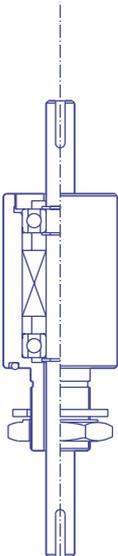


Ferrofluidic®
Vacuum
Rotary
Feedthroughs



Ferrotec Corporation

Ferrotec USA (formerly known as Ferrofluidics Corporation) developed and commercialized the first magnetic liquid feedthroughs shortly after the invention of ferrofluids in the late 1960s. Feedthroughs based on magnetic liquids rapidly became popular due to the advantages they offered over other types of feedthroughs. For example, Ferrofluidic® rotary seals can be used at high speeds, do not wear, are non-contaminating and offer high torque direct drive transmission. Magnetic liquid feedthroughs are the industry standard for many applications in the vacuum industry and are used by semiconductor and optical deposition equipment manufacturers and end users worldwide.

Over the last 30 years, Ferrotec has continually improved and perfected its designs as well as adding a host of other engineering capabilities to ensure that it remains at the forefront of vacuum sealing technology. This has included advances in both the seal design and in the ferrofluids used in the seal. By developing and manufacturing its own fluids the company has retained control of the most important element in the seal.

Ferrotec offers much more than standard rotary feedthroughs. The company offers modifications and custom variations to all feedthroughs in this catalog as well as complete custom design and manufacturing capabilities. This includes the design, manufacture and test of Ferrofluidic seals, motorized spindles and electro-mechanical sealing sub-systems containing Ferrofluidic seals.

Ferrotec has over 100.000 m² of design, engineering and manufacturing operations in the US, Japan and China and sales and service operations throughout the US, Europe and Asia. This enables the company to offer unrivalled engineering, service and support to its customers.

A	USA • Nashua, NH
B	USA • Santa Clara, CA
C	Germany • Untertensingen
D	United Kingdom • Bicester
E	Spain • Mostoles
F	Italy • Milano
G	France • Neyron
H	Japan • Tokyo
I	China • Shanghai
J	China • Hangzhou



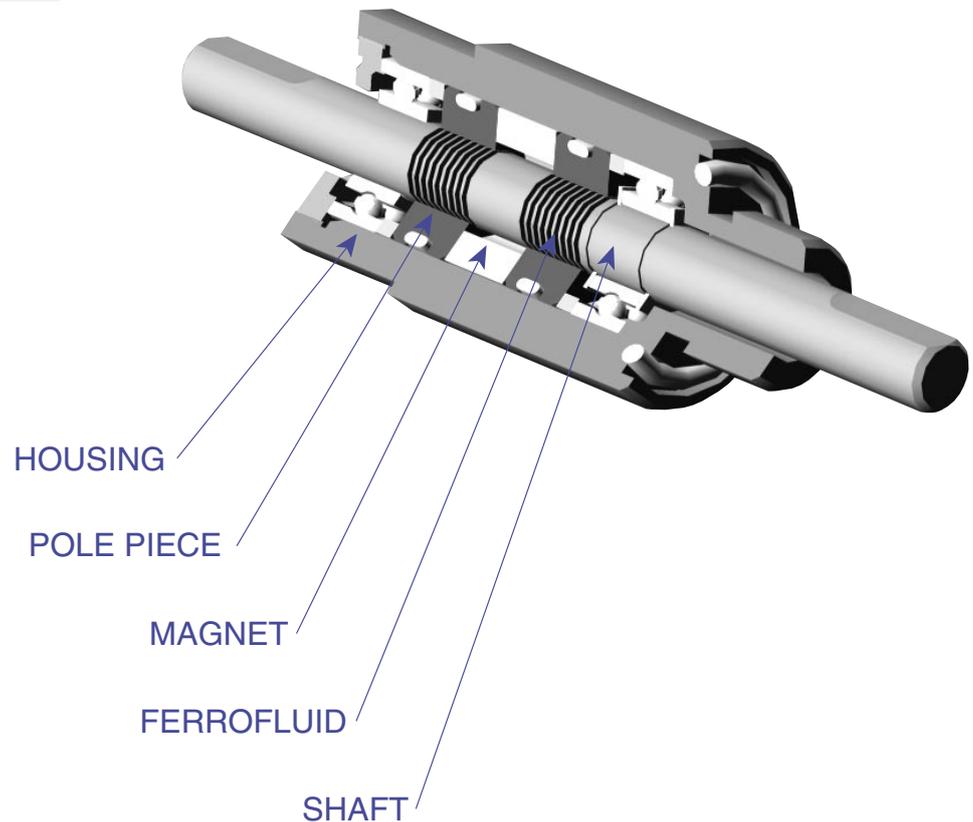
Our Products

This catalog outlines Ferrotec's engineering capabilities and our standard feedthroughs. Many of these feedthroughs are also available in other shaft sizes and all can be modified, for example, by adding water cooling, using a more inert ferrofluid, or modifying the shaft length or housing flange. Custom designed rotary vacuum seals, motorized spindles and electro-mechanical sealing sub-systems can also be designed and manufactured. Please contact us to discuss your requirements in more detail.

If you do not see what you want in this catalog or require further literature or technical information, please call your local sales office (details on back cover) or visit our web site www.ferrotec.com where you can find full product listings.



Ferrofluidic® Magnetic Fluid Sealing Technology



Principles of operation A Ferrofluidic® seal takes advantage of the response of a magnetic fluid to an applied magnetic field. The basic seal components include ferrofluid, a permanent magnet, two pole pieces and a magnetically permeable shaft. The magnetic circuit, completed by the stationary pole pieces and the rotating shaft, concentrates magnetic flux in the radial gap under each pole piece. When fluid is applied to this gap it assumes the shape of a liquid O-ring and produces a hermetic seal. Ferrofluidic® vacuum rotary feedthroughs utilize multiple rings of ferrofluid contained in stages formed by grooves machined into either the shaft or pole pieces. Typically a single stage can sustain a pressure differential of 200 mbar. The pressure capacity of the entire feedthrough is approximately equal to the sum of the pressure capacities of the individual stages.

Benefits of Ferrofluidic Feedthroughs

- Hermetic Sealing** A Ferrofluidic® seal provides a hermetic seal under both static and dynamic conditions against gas, vapor and other contaminants. Leakage rates are in the region of 10^{-11} [He] mbar l s⁻¹.
- Long Life** As the sealing medium is a fluid, there is virtually no friction between the rotating and stationary components so the seal does not wear. The fluids used in Ferrofluidic® seals are inert, stable, low vapor pressure ferrofluids. The seal lifetime depends on the application, but many Ferrofluidic® seals have been in operation over 10 years without maintenance.
- High Reliability** A Ferrofluidic® seal contains a simple permanent magnetic circuit and low volatility ferrofluid. The only parts subject to wear are self-contained ball bearings which are engineered to provide reliable operation.
- Non-Contaminating** Since there is no mechanical friction within the ferrofluid or between the ferrofluid and the static seal components or shaft, no particles are produced which could contaminate the system. Low vapor pressure ferrofluids maintain seal integrity even in high vacuums better than 10^{-9} mbar.
- High Speed Capability** Ferrofluidic® seals provide hermetic sealing even at high rotational speeds. Current technology has produced configurations that perform at dN values of 500.000 (where d=shaft diameter in mm and N=rotational speed in min⁻¹). For a 1" feedthrough this equates to a rotational speed of 20.000 min⁻¹.
- Optimum Torque Transmission** Through-shaft construction permits 100% of the engineered torque transmission and provides in-phase rotation without backlash or slip errors.
- No Set-Leakage Failures** Ferrofluidic® seals provide leak-free performance, even in intermittent and static conditions. Unlike elastomeric seals, they are not subject to plasticizing and relaxation effects during idle periods.
- Smooth Operation** The low viscous drag of the ferrofluid is independent of the pressure applied across the seal. Operation therefore is extremely smooth.



Engineering Capabilities

Feedthrough parameters that can be modified or customized include the mounting configuration, the ferrofluid used, bearing type and position, the shaft size, strength and termination features, the residual magnetic field, the pressure capacity and the location of sealing stages.

Mounting Configurations

Virtually any mounting requirement can be accommodated for securing the housing to a chamber wall or securing components to the rotating shaft. Industry standard mounting flanges and custom configurations for the housing are available and custom lengths and designs can be provided for the shaft. Standard mounting configurations include threaded nose, nut mount, flange mount, cartridge mount, compliant mount, ConFlat®, ISO-K, ISO-F and ISO-KF flange mounts.



Fluid

The standard ferrofluid used is synthetic hydrocarbon based with very low volatility and therefore low outgassing and long product life. It offers medium drag torque and excellent all round reactive gas and temperature resistance. However, for certain applications other types of ferrofluid may be more appropriate. Where low torque is required, synthetic ester based ferrofluids are used, but due to their higher volatility a degree of lifetime and temperature capability will be sacrificed. Fluorocarbon based ferrofluids are used in applications involving the most reactive gases and highest temperatures. They have the lowest outgassing rates and offer the longest life. However they have a higher viscosity which increases starting and running torque and can limit the maximum attainable speed due to heat generation caused by viscous shearing.

Bearings

Nearly all feedthroughs use either radial contact or angular contact ball bearings. Bearing configurations are divided into 2 types depending on how they support the seal – simply supported or cantilevered. Simply supported seals generally allow higher shaft loading due to bearing spacing, but necessitate having one bearing exposed to the process (PFPE grease lubricated). Cantilevering removes the need for a process side bearing, but may limit the radial and moment loads that can be applied. Typical uses for cantilevered seals are UHV and reactive gas applications.

Water Cooling

Most seals can be water-cooled which allows operation at higher temperatures. This is usually achieved by passing a cooling liquid into the pole-pieces through channels in the feedthrough housing. For higher temperature applications, shaft cooling, where coolant is supplied to the rotating shaft through a rotary water union, is also available and can be used along with the housing cooling option.

Additional Features

Ferrotecs' engineering department has over 100 years combined experience in designing feedthroughs for all types of applications and is always available to assist you in selecting or designing a feedthrough or sealing sub-system. Additional features that can be incorporated include:

- custom magnets for resistance to demagnetization or for processes sensitive to magnetic fields
- heat treated shafts for higher torque capacity
- electrically or thermally insulating sleeves and flanges
- advanced bearing lubricants to meet stringent outgassing, speed, temperature or life requirements
- alternative materials to reduce cost or withstand special environments
- co-axial, tri-axial, linearly translating and other shaft options
- integration with other system components such as motors, drives, gears, slip rings, sensors and electrical/gas passthroughs

Capability and Applications

There are many feedthrough parameters that can be modified or custom designed to ensure that the final product matches your application. These include the mounting configuration, the ferrofluid used, bearing type and position, the shaft strength and termination features, the residual magnetic field and the location of sealing stages (on the stator or rotor). These pages include examples of custom engineered feedthroughs and sealing sub-systems designed and built by Ferrotec.

Rotary gas union

APPLICATIONS: CVD, vacuum deposition systems, gas handling modules



Ferrofluidic® rotary gas unions offer manufacturers of CVD and other deposition systems an efficient and flexible method of introducing gases into a process. A static gas feed runs into the rotating shaft which supports the wafer. This ensures that the gas outlet is in the center of the wafer, resulting in uniform coating characteristics.

Multi-axial feedthroughs

APPLICATIONS: wafer handling, CVD wafer rotation with stationary inner shaft



Ferrotec offers multi-axial feedthroughs for wafer handling applications. These offer extremely high repeatability with zero backlash. Linear motion can be incorporated and a cantilevered seal design is optional for UHV optimization. Since the feedthroughs employ a single shaft per axis to transmit torque to the load, torsional stiffness is maximized allowing for the highest torque transmission of any UHV wafer handling rotary sealing technology.

Reactive gas seal

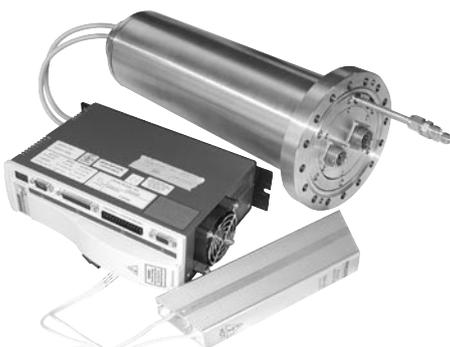
APPLICATIONS: MOCVD, LPCVD, PECVD, designs where aggressive cleaning agents are used



Reactive gas seals for applications such as MOCVD use an inert fluorocarbon based fluid. They feature a cantilevered seal design to protect the bearings from process gases. Special materials are used in the seal construction. Inert gas purges or protective plating can also be added to prevent corrosive attack of seal components.

in-line drive motorized feedthroughs

APPLICATIONS: anywhere where a motor is used, particularly where servo control is necessary



An in-line motorized feedthrough is compact in comparison to an offset or shaft-coupled drive. Ferrofluidic in-line motorized feedthroughs feature a brushless servomotor and matching amplifier with power supply and sinusoidal commutation. Application appropriate feedback devices and command loops are incorporated. As the feedthrough has the motor fully integrated around the shaft rather than coupled to it, it provides optimum drive-to-load torque efficiency over the life of the product. Direct drive feedthroughs are available with either solid or hollow shafts.

High speed, large diameter hollow shaft feedthroughs



APPLICATIONS: optical coating applications, 300 mm wafer rotation mechanisms

High speed, large diameter hollow shaft feedthroughs are ideal for optical coating applications, e.g. fiber optic filter manufacturing. These feedthroughs are configured with a double Ferrofluidic® seal to enable static access to the rear of the seal. Drive is supplied via a toothed belt through the side of the housing or an integral brushless motor within the feedthrough housing. The product can then be accurately observed or measured through the large diameter hollow shaft without the difficulties associated with a rotating window. Seals with an 8" internal diameter can be used at speeds up to 1.000 min⁻¹.

High precision spindle design



APPLICATIONS: wafer handling, ion implantation

Ferrofluidic® spindles can be engineered to rotate with as little as 0,005 mm (0,0001") of run-out. These products are ideal for high precision wafer handling/aligning applications and wafer/substrate rotation applications where wobble requirements are very stringent. Axial, radial and torsional spindle stiffness is achieved by custom engineering the bearing and shaft designs.

Compact designs



APPLICATIONS: FLIR devices, retrofit feedthroughs, rinser-dryers

Ferrotec offers extremely compact seals with small seal envelopes. These are sometimes the only option in the case of retrofits where there is limited axial or radial space available. In new designs they are often beneficial to the overall system layout.

Rotary-linear feedthroughs



APPLICATIONS: wafer handling and alignment with Z-motion

Rotary linear feedthroughs integrate a Ferrofluidic® rotary seal with an edge-welded metal bellows linear seal. They use pre-loaded angular contact rotary bearings and sleeve or ball-type linear bearings. Such feedthroughs are ideal for wafer handling and aligning applications where indexing and translation are involved.

Retrofit feedthroughs

Ferrotec offers a range of retrofit feedthroughs for many vacuum systems supplied by leading semiconductor OEMs. Please call for details about the feedthroughs available for your system.



Repair and servicing

Ferrotec offers a full worldwide repair service for magnetic liquid feedthroughs and subsystems. All feedthroughs returned for repair are completely disassembled, inspected and the cause of degradation determined. They are then fully refurbished and parts replaced where necessary. The repaired feedthrough will always be fully tested and is returned with a full warranty.

Using This Catalog

This catalog is a product overview. It gives a snapshot of our capabilities and includes product specifications for only our most commonly manufactured standard feedthroughs. All feedthrough types featured in this catalog are available in a complete range of sizes. Customizations and variations such as fluorocarbon based fluid for use with reactive gases, different types of bearings and features such as water cooling are available with most products. Please call Ferrotec with details of your application for advice on selecting an appropriate product.

Please contact your local Ferrotec sales office (details on back cover) for:

- Further information on any products featured in this catalog or on our web site
- Assistance in selecting a feedthrough
- Advice if you do not see what you are looking for here
- Customization for your application
- Information about how Ferrotec can assist with your sub-system manufacturing requirements

Some specifications are common to the majority of feedthroughs contained in this catalog. These are outlined below.

Temperature range (Uncooled)* ¹	0..100°C
Vacuum pressure* ²	10 ⁻⁹ mbar
Leakage rate* ³	10 ⁻¹¹ mbar l s ⁻¹
Gas compatibility* ⁴	inert gas
Housing material	300 series SS* ⁵
Shaft material	400 series* ⁶ SS or 17-4* ⁷ PH
Maximum shaft run-out	0,076 mm

*¹ water cooled units may exceed these temperatures. Most units are bakeable to 150°C.
 *² estimated value. Actual performance will depend on system pumping speed and other gas loads.
 *³ units not regularly tested to this level as it is beyond the capability of common vacuum equipment.
 *⁴ for sealing in reactive environments a fluorocarbon based ferrofluid maybe required.
 *⁵ ISO 1.4301 or similar
 *⁶ ISO 1.4000 or similar
 *⁷ ISO 1.4542 or similar

Metric and Inch feedthrough model numbers correspond to the following guides. Please use these to assist you in selecting the correct model and part numbers.

METRIC

S M L - 0 0 4 - N N

SHAFT
H: hollow shaft
S: solid shaft

FLUID
F: fluorocarbon based (reactive gases)
L: standard hydrocarbon

SHAFT DIAMETER (mm)

BALL BEARINGS
C: both on atmospheric side
H: heavy duty
N: standard (vacuum and atmospheric sides)

MOUNTING
F: flange
M: mini-flange
N: nut
S: screw
T: sleeve

COOLING/CLAMP
C: clamp
M: water cooling and clamp
N: no water cooling, no clamp
W: water cooling

INCH

S S - 2 5 0 - S L A E W P

SHAFT
SS: solid shaft
HS: hollow shaft
CM: compliant mount
RU: rotary union
CX: co-axial
TX: tri-axial
HD: heavy duty
MS: module seal
MSS: sleeved module seal
SM: sealed motor

BEARING CONFIGURATION
S: simply supported
C: cantilevered

SHAFT DIAMETER
188=0,1875 in
250=0,250 in
375=0,375 in
1000=1,000 in

FLUID
F: fluorocarbon based (reactive gases)
L: standard hydrocarbon

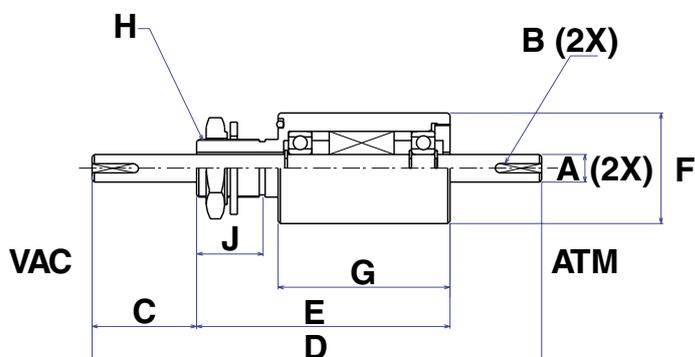
MOUNTING
A: nose (threaded)
B: nut mount (threaded body)
C: ConFlat® flange
F: Ferro flange
E: custom
O: ISO flange
K: KF flange
X: cartridge seal

FEATURES
S: sleeve
W: water-cooled
C: shaft clamp
I: electrical isolation
Un: number of union services
P: pulley

	Thread Size	ConFlat® Flange Size	ISO Flange Size	Ferro Flange Size	Kwik Flange
A	0,3125-24	1,33	63	6,0	16
B	0,4375-20	2,75	100	7,0	25
C	0,50-20	4,5	160	8,0	40
D	0,75-16	6,0	200	9,0	50
E	1,0-14	8,0	250	10,0	
F	1,5-24	10,0	320	5,0HD	
G			500	6,0HD	
H				7,0HD	
S	SPECIAL				



Threaded Mount Feedthroughs



INCH SIZES

Model Number	SS-188-SLAA	SS-250-SLAB	SS-500-SLAE/ SS-500-SLAEW	SS-750-SLAE / SS-750-SLAEW
Part Number	103971	103978	103191/ 103204 (water cooled)	103193/ 103206 (water cooled)
Shaft diameter [mm]	A Ø4,762 (3/16")	Ø6,35 (1/4")	Ø12,7 (1/2")	Ø19,05 (3/4")
Shaft termination [in]	B 0,030d x 0,37L (flat)	0,030d x 0,40L (flat)	0,126w x 0,77d x 1,0L (keyway)	0,188w x 0,114d x 1,0L (keyway)
Shaft extension (Vac) [in]	C 12,7	19,05	63,25	2,49
Overall length [mm]	D 65,075	87,3	223,825	223,825
Housing overall length [mm]	E 40,132	49,2	128,83	128,83
Housing diameter [mm]	F Ø16	Ø19,05	Ø72,9	Ø72,9
Body length [mm]	G 33,02	39,675	90,475	90,475
Thread	H 5/16-24 UNF-2A* 7/16-20 UNF-2A*		1"-14 UNS-2A	1"-14 UNS-2A
Thread length [mm]	J 7,1	9,5	33,7	33,7
Fitting locations for optional water cooling	N/A	N/A	22,6 44,19	22,6 44,19
Torque capacity [Nm]	1,12	1,8	20,3	75,7
Bearing type/material	R166/SS	R4/SS	R8/SS	R12/SS
Maximum no-load speed [min ⁻¹]	10.000	10.000	10.000	8.100
Face seal O-ring, Viton	2-012	2-015	2-128	2-128

* supplied without nut and washer

METRIC SIZES

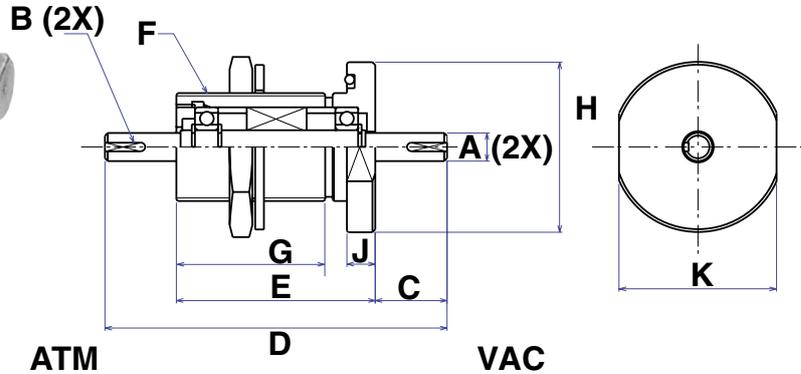
Model Number	SSL-004-NN	SSL-005-NN	SSL-006-NN	STL-012-NN/ STL-012-WN	STL-020-NN/ STL-020-WN
Part Number	04010	04040	04000	09507/ 03905 (water cooled)	009508/ 04008 (water cooled)
Shaft Diameter [mm]	A Ø4 ⁺⁰ _{-0,018}	Ø5 ⁺⁰ _{-0,018}	Ø6 ⁺⁰ _{-0,018}	Ø12 ⁺⁰ _{-0,027}	Ø20 ⁺⁰ _{-0,033}
Shaft termination [mm] (with x) depth x length	B 0,5 x 10 (flat)	0,5 x 10 (flat)	0,5 x 10 (flat)	4 x 2,5 x 20 (keyway)	6 x 3,5 x 25 (keyway)
Shaft extension (Vac) [mm]	C 15	15	15	40	55
Overall length [mm]	D 76,5	76,5	76,5	179	211
Housing overall length [mm]	E 46,5	46,5	46,5	109	121
Housing diameter [mm]	F Ø21	Ø21	Ø21	Ø48	Ø63
Body length [mm]	G 36,5	36,5	36,5	74	82
Thread	H M12x1,5*	M12x1,5*	M12x1,5*	M25x1,5	M30x1,5
Fitting locations for optional water cooling	K1 N/A	N/A	N/A	36,5	40,5
Torque capacity [Nm]	1	1,5	1,5	23,5	108,5
Bearing type/material	686/SUS440C**	686/SUS440C	686/SUS440C	6002/SUS440C	6005/SUS440C***
Face seal O-ring	S14	S14	S14	G35	G50

* supplied WITHOUT nut and washer

** similar to ISO 1.4435

*** similar to ISO 1.4125

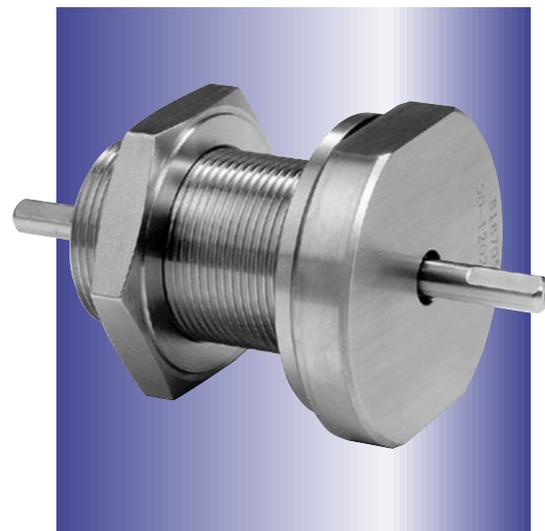
Nut Mount Feedthroughs



INCH SIZES

Model Number	SS-250-SLBD	SS-250-SLBE	SS-250-SLBE	SS-375-SLBE	SS-375-SLBE	SS-375-CFBE*	SS-375-SLBF	SS-250-SLBE
Part Number	103236	103237	103982	108664	103990	121132	103991	107519
Shaft diameter [in]	A Ø6,35 (1/4")	Ø6,35 (1/4")	Ø6,35 (1/4")	Ø9,525 (3/8")	Ø9,525 (3/8")	Ø9,525 (3/8")	Ø9,525 (3/8")	Ø6,35 (1/4")
Shaft termination [in]	B 0,76 x 10,16 (flat)	0,76 x 10,16 (flat)	0,76 x 19 (flat)	1,14 x 19 (flat)	0,76 x 10,16 (flat)			
Shaft extension (Vac) [mm]	C 19,05	19,05	19,05	22,1	18,54	19,05	19,05	19,05
Overall length [mm]	D 87,3	87,3	87,3	86,1	117,475	114,3	3,97	3,125
Housing overall length [mm]	E 49,02	49,02	49,02	41,9	79,76	76,2	2,47	1,625
Thread	F 0,750-16UNF-2A	1-14UNS-2A	1-20UNEF-2A	1-14UNS-2A	1-14UNS-2A	1-14UNS-2A	1,5-12UNF-2A	1-14UNS-2A
Thread length [mm]	G 38,6	38,1	338,1	11,4	18	65,7	43,6	34,9
Flange diameter [mm]	H Ø41,275	Ø41,275	Ø41,275	Ø41,275	Ø41,15	Ø41,275	Ø53,85	Ø41,15
Flange thickness [mm]	J 6,35	6,35	6,35	8,89	20,574	6,35	0,25	0,25
Flange wrench flat [in]	K 1,5	1,5	1,5	1,5	n/a	1,5	n/a	1,5
Torque capacity [Nm]	1,7	1,7	1,7	7,6	7,6	7,6	7,6	1,7
Bearing type/material	R4/SS	R4/SS	R4/SS	R6/SS, R620/SS	R6/SS	6800/SS	R6/SS	R4/SS
Maximum no-load speed [min ⁻¹]	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000
Face seal O-ring	2-026	2-026	2-215	2-026	2-026	2-026	2-132	2-026

* cantilevered configuration

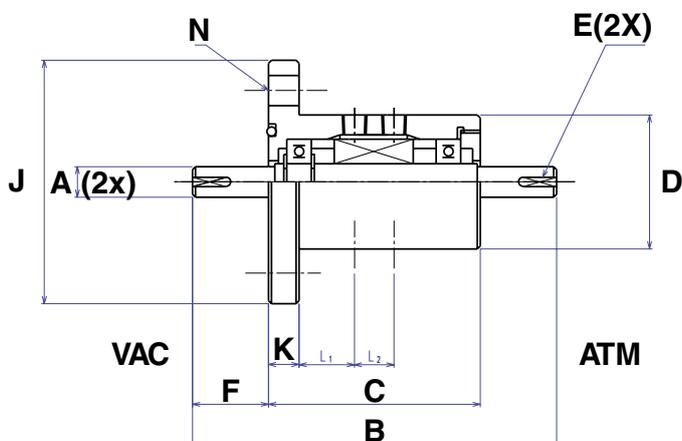
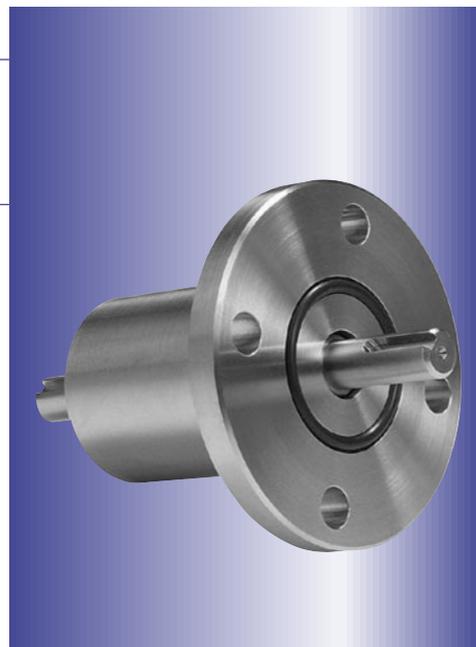


METRIC SIZES

Model Number	SNL-006-NN	SNL-010-NN
Part Number	04060	04001
Shaft diameter [mm]	A Ø6 ⁺⁰ _{-0,018}	Ø10 ⁺⁰ _{-0,022}
Shaft termination [mm]	B 0,5 x 12 (flat)	3 x 1,8 x 14 (keyway)
Shaft extension (Vac) [mm]	C 20	25
Overall length [mm]	D 97,5	119,5
Housing overall length [mm]	E 57,5	69,5
Thread	F M32x1,5	M38x1,5
Flange diameter [mm]	H Ø55	Ø60
Flange thickness [mm]	J 10	10
Flange wrench flat [mm]	K 49	55
Torque capacity [Nm]	2,5	13,5
Bearing type/material	627/SUS440C	6001/SUS440C*
Face seal O-ring	P35	P41

* similar to ISO 1.4435

Flange Mount Feedthroughs



INCH SIZES

Model Number	SS-250-SLCB	SS-250-SLCA	SS-375-SLCBW	SS-375-CFCB*1	SS-500-SLFA	SS-500-SLCB	SS-750-SLFA	HD750SLFFW*2
Part Number	103532	103915	103912	121060	103244	103909	103246	103904
(with watercooling)				(121099)	(103182)			
Shaft diameter [mm]	A Ø6,35 (1/4")	Ø6,35 (1/4")	Ø9,525 (3/8")	Ø9,525 (3/8")	Ø12,7 (1/2")	Ø12,7 (1/2")	Ø19,05 (3/4")	Ø19,05 (3/4")
Shaft termination [mm]	E 0,76 x 10,16 (flat)	3,2 x 19,56 x 25,4 (keyway)	3,2 x 19,56 x 25,4 (keyway)	4,78 x 2,9 x 25,4 (keyway)	4,78 x 2,9 x 25,4 _{VAC} (keyway) 50,8 _{ATM} (keyway)			
Shaft extension (Vac) [mm]	F 19,05	19,05	19,05	19,05	31,75	63,5	30,94	67,8
Overall length [mm]	B 103,1	82,6	115,8	114,3	153,2	219,9	153,2	238,7
Housing overall length [mm]	C 67,3	44,5	77,7	76,2	90,4	124,6	90,5	124
Housing diameter [mm]	D Ø38,1	Ø19,05	Ø38,1	Ø38,1	Ø72,9	Ø60,3	Ø72,9	Ø76,2
Flange diameter [mm]	J Ø69,3	Ø33,8	Ø69,3	Ø69,3	Ø152,4	Ø69,3	Ø152,4	Ø127
Flange thickness [mm]	K 12,7	7,2	12,7	12,7	9,7	12,7	9,7	14,2
Fitting locations for optional water cooling L ₁ , L ₂	n/a	n/a	27,1 31,5	19,05	12,7 44,2	n/a	n/a	40,1 39,1
mounting holes	N Ø6,73 (6x on Ø58,72 bc)	Ø4,37 (6x on Ø26,97 bc)	Ø6,73 (6x on Ø58,72 bc)	Ø6,73 (6x on Ø58,72 bc)	Ø19,05 (4x on Ø120,65 bc)	Ø6,73 (6x on Ø58,72 bc)	Ø19,05 (4x on Ø120,65 bc)	Ø10,3 (6x on Ø101,6 bc)
Torque capacity [Nm]	1,7	1,7	7,6	7,6	20,3	20,3	75,7	280
Bearing type/material	R4/SS	R4/SS	R6/SS	6800/SS	R8/SS	R8/SS	R12/SS	7305/BS
Maximum no-load speed [min ⁻¹]	10.000	10.000	10.000	10.000	10.000	10.000	8.100	3.000
Face seal O-ring	ConFlat Flange	ConFlat Flange	ConFlat Flange	ConFlat Flange	2-234	ConFlat Flange	2-234	2-337

*1 cantilevered configuration

*2 heavy duty

METRIC SIZES

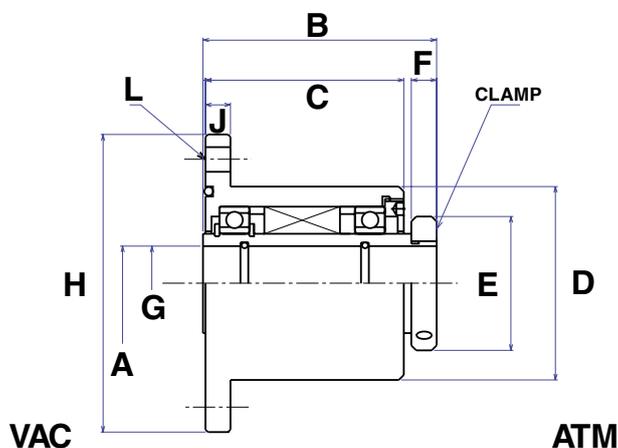
Model Number	SFL-006-NN	SFL-010-NN	SFL-012-NN	SFL-020-NN	SFL-030-WH
Part Number	09295	09297	09299	09264	04094
Shaft diameter [mm]	A Ø6 ⁺⁰ _{-0,018}	Ø10 ⁺⁰ _{-0,022}	Ø12 ⁺⁰ _{-0,027}	Ø20 ⁺⁰ _{-0,033}	Ø30 ⁺⁰ _{-0,033}
Shaft termination [mm]	E 0,5 x 12 (flat)	3 x 1,8 x 14 (keyway)	4 x 2,5 x 20 (keyway)	6 x 3,5 x 25 (keyway)	10 x 5 x 80 (keyway)
Shaft extension (Vac) [mm]	F 20	25	30	35	90
Overall length [mm]	B 97,5	119,5	133,5	151,5	321
Housing overall length [mm]	C 57,5	69,5	73,5	81,5	141
Housing diameter [mm]	D Ø38	Ø44	Ø48	Ø63	Ø105
Flange diameter [mm]	J Ø80	Ø80	Ø90	Ø105	Ø160
Flange thickness [mm]	K 10	10	10	10	20
Mounting holes	N Ø10 (4x on Ø60 bc)	Ø10 (4x on Ø60 bc)	Ø10 (4x on Ø70 bc)	Ø10 (4x on Ø85 bc)	Ø12 (6x on Ø135 bc)
Torque capacity [Nm]	2,5	13,5	23,5	108,5	365
Bearing type/material	627/SUS440C	6001/SUS440C**	6002/SUS440C	6005/SUS440C	6207/SUJ2***
Face seal O-ring	G25	G30	G35	G50	

* For additional ConFlat® and ISO Flange feedthroughs see page 13.

** similar to ISO 1.4435

*** similar to ISO 1.3505

Hollow Shaft Flange Mount Feedthroughs



INCH SIZES

Model Number		HS-500-SLFAC/ HS-500-SLFACW	HS-1000-SLFBC/ HS-1000-SLFBCW	HS-1500-SLFBCW	HS-1500-CFFCWPS*	HS-2000-SLFBC
Part Number		103358/ 105395(water cooled)	103359/ 105396(water cooled)	103354	107428	103361/ 103921(water cooled)
Bore diameter [mm]	A	Ø12,75	Ø25,45	Ø38,15	Ø38,125	Ø50,85
Overall length [mm]	B	81,66	84,84	94,34	175,26	100,74
Housing length [mm]	C	69,85	69,85	76,2	127	82,55
Housing diameter [mm]	D	Ø69,85	Ø76,2	Ø95,25	Ø123,95	Ø106,17
Clamp diameter [mm]	E	31,75	50,8	76,2	n/a	88,9
Clamp thickness [mm]	F	9,652	12,7	15,75	n/a	15,75
Recommended shaft diameter [mm]	G	Ø12,7 ⁺⁰ _{-0,002}	Ø25,4 ⁺⁰ _{-0,002}	Ø38,1 ⁺⁰ _{-0,002}	Ø38,1 ⁺⁰ _{-0,002}	Ø50,8 ⁺⁰ _{-0,002}
Flange diameter [mm]	H	Ø142,4	Ø177,8	Ø177,8	Ø203,2	Ø177,8
Flange thickness [mm]	J	9,65	9,65	9,65	12,7	9,65
Fitting locations for optional water cooling		13,7 29,2	8,9 34,5	14 28,7	11,2 32,5	15,8 31,2
Mounting holes	L	Ø19 (4x on Ø120,65 bolt circle)	Ø19 (4x on Ø139,7 bolt circle)	Ø19 (4x on Ø139,7 bolt circle)	Ø19 (4x on Ø177,8 bolt circle)	Ø19 (4x on Ø139,7 bolt circle)
Bearing type/material		6903/BS	6906/BS	6909/BS	7012/BS	6911/BS
Maximum no-load speed [min ⁻¹]		9.500	7.000	6.500	6.000	5.500
Flange face O-ring		2-238	2-244	2-244	2-256	2-244
Shaft extension (vac) [mm]		0,762	0,762	0,762	0,762	0,762

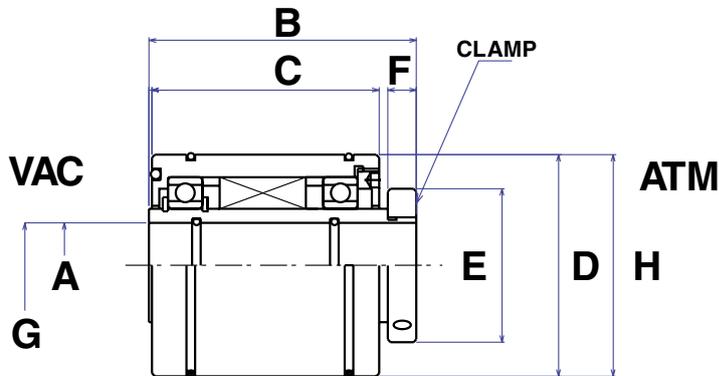
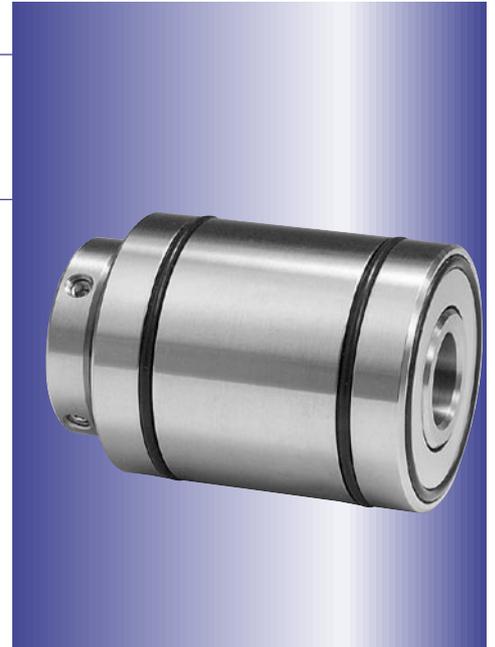
* cantilevered configuration

METRIC SIZES

Model Number		HFL-010-CN/ HFL-010-MN	HFL-020-CN/ HFL-020-MN	HFL-025-CN/ HFL-025-MN	HFL-030-CN/ HFL-030-MN	HFL-040-CN/ HFL-040-MN	HFL-050-CN/ HFL-050-MN	HFL-075-CN/ HFL-075-MN
Part Number (water cooled)		07142 (004172)	07143 (004184)	07146 (003918)	007147 (004110)	007148 (004122)	007242 (004151)	007244 (004190)
Bore diameter [mm]	A	Ø10 ^{+0,03} _{+0,01}	Ø20 ^{+0,04} _{+0,02}	Ø25 ^{+0,04} _{+0,02}	Ø30 ^{+0,04} _{+0,02}	Ø40 ^{+0,05} _{+0,02}	Ø50 ^{+0,05} _{+0,02}	Ø75 ^{+0,06} _{+0,03}
Overall length [mm]	B	78	82,5	88	93	96	98	115
Housing length [mm]	C	64	68,5	74	79	80	82	96
Housing diameter [mm]	D	Ø51	Ø63	Ø71	Ø78	Ø90	Ø103	Ø143
Clamp diameter [mm]	E	Ø34	Ø44	Ø49	Ø54	Ø69	Ø79	Ø109
Clamp thickness [mm]	F	10	10	10	10	12	12	15
Recommended shaft diameter [mm]	G	Ø10 ^{+0,01} _{-0,03}	Ø20 ^{+0,01} _{-0,03}	Ø25 ^{+0,01} _{-0,03}	Ø30 ^{+0,01} _{-0,03}	Ø40 ^{+0,01} _{-0,03}	Ø50 ^{+0,01} _{-0,03}	Ø75 ^{+0,01} _{-0,04}
Flange diameter [mm]	H	Ø90	Ø105	Ø120	Ø120	Ø145	Ø160	Ø210
Flange thickness [mm]	J	10	10	10	10	10	12	12
Fitting locations for optional water cooling		20	22,5	26	27	27	26,5	33
Mounting holes	L	Ø10 (4x on Ø70 bolt circle)	Ø10 (4x on Ø85 bolt circle)	Ø10 (4x on Ø100 bolt circle)	Ø10, 4x on Ø100 bolt circle)	Ø12 (4x on Ø120 bolt circle)	Ø12 (4x on Ø135 bolt circle)	Ø12 (8x on Ø185 bolt circle)
Bearing type/material		16003/SUJ2	6906/SUJ2	6907/SUJ2*	6908/SUJ2	6910/SUJ2	6912/SUJ2	6918/SUJ2
Shaft extension (vac) [mm]		1	1	1	1	1	1	1
Face seal O-ring		G40	G50	G60	G70	G80	G90	G130

*similar to ISO 1.3505

Hollow Shaft Cartridge Mount Feedthroughs



INCH SIZES

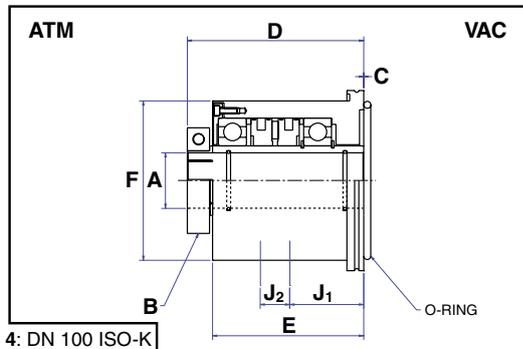
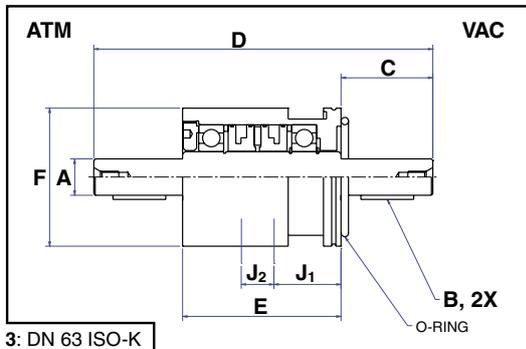
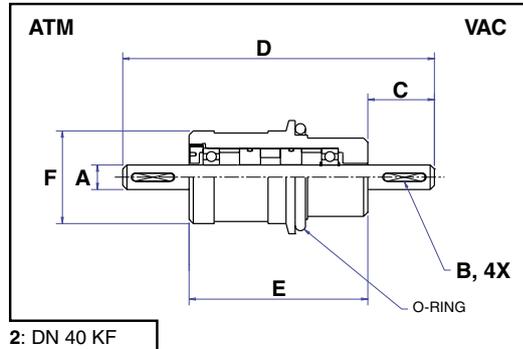
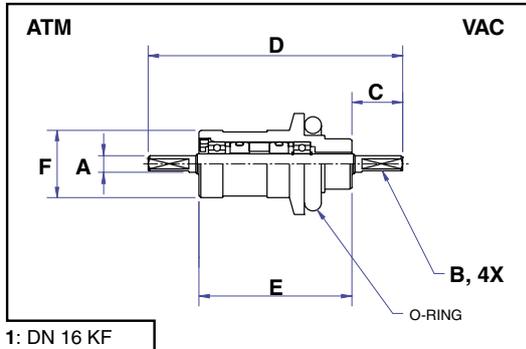
Model Number	HS500SLXSC	HS1000SLXSC	HS1500SLXSC	HS2000SLXSC
Part Number	103318	103319	103320	103321
Bore diameter [mm]	A Ø12,75	Ø25,45	Ø12,75	Ø50,85
Overall length [mm]	B 82,55	84,81	94,34	100,74
Housing length [mm]	C 69,85	69,85	76,2	82,55
Housing diameter [mm]	D Ø50,75	Ø66,6	Ø82,5	Ø95,2
Clamp diameter [mm]	E 31,75	50,8	76,2	88,9
Clamp thickness [mm]	F 21,08	12,7	15,75	15,75
Recommended shaft diameter [mm]	G Ø12,7 ⁺⁰ _{-0,05}	Ø25,4 ⁺⁰ _{-0,05}	Ø38,1 ⁺⁰ _{-0,05}	Ø50,8 ⁺⁰ _{-0,05}
Recommended chamber bore diameter [mm]	H Ø50,8 ^{+0,05} ₋₀	Ø66,675 ^{+0,05} ₋₀	Ø82,55 ^{+0,05} ₋₀	Ø95,25 ^{+0,05} ₋₀
Shaft extension (vac) [mm]	0,76	0,76	0,76	0,76
Bearing type/material	6903/BS	6906/BS	6909/BS	6911 BS
Maximum no-load speed [min ⁻¹]	9.500	8.000	6.500	5.500

METRIC SIZES

Model Number	HTL-010-CN	HTL-020-CN	HTL-025-CN	HTL-030-CN	HTL-040-CN	HTL-050-CN	HTL-075-CN
Part Number	004199	004125	001473	004141	004129	004185	004140
Bore diameter [mm]	A Ø10 ^{+0,03} _{+0,01}	Ø20 ^{+0,04} _{+0,02}	Ø25 ^{+0,04} _{+0,02}	Ø30 ^{+0,04} _{+0,02}	Ø40 ^{+0,05} _{+0,02}	Ø50 ^{+0,05} _{+0,02}	Ø75 ^{+0,05} _{+0,02}
Overall length [mm]	B 78	82,5	88	93	96	98	115
Housing length [mm]	C 64	68,5	74	79	80	82	96
Housing diameter [mm]	D Ø48 ⁺⁰ _{-0,02}	Ø58 ⁺⁰ _{-0,03}	Ø63 ⁺⁰ _{-0,03}	Ø73 ⁺⁰ _{-0,03}	Ø88 ⁺⁰ _{-0,04}	Ø98 ⁺⁰ _{-0,04}	Ø137 ⁺⁰ _{-0,04}
Clamp diameter [mm]	E 34	44	49	54	69	79	109
Clamp thickness [mm]	F 10	10	10	10	12	12	15
Recommended shaft diameter [mm]	G Ø10 ^{-0,01} _{-0,03}	Ø20 ^{-0,01} _{-0,03}	Ø25 ^{-0,01} _{-0,03}	Ø30 ^{-0,01} _{-0,03}	Ø40 ^{-0,01} _{-0,03}	Ø50 ^{-0,01} _{-0,03}	Ø75 ^{-0,01} _{-0,03}
Recommended housing diameter [mm]	H Ø48 ^{+0,05} _{+0,03}	Ø58 ^{+0,06} _{+0,03}	Ø63 ^{+0,06} _{+0,03}	Ø73 ^{+0,06} _{+0,03}	Ø88 ^{+0,07} _{+0,03}	Ø98 ^{+0,07} _{+0,04}	Ø137 ^{+0,07} _{+0,04}
Shaft extension (vac) [mm]	1	1	1	1	1	1	1
Face seal O-ring	S38	S48	S53	S60	S75	S85	S125
Bearing type/material	16003/SUJ2	6906/SUJ2	6907/SUJ2*	6908/SUJ2	6910/SUJ2	6912/SUJ2	6918/SUJ2

* similar to ISO 1.3505

New Metric Feedthroughs



METRIC SIZES

Drawing Reference	1	2	3	4
Model Number	SFL-005-NN ¹	SFL-012-NN ²	SFL-025-WN ³	HFL-040MN ⁴
Part Number	132097	132098	132099	132100
Shaft diameter [mm]	A Ø5 ^{-0,004 -0,012}	Ø12 ^{-0,006 -0,017}	Ø25 ^{+0,015 -0,002}	Ø40 ^{+0,05 -0,025}
Shaft termination [mm]	B 0,5 x 12 flat, 4x	4h9 x 20 key 2x	8h9 x 36 key 2x	CLAMP
Shaft extension (Vac) [mm]	C 15	32	62,5	0
Overall length [mm]	D 75	150	231	126
Housing overall length [mm]	E 45	86	108	108
Housing diameter [mm]	F Ø20 ^{-0,007 -0,02}	Ø45 ^{-0,009 -0,025}	Ø95	Ø115
Flange diameter [mm]	Ø31	Ø51	Ø72	Ø96
Fitting locations for optional water cooling J ₁ , J ₂			46,22	53,21
Torque capacity [Nm]	1,5	16,5	174,5	
Bearing type/material	686/SS	6001/SS	6207/BS	6210/BS
Maximum no-load speed [min ⁻¹]	7300	10 000	4800	3100
Face seal O-ring	18x5	42x5	75,6 x 5,3 (2-337)	107,2 x 5,3 (2-347)
Flange Type	DN 16 KF	DN 40 KF	DN 63 ISO-K	DN 100 ISO-K

*1: also available in shaft diameters:

diameter	model number	part number
Ø4	SFL-004-NN	132146
Ø6	SFL-006-NN	132145

*2: also available in shaft diameters:

Ø10	SFL-010-NN	132147
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*3: also available in shaft diameters:

Ø20	SFL-020-WN	132148
Ø30	SFL-030-WN	132149

*4: also available in shaft diameters:

Ø20	HFL-020-MN	132151
Ø30	HFL-030-MN	132150

• Note: Other external dimensions will also vary for these feedthroughs

Technical Specifications

PERSONAL DETAILS

Company: _____ Contact: _____
Address: _____ Telephone: _____
_____ Fax: _____
_____ E-mail: _____

Preferred drawing format: .dwg [] .dxf [] other []

Application: _____

Shaft diameter: _____ Similar to catalog standard: _____

OPERATIONAL CONDITIONS

Differential pressure (mbar): _____ Pressure cycling (amplitude/frequency): _____

Base pressure (mbar): _____ Rotary speed (min⁻¹)max: _____ normal: _____

Process pressure (mbar): _____ Duty cycle (hours/day;days/year) _____

Axial load(s): Please specify location(s)/direction(s): _____

Radial load(s): Please specify location(s)/direction(s): _____

Torque transmitted: _____

Mounting orientation of feedthrough with respect to chamber :
Horizontal: []
Vertical/top: []
Vertical/bottom: []

Gases: Partial pressure of each: _____

Chemically reactive?: YES [] NO [] If yes, please specify: _____

Temperature a) at feedthrough housing interface: _____ b) at feedthrough shaft: _____

Water cooling available?: YES [] NO []

Particulate contamination?: YES [] NO [] If yes, please specify: _____

Radiation exposure?: YES [] NO [] If yes, please specify: _____

Liquid/solvent exposure?: YES [] NO [] If yes, please specify: _____

Magnetic field present?: YES [] NO [] If yes, please specify (magnitude and direction): _____

ALLOWABLE LIMITS

Max. allowable shaft axial runout: _____ Location(s): _____

Max. allowable shaft radial runout: _____ Location(s): _____

Max. allowable axial play: _____

Max. allowable radial play: _____

Max. stray flux density: _____ Location(s): _____ Direction(s): _____

Maximum seal drag torque: _____

PLEASE ATTACH SKETCH FOR CLARIFICATION (IF AVAILABLE) AND FAX BACK TO YOUR LOCAL FERROTEC SALES OFFICE OR REPRESENTATIVE (DETAILS ON BACK COVER)



GERMANY (European Headquarters)

Ferrotec GmbH
Seerosenstraße 1
72669 Untertensingen
P +49 70 22-92 70-0
F +49 70 22-92 70-10
E ferro@ferrotec.com
www.ferrotec-europe.de

USA (US Headquarters)

Ferrotec (USA) Corporation
40 Simon Street
Nashua, NH 03060
P +1 (603) 883-9800
F +1 (603) 883-2308
E info@ferrotec.com
www.ferrotec.com

JAPAN (Corporate Headquarters)

Ferrotec Corporation
1-4-14 Kyobashi
Chuo-ku, Tokyo 104-0031
P +81-3-3281-8808
F +81-3-3281-8848
E info@ferrotec.co.jp
www.ferrotec.co.jp

UNITED KINGDOM

Ferrotec (UK) Limited
Unit 11A, Talisman Business Centre
Bicester, Oxon OX26 6HR
P +44 1869 363200
F +44 1869 363201
E info@ferrotec.co.uk

ITALY

Ferrotec S.r.l.
Via Medici 15
20123 Milano
P +39 02 86 46 70 82
F +39 02 72 09 40 79
E gbasile@ferrotec.com

SPAIN

Ferrotec (Iberia) S.A.
C.S.I. "Los Rosales" C/. La Fragua, 1
28935 Mostoles
P +34 9 16 13 16 53
F +34 9 16 13 19 64
E mvazquez@ferrotec.com

FRANCE

Ferrotec SARL
21, chemin des DARES
01700 Neyron
P +33 4-78-55-16-82
F +33 4-78-55-16-85
E etouilloux@ferrotec.com