

TA-Luft and ATEX compliant sealing solution
for a distillation unit

EagleBurgmann[®]
Rely on excellence

M481KL shaft seal

Information **EN06061**



Operating conditions

Distillation vessel: Steel, 2,5 m³ capacity
Medium: Organic product with high boiling point

Hazardous material class for this medium: Toxic

Operating temperature: 250 ... 280 °C

Maximum temperature: 300 °C

Operating pressure 0.005 ... 1.8 bar absolute (vacuum)

Rotational speed: 41 min⁻¹

Seal incl. materials:

M481KL-D24/100-E11.1, BQ2KHGE (1.4571)-BQ2V/KHGE (1.4122)

Application: Agitator with top drive

Supply system: TS 1016 with cooling coil and SPU 2040/A006-00 circulation pump

Barrier medium: White oil

Barrier pressure: 3 bar

Operation mode: The temperature of the barrier medium at the seal outlet is approx. 60 °C

ATEX: Ex-Zone 1 corresponding to II 2 GD cb T3, temperature class T3

Polymerization barrier for flushing:

Nitrogen feed, 3 standard liters per min (acc. to ISO standard).

In the process stage presented here, a high-boiling toxic product is separated in a steel distillation vessel from Chema Prozess- und Systemtechnik from the residue by evaporation. The distillation vessel is run discontinuously in batch operation. This means that the vessel is filled at the beginning of the process and then heated up to the operating temperature. Due to different boiling points the product is separated by distillation.

When the vessel has cooled down, the residue is removed and the vessel is refilled.

The medium to be separated has a melting point of 155 °C and a tendency to resublimates, i.e. it changes its state of aggregation directly from gaseous into solid. This tendency to resublimates is problematic because product deposits can build up on the seal and can lead to the seal hanging up.

EagleBurgmann solves sealing problems

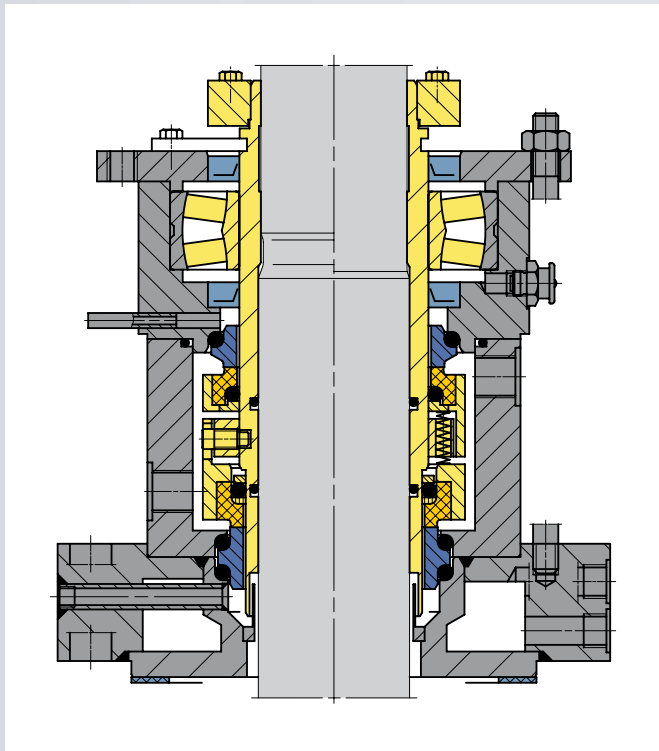
Until now, the sealing was performed using a double packing with a flush. The problem with this sealing solution was that it was not conform to current industrial standards based on the today's legislation such as TA-Luft and ATEX. In order to fulfill these requirements, the stuffing box packing was replaced by TA-Luft-compliant mechanical seal, type M481KL-D24, which is conform to ATEX Zone 1 II GD cb T3. The seal is a double mechanical seal with integrated bearing in cartridge design. The seal is self-closing.

EagleBurgmann Germany GmbH & Co KG

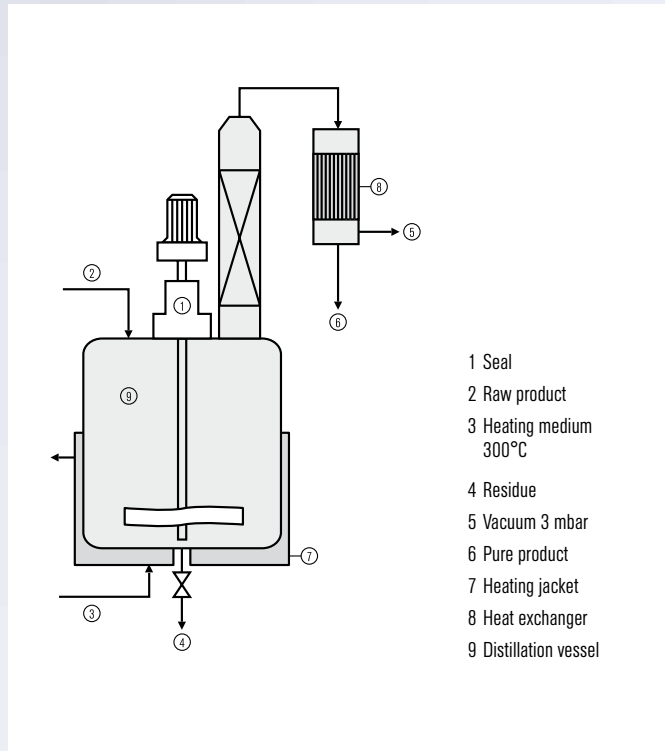
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EagleBurgmann M481KL-D24-E11 Agitator Seal



- 1 Seal
- 2 Raw product
- 3 Heating medium 300°C
- 4 Residue
- 5 Vacuum 3 mbar
- 6 Pure product
- 7 Heating jacket
- 8 Heat exchanger
- 9 Distillation vessel

Diagram showing the high temperature distillation unit

Special features include an integrated “cooling flange” and the use of a polymerization barrier. However, in this application the “cooling”- flange is not utilized for cooling but for heating, in order to prevent product resublimation. Temperatures produced here range between 155 and 200 °C.

The polymerization barrier, which is a sort of labyrinth, is arranged below the seal on the product side and is continually flushed with nitrogen. This prevents the medium from reaching the seal and forming a deposit, resulting in the seal hanging up. Normally, polymerization barriers utilize liquid quench media.

Originally, it was proposed to use a medicinal grade white oil. However, the fact that this produced minor leakage into the product was unacceptable to the customer. It was therefore decided to go with nitrogen as the flush medium without retro-fitting of the seal. It is recommended to use a throttle for gaseous media in order to achieve higher flow rates. It is also possible to achieve precise drain-off of any leakage in order to fulfill TA-Luft air quality control requirements.

Specifically because of the high temperatures involved, a special perfluoro rubber (KH) that is resistant up to 315 °C is used for the elastomers on the product side and to some extent on the atmosphere side as well.

Successful upgrade to industrial standard

With this contemporary seal solution the plant operator rebuilt its equipment right up to current industrial standards and to fulfill the demands of legislation in every respect as set out by TA-Luft and ATEX. Emissions are reduced to a minimum and security of employment also achieves significant improvement. In addition, the seal's lifetime is also noticeably prolonged.