

Compact-design double mechanical seal for screw compressors

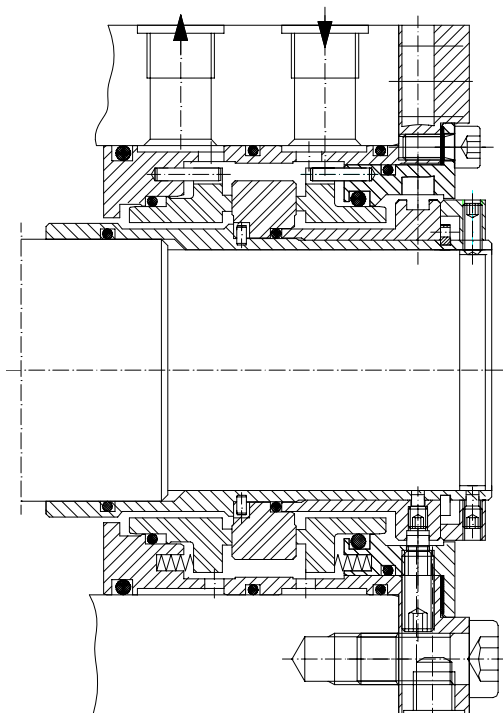
Environment protecting sealing of process gas - oil mixtures

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Aerzener Screw Compressors of the series VMY are single-stage compressors with oil injection for process gases. This equipment is used in the chemical and petrochemical industry, power plants and closed-loop refrigeration systems. To be sealed are natural and inert gas, methane, propane, hydrocarbons, helium, ammonium, HCL as well as mixed and process gases. In addition, due to oil injection, a certain oil content is also present and needs to be sealed. The mechanical seal is sealing the drive-shaft of the compressor.

Operation of the compressor:

1. The process gas is taken in and being compressed by means of the piston geometry.
2. From a separate oil container oil is sprayed into the compression space. This assures that main- and secondary piston do not contact each other and that the gap between piston and housing is made gas-tight. In addition the oil injection enables the compressor to cope with fluctuations in flow, temperatures and pressures.
3. The compressed gas is being passed on. The oil goes through a filter, a so-called demister, an oil-cooler and -separator and is then put again into the oil circulation system.



Requirements for the mechanical seal and its accessories:

The specific requirements upon seal and accessories were as follows:

- Due to the media applied, an environmentally protective mechanical double-seal was to be used.
- Due to the very compact design of the equipment, leaving only a short installation space for the seal of 100mm with a 4" (101,65) dia. shaft, required a special seal-design.
- Elimination of previously encountered problems with customary mechanical seals, namely distortion of seal-faces leading to excessive leakage and premature failure.
- Heavy-duty barrier fluid unit as an accessory assuring a high degree of heat dissipation.
- Using the compressor-own oil supply system as barrier fluid for the mechanical seal.

Technical Data/ Application parameter of the seal:

• p_{\max} (dyn.):	25 bar
• p_{\max} (stat.):	50 bar
• $p_{\text{compressor}}$:	20 bar
• $p_{\text{barrier fluid}}$:	22 bar
• Oil- t_{\max} :	80 °C
• Oil- t_{\min} :	25 °C
• oil flow rate:	7 l/min
• oil flow rate $_{\min}$:	4 l/min
• heat dissipation:	6 kW
• shaft dia:	4" (101,65 mm)
• n_{\max} :	3600 rpm

Mechanical Seal and Barrier fluid system:

To fulfil the special design requirements as well as operating data, a double mechanical seal, customized to the equipment, CHETRA style 351F-4", was designed (ref. pict. 1).

This seal was built in a compact <face-to-face> arrangement to fit into the installation space.

At the same time, measures were taken to eliminate seal-face distortions.

To effect this requirement a solid rotary centre-seal-face was placed running against two stationary seal-faces. These 2 faces – with multiple springs – are arranged in a stationary manner. (Sometimes such a concept is also referred to as „rotary seat“ with „stationary seal faces“).

In connection with the robust design and the stationary sealing arrangement, that is practically „self-aligning“, stable conditions on the seal-faces are prevailed.

An additional design measure increase operation safety – the inside seal is double-balanced. this assures that in case of barrier fluid pressure-loss the seal stays shut.

Material of the seal/ barrier fluid arrangement:

Seal-faces (rotary and stationary) are of Silicone carbide (SiSiC); secondary seals depending on media sealed are Viton (FPM), Neoprene (CR) or PTFE; other seals-components are made of stainless steel 1.4571 (316Ti).

The barrier fluid system, style 20LSK (ref. pict. 2) is in view of the amount of required heat dissipation designed with 20l capacity and equipped with a cooling line. Barrier fluid is oil taken from compressor-own oil supply system.

Prior to entering the seal, the oil passes through a cooler.

Additional accessories of the barrier fluid unit for operation, monitoring and safety aspects are:

- manual refill-pump to refill barrier fluid while equipment is in operation. For efficiency the volume per stroke is 30 cm³.
- 2-contact level switch (min/max) for monitoring the level with alarm signal
- sight glass for optical control
- measuring unit for pressure and temperature with valve and transformer gate
- safety valve (set at 12 bar)
- circulation pump

The whole barrier fluid system is ready-for-operation mounted upon a base-plate and connected to the seal through 1/2"-NPT-fittings.

