

*oil & gas measurement solutions*



# Solartron ISA

## temperature measurement

design, engineering and manufacture of intrusive  
temperature elements



# Solartron ISA, experience and quality...

Solartron ISA Temperature Measurement is a division of Solartron ISA. The temperature division provides a specialist service in the design, engineering and manufacture of a wide range of intrusive temperature elements which are described in the following pages.

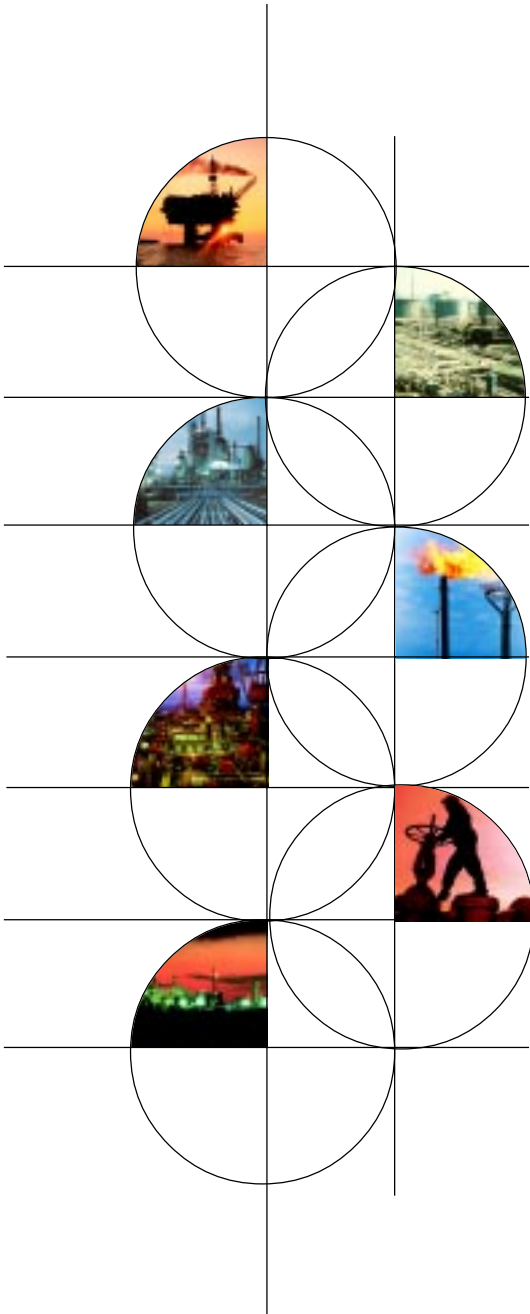
The purpose of this brochure is to make it as easy as possible, using a simple selection code, for engineers and others involved in the selection and specification of temperature measurement devices, to select the exact product they need. However, if further advice or assistance is necessary, Solartron ISA has a team of highly experienced temperature measurement engineers on hand to talk through issues such as product selection and performance. Solartron ISA Temperature Measurement welcomes problematic or unusual applications and will always do its best to help customers with special application needs.

Solartron ISA Temperature Measurement is supported by state of the art production facilities using the latest CNC drilling and machining technologies. This ensures precision of manufacture, matched by excellent inspection facilities and speed of response that our customers have come to rely on.

In addition to terminal heads, thermowells and sensors, Solartron ISA can supply a wide range of industry standard transmitters and can now offer its own HMT S33 fully smart programmable transmitter.

Whether for a multi-million pound project, or a fast-track replacement unit, Solartron ISA Temperature Measurement is a dedicated, specialised resource for all your temperature measurement needs.





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...for confidence in your temperature measurement applications

## Introduction to temperature measurement

It has long been recognised that both the measurement and control of temperature is necessary for the correct and safe functioning of virtually all industrial and everyday processes.

In industrial processes such as oil and gas exploration and production and the manufacture of chemicals, pharmaceuticals and food processing, temperature measurement is one of the major factors in determining safe and efficient manufacture and also guaranteeing quality of product.

In process plant operation careful monitoring and control of temperature is paramount to ensure the most cost effective use of fuel and many other natural resources and is also a contributory factor towards development of acceptable safe working practices. Temperature measurement is also an ancillary requirement to many other mechanical and electrical measurements, which are desirable in industry.

To satisfy these demands there are very many methods of practical temperature measurement in use. Simple devices such as liquid in glass thermometers, which were the earliest thermometers to be developed and are still extensively used in some industries.

Temperature gauges utilising the bi-metal expansion principle are used where a simple quick visual indication of temperature is required

Practical temperature measurement systems for industrial applications utilise either thermocouple or resistance thermometer sensors as the primary device for the measurement of temperature. The major feature of both these devices is that the output is in the form of an electrical signal which can be easily processed to display, record and control temperature.

Choice of device is governed by many factors, temperature range, accuracy, cost, process requirements to name but a few.

**Thermocouples** of various conductor combination can be used generally over the range  $-250^{\circ}\text{C}$  to  $+2000^{\circ}\text{C}$  and beyond.

Thermocouples are comparatively simple devices to produce and therefore their cost is relatively low. They can be manufactured from mineral insulated cable which means that they are small and extremely rugged. They provide a convenient electrical millivolt output for data logging and control. One of the inherent problems with thermocouples is that this output is not generated at the point of contact, the hot junction, but at all sections along the conductors. To give accurate temperature measurements the conductors need to be both physically and chemically homogeneous along their length. Temperature cycling tends to change these properties and for this reason thermocouple devices are not as accurate as resistance thermometers.



**Resistance Thermometers** can be used over the range  $-200^{\circ}\text{C}$  to  $+800^{\circ}\text{C}$ . The actual resistance element is usually a wire wound platinum element encapsulated into a high purity alumina ceramic. The platinum used in the construction is usually pure platinum alloyed with other platinum group metals to produce the desired alpha value required, this normally being 0.003850 with a resistance at  $0^{\circ}\text{C}$  of 100 ohms.

Resistance Thermometers can be considered to be more expensive to produce than thermocouples.

The relationship between temperature and resistance is almost linear and therefore very accurate measurements of temperature are possible. Resistance Thermometers are capable of long term stability and are virtually unaffected by temperature cycling. The output signal can be easily processed using modern microprocessors.

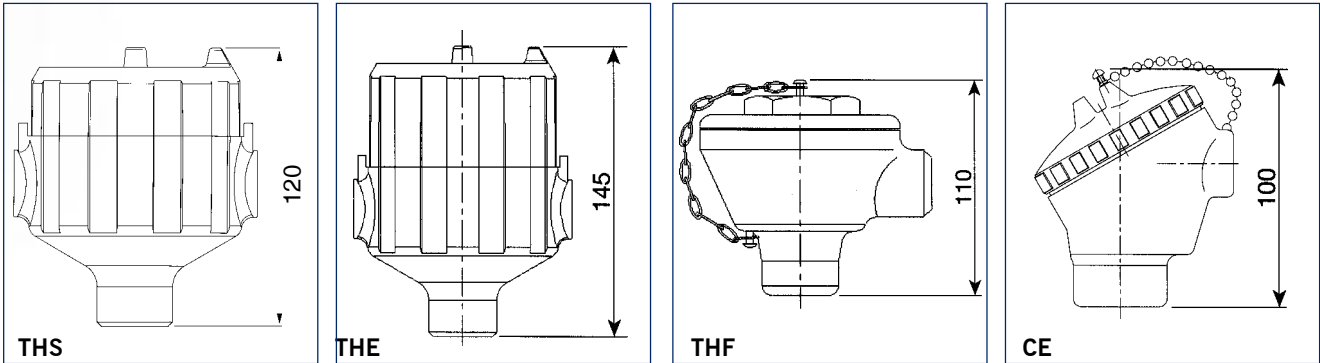
Modern technology now allows the output from both devices to be converted to an industry standard 4 - 20mA signal by using 'in head' transmitters. Transmitters may be standard analogue, intelligent or smart, the latter giving the measuring device more functionality and better performance.



## Terminal heads

Terminal Heads are used to both enclose terminations between incoming instrument cables with the sensor and to house 'Head Mounted Transmitters'. This component can be selected from a range of materials and a number of cable entries.

- Terminal Heads can be supplied as component parts or as an integral part of a complete assembly.
- All Terminal Heads supplied accept DIN style terminal blocks and most 'hockey puck' Transmitters.
- All Terminal Heads are supplied with M20 x 1.5mm female entries as standard. (½" NPT available on request).
- Materials of construction can be selected as Stainless Steel, Epoxy Painted Aluminium Alloy or Cast Iron.
- Terminal Head types 'THS, THE & THF' are all available certified for use in Hazardous Areas however certification is only applicable when supplied as part of a complete assembly.

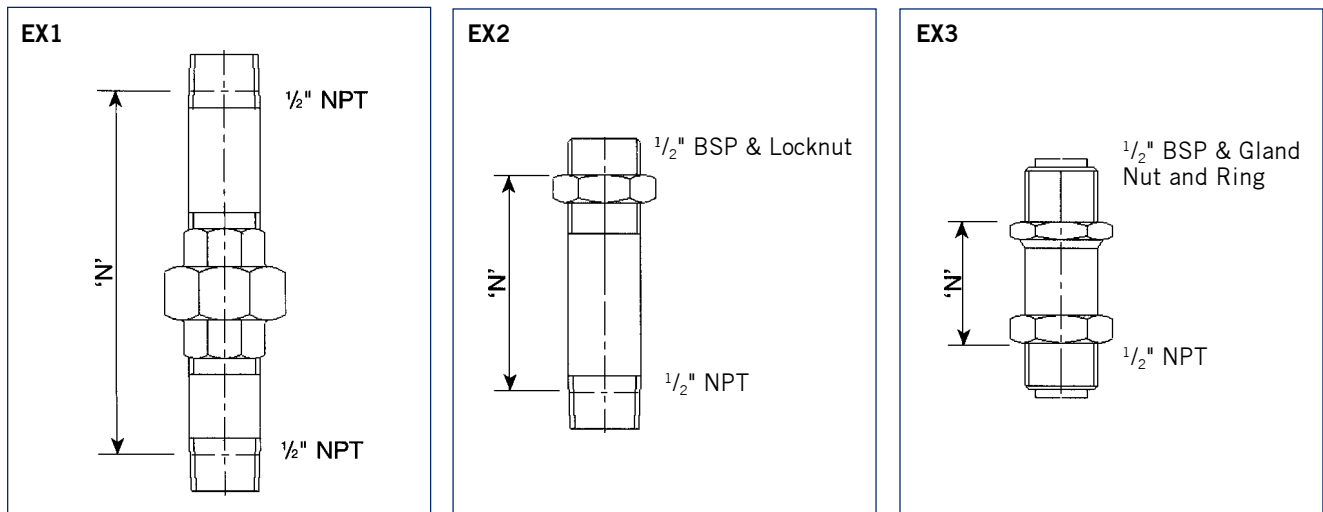


Type	Material	IP Rating	No. of Cable Entries	Finish	Hazardous Area Usage	
<b>THS-S</b>	St St	66/67	Single & Dual	Self	Safe	EExd IIC T6
<b>THS-A</b>	Al Alloy	66/67	Single & Dual	Epoxy	Safe	EExd IIC T6
<b>THE-S</b>	St St	66/67	Single & Dual	Self	Safe	EExd IIC T6
<b>THE-A</b>	Al Alloy	66/67	Single & Dual	Epoxy	Safe	EExd IIC T6
<b>THF-C</b>	Cast Iron	67	Single	Epoxy	Safe	EExd IIC T6
<b>CE</b>	Al Alloy	67	Single	Epoxy	Safe	-

## Extension pieces

Extension Pieces are used to connect the Terminal Head to the Thermowell and for lagged lines to position the Terminal Head above the lagging jacket. The arrangements shown all allow 180° orientation of the cable entry position.

- EX1** Nipple / Union / Nipple extensions are available in 316 Stainless Steel and Galvanised Carbon Steel.
- EX2** Single Nipple with locknut extensions are available in 316 Stainless Steel as standard.
- EX3** ½" BSP Gland Nut & Ring extensions are available in 316 Stainless Steel as standard.



## Temperature sensors

### Resistance Thermometers

Solartron ISA Resistance Thermometers are constructed in accordance with the latest requirements of international standard IEC-751: 1983 and national standards BS 1904 and DIN 43760. The basic value for resistance being 100 ohms at 0°C with a fundamental interval of 38.5 ohms. Other elements with different fundamental intervals can be supplied. The Resistance Thermometer is constructed using a wire wound platinum resistance element housed within a 6mm diameter stainless steel sheath. Cold end termination is achieved with a DIN style terminal block or mounting plate with flexible tails. The resistance thermometer can also be supplied with an integrally mounted temperature transmitter. Resistance Thermometers are supplied as standard with a temperature tolerance conforming to IEC 751 Class B. Other tolerances are available on request.

### Thermocouples

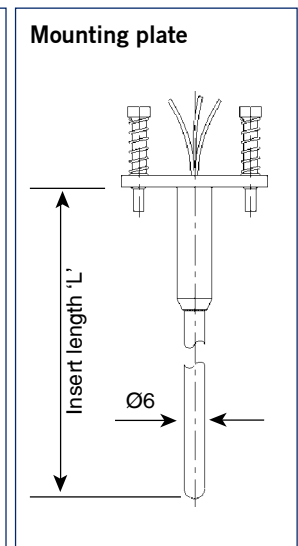
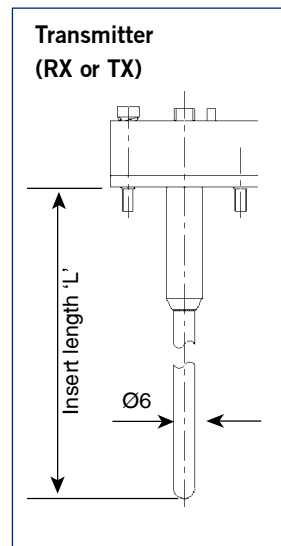
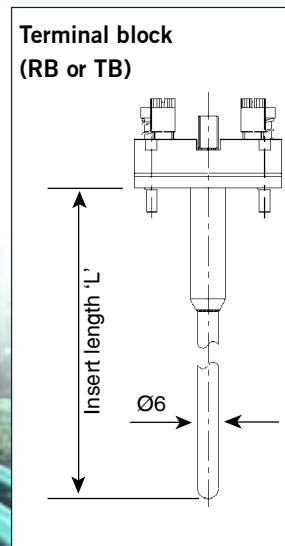
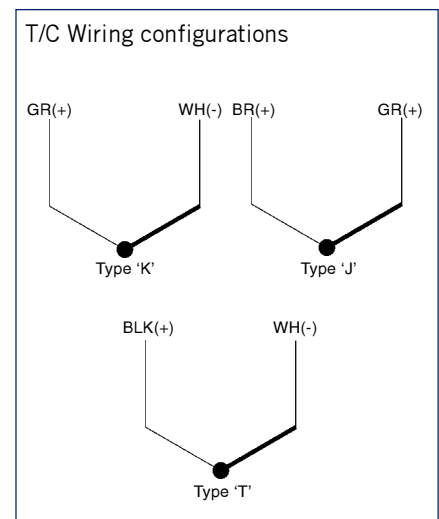
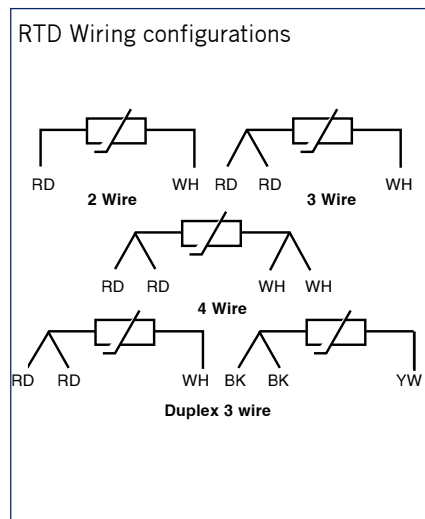
Solartron ISA Thermocouples are constructed in accordance with the latest requirements of IEC 584-1 Thermocouple types 'J', 'K' and 'T' are readily available. All other types are available on request.

Construction is from a 6mm diameter stainless steel sheath. Other sheath materials available on request.

The thermocouple hot junction can be supplied as insulated or grounded. Cold end termination is achieved with a DIN style terminal block or mounting plate with flexible tails.

Thermocouples can also be supplied with an integrally mounted temperature transmitter. Thermocouples are normally supplied as standard with a tolerance conforming to IEC 584 Class 2 but other tolerances are available on request.

**NOTE:-** Hazardous area approvals are available for both types of sensor but reference must be made to the complete assembly arrangement as shown on Page 5



## Temperature transmitters

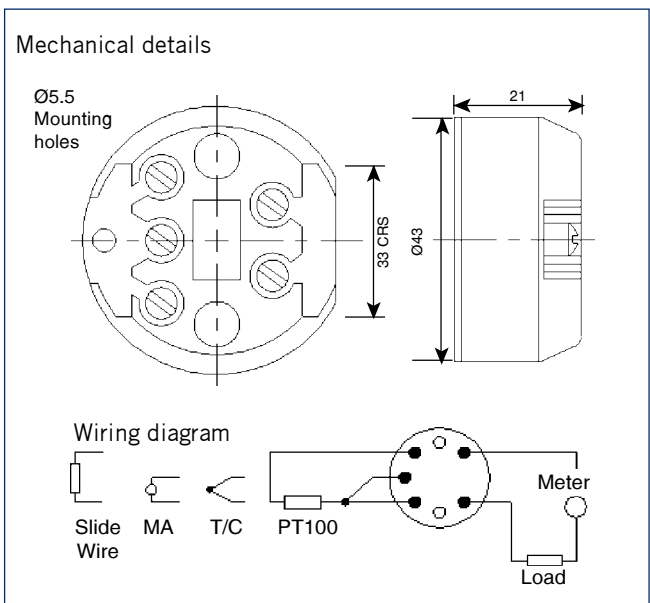
Temperature transmitters are used to convert the input signal from both Resistance Thermometers and Thermocouples into the industry standard current output normally 4-20 mA.

Solartron ISA offers both **Locally Programmable** and fully **'Hart' Smart** intelligent devices.

- ▶ Both devices are mounted in a NORYL enclosures which make them suitable for use in most environmental applications.  
The small compact size allows them to be used in the complete range of Solartron ISA connection heads and also the DIN Form B range of connection heads.
- ▶ Electrical connection on both devices is achieved via screw terminals on the top face of the transmitter.
- ▶ Mechanical connection to the temperature elements is achieved via spring loaded screws on the mounting plate.
- ▶ Input / Output isolation is achieved for both devices electrically and mechanically.
- ▶ Failsafe 'Burnout' feature selectable either Upscale (Current > than 20 mA) or Downscale (Current < than 20mA).
- ▶ Protection against reverse connection such that reverse polarity results in virtually zero current flow.

### MODEL No. HMTS33 (Programmable)

Power supply:	10 To 35 VDC
Output	<3.8 mA to >20.2mA
Communication:	Windows based PC software via RS232 adaptor
Input types:	PT100, Thermocouple
I/O Isolation:	500 VAC RMS
Ambient operating Temperature:	-40 to 85°C
Approvals:	Cenelec Eexia IIC T5 Cenelec Exn II



## Thermowells

### Introduction

Thermowells are precise components serving as a protective device for the primary detecting elements.

Their use allows the primary device to be replaced without the need to close the process line.

Pressure, temperature and the corrosive properties of the process medium all need to be given careful consideration when both designing and selecting materials for the Thermowell to ensure complete dependability of the system.

### Design

Thermowells are designed to meet the requirements of the pressure vessel codes of British and International standards and also specific requirements of many company standards such as Shell, BP and UOP. Frequency and stress calculations in accordance with the requirements of ASME PTC19.3 can be supplied when requested.

### Materials

When selecting materials for the manufacture of Thermowells due consideration should be given to properties of the process medium. Thermowells can be supplied in the following listed materials:-

- ▶ 304 St Stl to UNS S304000
- ▶ 316 St Stl to UNS S316000
- ▶ 321 St Stl to UNS S321000
- ▶ 310 St Stl to UNS S310000
- ▶ Duplex St Stl to UNS S31803
- ▶ Super Duplex St Stl to UNS S32750 or 60
- ▶ 6% Mo. to UNS S35420
- ▶ Alloy 400 to UNS N04400

- ▶ Alloy 600 to UNS N04400
- ▶ Alloy 800 to UNS N04400
- ▶ Hastelloy C276 to UNS N04400
- ▶ Carbon Steel to ASTM A105

Other materials are available, please contact our office for further information.

### Construction

Solartron ISA Thermowells are drilled and machined from barstock or 'One Piece Forging'.

The common classification for this construction method is 'Solid Drilled Thermowells'.

Solartron ISA can supply Solid Drilled Thermowells using a number of differing process connections, namely:

- ▶ Screwed
- ▶ Flanged Connection
- ▶ Weld In
- ▶ High Pressure Hub

All Thermowells are machined on the very latest state of the art CNC deep hole drilling and profiling machines with welding by TIG & MMA to the requirements of fully supported ASME IX weld procedures.

**Screwed Thermowells** are available machined either from round bar with spanner flats machined or from hexagon bar. The connection threads can be selected to client requests in either parallel or tapered forms, conforming to API, NPT, BSP national standards.

**Flanged Thermowells** are available machined either from round bar with a welded on flange connection or from 'One Piece Forging'.

Where a welded flange connection is required this can be supplied with three differing weld geometries:

- ▶ Single 'J' preparation & weld
- ▶ Screwed & seal weld
- ▶ Double 'J' preparation & full penetration weld

Where a 'One Piece Forged' construction is required this would be machined from a single billet forged to dimensions close to the finished dimensions.

This ensures that the grain structure runs along the machined surfaces hence giving optimum mechanical strength. Flanged Thermowells in general conform to the requirements of ANSI B16.5. However other national standards are available on request.

### Special Applications

Thermowells which require surface treatments to overcome process conditions with high corrosive or abrasive elements are available on request.

- ▶ Stellite & Tungsten coating
- ▶ FEP & PTFE lining

### Identification

All Thermowells are identified with:

- ▶ Material and Cast numbers.
- ▶ Tagging to customer requirements.

### Quality Assurance

All Thermowells are subject to the following in-house statutory tests :-

- ▶ Visual and dimensional check
- ▶ Ultrasonic check to determine concentricity
- ▶ Pressure test

When requested, the following activities are available:-

- ▶ Dye Penetrant Examination
- ▶ Radiography
- ▶ Positive Material Identification
- ▶ Post Weld Heat Treatment

## Special applications

### Surface Temperature Measurement

Many situations arise in industrial applications where it is not permissible or desirable to fit an intrusive measuring device into the pipeline or vessel. In these instances the surface temperature of the pipe or vessel is measured.

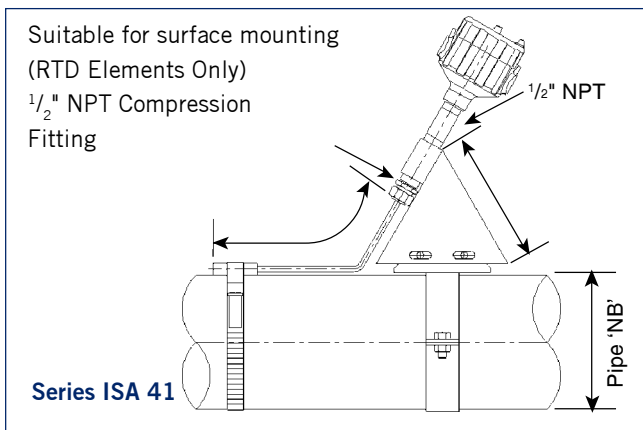
Both RTD Elements and Thermocouples can be used for these applications using differing installation methods.

Below we describe and show arrangements and characteristics.

\* However when selecting this option it must be clearly understood that surface temperature measurement is not a true indication of the temperature of the pipe or vessel contents as there are many variables which affect the actual temperatures indicated. In addition, for both devices we advise that the local area be substantially lagged.

### RTD Assemblies

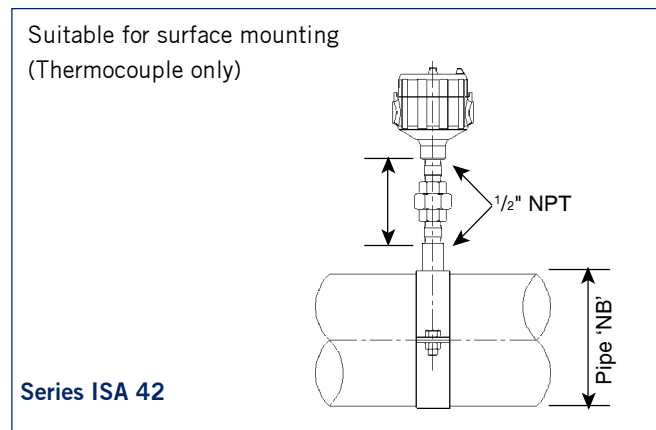
RTD Elements for surface temperature measurement require 'lying' along the surface to be monitored as the RTD bulb in the tip of the element has a sensing length of approximately 30 mm from the element tip. This portion is best located within a 'heatsink' block. This arrangement gives a robust and accurate installation



### Thermocouple Assemblies

Thermocouple Elements are a tip sensitive device and therefore the preferred method of mounting is vertical to the surface to be measured. This achieves the optimum measurement by thermal conductivity.

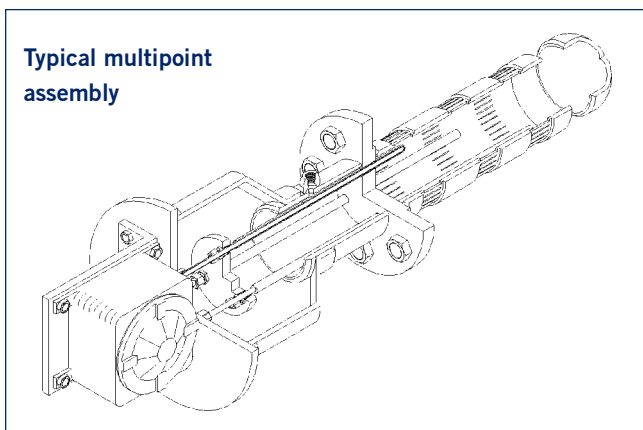
*Other arrangements for surface measurement are available on request.*



### Multipoint Assemblies

Multipoint Assemblies are used where it is required to monitor or control varying parameters within vessels or reactors. These assemblies can be supplied as Thermocouples or Resistance Thermometers.

The general arrangement for the multipoint assembly consists of the following:



### Calibration

A full calibration service is available in-house for resistance thermometers, thermocouples and all temperature transmitter types. Test equipment is fully traceable to National Standards



## RTD & T/C assemblies for oil, gas & petrochemical use

Select code as appropriate (example shown)

ISA 04

**Series No.** \* Select style of assembly from arrangements shown facing

<b>Certification</b>	S	Safe Area	I	Eexia IIC T5	→	D
	D	Eexd IIC T6	N	Exn II T5		

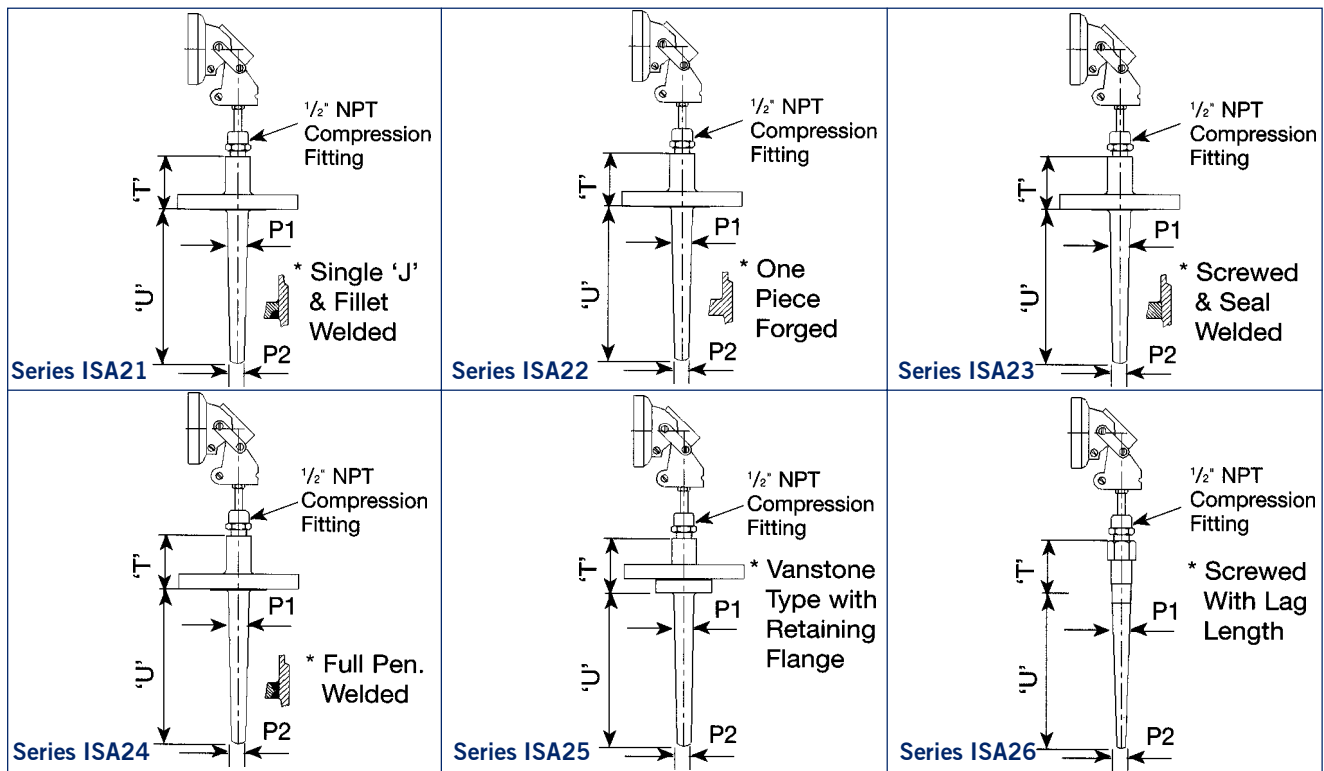
<b>Terminal Head</b>	<b>Material</b>				→	S
	S	Stainless Steel				
	A	Epoxy Painted Aluminium Alloy				
	C	Epoxy Painted Cast Iron				
	<b>Cable Entries</b>				→	S
	S	Single M20 x 1.5 mm (F)				
	D	Dual M20 x 1.5 mm (F) (Only Stainless Steel & Aluminium Alloy)				

<b>Extension Piece</b>	<b>Material</b>				→	S
	S	316 Stainless Steel				
	C	Galvanised Carbon Steel				
	<b>Length</b>				→	130
	XXX	Extension Length `N` in millimetres				

<b>Thermowell</b>	<b>Material (1st letter for Stem / 2nd letter for flange material)</b>						→	B B				
	A	304 St Stl	E	Duplex St Stl	J	Alloy 600						
	B	316 St Stl	F	Super Duplex	K	Alloy 625						
	C	321 St Stl	G	6%Mo St Stl	L	Alloy 800HT						
	D	310 St Stl	H	Alloy 400								
	<b>Process Connection</b>								→	G		
	A	25mm 150LB	H	40mm 600LB	R	3/4" BSPT						
	B	25mm 300LB	J	40mm 2500LB	S	3/4" NPT						
	C	25mm 600LB	K	50mm 150LB	T	1" BSPT						
	D	25mm 1500LB	L	50mm 300LB	U	1" NPT						
	E	25mm 2500LB	M	50mm 600LB	O	*Non Flanged designs						
	F	40mm 150LB	N	50mm 1500LB								
	G	40mm 300LB	P	50mm 2500LB								
	<b>Flange Facing</b>										→	RF
	RF	Raised Face										
	RJ	Ring Type Joint										
	00	*For Screwed, Weld In & Hub Type Wells							→	27 18		
	<b>Stem Profile</b>											
	XXXX	Insert Top P1 & Tip P2 diameters in millimetres							→	300		
	<b>Immersion Length U</b>											
XXX	Length in millimetres											
<b>Lagging Length T</b>						→	70					
XXX	Length in millimetres											

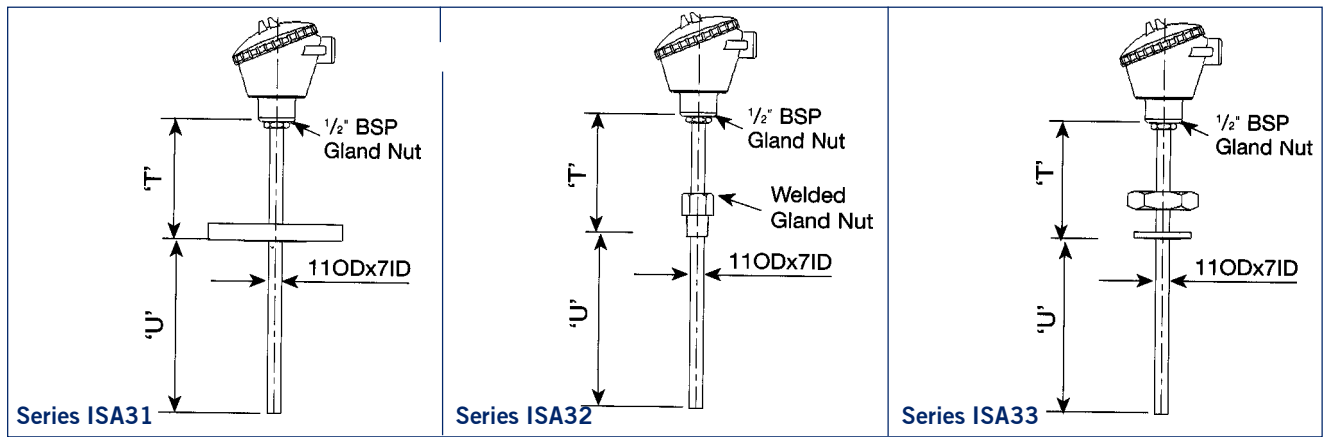
<b>Element / Transmitter</b>	<b>Type</b>				→	RX		
	RB	PT100 RTD Element (With DIN Terminal Block)						
	RX	PT100 RTD Element & Transmitter						
	TB	Thermocouple Element (With DIN Terminal Block)						
	TX	Thermocouple Element & Transmitter						
	<b>No. Circuits</b>						→	S
	S	Single (RTD wiring - 4 wire system supplied as standard)						
	D	Duplex (RTD wiring - 2 x 3 wire system supplied as standard)						
	T	Triplex (Thermocouple only)						
	<b>Calibration &amp; Tolerance</b>						→	B
	A	PT100 IEC751Class A						
	B	PT100 IEC751Class B						
	J	Type J (Fe/Con) IEC584-1Class 2 (Insulated junction as standard)						
	K	Type K (NiCr/NiAl) IEC584-1Class 2 (Insulated junction as standard)						
	T	Type T (Cu/Con) IEC584-1Class 2 (Insulated junction as standard)						
<b>Transmitter Type</b>				→	S33			
S33	ISA HMT S33 Programmable device							
0000	No Transmitter Required			→	NO P00			
<b>Range</b>								
N..P...	Negative & Positive values in C or F scale as required							
0000	Where no Transmitter is required							

## Indicator assemblies for oil, gas & petrochemical use



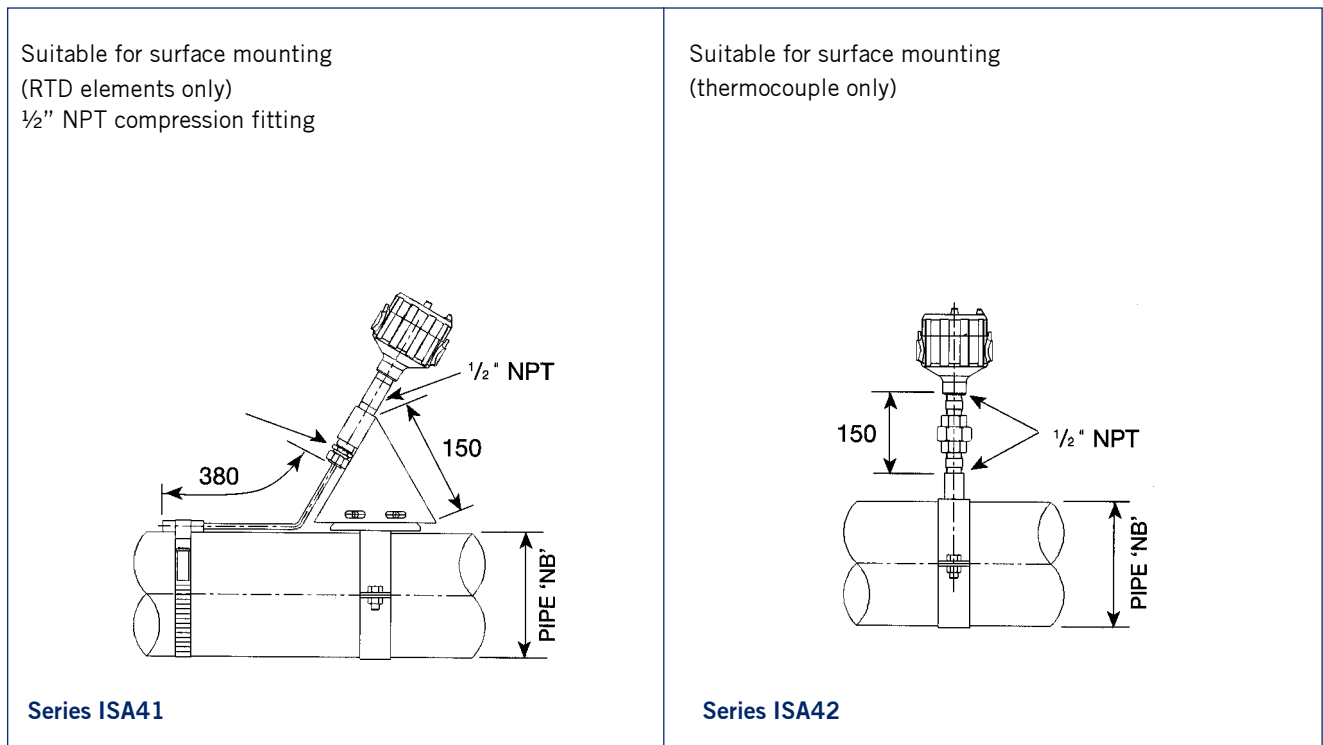
Series No.		* Select style of assembly from arrangements shown above.	Select code as appropriate (example shown)
			ISA 22
<b>Indicator</b>	Every Angle Case Material		
	A	304 St Stl	→ B
	B	316 St Stl	
	Case Diameter		
	100	100 mm diameter	→ 100
	125	125 mm diameter	
	150	150 mm diameter	
	Stem Diameter		
	6	6 mm diameter 316 St Stl	→ 6
	8	8 mm diameter 316 St Stl	
	Range		
	N..P... Negative & Positive values in C or F scale as required		→ NO P100
<b>Thermowell</b>	Material (1st letter for Stem / 2nd letter for flange material)		
	A	304 St Stl	
	B	316 St Stl	→ B B
	C	321 St Stl	
	D	310 St Stl	
	E	Duplex St Stl	
	F	Super Duplex	
	G	6%Mo St Stl	
	H	Alloy 400	
	J	Alloy 600	
	K	Alloy 625	
	L	Alloy 800HT	
	Process Connection		
	A	25mm 150LB	
	B	25mm 300LB	
	C	25mm 600LB	
	D	25mm 1500LB	
	E	25mm 2500LB	
	F	40mm 150LB	
	G	40mm 300LB	
	H	40mm 600LB	
	J	40mm 2500LB	
	K	50mm 150LB	
	L	50mm 300LB	
	M	50mm 600LB	
	N	50mm 1500LB	
	P	50mm 2500LB	
	R	3/4" BSPT	→ I
	S	3/4" NPT	
	T	1" BSPT	
	U	1" NPT	
	O	*Non Flanged designs	
	Flange Facing		
	RF	Raised Face	
	RJ	Ring Type Joint	→ RJ
	00	*For Screwed, Weld In & Hub Type Wells	
	Stem Profile		
	XXXX	Insert Top 'P1' & Tip 'P2' diameters in millimetres	→ 27 18
	Immersion Length 'U'		
	XXX	Length in millimetres	→ 300
	Lagging Length 'T'		
	XXX	Length in millimetres	→ 70

**RTD & T/C assemblies for low pressure applications**



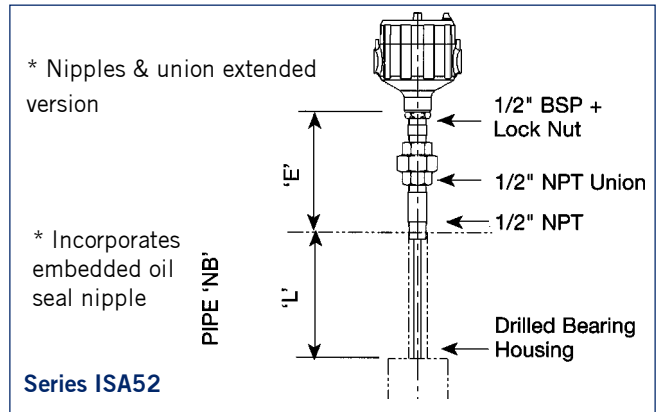
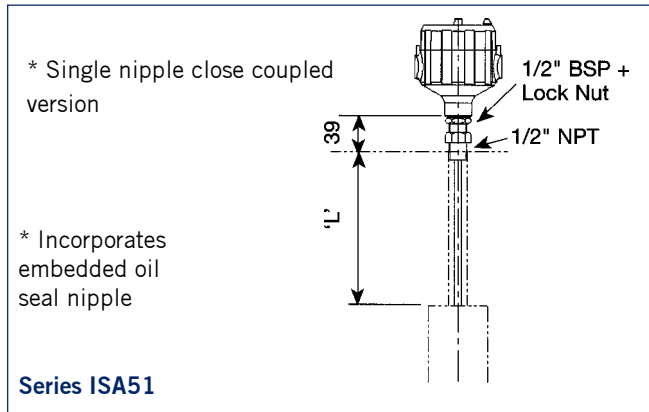
Series No.		* Select style of assembly from arrangements shown above.		Select code as appropriate (example shown)	
<b>Certification</b>	S Safe Area I Exia IIC T5	N	Exn II T5	ISA 32	
<b>Terminal Head</b>	Material A Epoxy Painted Aluminium Alloy			A	
	Cable Entries S Single M20 x 1.5 mm (F)			S	
<b>Pocket</b>	Material (1st letter for Stem / 2nd letter for flange material)			B B	
	A 304 St Stl      E 446 St Stl B 316 St Stl      F Alloy 400 C 321 St Stl      G Alloy 600 D 310 St Stl      O * For Screwed & Hygienic Pockets				
	Process Connection			H	
	A 25mm 150LB      E 50mm 150LB      I 3/4" BSPT B 25mm 300LB      F 50mm 300LB      J 3/4" NPT C 40mm 150LB      G 1/2" BSPT      K 40mm IDF Hygienic D 40mm 300LB      H 1/2" NPT      L 50 mm IDF Hygienic				
	Flange Facing			00	
	RF Raised Face RJ Ring Type Joint OO *For Screwed & Hygienic Pockets				
	Immersion Length U			200	
	XXX Length in millimetres				
	Lagging Length T			50	
	XXX Length in millimetres				
<b>Element / Transmitter</b>	Type			TB	
	RB PT100 RTD Element (With DIN Terminal Block) RX PT100 RTD Element & Transmitter TB Thermocouple Element (With DIN Terminal Block) TX Thermocouple Element & Transmitter				
	No. Circuits			D	
	S Single (RTD wiring - 4 wire system supplied as standard) D Duplex (RTD wiring - 2 x 3 wire system supplied as standard) T Triplex (Thermocouple only)				
	Calibration & Tolerance			K	
	A PT100 IEC751Class A B PT100 IEC751Class B J Type `J` (Fe/Con) IEC584-1Class `2` (Insulated junction as standard) K Type `K` (NiCr/NiAl) IEC584-1Class `2` (Insulated junction as standard) T Type `T` (Cu/Con) IEC584-1Class `2` (Insulated junction as standard)				
	Transmitter Type			0000	
	S33 ISA HMT S33 Programmable device 0000 No Transmitter Required				
	Range			0000	
	N..P... Negative & Positive values in C or F scale as required 0000 Where no Transmitter is required				

## Surface mounted RTD & T.C assemblies for oil, gas & petrochemical use



Series No.	* Select style of assembly from arrangements shown above.	Select code as appropriate (example shown)	
		<b>ISA 41</b>	
<b>Certification</b>	S Safe Area I Eexia IIC T5	→ <span style="border: 1px solid black; padding: 2px 10px;">D</span>	
	D Eexd IIC T6 N Exn II T5		
<b>Terminal Head</b>	<b>Material</b>	→ <span style="border: 1px solid black; padding: 2px 10px;">S</span>	
	S St Stl		
	A Epoxy Painted Aluminium Alloy		
	C Epoxy Painted Cast Iron		
<b>Cable Entries</b>	S Single M20 x 1.5 mm (F)	→ <span style="border: 1px solid black; padding: 2px 10px;">S</span>	
	D Dual M20 x 1.5 mm (F) (Only St Stl & Al Alloy)		
<b>Pipe Clamp</b>	<b>Size</b>	→ <span style="border: 1px solid black; padding: 2px 10px;">12</span>	
	XX Pipe N.B. inches		
<b>Element / Transmitter</b>	<b>Type</b>	→ <span style="border: 1px solid black; padding: 2px 10px;">RX</span>	
	RB PT100 RTD Element (With DIN Terminal Block)		
	RX PT100 RTD Element & Transmitter		
	TB Thermocouple Element (With DIN Terminal Block)		
	TX Thermocouple Element & Transmitter		
	<b>No. Circuits</b>		→ <span style="border: 1px solid black; padding: 2px 10px;">S</span>
	S Single (RTD wiring - 4 wire system supplied as standard)		
	D Duplex (RTD wiring - 2 x 3 wire system supplied as standard)		
	T Triplex (Thermocouple only)		
	<b>Calibration &amp; Tolerance</b>		→ <span style="border: 1px solid black; padding: 2px 10px;">A</span>
A PT100 IEC751Class A			
B PT100 IEC751Class B			
J Type J (Fe/Con) IEC584-1Class 2 (Insulated junction as standard)			
K Type K (NiCr/NiAl) IEC584-1Class 2 (Insulated junction as standard)			
T Type T (Cu/Con) IEC584-1Class 2 (Insulated junction as standard)			
<b>Transmitter Type</b>	→ <span style="border: 1px solid black; padding: 2px 10px;">S33</span>		
S33 ISA HMT S33 Programmable device			
0000 No Transmitter Required			
<b>Range</b>	→ <span style="border: 1px solid black; padding: 2px 10px;">N20 P50</span>		
N..P... Negative & Positive values in C or F scale as required			
0000 Where no Transmitter is required			

## Bearing housing RTD & T.C assemblies for oil, gas & petrochemical use



Series No.		* Select style of assembly from arrangements shown above.		Select code as appropriate (example shown)
<b>Certification</b>	S Safe Area I Eexia IIC T5 D Eexd IIC T6 N Exn II T5			ISA 51
<b>Terminal Head</b>	Material S Stainless Steel A Epoxy Painted Aluminium Alloy C Epoxy Painted Cast Iron Cable Entries S Single M20 x 1.5 mm (F) D Dual M20 x 1.5 mm (F) (Only Stainless Steel & Aluminium Alloy)			S
<b>Extension Piece</b>	Material S Single sealing nipple E Nipple / Union / Nipple Length XXX Extension Length 'N' in millimetres ('E' option only)			E
<b>Bearing Hole</b>	Depth Length L XXX Length L in millimetres Diameter (Tip diameter to suit) 3 3 mm x 25 mm long 4 4.5 mm x 25 mm long 6 6 mm x 25 mm long			115
<b>Element / Transmitter</b>	Type RB PT100 RTD Element (With DIN Terminal Block) RX PT100 RTD Element & Transmitter TB Thermocouple Element (With DIN Terminal Block) TX Thermocouple Element & Transmitter No. Circuits S Single (RTD wiring - 4 wire system supplied as standard) D Duplex (RTD wiring - 2 x 3 wire system supplied as standard) T Triplex (Thermocouple only) Calibration & Tolerance A PT100 IEC751Class 'A' B PT100 IEC751Class 'B' J Type 'J' (Fe/Con) IEC584-1Class '2' (Insulated junction as standard) K Type 'K' (NiCr/NiAl) IEC584-1Class '2' (Insulated junction as standard) T Type 'T' (Cu/Con) IEC584-1Class '2' (Insulated junction as standard) Transmitter Type S33 ISA HMT S33 Programmable device 0000 No Transmitter Required Range N..P... Negative & Positive values in C or F scale as required 0000 Where no Transmitter is required			90
				4
				RX
				D
				A
				2 X S33
				NO P150

## Products and Services from Solartron

### **Solartron ISA differential pressure range includes;-**

orifice plates, carrier assemblies, flange assemblies, venturi tubes, meter runs, dall tubes, flow nozzles, pitot tubes, condensate chambers and the ISA ProFlo (single chamber orifice fitting).

### **Wet gas flow measurement**

Wet gas, sometimes referred to as high GVF (Gas Void Fraction) metering now plays an important role in reservoir management and allocation of hydrocarbon gas fields in most new field developments.

Solartron ISA has been actively involved in the development of wet gas metering techniques for both topside and subsea applications and can supply meters where prior knowledge of liquid fraction is no longer necessary.

### **Multiphase flow measurement**

Multiphase flow measurement, where oil, gas and water flow rates are required to replace traditional well testing with separators or for reservoir management, has been gaining acceptance on a worldwide basis. Solartron ISA can provide multiphase metering solutions for a wide range of flow regimes and liquid fractions.

### **Flow computing**

The modern flow computer is critical to the accuracy, reliability and security of fiscal and custody transfer flow measurement of liquid and gas products. As well as being the engine room of the metering skid the flow computer also provides the required reports and data to the supervisory system.

### **Density**

Solartron Mobrey industrial densitometers are built to tackle the most difficult and demanding process and metering applications. Rugged and reliable with very low maintenance, they have become the industry standard for on-line density measurement.

Solartron Mobrey has comprehensive ranges of suspended solids and sludge density monitors for use in municipal and industrial water and effluent processes.

### **Viscosity**

Solartron Mobrey specialises in the manufacture of process viscosity transmitters and analysers, including complete analyser systems. The products are replacing many existing technologies and are being used in applications where previously only laboratory measurements could be made.

### **Level**

A leading manufacturer of level instrumentation, Solartron Mobrey offers one of the widest ranges of measuring techniques available. From the industry standard Mobrey float level switch to smart/intelligent ultrasonic instruments and radar level transmitters, Solartron Mobrey supplies product to the process and utility markets worldwide.



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