

Double Mechanical Seals

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
Etaprime L	2753.81
Etaprime B	2753.82

1.2 Technical data

Design details The shaft is sealed by 2 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

Shaft unit	Mechanical seal			
	Outboard (433.02)		Inboard (433.01)	
	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	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

- ✓ Dismantle the pump as described in operating manual 2753.81 or 2753.82.
 - ✓ The back pull-out unit has been placed in a clean and level assembly area.
1. Take hexagon nut 920.95, disc 550.95 (shaft unit 25 only), safety device 930.95, impeller 230 and discs 550.02/.04 off shaft 210.
 2. Take key 940.01 out of the shaft keyway.
 3. Take spacer sleeve 525 (shaft unit 35 only) off shaft 210.
 4. Remove fitting 720.13/.14 and joint ring 411.13/.14.
 5. Undo hexagon nut 920.02 at seal cover 471. Abut the seal cover against the bearing bracket or motor, as applicable.

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

6. **On models with a clamped casing cover:** Undo bolt 901.98 (long-coupled design) or screw 914.22 (close-coupled design) and remove. Separate casing cover 161 from the locating fit of bearing bracket 330 or from the locating fit of drive lantern 341, as applicable. Pull it off shaft 210.
On models with a bolted casing cover: Undo hexagon nut 920.15. Use forcing screws 901.31 to separate casing cover 161 from bearing bracket 330 or drive lantern 341. Pull it off shaft 210.
7. Pull shaft sleeve 523 with the two rotating assemblies of mechanical seals 433.01/433.02 off shaft 210.
8. Remove seal cover 471 with the mating ring of outboard mechanical seal 433.02 from shaft 210.
9. Remove circlip 932.05 and the ring from casing cover 161.
10. Remove the stationary mating ring of mechanical seal 433.01 from the casing cover.
11. Remove the stationary mating ring of mechanical seal 433.02 from seal cover 471.
12. Loosen and remove the rotating assembly of mechanical seals 433.01 and 433.02 from shaft sleeve 523.
13. Remove and dispose of gasket 400.15 (for SU 25: 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.

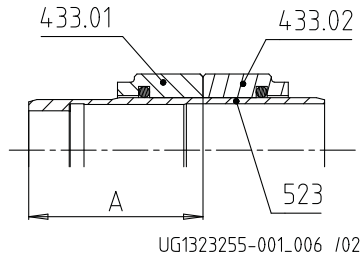




Fig. 1: Adjusting dimension A

Table 4: Adjusting dimension

Bearing bracket	Adjusting dimension A
WS25	53,5
WS35	63

- ✓ Observe / carry out the notes and steps given in operating manual 2753.81/.82.
 - ✓ 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 the mating ring location in casing cover 161 and seal cover 471. Gently remove any deposits. If score marks or scratches are still visible, replace the affected parts.

	NOTE
	<p>To reduce friction forces when assembling the seal, wet the shaft sleeve and the location of the stationary ring with water.</p>
	CAUTION
	<p>Elastomers in contact with oil/grease Shaft seal failure!</p> <ul style="list-style-type: none"> ▷ Use water as assembly lubricant. ▷ Never use oil or grease as assembly lubricant.

2. Fit the rotating assembly of mechanical seals 433.01 and 433.02 on shaft sleeve 523 (observe distance 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 SU 25: joint ring 411.15) in seal cover 471.
7. Slide seal cover 471 onto shaft 210 until it rests against bearing bracket 330 or the motor.
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. Slide casing cover 161 onto bearing bracket 330 or drive lantern 341, as applicable. While doing so, carefully slide seal cover 471 onto casing cover 161.
On models with a clamped casing cover: Slide casing cover 161 onto bearing bracket 330 or drive lantern 341, as applicable. While doing so, carefully slide seal cover 471 into casing cover 161. Insert bolts 901.98 (long-coupled design) or screws 914.22 (close-coupled design) and tighten to fasten casing cover 161 in place.
10. Fit and tighten hexagon nuts 920.15 at casing cover 161.
11. Fit and tighten nuts 920.02 at seal cover 471.
12. Slide spacer sleeve 525 (shaft unit 35 only) onto shaft 210.
13. Place key 940.01 in the shaft keyway.
14. Slide discs 550.02/.04, impeller 230, disc 550.95 (shaft unit 25 only) and safety device 930.95 onto the shaft. Tighten with hexagon nut 920.95.
15. Position fittings 720.13/.14 with joint rings 411.13/.14 in seal cover 471 or casing cover 161, as applicable, and tighten.
16. Carry out all other relevant steps given in operating manual 2753.81 or 2753.82.

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

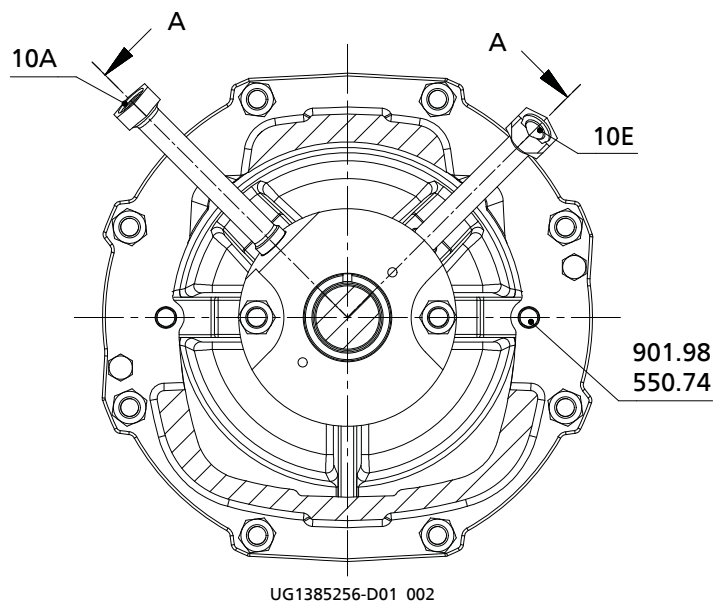


Fig. 2: Connections of seal supply system

Table 5: Connections

Connection ²⁾	Description	Size ³⁾
10A	Barrier fluid outlet	G 1/4
10E	Barrier fluid inlet	G 1/4

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 ⁴⁾	Calculating barrier fluid pressure during operation
Phosphatising 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)

2) Plugged during transport
3) According to ISO 228
4) Also during pump standstill

Large-scale industrial plants

- | | |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Barrier fluid | <ul style="list-style-type: none"> ▪ Ultrafiltrate (residual solvent content approx. 50% of the solvent in the paint) ▪ Return barrier fluid to ultrafiltration stage. <p>Monitor the ultrafiltrate for contamination (clouding). In the event of a malfunction make sure the ultrafiltrate does not reach the barrier fluid vessel.</p> |
| Barrier fluid pressure | <ul style="list-style-type: none"> ▪ 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 | <ul style="list-style-type: none"> ▪ The temperature of the barrier fluid should be within the processing range of the paint (normally 25 to +30 °C). |
| Circulation flow | <ul style="list-style-type: none"> ▪ 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 | <ul style="list-style-type: none"> ▪ 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 | <ul style="list-style-type: none"> ▪ 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 | <p>Cooling of the thermosyphon system is required if the following limits are exceeded:</p> <ul style="list-style-type: none"> ▪ 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

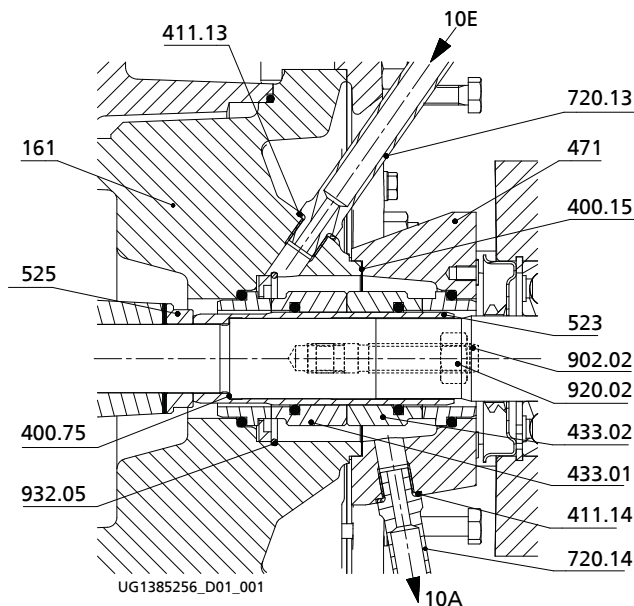


Fig. 3: Variant with double mechanical seal in back-to-back arrangement

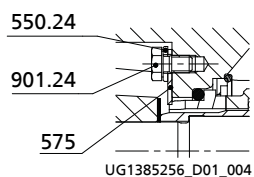


Fig. 4: Position of anti-rotation device SU 25

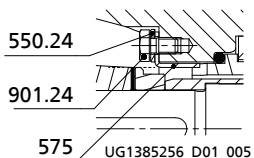


Fig. 5: Position of anti-rotation device SU 35

Part number	Description	Part number	Description
161	Casing cover	720.13/.14	Fitting
400.15 ⁵⁾ /.75	Gasket	901.24	Hexagon head bolt
411.13/.14	Joint ring	902.02	Stud
433.01	Mechanical seal (inboard)	920.02	Nut
433.02	Mechanical seal (outboard)	932.05	Circlip
471	Seal cover		
523	Shaft sleeve	Auxiliary connections	
525 ⁶⁾	Spacer sleeve	10A	Barrier fluid outlet
550.24	Disc	10E	Barrier fluid inlet
575	Strip		

5) Only for shaft unit 25: joint ring 411.15
6) For shaft unit 35 only; shaft unit see data sheet.



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