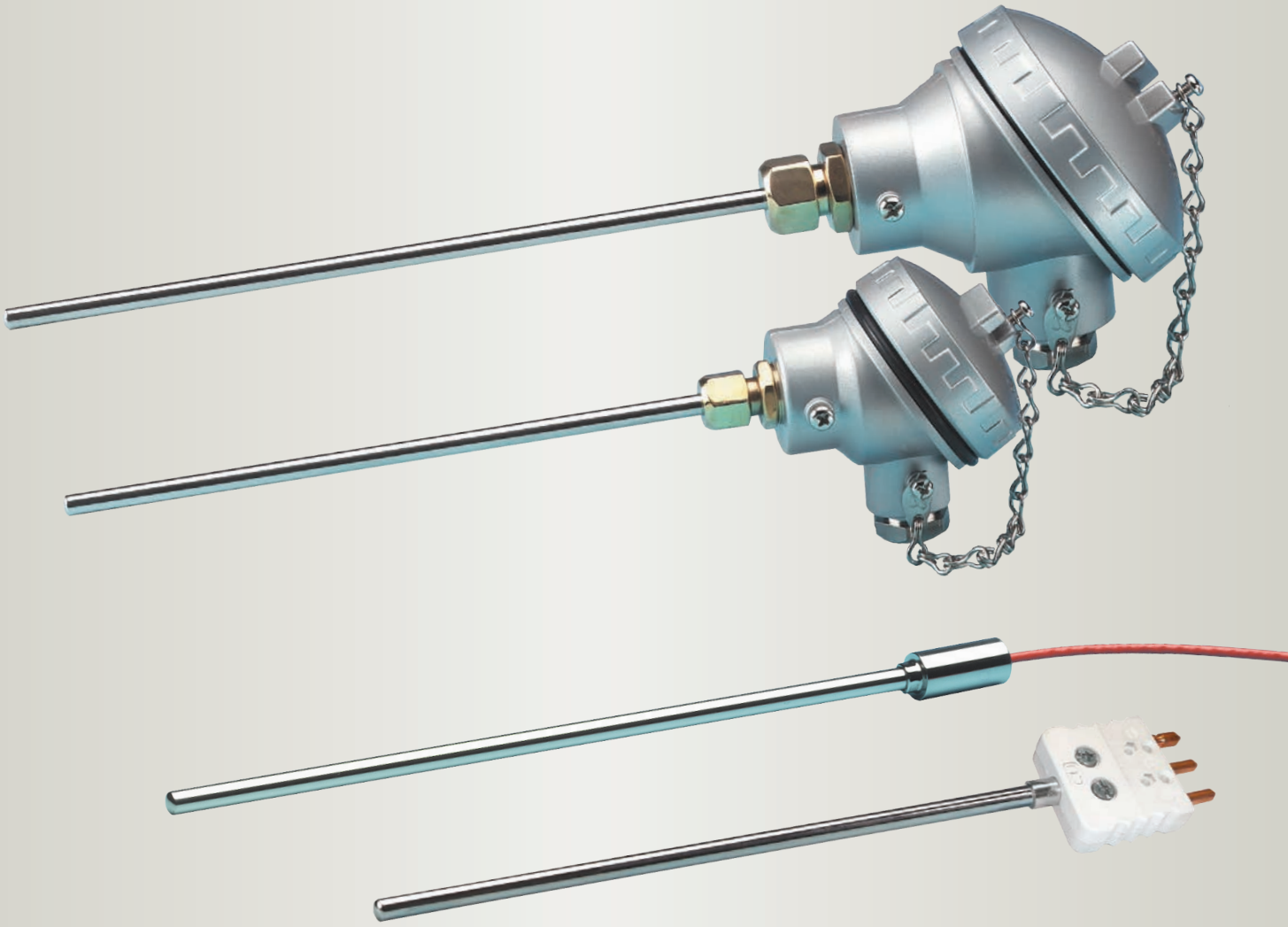
Mineral Insulated Resistance Thermometers - Type 17 & 18



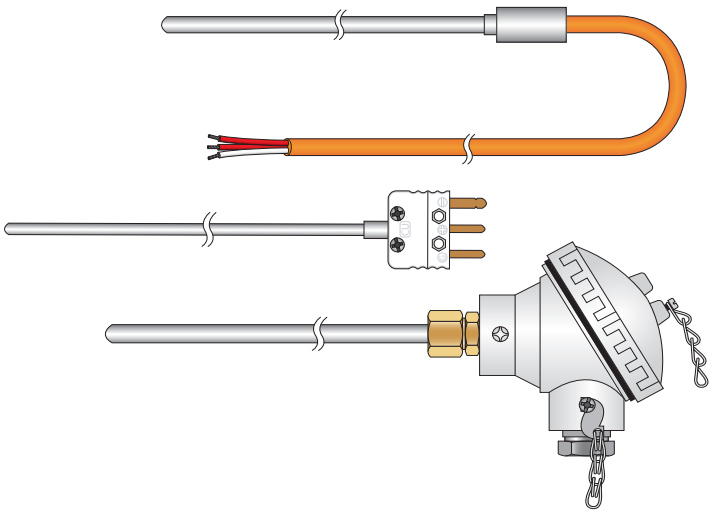
A range of semi flexible mineral insulated resistance thermometers, suited to a wide variety of industrial applications up to 500°C (Type 17) or 600°C (Type 18).

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

TC Measurement & Control AB

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 500°C. Type 18's are best suited for applications up to 600°C 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 -100°C to +600°C, 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**
- **UKAS calibration is available for our range of Mineral Insulated Resistance Thermometer assemblies**



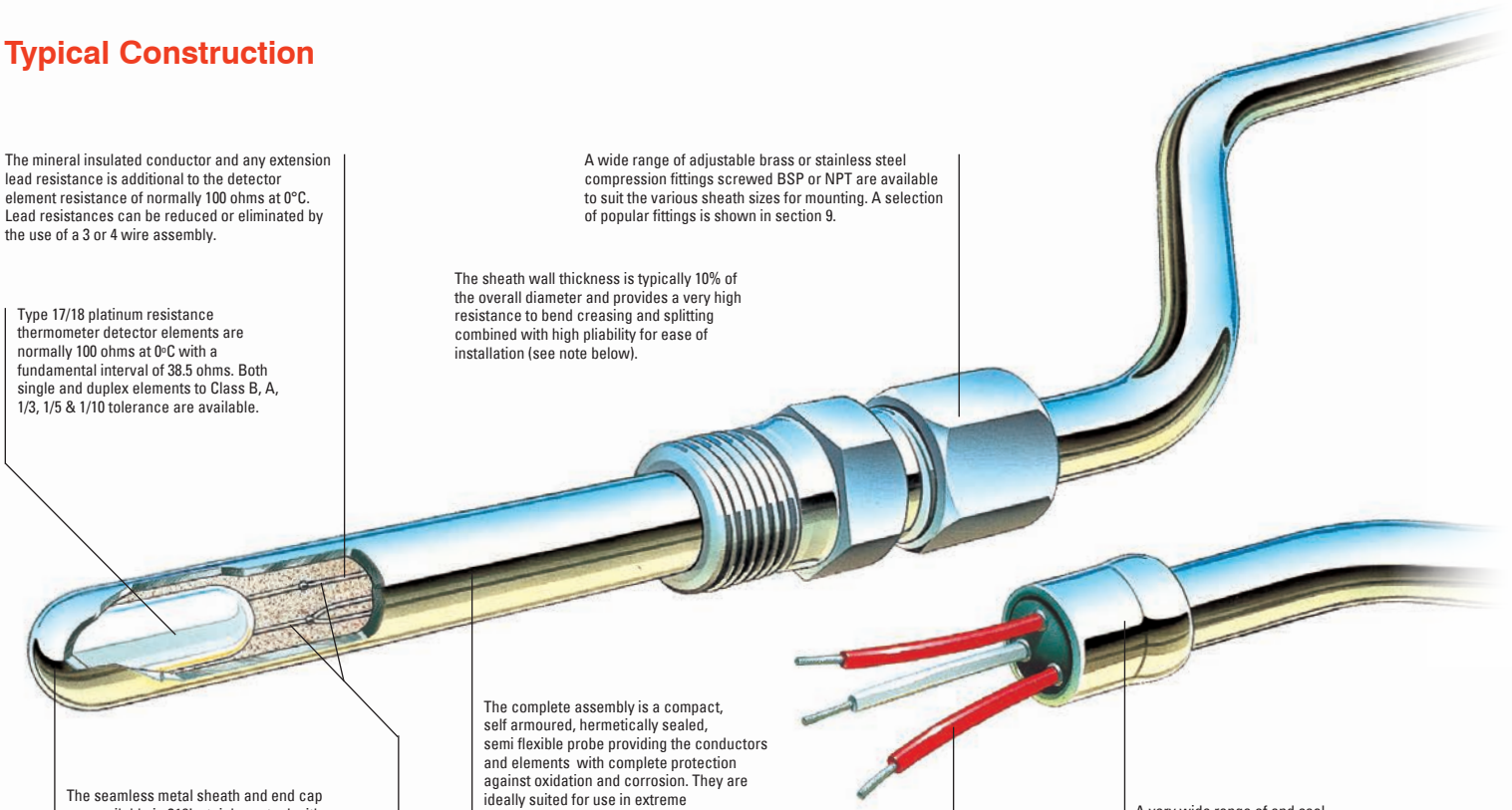
Typical Construction

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 BSP or NPT 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 1.5, 2.0, 3.0, 4.5, 6.0 or 8.0mm. Sheaths can also be bonded with a range of fluoroplastic claddings to suit particular corrosive environments.

The complete assembly is a compact, self armoured, 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 -100°C to +600°C.

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 armoured or metal braided cables. 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.

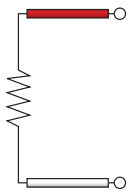
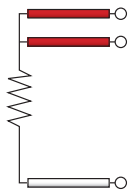
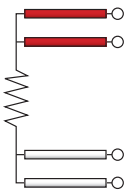
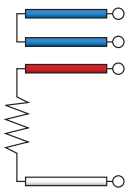
Quality Control All materials and assemblies are subject to rigorous quality checks during manufacture through to final test and inspection procedures. TC Ltd are also equipped to perform additional checks such as Radiography, UKAS Calibration and more.

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.**	-100 to +500°C
18	**Type 18** Semi flexible, mineral insulated. Good for high accuracy and/or high temperature applications.	-100 to +600°C

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	0.126"
	4.5mm	0.177"
	4.8mm	0.189"
	6.0mm	0.236"
	6.4mm	0.251"
	8.0mm	0.315"

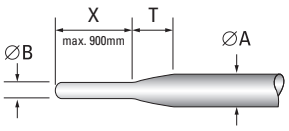
SECTION 4	Wiring Configuration			
Code	2	3	4	4BL
Schematic				
	2 wire	3 wire	4 wire	4 wire Blind Loop

SECTION 5	Assembly Selector Table						
	Configuration	Sheath Diameter available for each Configuration					
Elements	(No. of wires)	1.5mm	2.0mm	3.0mm	4.5mm	6.0mm	8.0mm
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 1.5mm, 2.0mm, 3.0mm, 4.5mm, 6.0mm and 8.0mm.
Operating Temperatures	Standard Type 18 assemblies have an operating temperature range for the tip and stem of -100°C to + 600°C (Type 17's are -100°C to +500°C). 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 60mm.
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 50mm 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 900mm and virtually any diameter between 3.0mm and 5.2mm with the most popular sizes are shown in the table. Please contact us for other sizes.

∅B	Approximate Transition Lengths ('T' mm) for given ∅ 'A' mm						
	6.0mm	4.5mm	3.0mm	2.0mm	1.5mm	1.0mm	0.5mm
6.0mm	–	–	–	–	–	–	–
4.5mm	6	–	–	–	–	–	–
3.0mm	12	6	–	–	–	–	–

Type 17 &18 Mineral Insulated Resistance Thermometers

SECTION 7

Types of End Seal Configuration

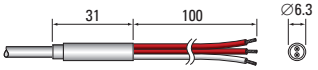
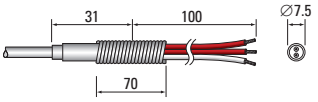
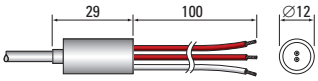
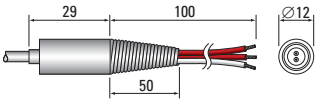
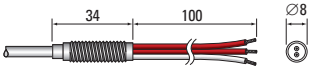
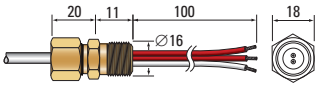
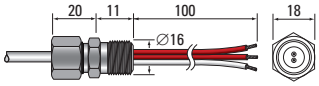
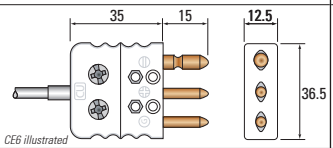
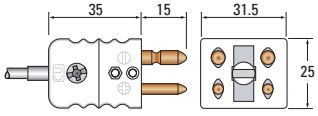
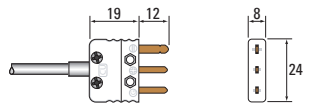
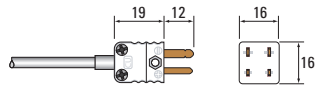
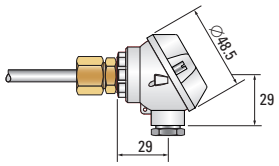
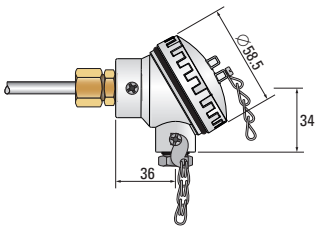
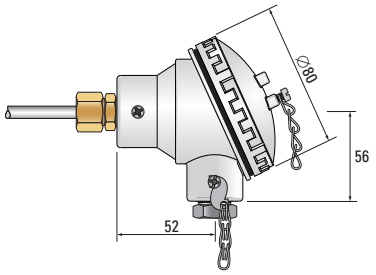
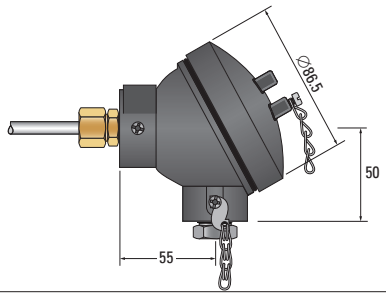
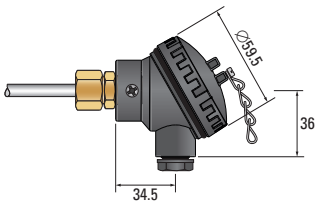
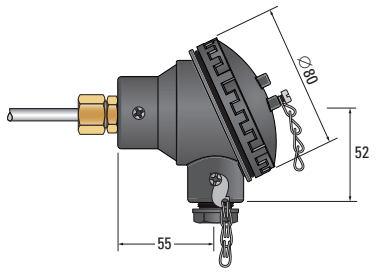
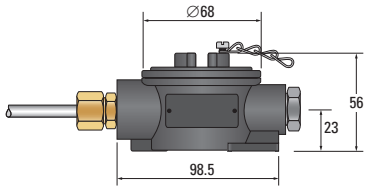
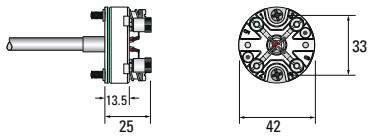
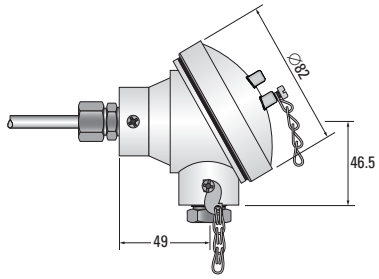
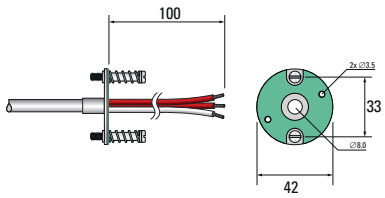
	Diagram	Specification
CE1		**Temporary Internal Seal with Bare Conductors** for all sheath diameters **CE1** Maximum end seal temperature **135**°C *Note: Only suitable as a temporary seal for applications adding an alternative seal later.*
CE2L		**Crimp on Stainless Steel Pot Seal** for sheath diameters up to 3.0mm **CE2L** Pot Seal rated to **135**°C **CE2LA** Pot Seal rated to **235**°C *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 100mm tails.	**Stainless Steel Pot Seal with Anti Chafe Spring** for sheath diameters up to 3.0mm **CE2CTRL** Pot Seal rated to **135**°C **CE2CTRLA** Pot Seal rated to **235**°C *see section 8 if extension leads are required*
CE4CL		**Crimp on Stainless Steel Pot Seal** for sheath diameters between 3.0mm & 8.0mm **CE4CL** Pot Seal rated to **135**°C **CE4CLA** Pot Seal rated to **235**°C *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 100mm tails.	**Stainless Steel Pot Seal with Anti Chafe Spring** for sheath diameters between 3.0mm & 8.0mm **CE4CTRL** Pot Seal rated to **135**°C **CE4CTRLA** Pot Seal rated to **235**°C *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 3.0mm **CE3L** Pot Seal rated to **135**°C **CE3LA** Pot Seal rated to **235**°C *see section 8 if extension leads are required*
CE5		**16mm ISO x 1.5mm Brass Compression Gland Pot Seal** for sheath diameters up to 8.0mm **CE5** Pot Seal rated to **135**°C **CE5A** Pot Seal rated to **235**°C *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 8.0mm **CE5S** Pot Seal rated to **135**°C **CE5SA** Pot Seal rated to **235**°C *see section 8 if extension leads are required*
CE6	 CE6 illustrated	**Standard 3-pin (round pin) Plug** for sheath diameters between 1.5mm & 8.0mm **CE6** Plug rated to **220**°C **CE6H** Plug rated to **300**°C
CE8		**Standard 4-pin (round pin) Plug** for sheath diameters between 1.5mm & 8.0mm **CE8** Plug rated to **220**°C
CE7	 CE7 illustrated	**Miniature 3-pin (flat pin) Plug** for sheath diameters between 1.5mm & 3.2mm **CE7** Plug rated to **220**°C **CE7H** Plug rated to **300**°C
CE9		**Miniature 4-pin (flat pin) Plug** for sheath diameters between 1.5mm & 3.2mm **CE9** Plug rated to **220**°C

	Diagram	Specification
MAA		**Micro Die Cast Alloy Head** for diameters 3.0mm to 6.0mm 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 16mm x 1.5mm ISO metal pinch gland on the cable entry for cables from 4mm to 9.5mm diameter.
CE10		**Miniature Die Cast Alloy Head** for diameters 3.0mm to 8.0mm 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 16mm x 1.5mm ISO metal pinch gland on the cable entry for cables from 3mm to 8mm diameter.
CE11		**Standard Die Cast Alloy Head** for diameters 4.5mm to 8.0mm 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 20mm x 1.5mm ISO metal pinch gland on cable entry for cables from 6mm to 14mm diameter.
CE12		**Heavy Duty Cast Iron Head** for diameters 4.5mm to 8.0mm 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 20mm x 1.5mm ISO metal pinch gland on cable entry for cables from 6mm to 14mm diameter.
CE16		**Miniature Plastic Head** for diameters 3.0mm to 8.0mm 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 16mm x 1.5mm ISO plastic pinch gland on cable entry for cables from 3mm to 8mm diameter.
CE17		**Standard Plastic Head** for diameters 4.5mm to 8.0mm 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 20mm x 1.5mm ISO plastic pinch gland on the cable entry for cables from 6mm to 14mm diameter.

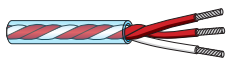
continued

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 4.5mm to 8.0mm Die cast alloy straight through terminal head with a bakelite terminal block. Suitable for simplex or duplex assemblies. Supplied with a 20mm x 1.5mm pitch ISO pinch gland on the cable entry for cables from 6mm to 14mm diameter. **If supported at fixing holes, suitable for diameters of 1mm and above.*	**CE20**		**Spring Loaded Terminal Block** for diameters 3.0mm to 8.0mm 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 3mm, 4.5mm, 6mm and 8mm sheaths only. The ceramic terminal block has 2 x 33mm spaced mounting holes. Suitable for simplex, duplex and triplex assemblies.
CE19		**Stainless Steel Head** for diameters 4.5mm to 8.0mm 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 20mm x 1.5mm ISO metal pinch gland on cable entry for cables from 6mm to 14mm diameter.	**CE20/ BP**		**DIN Mounting Plate** for diameters 3.0mm to 8.0mm 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 3mm, 4.5mm, 6mm and 8mm sheaths only. 100mm tails allows for connection to a head mounting transmitter or other suitable terminal block.

SECTION 8 — Extension Cables

	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 (105°C)** Cores of 7/0.2mm stranded copper conductors. Cores HR PVC insulated. Cores bunched together. Tinned copper wire braid screen. HR PVC sheathed overall.	**TEF**	**TEF7** - 1 core		**PFA 'Single' (250°C)** One core of 7/0.2mm stranded 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 (250°C)** Cores of 7/0.2mm stranded 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 (250°C)** Cores of 7/0.2mm stranded copper conductors. Cores PFA insulated. Cores bunched together. Silicone Rubber sheathed overall.
RT	**RT38** - 3 core **RT48** - 4 core		**PFA Insulated (250°C)** Cores of 7/0.2mm (RT38) or 7/0.15mm (RT48) stranded 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 (480°C)** Cores of 7/0.2mm stranded 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 cable is required, leave this section of the order code blank and the sensor will be supplied with PFA tails. Other cables 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
1.5mm	SFS18T15	SFS14T15	SFS12T15	4.5mm	SFS18T45	SFS14T45	SFS12T45
2.0mm	SFS18T20	SFS14T20	SFS12T20	6.0mm	SFS18T60	SFS14T60	SFS12T60
3.0mm	SFS18T30	SFS14T30	SFS12T30	8.0mm	–	SFS14T80	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 °C)

TXL PRT



Fully Linearised

Suitable for use with the following terminal heads: **CE11, CE12, CE17, CE18** and **CE19** and other standard heads with 33mm fixing.

Typical Order Code: **TXLPRT (0/200°C)**

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 mm)	End Seal Termination (see section 7)	Resistance Value of Element (see section 2)	Grade of Element (see section 6)	Extension Cable (see section 8)	Reduced Tip Dimensions (if required)	Optional Compression Fitting (see section 9)	Optional Transmitter (see section 10)
17	1	6.0	3	250	CE4CL	R100	B	2 MTRS RP37	REDUCED TIP: 3.0mm x 50mm LONG	SFS12T60	

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