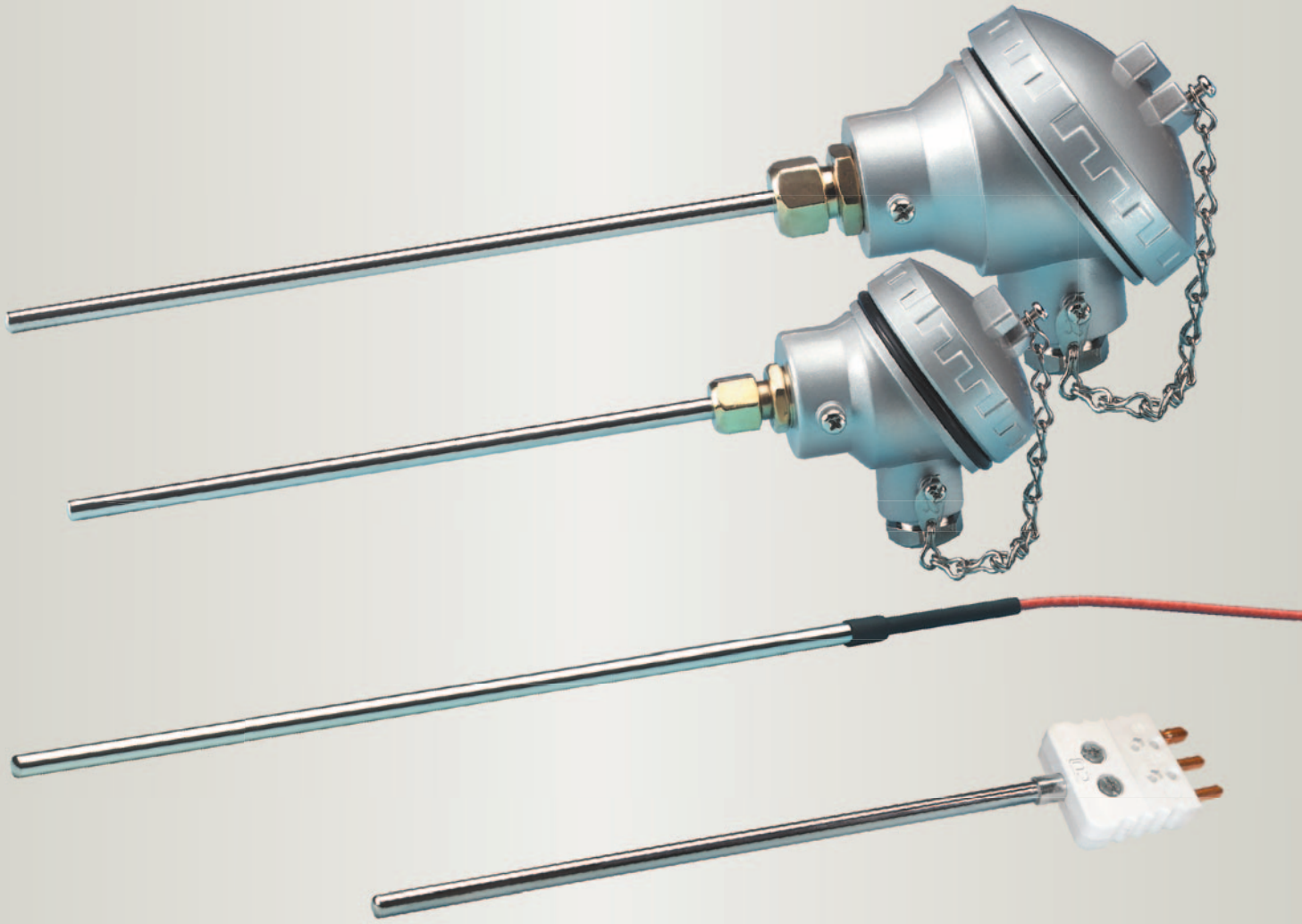
Rigid Stem Resistance Thermometers - Type 16



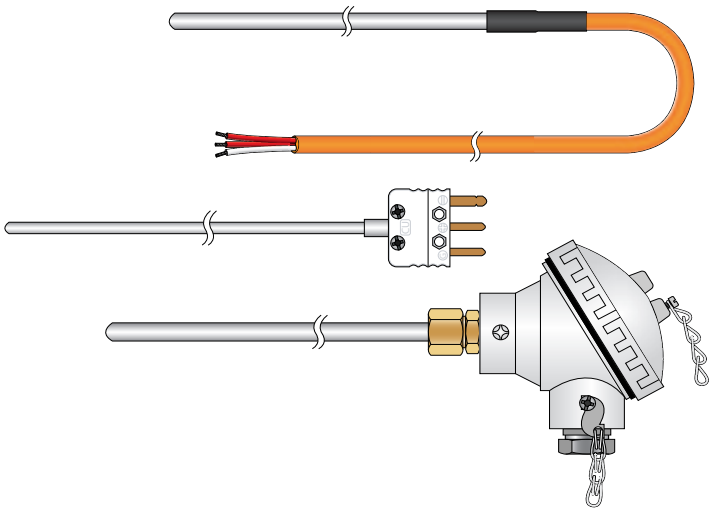
A range of rigid stem 316L stainless steel sheathed resistance thermometers, suited to a wide variety of industrial applications up to 250°C.

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

TC Measurement & Control AB

Type 16 Rigid Stem Resistance Thermometers

- This style of sensor is ideal for rigid stem applications or where the sensor is shorter than 50mm. They are suitable for many applications and are rated to 250°C
- 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
- Operating temperature range of -75°C to +250°C
- 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 Rigid Stem Resistance Thermometer assemblies



Typical Construction

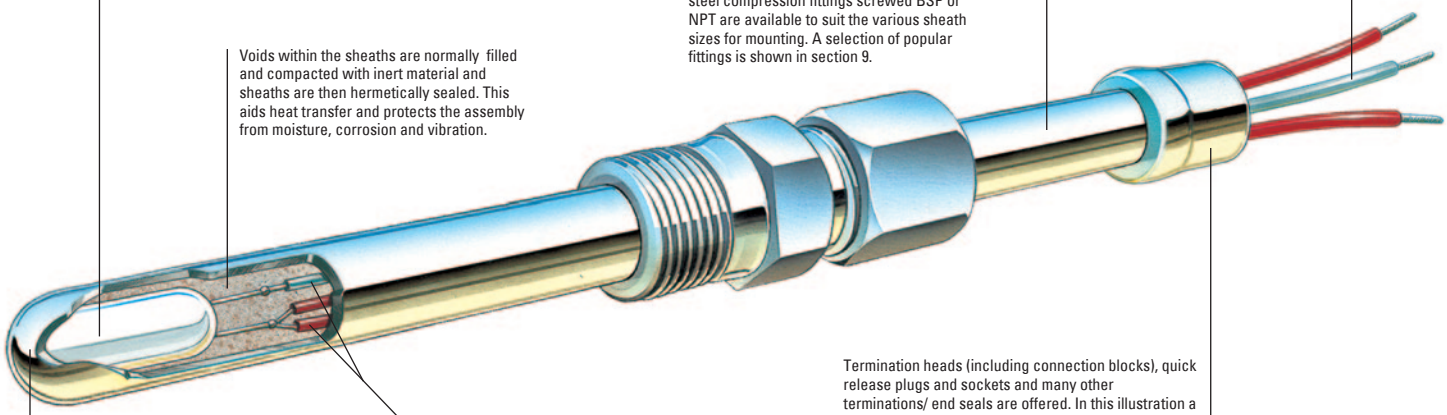
Type 16 platinum resistance thermometer detector elements are normally 100 ohms at 0°C with a fundamental interval of 38.5 ohms. Single, duplex and triplex elements to Class B, A, 1/3, 1/5 & 1/10 tolerance are available.

Seamless metal sheath in 316L stainless steel with a welded end cap. Sheath lengths to suit customer requirements. Available in a range of sheath diameters and an optional reduced tip for faster response. Sheaths can be supplied with bends at right angles or otherwise to meet customer requirements. Additionally these sheaths can be supplied with a variety of plastic claddings to suit particularly corrosive environments. Sensors should not be bent after manufacture.

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.

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.

Voids within the sheaths are normally filled and compacted with inert material and sheaths are then hermetically sealed. This aids heat transfer and protects the assembly from moisture, corrosion and vibration.



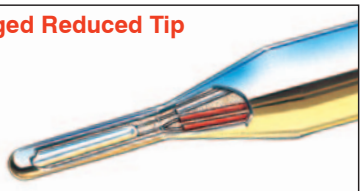
Termination heads (including connection blocks), quick release plugs and sockets and many other terminations/ end seals are offered. In this illustration a Type 16 is shown with straight through PFA insulated flying leads. The body of this seal is stainless steel and the seal is made with high temperature epoxy resin. If alternative flying leads are required then they will be bonded to the elements attachment leads prior to the epoxy seal being completed.

The tip and stem operating temperature of Type 16 platinum resistance thermometer assemblies is - 75°C to 250°C. If higher or lower operating temperatures are required, we recommend our Type 17 or 18 mineral insulated resistance thermometers.

Attachment leads within the 316L stainless steel sheath are offered in 2, 3 and 4 wire configurations for single, duplex and triplex element units. As standard, leads are PFA insulated.

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.

Swaged Reduced Tip



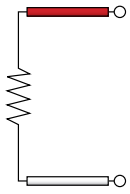
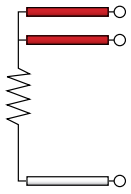
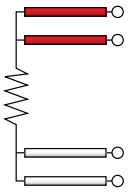
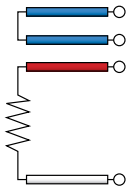
Swaged end reduced tip temperature sensors provide a unique fast response, high strength, low displacement, homogenous solution to many problematical temperature measurement applications. The technique combines the two usually mutually exclusive advantages of having a very rugged large diameter metal sheath over most of its length with a low thermal mass, fast response, reduced diameter swaged tip, and with the transition from one to the other maintaining homogeneity and integrity.

Rigid Stem Resistance Thermometers Type 16

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

SECTION 2	Sheath Diameter (mm)	Sheath Diameter (inches)
Standard Sizes	2.0mm	0.079″
	2.38mm	0.094″
	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″
	10.0mm	0.394″
	12.7mm	0.500″

SECTION 3	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

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)	2.0mm	2.38mm	3.0mm	4.5mm	6.0mm	8.0mm	10.0mm	12.7mm
1	2 wire	✔	✔	✔	✔	✔	✔	✔	✔
	3 wire	✔	✔	✔	✔	✔	✔	✔	✔
	4 wire	✔	✔	✔	✔	✔	✔	✔	✔
2	2 wire		✔	✔	✔	✔	✔	✔	✔
	3 wire			✔	✔	✔	✔	✔	✔
	4 wire					✔	✔	✔	✔
3	2 wire					✔	✔	✔	✔
	3 wire					✔	✔	✔	✔
	4 wire						✔	✔	✔

Specifications and General Information	
Detector Elements	Rigid stem 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 1 and 3). 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 between 2.0mm and 12.7mm.
Operating Temperatures	Standard Type 16 assemblies have an operating temperature range for the tip and stem of -75°C to + 250°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 much wider tip, stem and 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 16 platinum resistance thermometer assemblies is generally to IEC 60751 (BS EN 60751).
Bending Radius	Sensors should not be bent after supply, however, TC Ltd are able to put right angle bends or other bends in the sheath during manufacture.

Type 16 Rigid Stem Resistance Thermometers

SECTION 7

Types of End Seal Configuration

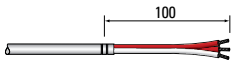
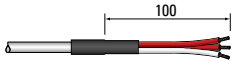
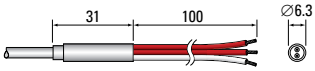
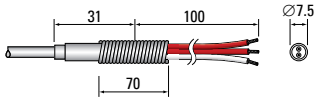
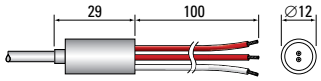
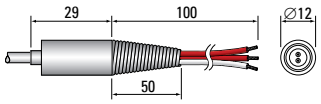
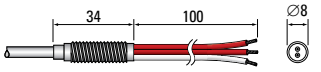
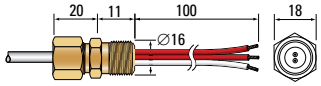
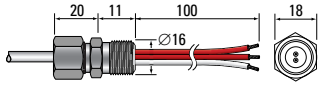
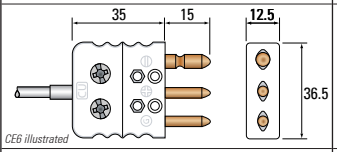
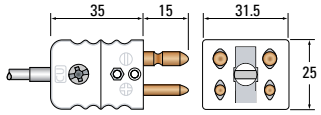
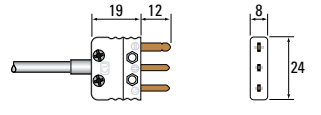
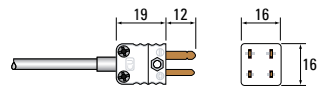
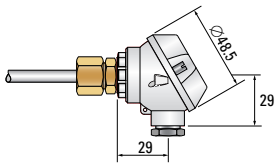
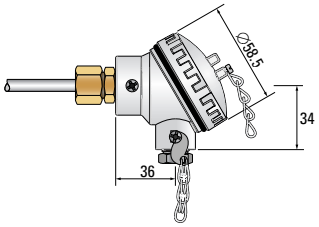
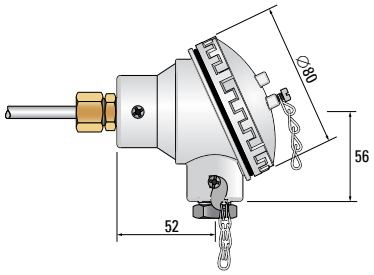
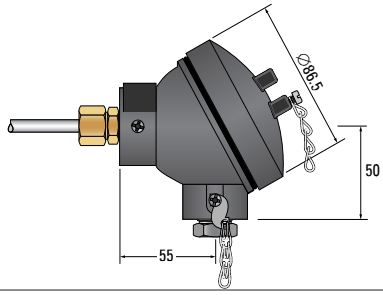
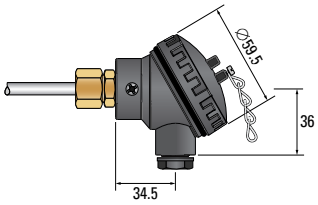
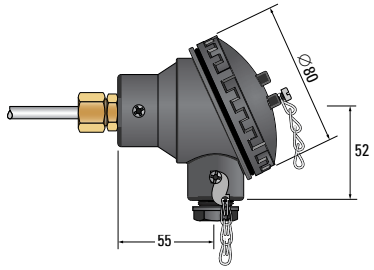
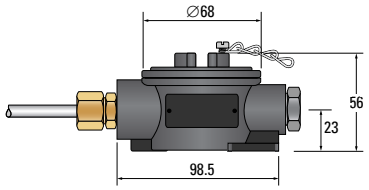
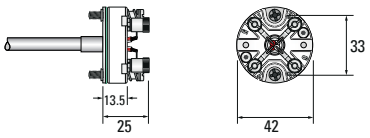
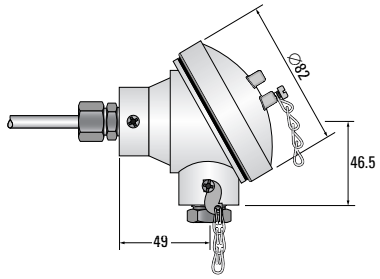
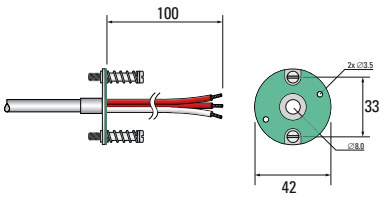
	Diagram	Specification
CE1		**Internal Seal Epoxy Resin Seal** for all sheath diameters CE1 Maximum end seal temperature **135**°C
CE1WT		**Water Tight End Seal** for sheath diameters of 6.0mm. Must be supplied with Silicone Rubber extension lead. CE1WT Maximum end seal temperature **125**°C
CE1A		**Internal Seal with Heatshrink Sleeve** for all sheath diameters CE1A Maximum end seal temperature **135**°C
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) Plug** for sheath diameters between 1.0mm & 8.0mm CE6 Plug rated to **220**°C CE6H Plug rated to **300**°C
CE8		**Standard 4-pin (round) Plug** for sheath diameters between 1.0mm & 8.0mm CE8 Plug rated to **220**°C
CE7	 *CE7 illustrated*	**Miniature 3-pin (round) Plug** for sheath diameters between 1.0mm & 3.2mm CE7 Plug rated to **220**°C CE7H Plug rated to **300**°C
CE9		**Miniature 4-pin (flat) Plug** for sheath diameters between 1.0mm & 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 12.7mm 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 12.7mm 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 12.7mm 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.

Rigid Stem Resistance Thermometers Type 16

SECTION 7 — Types of End Seal Configuration (continued)

	Diagram	Specification		Diagram	Specification
CE18		**Alloy Straight Through Head** for diameters 4.5mm to 12.7mm 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 12.7mm 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
2.0mm	SFS18T20	SFS14T20	SFS12T20	6.0mm	SFS18T60	SFS14T60	SFS12T60
3.0mm	SFS18T30	SFS14T30	SFS12T30	8.0mm	–	SFS14T80	SFS12T80
4.5mm	SFS18T45	SFS14T45	SFS12T45				

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 5)	Sheath Diameter (see section 2)	No. of Wires (see section 4 and 5)	Sheath Length (in mm)	End Seal Termination (see section 7)	Resistance Value of Element (see section 1)	Grade of Element (see section 3)	Extension Cable (see section 8)	Optional Compression Fitting (see section 9)	Optional Transmitter (see section 10)
16	**1**	**6.0**	**4**	**200**	**CE4CL**	**R100**	**B**	**2 MTRS RP47**	**SFS12T60**	

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