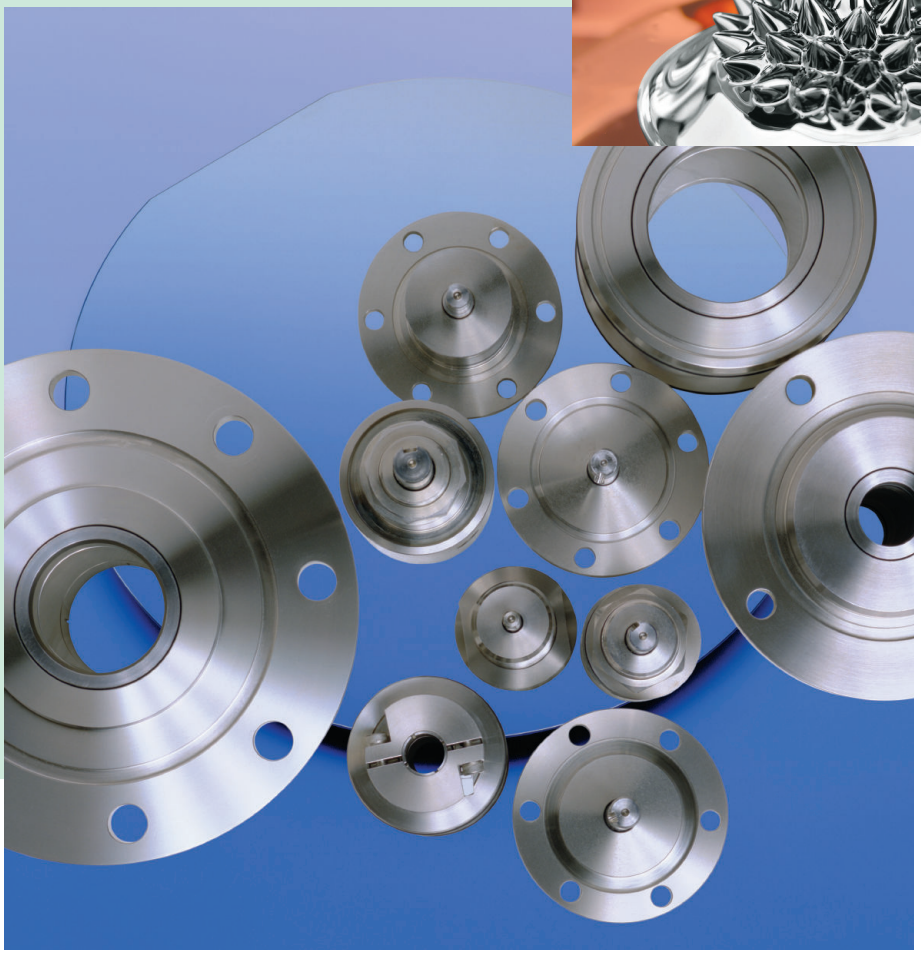
Rotary
Vacuum Products

Magnetic fluid sealing for vacuum and other environments

Magnetic Rotary Motion Feedthrough's





Rotary Vacuum Products

Magnetic fluid sealing for vacuum and other environments

MAGNETIC ROTARY MOTION FEEDTHROUGH

INTRODUCTION

Welcome to the Rotary Vacuum Products

Rotary Vacuum Products has been a world leader in the design and manufacturing of Magnetic Fluid Rotary Motion Feedthroughs since 1985. For nearly a quarter of a century Rotary Vacuum Products have consistently shown to be of extremely high quality at competitive prices. All of our highly skilled people are committed to producing the foremost Rotary Motion Feedthrough in the world.

Rotary Vacuum Products patented designs have consistently proven to have a longer life in demanding applications as compared to our competitors. Rotary Vacuum Products SuperseaL series not only performs to our exceptionally high standards but has a very manageable price tag. We also specialize in Custom Products and our highly skilled and experienced engineering team works closely with you to design for your application needs.

We offer a complete rebuild service on any product we sell as well as any competitor products.

Thank you for your interest in Rotary Vacuum Products and we look forward to a lasting relationship.

David Mahoney
CEO

Rotary Vacuum Products

Magnetic fluid sealing for vacuum and other environments

MAGNETIC ROTARY MOTION FEEDTHROUGH

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Magnetic fluid sealing for vacuum and other environments

Rotary Magnetic Seal Handling Precautions



1. When you operate the Magnetic seal unit for the first time, or when it has not been turned for two weeks or more, we suggest that it should be conditioned by rotating the shaft 20 or more turns before exposure to vacuum. As the way of drive, you don't mind either the hand-operating or the motor drive. This is because of reducing the pressure rise with spike-shaped when it starts, as there is a possibility that it will happen after stop and leaving for the long time.

2. Do not use any solvents around the Magnetic seal unit! Solvents such as alcohol, acetone, paint thinner, etc., can attack the fluid sealing element in the Magnetic seal unit, causing it to leak. If cleaning of the seal housing or shaft is necessary, use a small amount of alcohol moistening a cloth, taking care to prevent any excess solvent from entering the Magnetic seal unit.

3. Do not use solvents or soap solution for leak testing! Using solvent or soap solution leak testing methods will destroy the fluid sealing element in the Magnetic seal unit, causing it to leak! Always leak test with a Helium Mass Spectrometer leak tester for best results.

4. Do not apply a pressure in excess of the Magnetic seal pressure rating! Unless otherwise specified, the maximum pressure difference across the Magnetic seal unit is 1 kg/cm2, or 2.5 atmospheres, or 36.75 PSI.

5. A pressure rise (or 'pressure spike' or 'burp') might occur when first starting shaft rotation after evacuation. To minimize this condition, rotate the shaft prior to evacuation as per 1 above, and continue to rotate it during evacuation at about 5-10 RPM for at least 5 minutes.

6. Install the Magnetic seal unit in the correct direction! Note which side is intended for vacuum, and which side is intended for atmosphere during installation. Do not reverse them, or the unit could be damaged.

7. Do not lubricate the bearings! They are sealed and lubricated for the life of the unit. Lubricating oil or grease could damage the fluid seal element, causing it to leak.

8. Protect the Magnetic seal from particles! If the unit is to be used where particles of sand, silicon, heavy vacuum evaporation processes, install a shield to prevent the particles from entering and damaging the Magnetic seal unit.

9. When the Magnetic seal unit requires overhaul or repairs, please return it to Rotary Vacuum Products. Your Magnetic seal is a precision vacuum sealing spindle. Disassembling it will damage precision surfaces and components, possibly rendering it un-repairable.

10. The vacuum sealing surfaces of your Magnetic seal require careful attention. Please do not scratch any surface where an O-ring must seal. If you can feel a scratch with your fingernail, it will leak! Do not hammer on or drop the unit. Do not pry unit from your machine with pry bars. Do not hammer or drop anything on the shaft end, as this will damage the bearings.

Catalog Tips

Features

The unique Magnaseal design eliminates the grooved shafts found in competing products. The stronger, stiffer shafts provide high torque ratings per shaft size and reduced gas bursting during rotation, especially if side loading is applied. Many models employ larger bearings as well. Most flanged models embody flanges and housings machined as a single piece for optimum vacuum integrity and alignment.

These products are manufactured in the USA under Rotary Vacuum Products US Patent 4,605,233 and other patents. The balanced multi-magnet design covered by this patent means external magnetic fields are substantially reduced.

All products are suitable for use at pressures as low as 10-8 torr. Operation at lower pressures may be feasible (contact Rotary Vacuum Products for application information). Pressure differentials of 2 atmospheres (in either direction) are allowable. Operating temperature must never exceed 100 °C; continuous operation above 85 °C is not recommended. Higher temperatures are possible with water cooling or special fluid.

How to use this catalog

To select a feedthrough for a new application, locate the table for the appropriate shaft type (solid or hollow) and mounting style (through-hole, flanged, or bore mount). Dimensional and performance information is tabulated and keyed to an outline drawing. For application engineering assistance or information beyond the scope of the tabulated data, please contact Rotary Vacuum Products, Phone: 603-890-6001.

To identify the Magnaseal direct replacement for a Ferrofluidics/Ferrotec Corp. product, locate the FFC Part Number/Model Number at the bottom of each column of tabulated data or refer to the Product Cross Reference chart. For FFC products not listed, please contact Rotary Vacuum Products and our trained staff will assist you in finding a replacement seal.

Solid shaft styles

LSR ····· Low-profile through-hole mount
BS ····· Threaded neck nose mount
CF ····· Conflat flange mount
F1 ····· O-ring seal outside chamber
F2 ····· O-ring seal inside chamber

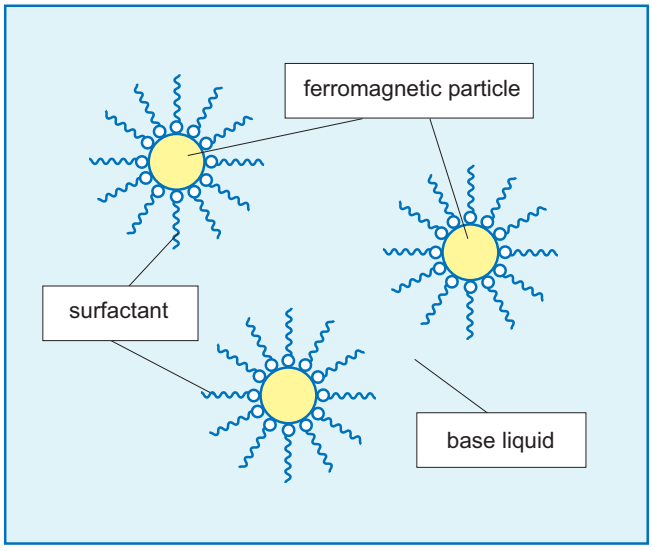
Hollow shaft styles

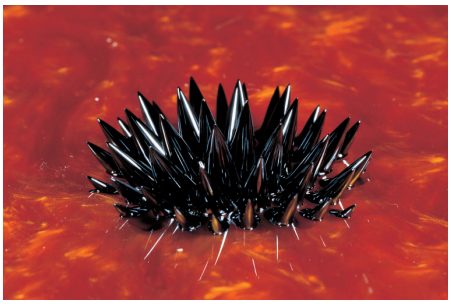
HS-C ····· Cartridge mount with shaft clamp
F1-HS-C···· Flange mount with shaft clamp

-W suffix ····· Water-cooled versions

Magnetic Fluid

Magnetic fluid is an unusual fluid in that it is attracted to a magnet. In the 1960s, NASA developed the magnetic fluid as part of its space programs. Magnetic fluid has three ingredients: ferromagnetic particles such as magnetite and composite ferrite, surfactant, and a base liquid such as water or oil. The surfactant coats the 10 nm-dia ferromagnetic particles to avoid coagulation and keep them stably dispersed in the base liquid, forming a ferromagnetic fluid. Its dispersibility also remains stable in high magnetic fields.

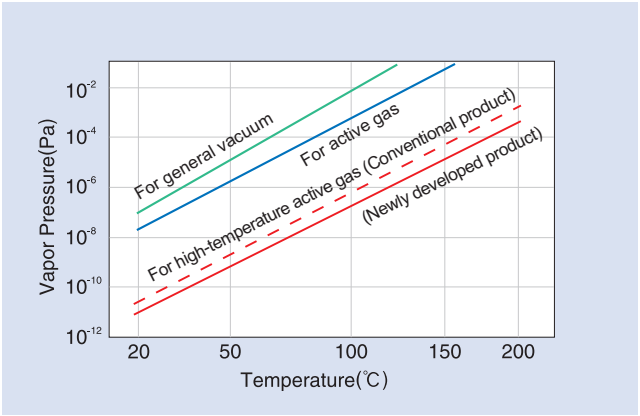




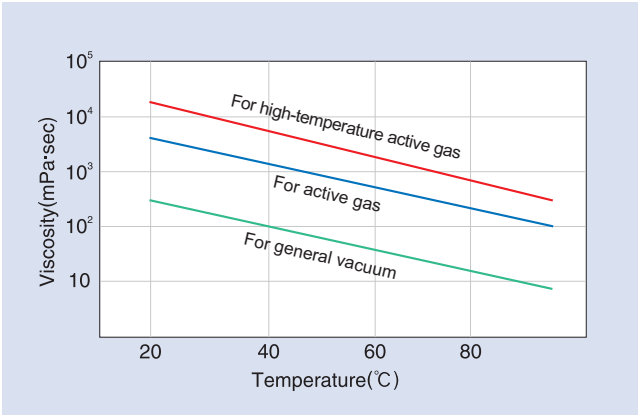
Spiking phenomenon

This photo shows a phenomenon called 'spiking' that occurs when magnetic fluid is placed in a container and a magnet is brought under the container. Magnetic force acting on the surface of the magnetic fluid produces 'spikes', that look like large nails sticking out of the surface.

Vapor pressure - temperature characteristics



Viscosity - temperature characteristics



Excellent Magnetic-field Resistance

Rotary Vacuum Products offers a magnetic rotary seal unit featuring high resistance to external magenetic fields. This feature comes from a magnetic circuit that is unique to Rotary Vacuum Products as well as high energy rare earth magnets

Magnets are arranged in opposition to each other (SN-NS) to produce the magnetic field distribution shown in Fig.1. The magnetic flux distribution changes abruptly at the edge of the pole pieces between S-S and N-N, and magnetic fluid converges towards the center of the magnetic flux (from both sides). If a magnetic circuit has only one magnet, an ideal convergence cannot be obtained because the magnetic flux will be dispersed. The magnets have excellent characteristics, such as a strong resistance to external magnetic field, and a large maximum energy product (BH) in comparison with conventional ferrite and alnico magnets.

Fig. 1: Conceptual drawing of magnetic flux distribution

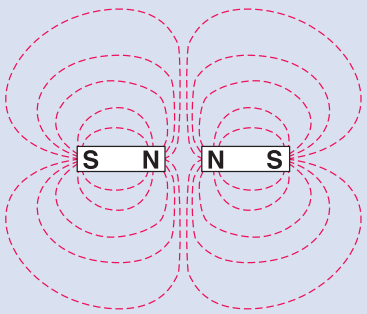
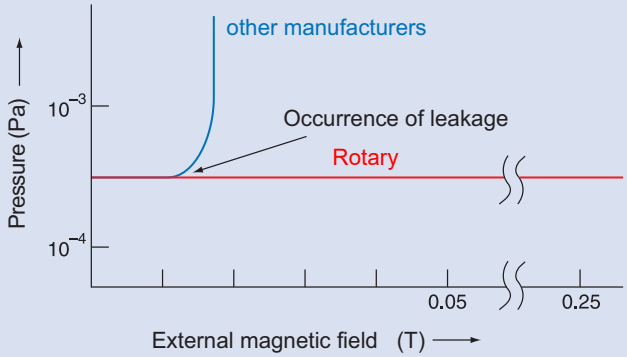
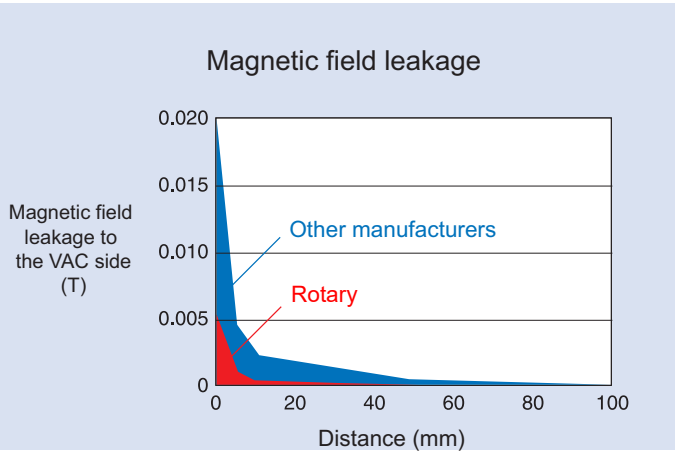


Fig. 2: Test results on magnetic-field resistance of magnetic rotary seal unit

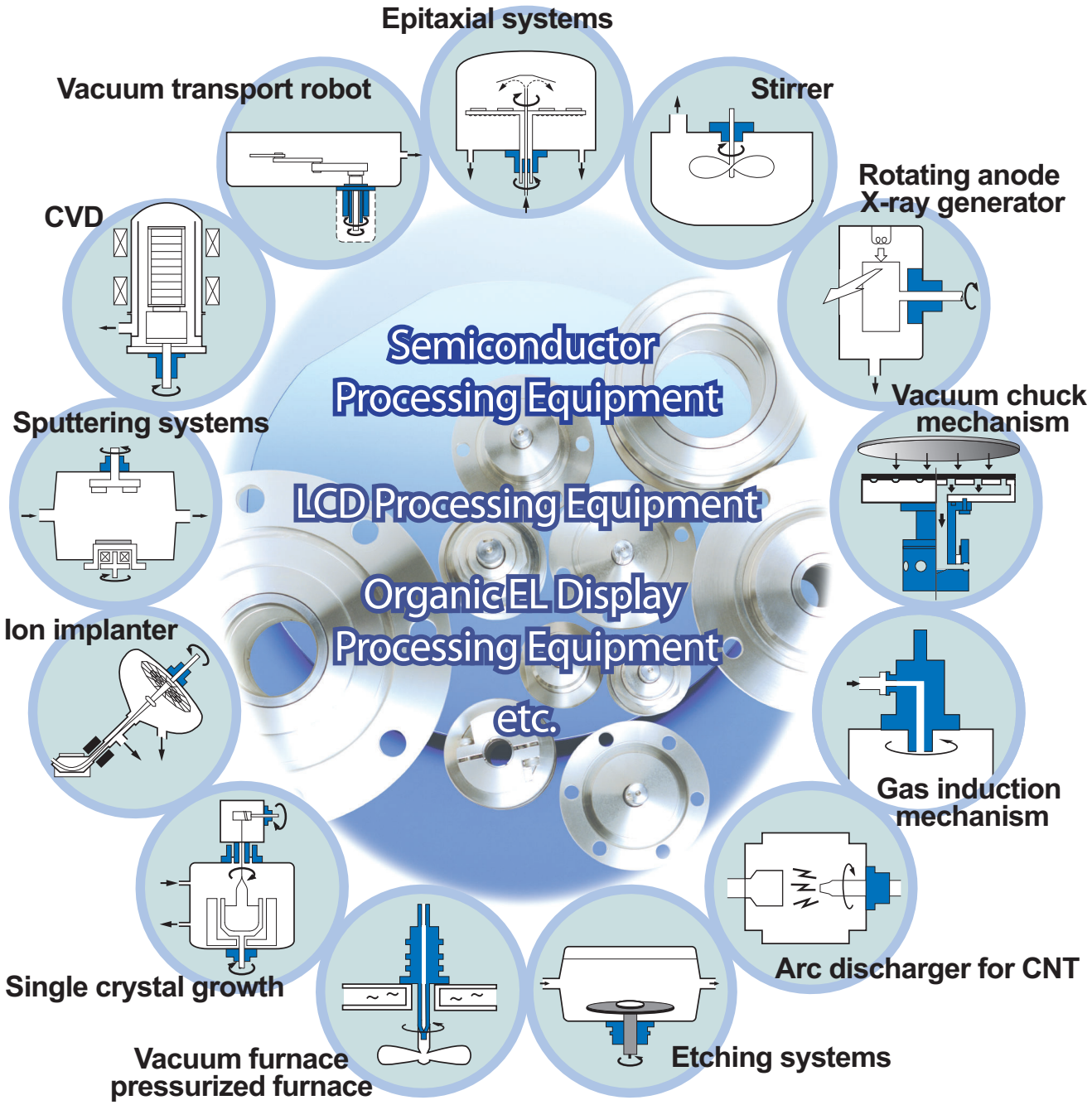


Magnetic field leakage

There is very little leakage of magnetic field, due to Rotary's unique magnetic circuitry. The seals can be used in equipment that are susceptible to magnetic field leakage, such as that from an electron beam.



Application examples



Rotary Vacuum Products helps to provide a clean vacuum

Magnetic rotary seal unit, developed with Rotary's own technologies, is the optimum tool for the introduction of rotary motion into vacuum or differential pressure environments.

- Clean high vacuum
- Wide range of rotation speeds, from low to high
- High reliability with leak-free operation
- Long service life resulting from non-contact sealing
- Usable in pressurized, active gas atmospheres
- Concentric or eccentric multi-axial sealing units available
- High transmitted torque, zero backlash
- Custom designs are also available to suit your application

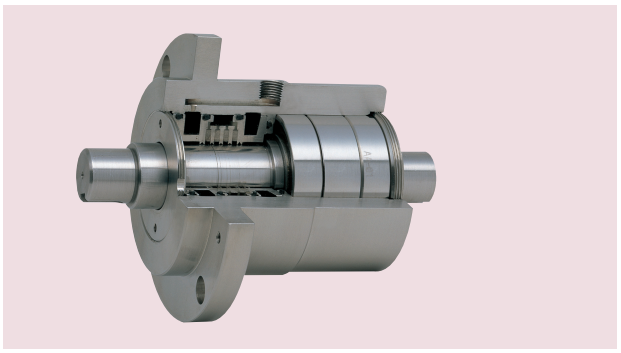
Unlike the conventional rubber seal or mechanical seal, the Rotary Vac magnetic ferro seal unit employs a magnetic fluid which fills the gap between the moving shaft and its stationary housing to act as sealer. Sealing is effected without friction by the action of a powerful high-energy magnet. This results in a long, wear-free service life. Moreover, because of the unique Rotary Vacuum magnetic circuit, very high reliability is attained, allowing a pressure differential of 202 kPa(30 PSIG). Another benefit of this unique seal design is near zero leakage: less than $1.3X10^{-12}$ Pa·m^3/sec ($1.3X10^{-11}$ std. cc/sec) (Helium). The Rotary magnetic rotary seal units serves a broad spectrum of applications including the latest production equipment for semiconductors, thin film coating, PVD, CVD, liquid crystal/plasma FPDs and organic EL, and sealing of single axis and multi-axial rotary sections of clean robots.

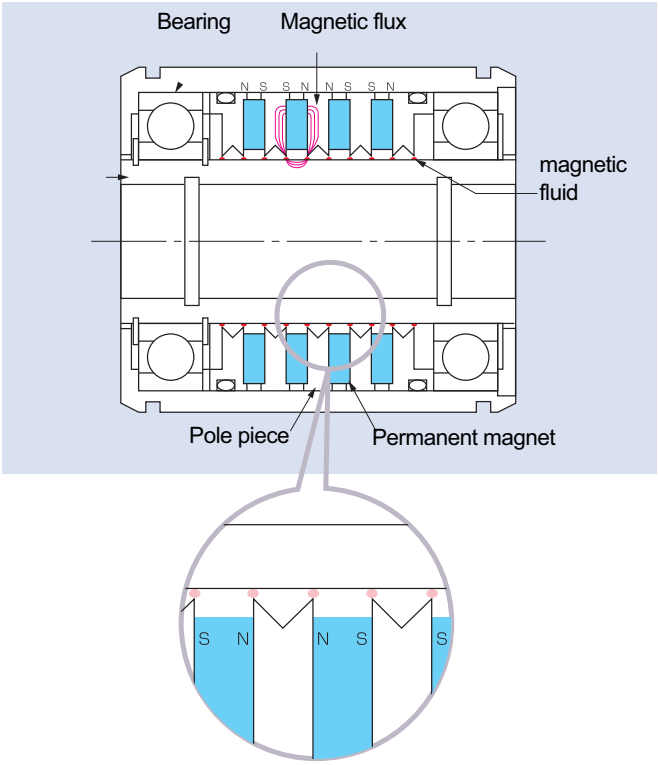
Magnetic circuit configuration unique to Rotary Vacuum Products

These magnets are arranged in opposition to each other (NS-SN-NS) to produce powerful magnetic flux patterns in opposing directions. The inner periphery of the pole piece has two knife edges at which the repulsive magnetic flux is concentrated. Consequently, an ideal magnetic circuit is formed to concentrate the magnetic fluid in the seal areas, maintaining the pressure differential across each stage.

This design allows a large gap between the pole piece and the rotary shaft, thereby allowing high-speed shaft rotation, large shaft diameters and a long service life.







SuperseaL Styled Concept
Low Cost

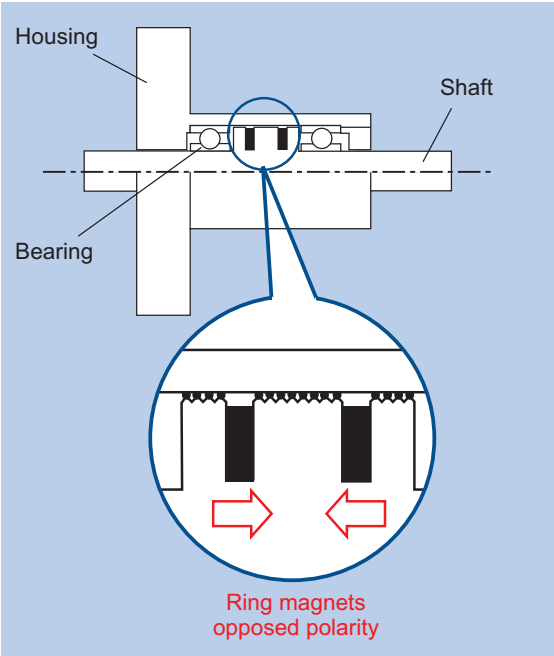
Two opposed-polarity magnets are placed within the rotating shaft and the housing (made of ferromagnetic material) is an integral part of the magnetic circuit. A number of carefully formed grooves on the surface of the shaft determine the location of the fluid sealing rings. Because the shaft diameter is larger than the bearing journals in the region containing the magnets and grooves, there is no loss of strength as a result of using a grooved shaft.

The magnets are embedded in a matrix of ferromagnetic shaft materials, which acts as a magnetic shunt. The casual observer may think this would weaken the magnetic field in the fluid seal region, leading to a very weak seal. In reality, by proper selection of materials and careful design, Rotary Vacuum SuperseaL feedthroughs are engineered to have high pressure capacity.

Benefits of the SUPERSEAL design

- **Fewer parts means lower cost and higher reliability**
- **Only two machined parts: shaft and housing**
- **Economical alternative to o-ring mechanical feedthrough**
- **Provides better alignment between seal components**
- **Permits extremely low external magnetic field because housing is magnetic**
- **Uses no internal static seal (o-ring), thereby eliminating a potential source of leakage**

The SUPERSEAL design is protected by United States and international patents.



Common specification

- Max. opr. press. differential : 37 (PSIG) / 2.5 (ATM)
- Proof press.
  Tested to (PSIG@2000rpm) : 38
- Helium leak
  Tested to (std. cc/sec) : 5.00E-9
- Bearing lubricant
  Vapor press. (Torr) : 1.00E-13
- Bearing lubricant type : Fomblin/Krytox Blend
- Vacuum : Either End

Materials

- Housing : 17-4 PH SS
- Shaft : 17-4 PH SS

Ferrofluid type

A300S

- Base oil : Hydrocarbon
- Vapor pressure (torr) : 1.00E-10
- Max. opr. temp. (℃) : 80
- Feedthrough suitable
  for Operating to (Torr) : 1.00E-8

F-310

- Base oil : Perfluorinated polyether
- Vapor pressure (torr) : 1.00E-12
- Max. opr. temp.(C°) : 100
- Feedthrough suitable
  for operating to (Torr) : 1.00E-9

Common Specification

Operating pressure	From atmospheric pressure to 10^{-6} Pa	
Leak rate(He)	Less than 9.9×10^{-11} Pa·m^3/sec	
Atmosphere	For vacuum, inert gas or reactive gas	
Material	Housing Shaft Pole piece Bearing O-ring	SUS304 SUS630 SUS630 SUJ2 FKM
	Bearing lubricant	Vac. side: Fluorinated vacuum grease Atm. side: Anti-corrosive grease
Standard accessories	O-ring Washer and nut (LSB series)	

Operating temperature range (NO WATER-COOLING)

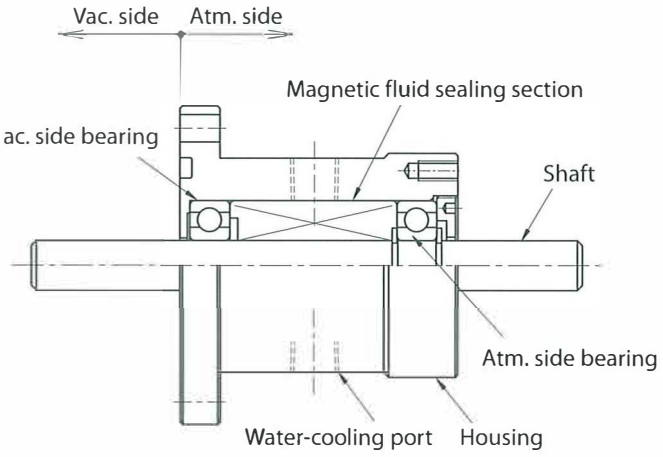
Temperatures listed below are indications for using Magnetic seals safely without water-cooling. In the case of using Magnetic seals at out of range of those temperatures, water-cooling may be required.

Magnetic fluid	Temperature
Standard	10 to 80 ℃
Anti-corrosion	10 to 100 ℃
Low vapor pressure and anti-corrosion	10 to 120 ℃

Basic structure and Bearing arrangement

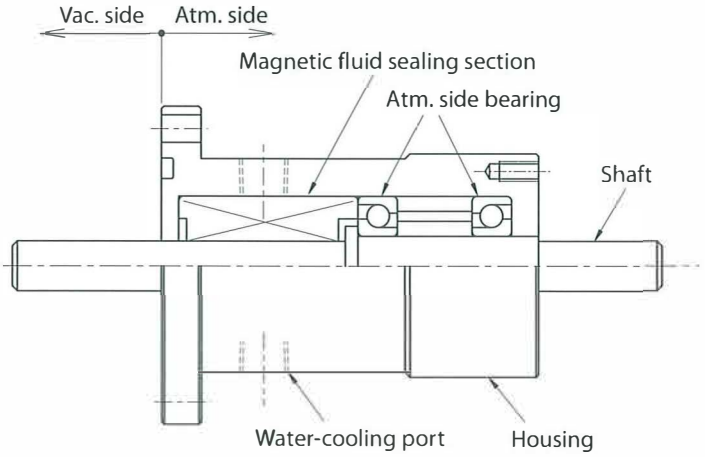
STANDARD

Bearings are arranged in the vac. and the atm. side



CANTILEVER

Bearings are arranged only in the atm. side



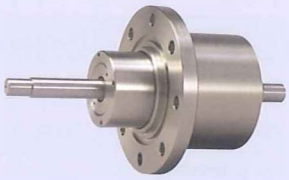
Handling Precautions

- When you operate the Magnetic seal unit for the first time, or when it has not been turned for two weeks or more, we suggest that it should be conditioned by rotating the shaft 20 or more turns after you make it vacuous.
- Do not use any solvents around the Magnetic seal unit! Solvents such as alcohol, acetone, paint thinner, etc., can attack the fluid sealing element in the Magnetic seal unit, causing it to leak.
- Do not use solvents or soap solution for leak testing! Always leak test with a Helium leak detector for best results.
- Install the Magnetic seal unit in the correct direction!
- The vacuum sealing surfaces of your Magnetic seal require careful attention. Please do not scratch any surface where an O-ring must seal.
- When the Magnetic seal unit requires overhaul or repairs, please return it to Rotary Vacuum Products without disassembling.

Custom-made models

Rotary Vacuum Products offers custom-made Magnetic seals matched with your requirements.

FOR VACUUM TRANSPORT ROBOTS



Multi-axial seals



Bellows combination seals



Large diameter dustproof seals

Rotaries multi-axial seals are rigid and compact design, so the best choice for the large substrate handling robots. In addition, we can offer the bellows combination seals used where both rotary and linear motion is required.

MOTOR EQUIPPED MODELS



F1M type



F1Ttype



F1M
large diameter hollow shaft type

Low vibration, compact design and long service life.

FUNCTION ENHANCED PRODUCTS



High-pressure type



With a purge mechanism



Vacuum chuck mechanism



Shaft extension type



Differential pumping type



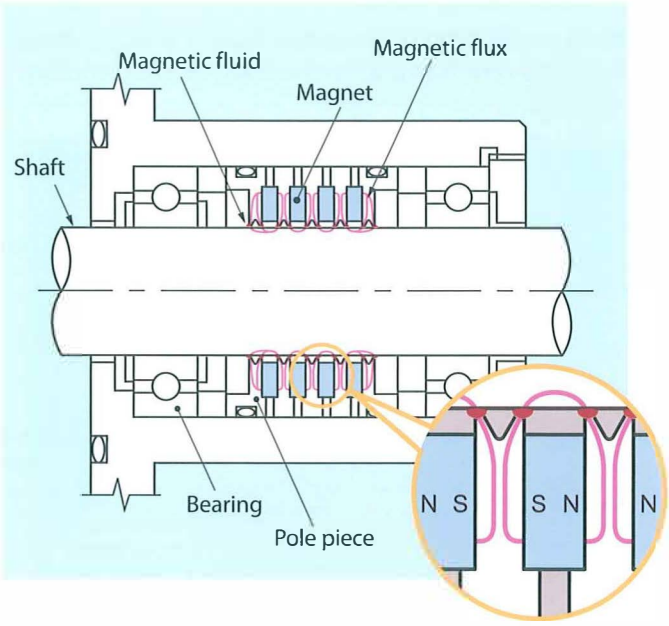
With a gas induction mechanism

Rotary Vacuum Products has a lot of experience in designing Magnetic seals of various shapes and the functions.

Help to Provide a Clean Vacuum

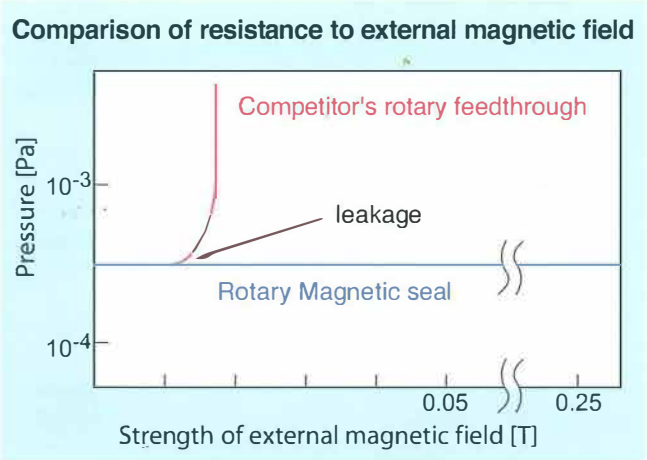
Magnetic circuit configuration unique to Rotary Vacuum Products

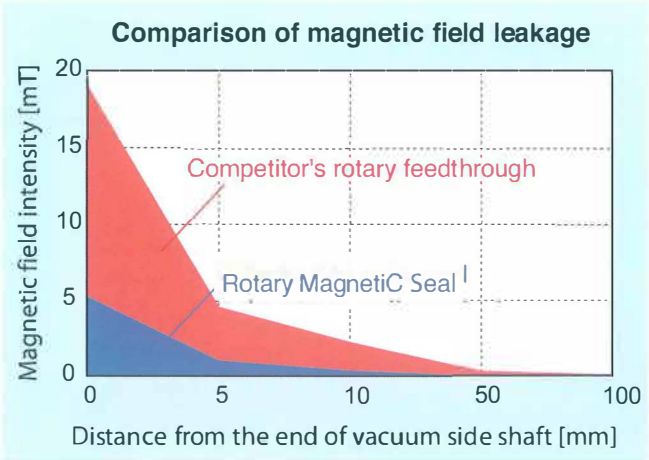
Rotary Magnetic Seals form powerful magnetic fields repelled each other by arranging the same pole of the magnets on both sides of a pole piece(NS-SN-NS).
The tip of the pole piece inserted in this strong magnetic field is split in two, creating a independent magnetic circuit.
The repulsion effect between the two adjacent magnetic fields focuses the magnetic flux on the tips of the pole piece to hold the magnetic fluid firmly in place.
This arrangement enables each stage of the seal to withstand even large pressure differentials.
As a result, the Magnetic Seals can be made compactly.
With this magnetic-circuit structure's ability to withstand even large pressure gradients, the gap between the pole piece and shaft can be quite large.
For the same reason, the magnetic seals can design the product of a high speed rotation or a large diameter shaft.



External magnetic field and magnetic-field leakage

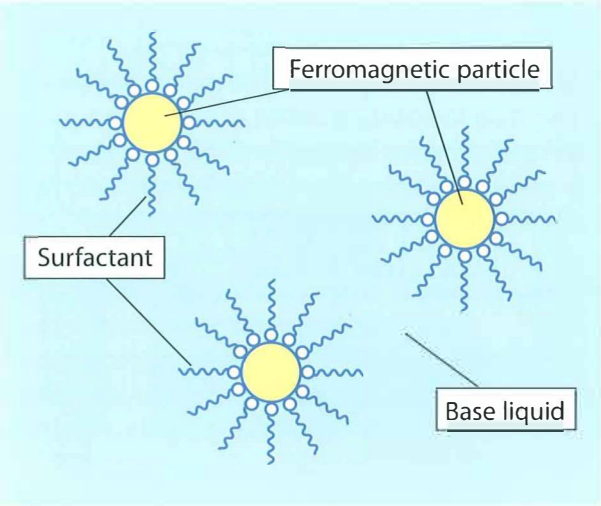
The magnetic circuit of Rotary Magnetic Seals is housed entirely within the pole piece. This structure offers the advantages of minimizing magnetic flux leakage from the Magnetic seal and protecting the magnetic field from influence from external magnetic fields.
As a result, Rotary Magnetic Seals are relied on applications both in equipment that must be shielded from external magnetic fields (such as those from electron-beam lithography system) and in equipment on which strong magnetic fields are applied (such as large diameter silicon growth system).





Magnetic Fluid

Magnetic fluid is a fluid that is attracted to a magnet, just like iron. That has three main constituents: ferromagnetic particles such as magnetite, a surfactant, and a base liquid such as water or oil.
The surfactant coats the ferromagnetic particles, each of which has a diameter of about 10 nm.
This prevents coagulation and keeps the particles evenly dispersed throughout the base liquid.
Its dispersibility remains stable in strong magnetic fields.
Main application of magnetic fluid is a rotary feedthrough. Magnetic fluid is held in place by the magnetic field and that forms a hermetically sealing liquid O-ring seal around a shaft of a rotary feedthrough.





Spike phenomenon

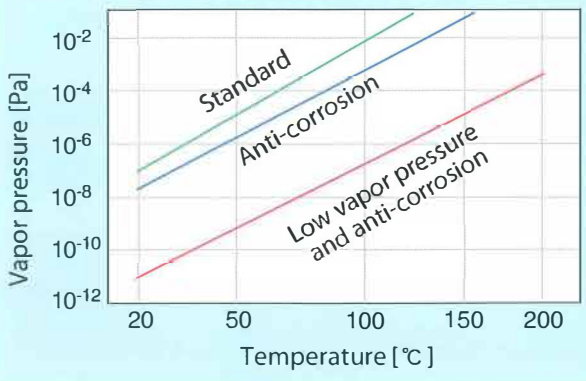
When you move magnet closer to magnetic fluid, you will find many spikes on its surface.

This performance of magnetic fluid is called "Spike phenomenon". The shape of spikes are determined by the balance of surface tension and magnetic force of magnet.

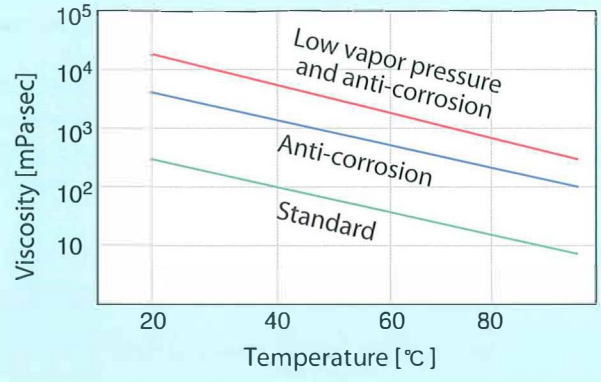
Characteristics of Rotary Magnetic Fluid

Rotary has three types of magnetic fluid, "Standard", "Anti-corrosion" and "Low vapor pressure and anti-corrosion". We propose the magnetic fluid which is optimum to your specification.
The "vapor pressure - temperature characteristics" shows the relation between the temperature and the vapor pressure of the magnetic fluid. This is also called a "vapor pressure curve".
The "low vapor pressure" indicates that there is little evaporation even at a high temperature and a high vacuum. That is, the generation of the out gas that causes the contamination is also little.

Vapor pressure-Temperature characteristics



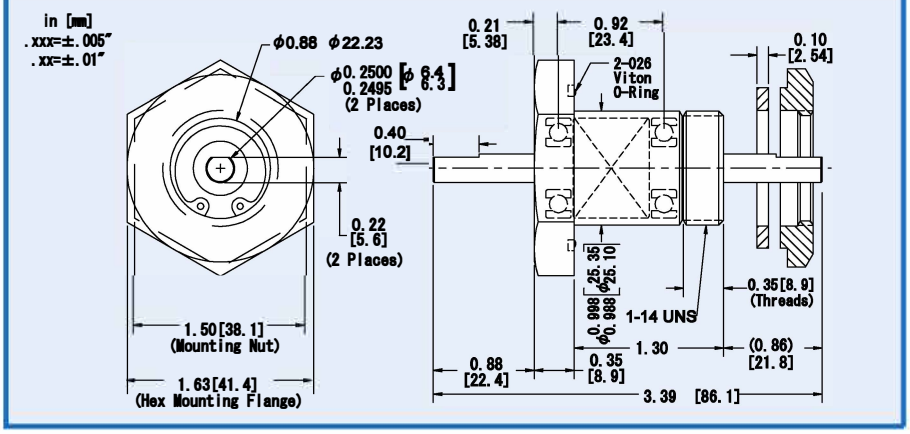
Viscosity-Temperature characteristics



Solid Shaft

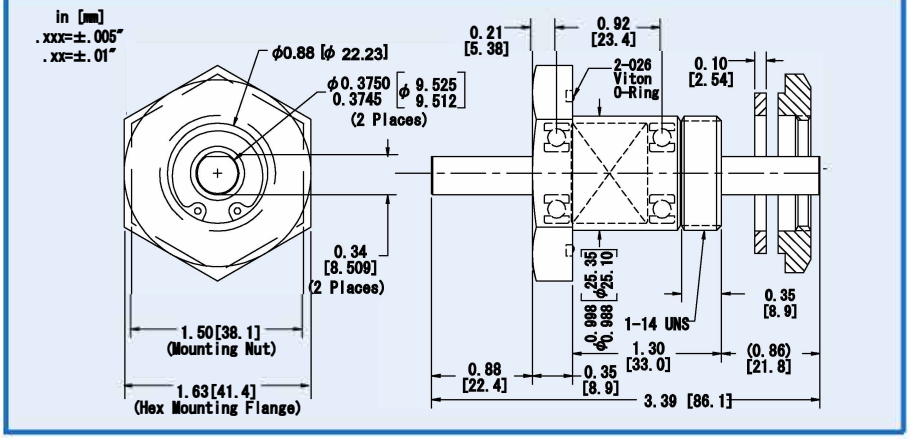
Base Plate (through hole)

FD-LSR-0250-LC and FD-LSR-0250-LC-F*



Nut and washer supplied

FD-LSR-0375-LC and FD-LSR-0375-LC-F*



* F Denotes higher temperature fluid

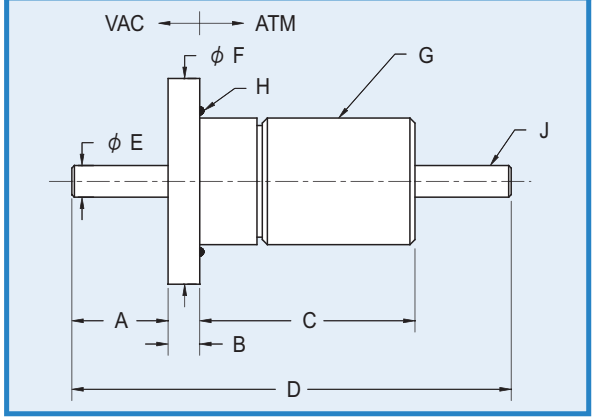
Feedthrough usable on thinner baseplates by ordering additional washers: Product No.10C-91081741

Product No.	10C-97092602	10C-98082600	10C-97092600	10C-98082500
Model	FD-LSR-0250-LC	FD-LSR-0250-LC-F	FD-LSR-0375-LC	FD-LSR-0375-LC-F
Price	$395	$445	$395	$445
Transmission torque(lbs-in)	50	50	160	160
Drag torque(oz-In), Break-away	11	20	11	20
Drag torque(oz-in) @100 rpm / 1000 rpm	6 / 9	22 / 28	6 / 9	22 / 28
Fit base plates	3/4" to 1"	3/4" to 1"	3/4" to 1"	3/4" to 1"
Max. No-load RPM	5000	2500	5000	2500
Ferrofluid type	A300S	F-310	A300S	F-310
Bearing type	R6	R6	R6	R6
Bearing static load, max(lbs)	305	305	305	305
Bearing dynamic load(lbs)	575	575	575	575

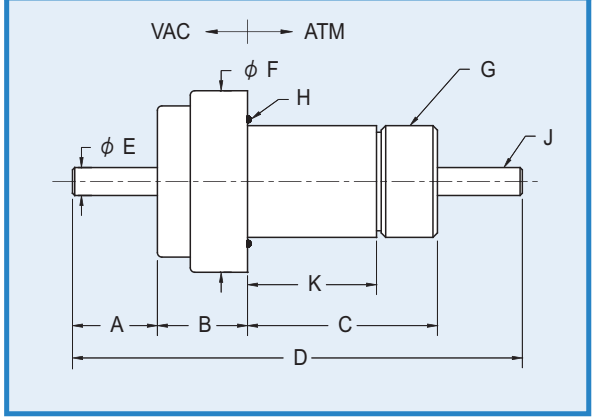
Solid Shaft

Base Plate (Through Hole)

Standard Form



Long Form



Nut and Washer Supplied

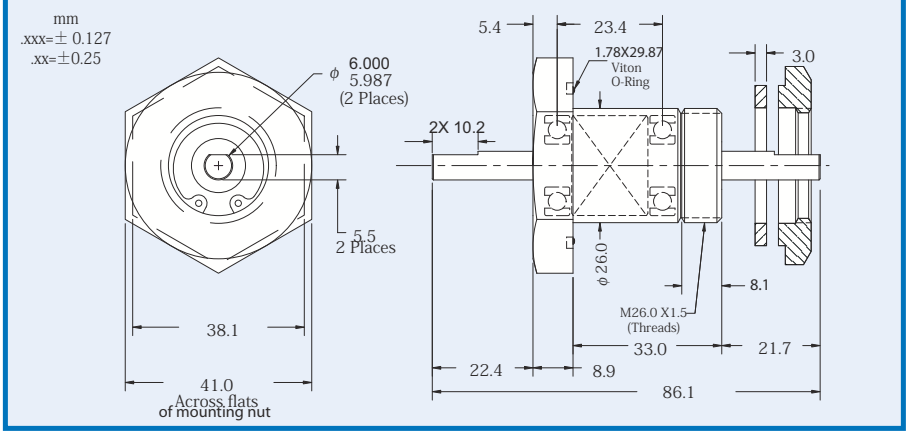
Model	Standard Form					Long Form	
	0.250" Shaft			0.375" Shaft		0.250" Shaft	0.375" Shaft
	0.75" Body	1.00" Body	1.50" Body	1.00" Body	1.50" Body	1.00" Body	1.00" Body
Product No.	10C-8909-B	10C-8908-A	10C-8909-A	10C-8912-A	10C-8911-B	10C-8908-B	10C-8911-A
Discription	FD-LSR-0250-D	FD-LSR-0250-A	FD-LSR-0250-C	FD-LSR-0375-C	FD-LSR-0375-B	FD-LSR-0250-B	FD-LSR-0375-D
Max. RPM	15000	15000	15000	10000	10000	15000	10000
Torque(lb-in)	50	50	50	160	160	50	160
A(inch)	0.75	0.75	0.75	0.88	0.75	0.75	0.74
B(inch)	0.25	0.25	0.25	0.35	0.25	0.81	0.81
C(inch)	1.68	1.68	2.10	1.30	2.22	2.33	2.33
D(inch)	3.44	3.44	3.85	3.39	3.97	4.64	4.63
E(inch, 2 places)	0.2500 /0.2495	0.2500 /0.2495	0.2500 /0.2495	0.3750 /0.3745	0.3750 /0.3745	0.2500 /0.2495	0.3750 /0.3745
F(inch)	1.63	1.63	2.25	1.63	2.12	1.62	1.62
G(thread)	0.75-16	1.00-14	1.50-12	1.00-14	1.50-12	1.00-14	1.00-14
H(O-ring)	2-026	2-026	2-132	2-026	2-132	2-026	2-026
J(end detail) (2 places)	0.03x0.40 flat	0.03x0.40 flat	0.03x0.40 flat	0.04x0.88 flat	0.03x0.40 flat	0.03x0.40 flat	0.03x0.40 flat
K(inch)						1.50	1.62
FFC Part No.	50A103236	50A103237	50A103979	50A108664	50A103991	50A104445	50A103990
FFC Model No.	SB-250-GN-085	SB-250-AN-086	SB-250-CN-011	SB-375-AN-176	SB-375-CN-103	SB-253-AN-010	SB-375-AN-087

SuperseaL

Solid MetricShaft

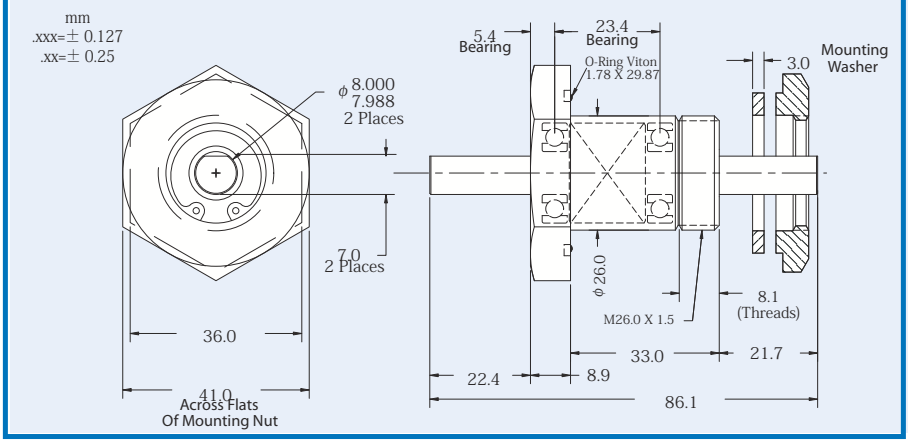
Base Plate (through hole)

RMS-LSR-06-LC and RMS-LSR-06-LC-F*



Nut and washer supplied

RMS-LSR-08-LC and RMS-LSR-08-LC-F*



* F Denotes higher temperature fluid

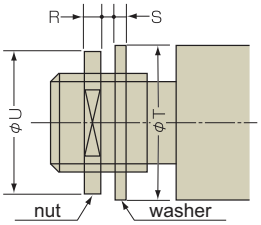
Feedthrough usable on thinner baseplates by ordering additional washers: Product No.10C-91081741

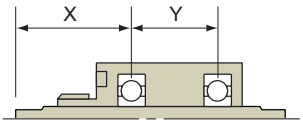
Product No.	10C-26101200	10C-26101202	10C-26101000	10C-26101002
Model	RMS-LSR-06-LC	RMS-LSR-06-LC-F	RMS-LSR-08-LC	RMS-LSR-08-LC-F
Price	$445	$495	$445	$495
Transmission torque(N-M)	5.65	5.65	18.08	18.08
Drag torque(N-M), Break-away	0.78	.141	0.78	.141
Drag torque(N-M) @100rpm / 1000rpm	.042 / .064	.155 / .198	.042 / .064	.155 / .198
Fit base plates	19 to 25mm	19 to 25mm	19 to 25mm	19 to 25mm
Max. no-load RPM	5000	2500	5000	2500
Ferrofluid type	A300S	F-310	A300S	F-310
Bearing type	R6	R6	R6	R6
Bearing static load, max (N)	1357	1357	1357	1357
Bearing dynamic load (N)	2558	2558	2558	2558

Solid Shaft

BS (Nose mount) - LS (Base plate through hole)

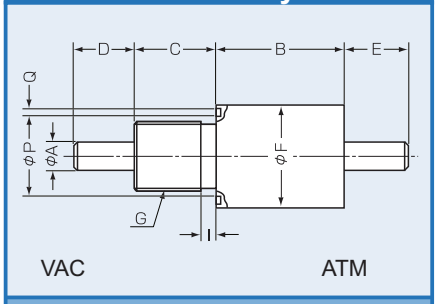
Both the BS and LS series are designed to be compact sealing systems for easy installation.

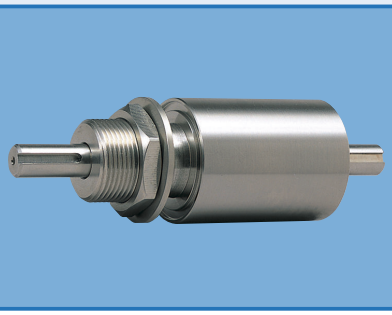




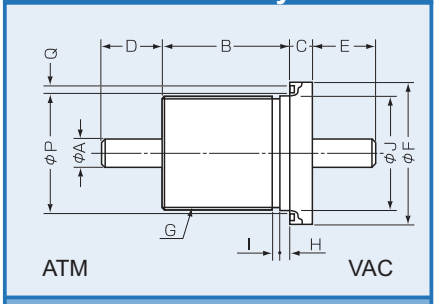
Bearing location

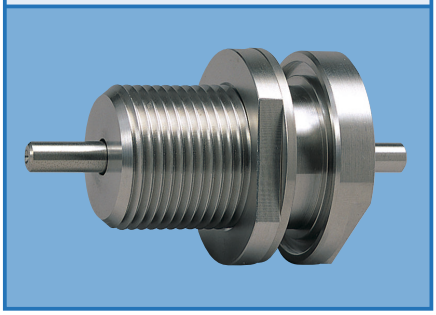
RMS-BS style





RMS-LS style





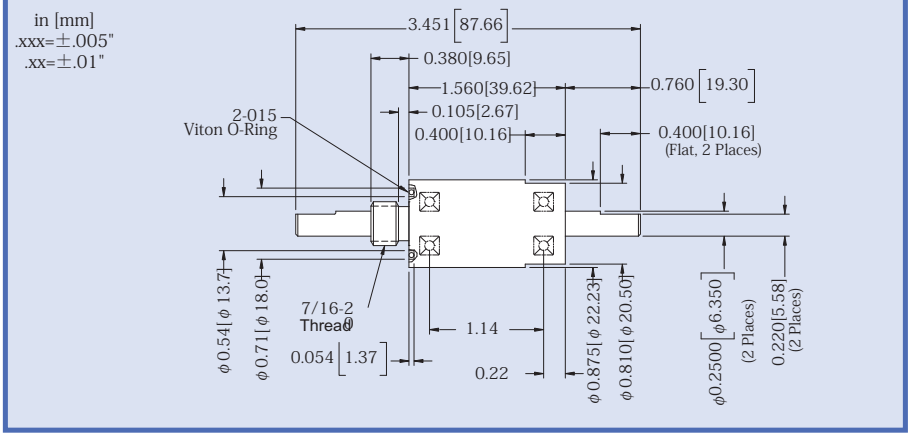
For the shaft end shape, see Page 33

Model	RMS-BS style				RMS-LS style			
	BS-5	BS-6	BS-10	BS-20	LS-5	LS-6	LS-10	LS-12
Product No.	10C-9020 -G010	10C-9020 -G020	10C-9020 -G030	10C-9020 -G040	10C-9020 -M010	10C-9020 -M020	10C-9020 -M030	10C-9020 -M040
Transmission torque	1 N-M	1.6 N-m	8 N-m	60 N-m	1 N-m	1.6 N-m	8 N-m	13 N-m
Max speed (RPM)	15,000	15,000	12,000	7,000	15,000	15,000	12,000	10,000
A (mm)	$5^{-0.010}_{-0.022}$	$6^{-0.010}_{-0.022}$	$10^{-0.013}_{-0.028}$	$20^{-0.020}_{-0.041}$	$5^{-0.010}_{-0.022}$	$6^{-0.010}_{-0.022}$	$10^{-0.013}_{-0.028}$	$12^{-0.016}_{-0.034}$
B (mm)	32	42	52	60	26	40	44	54
C (mm)	6	10	30	34	6	8	8	10
D (mm)	12.5	15	23	36	15	15	23	30
E (mm)	15	15	23	36	15	15	23	30
F (mm)	16	28	38	54	28	42	48	58
G	M8 x 1	M12 x 1.75	M25 x 1.5	M40 x 1.5	M18 x 1.5	M28 x 2	M36 x 1.5	M45 x 1.5
H (mm)	-	-	-	-	4	6	6	6
I (mm)	1.5	2	3	3	1	3	3	3
J (mm)	-	-	-	-	$18^{0}_{-0.2}$	$28^{0}_{-0.2}$	$36^{0}_{-0.2}$	$45^{0}_{-0.2}$
P (mm)	10	18	30	42	20	32	40	50
Q (mm)	2.1	2.1	2.7	2.7	2.1	2.7	2.7	2.7
X (mm)	23.5	32.5	61.5	83	19.3	25.5	31.5	42
Y (mm)	22.2	28	35	37	22.6	29	35	43
O-ring (fluororubber)	S10	S18	S30	S42	S20	S32	S40	S50
Bearing type	695	636	6200	6004	695	636	6200	6201
Nut U / R (mm)	15 / 3	22 / 5	34 / 6	54 / 12	28 / 5	42 / 5	46 / 8	58 / 10
Washer T / S (mm)	16 / 1	28 / 2	38 / 2	54 / 3	28 / 2	42 / 2	52 / 3	58 / 2
Shaft end shape	K	L	M	M	K	L	M	M
a (mm)	-	10	20	32	-	10	20	20
b (mm)	-	0.5	1.8	3.5	-	0.5	1.8	2.5
c (mm)	-	-	$3^{+0.025}_{0}$	$6^{+0.030}_{0}$	-	-	$3^{+0.025}_{0}$	$4^{+0.030}_{0}$

Solid Shaft

Nose Mount

FD-BS-0250-LC and FD-BS-0250-LC-F*



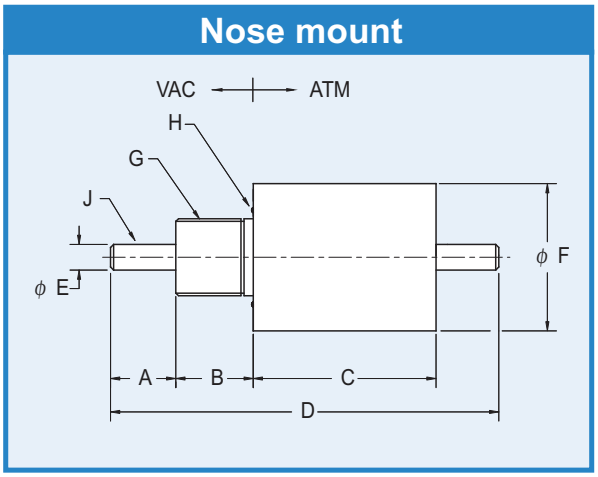
***F denotes Fomblin Fluid for higher temperature usage**

Product No.	10C-99011200	10C-99011202
Model	FD-BS-0250-LC	FD-BS-0250-LC-F
Price	$395	$445
Transmission torque(lbs-in)	50	50
Drag torque(oz-in), Break-away	8	14.5
Drag torque(oz-in) @100rpm / 1000rpm	4.5 / 6.5	16 / 20
Max. no-load RPM	7500	3000
Ferrofluid type	A300S	F-310
Bearing type	R4B	R4B
Bearing static load, max(lbs)	150	150
Bearing dynamic load(lbs)	362	362

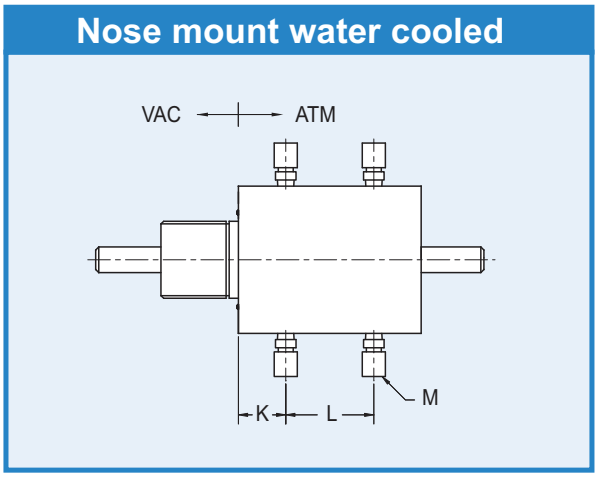
Solid Shaft

Nose Mount

Nose mount



Nose mount water cooled



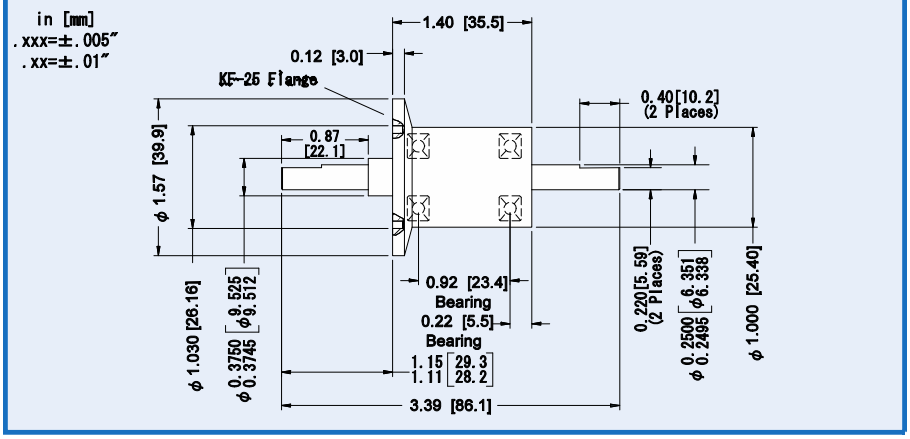
Nut and washer not supplied

Style	FD-BS style				FD-BS-W style	
	0.188"Shaft	0.250"Shaft	0.500"Shaft	0.750"Shaft	0.500"Shaft	0.750"Shaft
	0.31" Neck	0.44" Neck	1.00" Neck		1.00" Neck	
Product no.	10C-8917-A	10C-8917-B	10C-8913-B	10C-8916-A	10C-8914-A	10C-8916-B
Model	FD-BS-0188	FD-BS-0250	FD-BS-0500	FD-BS-0750	FD-BS-0500-W	FD-BS-0750-W
Max. RPM	15000	15000	10000	7000	10000	7000
Torque(lb-in)	7	50	380	1400	380	1400
A(inch)	0.50	0.75	2.49	2.49	2.49	2.49
B(inch)	0.28	0.38	1.51	1.51	1.51	1.51
C(inch)	1.30	1.56	3.56	3.56	3.56	3.56
D(inch)	2.56	3.44	8.81	8.81	8.81	8.81
E(inch, 2 places)	0.1875 /0.1870	0.2500 /0.2495	0.5000 /0.4995	0.7500 /0.7495	0.5000 /0.4995	0.7500 /0.7495
F(inch)	0.63	0.75	2.87	2.87	2.87	2.87
G(thread)	5/16-24	7/16-20	1-14	1-14	1-14	1-14
H(o-ring)	2-012	2-015	2-128	2-128	2-128	2-128
J(Shaft end) (2 places)	0.03x0.37 flat	0.03x0.40 flat	0.125/.070/1.00 KEYWAY(w/d/l)	0.187/.107/1.00 KEYWAY(w/d/l)	0.125/.070/1.00 KEYWAY(w/d/l)	0.187/.107/1.00 KEYWAY(w/d/l)
K(inch)					0.88	0.89
L(inch)					1.74	1.74
M(4 places)					FITTINGS FOR 0.25" OD TUBE	FITTINGS FOR 0.25" OD TUBE
FFC part no.	50A103971	50A103978	50A103191	50A103193	50A103204	50A103206
FFC model no.	MB-188-LN-090	MB-250-KN-089	SB-500-AN-069	SB-750-AN-077	SB-500-AW-072	SB-750-AW-080

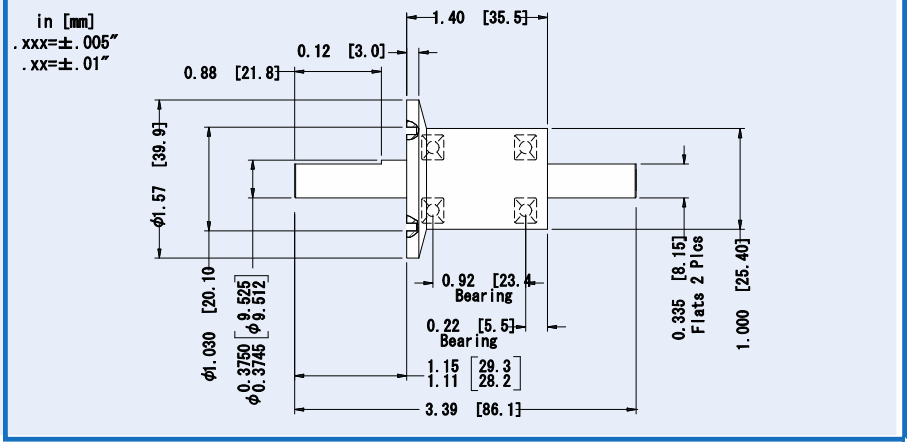
Solid Shaft

Klamp Flange

FD-F1-KF25-0250-LC and FD-F1-KF25-0250-LC-F*



FD-F1-KF25-0375-LC and FD-F1-KF25-0375-LC-F*



* F Denotes higher temperature fluid

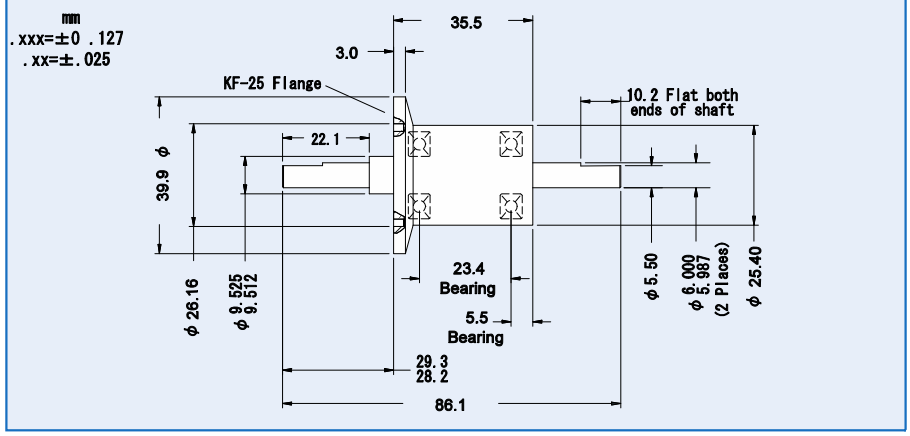
Product No.	10C-99020600	10C-99020602	10C-99020500	10C-99020502
Model	FD-F1-KF25 -0250-LC	FD-F1-KF25 -0250-LC-F	FD-F1-KF25 -0375-LC	FD-F1-KF25 -0375-LC-F
Price	$395	$445	$395	$445
Transmission torque(lbs-in)	50	50	160	160
Drag torque(oz-in), Break-away	11	20	11	20
Drag torque(oz-in) @100rpm / 1000rpm	6 / 9	22 / 28	6 / 9	22 / 28
Max. no-load RPM	5000	2500	5000	2500
Ferrofluid type	A300S	F-310	A300S	F-310
Bearing type	R6	R6	R6	R6
Bearing static load, max(lbs)	305	305	305	305
Bearing dynamic load(lbs)	575	575	575	575

SuperseaL

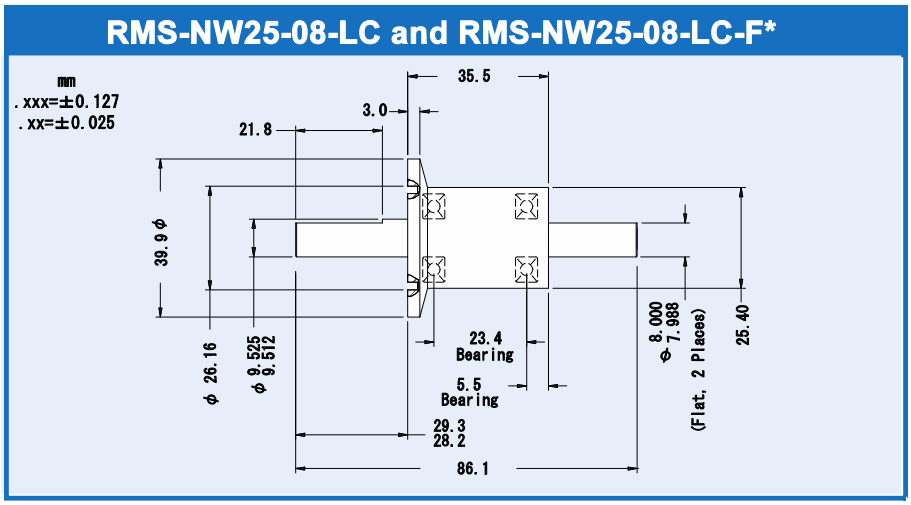
Solid Metric Shaft

Klamp Flange

RMS-NW25-06-LC and RMS-NW25-06-LC-F*



RMS-NW25-08-LC and RMS-NW25-08-LC-F*



* F Denotes higher temperature fluid

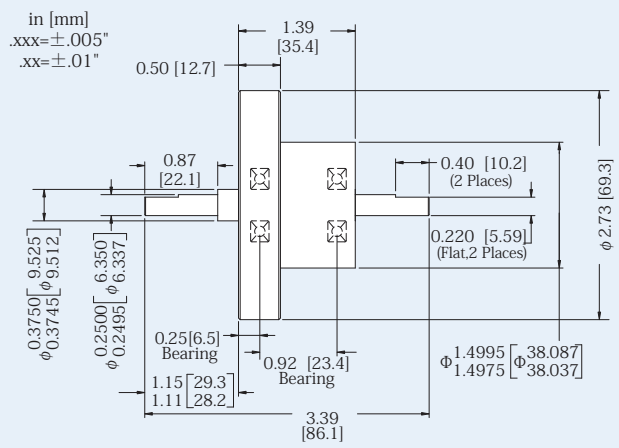
Product No.	10C-26101300	10C-26101302	10C-26101100	10C-26101102
Model	RMS-NW25 -06-LC	RMS-NW25 -06-LC-F	RMS-NW25 -08-LC	RMS-NW25 -08-LC-F
Price	$445	$495	$445	$495
Transmission torque(N-M)	5.65	5.65	18.08	18.08
Drag torque(N-M), Break-away	0.078	0.141	0.078	0.141
Drag torque(N-M) @100rpm / 1000rpm	0.042 / .064	0.155 / 0.198	0.042 / .064	0.155 / .198
Max. no-load RPM	5000	2500	5000	2500
Ferrofluid type	A300S	F-310	A300S	F-310
Bearing type	R6	R6	R6	R6
Bearing static load, max(N)	1357	1357	1357	1357
Bearing dynamic load(N)	2558	2558	2558	2558

SuperseaL

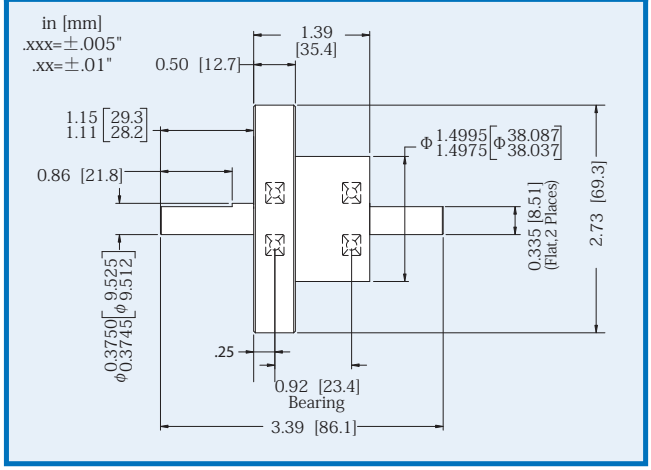
Solid Shaft

2.75” CF and 1.33” (CFM) Flanges

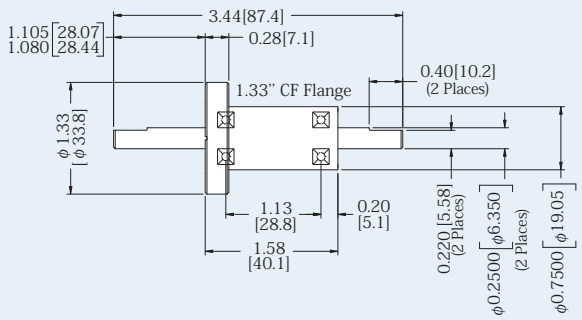
FD-CF-0250-LC and FD-CF-0250-LC-F*



FD-CF-0375-LC and FD-CF-0375-LC-F*



FD-CFM-0250-LC and FD-CFM-0250-LC-F*



* F Denotes higher temperature fluid

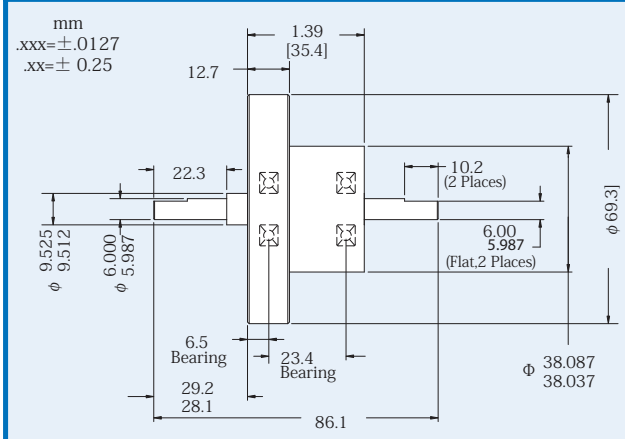
Product No.	10C-99011400	10C-99011402	10C-99011500	10C-99011502	10C-99011300	10C-99011302
Model	FD-CF -0250-LC	FD-CF -0250-LC-F	FD-CF -0375-LC	FD-CF -0375-LC-F	FD-CFM -0250-LC	FD-CFM -0250-LC-F
Price	$495	$545	$495	$545	$445	$495
Transmission torque(lbs-in)	50	50	160	160	50	50
Drag torque(oz-in), Break-away	11	20	11	20	8	14.5
Drag torque(oz-in) @100rpm / 1000rpm	6 / 9	22 / 28	6 / 9	22 / 28	4.5 / 6.5	4.5 / 6.5
Flange	2.75" CF	2.75" CF	2.75" CF	2.75" CF	1.33" CF	1.33" CF
Bolt hole dia. Bolt circle dia.	6@0.265 DIA. 2.3120 DIA.	6@0.265 DIA. 2.3120 DIA.	6@0.265 DIA. 2.3120 DIA.	6@0.265 DIA. 2.3120 DIA.	6@0.172 DIA. 1.0620 DIA.	6@0.172 DIA. 1.0620 DIA
Max. no-load RPM	5000	2500	5000	2500	7500	3000
Ferrofluid type	A300S	F-310	A300S	F-310	A300S	A300S
Bearing type	R6	R6	R6	R6	R4B	R4B
Bearing static load, max(lbs)	305	305	305	305	150	150
Bearing dynamic load(lbs)	575	575	575	575	362	362

SuperseaL

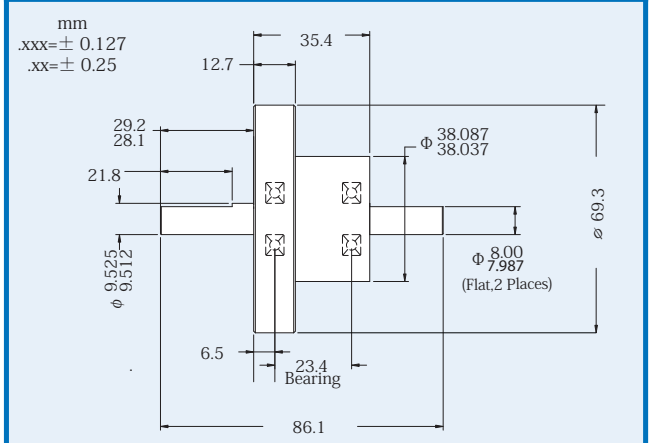
Solid Metric Shaft

2.75 Inch Conflat Flange

RMS-CF-06-LC and RMS-CF-06-LC-F*



RMS-CF-08-LC and RMS-CF-08-LC-F*



Coming soon
Metric CFM
Version

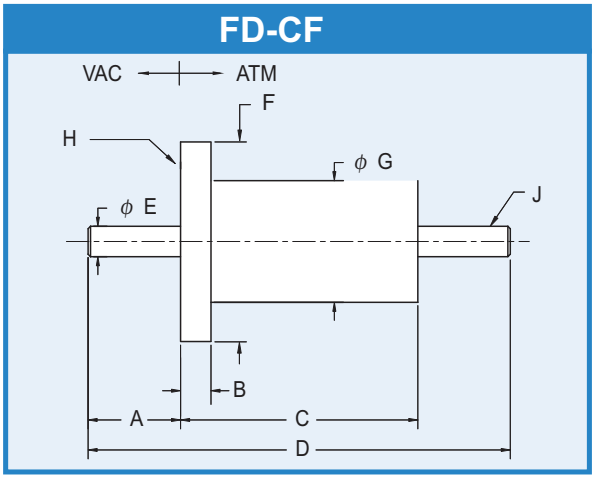
* F Denotes higher temperature fluid

Product No.	10C-26101400	10C-26101402	10C-26100900	10C-26100902		
Model	RMS-CF -06-LC	FD-CF -06-LC-F	RMS-CF -08-LC	RMS-CF -08-LC-F	CFM	CFM
Price	$555	$605	$555	$605		
Transmission torque(N-M)	5.65	5.65	18.08	18.08		
Drag torque(N-M), Break-away	0.078	0.141	0.078	0.141		
Drag Torque(N-M) @100rpm / 1000rpm	0.042 /0.064	0.155 / 0.198	0.042 / 0.064	0.155 / 0.198		
Flange	2.75" CF	2.75" CF	2.75" CF	2.75" CF		
Bolt hole dia. Bolt circle dia.	6@6.73 DIA. 58.72 DIA.	6@6.73 DIA. 58.72 DIA.	6@6.73 DIA. 58.72 DIA.	6@6.73 DIA. 58.72 DIA.		
Max. no-load RPM	5000	2500	5000	2500		
Ferrofluid type	A300S	F-310	A300S	F-310		
Bearing type	R6	R6	R6	R6		
Bearing static load, max(N)	1357	1357	1357	1357		
Bearing dynamic load(N)	2558	2558	2558	2558		

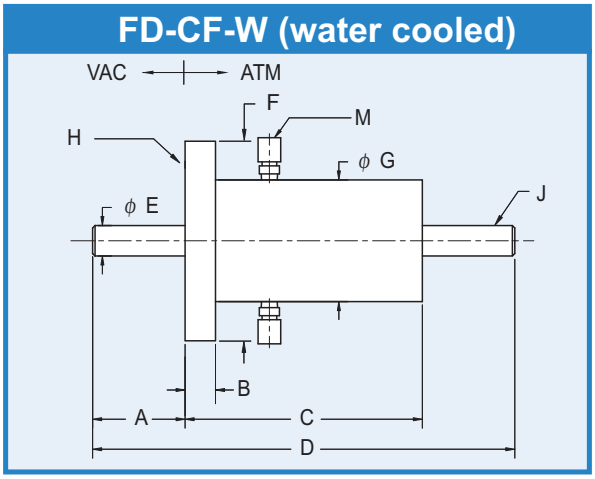
Solid Shaft

CF Flange

FD-CF



FD-CF-W (water cooled)



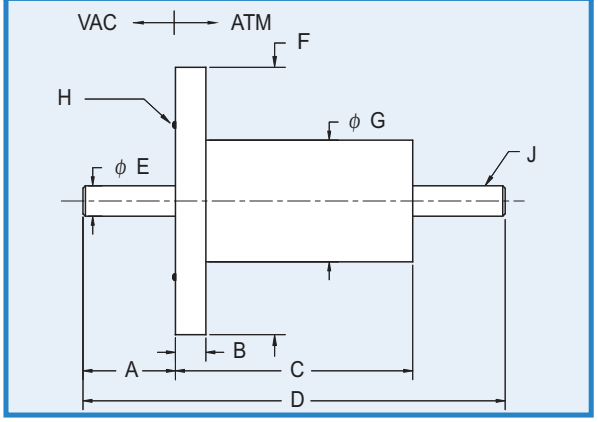
Fittings supplied

Style	FD-CF style			FD-CF-W style	
	0.250" Shaft		0.375" Shaft	0.250" Shaft	0.375" Shaft
	1.33" CF	2.75" CF		2.75" CF	
Product No.	10C-8918-A	10C-8910-A	10C-8912-B	10C-8910-B	10C-8913-A
Model	FD-CFM-0250	FD-CF-0250	FD-CF-0375	FD-CF-0250-W	FD-CF-0375-W
Max. RPM	15000	15000	10000	15000	10000
Torque(lb-in)	50	50	160	50	160
A(inch)	0.75	0.75	0.75	0.75	0.75
B(inch)	0.28	0.50	0.50	0.50	0.50
C(inch)	1.75	2.56	2.56	2.56	2.56
D(inch)	3.25	4.06	4.06	4.06	4.06
E(inch, 2 places)	0.2500/0.2495	0.2500/0.2495	0.3750/0.3745	0.2500/0.2495	0.3750/0.3745
F(inch)	1.33	2.75	2.75	2.75	2.75
G(inch)	0.75	1.50	1.50	1.50	1.50
H(flange)	1.33" CF	2.75" CF	2.75" CF	2.75" CF	2.75" CF
J(shaft end) (2 places)	0.03x0.40 flat	0.03x0.40 flat	0.03x0.40 flat	0.03x0.40 flat	0.03x0.40 flat
M(2 places)				FITTINGS FOR 0.25"OD TUBE	FITTINGS FOR 0.25"OD TUBE
FFC part no.	50A103915	50A103532	50A103154	50A103501	50A103912
FFC model no.	MB-250-BN-101	SB-253-BN-026	SB-375-BN-147	SB-253-BW-148	SB-375-BW-151

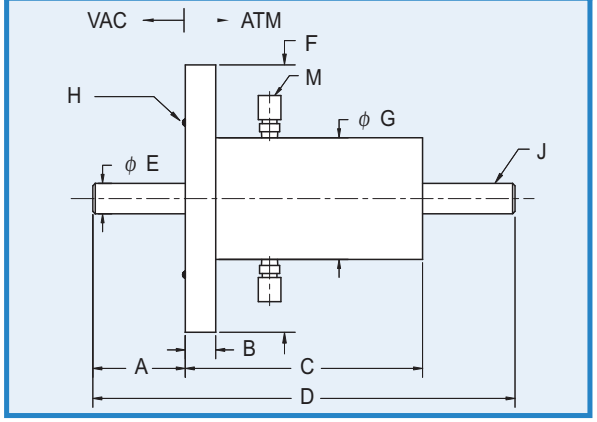
Solid Shaft

Flange Mount

FD-F1



FD-F1-W (water cooled)



Other shaft, flange sizes and configurations available. Heavy-duty versions available.

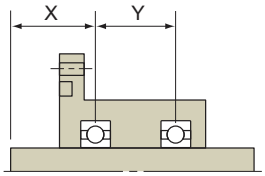
Style	0.500" Shaft 6.00" o-ring flange	
	FD-F1 style	FD-F1-W style
Product No.	10C-8915-A	10C-8915-B
Model	FD-F1-0500	FD-F1-0500-W
Max. RPM	10000	10000
Torque(lb-in)	380	380
A(inch)	1.22	1.22
B(inch)	0.38	0.38
C(inch)	3.56	3.56
D(inch)	6.03	6.03
E(inch, 2 places)	0.5000/0.4995	0.5000/0.4995
F(inch)	6.00	6.00
hole pattern	(4)x0.750 dia on 4.750 dia. BC	(4)x0.750 dia on 4.750 dia. BC
G(inch)	2.87	2.87
H(o-ring)	2-234	2-234
J(end detail, 2 places)	0.125/0.070/1.00, KEYWAY (w/d/l)	0.125/0.070/1.00, KEYWAY (w/d/l)
M(2 places)		FITTING FOR 0.25" OD TUBE
FFC part no.	50A103244	50A103182
FFC model no.	SB-500-FN-049	SB-500-FW-057

Metric Solid Shaft

Flange Mount

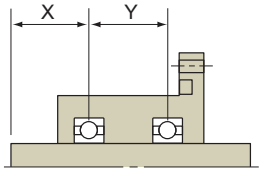
The F series is a flange type featuring high rigidity for heavy load capability.

F1

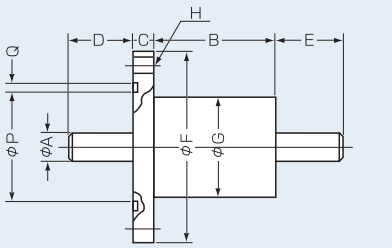


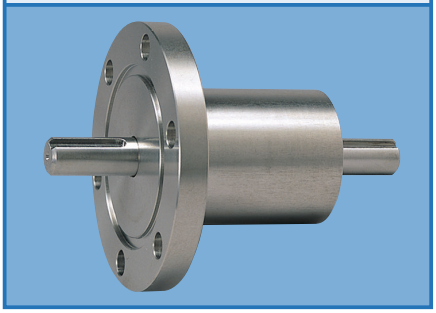
Bearing location

F2

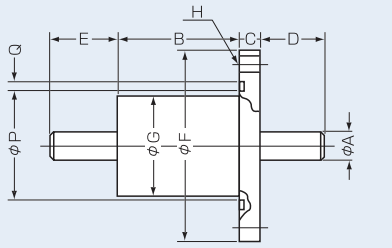


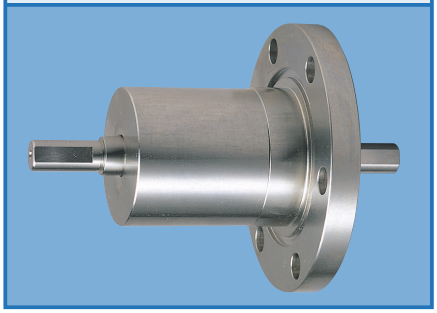
RMS-F1-Flange style





RMS-F2-Flange style





Model	RMS-F1 · RMS-F2 style						
	F1(F2)-5	F1(F2)-6	F1(F2)-10	F1(F2)-12	F1(F2)-20	F1(F2)-30	F1(F2)-40
Product No.	10C-9020-J010(K010)	10C-9020-J020(K020)	10C-9020-J030(K030)	10C-9020-J040(K040)	10C-9020-J050(K050)	10C-9020-J060(K060)	10C-9020-J070(K070)
Transmission torque	1 N-m	1.6 N-m	8 N-m	13 N-m	60 N-m	210 N-m	500 N-m
Max. speed (RPM)	15,000	15,000	12,000	10,000	7,000	6,000	4,000
A (mm)	$5^{-0.010}_{-0.022}$	$6^{-0.010}_{-0.022}$	$10^{-0.013}_{-0.028}$	$12^{-0.016}_{-0.034}$	$20^{-0.020}_{-0.041}$	$30^{-0.020}_{-0.041}$	$40^{-0.025}_{-0.050}$
B (mm)	26	40	44	54	52	68	75
C (mm)	6	8	8	10	10	12	15
D (mm)	15	15	23	40	36	50	60
E (mm)	15	15	23	30	36	50	60
F (mm)	36	52	70	80	114	114	140
G (mm)	16 ($16^{-0.1}_{-0.2}$)	28($28^{-0.1}_{-0.2}$)	36($36^{-0.1}_{-0.2}$)	40($40^{-0.1}_{-0.2}$)	60($60^{-0.1}_{-0.2}$)	68($68^{-0.1}_{-0.2}$)	84($84^{-0.1}_{-0.2}$)
H	6- Φ4.3 PD28	6- Φ4.5 PD40(43)	6- Φ6.7 PD58.7	6- Φ7.0 PD65.0	8- Φ8.5 PD92.2	8- Φ8.5 PD92.2	8- Φ11 PD115
P (mm)	18(18)	24(30)	42(42)	45(45)	70(70)	70(70)	90(90)
Q (mm)	2.1	2.7	2.7	2.7	2.7	2.7	2.7
X (mm)	20(20)	28.5(28.5)	51.5(31.5)	52(42)	51(51)	65.5(65.5)	76(76)
Y (mm)	22.7(22.7)	28(28)	35(35)	43(43)	37(37)	54(54)	63(63)
O-ring (fluororubber)	S18	S24(S30)	S42	S45	S70	S70	S90
Bearing type	695	636	6200	6201	6004	6006	6908
Shaft end shape	K	L	M	M	M	M	M
a (mm)	-	10	20	25	32	35	40
b (mm)	-	0.5	1.8	2.5	3.5	4	5
c (mm)	-	-	$3^{+0.025}_{0}$	$4^{+0.030}_{0}$	$6^{+0.030}_{0}$	$8^{+0.036}_{0}$	$12^{+0.043}_{0}$

For the shaft end shape, see P33

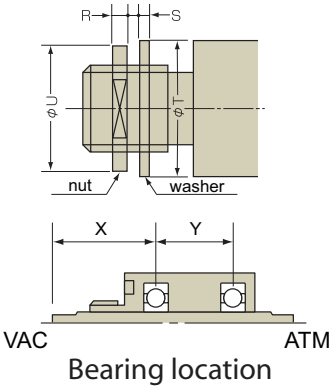
Metric Solid Shaft

Flanged and Nose Mount Water Cooled

This series is designed for safe operation in high temperature environments. It also minimizes heat generation from bearings during long-term shaft rotation at high speeds, resulting in extended service life.

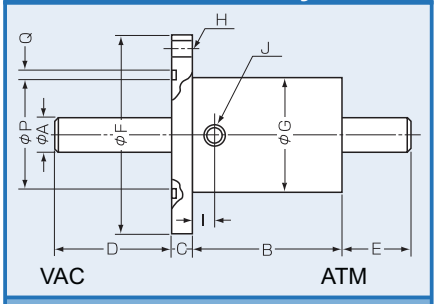
Cooling water

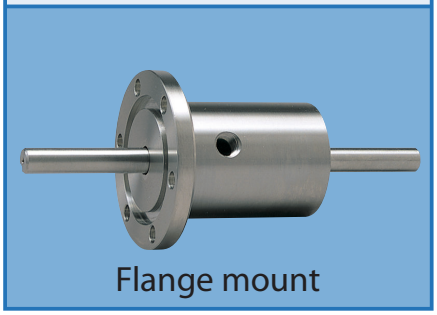
Flow rate : ≧ 1 l/min
Water pressure : ≦ 300 kPa



Bearing location

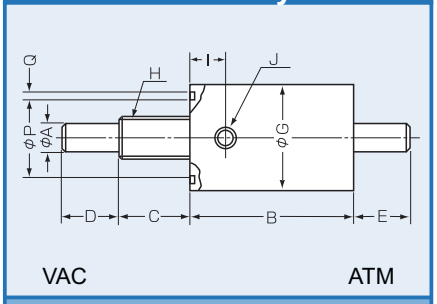
RMS-F1-W style

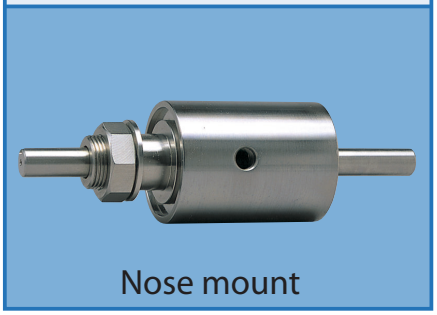




Flange mount

RMS-BS-W style





Nose mount

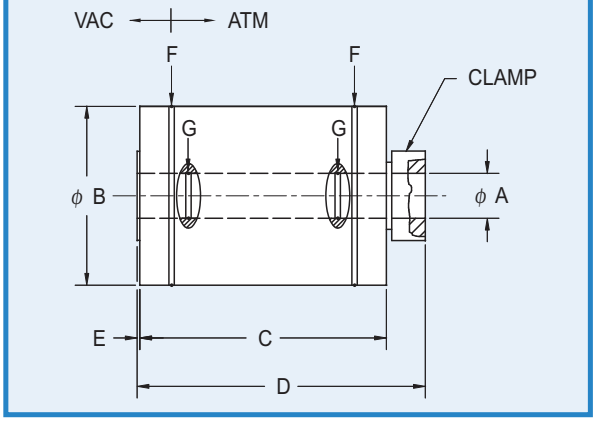
For the shaft end shape, see Page 33
Fittings for connecting cooling water pipe are provided

Model	RMS-F1-W style				RMS-BS-W style	
	F1-6-W	F1-10-W	F1-12-W	F1-20-W	BS-12-W	BS-20-W
Product No.	10C-9020 -L020	10C-9020 -L030	10C-9020 -L040	10C-9020 -L050	10C-9020 -H010	10C-9020 -H020
Transmission torque	1.6 N-m	8.0 N-m	13 N-m	60 N-m	13 N-m	60 N-m
Max. speed (RPM)	15,000	12,000	10,000	7,000	10,000	7,000
A (mm)	$6^{-0.010}_{-0.022}$	$10^{-0.013}_{-0.028}$	$12^{-0.016}_{-0.034}$	$20^{-0.020}_{-0.041}$	$12^{-0.016}_{-0.034}$	$20^{-0.020}_{-0.041}$
B (mm)	48	62	82	78	90	90
C (mm)	6	8	8	10	38	38
D (mm)	30	50	71	59	33	36
E (mm)	20	50	37	36	38	36
F (mm)	60	70	88	114	-	-
G (mm)	36	46	60	62	60	62
H	4-Φ5.4 PD50	6-Φ6.7 PD58.7	4-Φ6.5 PD74	8-Φ8.5 PD92.2	M25 x 1.5	M40 x 1.5
I (mm)	15	18	21	24	29	32
J	2-Rc1/8	2-Rc1/8	2-Rc1/8	2-Rc1/8	2-Rc1/8	2-Rc1/8
P (mm)	30	40	40	70	40	50
Q (mm)	2.7	5.0	5.0	5.0	5.0	4.1
X (mm)	37.5	59	83.5	74	83.5	85
Y (mm)	40	52.5	67.5	63	67.5	69
Shaft End Shape	L	M	M	M	M	M
a (mm)	10	20	30	32	30	32
b (mm)	0.5	1.8	2.5	3.5	2.5	3.5
c (mm)	-	$3^{+0.030}_{0}$	$4^{+0.030}_{0}$	$6^{+0.030}_{0}$	$4^{+0.030}_{0}$	$6^{+0.030}_{0}$
O-ring (fluororubber)	S30	V40	V40	V70	V40	G50
Bearing type	636	6200	6301	6004	6301	6004
Nut U / R (mm)	-	-	-	-	60 / 6	54 / 12
Washer T / S (mm)	-	-	-	-	60 / 2	54 / 3

Hollow Shaft

Cartridge Mount

Cartridge mount w/clamp

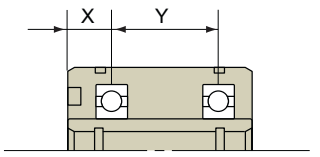


Nominal	For use with shaft sizes indicated				
	0.5	**1.0**	**1.5**	**2.0**	**3.0**
Recommended	**0.501 / 0.498**	**1.001 / 0.998**	**1.501 / 1.498**	**2.001 / 1.998**	**3.001 / 2.998**
Product No.	10C-8925-A	10C-8925-B	10C-8925-C	10C-8925-D	10C-8925-E
Model	FD-HS-0500-C	FD-HS-1000-C	FD-HS-1500-C	FD-HS-2000-C	FD-HS-3000-C
Max. RPM	6000	4500	3000	2500	1800
A(inch)	0.502 / 0.503	1.002 / 1.003	1.502 / 1.503	2.002 / 2.003	3.002 / 3.003
B(inch)	1.998 / 1.997	2.623 / 2.622	3.248 / 3.247	3.748 / 3.747	5.248 / 5.247
C(inch)	2.750	2.750	3.000	3.250	3.625
D(inch)	3.209	3.339	3.65	3.966	4.464
E(inch)	0.03	0.03	0.03	0.03	0.03
F(o-ring)	2-032	2-037	2-041	2-153	2-159
G(o-ring)	2-014	2-022	2-029	2-033	2-151
FFC part no.	50A103318	50A103319	50A103320	50A103321	50A103322
FFC model no.	SC-500-C	SC-1000-C	SC-1500-C	SC-2000-C	SC-3000-C

Metric Hollow Shaft

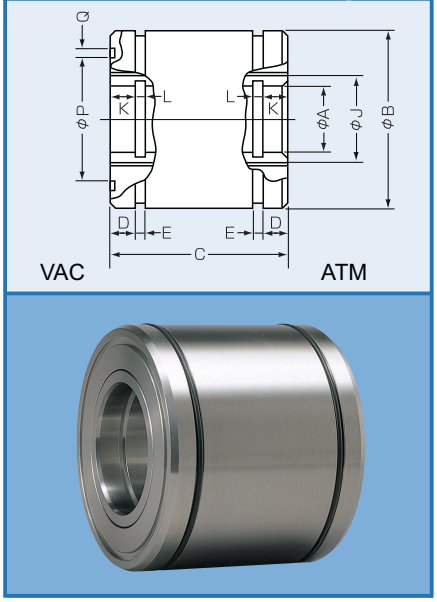
Cartridge Mount

The hollow shaft type is suited for applications that require the use of a nonmagnetic shaft or a shaft having a special shape. In this case, a magnetic sleeve is provided on the outside of the shaft to compose the sealing section. Versions with clamp are also available. This compact sealing system allows the customer to configure his shaft for a wide range of application.

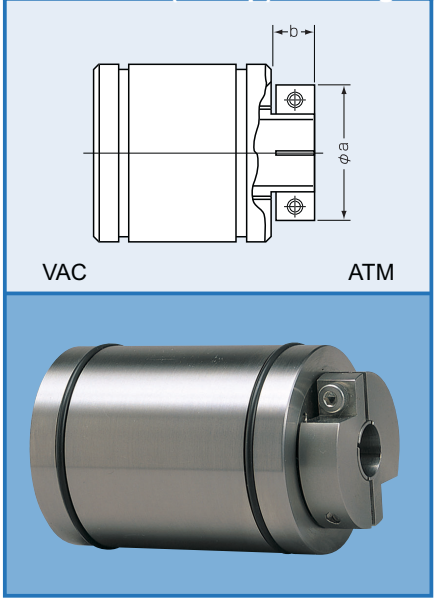


Bearing location

RMS-HS cartridge



RMS-HS-C (clamp) cartridge



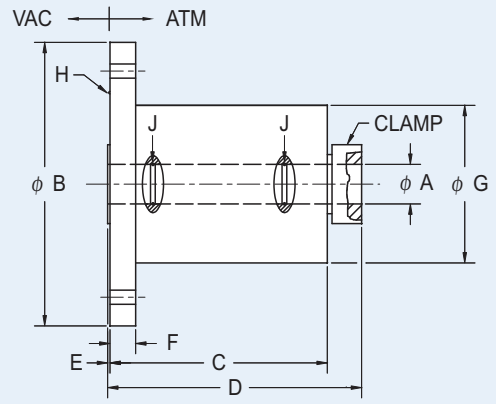
If shaft clamping is required, add "-C" at the end of the model no.

Model		RMS-HS style								
		HS-10	HS-12	HS-20	HS-24	HS-32	HS-38	HS-40	HS-50	HS-75
Product No.		10C-9020 -A010	10C-9020 -A020	10C-9020 -A030	10C-9020 -A040	10C-9020 -A050	10C-9020 -A060	10C-9020 -A070	10C-9020 -A080	10C-9020 -A090
A (mm)		$10^{+0.015}_{0}$	$12^{+0.018}_{0}$	$20^{+0.021}_{0}$	$24^{+0.021}_{0}$	$32^{+0.025}_{0}$	$38^{+0.025}_{0}$	$40^{+0.025}_{0}$	$50^{+0.025}_{0}$	$75^{+0.030}_{0}$
B (mm)		$40^{-0.009}_{-0.025}$	$40^{-0.009}_{-0.025}$	$60^{-0.010}_{-0.029}$	$63^{-0.010}_{-0.029}$	$73^{-0.010}_{-0.029}$	$83^{-0.012}_{-0.034}$	$90^{-0.012}_{-0.034}$	$95^{-0.012}_{-0.034}$	$126^{-0.014}_{-0.039}$
C (mm)		50	50	64	64	64	64	64	82	92
D (mm)		7.5	7.5	9	9	9	9	9	10	10
E (mm)		2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
J (mm)		17	17	28	30	40	50	50	60	90
K (mm)		7.5	7.5	10	9	9	9	9	10	10
L (mm)		2.1	2.1	2.1	2.7	2.7	2.7	2.7	2.7	2.7
P (mm)		24	24	44	46	50	60	60	80	100
Q (mm)		2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7
X (mm)		10	10	11	12.5	13	13	13	15.5	16.5
Y (mm)		31	31	42	41	40	40	40	56	64.5
O-ring	Flange	S24	S24	S44	S46	S50	S60	S60	S80	S100
	Inner (2 pcs)	S10	S12	S20	S24	S32	S38	S40	S50	S75
	Outer (2 pcs)	S36	S36	S56	S60	S70	S80	S85	S90	S120
Bearing type		16003	16003	60 / 28	6006	6908	6910	6910	6912	6818
Max. speed (RPM)		6,000	6,000	4,500	4,500	3,600	3,000	3,000	2,500	1,800
Product no.		10C-9020 -B010	10C-9020 -B020	10C-9020 -B030	10C-9020 -B040	10C-9020 -B050	10C-9020 -B060	10C-9020 -B070	10C-9020 -B080	10C-9020 -B090
C series	a (mm)	36	38	48	52	58	66	68	86	118
	b (mm)	12	12	15	15	15	15	15	18	21

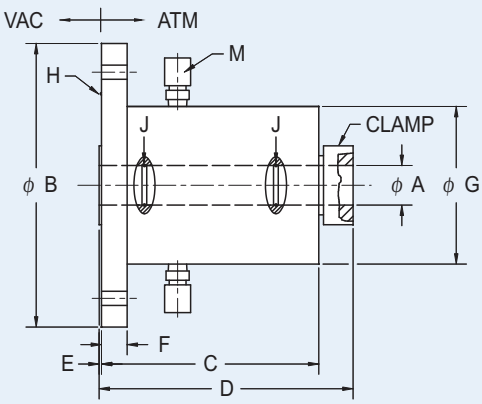
Hollow Shaft

Flange Mount

FD-F1-HS



FD-F1-HS-W (water cooled)

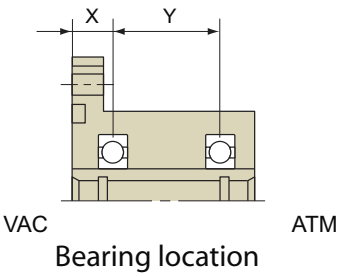


Nominal	For use with shaft sizes indicated				
	0.5	**1.0**	**1.5**	**2.0**	**3.0**
Recommended	**0.501 / 0.498**	**1.001 / 0.998**	**1.501 / 1.498**	**2.001 / 1.998**	**3.001 / 2.998**
Product No.	10C-8926-A	10C-8926-B	10C-8926-C	10C-8926-D	10C-8926-E
Model	FD-F1-HS-0500-C	FD-F1-HS-1000-C	FD-F1-HS-1500-C	FD-F1-HS-2000-C	FD-F1-HS-3000-C
Max. RPM	6000	4500	3000	2500	1800
A(inch)	0.502 / 0.503	1.002 / 1.0003	1.502 / 1.503	2.002 / 2.003	3.002 / 3.003
B(inch)	6.00	7.00	7.00	7.00	10.00
hole pattern	(4)x0.75 dia on 4.750 B.C.	(4)x0.75 dia on 5.500 B.C.	(4)x0.75 dia on 5.500 B.C.	(4)x0.75 dia on 5.500 B.C.	(8)x0.75 dia on 8.500 B.C.
C(inch)	2.75	2.75	3.00	3.25	3.87
D(inch)	3.215	3.339	3.65	3.966	4.717
E(inch)	0.03	0.03	0.03	0.03	0.03
F(inch)	0.38	0.38	0.38	0.38	0.62
G(inch)	2.75	3.00	3.75	4.18	5.87
H(O-ring)	2-238	2-244	2-244	2-244	2-262
J(O-ring)	2-014	2-022	2-029	2-033	2-151
FFC part no.	50A103358	50A103359	50A103360	50A103361	50A103362
FFC model no.	SC-500-FC	SC-1000-FC	SC-1500-FC	SC-2000-FC	SC-3000-FC
	10C-8927-A	10C-8927-B	10C-8927-C	10C-8927-D	10C-8927-E
Model	FD-F1-HS-0500-W-C	FD-F1-HS-1000-W-C	FD-F1-HS-1500-W-C	FD-F1-HS-2000-W-C	FD-F1-HS-3000-W-C
A....J	See above	See above	See above	See above	See above
M(2 places)	FITTING FOR 0.25" OD TUBE	FITTING FOR 0.25" OD TUBE	FITTING FOR 0.25" OD TUBE	FITTED FOR 0.25" OD TUBE	FITTING FOR 0.25" OD TUBE
FFC part no.	50A105395	50A105396	50A105354	50A103921	50A105397
FFC model no.	SC-500-FWC	SC-1000-FWC	SC-1500-FWC	SC-2000-FWC	SC-3000-FWC

Metric Hollow Shaft

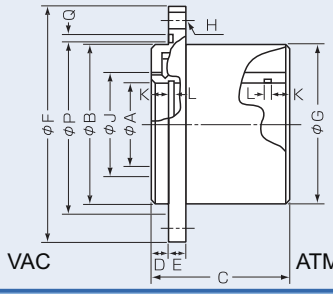
Flange Mount

A flange is provided for the RMS-HS series to facilitate application mounting.



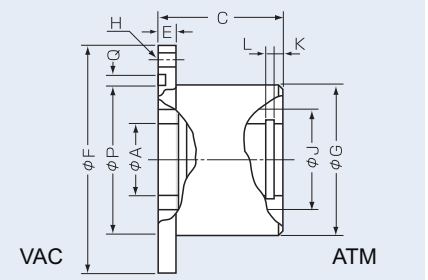
Bearing location

RMS-F1-HS w/pilot mount

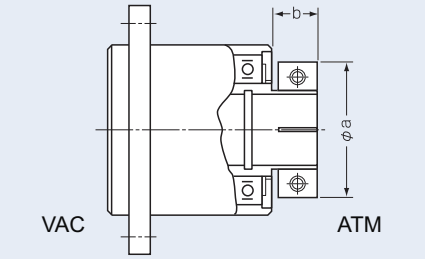




RMS-F1-HS



RMS-F1-HS-C (Clamp)



If shaft clamping is required, add "-C" at the end of the model no.

Model		RMS-F1-HS style									
		F1-HS-10	F1-HS-12	F1-HS-20	F1-HS-24	F1-HS-26	F1-HS-32	F1-HS-38	F1-HS-40	F1-HS-50	F1-HS-75
Product No.		10C-9020 -C010	10C-9020 -C020	10C-9020 -C030	10C-9020 -C040	10C-9020 -C050	10C-9020 -C060	10C-9020 -C070	10C-9020 -C080	10C-9020 -C090	10C-9020 -C100
A (mm)		$10^{+0.018}_{0}$	$12^{+0.018}_{0}$	$20^{+0.021}_{0}$	$24^{+0.021}_{0}$	$26^{+0.021}_{0}$	$32^{+0.025}_{0}$	$38^{+0.025}_{0}$	$40^{+0.025}_{0}$	$50^{+0.025}_{0}$	$75^{+0.025}_{0}$
B (mm)		-	-	$62^{-0.010}_{-0.029}$	$63^{-0.010}_{-0.029}$	$70^{-0.010}_{-0.029}$	$73^{-0.010}_{-0.029}$	$83^{-0.036}_{-0.071}$	$83^{-0.036}_{-0.071}$	$95^{-0.012}_{-0.034}$	$126^{-0.014}_{-0.039}$
C (mm)		50	50	64	64	64	64	64	64	82	92
D (mm)		-	-	10	10	10	10	10	10	10	10
E (mm)		8	8	10	10	10	10	10	10	10	15
F (mm)		70	70	106	106	120	130	136	136	140	180
G (mm)		42	42	62	63	70	73	83	83	95	126
H		6- Φ6.7 PD 59.8	6- Φ6.7 PD 59.8	6- Φ7 PD 90	6- Φ7 PD 90	6- Φ9 PD 100	6- Φ9 PD 110	6- Φ9 PD 114	6- Φ9 PD 114	6- Φ9 PD 124	6- Φ11 PD 160
J (mm)		17	17	28	30	32	40	50	50	60	90
K (mm)		7.5	7.5	10	9	9	9	9	9	10	10
L (mm)		2.1	2.1	2.1	2.7	2.7	2.7	2.7	2.7	2.7	2.7
P (mm)		42	42	70	70	75	85	90	90	100	135
Q (mm)		2.7	2.7	2.7	2.7	4.1	4.1	2.7	2.7	2.7	2.7
X (mm)		10	10	11	12.5	13.5	13	13	13	15.5	16.5
Y (mm)		31	31	42	41	39	40	40	40	56	64
O-ring	Flange	S42	S42	S70	S70	G75	G85	S90	S90	S100	S135
	Inner (2 pcs)	S10	S12	S20	S24	S26	S32	S38	S40	S50	S75
Bearing type		16003	16003	60 / 28	6006	60 / 32	6908	6910	6910	6912	6818
Product no.		10C-9020 -D010	10C-9020 -D020	10C-9020 -D030	10C-9020 -D040	10C-9020 -D050	10C-9020 -D060	10C-9020 -D070	10C-9020 -D080	10C-9020 -D090	10C-9020 -D100
C series	a (mm)	38	38	48	52	52	58	66	68	86	118
	b (mm)	12	15	15	15	15	15	15	15	18	21

$^{+0.030}_{0}$

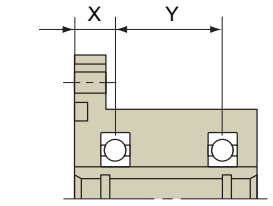
Metric Hollow Shaft

Flange Mount Water Cooled

Water-cooled type is available even for the hollow shaft types.

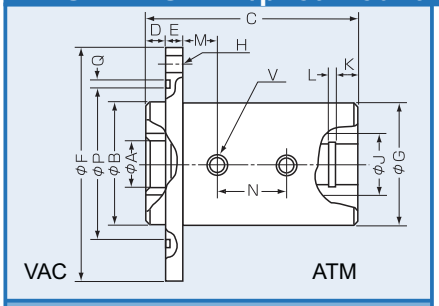
Cooling water

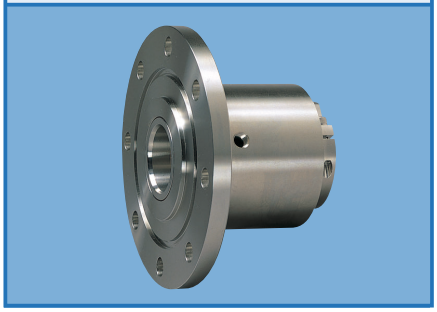
Flow rate : ≦ 1L/min
Water pressure : ≧ 300 kPa



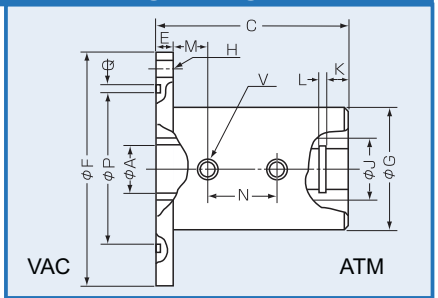
Bearing Location

RMS-F1-HS-W w/pilot mount

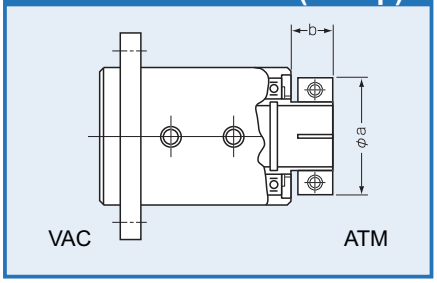




RMS-F1-HS-W



RMS-F1-HS-W-C (clamp)



If shaft clamping is required, add "-C" at the end of the model no.
Fittings for connecting cooling water are provided.

Model		RMS-F1-HS-W style									
		F1-HS-10-W	F1-HS-12-W	F1-HS-20-W	F1-HS-24-W	F1-HS-26-W	F1-HS-32-W	F1-HS-38-W	F1-HS-40-W	F1-HS-50-W	F1-HS-75-W
Product no.		10C-9020 -E010	10C-9020 -E020	10C-9020 -E030	10C-9020 -E040	10C-9020 -E050	10C-9020 -E060	10C-9020 -E070	10C-9020 -E080	10C-9020 -E090	10C-9020 -E100
A (mm)		$10^{+0.015}_{0}$	$12^{+0.018}_{0}$	$20^{+0.021}_{0}$	$24^{+0.021}_{0}$	$26^{+0.021}_{0}$	$32^{+0.025}_{0}$	$38^{+0.025}_{0}$	$40^{+0.025}_{0}$	$50^{+0.025}_{0}$	$75^{+0.030}_{0}$
B (mm)		-	-	$64^{-0.010}_{-0.029}$	$70^{-0.010}_{-0.029}$	$70^{-0.010}_{-0.029}$	$73^{-0.010}_{-0.029}$	-	-	$105^{-0.012}_{-0.034}$	$130^{-0.014}_{-0.039}$
C (mm)		70	70	105	105	116	116	102	102	110	110
D (mm)		-	-	10	10	10	10	-	-	10	10
E (mm)		8	8	10	10	10	10	10	10	10	12
F (mm)		84	84	116	120	130	130	135	135	155	178
G (mm)		52	52	64	76	76	80	90	90	105	130
H		6-Φ6.5 PD 70	6-Φ6.5 PD 70	4-Φ9 PD 96	4-Φ9 PD 96	4-Φ9 PD 110	6-Φ9 PD 110	6-Φ8.5 PD 114	6-Φ8.5 PD 114	6-Φ9 PD 135	6-Φ9 PD 160
J (mm)		17	17	28	30	32	40	50	50	60	90
K / L (mm)		7 / 2.1	7 / 2.1	11 / 2.1	10 / 2.7	10 / 2.7	10 / 2.7	10 / 2.7	10 / 2.7	14 / 2.7	10 / 2.7
M / N (mm)		19 / -	19 / -	18 / -	16 / 38	20 / 40	20 / 38	23 / 37	23 / 3	18 / 38	17 / 36
P (mm)		50	50	70	75	85	85	80	80	110	135
Q (mm)		2.7	2.7	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
V		2-Rc1/8	2-Rc1/8	2-Rc1/8	4-Rc1/8	4-Rc1/8	4-Rc1/8	4-Rc1/8	4-Rc1/8	4-Rc1/8	4-Rc1/8
X / Y (mm)		9 / 51.5	9 / 51.5	13 / 79	10.5 / 84	14.5 / 90	12 / 92	13 / 77	13 / 77	15.5 / 83	15.5 / 83
O-ring	Flange	S50	S50	G70	G75	G85	G85	G80	G80	G110	G135
	Innner (2pcs)	S10	S12	S20	S24	S26	S32	S38	S40	S50	S75
Bearing type		16003	16003	60 / 28	6006	60 / 32	6908	6910	6910	6912	6818
Max. Speed (RPM)		6,000	6,000	6,000	4,000	4,000	3,600	3,000	3,000	2,500	1,800
Product no.		10C-9020 -F010	10C-9020 -F020	10C-9020 -F030	10C-9020 -F040	10C-9020 -F050	10C-9020 -F060	10C-9020 -F070	10C-9020 -F080	10C-9020 -F090	10C-9020 -F100
C series	a (mm)	36	38	48	52	52	58	66	68	86	118
	b (mm)	12	12	15	15	15	15	15	18	18	21

Custom-designed Products

Various functions may be achieved based on the standard items. Shafts, locating bosses, and bellows can be added to customize the Rotary sealing system to your application.

Flange Mount

Solid Shaft Cantilevered* Type

*The cantilevered design isolates both bearings from the process

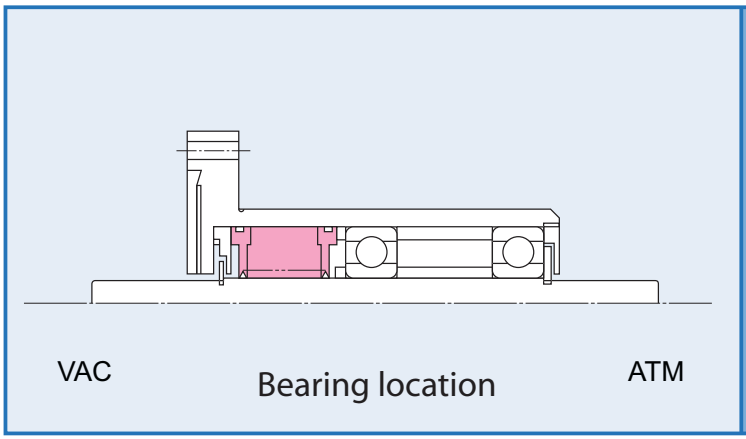
- Prevention of dust generated from the bearing at vacuum side
- High speed rotation
- Long service life

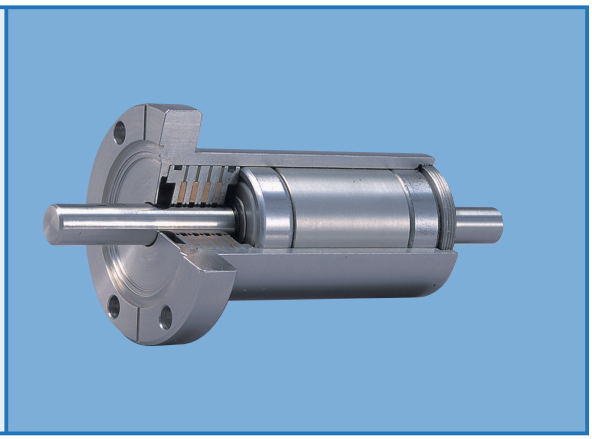
Specifications:

Vacuum integrity	10^{-6} Pa (pressure differential 250 kPa)
Atmosphere	For vacuum, inert gas, active gas
Bearing mechanism	Atmosphere side (cantilever bearing system)

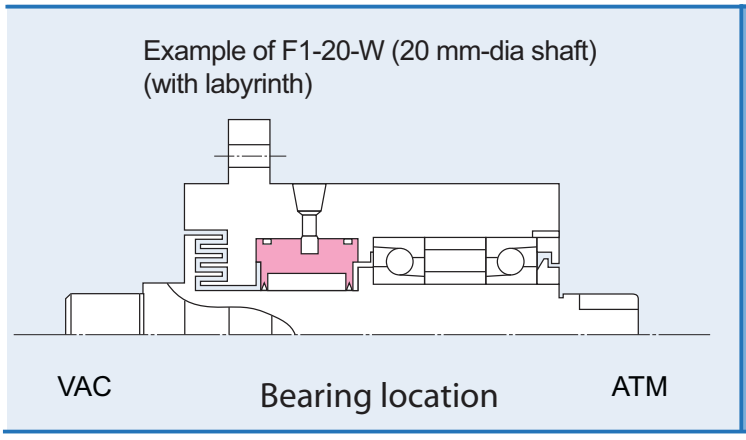
The cantilever type has the above features and is available with either solid or hollow shafts.

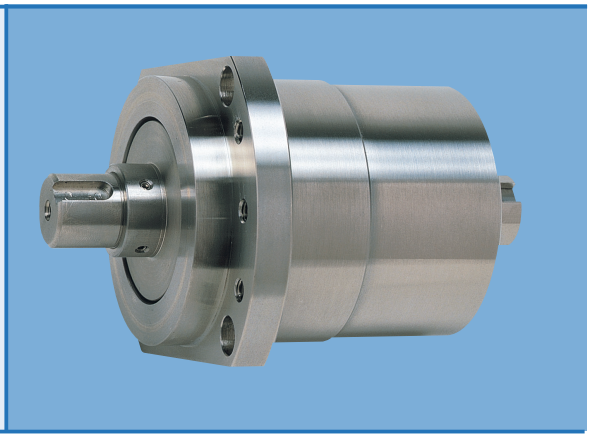
Consult us on diameter, rpm, and installation method (flange method).





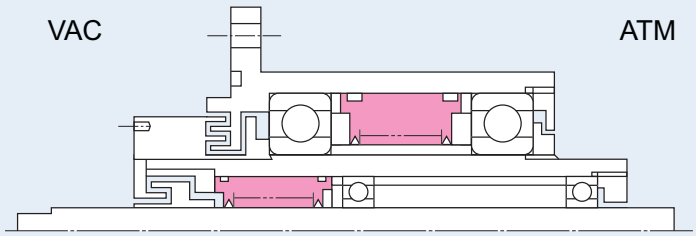
Example of F1-20-W (20 mm-dia shaft) (with labyrinth)



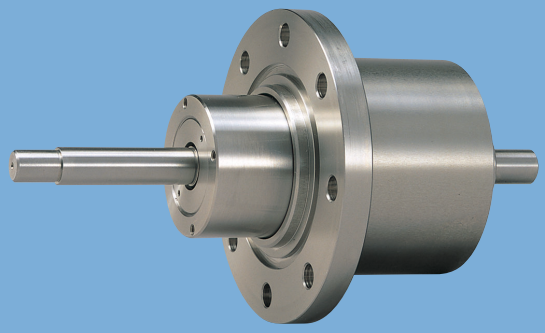


Clean/Vacuum
Magnetic Rotary Seal for Robot

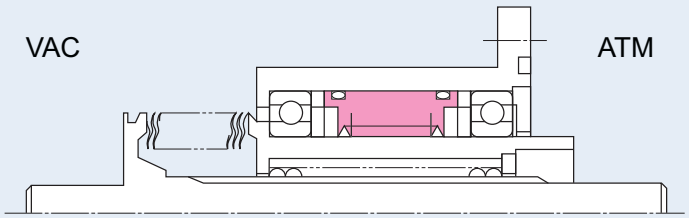
Multiaxial seals



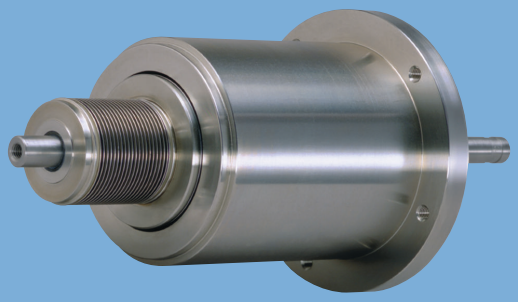
Application: For carriage
Specification: Vacuum 10^{-6} Pa



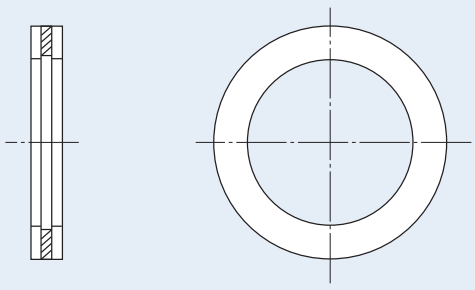
With bellows



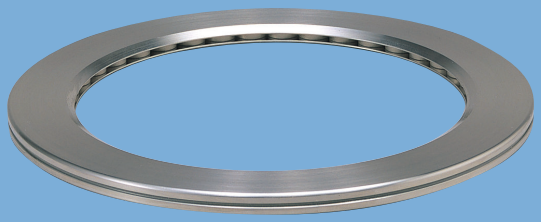
Application: For rectilinear stroke and rotation
Specification: Stroke of 10 mm or more



Dustproof seals (exclusion seals)



Application: For protection from airborne dust



Direct Drive

Motor Equipped Models

These models contribute to vibration reduction and make the equipment smaller.

Model No.	RMS-F1M-20-W
Seal section	Cantilever type
Power supply	Single-phase 100 V
Motor	AC servo
Rated torque (N·m)	0.6
Maximum torque (N·m)	1.9
Rated revolutions (rpm)	3000
Maximum revolutions (rpm)	5000
Motor output (W)	200
Vacuum integrity (Pa)	10^{-6}

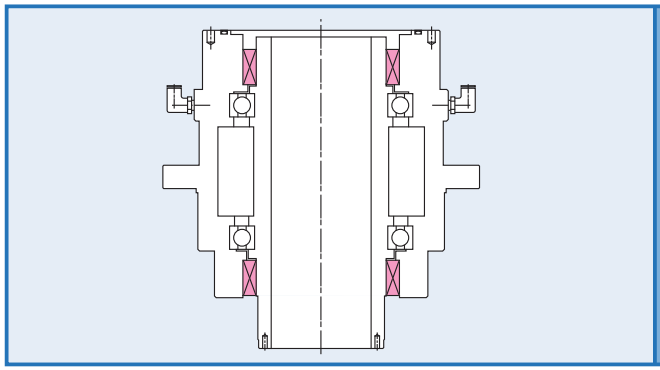


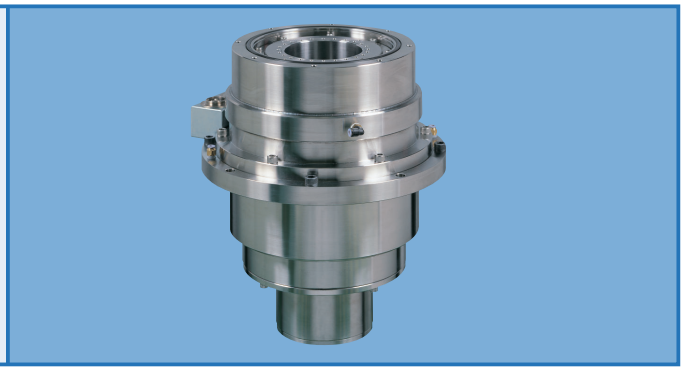
Model No.	Output	Output axial diameter
RMS-F1-M4501-8-W	30W	Φ8
RMS-F1-M4503-8-W	100W	Φ8
RMS-F1-M4509-14-W	400W	Φ14
RMS-F1-M4514-19-W	800W	Φ19

Contact Rotary Vacuum Products for special specifications such as axial diameter.



Large-diameter hollow shaft type





A hollow shaft direct center drive achieves the following:

- Low vibration
- Compactness
- Long service life

Specifications

Atmosphere	N_2, O_2 or Inert gas
Pressure range	From atmospheric pressure through 10^{-6} Pa
Rotation speed	Up to 2000 rpm
Rotation axis	Hollow shaft Φ75 or more
Seal type	Twin seal

Direct Drive

Motorized Feedthroughs

Plug and Run

5000 RPM Maximum Speed
3-40 lbs-in net torque available

NEMA-flanged motors

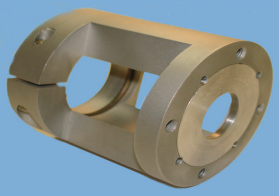


3/8" Feedthrough with servomotor option shown

Adapter packages available

Adapter-only available for

17-34 NEMA-flanged motors



Feedthrough adapter only shown

Coupling packages

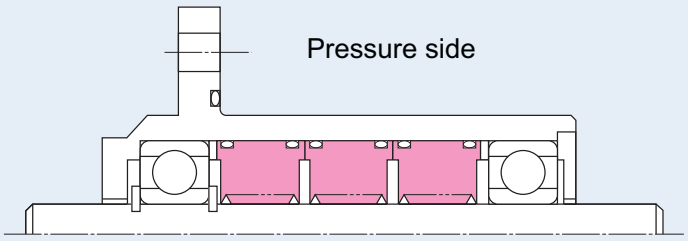
Feedthrough, adapter, and coupling



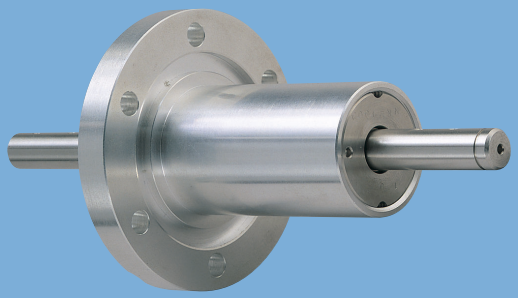
Feedthrough, adapter, and coupling shown

Function Enhanced Products

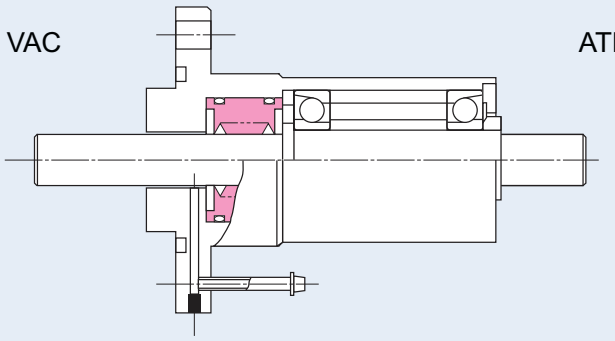
High pressure type



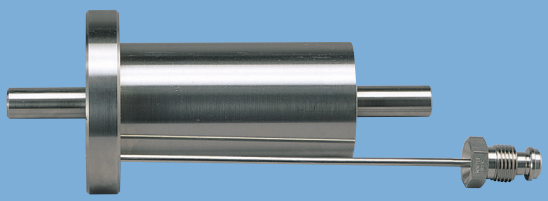
Application: Sealing of high pressure container, etc.
Specification: Pressure differential 350 kPa, revolution speed 3000 rpm



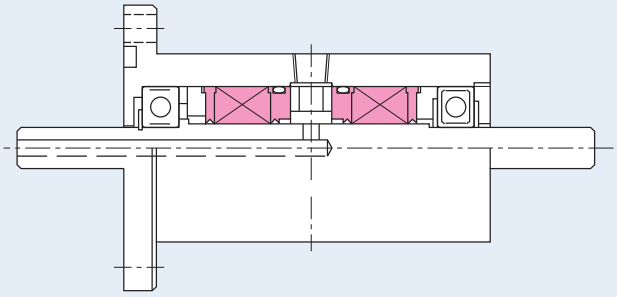
With a purge port

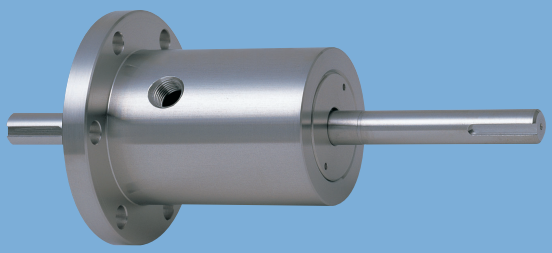


Application: Prevention of contamination with gas or dust particles
Specification: 10^{-4} Pa



Gas induction type (vacuum chuck/union)

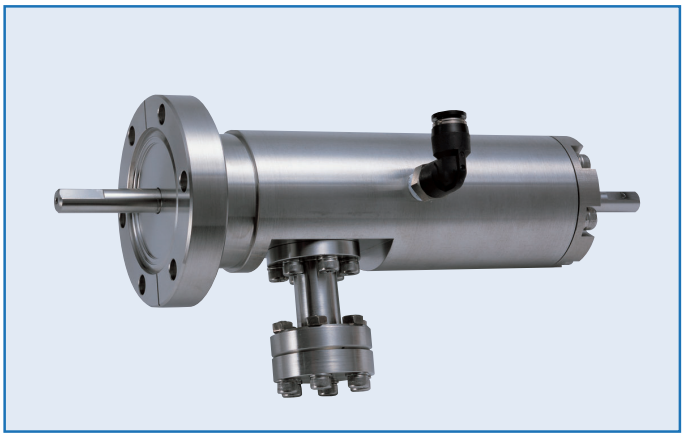




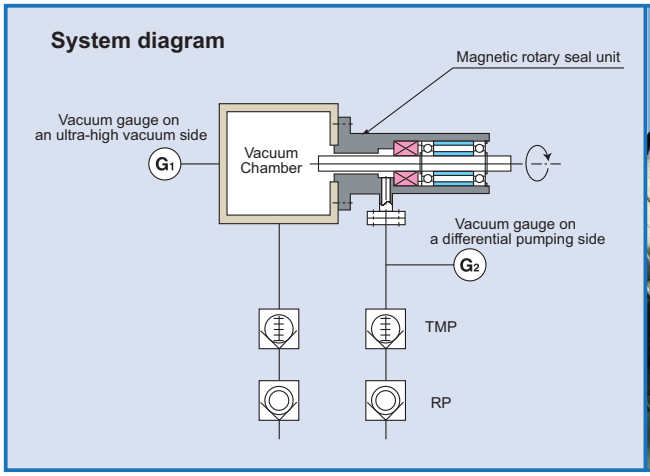
Ultra-High Vacuum

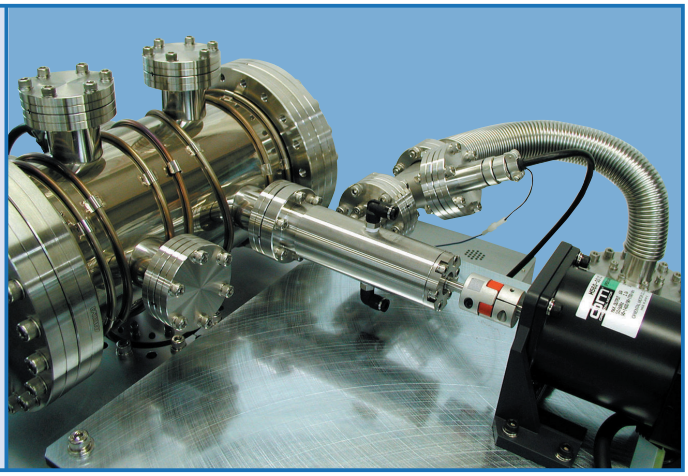
Rotary Vacuum Products has developed a magnetic rotary seal unit featuring a unique structural system as a rotary feedthrough system for ultra-high vacuum.

The evacuation of an interstage port keeps oil mist and microbubbles of magnetic fluid base liquid from entering the vacuum side, preventing the contamination of the vacuum. The chamber remains in an ultra-high vacuum state as a result of differential pumping through an orifice. High torque can be transmitted with this unit.



An example of an ultra-high vacuum system with the magnetic rotary seal RMS series





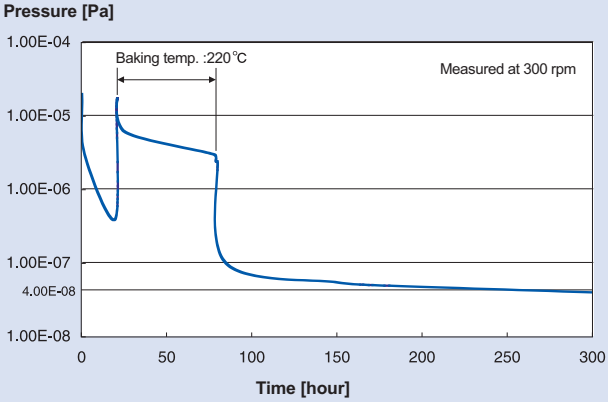
The system has the following features:

- Ultra-high vacuum (up to 10^{-8} Pa) is achieved by an orifice effect and the adoption of differential pumping that prevents base liquid mist from entering the ultra-high vacuum side
- Ultra High vacuum levels are attainable
- High rpm is possible

Specifications

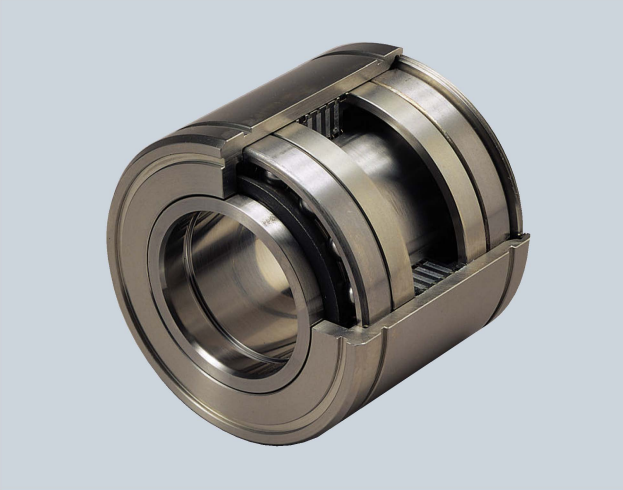
Ultimate pressure	up to 10^{-8} Pa
Temperature range	0 to 80°C
Rotation speed	100 to 700 rpm
Evacuation system	Differential pumping method

Pressure measurement result



Rotary Vacuum Products Feedthrough
for application under high magnetic field

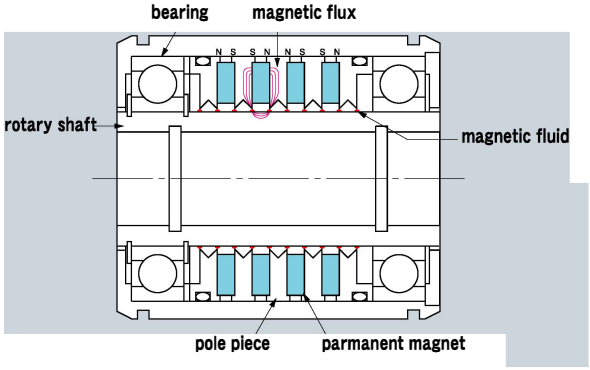
Magnetic rotary feedthrough with Rotary's unique magnetic circuit technology permits application under high magnetic field.



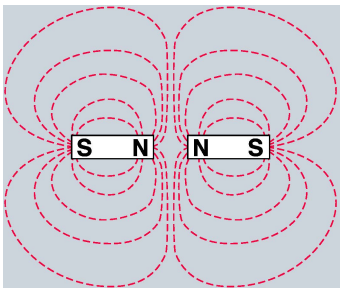
Applications

- Single crystal growth system (MCZ method)
- Accelerator (cyclotron, linac)
- Sputtering equipment (magnetron plasma)
- Various magnetization and deposition systems
- Electron microscope (X–Y stage, shutter)

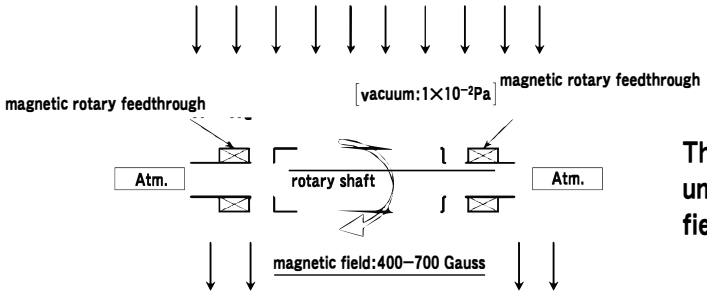
Magnetic circuit configuration



Magnetic flux distribution



An application example: high magnetic field of 400mm Si single crystal growth



The suitability was confirmed under 700 Gauss of magnetic field.

[result] No leak was detected by Helium leak detector.

SSi Super Silicon Crystal Research Institute Corp.

provided by courtesy of Super Silicon Crystal Research Institute Corp.

Magnetic fluid sealing for vacuum and other environments

Expert Feedthrough Repairs

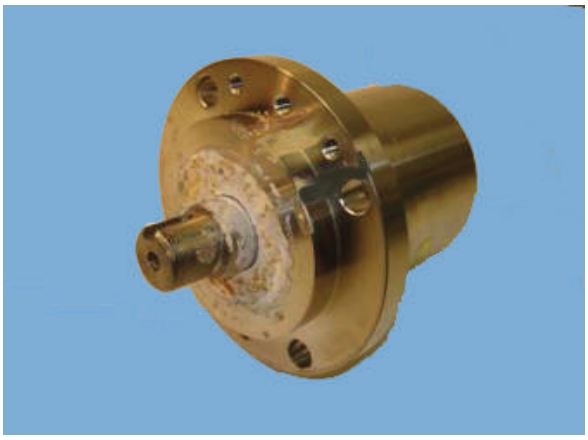
Rotary Vacuum Products feedthroughs are manufactured to consistently provide reliable service in all applications where rotary motion access in a vacuum environment is needed. Rotary pays great attention to detail during the engineering and manufacturing of our feedthroughs.

Even the best engineered and built products eventually wear out and require service. When this occurs, Rotary Vacuum Products, experienced repair group is standing by to ensure the repair/rebuilding process is performed, expertly, in a timely fashion.

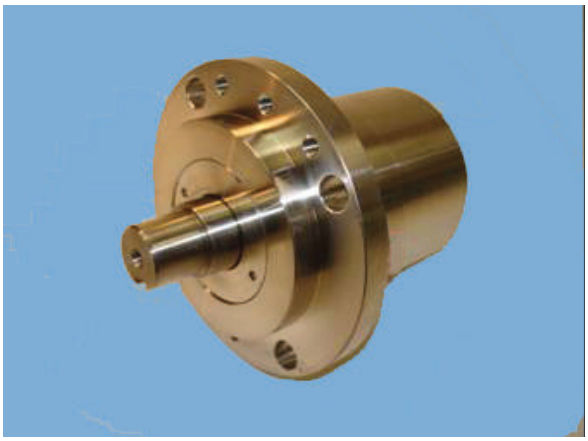
In most cases the parts needed are in our vast inventory. We pride ourselves in precision and timely turn around of all Rotary and Non-Rotary product repairs. Rotary is determined to provide the ultimate service and offers the best warranty in the industry on all repairs/rebuilds.

Call (603-890-6001, fax (603)-890-6016, or email: rvp-sales@rotaryvac.com today

We also repair higher level assemblies



Feedthrough before rebuild



Feedthrough after complete rebuild

FEEDTHROUGH INFORMATION

Standard series

The shaft is held with bearings at both ends of the housing. This series offers large transmission torque, no backlash, and high-precision rotation.
The bearings on the vacuum side are treated with special grease suitable for use in an extremely high vacuum to assure a clean vacuum system.

Common specifications

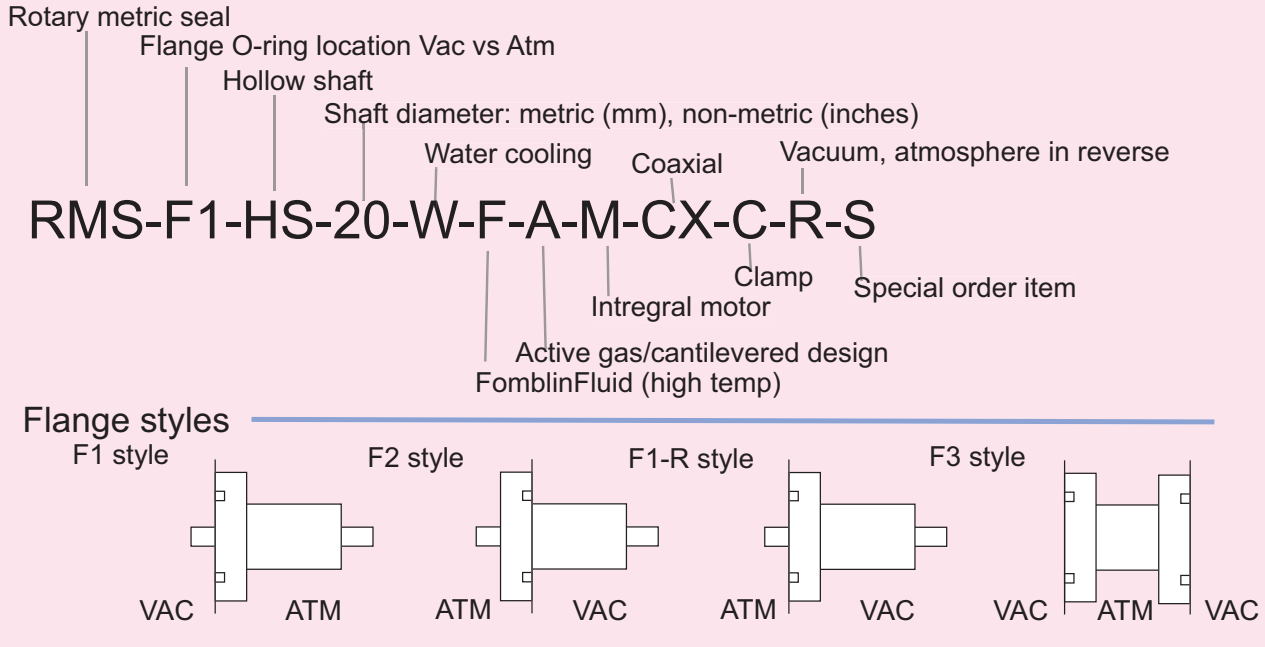
- Vacuum integrity : 10^{-6}Pa
- Pressure differential : 250kPa
- Operating temp. range : 0 to 100 ℃
- Leak rate : <1.3X10^{-12}Pa·m^3/sec(He)
- Atmosphere : For vacuum, inert gas, active gas
- Standard accessories : O-rings, washers and nuts (BS,LS series)

- Materials

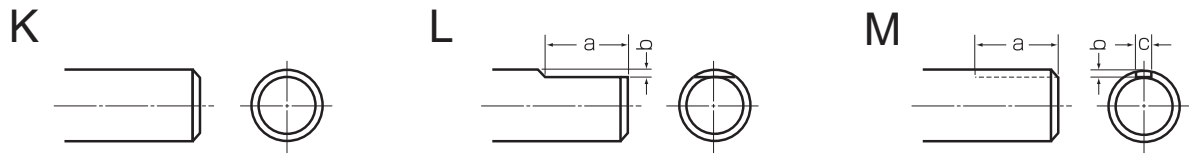
Case section : SUS303
Shaft : SUS 630
Pole piece : SUS 630
Bearing lubrication:
Vac side : High-vacuum grease
Atm side : Grease with anti-corrosive agent

Magnetic fluid base oil
Standard : Alkyl naphthalene
For active gas : perfluoro-polyether
For high heat resistance : perfluoro-polyether

Model



Shaft end shape



Rotary
Vacuum Products

Product Cross Reference
Ferrofluidics/Ferrotec to Rotary

Ferrofluidics /Ferrotec Corp.		Rotary	
P/N Note 1	Model	Prod. No.	Model
Solid Shaft Models			
103971	MB-188-L-N-090	10C-8917-A	FD-BS-0188
103915	MB-250-B-N-089	10C-8918-A	FD-CFM-0250
103978	MB-250-K-N-101	10C-8917-B	FD-BS-0250
103237	SB-250-A-N-086	10C-8908-A	FD-LSR-0250-A
103982	SB-250-E-N-121(sloan)	10C-8920-B	FD-LSR-0250-sloan
103236	SB-250-G-N-085	10C-8909-B	FD-LSR-0250-D
103979	SB-252-C-N-011	10C-8909-A	FD-LSR-0250-C
104445	SB-253-A-N-010	10C-8908-B	FD-LSR-0250-B
103532	SB-253-B-N-026	10C-8910-A	FD-CF-0250
103501	SB-253-B-W-148	10C-8910-B	FD-CF-0250-W
103990	SB-375-A-N-087	10C-8911-A	FD-LSR-0375-A
108664	SB-375-A-N-176	10C-8912-A	FD-LSR-0375-C
103154	SB-375-B-N-147	10C-8912-B	FD-CF-0375
103912	SB-375-B-W-151	10C-8913-A	FD-CF-0375-W
103991	SB-375-C-N-103	10C-8911-B	FD-CF-0375-B
103994	SB-375-E-N-150(MRC)	10C-8921-A	FD-F1-0375-MRC
106063	SB-10MM-KF40(Balzers)	10C-8922-A	FD-KF-0394-Balzers
103191	SB-500-A-N-069	10C-8913-B	FD-BS-0500
103204	SB-500-A-W-072	10C-8914-A	FD-BS-0500-W
103909	SB-500-B-N-012	10C-8914-B	FD-CF-0500
103244	SB-500-F-N-049	10C-8915-A	FD-F1-0500
103182	SB-500-F-W-057	10C-8915-B	FD-F1-0500-W
103193	SB-750-A-N-077	10C-8916-A	FD-BS-0750
103206	SB-750-A-W-080	10C-8916-B	FD-BS-0750-W
Heavy-Duty Cantilevered Types, Solid Shaft			
103904	HDSB-750-F-W-134	10C-8919-A	FD-F1-0750-W
104259	HDSB-1000-F-W-135	10C-8919-B	FD-F1-1000-W
103328	HDSB-1687-F-W-136	10C-8920-A	FD-F1-1687-W

Ferrofluidics /Ferrotec Corp.		Rotary	
P/N Note 1	Model	Prod. No.	Model
Hollow Shaft Models			
103318	SC-500-C	10C-8925-A	FD-HS-0500-C
103358	SC-500-FC	10C-8926-A	FD-F1-HS-0500-C
105395	SC-500-FWC	10C-8927-A	FD-F1-HS-0500-W-C
103319	SC-1000-C	10C-8925-B	FD-HS-1000-C
103359	SC-1000-FC	10C-8926-B	FD-F1-HS-1000-C
105396	SC-1000-FWC	10C-8927-B	FD-F1-HS-1000-W-C
103320	SC-1500-C	10C-8925-C	FD-HS-1500-C
103360	SC-1500-FC	10C-8926-C	FD-F1-HS-1500-C
103354	SC-1500-FWC	10C-8927-C	FD-F1-HS-1500-W-C
103321	SC-2000-C	10C-8925-D	FD-HS-2000-C
103361	SC-2000-FC	10C-8926-D	FD-F1-HS-2000-C
103921	SC-2000-FWC	10C-8927-D	FD-F1-HS-2000-W-C
103322	SC-3000-C	10C-8925-E	FD-HS-3000-C
103362	SC-3000-FC	10C-8926-E	FD-F1-HS-3000-C
105397	SC-3000-FWC	10C-8927-E	FD-F1-HS-3000-W-C
Heavy-Duty Cantileverd Types, Hollow Shaft			
* = includes Delrin Shaft Sleeve for electrical isolation			
107426	HS-750-F-W-S	10C-8928-D *	FD-F1-HS-A-0750-E
107423	HS-1000-F-W	10C-8928-A	FD-F1-HS-A-1000
107427	HS-1250-F-W-S	10C-8928-E *	FD-F1-HS-A-1250-E
107424	HS-1500-F-W	10C-8928-B	FD-F1-HS-A-1500
107428	HS-1500-F-W-S	10C-8928-F *	FD-F1-HS-A-1500-E
107425	HS-1750-F-W	10C-8928-C	FD-F1-HS-A-1750

Notes

1. Part no. may be preceded with 50 - A, B, C, or D

For products not listed in these tables, please inquire

A wide range of other products and services are availale. If items listed in this catalog are not suitable for your application, please contact Rotary Vacuum Products.