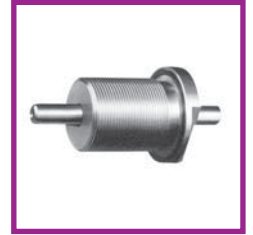


Mechanical Feedthroughs

Rotary Feedthroughs with
Magnetofluid Sealing



Rotary Feedthroughs with Magnetofluid Sealing

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Rotary Feedthroughs with Magnetofluid Sealing

Introduction

VACOM's rotary feedthroughs with magnetofluid sealing are delivered by RIGAKU, a leading manufacturer of these products. They stand out especially due to the following properties:

- Large transmission torque
- No backlash
- Appropriate for rough, fine and high vacuum
- High pressure capacity
- High reliability due to leak-free operation
- Very low magnetic leakage
- Maintenance-free design
- Long-term maintenance
- Up to 15,000 revolutions / minute
- Manufacturing of customised solutions (100 pieces and upward)

Functional principle

Unlike the conventional rotary feedthroughs with elastomer or bellow seal, a magnetic fluid is used as the dynamic seal that fills the gap between the moving shaft and its stationary housing. These liquid o-ring seal is held in place by powerful ring magnets without causing friction. This will result in no wearing or minimal heat generation so that long service life and high reliability are assured. The feedthroughs withstand differential pressures of above 2.5 bar. They have very low leak rates of up to 10^{-11} mbar l/s (He) or less and are absolutely vacuum suitable. They reach a rotational speed up to several thousand revolutions per minute. RIGAKU's rotary feedthroughs have already proven long life and reliability by its use as components of high power x-ray generators and semiconductor process equipment. Besides standard examples customised solutions are available.

Temperatur dependency

Because the magnetofluid is a liquid, the operating temperature is an important parameter for the usage of rotary feedthroughs.

A non-stop operation is possible up to a temperature of 60 °C. The use of water-cooled feedthroughs is recommended at higher temperatures. Furthermore the usage of temperature resistant carrier oils for the magnetofluid, such as PFPE, becomes necessary. Figure 1 allows a rough estimation of the point, when water cooling is recommended. Please contact your customer adviser for further information.

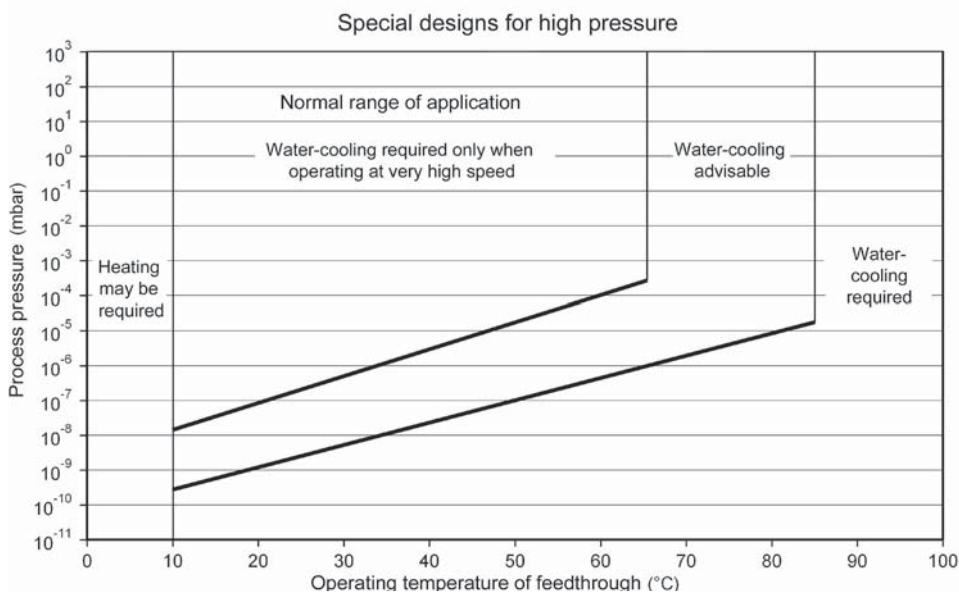


Figure 1

SUPERSEAL Series

Magnet alignment SUPERSEAL series

The SUPERSEAL series has an antipole alignment of the ring magnets. There are two ring magnets applied. The shaft itself serves as a pole shoe to support the ring magnets and the grooves for the sealing magnetofluid. The shaft's diameter is enlarged at the sealing area and designed to serve this purpose (see figure 2). This design is simpler and cheaper. Furthermore, it is possible to set static O-ring seals aside. However, it still has the same advantages concerning pressure capacity, leakage and service life as the RMS series.

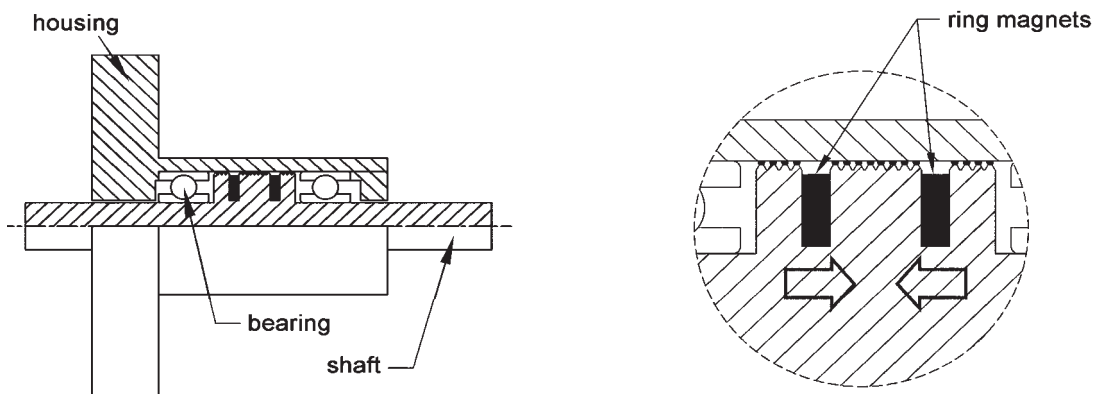


Figure 2

Magnet configuration RMS series

The standard feedthroughs of the RMS Series include 4 antipole ring magnets with the pole position: NS-SN-NS-SN. This alignment creates an especially strong field strength at the pole shoes which generate low external stray fields. Milled circular grooves are located at the pole shoes' inside, facing the shaft. The shaft itself is not weakened by grooves or the like. A strong magnetic field is concentrated in the gap between the magnet and the shaft, forming the magnetofluid into liquid o-rings between the grooves (see figure below) due to this design. A pressure stage is created between every two of these o-rings (see figure 3). Besides the very good leakage properties this design has another advantage, to withstand high differential pressures with few stages. Furthermore there evolves only minimal frictional heat due to the relatively big gap between magnet and shaft, as well as the low persistent forces of the magnetofluid. This also results in minimal maintenance requirements.

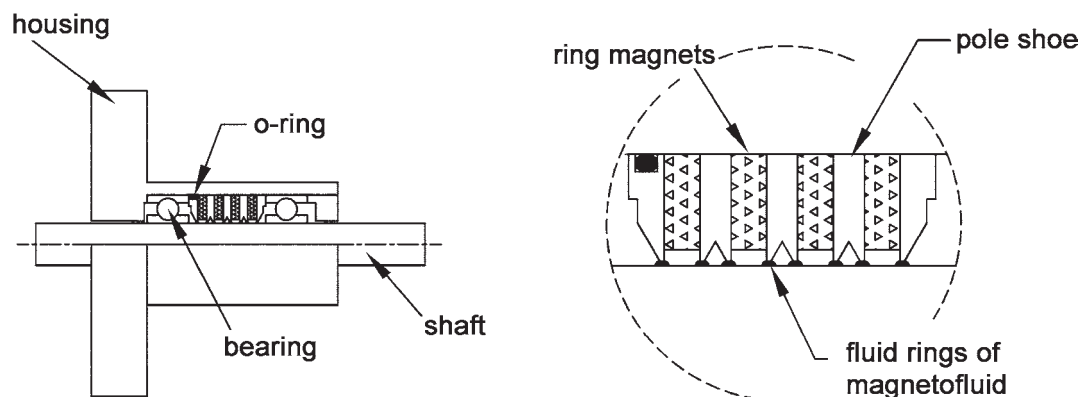
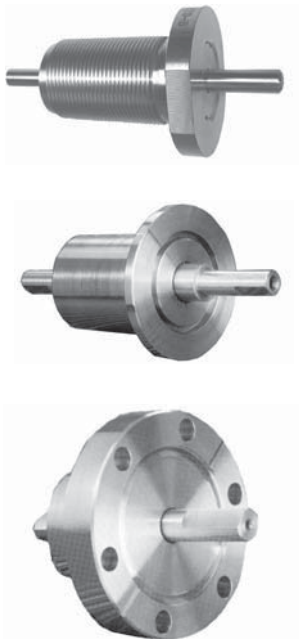


Figure 3

Rotary Feedthroughs with Magnetofluid Sealing

SUPERSEAL Series

Simple rotary feedthrough with bulkhead fitting for wall fastening, with KF or CF flange



- No internal o-ring seals
- Very low magnetic stray fields
- No magnets inside vacuum
- Rugged stainless steel shafts Ø 6 mm or Ø 8 mm
- Revolution 5000 RPM without load
- Pressure-resistant up to 2.5 bar differential pressure
- Insensitive to external magnetic fields (> 500 Gauss)
- Magnetofluid: synthetic oil or PFPE

Technical data

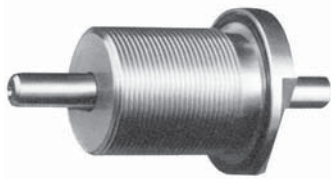
- Transmittable torque
 - shaft Ø 6 mm 5.65 Nm
 - shaft Ø 8 mm 18.00 Nm
- Max. revolution (loadfree)
 - synthetic oil 5000 RPM
 - PFPE 2500 RPM
- Static friction resistance
 - synthetic oil 7.8 Ncm
 - PFPE 14.2 Ncm
- Rotary friction resistance (100 RPM)
 - synthetic oil 4.3 Ncm
 - PFPE 15.6 Ncm
- Vacuum area
 - synthetic oil up to 10⁻⁸ mbar
 - PFPE up to 10⁻⁹ mbar
- Max. temperature
 - synthetic oil 80 °C
 - PFPE 100 °C
- Vapour pressure magnetofluid
 - synthetic oil 10⁻¹⁰ mbar
 - PFPE 10⁻¹² mbar
- Max. pressure difference 2.5 bar
- Helium leakage rate < 5 x 10⁻⁹ mbar l/s
- Material
 - housing / shaft stainless steel 17-4 PH
 - bearing grease Fomblin / Krytox blend
- Vapour pressure grease lubricant 10⁻¹³ mbar
- Max. bearing load (static) 1350 N
- Vacuum side arbitrarily

Order Code	Vacuum connection	Shaft diameter [mm]	Magnetofluid bearing oil
10C-26100900	DN40CF	8	synthetic oil
10C-26101400	DN40CF	6	synthetic oil
10C-26101100	DN25KF	8	synthetic oil
10C-26101300	DN25KF	6	synthetic oil
10C-26101200	M26	6	synthetic oil
10C-26100902	DN40CF	8	PFPE
10C-26101402	DN40CF	6	PFPE
10C-26101102	DN25KF	8	PFPE
10C-26101302	DN25KF	6	PFPE
10C-26101002	M26	8	PFPE
10C-26101202	M26	6	PFPE

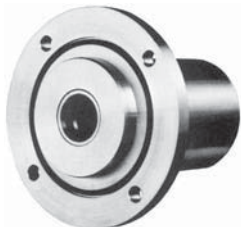
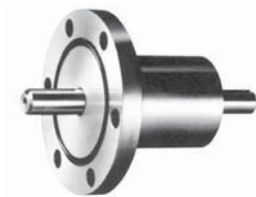
Rotary Feedthroughs with Magnetofluid Sealing

RMS Series

Standard feedthroughs for a large range of applications in industry and research



- Shaft ball bearings on both sides of the magnetofluid sealing
- Transmission of large torques
- Very high revolutions
- Various vacuum connections
- Robust and long-lasting
- Design with water cooling (optional)
- Design with a hollow shaft (optional)



Technical data

- | | |
|----------------------------|---|
| ■ Vacuum range | < 10 ⁻⁸ mbar |
| ■ Operating temperature | 0...100 °C (without cooling max. 60 °C) |
| ■ Differential pressure | < 2.5 bar |
| ■ He-leakage rate | < 10 ⁻¹¹ mbar l/s |
| ■ Material housing | stainless steel type 303 |
| ■ Material shaft | stainless steel type 630 |
| ■ Material pole shoes | stainless steel type 630 |
| ■ Ball bearing greasing | |
| vacuum side | high vacuum grease |
| atmosphere side | Grease with added anticorrosive |
| ■ Magnetofluid bearing oil | |
| standard | synthetic oil |
| reactive gases | PFPE |
| high temperature | PFPE |
| ■ Material O-Rings | FKM (included in shipment) |
| ■ Water cooling | |
| flow | 1...4 l/min |
| pressure | 3 bar |
| water temperature | 25 °C |
| connection | thread Rc 1/8" (2x or 4x) |

Option hollow shaft (HS)

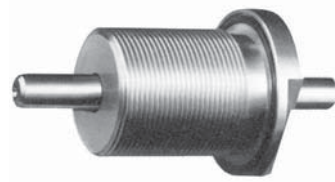
The models of the RMS series with a hollow shaft (HS) can be assembled with shafts of non-magnetic materials and special shafts (tubes, drive shafts or the like). The magnetofluid sealed area of the RMS-HS series is situated between a cylindrical hull (called hollow shaft) and the external housing. The hollow shaft and the housing can be turned in the opposite direction. The shaft that is actually going to be turned, is inserted accurately through the hollow shaft. Two static O-ring seals inside of the hollow shaft connect it with the shaft and seal the gap vacuum tight. If the shaft is turned, the hollow shaft turns as well. You can protect the shaft and the hollow shaft from distortions or displacements by means of a clamp (optional).

RMS-BS/RMS-LS Series

- Rotary feedthroughs for wall fastening
- RMS-BS series with housing exposed to atmosphere
- RMS-LS series with housing exposed to vacuum
- O-Ring groove on the front of the housing
- Including O-Ring seal, screw nut and washer
- Shaft diameter (mm): 5, 6, 10 and 20



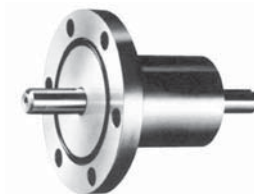
Serie RMS-BS



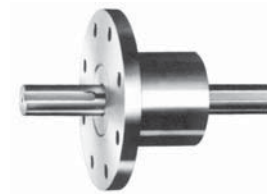
Serie RMS-LS

RMS-F1/RMS-F2 Series

- Rotary feedthroughs with flange
- RMS-F1 series with housing exposed to atmosphere
- RMS-F2 series with housing exposed to vacuum
- Flange with through holes and O-Ring groove
- Including O-Ring seal
- Shaft diameter (mm): 5, 6, 10, 12, 20, 30 and 40



Serie RMS-F1

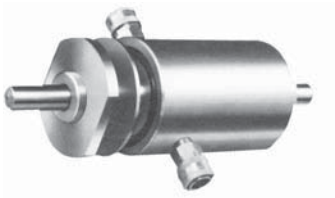


Serie RMS-F2

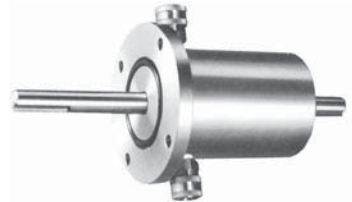
Rotary Feedthroughs with Magnetofluid Sealing

RMS-F1-W/RMS-BS-W Series

- Rotary feedthroughs with water cooling and connection for wall fastening or with flange
- Housing exposed to atmosphere
- RMS-F1-W series with flange, through holes and O-Ring groove
- RMS-BS-W series with thread for wall fastening and O-Ring groove at the front, including screw nut and washer
- Including O-Ring seal
- Shaft diameter of series RMS-BS-W (mm): 12 and 20
- Shaft diameter of series RMS-F1-W (mm): 6, 10, 12 and 20



Serie RMS-BS-W



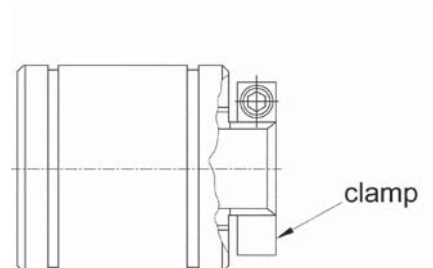
Serie RMS-F1-W

RMS-HS/RMS-HS-C Series

- Rotary feedthroughs with hollow shaft
- Housing exposed to atmosphere
- O-Ring groove at the front of vacuum side
- Design with or without safety clamp
- Including O-Ring seal
- Hollow shaft diameter (mm): 10, 12, 20, 24, 32, 38, 40, 50 and 75



Serie RMS-HS



RMS-F1-HS/RMS-F1-HS-C Series

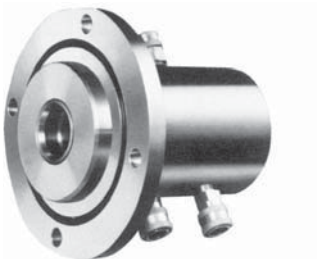
- Rotary feedthroughs with hollow shaft and flange
- Housing exposed to atmosphere
- Flange with through holes and O-Ring groove
- Design with or without safety clamp
- Including O-Ring seal
- Hollow shaft diameter (mm): 10, 12, 20, 24, 26, 32, 38, 40, 50 and 75



Serie RMS-F1-HS

RMS-F1-HS-W/RMS-F1-HS-W-C Series

- Rotary feedthroughs with hollow shaft, flange and water cooling
- Housing exposed to atmosphere
- Flange with through holes and O-Ring groove
- Design with or without safety clamp
- Including O-Ring seal
- Hollow shaft diameter (mm): 10, 12, 20, 24, 26, 32, 38, 40, 50 and 75



Serie RMS-F1-HS-W