Double Mechanical Seals

"Back-to-back" Arrangement
With Seal Supply System

Supplementary Operating Manual

KSB

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Supplementary Operating Manual Double Mechanical Seals

Original operating manual

Contents

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 numbers of the operating/installation manuals
Etaprime	2746.8

1.2 Technical data

Design details

The shaft is sealed by two non-balanced single bi-directional mechanical seals to EN 12756 in back-to-back arrangement, with barrier system.

Seal size/ material variant

Table 2: Material variant

Shaft unit	Mechanical seal			
	Outboard		Inboard	
	Seal size	Material variant[1)]	Seal size	Material variant
25	KU028S-M7-N	Q1BVGG	KU028S-M7-G49	Q1Q1K9GG-G
35	KU038S-M7-N		KU038S-M7-G49	

Material code

Table 3: Material code

Item	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)
		K9	Perfluoroelastomer
4	Spring	G	CrNiMo steel
5	Other components	G	CrNiMo steel

1.3 Removing the shaft seal

1.3.1 Removing the shaft seal - shaft units 25/35

1. Dismantle the pump as described in operating manual 2746.8.
2. Take off hexagon nut 920.95, disc 550.01 (shaft unit 25 only), safety device 930.95, impeller 230 and discs 550.02/550.04.
3. Take key 940.01 out of the shaft keyway.
4. Remove special part 720.02/720.03.
5. Unscrew hexagon nut 920.02 from stud 902.02 and slide seal cover 471 towards the motor end.
6. **Model with bolted casing cover:** Unscrew nuts 920.24.
7. Press casing cover 161 with mating ring holder 476.01, parallel pin 562.01, the mating ring of inboard mechanical seal 433.01 and circlip 932.01 out of the drive lantern and pull them off shaft sleeve 523.
8. Pull shaft sleeve 523 with the two rotating assemblies of mechanical seals 433.01/433.02 off shaft 210.

1) For units with closed thermosyphon system: material variant Q1Q1K9GG

9. Take seal cover 471 off shaft 210.
10. Pull the rotating assemblies of both mechanical seals 433.01/433.02 off the shaft sleeve.
11. Remove circlip 932.01 from casing cover 161.
12. Remove mating ring holder 476.01 with the mating ring of inboard mechanical seal 433.01 from casing cover 161.
13. Remove the mating ring of inboard mechanical seal 433.01 from mating ring holder 476.01 and remove the mating ring of outboard mechanical seal 433.02 from seal cover 471.
14. Remove gasket 400.01 from the shaft and gasket 400.04 from seal cover 471.

1.4 Fitting 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.
- Clean the shaft, shaft sleeve and the mating ring locations in mating ring holder 476.01 and seal cover 471, respectively, and gently remove any deposits.

NOTE

To reduce friction forces when assembling the seal, wet the shaft sleeve and the mating ring location with water.

1.4.1 Fitting the shaft seal - shaft units 25/35

1. Press the mating ring of outboard mechanical seal 433.02 into seal cover 471. Press in by hand or fingers only, making sure that pressure is applied evenly.
2. Glue mating ring holder 476.01 with fitted parallel pin 562.01 into casing cover 161 using Loctite Type 573.
3. Press the mating ring of inboard mechanical seal 433.01 into mating ring holder 476.01.
   Press in by hand or fingers only, making sure that pressure is applied evenly.
4. Additionally secure the mating ring with circlip 932.01.
5. Slide the rotating assemblies of inboard and outboard mechanical seals 433.01 and 433.02, respectively, onto the non-fitted shaft sleeve 523.
6. Slide seal cover 471 with the fitted mating ring of mechanical seal 433.02 and inserted gasket 400.04 onto shaft 210.
7. Slide gasket 400.01 onto shaft 210.
8. Push pre-assembled shaft sleeve 523 onto shaft 210.
9. Slide pre-assembled casing cover 161 onto shaft sleeve 523 and press it into the recess in drive lantern 341.
10. **Model with bolted casing cover:** Fit hexagon nuts 920.24.
11. Slide seal cover 471 into casing cover 161 and fasten with hexagon nuts 920.02.
12. Place key 940.01 into the keyway of shaft 210. Slide discs 550.02/550.04, impeller 230, safety device 930.95 and disc 550.01 (shaft unit 25 only) onto shaft 210 and tighten with hexagon nut 920.95.
13. Fit special part 720.02 in elbow 731.4 and special part 720.03 in seal cover 471 using Loctite Type 573 and hemp.

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:

- It dissipates the frictional heat developed.
- It prevents the pumped product from entering the sealing gap.

1.5.2 Connections

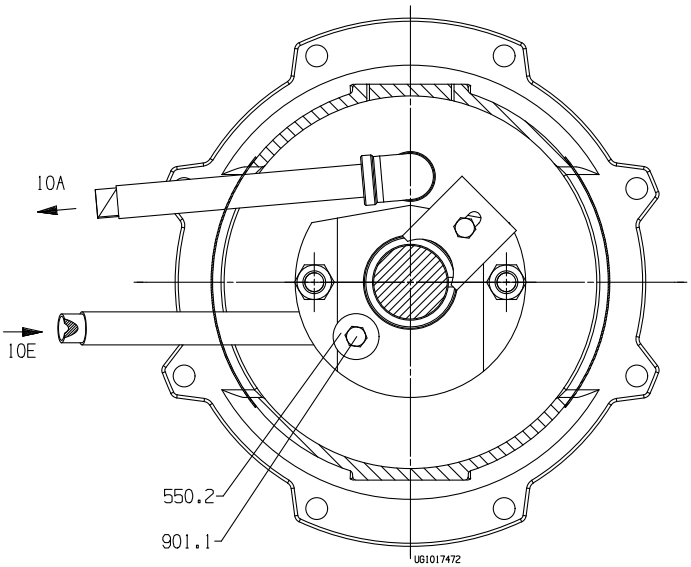

Fig. 1: Connections of seal supply system

Table 4: Connections

Connection[2)]	Description	Size[3)]
10A	Barrier fluid outlet	R3/8
10E	Barrier fluid inlet	R3/8

1.5.3 Requirements to be met by the seal supply system

Pipework routing requirements

When routing pipework and flexible tubing, make sure that there are no 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 5: Barrier fluid pressure

Type of system	Barrier fluid pressure[4)]	Calculating barrier fluid pressure during operation
Phosphatising plant	1.5-2 bar higher than system pressure of fluid to be sealed	$P_{barrier}$ = 3.5 bar + P_{inlet} (measured at the suction nozzle)
Dip painting plant	Approx. 4 bar higher than system pressure of fluid to be sealed	$P_{barrier}$ = 5.5 bar + P_{inlet} (measured at the suction nozzle)

2) Plugged during transport
3) EN 10226-1
4) Also during pump standstill

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 preferably be within the normal processing range of the paint, i.e. approx. 25-30 °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 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 ≥ 9 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.)
- 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, we recommend to use a SiC/SiC combination on 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

1.6.1 Shaft units 25/35

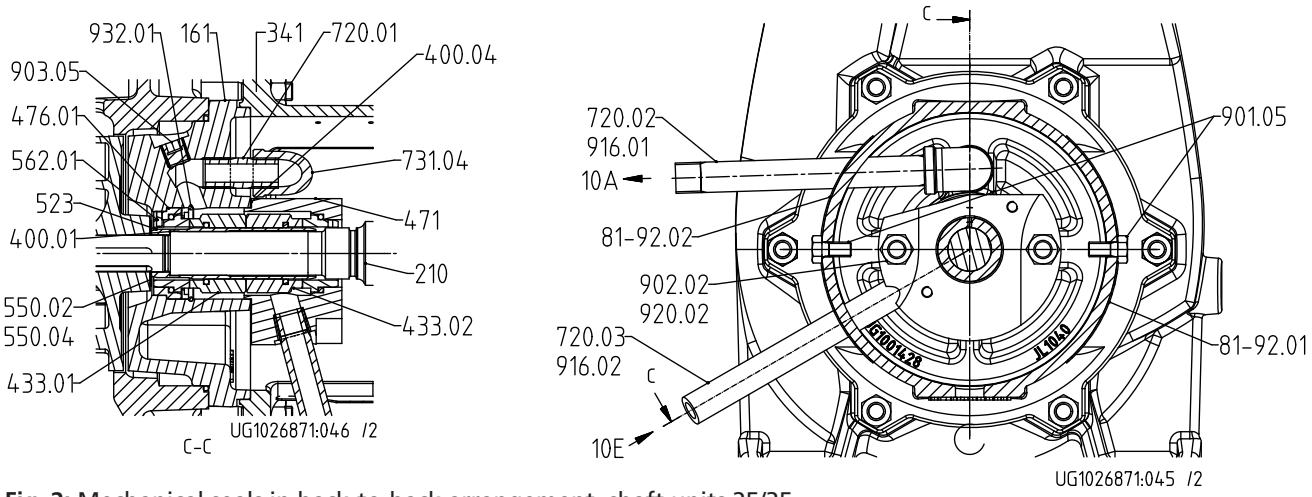

Fig. 2: Mechanical seals in back-to-back arrangement, shaft units 25/35

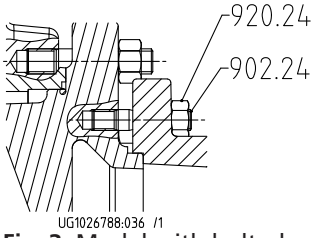

Fig. 3: Model with bolted casing cover

Table 6: List of components

Part No.	Description
161	Casing cover
210	Shaft
341	Drive lantern
400.01/.04	Gasket
433.01/.02	Mechanical seal
471	Seal cover
476.01	Mating ring holder
523	Shaft sleeve
550.02/.04	Disc
562.01	Parallel pin
720.01/02/.03	Special part
731.04	Pipe union
81-92.01/.02	Cover plate
901.05	Hexagon head bolt
902.02/.24	Stud
903.05	Screw plug
916.01/.02	Plug
920.02/.24	Nut
932.01	Circlip

Table 7: Connections

Connection[5)]	Description	Size[6)]
10A	Barrier fluid outlet	R3/8
10E	Barrier fluid inlet	R3/8

5) Plugged during transport
6) EN 10226-1

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