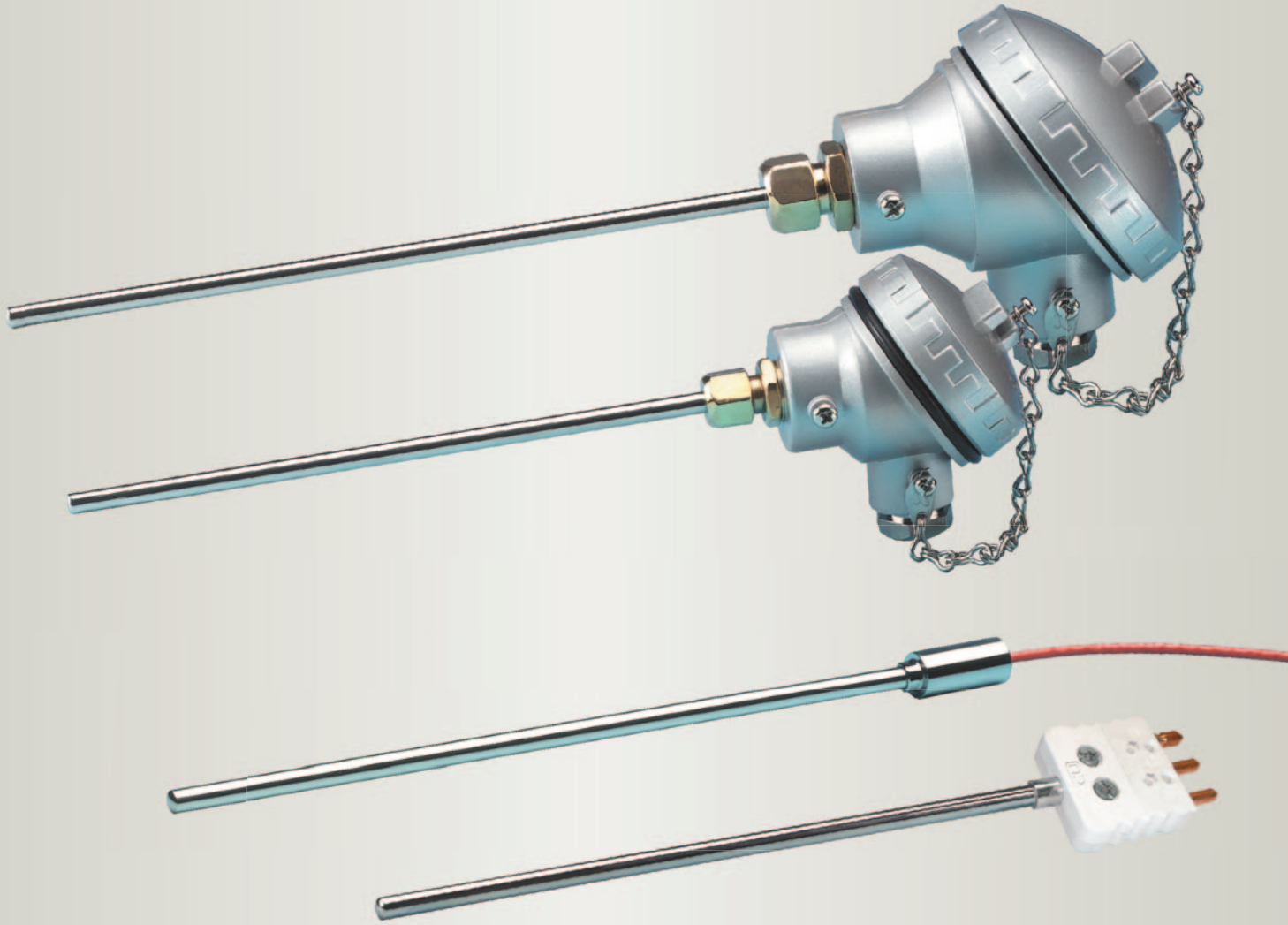
Mineral Insulated Resistance Thermometers - Type 17 & 18



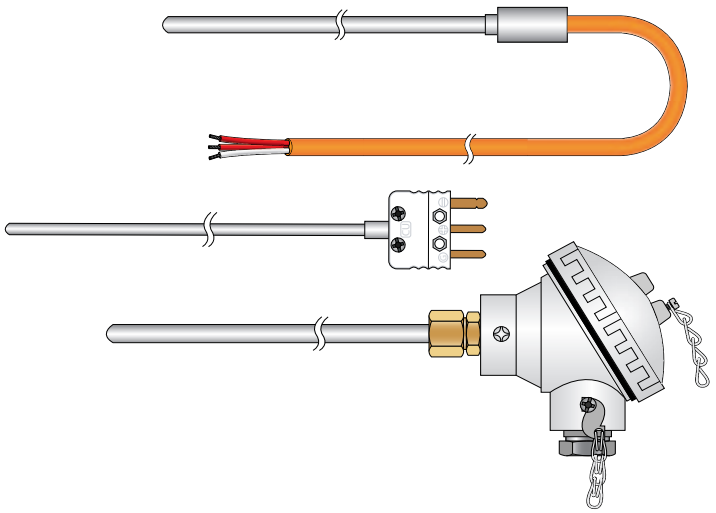
A range of semi flexible mineral insulated resistance thermometers, suited to a wide variety of industrial applications up to 930°F (Type 17) or 1110°F (Type 18).

Custom built to your specification and terminated in a large choice of end seal terminations and temperature ratings.

TC Inc for Temperature Sensing, Measurement and Control

Type 17 &18 Mineral Insulated Resistance Thermometers

- **Two styles of sensor are available; Type 17's, our most popular style, are economical, semi flexible and suited to a wide range of industrial applications up to 930°F. Type 18's are best suited for applications up to 1110°F or where a high accuracy element is incorporated**
- **Custom built to your specification and terminated in a wide choice of end seal terminations and temperature ratings**
- **High accuracy, repeatability and reproducibility as simplex, duplex or triplex element assemblies**
- **Sheaths can generally be bent, twisted and flattened to suit particular installations without impairing performance**
- **Operating temperature range of -148°F to +1110°F, depending on model**
- **Available in 2, 3 and 4 wire configurations, in grade B, A, 1/3, 1/5 or 1/10 tolerances**
- **316L Stainless Steel sheathed and manufactured to IEC 60751**
- **NIST* traceable calibration is available for our range of Mineral Insulated Resistance Thermometer assemblies (our equipment and standards are traceable to NIST via the Mutual Recognition Arrangement)**



*traceable to the SI (International System of Units) via a signatory of the CIPM Mutual Recognition Arrangement

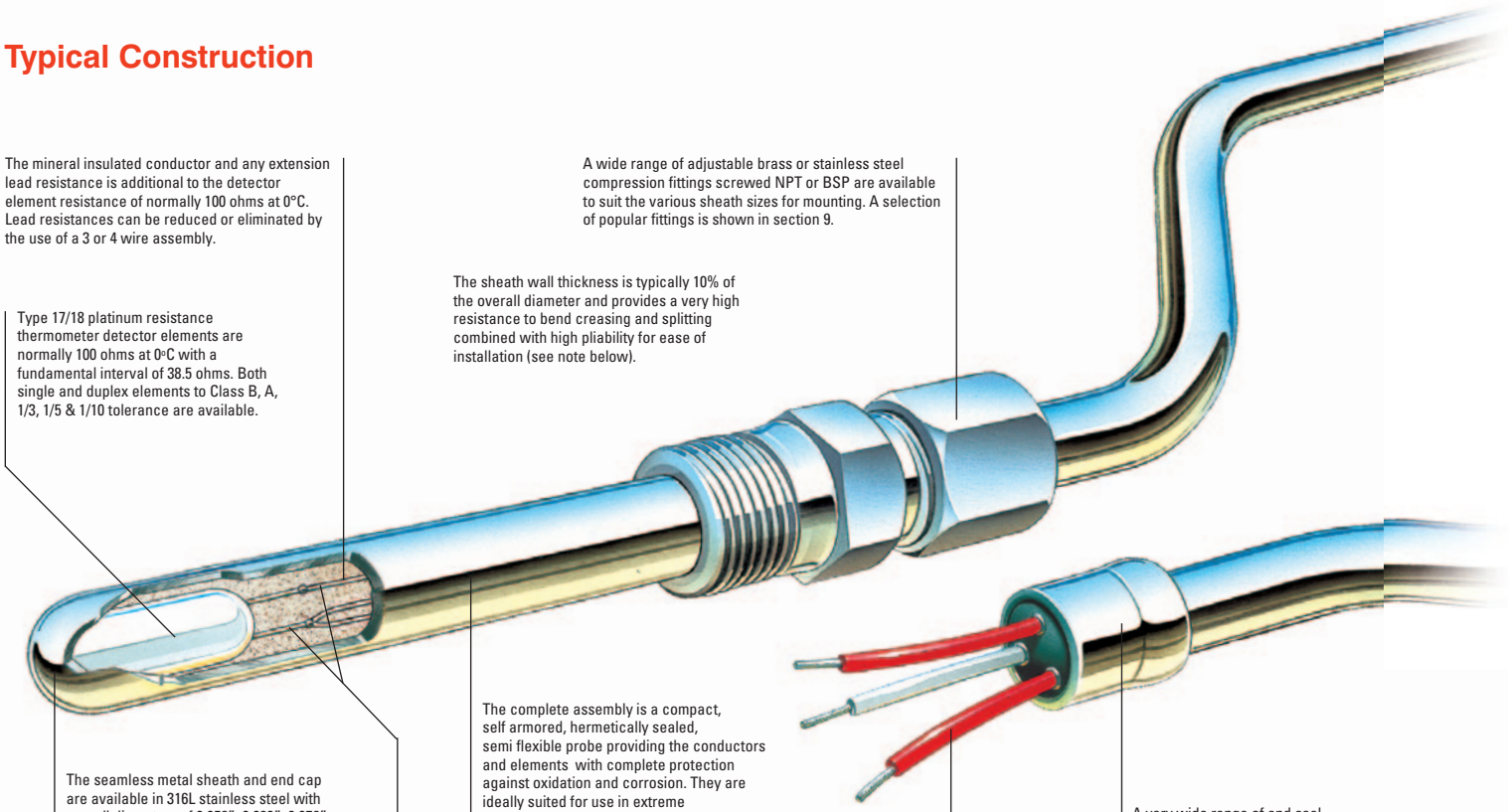
Typical Construction

The mineral insulated conductor and any extension lead resistance is additional to the detector element resistance of normally 100 ohms at 0°C. Lead resistances can be reduced or eliminated by the use of a 3 or 4 wire assembly.

Type 17/18 platinum resistance thermometer detector elements are normally 100 ohms at 0°C with a fundamental interval of 38.5 ohms. Both single and duplex elements to Class B, A, 1/3, 1/5 & 1/10 tolerance are available.

A wide range of adjustable brass or stainless steel compression fittings screwed NPT or BSP are available to suit the various sheath sizes for mounting. A selection of popular fittings is shown in section 9.

The sheath wall thickness is typically 10% of the overall diameter and provides a very high resistance to bend creasing and splitting combined with high pliability for ease of installation (see note below).



The seamless metal sheath and end cap are available in 316L stainless steel with overall diameters of 0.059", 0.062", 0.079", 0.118", 0.125", 0.177", 0.188", 0.236", 0.250" or 0.315". Sheaths can also be bonded with a range of fluoroplastic claddings to suit particular corrosive environments.

The complete assembly is a compact, self armored, hermetically sealed, semi flexible probe providing the conductors and elements with complete protection against oxidation and corrosion. They are ideally suited for use in extreme environmental conditions of high vibration, high pressure/vacuum and over a wide operational temperature range of -148°F to +1110°F.

A very wide range of end seal terminations are available within which the hermetic seal is effected.

The conductors and element are insulated by very tightly compacted magnesium oxide powder. The insulation resistance between the sheath and conductors is in excess of 100 MΩ.

If required, extension leads with PVC, PFA or fibreglass insulation are available, along with armored or metal braided wires. Other insulation materials are also available. Please see section 8 or contact us for further information.

NB. The sheaths of these assemblies have a nominal bending radius of 12 times the sheath diameter. This can be reduced to 4 times the sheath diameter given the careful use of a mandrel and bending in one set. The sheath should not be bent or worked within 50mm of the tip of assembly.

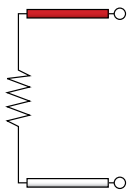
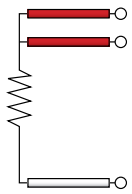
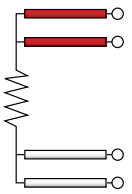
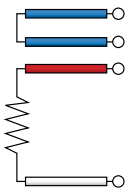
Quality Control All materials and assemblies are subject to rigorous quality checks during manufacture through to final test and inspection procedures. Our lab is also equipped to perform additional checks such as Radiography, UKAS Calibration and more.

Mineral Insulated Resistance Thermometers Type 17 &18

SECTION 1	Sensor Style	
	Description	Temperature Range
17	**Type 17** Semi flexible, mineral insulated. Reliable and economical, general purpose, class A and B elements only. **Our most popular style.**	-148 to +930°F
18	**Type 18** Semi flexible, mineral insulated. Good for high accuracy and/or high temperature applications.	-148 to +1110°F

SECTION 2	R_0 value
R_{100}	100Ω@0°C (0.003851°C^{-1})
R_{1000}	1000Ω@0°C (0.03851°C^{-1})

SECTION 3	Sheath Diameter (mm)	Sheath Diameter (inches)
Standard Sizes	1.5mm	0.059″
	2.0mm	0.079″
	3.0mm	0.118″
	3.2mm	0.125″
	4.5mm	0.177″
	4.8mm	0.188″
	6.0mm	0.250″
	6.4mm	0.251″
	8.0mm	0.315″

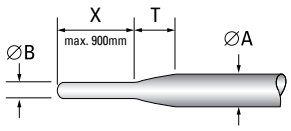
SECTION 4	Wiring Configuration			
Code	2	3	4	4BL
Schematic				
	2 wire	3 wire	4 wire	4 wire Blind Loop

SECTION 5	Assembly Selector Table						
	Configuration	Sheath Diameter available for each Configuration					
Elements	(No. of wires)	0.062″	delete	0.125″	0.188″	0.250″	0.313″
1	2 wire	✔	✔	✔	✔	✔	✔
	3 wire	✔	✔	✔	✔	✔	✔
	4 wire	✔	✔	✔	✔	✔	✔
2	2 wire			✔	✔	✔	✔
	3 wire			✔	✔	✔	✔
	4 wire					✔	✔
3	2 wire					**17 only**	**17 only**
	3 wire						
	4 wire						

SECTION 6	Tolerance of Element (IEC 60751 for Pt100)	
	Accuracy at 0°C	Accuracy at 100°C
B	±0.30°C	±0.80°C
A	±0.15°C	±0.35°C
1/3	±0.10°C	±0.27°C
1/5	±0.06°C	±0.16°C
1/10	±0.03°C	±0.08°C

Specifications and General Information	
Detector Elements	Mineral insulated platinum resistance thermometers embody, as standard, detector elements with a resistance of 100 ohms at 0°C with a fundamental interval 38.5 ohms to IEC 60751 class B (BS EN 60751 Class B). Alternative element resistance and tolerances are available (see sections 2 and 6). Single, duplex and triplex element assemblies are available.
Sheath Materials	Standard sheaths with welded closed ends are of 316L stainless steel seamless tube. 316L stainless steel is an 18/8 chromium nickel stainless steel modified by the addition of molybdenum which serves to increase its general corrosion resistance and mechanical strength. Assemblies with sheaths in other materials can be supplied upon request. Standard sheath diameters available are 0.059″, 0.079″, 0.118″, 0.125″, 0.177″, 0.188″, 0.236″, 0.250″ and 0.315″.
Operating Temperatures	Standard Type 18 assemblies have an operating temperature range for the tip and stem of -148°F to + 1110°F (Type 17's are -148°F to +930°F). End seals are not normally exposed to the tip and stem environment, and as standard are rated to those maximum temperatures listed in section 7. Assemblies with a wider tip and other end seal operating temperature ranges are available (for details of these please contact us).
Immersion Depth	Minimum recommended immersion length is 2.5″.
Response Times	Response times are governed by and vary with the environmental conditions of particular applications. Please contact us for further information.
Measurement Current	Recommended measurement current is typically 1mA.
Insulation Resistance	Between the leads and sheath at 100V DC >100 MΩ at ambient temperature.
Standards	The manufacture of Type 17/18 platinum resistance thermometer assemblies is generally to IEC 60751 (BS EN 60751).
Bending Radius	Normal minimum bending radius is 12 times the sheath diameter. This can be reduced to 4 times given the careful use of a mandrel and bending in one set. Do not bend within 2″ from the sensor tip.

Swaged Reduced Tip



Swaged end reduced tip temperature sensors provide a unique fast response, high strength, low displacement, homogenous solution to many problematical temperature measurement applications. The technique combines the advantages of having a rugged large diameter metal sheath over most of its length with a low thermal mass, faster response, reduced diameter tip.

The length of the reduced tip (X) can be any length up to 35″ and virtually any diameter between 0.062″ and 0.205″ with the most popular sizes are shown in the table. Please contact us for other sizes.

	Approximate Transition Lengths ('T' mm) for given ∅ 'A' mm						
∅B	0.250″	0.188″	0.125″	delete	0.062″	0.040″	0.020″
0.250″	–	–	–	–	–	–	–
0.188″	0.236″	–	–	–	–	–	–
0.125″	0.472″	0.236″	–	–	–	–	–
delete	0.630″	0.394″	0.157″	–	–	–	–
0.062″	0.709″	0.472″	0.236″	0.079″	–	–	–

Type 17 &18 Mineral Insulated Resistance Thermometers

SECTION 7

Types of End Seal Configuration

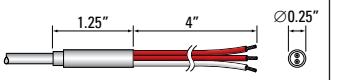
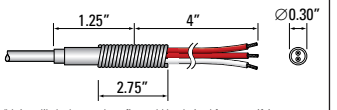
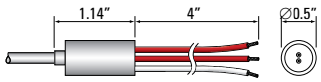
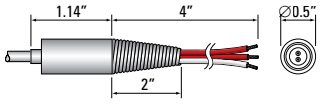
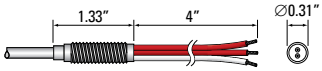
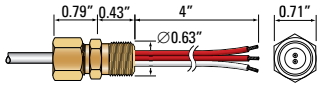
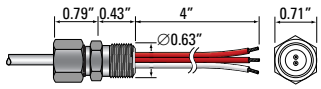
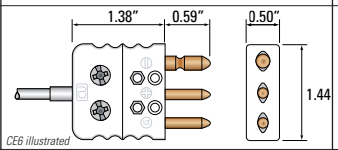
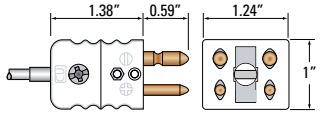
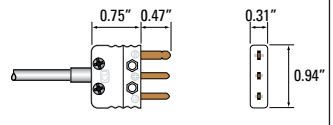
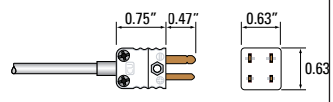
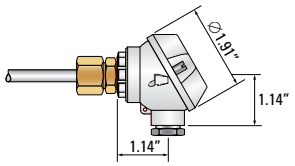
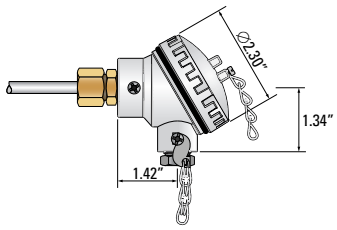
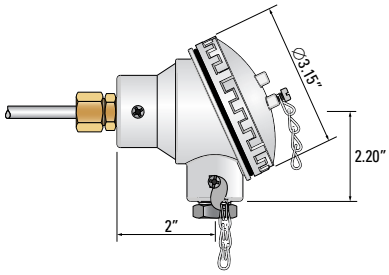
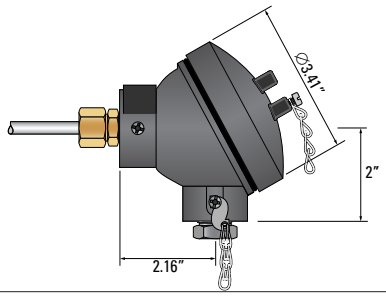
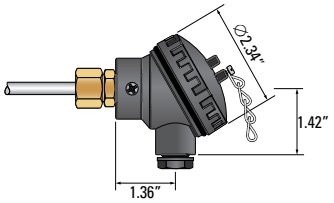
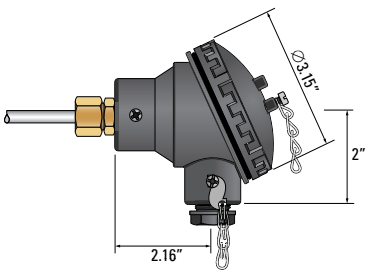
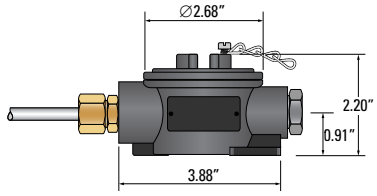
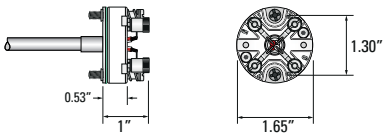
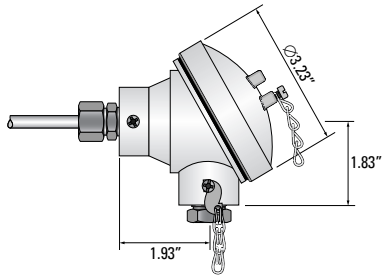
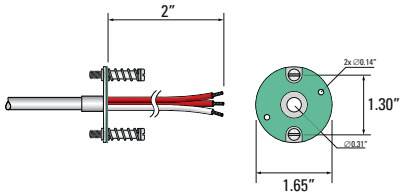
	Diagram	Specification
CE1		**Temporary Internal Seal with Bare Conductors** for all sheath diameters CE1 Maximum end seal temperature **275**°F *Note: Only suitable as a temporary seal for applications adding an alternative seal later.*
CE2L		**Crimp on Stainless Steel Pot Seal** for sheath diameters up to 0.125″ CE2L Pot Seal rated to **275**°F CE2LA Pot Seal rated to **455**°F *see section 8 if extension leads are required*
CE2 CTRL	 ** It is unlikely that any benefit would be derived from specifying this type of pot seal with the standard 4″ tails.*	**Stainless Steel Pot Seal with Anti Chafe Spring** for sheath diameters up to 0.125″ CE2CTRL Pot Seal rated to **275**°F CE2CTRLA Pot Seal rated to **455**°F *see section 8 if extension leads are required*
CE4CL		**Crimp on Stainless Steel Pot Seal** for sheath diameters between 0.125″ & 0.313″ CE4CL Pot Seal rated to **275**°F CE4CLA Pot Seal rated to **455**°F *see section 8 if extension leads are required*
CE4 CTRL	 ** It is unlikely that any benefit would be derived from specifying this type of pot seal with the standard 4″ tails.*	**Stainless Steel Pot Seal with Anti Chafe Spring** for sheath diameters between 0.125″ & 0.313″ CE4CTRL Pot Seal rated to **275**°F CE4CTRLA Pot Seal rated to **455**°F *see section 8 if extension leads are required*
CE3L	 *Lock nuts are available in stainless steel to suit the CE3L series and should be ordered separately as LN08S.*	**8mm ISO x 1mm Threaded Stainless Steel Pot Seal** for sheath diameters up to 0.118″ CE3L Pot Seal rated to **275**°F CE3LA Pot Seal rated to **455**°F *see section 8 if extension leads are required*
CE5		**16mm ISO x 1.5mm Brass Compression Gland Pot Seal** for sheath diameters up to 0.313″ CE5 Pot Seal rated to **275**°F CE5A Pot Seal rated to **455**°F *see section 8 if extension leads are required*
CE5S		**16mm ISO x 1.5mm St./St. Compression Gland Pot Seal** for sheath diameters up to 0.313″ CE5S Pot Seal rated to **275**°F CE5SA Pot Seal rated to **455**°F *see section 8 if extension leads are required*
CE6	 *CE6 illustrated*	**Standard 3-pin (round pin) Plug** for sheath diameters between 0.062″ & 0.315″ CE6 Plug rated to **430**°F CE6H Plug rated to **570**°F
CE8		**Standard 4-pin (round pin) Plug** for sheath diameters between 0.062″ & 0.315″ CE8 Plug rated to **430**°F
CE7	 *CE7 illustrated*	**Miniature 3-pin (flat pin) Plug** for sheath diameters between 0.062″ & 0.125″ CE7 Plug rated to **430**°F CE7H Socket rated to **570**°F
CE9		**Miniature 4-pin (flat pin) Plug** for sheath diameters between 0.062″ & 0.125″ CE9 Plug rated to **430**°F

	Diagram	Specification
MAA		**Micro Die Cast Alloy Head** for diameters 0.118″ to 0.250″ Weatherproof die cast alloy, epoxy coated, screw down terminal head with tube entry and cable entry at a right angle to each other, with a ceramic terminal block. Suitable for simplex and duplex assemblies. Supplied with a metal pinch gland on the wire entry for wires from 0.157″ to 0.374″ diameter. Wire entry thread is M16x1.5mm, process entry thread is M10x1.0mm.
CE10/ 12NPT		**Miniature Die Cast Alloy Head** for diameters 0.118″ to 0.315″ Weatherproof die cast alloy, epoxy coated, screw top terminal head with the tube entry and cable entry at a right angle to each other, with a ceramic terminal block. Suitable for simplex and duplex assemblies. Supplied with a metal pinch gland on the cable entry for wires from 0.118″ to 0.315″ diameter. cable entry thread is M16x1.5mm, process entry thread is 1/2″ NPT.
CE11/ 12NPT		**Standard Die Cast Alloy Head** for diameters 0.177″ to 0.315″ Weatherproof die cast alloy, epoxy coated, screw top terminal head with the tube entry and cable entry at a right angle to each other, with a ceramic terminal block. Suitable for simplex, duplex and triplex assemblies. Supplied with a metal pinch gland on cable entry for wires from 0.236″ to 0.551″ diameter. cable entry thread is M20x1.5mm, process entry thread is 1/2″ NPT.
CE12		**Heavy Duty Cast Iron Head** for diameters 0.177″ to 0.315″ Weatherproof cast iron, screw top terminal head with the tube entry and cable entry at a right angle to each other, with ceramic terminal block. Suitable for simplex, duplex and triplex assemblies. Supplied with a metal pinch gland on cable entry for wires from 0.236″ to 0.551″ diameter. cable entry thread is M20x1.5mm, process entry thread is 1/2″ BSP.
CE16		**Miniature Plastic Head** for diameters 0.118″ to 0.315″ Weatherproof plastic, screw top terminal head with the tube entry and cable entry at a right angle to each other, with a plastic terminal block. Suitable for simplex and duplex assemblies. Supplied with a plastic pinch gland on cable entry for wires from 0.118″ to 0.315″ diameter. cable entry thread is M16x1.5mm, process entry thread is 3/8″ BSP.
CE17		**Standard Plastic Head** for diameters 0.177″ to 0.315″ Weatherproof plastic, screw top terminal head with the tube entry and cable entry at a right angle to each other, with a plastic terminal block. Suitable for simplex, duplex and triplex assemblies. Supplied complete with a plastic pinch gland on the cable entry for wires from 0.236″ to 0.551″ diameter. cable entry thread is 1/2″ BSP, process entry thread is 1/2″ BSP.

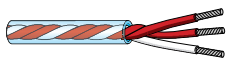
continued

Mineral Insulated Resistance Thermometers Type 17 &18

SECTION 7 — Types of End Seal Configuration (continued)

	Diagram	Specification		Diagram	Specification
CE18		**Alloy Straight Through Head** for diameters 0.177″ to 0.50″ Die cast alloy straight through terminal head with a bakelite terminal block. Suitable for simplex or duplex assemblies. Supplied with a metal pinch gland on the wire entry for wires from 0.236″ to 0.551″ diameter. Wire entry thread is M20x1.5mm, process entry thread is 1/2″ BSP. **If supported at fixing holes, suitable for diameters of 0.039″ and above.*	**CE20**		**Spring Loaded Terminal Block** for diameters 0.118″ to 0.315″ Spring loaded insert assemblies. The end seal is incorporated into a terminal block suitable for mounting into a CE11, CE12, CE17 or any other standard terminal head. Suitable for use with 0.118″, 0.125″, 0.177″, 0.188″, 0.236. 0.250″ and 0.315″ sheaths only. The ceramic terminal block has 2 x 1.3″ spaced mounting holes. Suitable for simplex, duplex and triplex assemblies.
CE19		**Stainless Steel Head** for diameters 0.177″ to 0.50″ Weatherproof stainless steel, screw top terminal head with the tube entry and cable entry at a right angle to each other, with a ceramic terminal block. Suitable for simplex, duplex and triplex assemblies. Supplied with a metal pinch gland on wire entry for wires from 0.236″ to 0.551″ diameter. Wire entry thread is M20x1.5mm, process entry thread is 1/2″ BSP.	**CE20/ BP**		**DIN Mounting Plate** for diameters 0.118″ to 0.315″ Spring loaded mounting plate assemblies. The end seal is incorporated into a mounting plate suitable for mounting into a CE11, CE12, CE17 or any other standard terminal head. Suitable for use with 0.118″, 0.125″, 0.177″, 0.188″, 0.236. 0.250″ and 0.315″ sheaths only. 4″ tails allows for connection to a head mounting transmitter or other suitable terminal block.

SECTION 8 — Extension Wires

	Code	Diagram	Specification		Code	Diagram	Specification
RP	**RP27** - 2 core **RP37** - 3 core **RP47** - 4 core **RP67** - 6 core **RP87** - 8 core		**HR PVC Insulated with Screen (220°F)** Cores of 24 AWG stranded (7x32 AWG) copper conductors. Cores HR PVC insulated. Cores bunched together. Tinned copper wire braid screen. HR PVC sheathed overall.	**TEF**	**TEF7** - 1 core		**PFA 'Single' (480°F))** One core of 24 AWG stranded (7x32 AWG) copper single conductor PFA insulated. Red / White.
RT	**RT27** - 2 core **RT37** - 3 core **RT47** - 4 core **RT67** - 6 core **RT87** - 8 core		**PFA Insulated with Screen (480°F)** Cores of 24 AWG stranded (7x32 AWG) copper conductors. Cores PFA insulated. Cores bunched together. Nickel plated copper wire braid screen. PFA sheathed overall.	**RS**	**RS37** - 3 core **RS47** - 4 core **RS67** - 6 core **RS87** - 8 core		**PFA / Silicone Rubber (480°F))** Cores of 24 AWG stranded (7x32 AWG) copper conductors. Cores PFA insulated. Cores bunched together. Silicone Rubber sheathed overall.
RT	**RT38** - 3 core **RT48** - 4 core		**PFA Insulated (480°F))** Cores of 24 AWG stranded (7x32 AWG, RT38) or 36 AWG stranded (7x34 AWG, RT48) copper conductors. Cores thin PFA insulated and bunched together. Thin PFA sheathed overall.	**RF**	**RF37** - 3 core **RF47** - 4 core **RF67** - 6 core		**Fibreglass Insulated with Steel Braid (900°F)** Cores of 724 AWG stranded (7x32 AWG) copper conductors. Cores double glass lapped, glass fibre braided and silicone varnished. Cores bunched together, glass fibre braided overall and impregnated with silicone varnish. Stainless Steel braid overall.

If no wire is required, leave this section of the order code blank and the sensor will be supplied with PFA tails. Other wires are available on request.

'HR' = Heat Resistant

SECTION 9 — Optional Stainless Steel Compression Fittings

Dia.	1/8″ BSPT	1/4″ BSPT	1/2″ BSPT	Dia.	1/8″ BSPT	1/4″ BSPT	1/2″ BSPT
0.062″	SFS18N16	SFS14N16	SFS12N16	**0.188″**	SFS18N47	SFS14N47	SFS12T47
0.079″	SFS18N20	SFS14N20	SFS12N20	**0.250″**	SFS18N64	SFS14N64	SFS12T64
0.125″	SFS18N32	SFS14N32	SFS12N32	**0.313″**	–	SFS14N80	SFS12T80

Other sizes and materials are available, please contact us for details.

SECTION 10 — Optional 4 to 20mA Head Mounted Transmitter (please specify range in °F)

TXL PRT

Fully Linearized

Suitable for use with the following terminal heads: **3P11, 3P12, 3P17, 3P18** and **3P19** and other standard heads with 1.3″ fixing.

Typical Order Code: **TXLPRT (0/300°F)**

Order Code - Example

Style No.	No. of Elements (see section 4 and 5)	Sheath Diameter (see section 3)	No. of Wires (see section 4 and 5)	Sheath Length (in inches)	End Seal Termination (see section 7)	Resistance Value of Element (see section 2)	Grade of Element (see section 6)	Extension Wire (see section 8)	Reduced Tip Dimensions (if required)	Optional Compression Fitting (see section 9)	Optional Transmitter (see section 10)
17	**1**	**0.250″**	**3**	**6″**	**CE4CL**	**R100**	**B**	**2 FT RP37**	REDUCED TIP: 0.118″ x 2″ LONG	**SFS12T64**	

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