

KSB Mechanical Seal

## Double Mechanical Seals

for Etabloc, Etanorm Type Series  
Back-to-Back Arrangement  
With Seal Supply System

## Supplementary Operating Manual



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Supplementary Operating Manual Double Mechanical Seals

Original operating manual

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## 1 Supplementary Operating Manual

### 1.1 General

This supplementary operating manual accompanies the installation/operating manual. All information contained in the installation/operating manual must be observed.

**Table 1:** Relevant operating manuals

Type series	Reference number of the installation/operating manual
Etabloc	1173.8
Etanorm	1311.8

### 1.2 Technical data

**Design details** The shaft is sealed by two unbalanced single bi-directional mechanical seals to EN 12756 in back-to-back arrangement, with barrier fluid system.

#### Seal size / material variant

**Table 2:** Material variant

Bearing bracket <sup>2)</sup>	Mechanical seal			
	Inboard, 433.01		Outboard, 433.02	
	Size and type of mechanical seal	Material variant	Size and type of mechanical seal	Material variant <sup>1)</sup>
WS25	KU028S / M7G49	Q1Q1KGG	KU028S / M7N	Q1BVGG
WS35	KU038S / M7G49		KU038S / M7N	
WS50				
WS60				
WS55	KU048S / M7G49		KU048S / M7N	

**Table 3:** Material code

Position	Description	Code letter	Materials
1	Primary ring	Q1	SiC, silicon carbide, sintered without pressure
2	Mating ring	B	Resin-impregnated hard carbon
		Q1	SiC, silicon carbide, sintered without pressure
3	Secondary seal	V	Fluoroelastomer (Viton)
		K	Perfluoroelastomer
4	Spring	G	CrNiMo steel
5	Other components	G	CrNiMo steel

### 1.3 Dismantling the shaft seal

- ✓ Dismantle the pump as described in the relevant operating manual.
- ✓ The back pull-out unit has been placed in a clean and level assembly area.
  1. Undo nuts 920.02 at seal cover 471. Slide the seal cover against the bearing bracket.
  2. Undo nuts 920.15 (if any) at casing cover 161.
  3. **For models with clamped casing cover:** Undo transport locks 901.98 and remove cover plates 81-92.01 and 81-92.02 with transport locks 901.98 and lock washers 554.98. Remove casing cover 161 from the bearing bracket.  
**For models with bolted casing cover:** Use forcing screws 901.31 to remove casing cover 161 from bearing bracket 330.

<sup>1</sup> For units with a closed thermosyphon (TS) system: material variant Q1Q1KGG

<sup>2</sup> Refer to the data sheet for the bearing bracket used

4. Pull shaft sleeve 523 with the rotating assemblies of mechanical seals 433.01 and 433.02 off shaft 210.
5. Take seal cover 471 off shaft 210.
6. Remove circlip 932.05 and the ring from casing cover 161.
7. Remove the stationary assembly (mating ring) of mechanical seal 433.01 from casing cover 161.
8. Remove the stationary assembly (mating ring) of mechanical seal 433.02 from seal cover 471.
9. Loosen and remove the rotating assembly of mechanical seals 433.01 and 433.02 from shaft sleeve 523.
10. Remove and dispose of gasket 400.15 (for WS25 joint ring 411.15) and gasket 400.75.

#### 1.4 Installing the shaft seal

##### Installing the mechanical seal

The following rules must be observed when installing the mechanical seal:

- Work cleanly and accurately.
- Only remove the protective wrapping of the contact faces immediately before installation takes place.
- Prevent any damage to the sealing surfaces or O-rings.

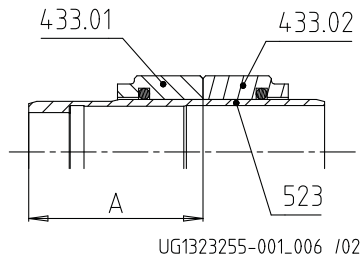


Fig. 1: Adjusting dimension A

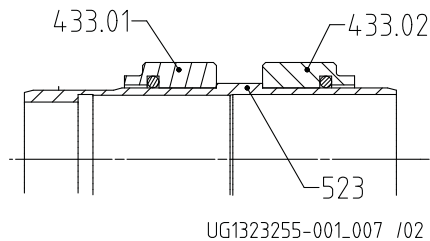




Fig. 2: Installing the mechanical seal for WS55

**Table 4:** Adjusting dimension

Bearing bracket	Adjusting dimension A
	[mm]
WS25	53,5
WS35	63
WS50	
WS60	
WS55	See Fig. "Installing the mechanical seal for WS55".

- ✓ Carry out / observe the steps and information given in the pump operating manual.
- ✓ The bearing assembly as well as the individual parts have been placed in a clean and level assembly area.
- ✓ All dismantled parts have been cleaned and checked for wear.
- ✓ Any damaged or worn parts have been replaced by original spare parts.
- ✓ The sealing surfaces have been cleaned.
  1. Clean shaft sleeve 523, and touch up any score marks or scratches with a polishing cloth, if necessary. If score marks or scratches are still visible, fit new shaft sleeve 523.

	<b>NOTE</b>
	To reduce friction forces when assembling the seal, wet the shaft sleeve and the location of the stationary ring with water.

	<b>CAUTION</b>
	<b>Elastomers in contact with oil/grease</b> Shaft seal failure! <ul style="list-style-type: none"> <li>▷ Use water as assembly lubricant.</li> <li>▷ Never use oil or grease as assembly lubricant.</li> </ul>

2. Fit the rotating assembly of mechanical seals 433.01 and 433.02 on shaft sleeve 523 (observe distance A , see Fig. "Adjusting dimension A").
3. Carefully position the stationary assembly (mating ring) of mechanical seal 433.01 with the O-ring in casing cover 161. Make sure to apply pressure evenly.
4. Insert the ring and circlip 932.05 in casing cover 161.
5. Carefully position the stationary assembly (mating ring) of mechanical seal 433.02 with the O-ring in seal cover 471. Make sure to apply pressure evenly.
6. Position gasket 400.15 (for WS25: joint ring 411.15) in seal cover 471.
7. Slide seal cover 471 onto shaft 210 until it rests against bearing bracket 330.
8. Slide shaft sleeve 523 (with the rotating assemblies) with new gasket 400.75 onto shaft 210.
9. **On models with a bolted casing cover:** Screw back but do not remove forcing screws 901.31. Fit casing cover 161 on bearing bracket 330.
10. Fit and tighten nuts 920.15 at casing cover 161.
11. **On models with a clamped casing cover:** Fit casing cover 161 on bearing bracket 330. Insert screws 901.98 (transport lock) into bearing bracket 330 and tighten them to fasten the casing cover.
12. Fit and tighten nuts 920.02 at seal cover 471.
13. Carry out / observe the other relevant steps and information given in the pump operating manual.

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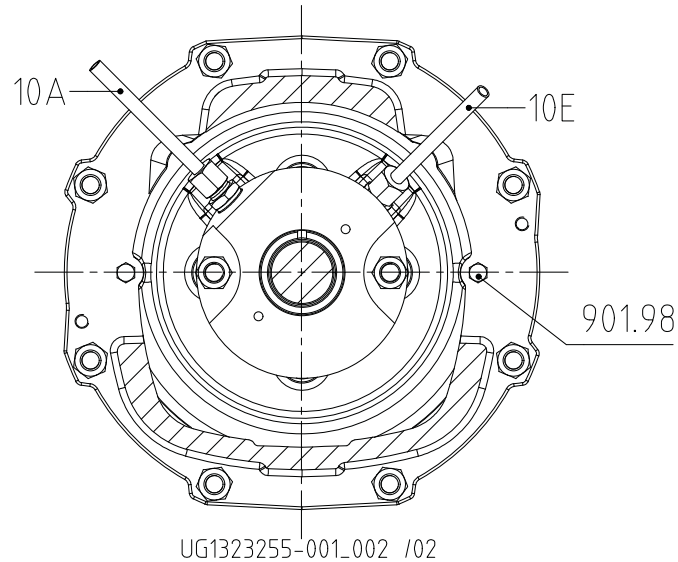
## 1.5 Seal supply system

### 1.5.1 Applications

In order to function properly, the mechanical seals require a barrier fluid. The barrier fluid completely fills the space between the inboard and the outboard mechanical seal. It serves two purposes:

- Dissipate friction heat
- Prevent the fluid handled from entering the sealing gap

### 1.5.2 Connections



**Fig. 3:** Connections of the seal supply system

**Table 5:** Connections

Connection <sup>3)</sup>	Description	Size
10A	Barrier fluid outlet	G 1/4
10E	Barrier fluid inlet	G 1/4

<sup>3)</sup> Plugged during transport

**1.5.3 Requirements to be met by the seal supply system**

**Pipework routing requirements** When routing pipework and flexible tubing, prevent any high points or ensure that high points can be vented separately to prevent dry running of the mechanical seal. The connecting pipes between the main pipe and the pump must be routed with a continuously rising slope to assure self-venting of the pipe and the mechanical seal, respectively.

**Barrier fluid pressure**

**Table 6: Barrier fluid pressure**

Type of system	Barrier fluid pressure <sup>4)</sup>	Calculating barrier fluid pressure during operation
Phosphating plant	1.5 to 2 bar higher than system pressure of fluid to be sealed	$P_{\text{barrier}} = 3.5 \text{ bar} + P_{\text{inlet}}$ (measured at the suction nozzle)
E-coating plant	Approx. 4 bar higher than system pressure of fluid to be sealed	$P_{\text{barrier}} = 5.5 \text{ bar} + P_{\text{inlet}}$ (measured at the suction nozzle)

**Large-scale industrial plants**

- Barrier fluid**
  - Ultrafiltrate (residual solvent content approx. 50% of the solvent in the paint)
  - Return barrier fluid to ultrafiltration stage.

Monitor the ultrafiltrate for contamination (clouding). In the event of a malfunction make sure the ultrafiltrate does not reach the barrier fluid vessel.
- Barrier fluid pressure**
  - Install a pressure boosting pump to ensure the barrier fluid pressure required.
  - Fit a by-pass valve in the return line, for instance, to maintain the minimum pressure. This valve must close tightly during idle periods and be used in conjunction with a sufficiently sized bladder accumulator to maintain the pressure in the system (e.g. in the event of a power failure or operating errors).
  - To ensure equal distribution of the barrier fluid, install orifice plates in the lines downstream of the mechanical seals. Use downstream valves for fine-tuning only.
  - Secure the barrier fluid system against barrier pressure failure (e.g. due to power failure), as the absence of barrier pressure will result in mechanical seal failure.
- Barrier fluid temperature**
  - The temperature of the barrier fluid should be within the processing range of the paint (normally 25 to +30 °C).
- Circulation flow**
  - To prevent the formation of paint deposits in the seal supply system and to stabilise the temperature in the sealing gap, we recommend a circulation flow of 2.5 - 5 l/min per seal.

**Small systems**

- Barrier fluid**
  - Ultrafiltrate
  - DI water with a slightly increased solvent content, e.g. 5 – 10 % butyl glycol
- Barrier fluid pressure** Ensure sufficient barrier fluid pressure by means of a continuous nitrogen supply or compressed air supply via a suitable pressure regulating valve.
- Thermosyphon system**
  - The thermosyphon vessel should be located approximately 1 metre above the centreline of the pump and connected with pipework.
  - Install pipes made of chrome nickel molybdenum cast steel with an inside diameter  $\geq 9 \text{ mm}$  and a steady rise, in order to avoid air pockets and consequent dry running of the mechanical seals.
  - Each pump must be provided with its own thermosyphon system so that the mechanical seals can be monitored individually and failure of one mechanical seal will not pose a risk to the others.
  - The pipe bend radius must be as large as possible to keep pipe friction losses as low as possible.
  - In order to stabilise the temperature, a circulating pump must be installed in the system. (Contact operator about explosion protection requirements.)

<sup>4</sup> Also during pump standstill



- Monitor the barrier fluid level by means of a level switch (contact operator about explosion protection requirements).
- Barrier fluid refill is by means of a manual refill pump.
- When a closed thermosyphon system is used, a SiC/SiC combination is recommended for the outboard mechanical seal as well, to avoid wear or damage to the seal faces caused by paint deposits or sticking.

**Cooling** Cooling of the thermosyphon system is required if the following limits are exceeded:

- Speeds > 1450 rpm
- Seal diameter > 60 mm
- Barrier fluid pressure > 6 bar
- Ambient temperature > 30 °C

1.6 General assembly drawing with list of components

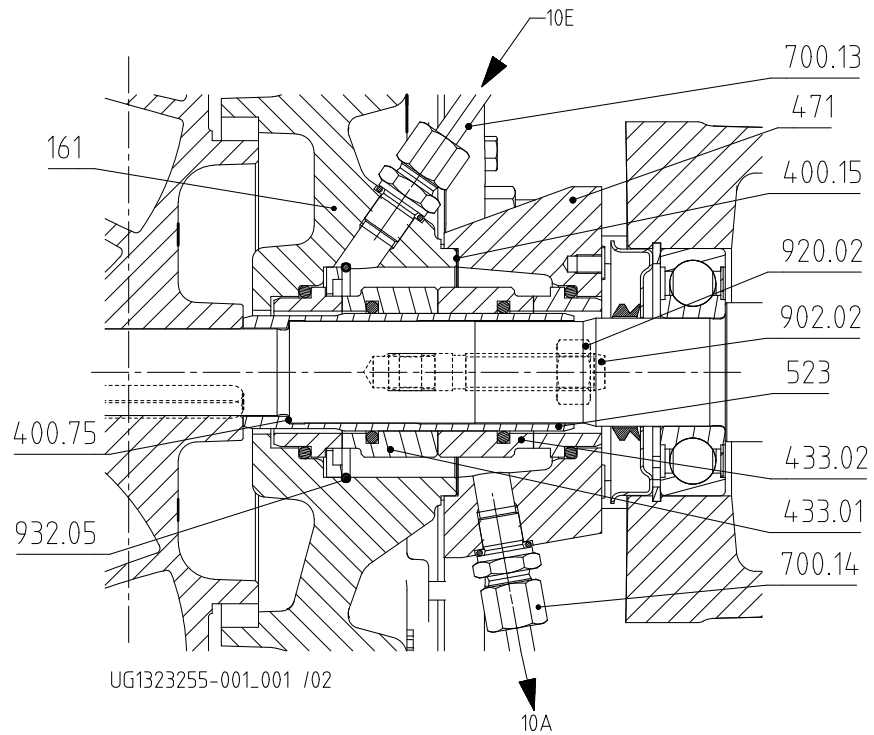


Fig. 4: General assembly drawing of seal

Table 7: List of components

Part No.	Description
161	Casing cover
400.15 <sup>5)</sup> /7.75	Gasket
433.01	Mechanical seal (inboard)
433.02	Mechanical seal (outboard)
471	Seal cover
523	Shaft sleeve
700.13/.14	Piping
902.02	Stud
920.02	Hexagon nut
932.05	Circlip

Table 8: Connections

Connection <sup>6)</sup>	Description	Size
10A	Barrier fluid outlet	G 1/4
10E	Barrier fluid inlet	G 1/4

<sup>5</sup> For bearing bracket WS25: joint ring 411.15

<sup>6</sup> Plugged during transport





**KSB SE & Co. KGaA**

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

Tel. +49 6233 86-0

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