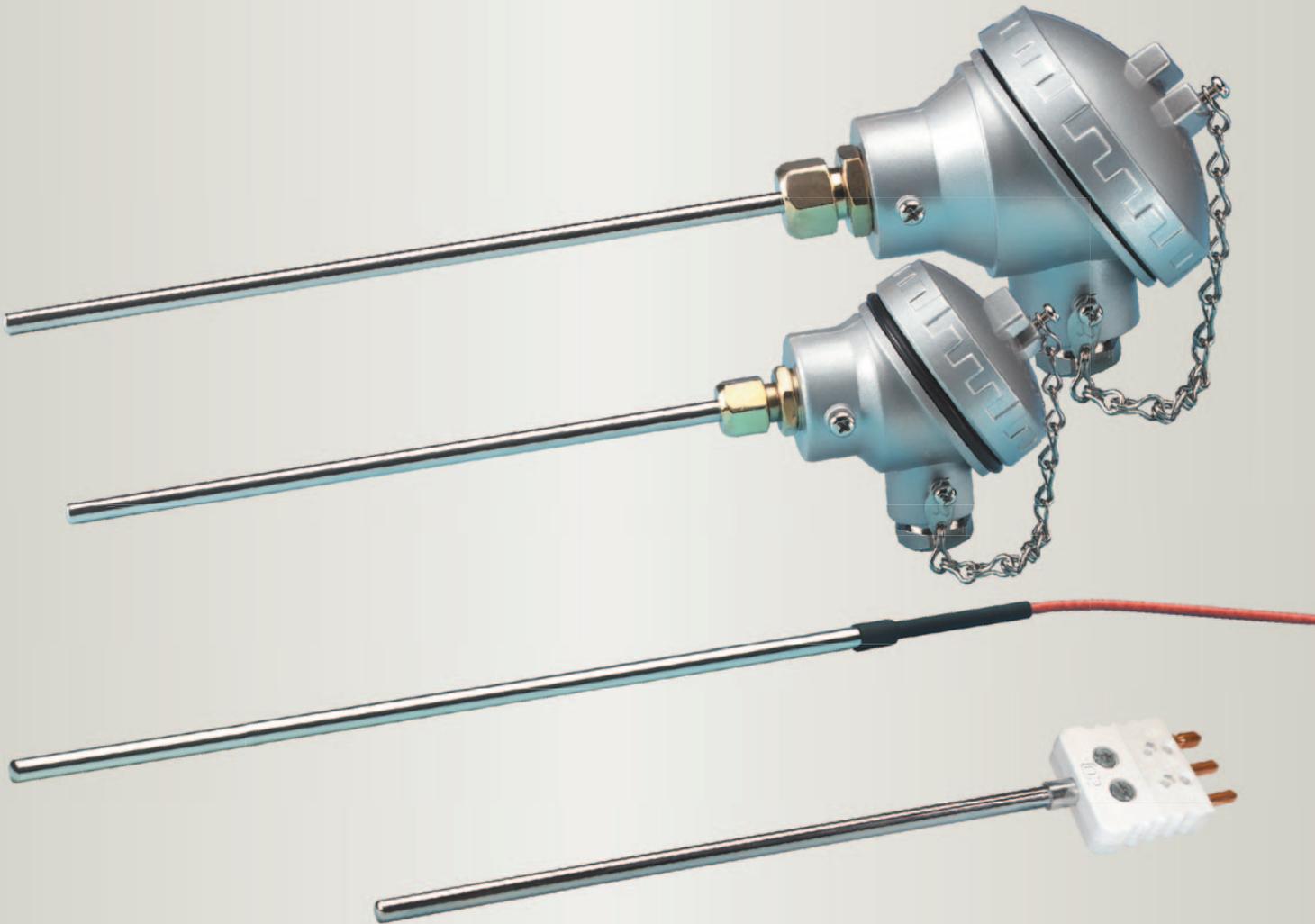




## Rigid Stem Resistance Thermometers - Type 16

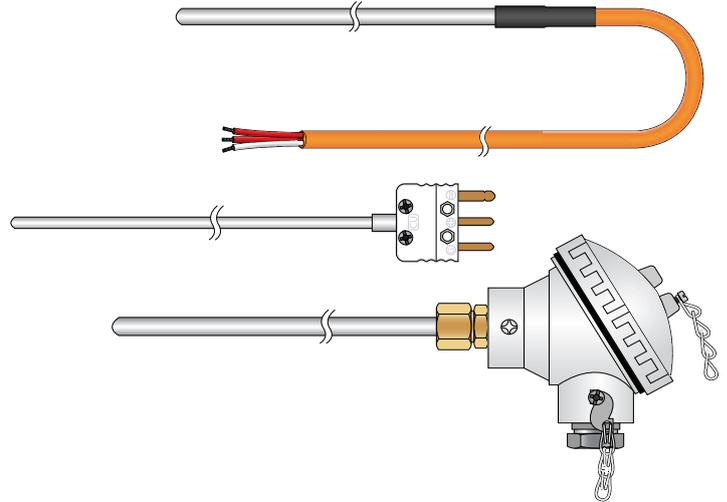


**A range of rigid stem 316L stainless steel sheathed resistance thermometers, suited to a wide variety of industrial applications up to 250°C.**

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

# 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

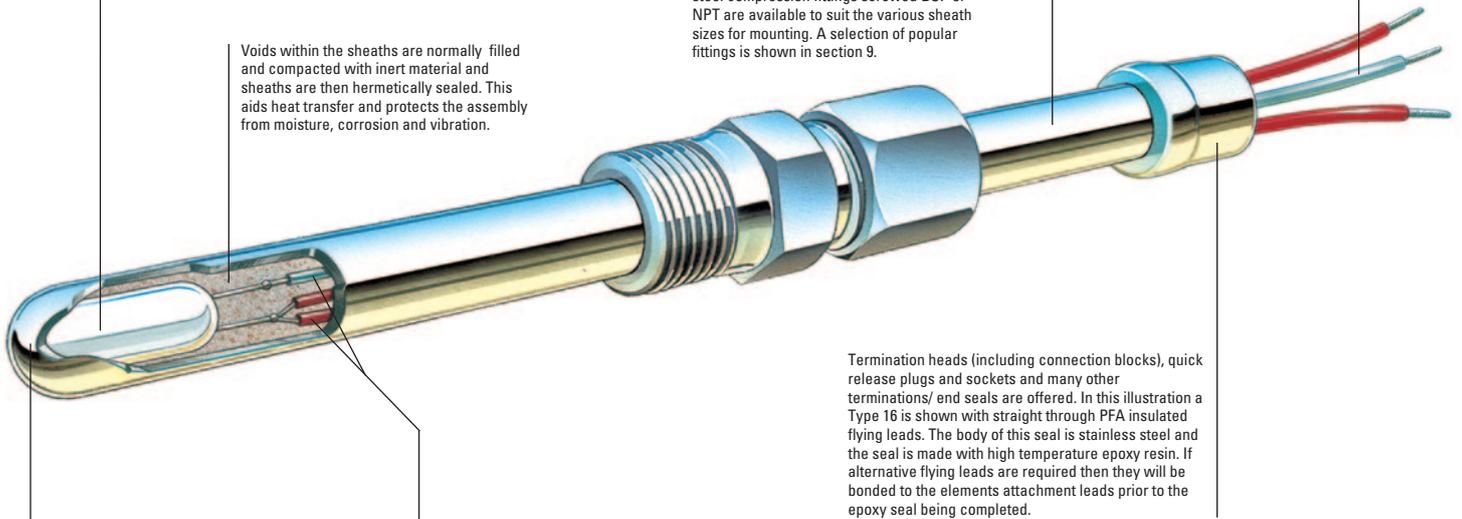
Type 16 platinum resistance thermometer detector elements are normally 100 ohms at 0°C with a fundamental interval of 38.5 ohms. Single, duplex and triplex elements to Class B, A, 1/3, 1/5 & 1/10 tolerance are available.

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.

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.

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.

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.

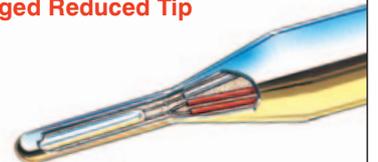


The tip and stem operating temperature of Type 16 platinum resistance thermometer assemblies is -75°C to 250°C. If higher or lower operating temperatures are required, we recommend our Type 17 or 18 mineral insulated resistance thermometers.

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.

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.

### 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.

**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.

# Rigid Stem Resistance Thermometers **Type 16**

SECTION 1	$R_0$ value
<b>R<sub>100</sub></b>	100Ω@0°C (0.003851°C <sup>-1</sup> )
<b>R<sub>1000</sub></b>	1000Ω@0°C (0.03851°C <sup>-1</sup> )

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>B</b>	±0.30°C	±0.80°C
<b>A</b>	±0.15°C	±0.35°C
<b>1/3</b>	±0.10°C	±0.27°C
<b>1/5</b>	±0.06°C	±0.16°C
<b>1/10</b>	±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	Configuration (No. of wires)	Sheath Diameter available for each Configuration							
		2.0mm	2.38mm	3.0mm	4.5mm	6.0mm	8.0mm	10.0mm	12.7mm
<b>1</b>	2 wire	✓	✓	✓	✓	✓	✓	✓	✓
	3 wire	✓	✓	✓	✓	✓	✓	✓	✓
	4 wire	✓	✓	✓	✓	✓	✓	✓	✓
<b>2</b>	2 wire		✓	✓	✓	✓	✓	✓	✓
	3 wire			✓	✓	✓	✓	✓	✓
	4 wire					✓	✓	✓	✓
<b>3</b>	2 wire					✓	✓	✓	✓
	3 wire					✓	✓	✓	✓
	4 wire						✓	✓	✓

Specifications and General Information	
<b>Detector Elements</b>	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.
<b>Sheath Materials</b>	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.
<b>Operating Temperatures</b>	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).
<b>Immersion Depth</b>	Minimum recommended immersion length is 60mm.
<b>Response Times</b>	Response times are governed by and vary with the environmental conditions of particular applications. Please contact us for further information.
<b>Measurement Current</b>	Recommended measurement current is typically 1mA.
<b>Insulation Resistance</b>	Between the leads and sheath at 100V DC >100 MΩ at ambient temperature.
<b>Standards</b>	The manufacture of Type 16 platinum resistance thermometer assemblies is generally to IEC 60751 (BS EN 60751).
<b>Bending Radius</b>	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		Diagram	Specification	
CE1		<b>Internal Seal Epoxy Resin Seal</b> for all sheath diameters <b>CE1</b> Maximum end seal temperature 135°C	MAA		<b>Micro Die Cast Alloy Head</b> 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.	
CE1WT		<b>Water Tight End Seal</b> for sheath diameters of 6.0mm. Must be supplied with Silicone Rubber extension lead. <b>CE1WT</b> Maximum end seal temperature 125°C				<b>Miniature Die Cast Alloy Head</b> 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.
CE1A		<b>Internal Seal with Heatshrink Sleeve</b> for all sheath diameters <b>CE1A</b> Maximum end seal temperature 135°C				<b>Standard Die Cast Alloy Head</b> 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.
CE2L		<b>Crimp on Stainless Steel Pot Seal</b> for sheath diameters up to 3.0mm <b>CE2L</b> Pot Seal rated to 135°C <b>CE2LA</b> Pot Seal rated to 235°C <i>see section 8 if extension leads are required</i>	CE10		<b>Heavy Duty Cast Iron Head</b> 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.	
CE2CTRL		<b>Stainless Steel Pot Seal with Anti Chafe Spring</b> for sheath diameters up to 3.0mm <b>CE2CTRL</b> Pot Seal rated to 135°C <b>CE2CTRLA</b> Pot Seal rated to 235°C <i>see section 8 if extension leads are required</i>				<b>Miniature Plastic Head</b> 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.
CE4CL		<b>Crimp on Stainless Steel Pot Seal</b> for sheath diameters between 3.0mm & 8.0mm <b>CE4CL</b> Pot Seal rated to 135°C <b>CE4CLA</b> Pot Seal rated to 235°C <i>see section 8 if extension leads are required</i>				<b>Miniature Plastic Head</b> 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.
CE4CTRL		<b>Stainless Steel Pot Seal with Anti Chafe Spring</b> for sheath diameters between 3.0mm & 8.0mm <b>CE4CTRL</b> Pot Seal rated to 135°C <b>CE4CTRLA</b> Pot Seal rated to 235°C <i>see section 8 if extension leads are required</i>	CE11		<b>Standard Plastic Head</b> 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 with a 16mm x 1.5mm ISO plastic pinch gland on the cable entry for cables from 6mm to 14mm diameter.	
CE3L		<b>8mm ISO x 1mm Threaded Stainless Steel Pot Seal</b> for sheath diameters up to 3.0mm <b>CE3L</b> Pot Seal rated to 135°C <b>CE3LA</b> Pot Seal rated to 235°C <i>see section 8 if extension leads are required</i>				<b>Standard Plastic Head</b> 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.
CE5		<b>16mm ISO x 1.5mm Brass Compression Gland Pot Seal</b> for sheath diameters up to 8.0mm <b>CE5</b> Pot Seal rated to 135°C <b>CE5A</b> Pot Seal rated to 235°C <i>see section 8 if extension leads are required</i>	CE12		<b>Standard Plastic Head</b> 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 with a 16mm x 1.5mm ISO plastic pinch gland on the cable entry for cables from 6mm to 14mm diameter.	
CE5S		<b>16mm ISO x 1.5mm St./St. Compression Gland Pot Seal</b> for sheath diameters up to 8.0mm <b>CE5S</b> Pot Seal rated to 135°C <b>CE5SA</b> Pot Seal rated to 235°C <i>see section 8 if extension leads are required</i>				<b>Standard Plastic Head</b> 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 with a 16mm x 1.5mm ISO plastic pinch gland on the cable entry for cables from 6mm to 14mm diameter.
CE6		<b>Standard 3-pin (round) Plug</b> for sheath diameters between 1.0mm & 8.0mm <b>CE6</b> Plug rated to 220°C <b>CE6H</b> Plug rated to 300°C	CE16		<b>Standard Plastic Head</b> 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 with a 16mm x 1.5mm ISO plastic pinch gland on the cable entry for cables from 6mm to 14mm diameter.	
CE8		<b>Standard 4-pin (round) Plug</b> for sheath diameters between 1.0mm & 8.0mm <b>CE8</b> Plug rated to 220°C				<b>Standard Plastic Head</b> 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 with a 16mm x 1.5mm ISO plastic pinch gland on the cable entry for cables from 6mm to 14mm diameter.
CE7		<b>Miniature 3-pin (round) Plug</b> for sheath diameters between 1.0mm & 3.2mm <b>CE7</b> Plug rated to 220°C <b>CE7H</b> Plug rated to 300°C	CE17		<b>Standard Plastic Head</b> 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 with a 16mm x 1.5mm ISO plastic pinch gland on the cable entry for cables from 6mm to 14mm diameter.	
CE9		<b>Miniature 4-pin (flat) Plug</b> for sheath diameters between 1.0mm & 3.2mm <b>CE9</b> Plug rated to 220°C				<b>Standard Plastic Head</b> 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 with a 16mm 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		<p><b>Alloy Straight Through Head</b> for diameters 4.5mm to 12.7mm</p> <p>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. <i>*If supported at fixing holes, suitable for diameters of 1mm and above.</i></p>	CE20		<p><b>Spring Loaded Terminal Block</b> for diameters 3.0mm to 8.0mm</p> <p>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.</p>
CE19		<p><b>Stainless Steel Head</b> for diameters 4.5mm to 12.7mm</p> <p>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.</p>	CE20/ BP		<p><b>DIN Mounting Plate</b> for diameters 3.0mm to 8.0mm</p> <p>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.</p>

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		<p><b>HR PVC Insulated with Screen (105°C)</b> Cores of 7/0.2mm stranded copper conductors. Cores HR PVC insulated. Cores bunched together. Tinned copper wire braid screen. HR PVC sheathed overall.</p>	TEF	TEF7 - 1 core		<p><b>PFA 'Single' (250°C)</b> One core of 7/0.2mm stranded copper single conductor PFA insulated. Red / White.</p>
RT	RT27 - 2 core RT37 - 3 core RT47 - 4 core RT67 - 6 core RT87 - 8 core		<p><b>PFA Insulated with Screen (250°C)</b> Cores of 7/0.2mm stranded copper conductors. Cores PFA insulated. Cores bunched together. Nickel plated copper wire braid screen. PFA sheathed overall.</p>	RS	RS37 - 3 core RS47 - 4 core RS67 - 6 core RS87 - 8 core		<p><b>PFA / Silicone Rubber (250°C)</b> Cores of 7/0.2mm stranded copper conductors. Cores PFA insulated. Cores bunched together. Silicone Rubber sheathed overall.</p>
RT	RT38 - 3 core RT48 - 4 core		<p><b>PFA Insulated (250°C)</b> 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.</p>	RF	RF37 - 3 core RF47 - 4 core RF67 - 6 core		<p><b>Fibreglass Insulated with Steel Braid (480°C)</b> 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.</p>

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		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)
	Fully Linearised		

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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