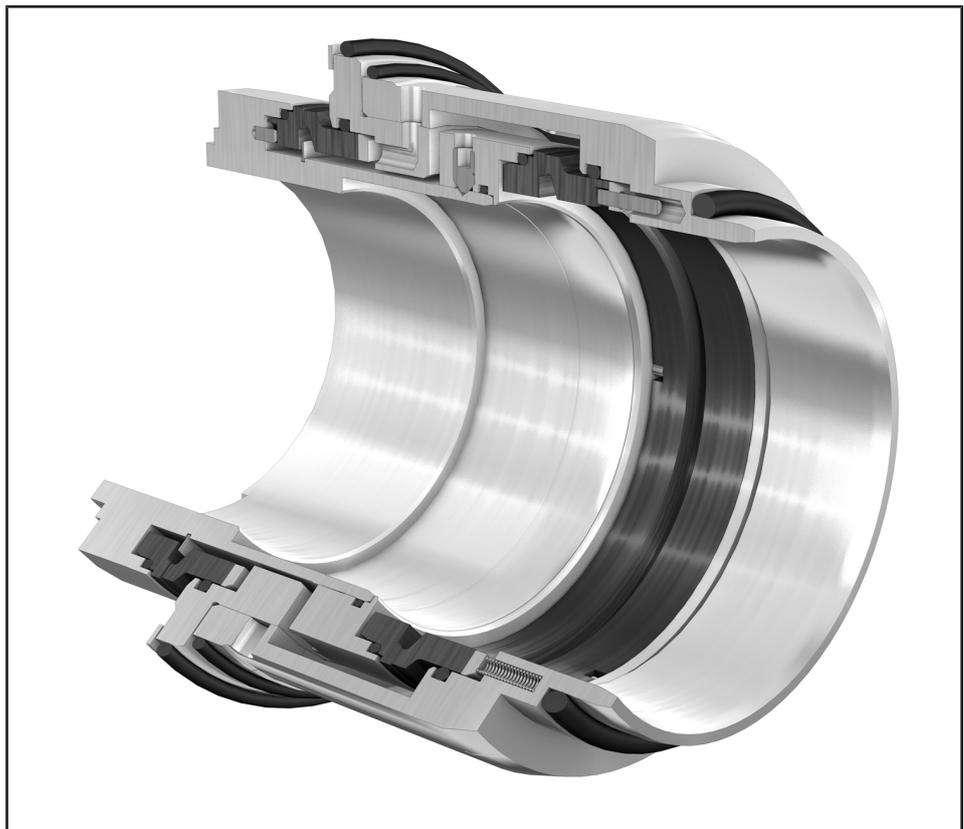


KSB Mechanical Seal

**4STQ**

## Installation/Operating Manual



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Installation/Operating Manual 4STQ

Original operating manual

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## 1 General

### 1.1 Principles

This operating manual is valid for the type series and variants indicated on the front cover.

The operating manual describes the proper and safe use of this equipment in all phases of operation.

The order number and order item number of the pump clearly identify the mechanical seal via the corresponding material number in the pump's parts list 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.

For any queries: [contact.ksbglrd@ksb.com](mailto:contact.ksbglrd@ksb.com)

### 1.2 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel.

### 1.3 Other applicable documents

**Table 1:** Overview of other applicable documents

Document	Contents
Data sheet	Description of the technical data of the pump (set) in which the mechanical seal is installed.
General assembly drawing <sup>1)</sup>	Description of the mechanical seal as part of the sectional drawing of the pump
Sub-supplier product literature <sup>1)</sup>	Operating manuals and other product literature describing accessories and integrated machinery components

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

### 1.4 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. 2.	Step-by-step instructions
	Note Recommendations and important information on how to handle the product

<sup>1</sup> If agreed to be included in the scope of supply

### 1.5 Key to safety symbols/markings

Table 3: Definition of safety symbols/markings

Symbol	Description
	<b>DANGER</b> This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury.
	<b>WARNING</b> This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.
	<b>CAUTION</b> This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.
	<b>Explosion protection</b> This symbol identifies information about avoiding explosions in potentially explosive atmospheres in accordance with EU Directive 2014/34/EU (ATEX).
	<b>General hazard</b> In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury.
	<b>Electrical hazard</b> In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage.
	<b>Machine damage</b> 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
  - Fitting direction
- The operator is responsible for ensuring compliance with all local regulations not taken into account.

### 2.2 Intended use

- This product must only be operated within the limit values stated in the technical product literature for the ambient temperature, fluid handled, speed, density, pressure, temperature and in compliance with any other instructions provided in the operating manual or other applicable documents.

### 2.3 Personnel qualification and training

- All personnel involved must be fully qualified to install, operate, maintain and inspect the product this manual refers to.
- The responsibilities, competence and supervision of all personnel involved in transport, installation, operation, maintenance and inspection must be clearly defined by the operator.
- Deficits in knowledge must be rectified by means of training and instruction provided by sufficiently trained specialist personnel. If required, the operator can commission the manufacturer/supplier to train the personnel.
- Training on the product must always be supervised by specialist technical personnel.

### 2.4 Consequences and risks caused by non-compliance with this manual

- 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 user/operator

- 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) during operation.
- Provide the personnel with protective equipment and make sure it is used.
- Contain leakages of hazardous fluids (e.g. explosive, toxic, hot) so as to avoid any danger to persons and the environment. Observe all legal requirements.
- The design of mechanical seals always produces a small amount of leakage.
- Higher leakage may occur especially in the running-in phase. The leakage must be drained off in a controlled way

### 2.7 Safety information for maintenance, inspection and installation

- Modifications or alterations of the mechanical seal require the manufacturer's prior consent.
- Use only original spare parts or parts/components authorised 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 are performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
- Only carry out work on the mechanical seal when the shaft is not rotating.

For mechanical seals installed in pump sets:

- The pump (set) must have cooled down to ambient temperature.
- Pump pressure must have been released and the pump must have been drained.
- When taking the pump set out of service always adhere to the procedure described in the manual.
- Decontaminate pumps which handle fluids posing a health hazard.
- As soon as the work has been completed, re-install and re-activate any safety-relevant devices and protective devices. Before returning the product to service, observe all instructions on commissioning.
- Observe the relevant sections of the corresponding pump operating manual.

### 2.8 Unauthorised modes of operation

Never operate the mechanical seal outside the limits stated in the data sheet and in this operating manual.

The warranty relating to the operating reliability and safety of the mechanical seal supplied is only valid if the mechanical seal is used in accordance with its intended use.

Any damage caused by dry running shall be excluded from the warranty.

### 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 supplying dealer and the insurer about the damage in writing immediately.

#### 3.2 Transport

	<b>CAUTION</b>
	<p><b>Improper transport</b> Damage to the mechanical seal!</p> <ul style="list-style-type: none"> <li>▷ Only transport the mechanical seal in suitable packaging.</li> <li>▷ Observe the weights, symbols and instructions indicated on the packaging.</li> <li>▷ Use suitable, approved lifting accessories.</li> </ul>

KSB's standard packaging is suitable for dry transport ,e.g. by truck, rail, air. Special packaging can be provided if specified in the contractual agreement.

	<b>CAUTION</b>
	<p><b>Removing transport locks too early</b> Damage to previously locked components during transport!</p> <ul style="list-style-type: none"> <li>▷ If transport locks are fitted, do not remove them too early.</li> </ul>

#### 3.3 Storage/preservation

	<b>CAUTION</b>
	<p><b>Improper storage</b> Damage due to humidity, vermin, corrosion and contamination!</p> <ul style="list-style-type: none"> <li>▷ Avoid outdoor storage.</li> <li>▷ Observe, check and record the storage conditions.</li> <li>▷ Regularly check the packaging for any damage.</li> <li>▷ Regularly check the humidity indicator of shrink-wrapped objects. The relative humidity should be &lt; 50 %.</li> <li>▷ If the relative humidity indicated for shrink-wrapped objects &gt; 50 %, have the equipment repacked by the manufacturer.</li> </ul>

	<b>CAUTION</b>
	<p><b>Improper storage</b> Impairment of O-rings' sealing function!</p> <ul style="list-style-type: none"> <li>▷ Do not store O-rings together with chemicals, solvents, fuels, acids, etc.</li> <li>▷ Protect O-rings from light, in particular from direct sun exposure and strong artificial light high in ultraviolet rays.</li> <li>▷ Check the O-rings for damage before they are fitted.</li> </ul>

	<b>CAUTION</b>
	<p><b>Wet, contaminated or damaged openings and connections</b></p> <p>Damage to the mechanical seal! Risk of embrittlement! Damage to elastomers!</p> <ul style="list-style-type: none"> <li>▸ Only open screw plugs and connections at the mechanical seal at the time of installation.</li> <li>▸ Avoid opening screw plugs, connections and similar before that time.</li> </ul>

We recommend taking the following measures for storing the mechanical seal:

For storing the mechanical seal observe standards ISO 2230 and DIN 7716.

Store the mechanical seal in its original packaging, placed on a level surface in a dry, protected room with constant conditions that meet the following requirements:

- Relative humidity < 65 %
- Temperature between 15 °C and 25 °C
- Moderately vented atmosphere
- Dust-free and vermin-free

If properly stored indoors, the equipment is protected for a maximum of 36 months. New mechanical seals are supplied by our factory duly prepared for storage.

### 3.4 Return to supplier

1. Remove the used mechanical seal from the system.
2. Always flush and clean the mechanical seal, particularly if it has been used for handling noxious, explosive, hot or other hazardous fluids.
3. If the mechanical seal has handled fluids whose residues could lead to corrosion damage in the presence of atmospheric humidity or could ignite upon contact with oxygen, the mechanical seal must also be neutralised and dried with anhydrous inert gas.
4. Always complete and enclose a certificate of decontamination when returning the mechanical seal. Always indicate any safety measures and decontamination measures taken.

	<b>NOTE</b>
	<p>If required, a blank certificate of decontamination can be downloaded from the following web site: <a href="http://www.ksb.com/certificate_of_decontamination">www.ksb.com/certificate_of_decontamination</a></p>

## 3.5 Disposal

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

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

## 4 Description

### 4.1 General description

- KSB mechanical seal

Mechanical seal for installation in pump sets and other rotating machinery in accordance with the manufacturer's instructions.

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

For information as per chemicals Regulation (EC) No. 1907/2006 (REACH), see <https://www.ksb.com/ksb-en/About-KSB/Corporate-responsibility/reach/>.

### 4.3 Designation

Example: C120/120M1-4STQ

Table 4: Designation key

Code	Description	
C	Design	
	C	Cartridge seal
120/120	Nominal diameter	
M	Direction of rotation	
	M	Bi-directional with multi-spring arrangement
	S	Bi-directional with single spring
	L	Direction of rotation anti-clockwise
	R	Direction of rotation clockwise
1	Anti-twist lock of mating ring	
	0	Without lock
	1	With lock
4STQ	Type series	

### 4.4 Materials

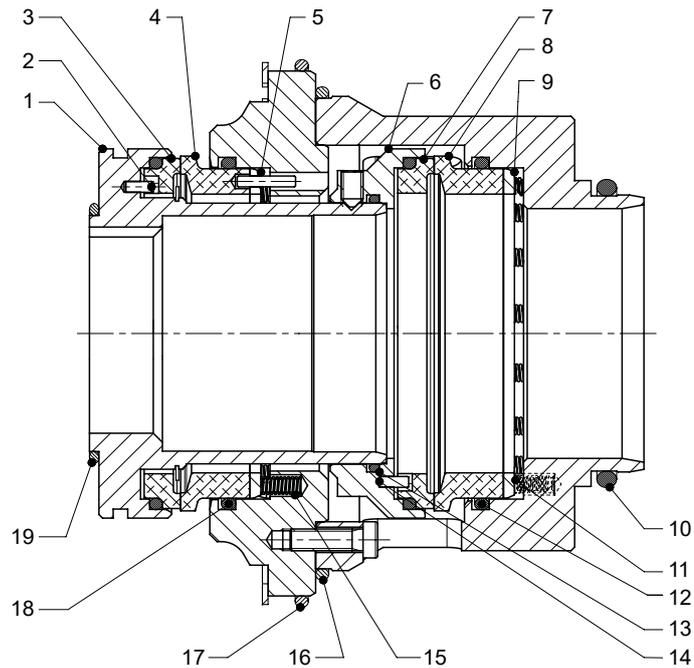
- Depending on the application
- See product literature of the pump
- Selection of suitable material variant on request

### 4.5 Design details

#### Design

- Cartridge seal
- Double seal arrangement
- Suitable for non-pressurised buffer fluid in acc. with API Plan 52
- Bi-directional
- Axial movability depending on the size (⇒ Section 6.3, Page 31)
- Multi-spring arrangement

### 4.6 Configuration and function



**Fig. 1:** Sectional drawing

**Design** Mechanical seal for installation in pump sets and other rotating machinery in accordance with the manufacturer's instructions.

KSB's mechanical seal 4STQ is a cartridge seal that has been especially developed for use in pumps of the Sewatec, Sewabloc and Amarex KRT type series. KSB's mechanical seal 4STQ can only be operated with a non-pressurised buffer fluid. It is a double mechanical seal. Its inboard seal is designed with an axially moveable primary ring 4 and a mating ring 3, its outboard seal with an axially moveable primary ring 8 and a mating ring 7. The inboard seal provides sealing on the product side, the outboard seal on the atmosphere side.

**Function** The inboard seal and outboard seal are stationary seals with a rotating mating ring 7. The rotating rings are in contact with the stationary primary rings 4 and 8 and form a sealing clearance. The springs 15 and 11 press the primary ring against the mating ring. They ensure that the seal faces stay in contact with each other also during unpressurised operation. The O-rings 12 and 18 provide sealing between the primary rings / mating rings and the housing parts. The O-rings 17, 16 and 10 provide sealing between the seal cartridge and the pump casing. The O-ring 19 provides sealing between the cartridge and the shaft. The O-ring 13 provides sealing between the mating ring carrier 6 and the shaft sleeve 1. Torque transmission from the shaft to the shaft sleeve is effected by the key. The parallel pins 2 and 14 as well as the thrust rings 5 and 9 ensure transmission of the torque from the primary rings and mating rings to the housing parts.

To prevent dry running of the outboard seal, the pressure of the buffer fluid applied to the seal must equal the ambient pressure as a minimum. The space between the inboard seal and the outboard seal must be completely filled with this fluid and vented.

## 5 Installation/Dismantling

	<b>NOTE</b>
<p>Priority shall be given to the installation instructions and/or installation sequence in the documents of the pump set into which this mechanical seal is to be installed. This also applies to the dismantling instructions and/or dismantling sequence.</p>	

### 5.1 Permissible aids

	<b>CAUTION</b>
<p><b>Impermissible cleaning agents</b>          Damage to the seal faces at the mechanical seal!</p> <ul style="list-style-type: none"> <li>▷ For removing minor contamination use only paper tissues and ethyl alcohol.</li> <li>▷ Do not use dirty cleaning cloths or cleaning cloths that leave behind lint.</li> </ul>	

	<b>CAUTION</b>
<p><b>Impermissible assembly aids</b>          Sealing elements made of ethylene propylene diene rubber perishing or swelling up!</p> <ul style="list-style-type: none"> <li>▷ Never let sealing elements come into contact with mineral oil base lubricants.</li> <li>▷ Use permissible lubricants only.</li> <li>▷ Verify that the assembly aids are silicon-free.</li> </ul>	

- Lubricants<sup>2)</sup>
  - Permanent lubricants, such as non-mineral grease (Klüber Asonic HQ 72-102) are used for elastomers that do not serve to transmit the torque. Examples are mating rings with an anti-twist lock or primary rings that move axially relative to the pump components.
  - Non-permanent lubricants such as a soap solution, for example, are used for elastomers that serve as a sealing element and, in addition, transmit the torque. An example would be a mating ring without anti-twist lock.
- Recommended cleaning agent for seal faces and grub screws: ethyl alcohol
- Thread-locking agent: Loctite, No. 243
- Open-ended wrench, ring spanner, socket wrench (cleaned, no impact tools)
- Torque wrench (cleaned)

### 5.2 Prerequisites

- Shaft run-out to ISO 5199:
  - For shaft diameter ≤ 50 mm: 0.05 mm max.
  - For shaft diameter 50 to 100 mm: 0.08 mm max.
  - For shaft diameter > 100 mm: 0.10 mm max.
- Face run-out of the shaft in relation to the vertical connection surface of the casing:
  - For shaft speed ≤ 750 rpm: 0.2 mm max.
  - For shaft speed > 750 rpm to 1000 rpm: 0.15 mm max.
  - For shaft speed > 1000 rpm to 1500 rpm: 0.08 mm max.

<sup>2)</sup> Lubricants must be compatible with all fluids used. They must not be aggressive to the secondary sealing elements.

- For shaft speed > 1500 rpm to 3000 rpm: 0.025 mm max.
- Permissible centre offset between the pump casing and the shaft:
  - Max. 0.2 mm for seals without pumping ring
  - Max. 0.1 mm for seals with pumping ring
- The seal faces are clean and have not been touched with fingers.
- The mechanical seal is in proper condition and complete.
- The elastomers are free from any contamination, cracks, softening, hardening, stickiness and discolouration.
- The mechanical seal has been placed down on a clean and level surface.

### 5.3 Installing the mechanical seal

#### 5.3.1 Installing the C022/025M1-4STQ and C033/033M1-4STQ double cartridge seals

	<p style="text-align: center;"><b>CAUTION</b></p> <p><b>Use of grease or other permanent lubricants</b> Torque transmission impeded / overheating of and damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Never use grease or other permanent lubricants for fitting the torque-transmitting elements of a mechanical seal.</li> <li>▷ Use soft soap to reduce any friction caused during assembly.</li> <li>▷ Never coat the mechanical seal faces with grease or oil.</li> </ul>
	<p style="text-align: center;"><b>CAUTION</b></p> <p><b>Improper installation of the mechanical seal</b> Damage to the seal faces!</p> <ul style="list-style-type: none"> <li>▷ Install the mechanical seal using the supplied mounting device 101-47.</li> <li>▷ Prevent sudden forces acting on the mounting device and mechanical seal.</li> </ul>

- ✓ The relevant documentation for installing the mechanical seal is observed. (⇒ Section 9.1.1, Page 34) (⇒ Section 9.1.2, Page 35)
  - ✓ The back pull-out unit has been removed from the pump casing and safely positioned and secured in a horizontal position.
  - ✓ The original 4STQ cartridge seal is fully assembled and undamaged.
  - ✓ Mounting device 101-47 is available.
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.
  2. Prior to assembly, wet the external elastomers (O-rings and gasket) and the seats of the mechanical seal at the shaft, discharge cover 163 and seal housing with a suitable lubricant (e.g. soap solution).
  3. Press mechanical seal 433 into discharge cover 163 by hand as far as possible.

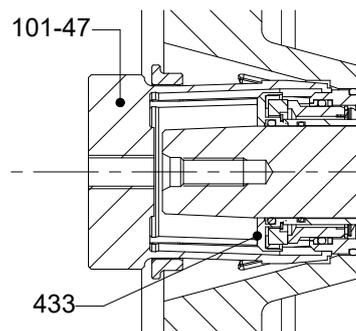
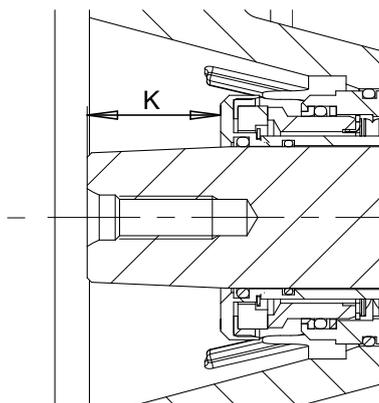


Fig. 2: Mounting device 101-47



**Fig. 3:** Reference dimension "K" from shaft end to mechanical seal

4. Fit mechanical seal 433 using mounting device 101-47. Check the mechanical seal position against reference dimension "K" (see table: Reference dimension "K") and correct the installation position if required.
5. Slide O-ring 412.58 over the shaft until it abuts against the mechanical seal.

**Table 5:** Reference dimension "K"

Size	Impeller type	Reference dimension "K"
		[mm]
40-252	F, K, S	39 +/- 0,5
50-215	F	25 +/- 0,5
50-216	F, S	25 +/- 0,5
65-215	F	25 +/- 0,5
65-216	E	33 +/- 0,5
65-217	F	25 +/- 0,5
65-253	K	43 +/- 0,5
80-215	F	25 +/- 0,5
80-216	E	33 +/- 0,5
80-216	F	25 +/- 0,5
80-252	F	39 +/- 0,5
80-253	E, F, K	43 +/- 0,5
80-315	D, K	43 +/- 0,5
80-317	D, F	43 +/- 0,5
100-215	F	25 +/- 0,5
100-253	D, E, K	43 +/- 0,5
100-254	F, K	39 +/- 0,5
100-315	D, E, F, K	43 +/- 0,5
100-316	D, F, K	43 +/- 0,5
100-317	E	43 +/- 0,5
150-253	D	43 +/- 0,5
150-315	D, F	43 +/- 0,5
150-317	E, K	43 +/- 0,5
200-315	D, K	43 +/- 0,5
200-316	K	43 +/- 0,5
200-317	K	43 +/- 0,5
200-318	K	43 +/- 0,5

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

	<p><b>⚠ WARNING</b></p> <p><b>Components with sharp edges</b> Risk of cutting or shearing injuries!</p> <ul style="list-style-type: none"> <li>▷ Always use appropriate caution for installation and dismantling work.</li> <li>▷ Wear work gloves.</li> </ul>
	<p><b>CAUTION</b></p> <p><b>Use of grease or other permanent lubricants</b> Torque transmission impeded / overheating of and damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Never use grease or other permanent lubricants for fitting the torque-transmitting elements of a mechanical seal.</li> <li>▷ Use soft soap to reduce any friction caused during assembly.</li> <li>▷ Never coat the mechanical seal faces with grease or oil.</li> </ul>
	<p><b>CAUTION</b></p> <p><b>Improper installation of the mechanical seal</b> Damage to the seal faces!</p> <ul style="list-style-type: none"> <li>▷ Install the mechanical seal using the supplied mounting device C.</li> <li>▷ Prevent sudden forces acting on the mounting device and mechanical seal.</li> </ul>

- ✓ The relevant documentation for installing the mechanical seal is observed. (⇒ Section 9.1.3, Page 36)
  - ✓ The back pull-out unit has been removed from the pump casing and safely positioned and secured in a horizontal position.
  - ✓ The original 4STQ cartridge seal is fully assembled and undamaged.
  - ✓ Mounting device C is available.
1. Guide the mechanical seal (without external O-rings) onto the shaft as far as it will go.

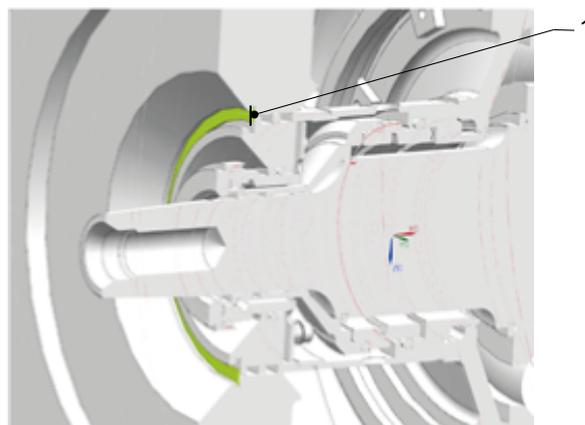
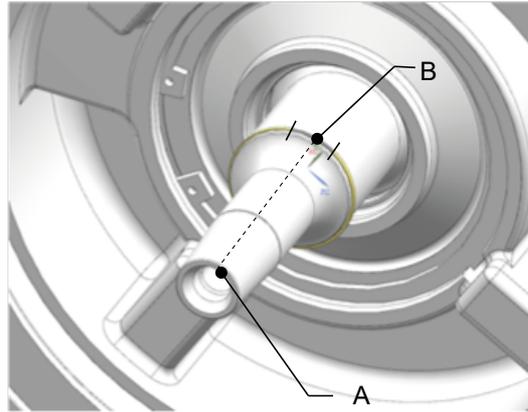


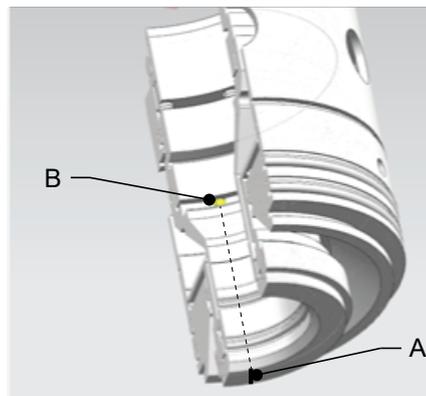
Fig. 4: Illustration of the groove

2. Visually check that the groove for the circlip in discharge cover 1 aligns with the corresponding surface of the mechanical seal (seal housing).
3. Pull the mechanical seal off the shaft.
4. Fit the circlip in the shaft groove.



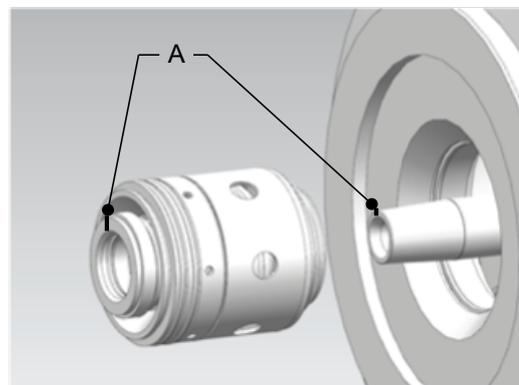
**Fig. 5: Marking the shaft end**

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



**Fig. 6: Marking the mechanical seal**

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



**Fig. 7: Aligning the markings**

8. 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.

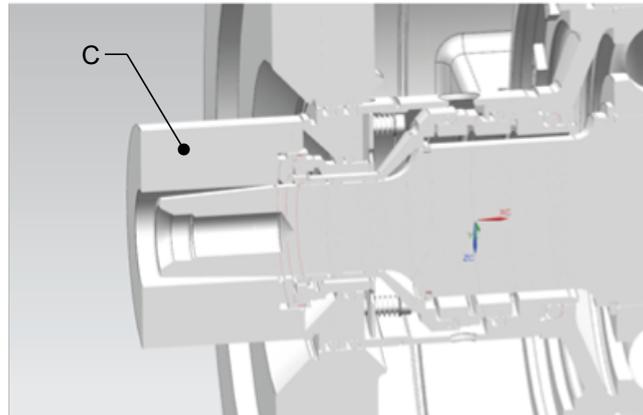


Fig. 8: Mounting device C

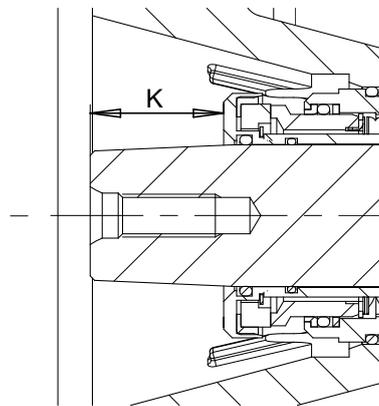


Fig. 9: Reference dimension "K" from shaft end to mechanical seal

9. 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.

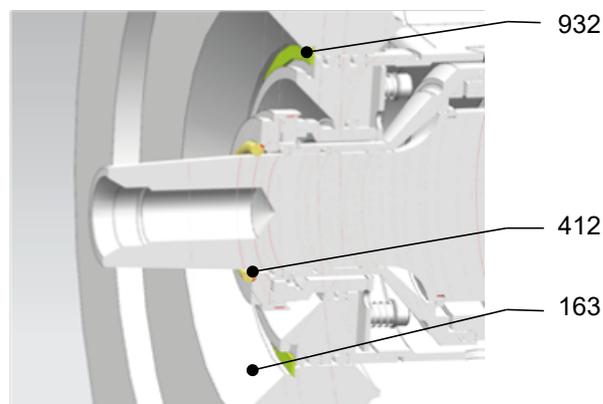


Fig. 10: Final assembly

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

### 5.3.3 Installing the double cartridge seal C055/065M1-4STQT

	<b>CAUTION</b>
	<p><b>Use of grease or other permanent lubricants</b></p> <p>Torque transmission impeded / overheating of and damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Never use grease or other permanent lubricants for fitting the torque-transmitting elements of a mechanical seal.</li> <li>▷ Use soft soap to reduce any friction caused during assembly.</li> <li>▷ Never coat the mechanical seal faces with grease or oil.</li> </ul>

- ✓ The relevant documentation for installing the mechanical seal is observed. (⇒ Section 9.1.4, Page 37)
- ✓ The back pull-out unit has been removed from the pump casing and safely positioned and secured in a horizontal position.
- ✓ The original 4STQ cartridge seal is fully assembled and undamaged.
  1. Apply a suitable lubricant to the O-rings. Ensure that no permanent lubricant comes into contact with the O-rings, in order to guarantee reliable torque transmission.
  2. Insert O-rings 412.54/.55/.56 in discharge cover 163. Ensure that no permanent lubricant is used.
  3. Insert O-ring 412.59 into the circular groove of shaft protecting sleeve 523.
  4. Apply a coat of a suitable grease to shaft 210 in the area of the mechanical seal and the impeller hub.
  5. Place key 940 in the shaft keyway.
  6. Align the groove in shaft sleeve 523 with key 940 in shaft 210.
  7. Carefully slide the entire cartridge seal 4STQT onto the shaft until seal cover 471 abuts discharge cover 163. Apply the axial force required for insertion into the discharge cover via the seal cover only. Ensure that primary ring 472.52 and mating ring 475.52 are not damaged. A tube with an inside diameter larger than 128 mm and outside diameter smaller than 145 mm can be used to press the stationary seal cover into the discharge cover of the pump.
  8. Fit circlip 932.53 in the groove of discharge cover 163. Make sure it is correctly seated.

## 5.3.4 Installing the double cartridge seal C055/065M1-4STQ

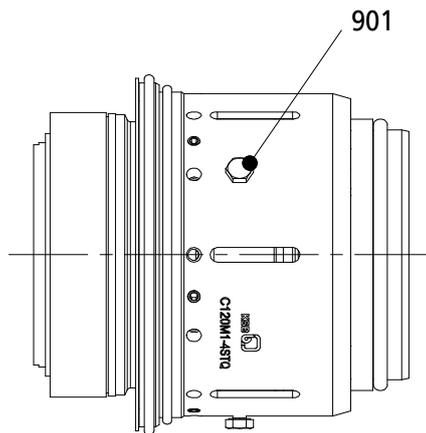
	<p style="text-align: center;"><b>CAUTION</b></p> <p><b>Use of grease or other permanent lubricants</b></p> <p>Torque transmission impeded / overheating of and damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Never use grease or other permanent lubricants for fitting the torque-transmitting elements of a mechanical seal.</li> <li>▷ Use soft soap to reduce any friction caused during assembly.</li> <li>▷ Never coat the mechanical seal faces with grease or oil.</li> </ul>
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- ✓ The relevant documentation for installing the mechanical seal is observed. (⇒ Section 9.1.5, Page 38)
- ✓ The back pull-out unit has been removed from the pump casing and safely positioned and secured in a horizontal position.
- ✓ The original 4STQ cartridge seal is fully assembled and undamaged.
  1. Apply a suitable lubricant to the O-rings. Ensure that no permanent lubricant comes into contact with the O-rings, in order to guarantee reliable torque transmission.
  2. Insert O-rings 412.54/.55/.56 in discharge cover 163. Ensure that no permanent lubricant is used.
  3. Apply a coat of a suitable grease to shaft 210 in the area of the mechanical seal and the impeller hub.
  4. Align the groove in shaft sleeve 523 with the groove in shaft 210.
  5. Carefully slide the entire cartridge seal 4STQ onto the shaft until seal cover 471 abuts discharge cover 163. Apply the axial force required for insertion into the discharge cover via the seal cover. Ensure that primary ring 472.52 and mating ring 475.52 are not damaged. A tube with an inside diameter larger than 128 mm and outside diameter smaller than 145 mm can be used to press the stationary seal cover into the discharge cover of the pump.
  6. Fit circlip 932.53 in the groove of discharge cover 163. Make sure it is correctly seated.
  7. Insert O-ring 412.06 into the circular groove of shaft protecting sleeve 523.

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

	<b>CAUTION</b>
	<p><b>Use of grease or other permanent lubricants</b></p> <p>Torque transmission impeded / overheating of and damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Never use grease or other permanent lubricants for fitting the torque-transmitting elements of a mechanical seal.</li> <li>▷ Use soft soap to reduce any friction caused during assembly.</li> <li>▷ Never coat the mechanical seal faces with grease or oil.</li> </ul>

- ✓ The relevant documentation for installing the mechanical seal is observed. (⇒ Section 9.1.6, Page 39)
  - ✓ The back pull-out unit has been removed from the pump casing and safely positioned and secured in a horizontal position.
  - ✓ The original 4STQ cartridge seal is fully assembled and undamaged.
1. Apply a suitable lubricant to the O-rings. Ensure that no permanent lubricant comes into contact with the O-rings, in order to guarantee reliable torque transmission.
  2. Insert O-rings 412.54 and 412.55 in discharge cover 163. Ensure that no permanent lubricant is used.
  3. Fit O-ring 412.59 on the shoulder of shaft seal housing 441.



**Fig. 11:** Illustration showing hexagon head bolt

4. Completely remove the hexagon head bolts 901 (x 3) that make up the transport lock and store them.
5. Apply a coat of a suitable grease to shaft 210 in the area of the mechanical seal and the impeller hub.
6. Align the groove in shaft sleeve 523 with the groove in shaft 210.
7. Carefully slide the entire cartridge seal 4STQ onto the shaft until seal cover 471 abuts discharge cover 163. Apply the axial force required for insertion into the discharge cover via the seal cover only. Ensure that primary ring 472.52 and mating ring 475.52 are not damaged. A tube with an inside diameter larger than 170 mm and outside diameter smaller than 190 mm can be used to press the stationary seal cover into the discharge cover of the pump.
8. Fit circlip 932.53 in the groove of discharge cover 163. Make sure it is correctly seated.

5.3.6 Installing the double cartridge seal C150/160M1-4STQ

	<b>CAUTION</b>
	<p><b>Use of grease or other permanent lubricants</b></p> <p>Torque transmission impeded / overheating of and damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Never use grease or other permanent lubricants for fitting the torque-transmitting elements of a mechanical seal.</li> <li>▷ Use soft soap to reduce any friction caused during assembly.</li> <li>▷ Never coat the mechanical seal faces with grease or oil.</li> </ul>

- ✓ The relevant documentation for installing the mechanical seal is being observed. (⇒ Section 9.1.7, Page 40)
  - ✓ The back pull-out unit has been removed from the pump casing and safely positioned and secured in a horizontal position.
  - ✓ The original 4STQ cartridge seal is fully assembled and undamaged.
1. Apply a suitable lubricant to the O-rings. Ensure that no permanent lubricant comes into contact with the O-rings, in order to guarantee reliable torque transmission.
  2. Verify that O-rings 412.55, 412.60 (2 nos.) and 412.59 are correctly seated in their respective grooves.
  3. Insert O-ring 412.54 in discharge cover 163. Ensure that no permanent lubricant is used.

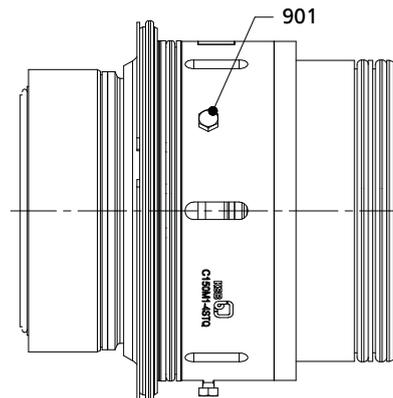


Fig. 12: Illustration showing hexagon head bolts

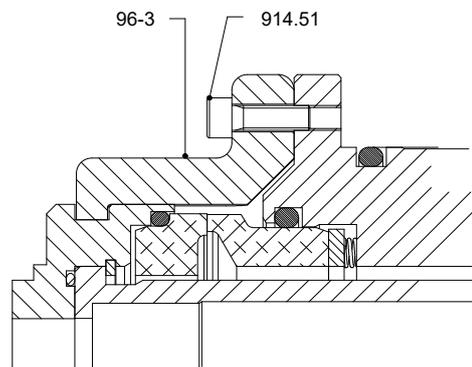
4. Remove the hexagon head bolts 901 (3 nos.) that make up the transport lock and store them.
5. Carefully slide the entire seal assembly onto the pump shaft.
6. Apply a coat of a suitable grease to shaft 210 in the area of the mechanical seal and the impeller hub.
7. Align the groove in shaft sleeve 523 with the groove in shaft 210.
8. Carefully slide the entire 4STQ cartridge seal onto the shaft until seal cover 471 abuts discharge cover 163. Apply the axial force required for insertion into the discharge cover in the area of the outside diameter of seal cover 471. Ensure that primary ring 472.52 and mating ring 475.52 are not damaged. A tube with an inside diameter larger than 225 mm and outside diameter smaller than 250 mm can be used to press the stationary seal cover into the discharge cover of the pump.
9. Place circlip 932.53 in the groove of discharge cover 163. Make sure it is correctly seated.
10. Fit O-ring 412.06 on the shoulder of shaft sleeve 523.

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## 5.3.7 Installing the double cartridge seal C190/190M1-4STQ

	<div style="background-color: #FFD700; padding: 5px;"><b>CAUTION</b></div> <p><b>Use of grease or other permanent lubricants</b></p> <p>Torque transmission impeded / overheating of and damage to the pump!</p> <ul style="list-style-type: none"> <li>▷ Never use grease or other permanent lubricants for fitting the torque-transmitting elements of a mechanical seal.</li> <li>▷ Use soft soap to reduce any friction caused during assembly.</li> <li>▷ Never coat the mechanical seal faces with grease or oil.</li> </ul>
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- ✓ The relevant documentation for installing the mechanical seal is observed. (⇒ Section 9.1.8, Page 41)
  - ✓ The back pull-out unit has been removed from the pump casing and safely positioned and secured in a horizontal position.
  - ✓ The original 4STQ cartridge seal is fully assembled and undamaged.
1. Apply a suitable lubricant to the O-rings. Ensure that no permanent lubricant comes into contact with the O-rings, in order to guarantee reliable torque transmission.
  2. Verify that O-rings 412.56 and 412.59 are correctly seated in their respective housing parts.

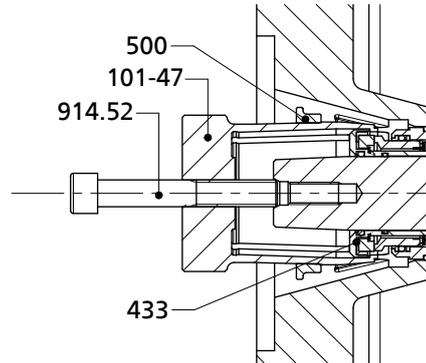


**Fig. 13:** Illustration of the assembly fixture

3. Completely remove and store the hexagon socket head cap screws 914.54 (8 nos.) and assembly fixtures 96-3 (3 nos.) serving as a transport lock.
4. Slide the entire seal assembly onto the pump shaft.
5. Apply a suitable lubricant to shaft 210 in the area of the mechanical seal and the impeller hub.
6. Align the groove in shaft sleeve 523 with the groove in shaft 210.
7. Carefully slide the entire cartridge seal 4STQ onto the shaft until seal cover 471 abuts discharge cover 163. Apply the axial force required for insertion into the discharge cover via the seal cover only. Ensure that primary ring 472.52 and mating ring 475.52 are not damaged. Hexagon socket head cap screws 914.52 can be used to press the stationary seal cover into the discharge cover of the pump.
8. Fit O-ring 412.06 on the shoulder of shaft sleeve 523.

## 5.4 Removing the mechanical seal

### 5.4.1 Removing the C022/025M1-4STQ and C033/033M1-4STQ double cartridge seals



**Fig. 14:** Removing the double cartridge seal

- ✓ The back pull-out unit and impeller have been removed.
1. Fix discharge cover 163 to bearing housing 350 using suitable bolts/screws and washers.
  2. Remove O-ring 412.58 from the shaft.
  3. Slide puller 101-47 over the shoulder of mechanical seal 433 and lock with ring 500.
  4. Press forcing screw 914.52 against shaft 210 and pull mechanical seal 433 out of discharge cover 163.

### 5.4.2 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 operating manual for the pump is on hand.
  - ✓ 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.

### 5.4.3 Removing the C055/065M1-4STQT double cartridge seal

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

- ✓ The operating manual for the pump is available.
  - ✓ The back pull-out unit of the pump has been removed from the pump casing and safely positioned and secured in a horizontal position.
  - ✓ The impeller and keys have been removed from the pump shaft.
1. Remove circlip 932.53 from discharge cover 163.
  2. Use the radial groove in shaft sleeve 523 to remove the mechanical seal cartridge. Remove evenly and carefully, using a suitable extraction tool.
  3. Carefully pull the complete cartridge seal off the shaft.

4. Remove O-rings 412.54/.55/.56 from discharge cover 163 and, if necessary, remove O-ring 412.58/.59 from the shaft sleeve 523 of the mechanical seal.
5. Take key 940 out of the keyway and store it.
6. Clean the pump components in the area of the mechanical seal, pump shaft 210, discharge cover 163 and bearing bracket 330. Check for any damage.

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

#### 5.4.4 Removing the C055/065M1-4STQ double cartridge seal

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

- ✓ The operating manual for the pump is available.
- ✓ The back pull-out unit of the pump has been removed from the pump casing and safely positioned and secured in a horizontal position.
- ✓ The impeller and keys have been removed from the pump shaft.
  1. Remove circlip 932.53 from discharge cover 163.
  2. 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. Remove O-rings 412.54/.55/.56 from discharge cover 163 and, if necessary, remove O-ring 412.06 from the shaft sleeve 523 of the mechanical seal.
  5. 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.**

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

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

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

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

#### 5.4.6 Removing the C150/160M1-4STQ double cartridge seal

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

- ✓ The operating manual for the pump is available.
- ✓ The back pull-out unit of the pump has been removed from the pump casing and safely positioned and secured in a vertical position.
- ✓ The impeller and keys have been removed from the pump shaft.
  1. Remove circlip 932.53 from discharge cover 163.
  2. Screw 2 (M8) eyebolts into the front face of shaft sleeve 523.
  3. Carefully pull the complete cartridge seal off the shaft by the eyebolts. Then remove the eyebolts again.
  4. Remove O-ring 412.54 from discharge cover 163.
  5. Remove O-ring 412.06 from shaft sleeve 523. Keep with the mechanical seal.
  6. Tighten the hexagon head bolts 901 (3 nos.) that make up the transport lock to a low torque (hand-tight).
  7. 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.**

#### 5.4.7 Removing the C190/190M1-4STQ double cartridge seal

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

- ✓ The operating manual for the pump is on hand.
- ✓ The back pull-out unit of the pump has been removed from the pump casing and safely positioned and secured in a vertical position.
- ✓ The impeller and keys have been removed from the pump shaft.
  1. Remove hexagon socket head cap screws 914.52.
  2. Screw 2 hexagon socket head cap screws (M8) into the front face of seal cover 471 and press the complete mechanical seal out of its seat.
  3. Screw 2 eyebolts (M8) into the front face of seal cover 471.
  4. Carefully pull the complete cartridge seal off the shaft by the eyebolts. Then remove the hexagon socket head cap screws and eyebolts again.
  5. Remove O-ring 412.06 from shaft sleeve 523. Keep with the mechanical seal.
  6. As a transport lock fit and evenly fasten hexagon socket head cap screws 914.54 and assembly fixtures 96-3 (4 nos.).
  7. 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.**

## 6 Operation

### 6.1 Safety instructions for operation

	<p><b>CAUTION</b></p> <p><b>Air intake via the seal faces</b>          Dry running of the seal and consequential seal failure!</p> <ul style="list-style-type: none"> <li>▸ For single seals the pressure in the seal chamber of the pump must always be higher than the ambient pressure.</li> </ul>
	<p><b>CAUTION</b></p> <p><b>Unsuitable fluid to be sealed off</b>          Damage to the machinery!</p> <ul style="list-style-type: none"> <li>▸ Take appropriate measures to ensure that the fluid to be sealed off at the mechanical seal is in liquid condition no matter what the operating status of the pump. This applies in particular when starting up and stopping the pump.</li> <li>▸ If the fluid to be sealed off forms deposits while the pump set cools down or during standstill of the pump set, the seal chamber must be flushed through with a clean liquid. The quantity and type of flushing liquid has to be defined by the operator for the specific material combination of the mechanical seal.</li> </ul>
	<p><b>CAUTION</b></p> <p><b>Excessive rise in temperature</b>          Damage to the mechanical seal!          Dry running or damage to the elastomers, incrustations at the seal faces, etc.</p> <ul style="list-style-type: none"> <li>▸ Shut down the pump as described in the operating manual.</li> </ul>
	<p><b>NOTE</b></p> <p>If the operating limits indicated are observed and the instructions given in this manual are complied with, the mechanical seal can be expected to give trouble-free operation. If the values during operation are not within the specified limits, the mechanical seal must be removed from the system and sent to KSB for inspection.</p>

### 6.2 Emissions

	<p><b>WARNING</b></p> <p><b>Incorrect handling of the fluid to be sealed off</b>          Risk of injury!</p> <ul style="list-style-type: none"> <li>▸ If the fluid to be sealed off and/or the buffer fluid have to meet the requirements of the German Hazardous Substances Regulations, the regulations on handling hazardous substances (safety data sheets to Directive 91/155/EEC) and the accident prevention regulations must be heeded.</li> </ul>
	<p><b>NOTE</b></p> <p>If a reduction in leakage cannot be observed or if other failures occur, the mechanical seal must be shut down, removed from the system and sent to KSB for inspection.</p>

	<b>NOTE</b>
	Any leakage must be drained off in a controlled way and safely disposed of. Components which may come into contact with the seal leakage must either be corrosion-resistant or must be adequately protected.

- For physical and technical reasons a mechanical seal cannot be leak-free.
- Leakage can be either in liquid or gaseous form. Its aggressiveness corresponds to that of the fluid to be sealed off.
- The quantity of leakage is influenced by several factors:
  - Seal selection
  - Manufacturing tolerances
  - Operating statuses
  - Smooth running of the pump
- In the running-in phase of the mechanical seal higher leakage can occur.

### 6.3 Operating limits

	<b>NOTE</b>
	Always observe the operating limits in the product literature and the other applicable documents.

	<b>NOTE</b>
	The following values are limits that depend on the seal face materials and elastomer materials. As the characteristics influence each other, operation at minimum/maximum limits is not possible for all characteristics at the same time.

**Table 6: Operating properties**

Characteristic					Value				
Cartridge seal		C022025-M1-4STQ	C033033-M1-4STQ	C033055-M1-4STQ	C055065-M1-4STQT	C055065-M1-4STQ	C120120-M1-4STQ	C150160-M1-4STQ	C190190-M1-4STQ
Pump		Amarex KRT / Sewatec	Amarex KRT / Sewatec	Amarex KRT / Sewatec	Sewatec	Sewatec	Sewatec	Sewatec	Sewatec
Bearing bracket		S01	S02	S03	S05	S05	S08	S09	S10
Fluid handled		Raw waste water	Raw waste water	Raw waste water	Raw waste water	Raw waste water	Raw waste water	Raw waste water	Raw waste water
Maximum temperature	T [°C]	≤ 100	≤ 100	≤ 100	≤ 70	≤ 70	≤ 70	≤ 70	≤ 70
Maximum dynamic pressure	p [bar]	16	16	16	11	11	10	10	10
Maximum static pressure	p [bar]	20	20	20	16	16	16	16	16
Maximum speed	n [rpm <sup>1</sup> ]	3600	3600	3600	1450	1450	1160	1160	1160
Axial displacement	[mm]	± 1	± 1,5	± 2	± 2,5	± 2,5	± 2,0	± 2,5	± 2,5
Weight	[kg]	1	1	2	6,5	6,5	11,8	25,0	49,0

## 7 Maintenance

### 7.1 Maintenance/inspection

**NOTE**

The operator is responsible for conducting checks.

- The mechanical seal is low in maintenance. Replace wear parts as necessary.
- Proper operation includes regular checks of the temperature and leakage (drainage) and of the mechanical seal's quench liquid pressure and fill level.
- When a system maintenance inspection or pump maintenance inspection is conducted, the mechanical seal should also be inspected. The seal faces should be reworked and all elastomer joint rings and springs should be replaced by new ones. KSB is available for inspecting the mechanical seal.

## 8 Trouble-shooting

	<p style="background-color: #f4a460; padding: 2px;"><b>⚠ WARNING</b></p> <p><b>Improper work to remedy faults</b> Risk of injury!</p> <ul style="list-style-type: none"> <li>▸ For any work performed to remedy faults, observe the relevant information given in this operating manual and/or in the product literature provided by the accessories manufacturer.</li> </ul>
	<p style="background-color: #0070c0; color: white; padding: 2px;"><b>NOTE</b></p> <p>Prior to conducting any work on the mechanical seal during the warranty period contact the manufacturer. KSB Service will be pleased to help you. Non-compliance with this instruction will lead to forfeiture of any and all rights to claims for damages.</p>
	<p style="background-color: #0070c0; color: white; padding: 2px;"><b>NOTE</b></p> <p>For any failures you cannot remedy or whose cause cannot be identified, contact the responsible KSB service centre.</p>

### What to do in the event of a fault/malfunction

- Determine and document the nature of the fault/malfunction.
- Monitor the development of leakage quantity. If necessary, shut down the pump as described in the operating manual.  
A steady flow of leakage indicates mechanical seal damage.

### Maintenance work, service work and installation work by KSB Service

- KSB Service GmbH | Service Center Pegnitz  
E-mail: [service-center.pegnitz@ksb.com](mailto:service-center.pegnitz@ksb.com)
- KSB Service LLC | Service Center Abu Dhabi  
E-Mail: [ksb@ksb.ae](mailto:ksb@ksb.ae)

### Contact for general queries:

- E-mail: [LPC\\_Mechanical.Seals@ksb.com](mailto:LPC_Mechanical.Seals@ksb.com)

### Further contact addresses:

- [www.ksb.com/contact](http://www.ksb.com/contact)

## 9 Related Documents

### 9.1 General drawings with list of components

#### 9.1.1 Cartridge seal C022/025M1-4STQ

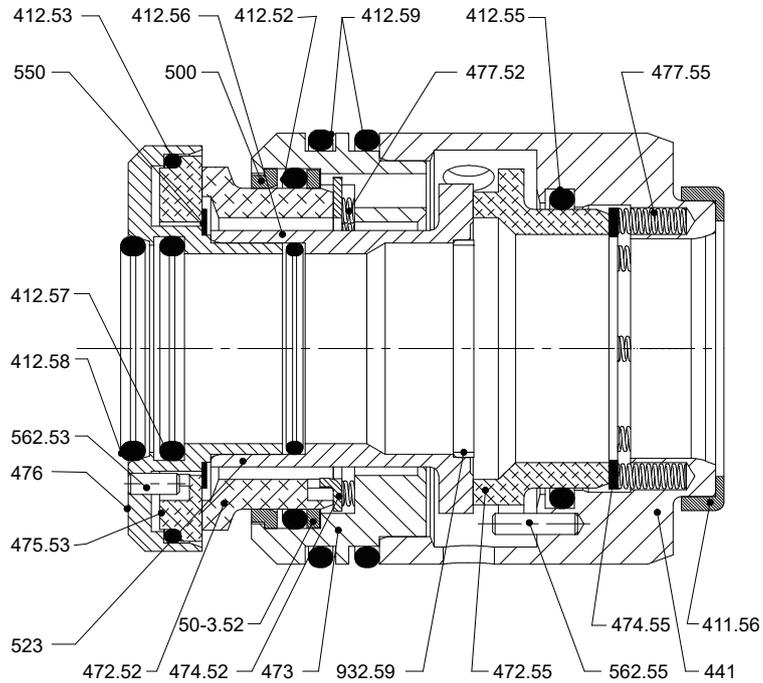


Fig. 15: Sectional drawing

Table 7: 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

9.1.2 Cartridge seal C033/033M1-4STQ

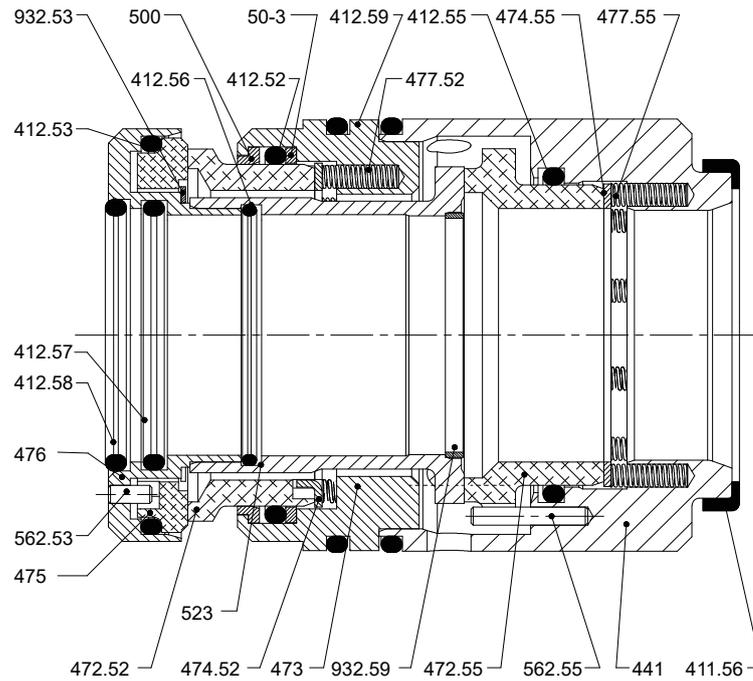


Fig. 16: Sectional drawing

Table 8: List of components

Part No.	Description	Part No.	Description
411.56	Joint ring	476	Mating ring carrier
412.52/.53/.55/.56/.57/.58/.59	O-ring	477.52/.55	Spring for mechanical seal
441	Shaft seal housing	50-3	Backing ring
472.52/.55	Primary ring	500	Ring
473	Primary ring carrier	523	Shaft sleeve
474.52/.55	Thrust ring	562.53/.55	Parallel pin
475	Mating ring	932.53/.59	Circlip

9.1.3 Cartridge seal C033/055M1-4STQ

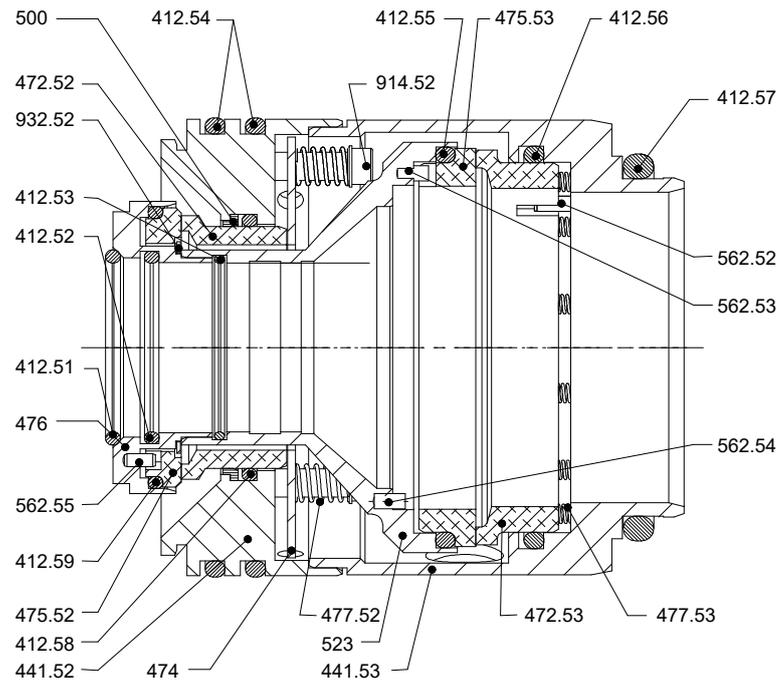


Fig. 17: Sectional drawing

Table 9: 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

9.1.4 Cartridge seal C055/065M1-4STQT

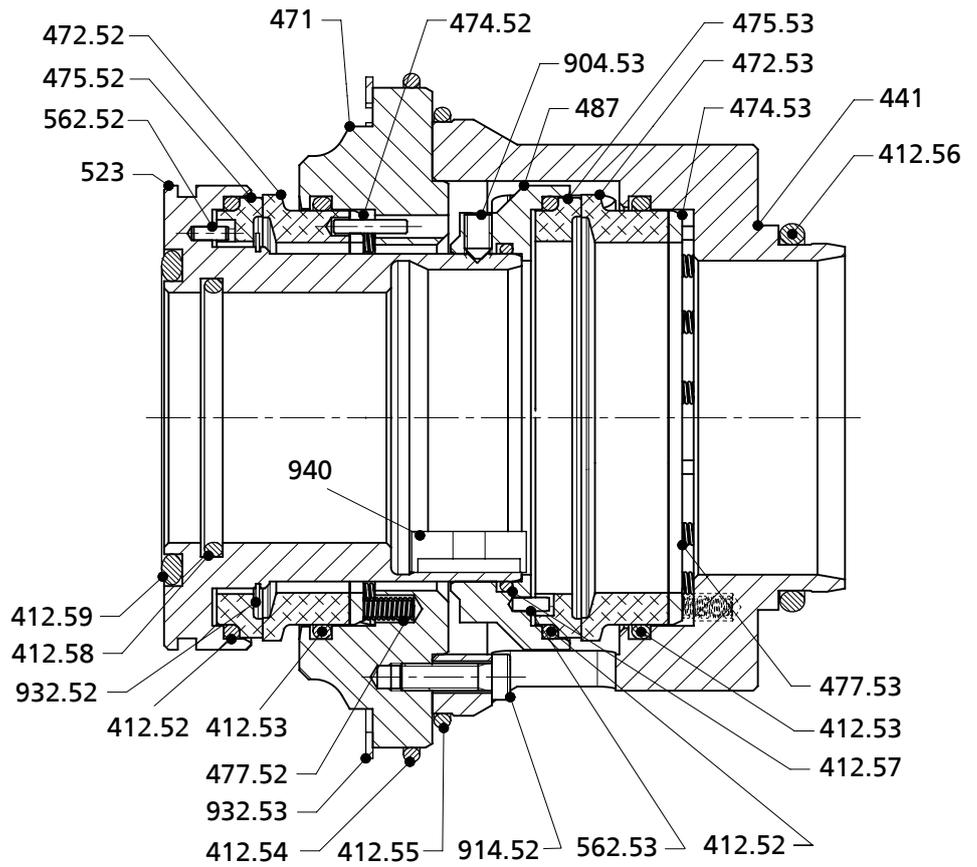


Fig. 18: Section

Table 10: List of components

Part No.	Description	Part No.	Description
412.52/.53/.54/.55/.56/.57/.58/.59	O-ring	487	Mating ring carrier
441	Shaft seal housing	523	Shaft sleeve
471	Seal cover	562.52/.53	Parallel pin
472.52/.53	Primary ring	904.53	Grub screw
474.52/.53	Thrust ring	914.52	Hexagon socket head cap screw
475.52/.53	Mating ring	932.52/.53	Circlip
477.52/.53	Spring for mechanical seal	940	Key

## 9.1.5 Cartridge seal C055/065M1-4STQ

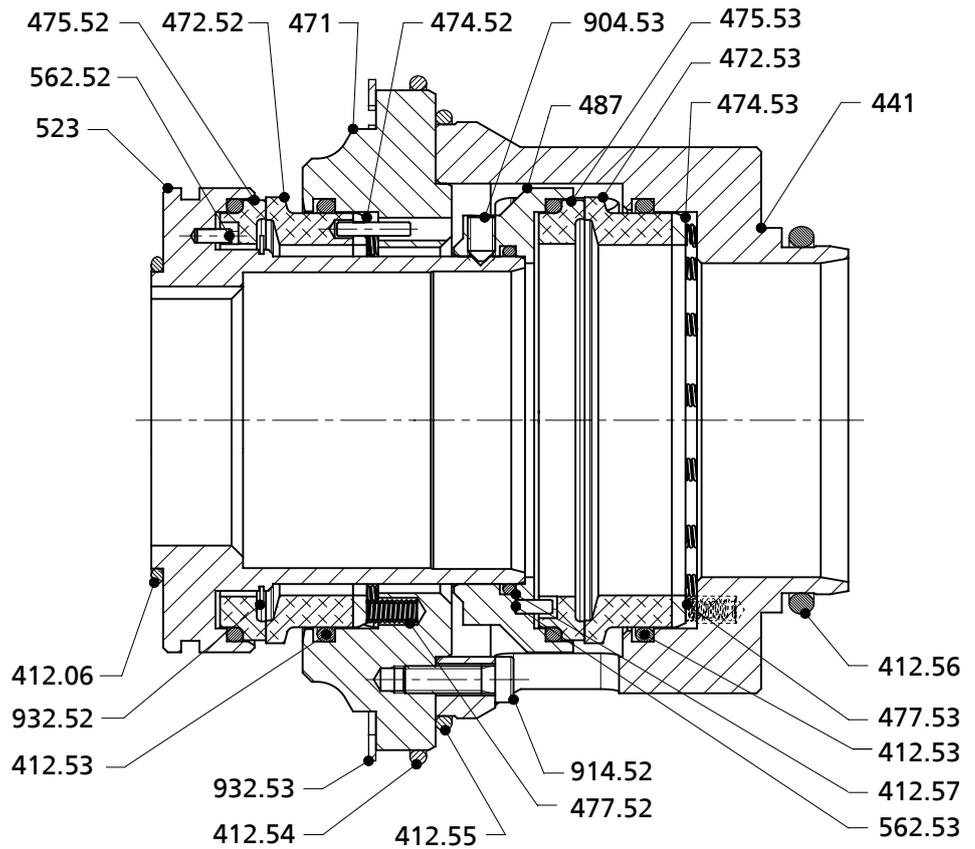


Fig. 19: Section

Table 11: List of components

Part No.	Description	Part No.	Description
412.06/.53/.54/.55/.56/.57	O-ring	487	Mating ring carrier
441	Shaft seal housing	523	Shaft sleeve
471	Seal cover	562.52/.53	Parallel pin
472.52/.53	Primary ring	904.53	Grub screw
474.52/.53	Thrust ring	914.52	Hexagon socket head cap screw
475.52/.53	Mating ring	932.52/.53	Circlip
477.52/.53	Spring for mechanical seal		

9.1.6 Cartridge seal C120/120M1-4STQ

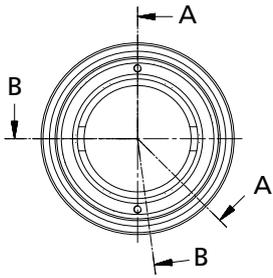


Fig. 20: Section axes

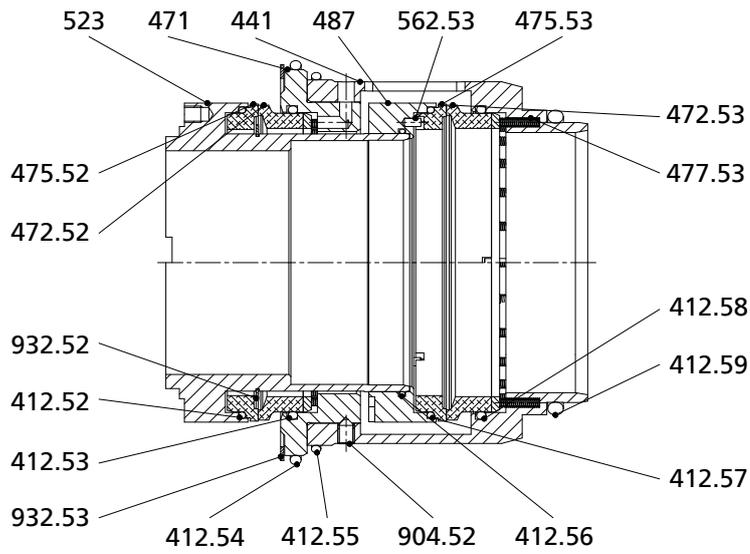


Fig. 21: View A

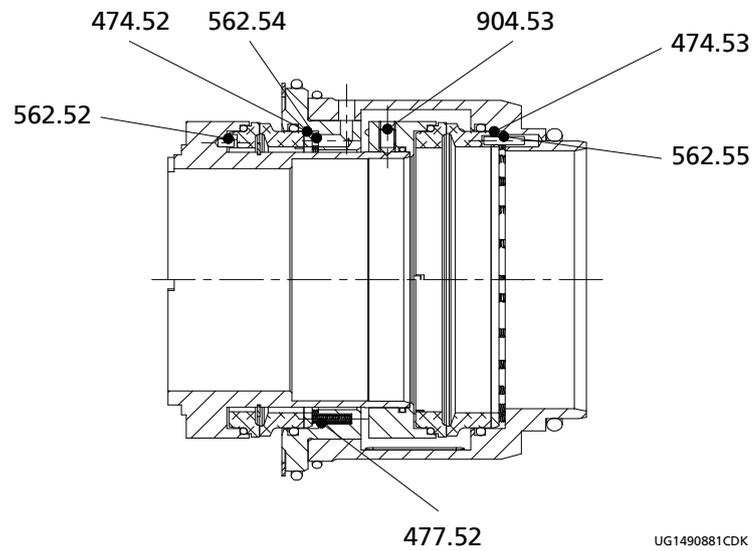


Fig. 22: View B

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Table 12: List of components

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

9.1.7 Cartridge seal C150/160M1-4STQ

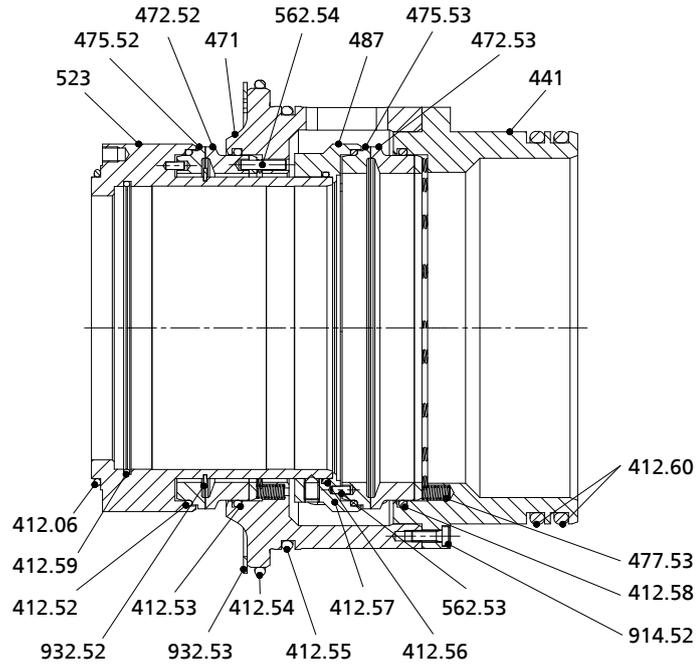


Fig. 23: View A

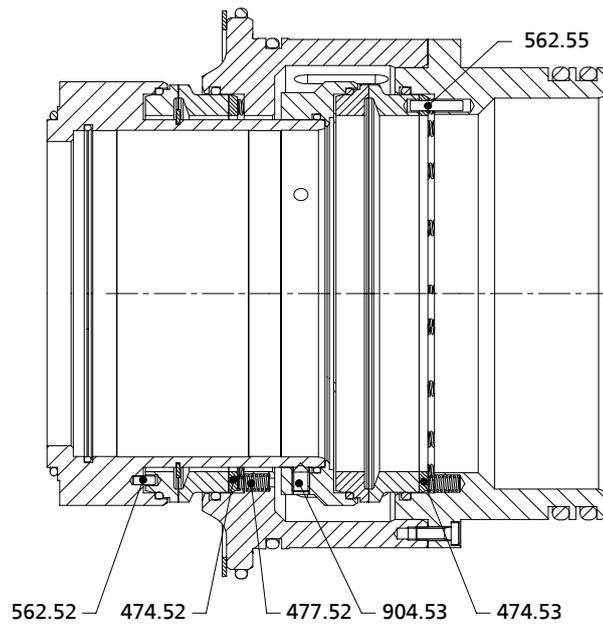


Fig. 24: View B

Table 13: List of components

Part No.	Description	Part No.	Description
412.06/.52/.53/.54/.55/.56/.57/.58/.59/.60	O-ring	487	Mating ring carrier
441	Shaft seal housing	523	Shaft sleeve
471	Seal cover	562.52/.53/.54/.55	Parallel pin
472.52/.53	Primary ring	901	Hexagon head bolt
474.52/.53	Thrust ring	904.53	Grub screw
475.52/.53	Mating ring	914.52	Hexagon socket head cap screw
477.52/.53	Spring for mechanical seal	932.52/.53	Circlip

9.1.8 Cartridge seal C190/190M1-4STQ

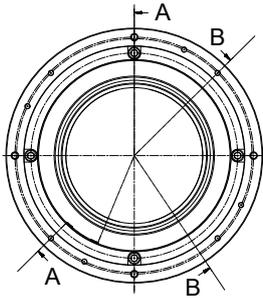


Fig. 25: Section axes

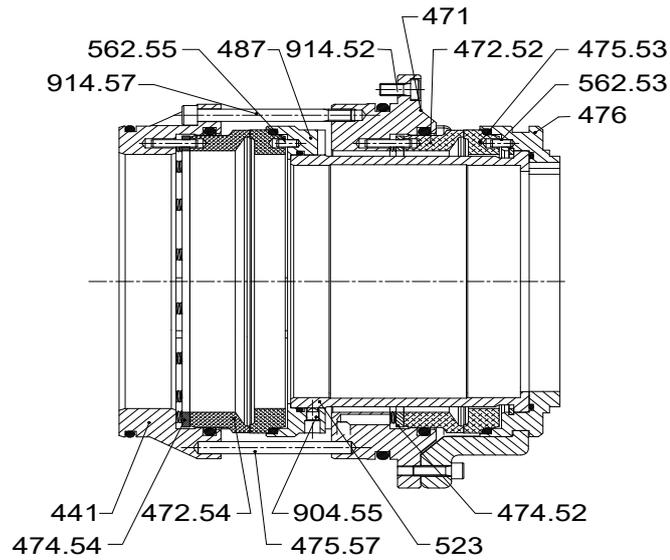


Fig. 26: View A

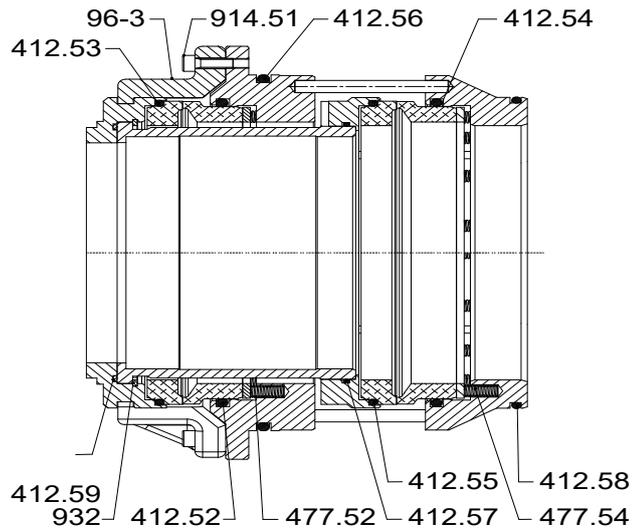


Fig. 27: View B

Table 14: List of components

Part No.	Description	Part No.	Description
412.51/.52/.53/.54/.55/.56/.57/.58/.59	O-ring	487	Mating ring carrier
471	Seal cover	523	Shaft sleeve
473	Primary ring carrier	562.53/.55/.57	Parallel pin
472.52/.54	Primary ring	904.55	Grub screw
474.52/.54	Thrust ring	914.51/.52/.54/.57	Hexagon socket head cap screw
475.53/.55	Mating ring	932	Circlip
476	Mating ring carrier	96-3	Assembly fixture
477.52/.54	Spring for mechanical seal		

2580.821/07-EN







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