SpectitE from TC Ltd

ATEX / IECEx Approved Pressure and Vacuum Sealed Feedthroughs for Sensors, Probes, Electrodes and Wires

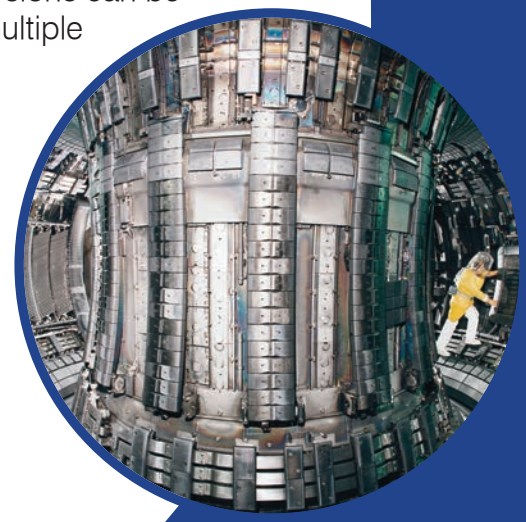
ATEX / IECEx Approved Sealed Feedthroughs for Pressure and Vacuum Applications

Spectite® 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.

Our extensive range of ATEX / IECEx approved Spectite® fittings are designed and tested for use in hazardous areas allowing them to be used for both gas and dust applications in zones 1/2 and 20/21/22 areas with the following approval:

Ex II 2G 1D
Ex db IIC Ex eb IIC Gb
Ex ta IIIC Da

The feedthroughs are typically made from stainless steel and are designed for mounting on to an Ex db, Ex eb or Ex tD process vessel or enclosure. Versions can be specified to seal on both single and multiple elements of different types and sizes.

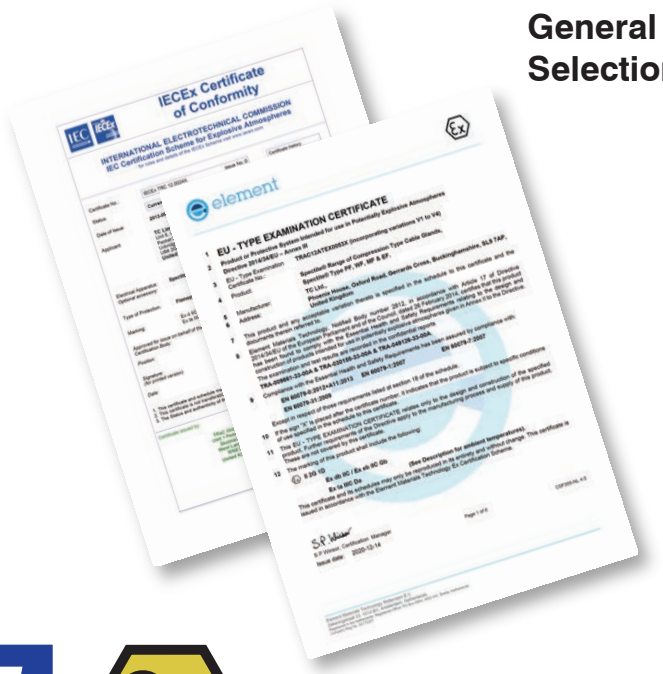


The feedthroughs are made from stainless steel and are designed for mounting on to a process vessel or enclosure. Versions can be specified to seal on both single and multiple elements of different types and sizes.

The cap nut is tightened to a pre-set torque to compress an internal sealant. 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 ATEX / IECEx approved Spectite® feedthrough assemblies can be found in this catalogue.

Contents



Series PF Feedthroughs for Single Elements

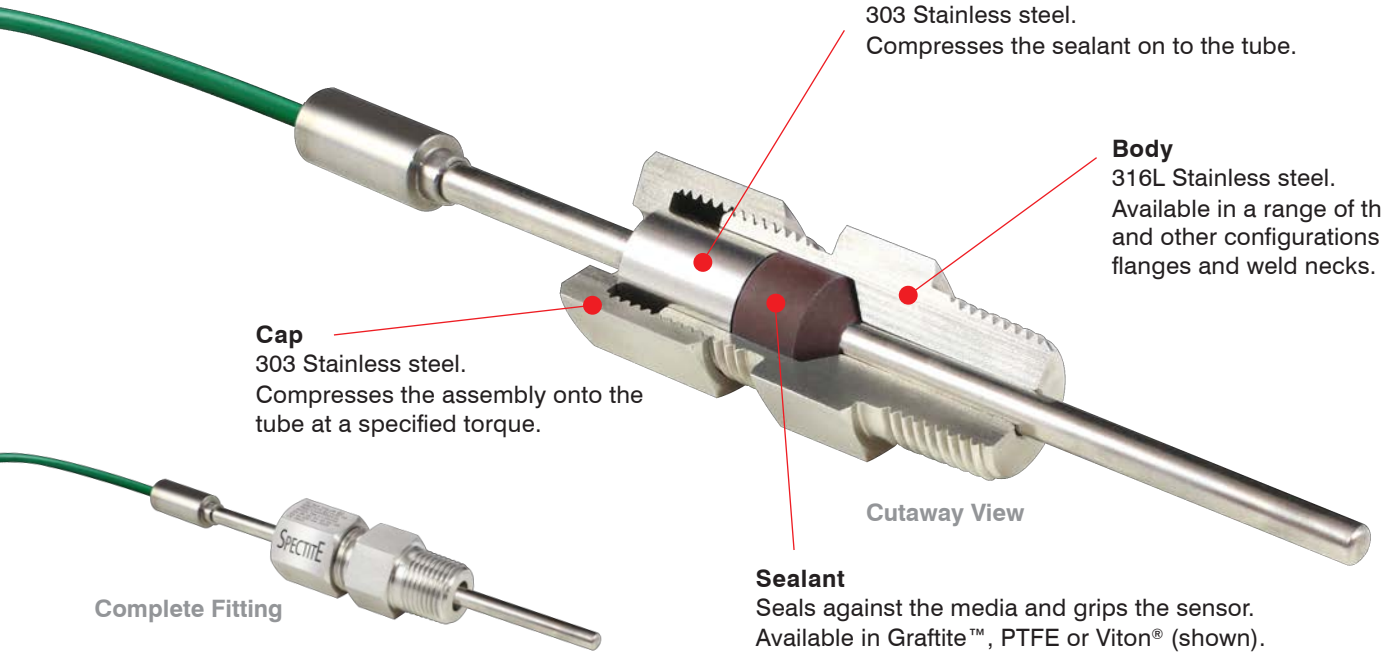
These feedthroughs are designed for sealing single elements, usually sensors, probes or tubes, where they penetrate a pressure or environmental boundary.

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 0.5mm Ø to 25.4mm Ø. There are five body sizes (1 to 5) having 1/8", 1/4", 1/2", 3/4" and 1" process connections with BSPT (conical gas or DIN 2999 'R') and NPT threads along with ISO, SAE and UNF threads as shown in section 3.

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

Typical Construction



Complete Fitting

Cutaway View

Follower
303 Stainless steel.
Compresses the sealant on to the tube.

Body
316L Stainless steel.
Available in a range of thread sizes and other configurations including flanges and weld necks.

Cap
303 Stainless steel.
Compresses the assembly onto the tube at a specified torque.

Sealant
Seals against the media and grips the sensor.
Available in Graftite™, PTFE or Viton® (shown).

- ATEX/IECEx Approved to: Ex II 2G 1D, Ex db IIC Gb / Ex eb IIC Gb, Ex ta IIIC Da
- Seal on probes, sensors, small-bore tubes and other similar elements
- Immersion length of the element can be easily adjusted as required
- Six sizes of feedthrough assembly
- Designed for easy installation of single elements 0.5mm to 25.4mm diameter
- Guide pressure range: Vacuum up to 700 bar
- Temperature range: -60°C to +450°C
- 316L Stainless steel wetted parts (see image above)
- Choice of three sealant materials
- Reusable fitting (dependant on sealant)

Alternative Configurations

Threaded Extension (B Cap)
Allows the gland to be terminated into the process as well as to a terminal head or conduit at the opposite end to the process.
See section 4 for details.

Weld Neck
Supplied without thread for permanent installation into the process by welding. Specify as 'WELD' for the thread size in the order code.

Section 1 - Series PF Sealants

Sealant Material	Code	Colour	Example	Operating Temperature Range	Re-usable	Material definition and properties
Graftite™	G	Grey / Black		**-60°C to +450°C (T1)**	✗	Graphite 98% purity. Impermeable to gases and liquids. Resistant to most media, not 'wetted' by molten metals or salts. Asbestos-free. No ageing or embrittlement. Good resistance to thermal shock. Conductive material (not electrically isolated).
PTFE	T	White		**-60°C to +200°C (T3)**	✓	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.
Viton®	V	Brown		**-40°C to +200°C (T3)**	✓	Fluoroelastomer. Resists hydrocarbons, corrosive chemicals and petroleum. Solvent, acid and base resistant. Low permeation rate. Mechanically robust at high temperatures.

Section 2 - Series PF Body Size, Pressure Guide [1] and available Bore Sizes for BSPT, BSPP and NPT Threads [2]

Body Size		Size 1 (1/8")			Size 2 (1/4")			Size 3 (1/2")			Size 4 (3/4")			Size 5 (1")		
Sealant		G	T	V	G	T	V	G	T	V	G	T	V	G	T	V
Element Sizes (dia)		*The maximum guide pressure value (in bar) at 20°C is shown for each sealant material according to element size[1]. These ratings are a guide and 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.*														
inches	mm															
0.020	**0.5**	450	200	350												
0.032	**0.8**															
0.040	**1.0**				550	500	700									
0.059	**1.5**		150	500												
0.062	**1.59**															
0.080	**2.0**	400	100	550	700	200										
0.118	**3.0**							550	200	550						
0.125	**3.2**															
0.157	**4.0**	350			550											
0.177	**4.5**															
0.187	**4.76**															
0.236	**6.0**				450	80					550	100	400	400	55	150
0.250	**6.35**															
0.312	**8.0**								150	450	350		250	200		
0.375	**9.5**															
0.393	**10.0**								100	350						
0.472	**12.0**										300	75	200		45	40
0.500	**12.7**															
0.625	**15.88**										200		150	100	30	20
0.750	**19.05**															
0.839	**21.3**															
1.00	**25.4**															

1 The guide pressures shown for each type of sealant are at 20°C. Spectite® feedthroughs from TC Ltd. 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 50% of the feedthrough guide pressure value at 20°C. With an increase in temperature, a reduction in the maximum guide pressure value can be expected. These ratings are a guide and 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.

2 Other types of process connection are available, see Section 3.

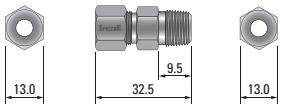
3 The element diameters shown are the common sizes routinely demanded for general industrial applications. Other sizes can be supplied between the minimum and maximum diameters shown.

Section 3 - Series PF Body Size and available Bore Sizes for all Thread Types - please refer to table for guide pressures in Section 2

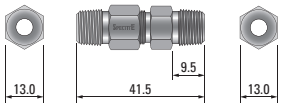
Size 1 (1/8" Thread or equivalent)

Standard Thread Sizes	Max. Tube Size
1/8" BSPT, 1/8" BSPP, 1/8" NPT	4.76mm
Alternative Thread Sizes	**Max. Tube Size**
M8x1.0, 3/8" UNF-24	4.76mm
M10x1.0, 7/16" UNF-24	4.76mm

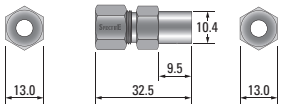
Standard Fitting



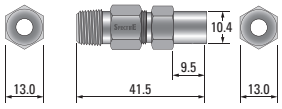
Fitting with Threaded Cap



Fitting with Weld Neck



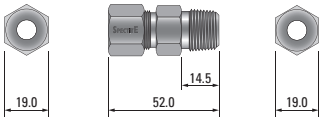
Fitting with Weld Neck and Threaded Cap



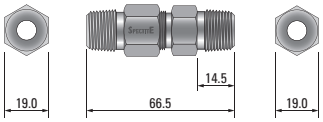
Size 2 (1/4" Thread or equivalent)

Standard Thread Sizes	Max. Tube Size
1/4" BSPT, 1/4" BSPP, 1/4" NPT	6.35mm
Alternative Thread Sizes	**Max. Tube Size**
M10x1.0, 7/16" UNF-20	6.35mm
M12x1.5, 1/2" UNF-20	6.35mm

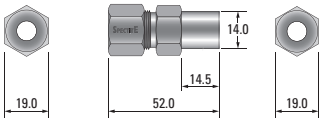
Standard Fitting



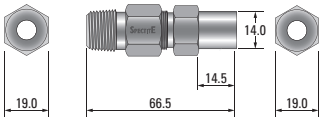
Fitting with Threaded Cap



Fitting with Weld Neck



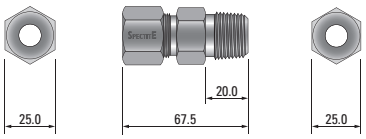
Fitting with Weld Neck and Threaded Cap



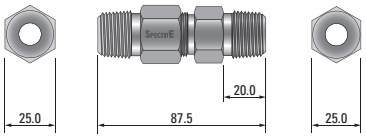
Size 3 (1/2" Thread or equivalent)

Standard Thread Sizes	Max. Tube Size
1/2" BSPT, 1/2" BSPP, 1/2" NPT	10.0mm
Alternative Thread Sizes	**Max. Tube Size**
3/8" BSPT, 3/8" BSPP, 3/8" NPT	10.0mm
M14x1.5, 7/16" SAE-20, 9/16" UNF-18	10.0mm
M16x1.5, 1/2" SAE-20, 5/8" UNF-18	10.0mm
M20x1.5, 9/16" SAE-24, 3/4" UNF-16	10.0mm

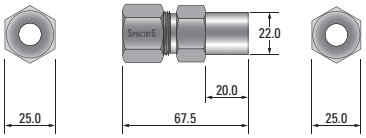
Standard Fitting



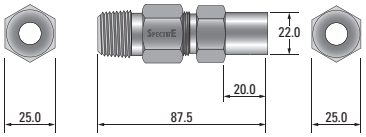
Fitting with Threaded Cap



Fitting with Weld Neck



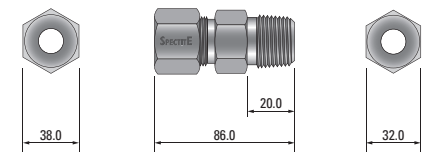
Fitting with Weld Neck and Threaded Cap



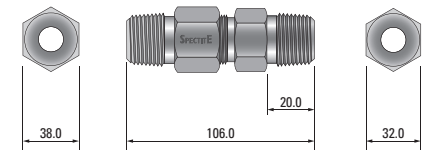
Size 4 (3/4" Thread or equivalent)

Standard Thread Sizes	Max. Tube Size
3/4" BSPT, 3/4" BSPP, 3/4" NPT	19.05mm
Alternative Thread Sizes	**Max. Tube Size**
M22x1.5, 3/4" SAE-16, 7/8" UNF-14	19.05mm
M24x2.0, 7/8" SAE-14, 1" UNF-14	19.05mm

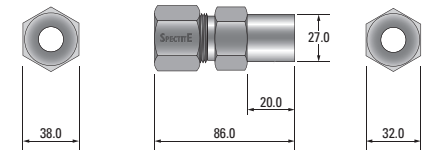
Standard Fitting



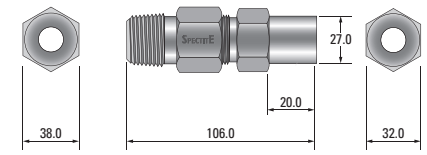
Fitting with Threaded Cap



Fitting with Weld Neck



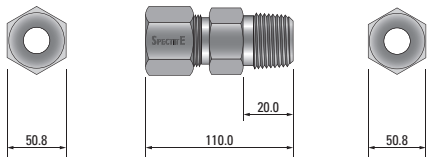
Fitting with Weld Neck and Threaded Cap



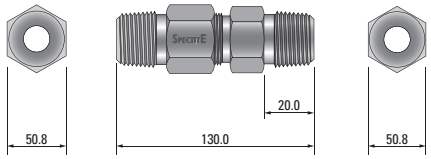
Size 5 (1" Thread or equivalent)

Standard Thread Sizes	Max. Tube Size
1" BSPT, 1" BSPP, 1" NPT	25.4mm
Alternative Thread Sizes	**Max. Tube Size**
M27x2.0, 1+3/16" SAE-12, 1" UNF-14	25.4mm
M33x2.0, 1+5/8" SAE-12, 1+1/8" UNF-14	25.4mm

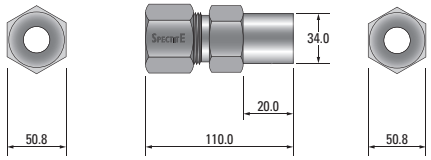
Standard Fitting



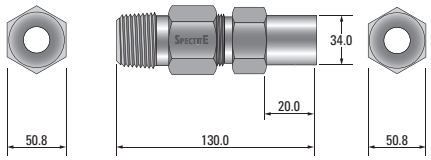
Fitting with Threaded Cap



Fitting with Weld Neck

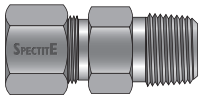
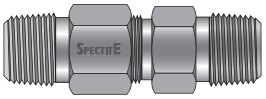


Fitting with Weld Neck and Threaded Cap



Please note: The overall length will vary slightly depending on the sealant used and the tube size.

Section 4 - Series PF Cap Configuration

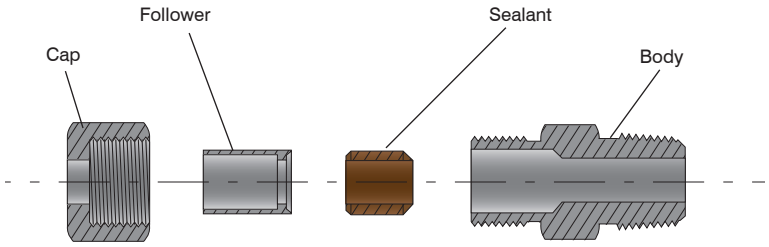
Style A	Description	Style B	Description
 **Standard**	Standard Fitting with single thread for direct mounting into process.		Standard Fitting with a Style B threaded extension for conduit/terminal head or enclosure connection. The thread form is the same as the process thread unless otherwise specified. *If a different thread form is required, please specify after the 'B' in the order code, for example:* *PF1 – 1/8" BSPP – 1.5 – G –* ***B NPT*** *If a B cap is used with a weld neck fitting, then the thread form must be specificied.*

Series PF Torque Settings - Max. values in Nm

Process Connection Size	Sealants		
	G	T	V
Size 1 (1/8")	20	12	15
Size 2 (1/4")	60	30	50
Size 3 (1/2")	135	75	85
Size 4 (3/4")	260	120	85
Size 5 (1")	300	400	300

G = Graftite™, T = PTFE, V = Viton®
To convert: ft/lb = Nm x 0.738; Kg/cm = Nm x 10.2.

Series PF Schematic



Typical components shown for a PF Series fitting.

Series PF - Order Code Examples

Feedthrough Series	Feedthrough Size (see Section 3)		Process Connection (see Section 3)		Element Diameter (see Section 2)		Sealant (see Section1)		Cap Configuration (see Section 4)		Rating
PF	1	–	1/8″ BSPT	–	3.0	–	V	–	A	–	EX
PF	2	–	1/4″ NPT	–	1.5	–	G	–	B	–	EX
PF	3	–	M16x1.5	–	6.0	–	T	–	A	–	EX
PF	4	–	WELD	–	10.0	–	V	–	A	–	EX

Series MF Feedthroughs for Multiple Elements

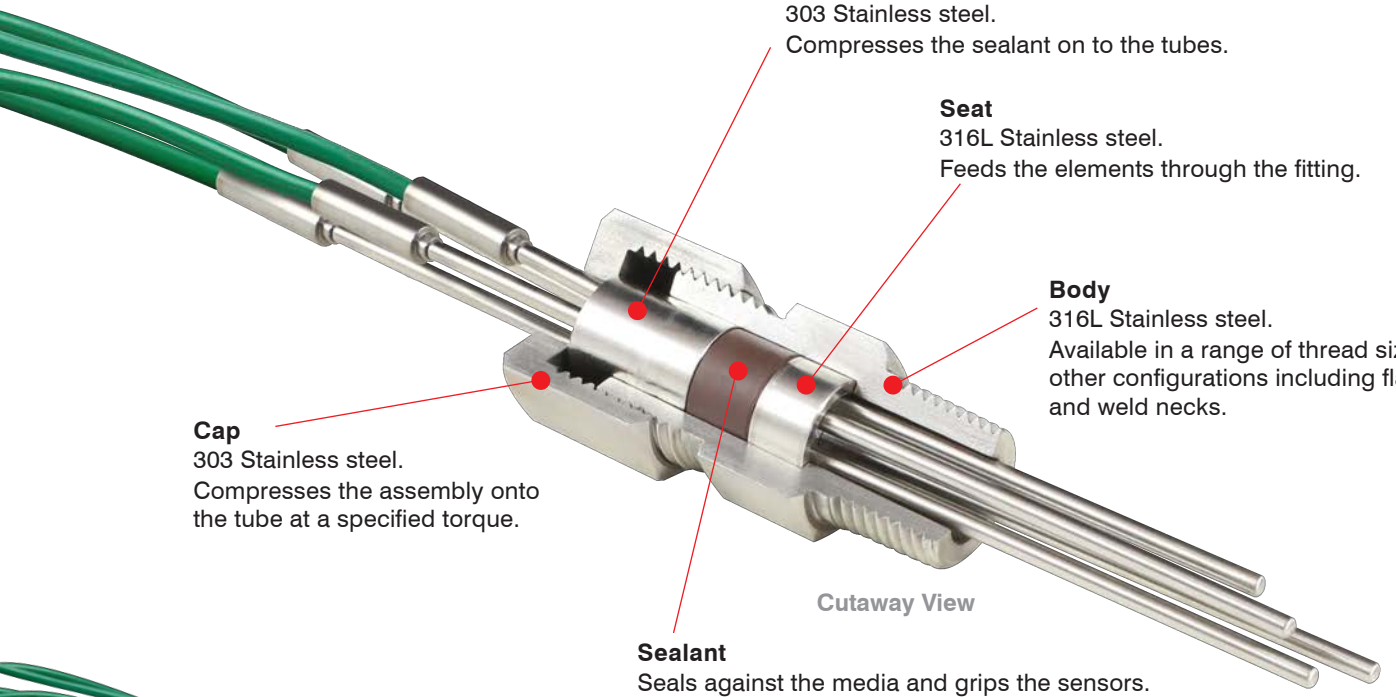
A single access port into an enclosure or process vessel is all that is needed to allow multiple probes, sensors, etc., to pass through an environmental or pressure boundary using a single feedthrough assembly.

Series MF feedthroughs can seal multiple elements within a single assembly including typically up to 40 x 1.0mm Ø, up to 12 x 3.0mm Ø or up to 4 x 6.0mm Ø elements. Please refer to the table for further details of feedthrough capacity and sizes of elements.

There are five body sizes having 1/8", 1/4", 1/2", 3/4" and 1" process connections in either BSPT (conical gas or DIN 2999 'R') and NPT threads.

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

Typical Construction



Follower
303 Stainless steel.
Compresses the sealant on to the tubes.

Seat
316L Stainless steel.
Feeds the elements through the fitting.

Body
316L Stainless steel.
Available in a range of thread sizes and other configurations including flanges and weld necks.

Cap
303 Stainless steel.
Compresses the assembly onto the tube at a specified torque.

Cutaway View

Sealant
Seals against the media and grips the sensors.
Available in Graftite™, PTFE or Viton® (shown).

Complete Fitting

- ATEX/IECEx Approved to: Ex II 2G 1D, Ex db IIC Gb / Ex eb IIC Gb, Ex ta IIIC Da
- Saves time and costs by allowing multiple sensors to pass through one feedthrough fitting
- Immersion length of each element can be easily adjusted as required
- Five sizes of feedthrough assembly
- Designed for carrying multiple elements 0.5mm to 9.53mm diameter
- Suitable for a mixture of sizes and types of elements
- Guide pressure range: Vacuum up to 700 bar
- Temperature range: -60°C to +450°C
- 316L Stainless steel wetted parts (see above)
- Choice of three sealant materials
- Reusable fitting dependant on sealant

Alternative Configurations

Threaded Extension (B Cap)
Allows the gland to be terminated into the process as well as to a terminal head or conduit at the opposite end to the process.
See section 4 for details.

Weld Neck
Supplied without thread for permanent installation into the process by welding. Specify as 'WELD' for the thread size in the order code.

Section 1 - Series MF Sealants

Sealant Material	Code	Colour	Example	Operating Temperature Range	Re-usable	Material definition and properties
Graftite™	G	Grey / Black		**-60°C to +450°C (T1)**	✗	Graphite 98% purity. Impermeable to gases and liquids. Resistant to most media, not 'wetted' by molten metals or salts. Asbestos-free. No ageing or embrittlement. Good resistance to thermal shock. Conductive material (not electrically isolated).
PTFE	T	White		**-60°C to +200°C (T3)**	✓	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.
Viton®	V	Brown		**-40°C to +200°C (T3)**	✓	Fluoroelastomer. Resists hydrocarbons, corrosive chemicals and petroleum. Solvent, acid and base resistant. Low permeation rate. Mechanically robust at high temperatures.

Section 2 - Series MF Body Size, Pressure Guide [1] and available Bore Sizes for BSPT, BSPP and NPT Threads [2]

Body Size		No. of Elements	Size 1 (1/8") [3]			No. of Elements	Size 2 (1/4")			No. of Elements	Size 3 (1/2")			No. of Elements	Size 4 (3/4")			No. of Elements	Size 5 (1")		
Sealant			G	T	V		G	T	V		G	T	V		G	T	V		G	T	V
Element Sizes (dia)		*The maximum guide pressure value (in bar) at 20°C is shown for each sealant material according to element size[1]. These ratings are a guide and 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.*																			
inches	mm																				
0.020	0.5	2 to 4	400	250	250	4 to 8	300	250	250												
0.032	0.8																				
0.040	1.0						500	200	500	4 to 16	700	250	450	8 to 40	550	250	400				
0.059	1.5					2 to 6															
0.062	1.59									4 to 12				8 to 28							
0.080	2.0																				
0.118	3.0					2		150		2 to 4		200	350	4 to 12			350	8 to 24	200	100	150
0.125	3.2																				
0.177	4.5									2		150	250	2 to 4	350	150	300	4 to 8	150	70	40
0.187	4.76													2 to 4							
0.236	6.0																	2 to 6			
0.250	6.35																				
0.315	8.0																	2 to 4			20
0.375	9.53																				

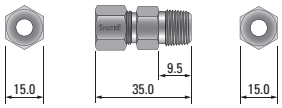
1 The guide pressures shown for each type of sealant are at 20°C. Spectite® feedthroughs from TC Ltd. have been designed to provide an efficient seal on the elements and restrain them from moving under pressure and vacuum. It is good installation practice to provide additional, mechanical restraint to the elements when differential pressure exceeds 50% of the feedthrough guide pressure value at 20°C. With an increase in temperature, a reduction in the maximum guide pressure value can be expected. These ratings are a guide and 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.
2 Other types of process connection are available, see Section 3.
3 Our Size 1 range utilises different internal parts.

Section 3 - Series MF Body Size and available Bore Sizes for all Thread Types - please refer to table for guide pressures in Section 2

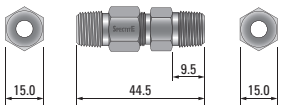
Size 1 (1/8" Thread or equivalent)

Standard Thread Sizes
1/8" BSPT, 1/8" BSPP, 1/8" NPT
Alternative Thread Sizes
M8x1.0, 3/8" UNF-24
M10x1.0, 7/16" UNF-24

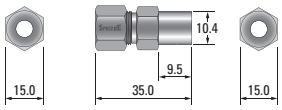
Standard Fitting



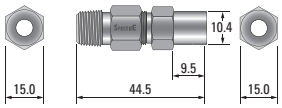
Fitting with Threaded Cap



Fitting with Weld Neck



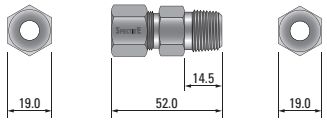
Fitting with Weld Neck and Threaded Cap



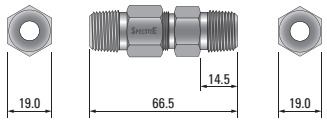
Size 2 (1/4" Thread or equivalent)

Standard Thread Sizes
1/4" BSPT, 1/4" BSPP, 1/4" NPT
Alternative Thread Sizes
M12x1.5, 1/2" UNF-20
M14x1.5, 7/16", UNF-18

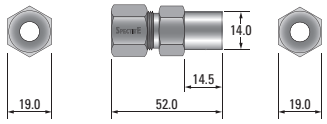
Standard Fitting



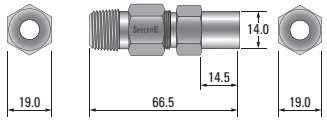
Fitting with Threaded Cap



Fitting with Weld Neck



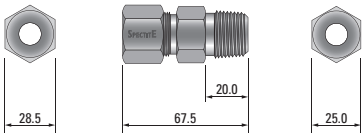
Fitting with Weld Neck and Threaded Cap



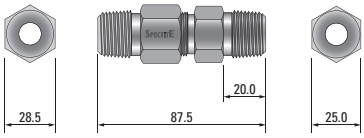
Size 3 (1/2" Thread or equivalent)

Standard Thread Sizes
1/2" BSPT, 1/2" BSPP, 1/2" NPT
Alternative Thread Sizes
3/8" BSPT, 3/8" BSPP, 3/8" NPT
M16x1.5, 1/2" SAE-20, 5/8" UNF-18
M20x1.5, 9/16" SAE-24, 3/4" UNF-16

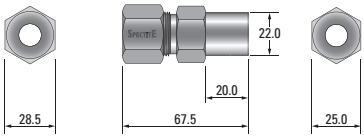
Standard Fitting



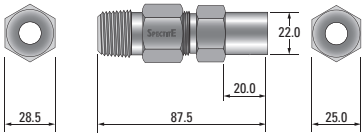
Fitting with Threaded Cap



Fitting with Weld Neck



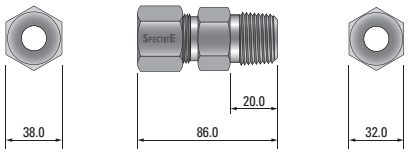
Fitting with Weld Neck and Threaded Cap



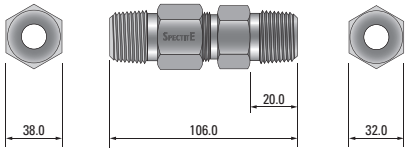
Size 4 (3/4" Thread or equivalent)

Standard Thread Sizes
3/4" BSPT, 3/4" BSPP, 3/4" NPT
Alternative Thread Sizes
M24x2.0, 7/8" SAE-14, 1" UNF-14

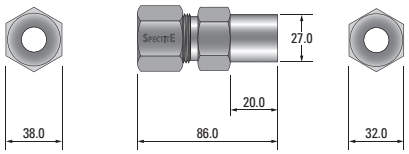
Standard Fitting



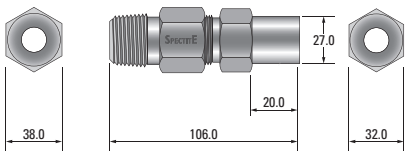
Fitting with Threaded Cap



Fitting with Weld Neck



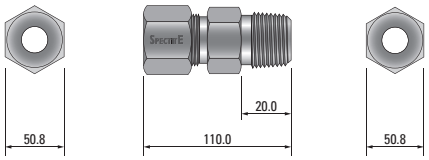
Fitting with Weld Neck and Threaded Cap



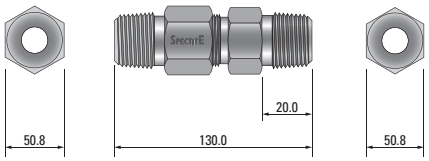
Size 5 (1" Thread or equivalent)

Standard Thread Sizes
1" BSPT, 1" BSPP, 1" NPT
Alternative Thread Sizes
M33x2.0, 1+5/8" SAE-12, 1+1/8" UNF-14

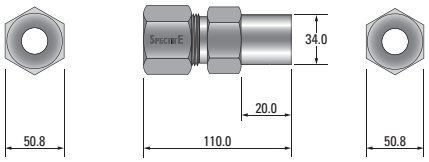
Standard Fitting



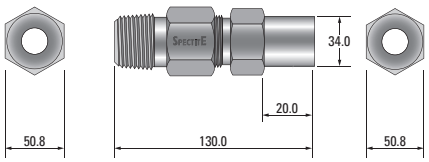
Fitting with Threaded Cap



Fitting with Weld Neck

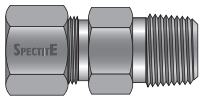
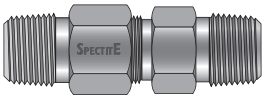


Fitting with Weld Neck and Threaded Cap



Please note: The overall length will vary slightly depending on the sealant used and the tube size.

Section 4 - Series MF Cap Configuration

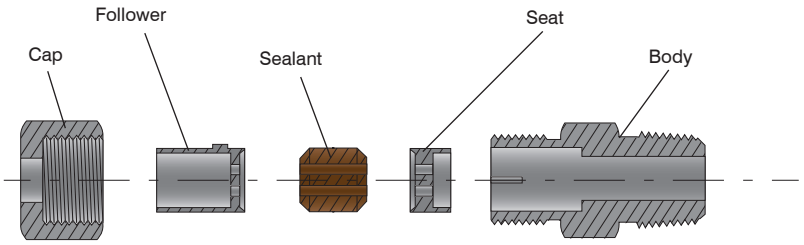
Style A	Description	Style B	Description
 **Standard**	Standard Fitting with single thread for direct mounting into process.		Standard Fitting with a Style B threaded extension for conduit/terminal head or enclosure connection. The thread form is the same as the process thread unless otherwise specified. *If a different thread form is required, please specify after the 'B' in the order code, for example:* *MF3 – 1/2″ BSPT – 1.5 – 8 – G – **B NPT*** *If a B cap is used with a weld neck fitting, then the thread form must be specificied.*

Series MF Torque Settings - Max. values in Nm

Process Connection Size	Sealants		
	G	T	V
Size 1 (1/8")	40	30	35
Size 2 (1/4")	50	35	40
Size 3 (1/2")	165	115	125
Size 4 (3/4")	260	150	175
Size 5 (1")	400	250	350

G = Graftite™, T = PTFE, V = Viton®
To convert: ft/lb = Nm x 0.738; Kg/cm = Nm x 10.2.

Series MF Schematic



Typical components shown for an MF Series fitting. Size 1 fittings have slightly different components.

Series MF - Order Code Examples

Feedthrough Series	Feedthrough Size (see Section 3)		Process Connection (see Section 3)		Element Diameter (see Section 2)		No. of Elements (see Section 2)		Sealant (see Section1)		Cap Configuration (see Section 4)		Rating
MF	1	–	1/8″ BSPT	–	1.0	–	2	–	V	–	A	–	EX
MF	2	–	1/4″ NPT	–	1.5	–	4	–	T	–	B	–	EX
MF	3	–	1/2″ BSPT	–	3.2	–	2	–	L	–	A	–	EX
MF	4	–	WELD	–	6.0	–	4	–	G	–	A	–	EX

Series WF Feedthroughs for Multiple Wires & Probes

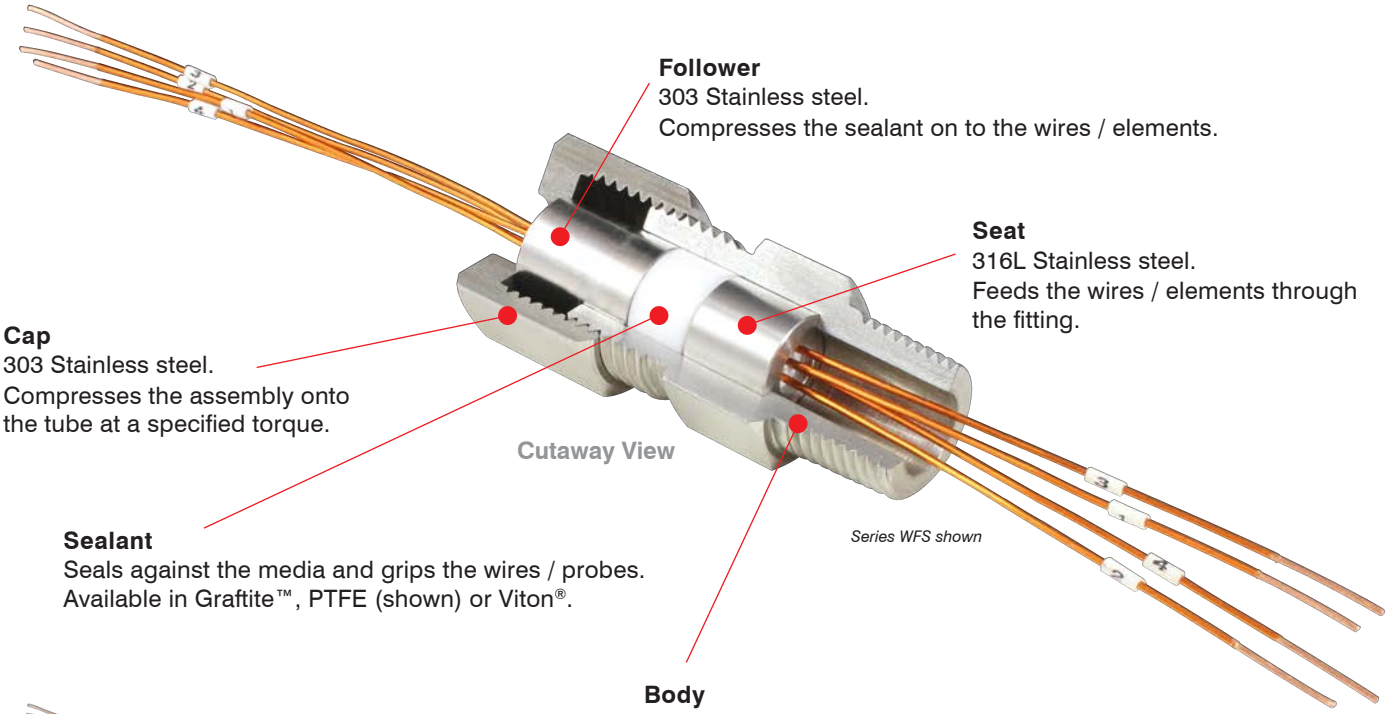
When multiple wires must pass through a pressure boundary, series WF feedthroughs can provide an efficient seal without recourse to epoxies or other non-adjustable fixture methods.

Different types of these assemblies may be specified according to the type of element required to pass through the feedthrough. Series WF assemblies cater for up to 12 bare or insulated wires – sizes from 24AWG (0.2mm^2) to 8AWG (approx. 8.8mm^2).

Ceramic insulators within WF feedthrough assemblies protect bare wires and provide additional isolation for Kapton® insulated wires. These are rated max. 55A @ 600Vdc/850Vac max. 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.

Typical Construction



Follower
303 Stainless steel.
Compresses the sealant on to the wires / elements.

Seat
316L Stainless steel.
Feeds the wires / elements through the fitting.

Cap
303 Stainless steel.
Compresses the assembly onto the tube at a specified torque.

Cutaway View

Series WFS shown

Sealant
Seals against the media and grips the wires / probes.
Available in Graftite™, PTFE (shown) or Viton®.

Body
316L Stainless steel.
Available in a range of thread sizes and other configurations including flanges and weld necks.

Complete Fitting

- ATEX/IECEx Approved to: Ex II 2G 1D, Ex db IIC Gb / Ex eb IIC Gb, Ex ta IIIC Da
- Seal on Kapton® insulated copper or thermocouple wires – **type WFS**
- Seal on PFA/PTFE insulated copper or thermocouple wires – **type WFT**
- Seal on bare wires carrying instrumentation voltages – **type WFR**
- Seal on small diameter sheathed sensors, max. 3.2mm dia. – **type WFP**
- High temperature glands using ceramic insulators – **type WFRH / WFPH**

- Guide pressure range: Vacuum up to 700 bar
- Temperature range: -60°C to +450°C
- 316L Stainless steel wetted parts (see above)
- Choice of sealant materials
- WF glands use ceramic insulators to isolate the sensors from all metal contact
- Individual wires can be replaced without complete disassembly
- Reusable fitting – sealant and internal components replaceable - see page 24

Feedthroughs for Multiple Wires & Probes Series WF

WFS
Seal on Kapton® insulated copper or thermocouple wire

WFT
Seal on PFA/PTFE insulated copper or thermocouple wires

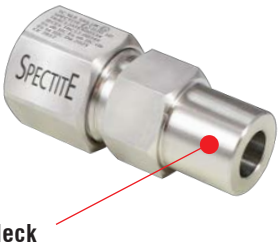
WFR
Seal on bare wires carrying instrumentation signals and/or voltages

WFP
Seal on metal sheathed sensors requiring electrical isolation

WFRH / WFPH
High temperature glands using ceramic insulators

Alternative Configurations

Threaded Extension (B Cap)
Allows the gland to be terminated into the process as well as to a terminal head or conduit at the opposite end to the process.
See section 4 for details.



Weld Neck
Supplied without thread for permanent installation into the process by welding. Specify as 'WELD' for the thread size in the order code.

Section 1 - Series WF Sealants

Sealant Material	Code	Colour	Example	Operating Temperature Range	Re-usable	Material definition and properties
Graftite™	G	Grey / Black		-60°C to +450°C (T1)	✗	Graphite 98% purity. Impermeable to gases and liquids. Resistant to most media, not 'wetted' by molten metals or salts. Asbestos-free. No ageing or embrittlement. Good resistance to thermal shock. Conductive material (not electrically isolated).
PTFE	T	White		-60°C to +200°C (T3)	✓	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.
Viton®	V	Brown		-40°C to +200°C (T3)	✓	Fluoroelastomer. Resists hydrocarbons, corrosive chemicals and petroleum. Solvent, acid and base resistant. Low permeation rate. Mechanically robust at high temperatures.

Section 2a - Body Size, Pressure Guide [1] and available Bore Sizes for **BSPT, BSPP** and **NPT** Threads [2]
Series WFS - Kapton® insulated wires - Max. 230°C rated

Body Size		No. of Elements	Size 1 (1/8")			No. of Elements	Size 2 (1/4")			No. of Elements	Size 3 (1/2")			No. of Elements	Size 4 (3/4")		
Sealant			G*	T	V		G*	T	V		G*	T	V		G*	T	V
Wire Size		*The maximum guide pressure value (in bar) at 20°C is shown for each sealant material according to element size[1]. These ratings are a guide and 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.*															
AWG	diam. (mm)																
24 Cu or T/C	0.5mm	2, 4	300	250	250	2, 4	300	250	250								
20 Cu or T/C	0.8mm									2, 4	700	250	450	6, 8 12	550	250	350
18 Cu	1.0mm																
16 Cu	1.3mm																
14 Cu	1.6mm													4, 6 8			
12 Cu	2.0mm																
10 Cu	2.5mm													2, 4			
8 Cu	3.2mm													3			

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	14	12	10	8
Max. current rating (A) at 230°C 600V AC / 850V DC max.	5	9	13	17	24	30	40	55

Section 2b - Body Size, Pressure Guide [1] and available Bore Sizes for **BSPT, BSPP** and **NPT** Threads [2]
Series WFT - PFA insulated wires - Max. 230°C rated

Body Size		No. of Elements	Size 1 (1/8")		No. of Elements	Size 2 (1/4")			No. of Elements	Size 3 (1/2")			No. of Elements	Size 4 (3/4")		
Sealant			T	V		G*	T	V		G*	T	V		G*	T	V
Wire Size		***The maximum guide pressure value (in bar) at 20°C is shown for each sealant material according to element size[1]. These ratings are a guide and 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.***														
AWG	diam. (mm)															
24 Cu or T/C	0.5mm	2, 4	250	250	2, 4	300	250	250								
20 Cu or T/C	0.8mm								2, 4	700	250	450	6, 8 12	550	250	350

Series WFT feedthroughs are supplied with PFA 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.

** Graftite™ sealants are conductive. Extra care must be taken where high voltages are present. Please contact TC Ltd for further guidance.*

1 The guide pressures shown for each type of sealant are at 20°C. Spectite® feedthroughs from TC Ltd. 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 50% of the feedthrough guide pressure value at 20°C. With an increase in temperature, a reduction in the maximum guide pressure value can be expected. These ratings are a guide and 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.

2 Other types of process connection are available, please contact us for details.

Section 2c - Body Size, Pressure Guide [1] and available Bore Sizes for **BSPT, BSPP** and **NPT** Threads [2]
Series WFR - Bare wires, WFP - Multiple Sensors - Max. 230°C rated, WFRH / WFPH - Max. 450°C rated

Body Size		No. of Elements	Size 1 (1/8")		No. of Elements	Size 2 (1/4")		No. of Elements	Size 3 (1/2")		No. of Elements	Size 4 (3/4")	
Sealant			T	V		T	V		T	V		T	V
WFR Wire Sizes (AWG)	**WFP** Element dia (mm)	***The maximum guide pressure value (in bar) at 20°C is shown for each sealant material according to element size[1]. These ratings are a guide and 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.***											
24	0.5	2, 4	250	250	2, 4	250	250						
20	0.8												
18	1.0							2, 3 4, 6 8	250	450			
14	1.5							2, 4			6, 8, 12	250	350
8	3.0										2, 4		
	3.2												
6	4.0										3	80	100

1 The guide pressures shown for each type of sealant are at 20°C. Spectite® feedthroughs from TC Ltd. 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 50% of the feedthrough guide pressure value at 20°C. With an increase in temperature, a reduction in the maximum guide pressure value can be expected. These ratings are a guide and 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.

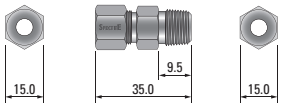
2 Other types of process connection are available, please contact us for details.

Section 3 - Series WF Body Size and available Bore Sizes for all Thread Types - please refer to table for guide pressures in Section 2

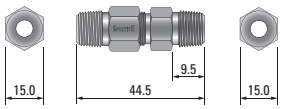
Size 1 (1/8" Thread or equivalent)

Standard Thread Sizes
1/8" BSPT, 1/8" BSPP, 1/8" NPT
Alternative Thread Sizes
M8x1.0, 3/8" UNF-24
M10x1.0, 7/16" UNF-24

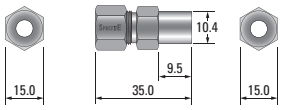
Standard Fitting



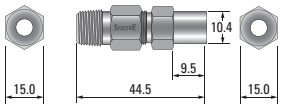
Fitting with Threaded Cap



Fitting with Weld Neck



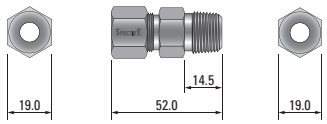
Fitting with Weld Neck and Threaded Cap



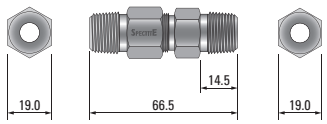
Size 2 (1/4" Thread or equivalent)

Standard Thread Sizes
1/4" BSPT, 1/4" BSPP, 1/4" NPT
Alternative Thread Sizes
M10x1.0, 7/16" UNF-20
M12x1.5, 1/2" UNF-20

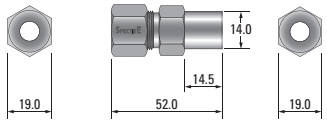
Standard Fitting



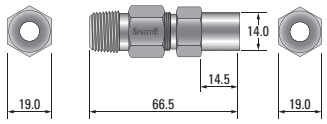
Fitting with Threaded Cap



Fitting with Weld Neck



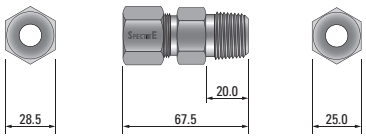
Fitting with Weld Neck and Threaded Cap



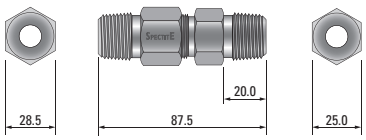
Size 3 (1/2" Thread or equivalent)

Standard Thread Sizes
1/2" BSPT, 1/2" BSPP, 1/2" NPT
Alternative Thread Sizes
3/8" BSPT, 3/8" BSPP, 3/8" NPT
M14x1.5, 7/16" SAE-20, 9/16" UNF-18
M16x1.5, 1/2" SAE-20, 5/8" UNF-18
M20x1.5, 9/16" SAE-24, 3/4" UNF-16

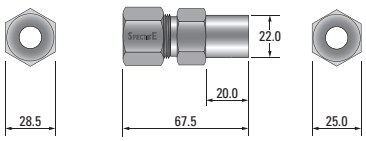
Standard Fitting



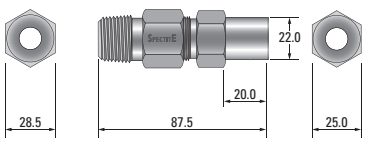
Fitting with Threaded Cap



Fitting with Weld Neck



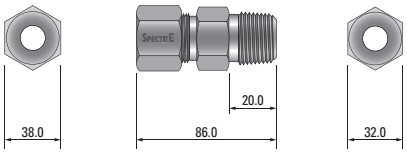
Fitting with Weld Neck and Threaded Cap



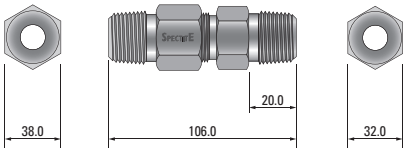
Size 4 (3/4" Thread or equivalent)

Standard Thread Sizes
3/4" BSPT, 3/4" BSPP, 3/4" NPT
Alternative Thread Sizes
M22x1.5, 3/4" SAE-16, 7/8" UNF-14
M24x2.0, 7/8" SAE-14, 1" UNF-14

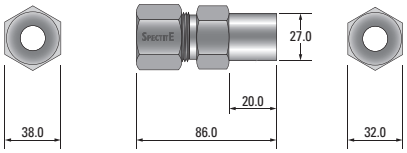
Standard Fitting



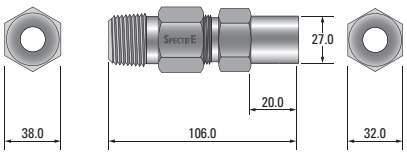
Fitting with Threaded Cap



Fitting with Weld Neck

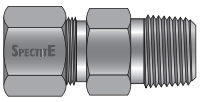
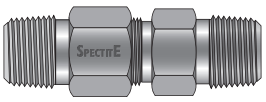


Fitting with Weld Neck and Threaded Cap



Please note: The overall length will vary slightly depending on the sealant used and the tube size.

Section 4 - Series WF Cap Configuration

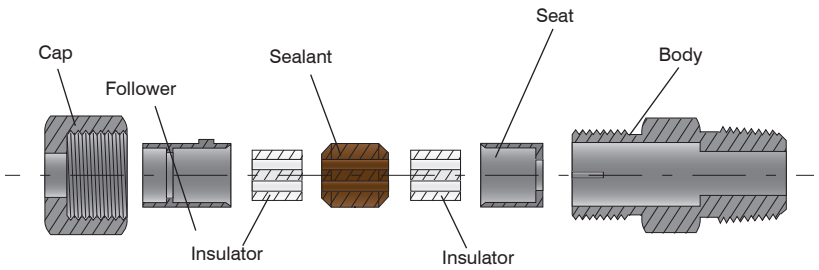
Style A	Description	Style B	Description
 **Standard**	Standard Fitting with single thread for direct mounting into process.		Standard Fitting with a Style B threaded extension for conduit/terminal head or enclosure connection. The thread form is the same as the process thread unless otherwise specified. *If a different thread form is required, please specify after the 'B' in the order code, for example:* *WFP3 – 1/2˝ BSPT – 1.0 – 8 – V –* ***B NPT*** *If a B cap is used with a weld neck fitting, then the thread form must be specificied.*

Series WF Torque Settings - Max. values in Nm

Process Connection Size	Sealants		
	G	T	V
Size 1 (1/8")	40	30	35
Size 2 (1/4")	50	35	40
Size 3 (1/2")	165	115	125
Size 4 (3/4") up to 8 Cu	260	150	175
Size 4 (3/4") 6 Cu	–	180	100

G = Graftite™, T = PTFE, V = Viton®
To convert: ft/lb = Nm x 0.738; Kg/cm = Nm x 10.2.

Series WF Schematic



Typical components shown for a WF Series fitting.

Series WF - Order Code Examples

Feedthrough Series	Feedthrough Size (see Sec. 3)		Process Connection (see Section 3)		Element Diameter (see Sec. 2)		No. of Elements (see Sec. 2)		Sealant (see Sec. 1)		Cap (see Sec. 4)		Wire Length CAP SIDE		Wire Length PROCESS SIDE		Rating
WFS	2	–	1/4″ BSPT	–	24K	–	4	–	V	–	A	–	1200mm	–	1200mm	–	EX
WFR	4	–	3/4″ NPT	–	14_{AWG}	–	12	–	T	–	B	–	not applicable	–	not applicable	–	EX
WFT	2	–	1/4″ BSPT	–	24K	–	4	–	T	–	A	–	800mm	–	800mm	–	EX
WFP	3	–	1/2″ BSPT	–	1.0	–	8	–	L	–	A	–	not applicable	–	not applicable	–	EX
WFS	4	–	WELD	–	14_{CU}	–	8	–	G	–	A	–	1000mm	–	1000mm	–	EX

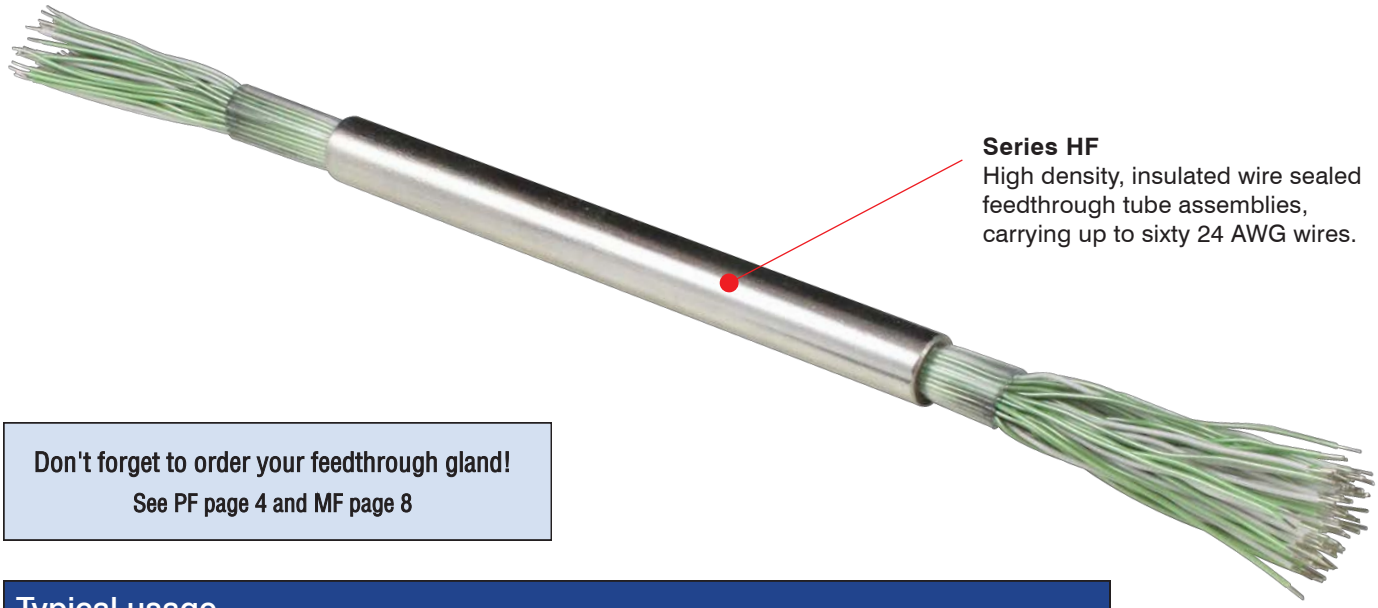
Note: if no wire length is specified in the part code fitting will be supplied as WFR/WFP type (without wires).

Series HF High Density Sealed Tubes

An FEP lined, stainless steel tube is swaged over multiple, insulated, single-core copper and/or thermocouple material wires to make a continuous wire, high-density, sealed feedthrough tube with up to 60 wires. 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. sealed tubes. They are suitable for use where outgassing is not permitted. The thermocouple pairs are available with or without junctions. Please contact us for further details.

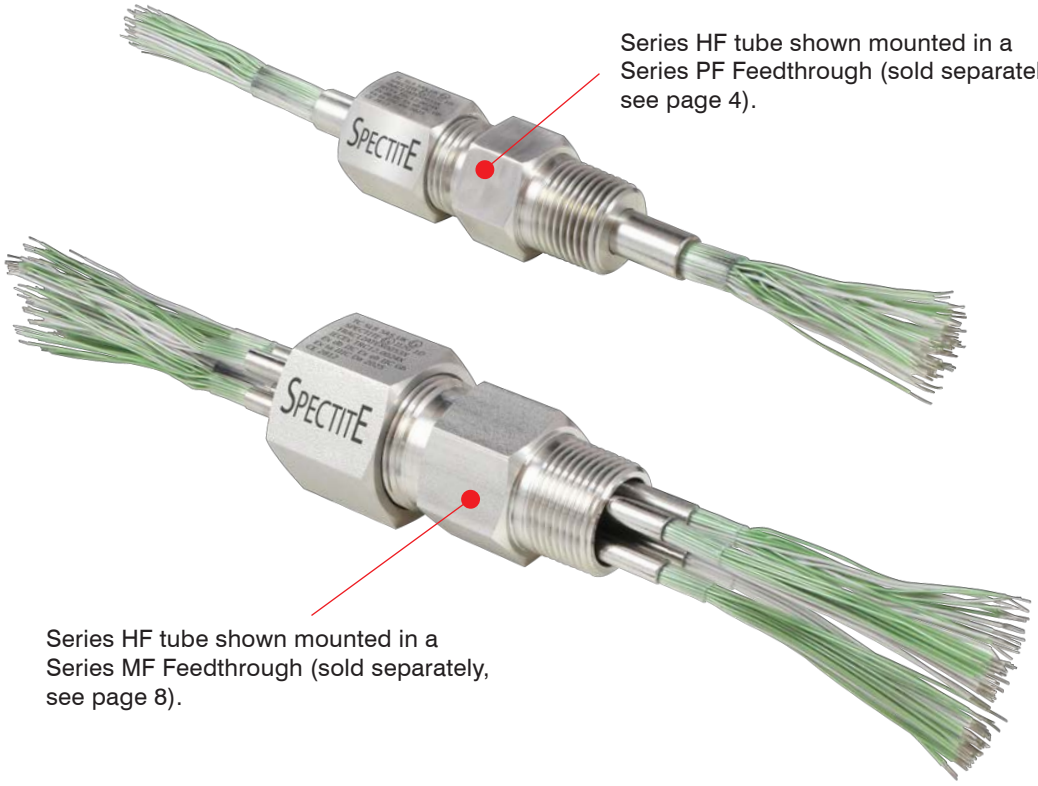
Typical Construction



Series HF
High density, insulated wire sealed feedthrough tube assemblies, carrying up to sixty 24 AWG wires.

Don't forget to order your feedthrough gland!
See PF page 4 and MF page 8

Typical usage



Series HF tube shown mounted in a Series PF Feedthrough (sold separately, see page 4).

Series HF tube shown mounted in a Series MF Feedthrough (sold separately, see page 8).

Series HF High Density Sealed Tubes

- ATEX/IECEx Approved to:
  Ex II 2G 1D, Ex db IIC Gb /
  Ex eb IIC Gb, Ex ta IIIC Da (using PF/MF fitting)
- **Single tube assembly mounts in a series PF feedthrough,** sold separately - see page 4
- **Multiple tubes mount in a series MF feedthrough,** sold separately - see page 8
- Saves time and costs by allowing multiple sensor wires to pass through a feedthrough as 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
- Max. current rating per wire 500mA at 100Vdc
- Guide pressure range: Vacuum up to 350 bar with low leak rate
- Temperature rating: -40°C to +125°C
- 4 tube sizes carrying 12, 24, 40 or 60 size 24AWG copper or thermocouple material wires

Series HF - Colour Codes

Thermocouple Pairs

Pairs bunched and numbered as pairs.

Thermocouple Type	IEC 60584.3	ANSI MC96.1
	IEC	ANSI
K	Green	Yellow
	White	Red
T	Brown	Blue
	White	Red
J	Black	White
	White	Red
N	Pink	Orange
	White	Red
R/S	Orange	Black
	White	Red
E	Purple	Lilac
	White	Red

Instrument Pairs

Pairs bunched and numbered as pairs.

Material	Part Code	Colours
Copper	CU2	Red
		White

Other colour combinations are available - please contact TC Ltd for more information.

RTD Wires

Wires bunched and numbered as Triples or Quads.

3 wire	4 wire
RTD3	RTD4
Red	Red
Red	Red
White	White
	White

Standard Copper 'Triples'

Wires bunched as'triples' with each triple numbered and containing 1 red, 1 white and 1 other colour as shown below.

Number of Wires	12 wire	24 wire	40 wire	60 wire
Part Code	STD	STD	STD	STD
Triple 1	Yellow	Yellow	Yellow	Yellow
Triple 2	Blue	Blue	Blue	Blue
Triple 3	Black	Black	Black	Black
Triple 4	Green	Green	Green	Green
Triple 5		Brown	Brown	Brown
Triple 6		Lilac	Lilac	Lilac
Triple 7		Orange	Orange	Orange
Triple 8		Pink	Pink	Pink
Triple 9			Yellow	Yellow
Triple 10			Blue	Blue
Triple 11			Black	Black
Triple 12			Green	Green
Triple 13			Brown	Brown
Triple 14				Lilac
Triple 15				Orange
Triple 16				Pink
Triple 17				Yellow
Triple 18				Blue
Triple 19				Black
Triple 20				Green

Series HF - Order Code Examples

Feedthrough Type		No. of wires and Material [2] (see above)		Wire Length CAP SIDE [1] (specify to nearest 100mm, minimum 500mm)		Wire Length PROCESS SIDE [1] (specify to nearest 100mm, minimum 500mm)		Colour Code (see above)
HF24	–	24Cu	–	1000mm	/	2500mm	–	RTD3
HF24	–	12Cu, 12J	–	1000mm	/	2000mm	–	STD - IEC
HF40	–	40K	–	1000mm	/	2800mm	–	IEC

1 *The wire lengths on each side of the sealed tube are the lengths of wire specified and do not include the length of the metal tube. Dimensions of the sealed tube are shown in the table below.*
2 *The number of wires refers to the total number of single wires, both copper and thermocouple wires passing through each size of sealed tube. Each series HF assembly can be specified, if required, with a combination of copper wires and thermocouple pairs.*

In the second example 4 triples of copper wire and 6 type-J thermocouple pairs are specified – total 24 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 pair is two wires.

Number of Wires / Tube Dimensions (mm)

Type	HF12	HF24	HF40	HF60
Number of Wires	12	24	40	60
Tube diameter (mm)	4.5	6.0	8.0	10.0
Tube length (mm)	80	100	100	100

Series EF High Voltage Electrode Feedthroughs (2kV)

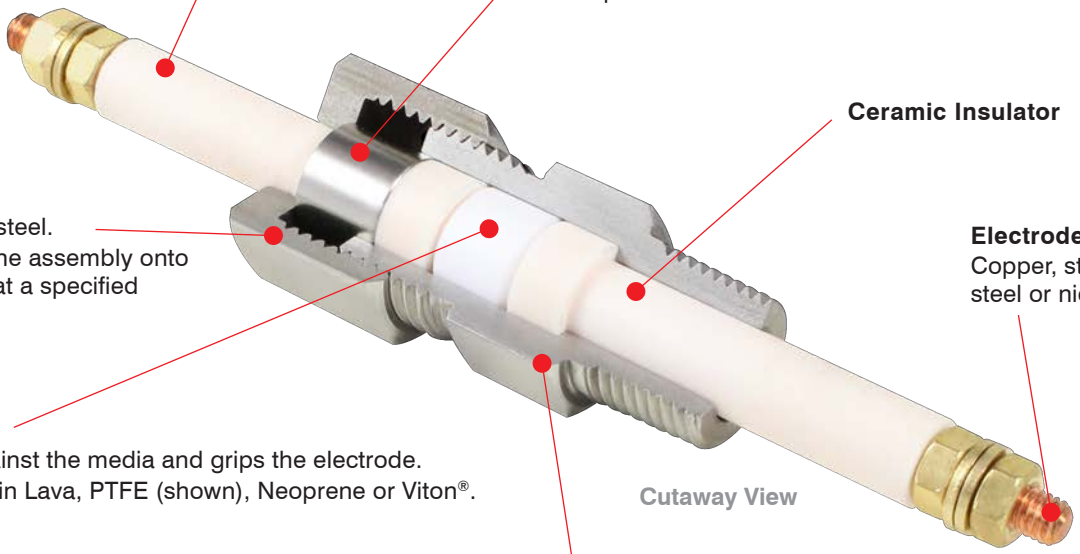
The integral electrode mounted in these feedthroughs enables specifiers to pass voltages up to 2kV in process enclosures, autoclaves, vacuum furnaces and reactor vessels to power heaters, electric motors and other devices needing high power supply.

Feedthroughs are available with three sizes of copper electrodes rated 40A, 100A and 200A at 2kV maximum. Stainless steel which has a lower current rating than copper electrodes, can be specified instead of copper.

Feedthroughs with copper electrodes have brass nuts and washers. Stainless steel nuts and washers are fitted to stainless steel and nickel electrodes.

Series EF sealed electrode assemblies are supplied pre-torqued for immediate installation. Integral insulators are made from ceramic.

Typical Construction

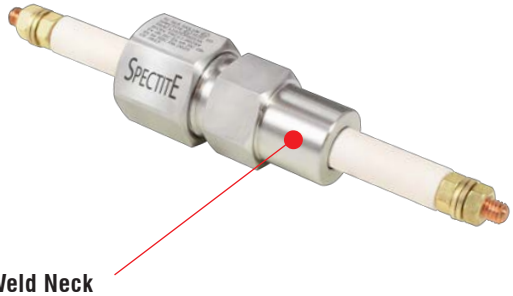


Complete Fitting

- ATEX/IECEx Approved to: Ex II 2G 1D, Ex db IIC Gb / Ex eb IIC Gb, Ex ta IIIC Da
- Integral Ceramic insulators
- Copper or stainless steel electrodes
- Three sizes of feedthrough assembly
- Rated for use at 2kV at up to 200A
- Guide pressure range: Vacuum up to 400 bar
- Choice of 2 sealant materials
- Temperature range: -60°C to +200°C
- Maintainable - internal components replaceable
- Electrodes pre-installed in feedthrough and torqued ready for installation

Alternative Configurations

Threaded Extension (B Cap)
Allows the gland to be terminated into the process as well as to a terminal head or conduit at the opposite end to the process.
See section 4 for details.



Weld Neck
Supplied without thread for permanent installation into the process by welding. Specify as 'WELD' for the thread size in the order code.

Section 1 - Series EF Sealants

Sealant Material	Code	Colour	Example	Operating Temperature Range	Re-usable	Material definition and properties
PTFE	T	White		-60°C to +200°C (T3)	✓	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.
Viton®	V	Brown		-40°C to +200°C (T3)	✓	Fluoroelastomer. Resists hydrocarbons, corrosive chemicals and petroleum. Solvent, acid and base resistant. Low permeation rate. Mechanically robust at high temperatures.

Section 2 - Body Size, Pressure Guide [1] and available Bore Sizes for **BSPT, BSPP** and **NPT** Threads [2]
Series EF -Maximum voltage rating 2kV

Body Size			Size 2 (1/4")		Size 3 (1/2")		Size 4 (3/4")	
Sealant			T	V	T	V	T	V
Voltage Rating			2kV		2kV		2kV	
Electrode Material	Electrode Current Ratings	Electrode dia. (mm)	***The table indicates the available electrode sizes for each feedthrough body size. The maximum guide pressure value (in bar) at 20°C is shown for each sealant material according to electrode size[1]. These ratings are a guide and 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.***					
Copper 316 Stainless Steel	40A 10A	3.2	350	550				
Copper 316 Stainless Steel	100A 15A	6.35			150	400		
Copper 316 Stainless Steel	200A 30A	12.7					150	150

1 *The guide pressures shown for each type of sealant are at 20°C. Spectite® feedthroughs from TC Ltd. have been designed to provide an efficient seal on the electrode and restrain them from moving under pressure and vacuum. It is good installation practice to provide additional, mechanical restraint to the electrode when differential pressure exceeds 50% of the feedthrough guide pressure value at 20°C. With an increase in temperature, a reduction in the maximum guide pressure value can be expected. These ratings are a guide and 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.*

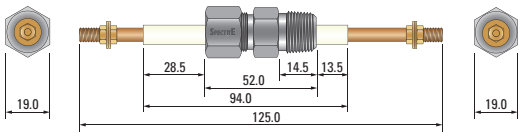
2 *Other types of process connection are available, see Section 3.*

Section 3 - Series EF Body Size and available Bore Sizes for all Thread Types - please refer to table for guide pressures in Section 2

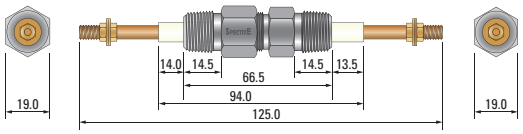
Size 2 (1/4" Thread or equivalent)

Standard Thread Sizes	Electrode Diameter
1/4" BSPT, 1/4" BSPP, 1/4" NPT	3.2mm
Alternative Thread Sizes	
M10x1.0, 7/16" UNF-20	
M12x1.5, 1/2" UNF-20	

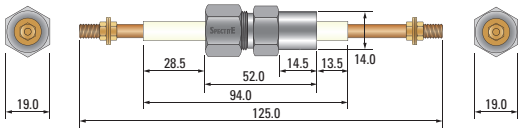
Standard Fitting



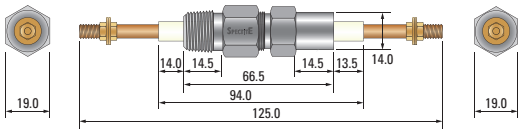
Fitting with Threaded Cap



Fitting with Weld Neck



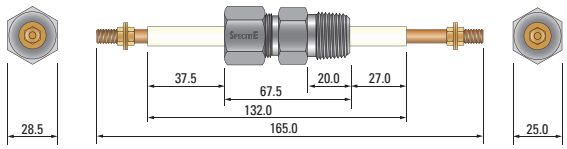
Fitting with Weld Neck and Threaded Cap



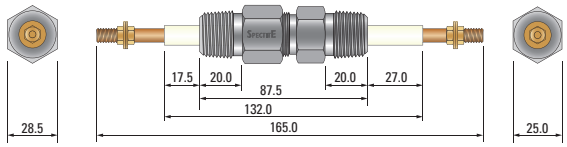
Size 3 (1/2" Thread or equivalent)

Standard Thread Sizes	Electrode Diameter
1/2" BSPT, 1/2" BSPP, 1/2" NPT	6.35mm
Alternative Thread Sizes	
3/8" BSPT, 3/8" BSPP, 3/8" NPT	
M14x1.5, 7/16" SAE-20, 9/16" UNF-18	
M16x1.5, 1/2" SAE-20, 5/8" UNF-18	
M20x1.5, 9/16" SAE-24, 3/4" UNF-16	

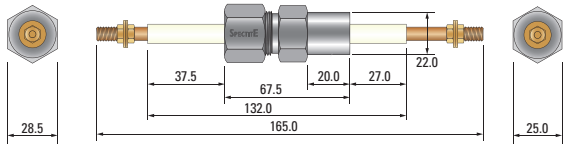
Standard Fitting



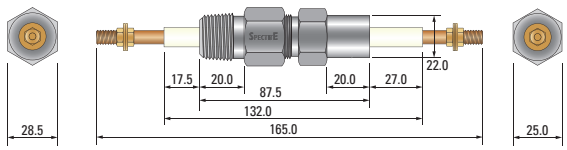
Fitting with Threaded Cap



Fitting with Weld Neck



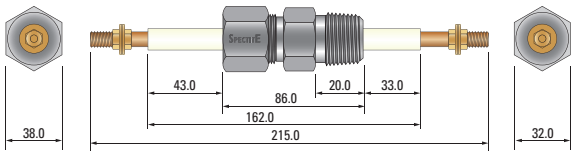
Fitting with Weld Neck and Threaded Cap



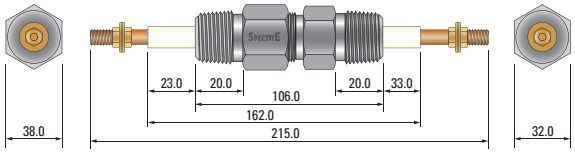
Size 4 (3/4" Thread or equivalent)

Standard Thread Sizes	Electrode Diameter
3/4" BSPT, 3/4" BSPP, 3/4" NPT	12.7mm
Alternative Thread Sizes	
M22x1.5, 3/4" SAE-16, 7/8" UNF-14	
M24x2.0, 7/8" SAE-14, 1" UNF-14	

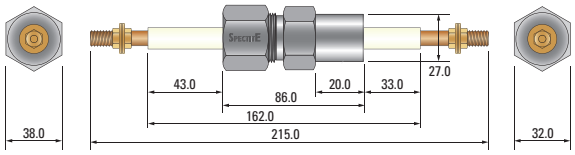
Standard Fitting



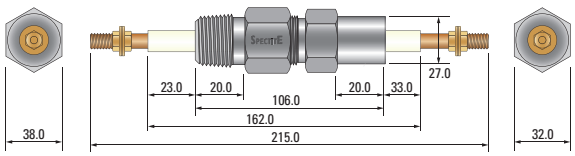
Fitting with Threaded Cap



Fitting with Weld Neck

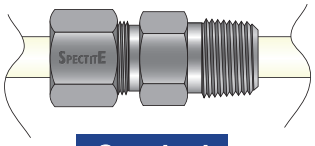
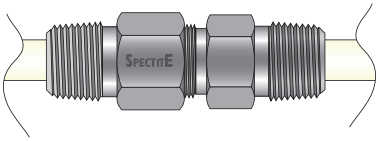


Fitting with Weld Neck and Threaded Cap



Please note: The overall length will vary slightly depending on the sealant used and the tube size.

Section 4 - Series EF Cap Configuration

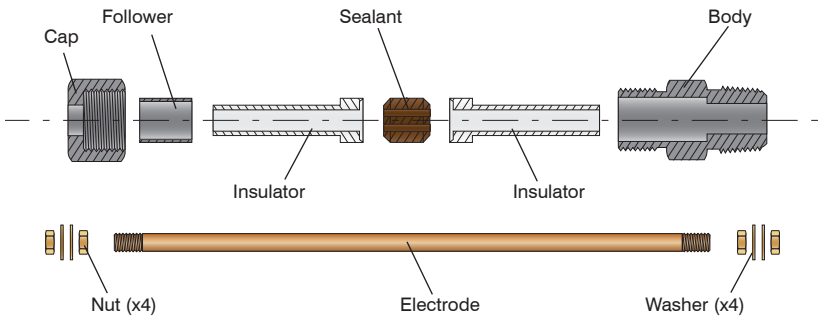
Style A	Description	Style B	Description
 Standard	Standard Fitting with single thread for direct mounting into process.		Standard Fitting with a Style B threaded extension for conduit/terminal head or enclosure connection. The thread form is the same as the process thread unless otherwise specified. *If a different thread form is required, please specify after the 'B' in the order code, for example:* *EF3 – 1/2˝ BSPT – CU – T–* ***B NPT*** *If a B cap is used with a weld neck fitting, then the thread form must be specificied.*

Series EF Torque Settings - Max. values in Nm

Process Connection Size	Sealants	
	T	V
Size 2 (1/4")	40	45
Size 3 (1/2")	60	65
Size 4 (3/4")	75	100

T = PTFE, V = Viton®
To convert: ft/lb = Nm x 0.738; Kg/cm = Nm x 10.2.

Series EF Schematic



Typical components shown for an EF Series fitting.

Series EF - Order Code Examples

Feedthrough Series	Feedthrough Size (see Section 3)		Process Connection (see Section 3)		Electrode (CU, 316 or NI)		Sealant (see Section1)		Cap Configuration (see Section 4)		Flange Details (only available with a weld neck)
EF	2	–	1/4˝ BSPT	–	CU	–	V	–	A	–	EX
EF	2	–	1/4˝ BSPT	–	316	–	T	–	B	–	EX
EF	2	–	M12 x 1.5	–	CU	–	V	–	B	–	EX
EF	4	–	WELD	–	316	–	T	–	B	–	EX

Accessories

RS - Replacement Sealants
For use with PF, MF, PSF, MSF, MSFD, WF, EF, BSF and ASF feedthroughs

Code	Description	Order Code Example	Note
RS	To specify a replacement sealant, please prefix the original order code of the feedthrough assembly for which the part is required by: RS.	RS-PF2-6.0-V RS-MF3-3.0-4-T	Blank (undrilled) sealants are also available. 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.

RP - Set of Replacement Internal Components
For use with PF, MF, PSF, MSF, MSFD, WF, BSF and ASF feedthroughs

Code	Description	Feedthrough Series	Internal Component List	Order Code Examples
RP	To specify a complete set of replacement parts, please prefix the original order code of the feedthrough assembly for which the part is required by: **RP** for a set of internal components.	PF	Follower and sealant	RP-PF2-6.0-V
		MF	Follower, sealant and seat	RP-MF3-3.0-4-T
		WF	Follower, Seat, 2x insulators and sealant	RP-WFP2-1.0-8-L

RI / RE - Replacement Insulators and Electrodes
For use with EF, EFT and EFP feedthroughs

Code	Description	Feedthrough Series	Internal Component List	Order Code Examples
RI	To specify replacement insulators or electrodes, please prefix the original order code of the feedthrough assembly for which the part is required by: **RI** for a pair of insulators	EF	Pair of ceramic insulators	RI-EF2
RE	**RE** for a replacement electrode (with nuts and washers) available in either copper, stainless steel or nickel - see part code examples	EF	Copper (CU), stainless steel (316) or nickel (NI) electrode with nuts and washers	RE-EF2-CU

TA - Thread Seal Tape

Code	Description	Order Code	Material	Tape Thickness	Reel Length	Temperature Range
TA	Use of mounting thread seal tapes assists the efficiency of tapered threads in to the process.	TA-PTFE20	PTFE	0.2mm	10 metres	-185˚C to +250˚C
		TA-PTFE30	PTFE	0.3mm	10 metres	-185˚C to +250˚C
		TA-PTFE50	PTFE	0.5mm	10 metres	-185˚C to +250˚C
		TA-GRA20	Graftite™	0.2mm	10 metres	-200˚C to +500˚C
		TA-GRA30	Graftite™	0.3mm	10 metres	-200˚C to +500˚C
		TA-GRA50	Graftite™	0.5mm	10 metres	-200˚C to +500˚C

TL - Thread Lubricant

Code	Description	Order Code
TL	Applied to feedthrough bodies, followers and caps when a feedthrough is opened so that elements or sealants can be replaced or elements adjusted. Speclube Lubricant is available in handy 10ml bottles with applicator brushes. Order as Speclube Thread Lubricant.	TL-10

Notes

General Specifications

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.

Spectite® sealed feedthrough assemblies from TC Ltd. have been designed to be easy to install and can be maintained. 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.

Guide Pressure Values

The pressure and temperature ratings and typical leak rates quoted are given for guidance only. Pressure values vary with temperature and sealant used. With an increase in temperature, a reduction in the maximum guide pressure value can be expected. Contact TC Ltd. for further details. The BSPT and NPT mounting thread guide pressure value is the same or is higher than the feedthrough guide pressure value.

Spectite® feedthroughs from TC Ltd. 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 50% of the feedthrough guide pressure value at 20°C. (Not applicable to series EF feedthroughs with integral electrodes). Consult TC Ltd. for further guidance on guide pressure values.

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

Leak rates

A typical leak rate for Spectite® feedthrough assemblies with Graftite, Neoprene, PTFE and Viton sealants is better than or equal to 1 x 10^{-6} scc/sec. under 1 Atm. He @ 20°C. (1 Atm. = 9.87 x 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 series PF & PSF for single elements) and the sealant material.

An example of a typical order code for a feedthrough for multiple sensors (8 x 1.5mm dia. probes):

MF3 - 1/2" BSPT - 1.5mm - 8 - T - B

If a feedthrough is required with a cap with a threaded conduit extension, the word Cap and the threadform required is added to the end of the order code, as shown in shadow in the example above.

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 TC Ltd.

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 minimises 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. Speclube Lubricant is available from TC Ltd. in handy 10ml bottles with applicator brushes. Order as **Speclube Thread Lubricant**.

Process connections

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

Feedthroughs with parallel threaded process connections, BSPP (parallel gas thread or 'G' thread) to BS2779, DIN ISO 228/1 & JIS B0202; 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.

Caps

Plain, hexagonal caps are available for all sizes of feedthrough. Additionally, caps with a threaded extension for a conduit connection are also available. Specifiers may choose **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: (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; (USA) AISI 316L; (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 303 stainless steel (W.-Nr. 1.4305 / UNS S30300)

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 Al_2O_3).

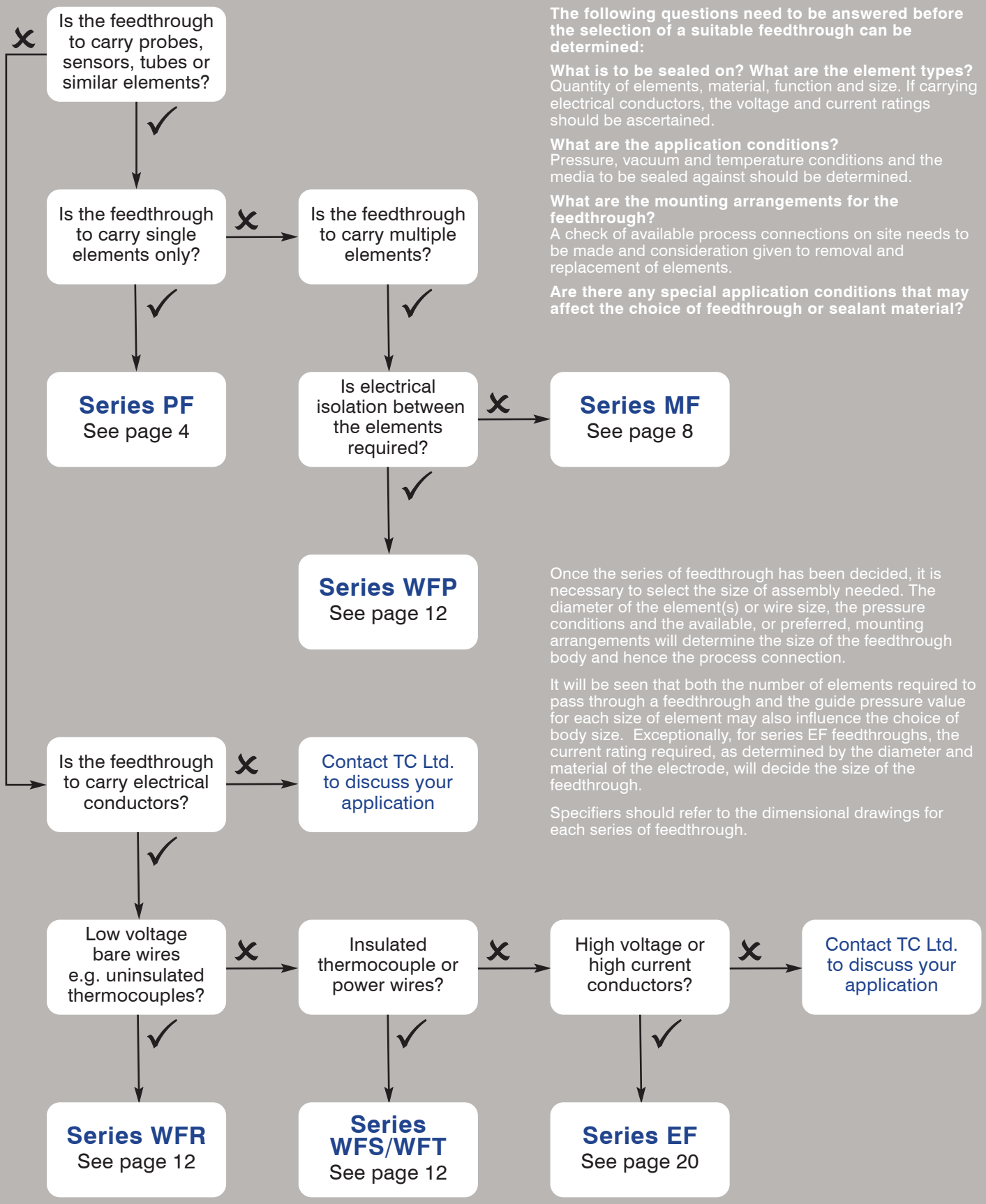
External, single-bore insulators in series WF feedthroughs are manufactured in aluminous porcelain. Internal insulators are manufactured in a high-performance, engineering plastic for use at temperatures up to +230°C or machineable glass ceramic for use up to +870°C.

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

Selection Guide

to choosing the correct feedthrough for your application



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 the 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 guide pressure value 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 the feedthrough.

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

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