

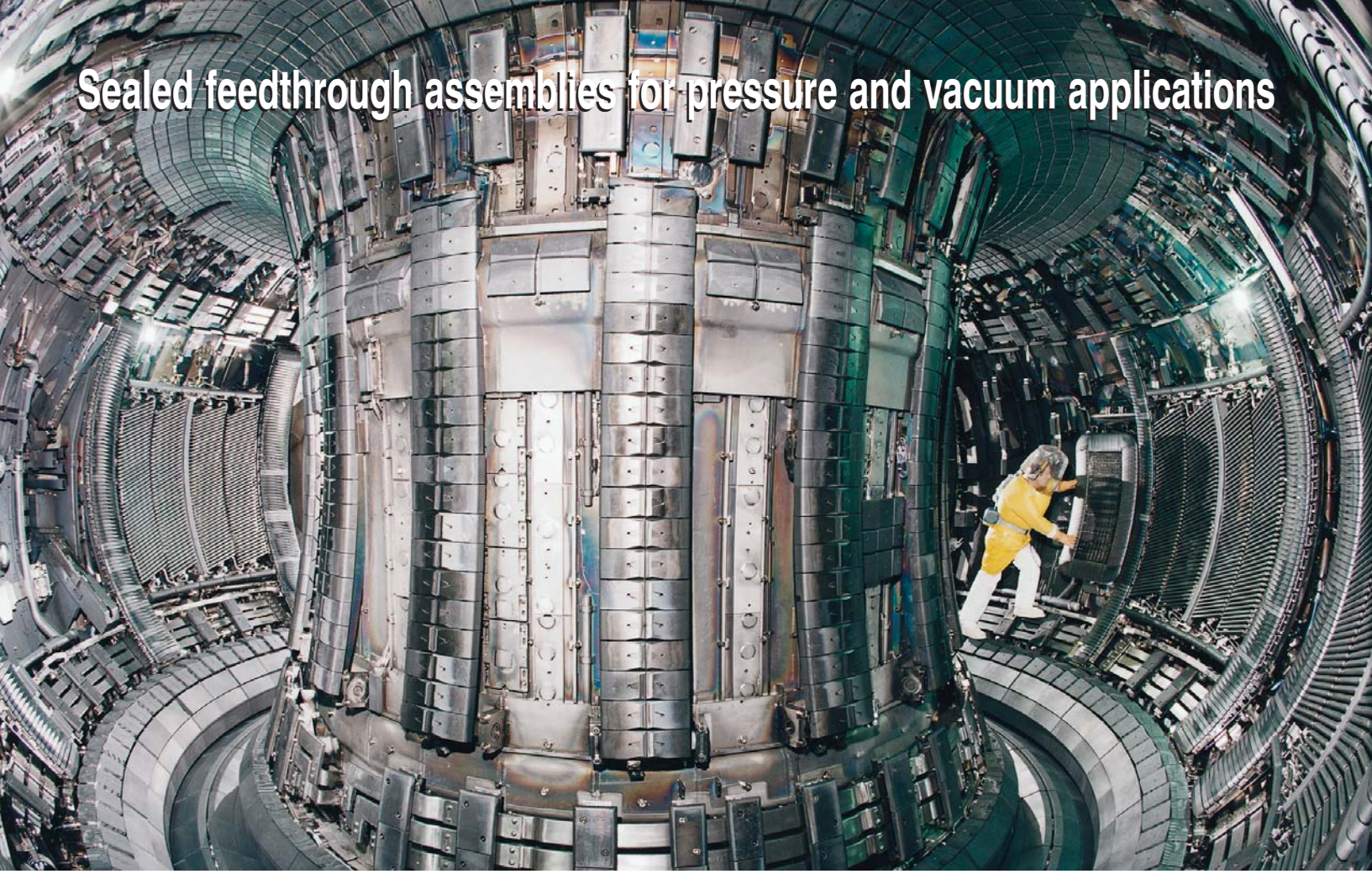
SPECTITE

Pressure and vacuum sealed feedthroughs
for sensors, probes, electrodes and wires



Spectite® sealed feedthroughs are essential when probes, sensors, electrodes, wires and other types of static elements need to be sealed as they pass through a pressure or environmental boundary.

Sealed feedthrough assemblies for pressure and vacuum applications



Sealed feedthroughs, sometimes called sealing glands, are used to seal elements under the most arduous conditions and have many applications in a wide variety of industries:

- **Process plant**
- **Power generation**
- **Vacuum equipment**
- **Petro-chem**
- **Pharmaceutical**
- **Glass production**
- **Semiconductor fabrication**
- **Energy distribution**

They inhibit the leakage of gases or other media and restrain the elements from moving in the assembly because of differential pressure. In some assemblies, elements are also electrically isolated from the feedthrough body and from each other.

The feedthroughs are made from stainless steel and are designed for mounting on to a process vessel or enclosure. Versions can be specified to seal on both single and multiple elements of different types and sizes.

The cap nut is tightened to a suitable torque value so as to compress an internal sealant to meet particular process conditions. The sealant provides an efficient pressure seal on the elements without damaging them. At the same time it restrains them from moving. Epoxy sealing is not used.

Details of the complete range of Spectite® feedthrough assemblies can be found in this catalog.



SPECTITE®
pressure and vacuum sealed feedthroughs



Series PF

for single probes, sensors, tubes and other similar elements.

6



Series MF

for multiple probes etc.

7



Series PSF and MSF

for probes etc., but with split internal components.

8



Series WF

for multiple, bare or insulated wires and small diameter sensors.

9



Series EF

with integral high current electrodes.

10



Series HF

high density, insulated wire, sealed tubes for mounting in Spectite® feedthroughs.

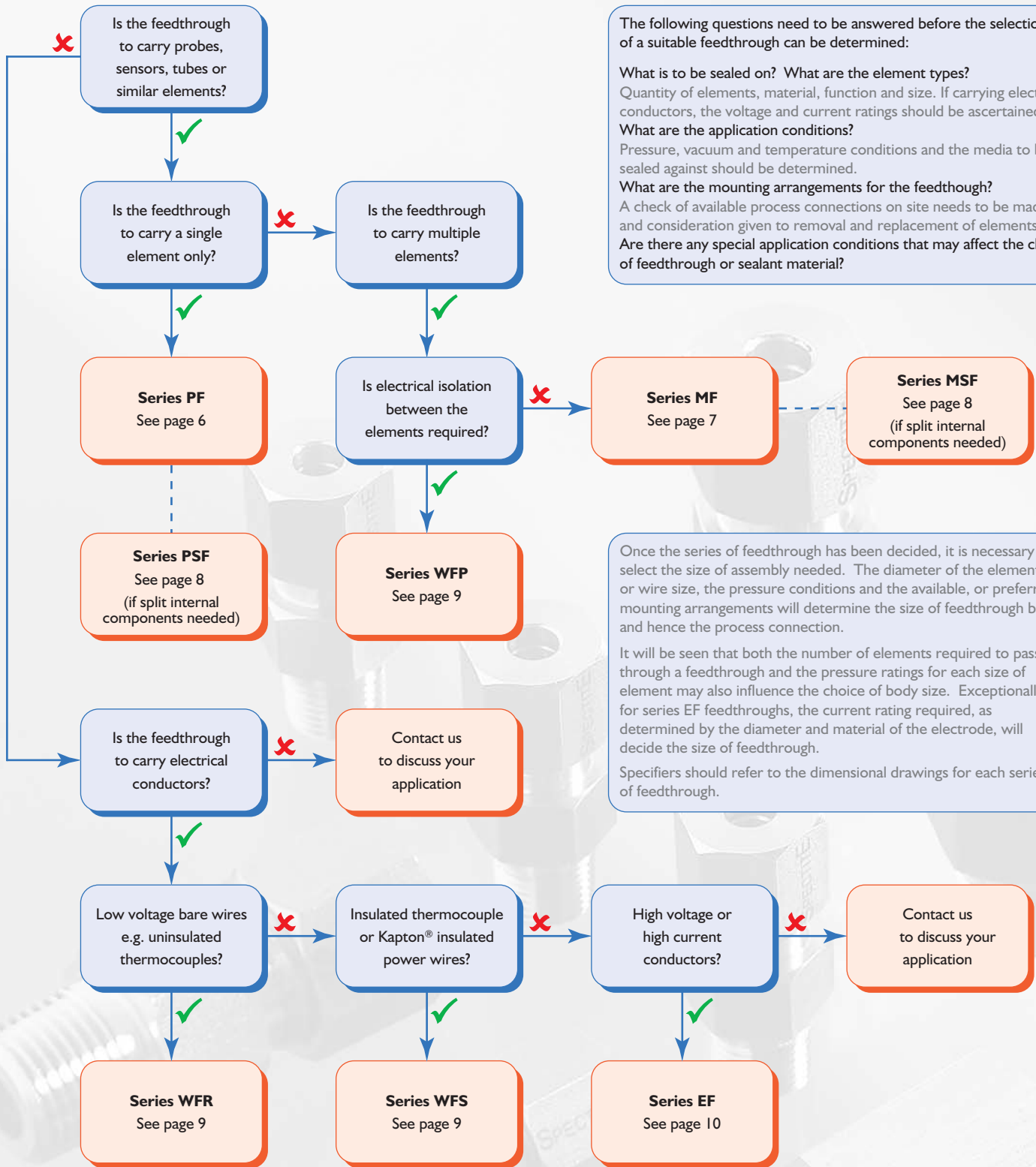
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General specifications, materials data

on the complete range of Spectite® fittings.

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Guide to the selection of feedthroughs and ordering



The following questions need to be answered before the selection of a suitable feedthrough can be determined:

What is to be sealed on? What are the element types?
Quantity of elements, material, function and size. If carrying electrical conductors, the voltage and current ratings should be ascertained.

What are the application conditions?
Pressure, vacuum and temperature conditions and the media to be sealed against should be determined.

What are the mounting arrangements for the feedthrough?
A check of available process connections on site needs to be made and consideration given to removal and replacement of elements.

Are there any special application conditions that may affect the choice of feedthrough or sealant material?






Once the series of feedthrough has been decided, it is necessary to select the size of assembly needed. The diameter of the element(s) or wire size, the pressure conditions and the available, or preferred, mounting arrangements will determine the size of feedthrough body and hence the process connection.

It will be seen that both the number of elements required to pass through a feedthrough and the pressure ratings for each size of element may also influence the choice of body size. Exceptionally, for series EF feedthroughs, the current rating required, as determined by the diameter and material of the electrode, will decide the size of feedthrough.

Specifiers should refer to the dimensional drawings for each series of feedthrough.

Sealants

The key factors in each application - temperature, pressure and process media - determine the choice of material for the internal sealant in all feedthroughs.

Sealant Material	Color	Example	Operating temperature range	Material definition and properties
Grafitite™	Grey / Black		-328 °F to +1,020 °F (-200 °C to +550 °C) to +1,600 °F (+870 °C) in a reducing atmosphere	Graphite 98% purity. Impermeable to gases and liquids. Resistant to most media, not 'wetted' by molten metals or salts. Asbestos-free. No aging or embrittlement. Good resistance to thermal shock. Not re-usable.
Neoprene	Green		-40 °F to +195 °F (-40 °C to +90 °C)	Synthetic rubber based on polychloroprene. The elastic properties of the polymer are enhanced by vulcanization. It is much more resistant to heat, light, oxidation, and petroleum than ordinary rubber. Re-usable.
Lava	Grey stone		-328 °F to 1,600 °F (-200 °C to +870 °C)	Natural Magnesium Silicate (Soapstone, Steatite or Rock Talc). Crushes to a powder when compressed. Porous to light gases and moisture. Hygroscopic. Not suitable for most vacuum applications. Not re-usable.
Teflon®	White		-328 °F to 480 °F (-200 °C to +250 °C)	Polytetrafluoroethylene. FDA approved grade to Title 21 -CFR 17. 1550 and is approved to US Pharmacopoeia Class VI. Has smooth, non-wetting, hydrophobic surfaces that resist biofilm buildup and the lowest coefficient of friction of any solid material. Low thermal transfer. Re-usable.
Viton®	Brown		-40 °F to 435 °F (-40 °C to +225 °C) intermittently to 545 °F (225 °C)	Fluoroelastomer. Resists hydrocarbons, corrosive chemicals and petroleum. Solvent, acid and base resistant. Low permeation rate. Mechanically robust at high temperatures. Re-usable.

Other sealant materials may be specified, usually for the individual special requirements of particular applications. Please contact Spectite Inc. for assistance.

Pressure ratings

The pressure and temperature ratings and typical leak rates quoted are given for guidance only. Pressure tests have been undertaken at 68°F (20°C) using elements appropriate to the feedthrough under test, i.e., Mineral insulated cable in probe feedthroughs, bare or insulated wire in wire feedthroughs, etc. Ratings vary with temperature and sealant used. With an increase in temperature, a reduction in the maximum pressure rating can be expected. Contact Spectite Inc. for further details. The NPT mounting thread pressure rating is the same or is higher than the feedthrough pressure rating.

Spectite® feedthroughs from Spectite Inc. have been designed to provide an efficient seal on the elements and restrain them from moving under pressure and vacuum. It is good installation practice to provide additional, mechanical restraint to the elements when differential pressure exceeds 75% of the feedthrough pressure rating at 68°F (20°C). (Not applicable to series EF feedthroughs with integral electrodes). Consult Spectite Inc. for further guidance on pressure ratings.

Feedthroughs with Grafitite, Neoprene, Teflon and Viton sealants are suitable for vacuum applications to 5×10^{-6} torr (6.67×10^{-4} Pa or 6.67×10^{-6} mbar). Lava sealants are not suitable for vacuum applications.

Leak rates

A typical leak rate for Spectite® feedthrough assemblies with Grafitite, Neoprene, Teflon and Viton sealants is better than or equal to 1×10^{-6} scc/sec. under 1 Atm. He @ 68°F (20°C). (1 Atm. = 9.87×10^4 Pa or 987.2 mbar).

Ordering information

Feedthrough and sealed tube assemblies are specified for ordering by a simple composite description that includes the type of feedthrough, the size of the feedthrough body (defined by the size of the process connection), the size of the element(s) to pass through the feedthrough, the number of elements (not applicable to PF & PSF for single elements), the sealant material, and the sealant material.

There are two types of cap. The more popular Type A cap with the internal mounting thread or the type B cap with an external mounting thread. The external mounting thread is always the same size as the process connection thread.

Order code arrangements for feedthroughs for multiple wires and with integral electrodes include additional parameters. Further details are given in the order code information for each series.

For assistance with specifying and ordering Spectite® feedthrough assemblies, particularly where there are high temperatures, high pressures or difficult application environments, contact Spectite Inc.

Replacement parts and thread lubricant

Sealants and other internal components for Spectite® feedthrough assemblies are available as replacement parts. To specify the component needed, prefix the order code of the feedthrough assembly for which the part is required by: **RS** for a replacement sealant; **RP** for a set of internal components, (i) for series MF feedthroughs comprising follower, sealant and seat, or (ii) for series WF feedthroughs comprising two internal insulators and sealant; **RI** for a pair of insulators for series EF feedthroughs; **RE** for a replacement electrode (with nuts and washers) for series EF.

A lubricant is applied to feedthrough bodies, followers and caps during assembly in our factory. It helps to prevent these component parts from binding and minimizes friction between mating surfaces. Each time a feedthrough assembly is opened so that elements or sealants can be replaced or elements adjusted, re-application of lubricant is recommended. Spectube Lubricant is available from Spectite Inc. in handy 1/4 ounce bottles with applicator brushes. Order as **Spectube Thread Lubricant**.

SPECTITE®

Series PF Feedthroughs for single elements

These feedthroughs are designed for sealing single elements, usually sensors, probes or tubes, where they penetrate a pressure or environmental boundary.

Common applications include sealing sheathed thermocouples and resistance thermometers, small-bore tubes and other types of sensor where they enter a process enclosure.

Series PF feedthroughs seal elements from 0.020" to 0.75". There are five body sizes having 1/16", 1/8", 1/4", 1/2" and 3/4" process connections with NPT threads. Contact us for other thread type availability.

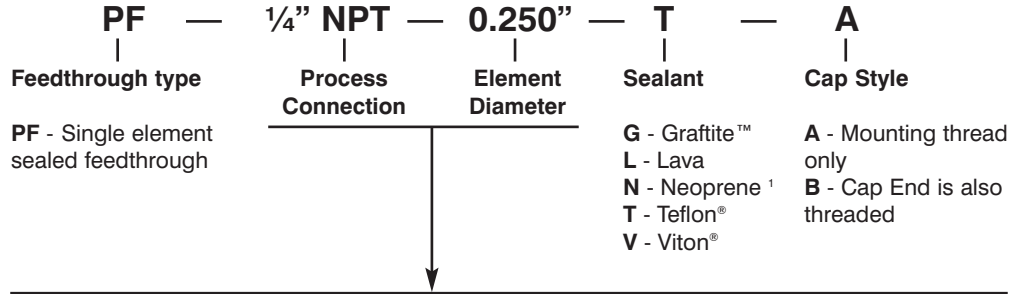
Spectite® feedthroughs are designed for ease of assembly and installation. Elements can be adjusted, removed and replaced when not under pressure or vacuum conditions.



- Seal on probes, sensors, small-bore tubes and other similar elements
- Immersion length of the element can be easily adjusted
- Five sizes of feedthrough assemblies
- Designed for easy installation of single elements 0.020" to 0.75" diameter
- Pressure range: Vacuum to 10,000 psi *
- Temperature range: -328°F to +1,600°F *
- Stainless steel body (316L), internal metal components & cap
- Choice of five sealant materials
- Reusable fitting – internal components replaceable

* dependent on sealant and fitting selected

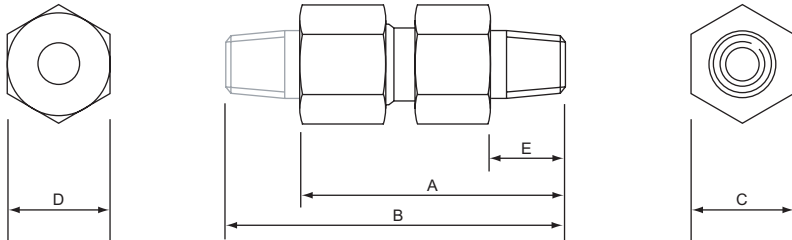
Order Code example:



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- 1 Neoprene sealants are not available for feedthroughs with 3/4" process connection
- 2 Other types of process connections are available, see back cover
- 3 The pressure ratings shown for each type of sealant are qualified at 68°F (20°C). With an increase in temperature, a reduction in the maximum pressure rating can be expected. Contact Spectite Inc. for further details.
- 4 The element diameters shown are the common sizes that are routinely demanded by customers for general industrial applications. Any size of element can be accommodated between the minimum and maximum element diameters shown for each size of feedthrough. Blank (undrilled) sealants are also available for series PF feedthroughs. When a blank sealant is required, the word 'Blank' should be inserted in the order code instead of an element diameter. Feedthroughs with blank sealants are not pressure rated.

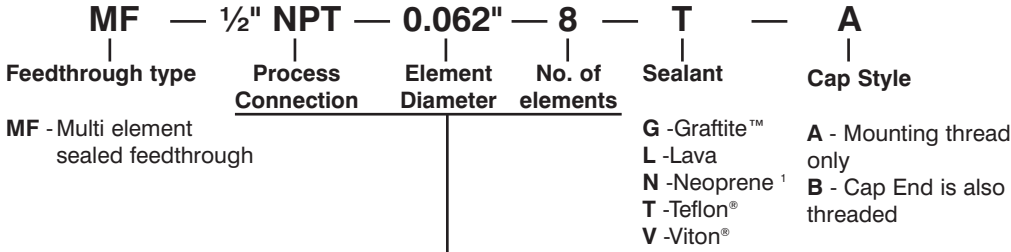
Dimensions



Process Connection	Overall length with plain cap	Overall length with cap with extension thread	Body hex.	Cap hex.	Body to process end
	Dim A	Dim B	Dim C	Dim D	Dim E
1/16"	1.102"	-	0.315"	0.374"	0.354"
1/8"	1.279"	-	0.512"	0.512"	0.374"
1/4"	2.047"	2.618"	0.748"	0.748"	0.571"
1/2"	2.657"	3.444"	1.000"	1.000"	0.787"
3/4"	3.386"	4.173"	1.259"	1.496"	0.787"

All dimensions in inches.
 For further information on cap styles, see page 5 under 'ordering information' and the back cover of this catalog.

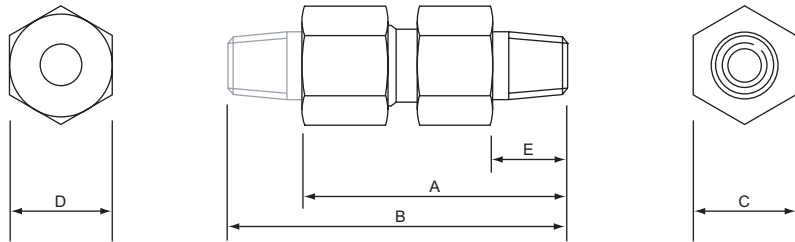
Order Code example:



Series MF	Process Connection																																							
	NPT (see back cover for other thread types) ²																																							
	1/8" ⁴					1/4"					1/2"					3/4"																								
Sealants	Pressure ratings for each type of sealant (in psi) ³					Pressure ratings for each type of sealant (in psi) ³					Pressure ratings for each type of sealant (in psi) ³					Pressure ratings for each type of sealant (in psi) ³																								
	No. of elements	G	L	N	T	V	No. of elements	G	L	N	T	V	No. of elements	G	L	N	T	V	No. of elements	G	L	T	V																	
Element sizes (dia)	The highlighted areas indicate the available element sizes for each feedthrough body size.																																							
(ins.)	mm																																							
0.020						5,800					3,600																													
0.032						5,800					3,600																													
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0.059						8,000					7,200					10,000					8,000																			
0.062						10,000					4,300					2,900					4, 8					12														
0.118																2, 4					5,000					2,900					5,000									
0.125						2															4, 8					12														
0.177																2					4,300					2,100					3,600									
0.187																					2, 4					5,000					2,100					5,800				
0.236																																								
0.250																																								

¹ Neoprene sealants are not available for feedthroughs with 3/4" process connection
² Other types of process connections are available, see back cover
³ The pressure ratings shown for each type of sealant are qualified at 68°F (20°C). With an increase in temperature, a reduction in the maximum pressure rating can be expected. Contact Spectrite Inc. for further details.
⁴ Our 1/8" range utilizes ceramic internal parts instead of metal.

Dimensions



Process Connection	Overall length with plain cap	Overall length with cap with extension thread	Body hex.	Cap hex.	Body to process end
	Dim A	Dim B	Dim C	Dim D	Dim E
1/8"	1.377"	-	0.591"	0.591"	0.472"
1/4"	2.047"	2.618"	0.748"	0.748"	0.571"
1/2"	2.657"	3.444"	1.000"	1.000"	0.787"
3/4"	3.386"	4.173"	1.259"	1.496"	0.787"

All dimensions in inches.
 The dimensions shown in the table above apply to Series MF, PSF and MSF feedthroughs.
 For further information on cap styles, see page 5 under 'ordering information' and the back cover of this catalog.



Series MF Feedthroughs for multiple elements

A single access port into an enclosure or process vessel is all that is needed to allow multiple probes, sensors, etc., to pass through an environmental or pressure boundary using a single feedthrough assembly.

Series MF feedthroughs can seal multiple elements within a single assembly including typically up to 40 x 0.040" dia., up to 12 x 0.125" or up to 4 x 0.250". Please refer to the table for further details of feedthrough capacity and sizes of elements.

There are four body sizes having 1/8", 1/4", 1/2" and 3/4" process connections with NPT threads. Contact us for other thread type availability.

Spectrite® feedthroughs are designed for ease of assembly and installation. Elements can be adjusted, removed and replaced when not under pressure or vacuum conditions.



- Saves time and costs by allowing multiple sensors to pass through one feedthrough
- Immersion length of each element can be easily adjusted
- Four sizes of sealed feedthroughs for probes, sensors, etc.
- Designed for carrying multiple elements 0.020" to 0.250" diameter
- Suitable for a mixture of sizes and types of elements
- Pressure range: Vacuum to 10,000 psi *
- Temperature range: -328°F to +1,600°F *
- Stainless steel body (316L), internal metal components and cap
- Choice of five sealant materials
- Reusable

* dependent on sealant and fitting selected

SPECTITE®

Series PSF and MSF

For single and multiple elements

Series PSF (single element) and MSF (multiple elements) feedthroughs are similar to series MF feedthroughs, but have split internal components.

This permits elements, that have a larger diameter section other than at the sealing point and can pass through the feedthrough body but not through the internal components, to be installed easily. Examples are probes with connectors or sensors with potting adaptors.

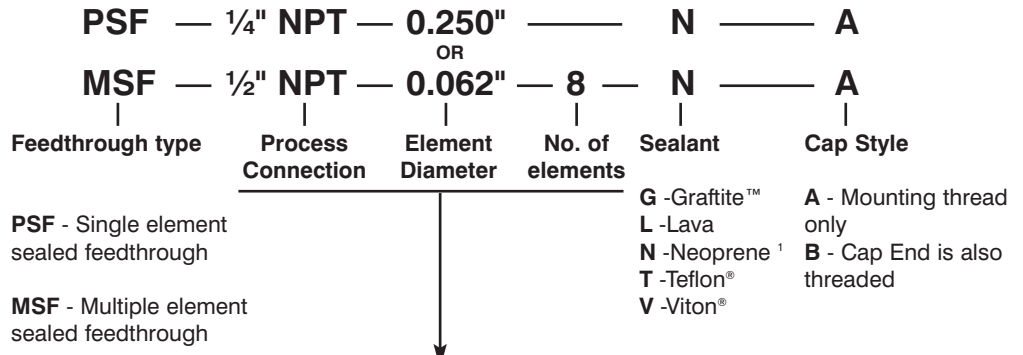
There are three body sizes having 1/4", 1/2" and 3/4" NPT process connections. Other process threads are also available, see back cover.

Spectite® feedthroughs are designed for ease of assembly and installation. Elements can be adjusted, removed and replaced when not under pressure or vacuum conditions.



- Individual elements can be replaced without complete disassembly
- Internal components – follower, sealant and seat are split to allow easy installation of elements with fitted connectors or large diameter sections
- Designed to carry single elements 0.040" to 0.5" diameter and multiple elements from 0.040" to 0.250" diameter
- Pressure range: Vacuum to 10,000 psi *
- Temperature range: -328°F to +1,600°F *
- Stainless steel body (316L), internal metal components and cap
- Immersion length of each element can be easily adjusted
- Reusable fitting – internal components are easily replaceable

Order Code example:



Series PSF Single element		Process Connection													
		NPT (see back cover for other thread types) ²													
		1/4"				1/2"				3/4"					
Sealants		G	L	N	T	V	G	L	N	T	V	G	L	T	V
Element sizes (dia) (ins.)	mm	The highlighted areas indicate the available element sizes for each feedthrough body size. The maximum pressure rating (in psi) is shown for each sealant material according to element size. ³													
0.040	1.0														
0.059	1.5	8,000		10,000	7,200										
0.062	1.59														
0.080	2.0														
0.118	3.0	10,000		8,000	3,600										
0.125	3.2		10,000												
0.177	4.5	8,000				10,000									
0.187	4.76														
0.236	6.0														
0.250	6.35	6,500		6,500	2,100		8,000	10,000				8,000	7,200		5,800
0.312	8.0														
0.375	9.5											4,300	2,100	6,500	5,000
0.393	10.0														1,400
0.472	12.0														3,600
0.500	12.7											4,300			1,000
															2,900

Series MSF Multiple elements		Process Connection													
		NPT (see back cover for other thread types) ²													
		1/4"				1/2"				3/4"					
Sealants		Pressure ratings for each type of sealant (in psi) ³				Pressure ratings for each type of sealant (in psi) ³				Pressure ratings for each type of sealant (in psi) ³					
Element sizes (dia) (ins.)		The highlighted areas indicate the available element sizes for each feedthrough body size.													
0.040	1.0														
0.059	1.5	2, 3		8,000	10,000	3,600	4,300		2, 3	4, 5					
0.062	1.59														
0.118	3.0														
0.125	3.2														
0.177	4.5														
0.187	4.76														
0.236	6.0														
0.250	6.35														

1 Neoprene sealants are not available for feedthroughs with 3/4" process connection
 2 Other types of process connections are available, see back cover
 3 The pressure ratings shown for each type of sealant are qualified at 68°F (20°C). With an increase in temperature, a reduction in the maximum pressure rating can be expected. Contact Spectite Inc. for further details.

Dimensions

See dimensions and diagrams on Page 7 (as series MF).

* dependent on sealant and fitting selected

Order Code examples:

WFS — 1/4" NPT — 24K¹ — 4 — V — A

WFR — 3/4" NPT — 14AWG — 12 — T — A

WFP — 1/2" NPT — 0.040" — 8 — L — A

Feedthrough type Process Connection Element Size No. of elements Sealant Cap Style

WFS - for Kapton® insulated wires
WFR - for multiple bare wires
WFP - for isolated multiple probes

G -Graftite™¹ **A** - Mounting thread only
L -Lava
N -Neoprene² **B** - Cap End is also threaded
T -Teflon®
V -Viton®

Series WFS Kapton® insulated wires	Process Connection																							
	NPT (see back cover for other thread types) ³																							
	1/8"			1/4"			1/2"			3/4"														
Sealants	No. of elements	L	N	T	V	No. of elements	G	L	N	T	V	No. of elements	G	L	N	T	V	No. of elements	G	L	T	V		
24 Cu or T/C	2, 4	10,000	10,000	5,000	10,000	2, 4	8,000	10,000	3,600	4,300	7,200													
20 Cu or T/C												2, 4	10,000	10,000	5,800	3,600	6,500	6, 8						
18 Cu																								
16 Cu																								
10 Cu																								
8 Cu																								

¹ Series WFS feedthroughs are supplied with Kapton® insulated copper or thermocouple-material wire to specified lengths, if required. The wires are fitted in the feedthrough, both ends of each wire, or Thermocouple pair, are identified with numbered markers and the feedthrough is torqued ready for installation.

Current ratings for Kapton® insulated copper wire:

Wire size (AWG)	24	20	18	16	10	8
Max. current rating (A) at 450°F (230°C) 600V ac / 850V dc max.	5	9	13	17	40	55

To specify the wire length, add (Y in. / Z in.) to the order code after the type of sealant specified. Y in. is the length of wire required on the cap side of the feedthrough. Z in. is the length of wire required on the process side of the feedthrough. Both dimensions to the nearest inch.

Example: WFS - 3/4" NPT - 20Cu - 12 - T (48" / 72").

If this information is omitted from the order code, feedthroughs will be supplied untorqued without wires.

When constructing the order code for the number of wires, it is essential to verify that the total number of wires specified equals the possible number of wires for the size of feedthrough required, remembering that each thermocouple material pair is two wires. e.g., WFS - 1/4" NPT - 24K - 4 - V (etc.) calls for two pairs (4 wires) 24AWG type K thermocouple material wire.

Series WFS assemblies can also be made with a combination of single copper wires and thermocouple pairs. Contact Spectrite Inc. for further details.

Series WFR Bare wires	Series WFP Multiple sensors	Process Connection																						
		NPT (see back cover for other thread types) ³																						
		1/8"			1/4"			1/2"			3/4"													
Sealants	No. of elements	L	N	T	V	No. of elements	L	N	T	V	No. of elements	L	N	T	V	No. of elements	L	T	V					
24	0.118"																							
20	0.032"																							
18	0.040"	2, 4	10,000	10,000	5,000	10,000	2, 4	10,000	3,600	4,300	7,200	2, 3	10,000	5,800	3,600	6,500								
14	0.062"											2, 4					6, 8, 12							
8	0.118"																							
	0.125"																							

¹ Graftite™ sealants are not available for all WFR and WFP feedthroughs, also WFS feedthroughs with 1/8" process connection.

² Neoprene sealants are not available for feedthroughs with 3/4" process connection

³ Other types of process connections are available, see back cover

⁴ The pressure ratings shown for each type of sealant are qualified at 68°F (20°C). With an increase in temperature, a reduction in the maximum pressure rating can be expected. Contact Spectrite Inc. for further details.

See page 11 for dimensions.

Series WF

For multiple wires & probes

When multiple wires must pass through a pressure boundary, series WF feedthroughs can provide an efficient seal without recourse to epoxies or other non-adjustable fixture methods.

Assemblies may be specified according to the type of element required to pass through the feedthrough and are suitable for up to 12 bare or insulated wires - sizes from 24 to 8 AWG.

Insulators within WF feedthroughs protect bare wires and provide additional isolation for Kapton® insulated power wires. They are rated max. 55A @ 600Vdc/850Vac. Feedthroughs with power wires can be supplied as complete assemblies, ready for installation, with wires cut to specified lengths.

WF feedthroughs can also accommodate up to 12 small diameter sensor elements that must be electrically isolated from each other.



Series WFS shown

- Seal on Kapton® insulated copper or thermocouple wires – type WFS
- Seal on bare wires carrying instrumentation voltages – type WFR
- Seal on small sheathed sensors, max. 0.125" dia. – type WFP
- Pressure range: Vacuum to 10,000psi *
- Temperature range: -328°F to +1,600°F *
- Stainless steel body (316L), cap, internal follower and seat
- Choice of sealant materials
- Individual wires can be replaced without complete disassembly
- Reusable fitting – sealant and internal components replaceable

* dependent on sealant and fitting selected

SPECTITE®

Series EF

High voltage/current electrode

The electrode mounted in these feedthroughs enables high voltage / current supplies in process enclosures, autoclaves, vacuum furnaces and reactor vessels to power heaters, electric motors and other devices needing high power supply.

Feedthroughs are available with three sizes of copper electrodes rated 40A, 100A & 200A at 2kV max. Stainless steel conductors, that have a lower current rating than copper electrodes, can be specified instead of copper. These are often used when temperatures exceed 720°F (380°C). Nickel conductors may also be specified to special order.

Series EF feedthroughs are usually supplied pre-torqued for immediate installation. Integral insulators are Alumina.



- Copper or Stainless steel electrodes
- Three sizes of feedthrough assemblies
- Rated for use at 2KV at up to 200A
- Pressure range: Vacuum to 8,500 psi *
- Temperature range:
Cu electrode: -328°F to +720°F *
SS electrode: -328°F to +1,600°F *
- Stainless steel body (316L), internal follower and cap; Alumina insulators
- Choice of 3 sealant materials
- Maintainable - sealants replaceable
- Electrodes pre-installed in feedthrough and torqued ready for installation

Order Code example:

EF — **1/2" NPT** — **Cu** — **L** — **A**
Feedthrough type — **Process Connection** — **Electrode** — **Sealant** — **Cap Style**

EF - Sealed feedthrough with integral electrode

Copper (Cu)
Stainless Steel (SS)

L -Lava
T -Teflon®
V -Viton®

A - Mounting thread only
B - Cap End is also threaded

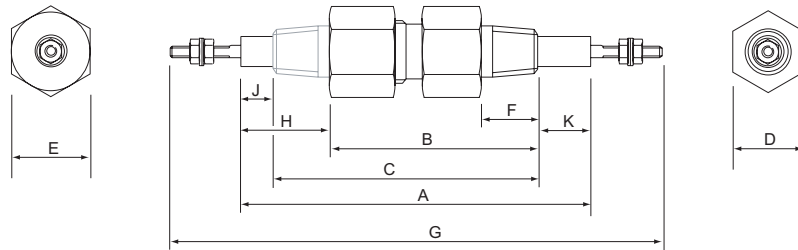
Series EF Max. voltage rating 2KV		Process Connection								
		NPT (see back cover for other thread types) ¹								
		1/4"			1/2"			3/4"		
		Sealants								
		L	T	V	L	T	V	L	T	V
Electrode materials and current ratings ²	Electrode dia. (in)	The maximum pressure rating (in psi) is shown for each sealant material. ³								
Cu 40A SS 10A	0.125	8,500	5,000	8,000						
Cu 100A SS 15A	0.250				6,500	2,100	5,800			
Cu 200A SS 30A	0.500							2,900	2,100	2,100

¹ Other types of process connections are available, see back cover

² Series EF feedthroughs may also be specified with Nickel electrodes

³ The pressure ratings shown for each type of sealant are qualified at 68°F (20°C). With an increase in temperature, a reduction in the maximum pressure rating can be expected. Contact Spectrite Inc. for further details.

Dimensions



Process Connection	Length over insulators (both types of cap)	Overall length of body and plain cap	Overall length of body and cap with ext'n thread	Body hex.	Cap hex.	Body to process end
	Dim A	Dim B	Dim C	Dim D	Dim E	Dim F
1/4"	3.700"	2.050"	2.618"	0.748"	0.748"	0.571"
1/2"	5.197"	2.657"	3.445"	1.000"	1.000"	0.787"
3/4"	6.378"	3.386"	4.173"	1.260"	1.496"	0.787"
	Overall length of electrode	Exposed length of insulator (cap side - plain cap)	Exposed length of insulator (cap side - cap with ext'n thread)	Exposed length of insulator (process side)		
	Dim G	Dim H	Dim J	Dim K		
1/4"	4.921"	1.122"	0.551"	0.531"		
1/2"	6.496"	1.476"	0.689"	1.063"		
3/4"	8.465"	1.693"	0.906"	1.299"		

All dimensions in inches.

For further information on cap styles, see page 5 under 'ordering information' and the back cover of this catalog.

* dependent on the sealant selected

Order Code example:

HF2 — **24** — **Cu** — **48"/96"** — **A**
OR
HF1 — **12** — **K** — **72"/144"** — **A**
Type No. of wires² Wire material Wire lengths each side of sealed tube¹ Cap Style
(specify to the nearest inch)

HF - High density tube assembly

A - Mounting thread only
B - Cap End is also threaded

No. of wires	12	24	40	60
Type				
HF1				
HF2				
HF3				
HF4				

¹ The wire lengths on each side of the sealed tube are the actual lengths of wire specified and do not include the length of the metal tube. Dimensions of the sealed tube can be found in the table below. Both ends of each wire, or thermocouple pair, are identified with numbered markers. Minimum wire length 18" each side.

² The number of wires refers to the total number of single wires, both copper and thermocouple-material wires passing through each size of sealed tube. Each series HF assembly can be specified, if required, with a combination of single copper wires and thermocouple pairs. When a combination is specified the following typical examples show how the order code can be configured:

HF2 - 12Cu, 12J - 36" / 72" and HF3 - 20K, 12T, 8Cu - 60" / 120"

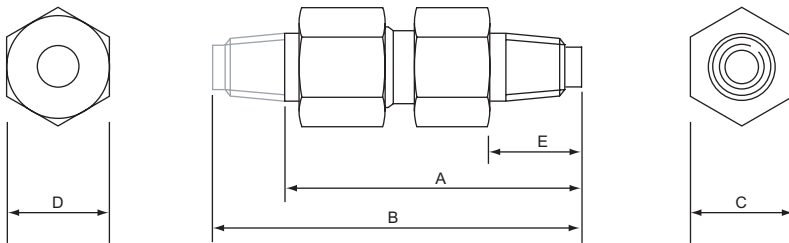
In the first example 12 single copper wires and 6 type-J thermocouple pairs are specified – total 24 wires. In the second example 10 type-K pairs, 6 type-T pairs and 8 single copper wires are specified – total 40 wires. When configuring these combinations of wires it is essential to verify that the total number of wires specified equals the possible number of wires for the size of tube assembly required, remembering that each thermocouple-material pair is two wires.

Temperature rating: -40°F to +260°F (-40°C to +125°C).

Dimensions

Type	HF1	HF2	HF3	HF4
Tube diameter	0.187"	0.250"	0.315"	0.393"
Tube length	3.25"	4"	4"	4"
Wire length	Customer specified			

Dimensions - Series WF Feedthroughs



Process Connection	Overall length with plain cap	Overall length with cap with extension thread	Body hex.	Cap hex.	Body to process end
	Dim A	Dim B	Dim C	Dim D	Dim E
1/8"	1.378"	-	0.591"	0.591"	0.472"
1/4"	2.283"	2.854"	0.748"	0.748"	0.689"
1/2"	2.972"	3.760"	1.000"	1.000"	0.984"
3/4"	3.701"	4.488"	1.260"	1.496"	0.984"

All dimensions in inches.

For further information on cap styles, see page 5 under 'ordering information' and the back cover of this catalog.

SPECTITE®

Series HF

High density, insulated wire, sealed tube assemblies

A Teflon-lined, stainless steel tube is swaged over multiple, usually Teflon, insulated, single-core copper and/or thermocouple-material wires to make a continuous wire, high-density, sealed feedthrough tube. These are used for thermocouples, resistance thermometers and low voltage instrumentation. The sealed tube assembly is usually mounted in a series PF or MF feedthrough. Series HF feedthroughs are manufactured with customer-specified wire lengths.

Epoxies and other sealants are not used in the construction of HF feedthroughs. They are suitable for use where outgassing is not permitted.



- Saves time and costs by allowing multiple sensor wires to pass through a feedthrough fitting for a single element
- Sealed tubes with continuous, multiple, insulated conductors
- Stainless steel tube (316L) is sealed without potting, epoxies or glues
- Copper or thermocouple-material wires types J, K, T & N
- Max. current rating 500mA at 100Vdc
- Pressure range: Vacuum to 5,000 psi with low leak rate
- 4 tube sizes for 12, 24, 40 or 60 size 24AWG copper or thermocouple material wires
- Single tube assembly mounts in a series PF or PSF feedthrough
- Multiple tubes mount in a series MF or MF feedthrough

SPECTITE®

General Specifications

Sealed feedthrough assemblies are pressure rated up to 10,000 psi and can be used in applications at a maximum temperature of +1,600°F (+870°C), dependent on the type of feedthrough and sealant material specified.

Sealed feedthroughs for single elements cater for sensors from 0.020" (0.5mm) dia. to 0.75" (19.05mm). Sizes that can be used in multiple element assemblies are from 0.020" (0.5mm) dia to 0.25" (6.35mm).

Spectite® sealed feedthrough assemblies from Spectite Inc. have been designed to be easy to install and maintain. Sealants and other internal parts are replaceable so that fittings can be re-used over and over again. If elements need replacement or adjustment, the feedthrough cap can be undone - after the pressure or vacuum in the vessel has been released - to allow movement or removal of all or individual elements.

Caution:

Spectite feedthrough assemblies have been designed to provide an efficient seal on the elements and restrain them from moving under pressure and vacuum. It is good installation practice to provide additional, mechanical restraint to the elements when the differential pressure exceeds 50% of the rated pressure of the feedthrough, particularly when using Teflon sealants or a lighter torque.

Feedthroughs should be installed by qualified personnel in accordance with relevant Health and Safety rules and with proper regard to safe working practices

The technical data and guideline information presented in this publication is provided in good faith; however no warranty, express or implied is given whatsoever as to its accuracy, and no liability is accepted for any errors or omissions. The suitability of any of the products described herein for a particular application is entirely at the discretion of the purchaser as being the best judge for that particular application. In the event of any problem or difficulty with the application of our products please let us know. It is the policy of this company to entertain information of this nature with a view to a speedy resolution to the benefit of all concerned. This policy is in addition to the purchaser's statutory and common law rights.

Process connections

Feedthrough bodies can be specified with a choice of threaded process connections. Feedthroughs with the common tapered threadforms, **NPT** (National pipe tapered thread) to ANSI/ASME B1.20.1 and **BSPT** (Conical gas thread or 'R' thread) to BS21, DIN 2999 ISO 7/1 & JIS B0203 are generally stocked items.

Feedthroughs with parallel threaded process connections, **SAE**, **BSPP** and **ISO metric** to DIN13, may also be specified. Feedthroughs with parallel mounting threads need an 'O' ring or a gasket seal (not supplied) to prevent leakage at the process connection.

Feedthroughs without process connection threads may be specified for welded mounting and with a fitted flange from a range of styles including ISO-KF and -CF types for the vacuum industry and general applications as well as Triclover® and triclamp types for the food and pharmaceutical industries.

Custom engineered assemblies can be designed and made to meet customers' specific application requirements.

SPECTITE®

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Caps

Plain, hexagonal caps are available for all sizes of feedthrough. Additionally, caps with a threaded extension for a conduit connection are also available. The following thread choices are available: **NPT**, **BSPP** (parallel gas thread) or **BSPT** (conical gas thread). These caps can be specified for feedthroughs with 1/4", 1/2" & 3/4" process connections. Cap threads are the same size as the corresponding feedthrough body process connection.

Pressure Equipment Directive (PED)

Spectite® sealed feedthroughs have been classified as 'Piping', satisfying the requirements of the category of Sound Engineering Practice (SEP), according to the European Pressure Equipment Directive (PED) 97/23/EC. The PED does not require the 'CE' symbol to be identified on Pressure Equipment that is categorised as SEP. Caps are marked **SPECTITE** on one of the hexagon faces.

Feedthrough component materials

Spectite® feedthrough bodies, followers, seats and series EF SS electrodes are manufactured in an Austenitic stainless steel UNS S31603, commonly designated 316L. Equivalent grades are: (USA) AISI 316L; (UK) BS 316 S11; (Germany) W.-Nr. 1.4404, DIN CrNiMo 17.13.2; (France) AFNOR Z2 CND 17.12; (Italy) UNI X2 CrNiMo 17.12; (Sweden) SS2353; (Japan) JIS SUS 316L. The typical chemical composition for this steel is 0.03%C, 16.0-18.0%Cr, 10-14%Ni, 2.0-3.0%Mo, 0.10%N. Caps are manufactured in stainless steel UNS S30300 (AISI 303).

When 316L is unsuitable for an application, the 'wetted' metal parts of feedthroughs, that come into contact with a process, can be manufactured in other stainless grades or other materials such as Hastelloy® and Inconel® grades, Monel® R-405 or mild (carbon) steel. There may be minimum manufacturing requirements for feedthroughs in 'exotic' materials.

Insulators in series WF feedthroughs with 1/8" process connections and in series EF feedthroughs are manufactured in high-purity recrystallised Alumina (Aluminium Oxide Al₂O₃).

External, single-bore insulators in series WF feedthroughs are manufactured in aluminous porcelain. Internal insulators are manufactured in a high-performance, engineering plastic for use at temperatures up to +450°F (+230°C) or machineable glass ceramic for use up to +1,600°F (+870°C).

Electrical conductors for Series EF feedthroughs are made in grade C101 copper or 316L stainless steel (as above). Nuts and washers on copper conductors are brass, stainless steel conductors have stainless steel nuts and washers.

The Spectube lubricant used on feedthrough components is a Chlorotrifluoroethylene Polymer (PCTFE). A copy of the Safety Data Sheet is available on request. Spectite® feedthroughs should not be degreased before installation.

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Teflon® is a registered trademark of E.I. du Pont de Nemours and Company

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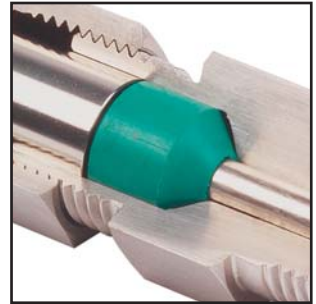
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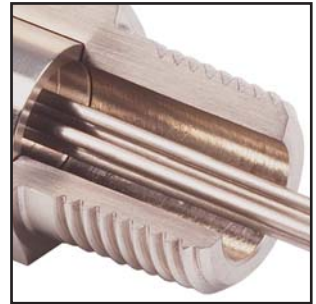
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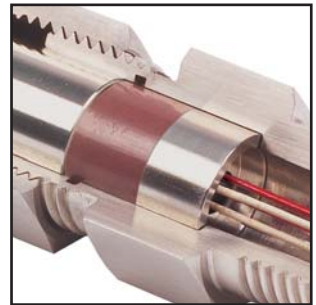
Spectite® feedthrough bodies, caps, followers and seats are manufactured in stainless steel.



A wide range of sealant materials is available to suit the most demanding of applications.



Spectite® sealed feedthroughs satisfy the requirements of the European Pressure Equipment Directive (PED).



Spectite® sealed feedthroughs have a wide operating temperature range.

Represented by:

