

## TB/TC, /TI, /TO Thermistor Temperature Sensors



### TB/TC, /TI, /TO Thermistor Temperature

#### Description

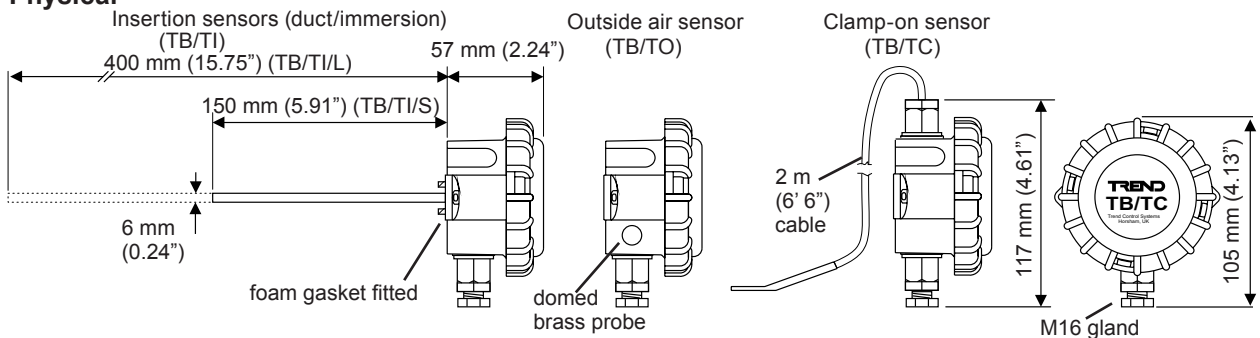
A range of low cost thermistor sensors comprising insertion, clamp-on, and outside air versions. A quick-release lid makes the TB/T.. range easy to install.

The insertion sensor may be used for duct or immersion purposes. It has a 6 mm diameter brass probe which is suitable for retrofit immersion applications and will fit most existing pockets (universal fitting kit option). Brass and stainless steel pockets are available. A foam gasket is fitted, and an adjustable depth flange option is available for its use as a duct sensor, enabling the insertion depth to be adjusted.

#### Features

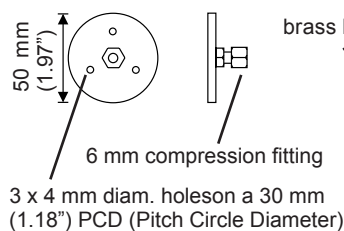
- Low cost
- High quality thermistors
- Brass probes
- M20 conduit entry with M16 cable gland
- IP67 housing
- Quarter turn quick release lid
- Easy to wire
- Universal fitting kit option for retrofit of immersion sensors
- Adjustable insertion depth flange option for duct sensors

#### Physical



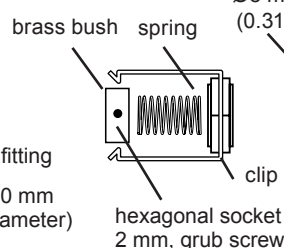
#### Adjustable Depth Flange (ACC/DF)

adjustable insertion depth for duct sensor use



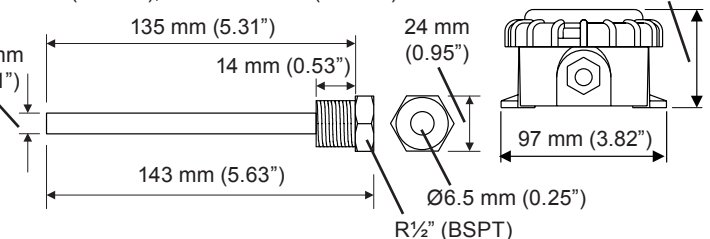
#### Universal Fitting Kit (ACC/UF)

for immersion sensor use in existing pockets



#### Pockets

Brass (WB150), Stainless Steel (WS150)



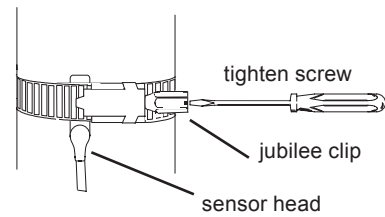
## INSTALLATION

### TB/TC

#### Sensor Head

Choose an accessible location for the sensor head, where the element will make good contact with the surface that is to be measured. The probe temperature range is  $-40\text{ }^{\circ}\text{C}$  to  $+100\text{ }^{\circ}\text{C}$  ( $-40\text{ }^{\circ}\text{F}$  to  $+212\text{ }^{\circ}\text{F}$ ). However the sensor's measurement range is  $-30\text{ }^{\circ}\text{C}$  to  $+100\text{ }^{\circ}\text{C}$  ( $-22\text{ }^{\circ}\text{F}$  to  $+212\text{ }^{\circ}\text{F}$ ).

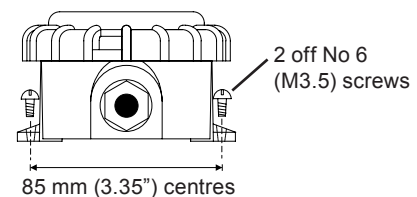
Strap the sensor head to the pipe using the jubilee clip provided. Wrap the clip around the pipe, pass the sensor head under the strap, and tighten the screw (as shown). Ensure that good contact is made between the sensor head and the surface. Where possible use a thermally conductive paste to ensure a good thermal contact and apply any insulation over both sensing element and pipe.



#### Junction Box

The junction box should be mounted on a flat surface. Choose a position which is a maximum of 2 m (6½') away from the sensor head. The permitted ambient temperature range is  $-40\text{ }^{\circ}\text{C}$  to  $+50\text{ }^{\circ}\text{C}$  ( $-40\text{ }^{\circ}\text{F}$  to  $+122\text{ }^{\circ}\text{F}$ ). Avoid direct contact with steam.

Screw the junction box in position using suitable wall plugs if required and 2 off No. 6 (M3.5) screws, (85 mm, 3.35" fixing centres).



### TB/TI

#### Mechanical

The probe temperature range is  $-40\text{ }^{\circ}\text{C}$  to  $+110\text{ }^{\circ}\text{C}$  ( $-40\text{ }^{\circ}\text{F}$  to  $+230\text{ }^{\circ}\text{F}$ ); the box range is  $-40\text{ }^{\circ}\text{C}$  to  $+50\text{ }^{\circ}\text{C}$  ( $-40\text{ }^{\circ}\text{F}$  to  $122\text{ }^{\circ}\text{F}$ ). However the sensor's measurement range is  $-30\text{ }^{\circ}\text{C}$  to  $+110\text{ }^{\circ}\text{C}$  ( $-22\text{ }^{\circ}\text{F}$  to  $+230\text{ }^{\circ}\text{F}$ ).

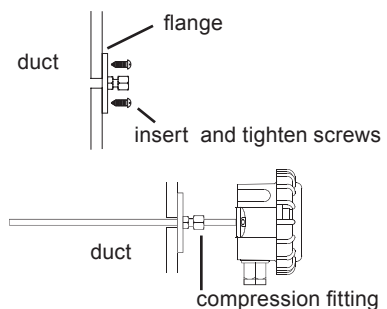
#### Use as a Duct Sensor

Choose a location where the sensor probe will lie in the airstream to be measured.

##### Sensor with optional flange

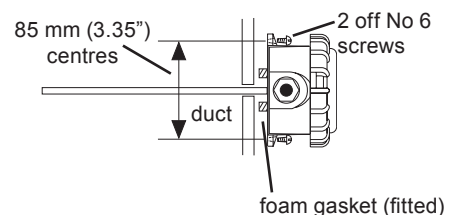
If the depth of the probe is to be adjusted, then the sensor must be mounted using the optional flange. Drill a 7 mm (0.28") diameter hole in the duct and use the mounting flange to mark the position of the 3 fixing holes. Drill the 3 pilot holes and mount flange with 3 off No. 6 x 3/4 S/S screws.

Insert the sensor probe through the flange into the duct to desired depth and tighten the compression fitting.



##### Sensor direct onto the duct

If the depth of the probe is not to be adjusted then the sensor can be mounted directly on to the duct. Drill a 7 mm diameter hole in the duct and mark the position of the 2 mounting holes with 85 mm (3.35") mounting centres. Drill 2 pilot holes in the positions marked. Insert the sensor probe into the duct, and screw to the duct with 2 off No. 6 x 3/4 S/S screws.



#### Use as an Immersion Sensor

##### New Pocket

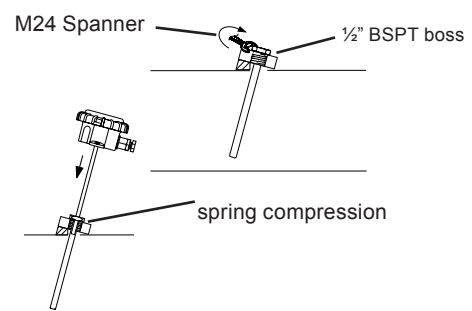
Choose an accessible location for the sensor pocket where it will lie in the liquid to be measured. Ensure no stratification in the liquid flow being measured (e.g. downstream of mixing valves or junctions). If used for chilled water ensure pocket is sealed around probe or fill pocket with thermally conducting oil to avoid the build up of condensation in bottom of pocket.

*Note that the Brass (WB150) and Stainless Steel (WS150) pockets are not suitable for use in a chlorine rich environment.*

Screw the pocket into a ½" BSPT threaded boss using M24 spanner. Apply sealant to boss thread. If the boss is threaded incorrectly, an adaptor should be used.

Slide sensor probe into pocket against spring compression with the cable entry at the desired angle.

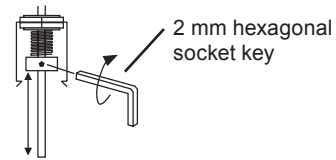
Ensure that the end of the probe is hard against the end of the pocket.



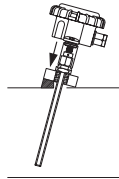
**Retrofit to existing pocket**

The Universal Fitting Kit enables sensor to be mounted in a number of different pocket types.

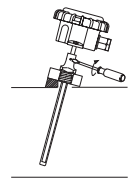
Adjust position of brass bush on probe so that probe inserts fully into pocket using 2 mm hexagonal socket key.



For pockets with a clip retaining groove simply insert probe into pocket and pull the metal clip over the top of the pocket to engage in the groove.



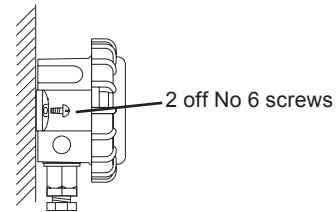
For pockets which hold sensor by a grub screw, tighten pocket grub screw onto brass bush. If necessary, spring and clip can be removed.



**TB/TO**

**Mechanical**

Choose an accessible location on a north facing wall (unless in the southern hemisphere), ensuring that the sensor is sited away from direct sunlight, and any heat sources which may come from the building - e.g. heating flues, open windows etc. Do not install the sensor in a location where it will be exposed to temperatures outside the box's temperature range (-40 °C to +50 °C, -40 °F to 122 °F). However the sensor's measurement range is -30 °C to +50 °C (-22 °F to +122 °F).



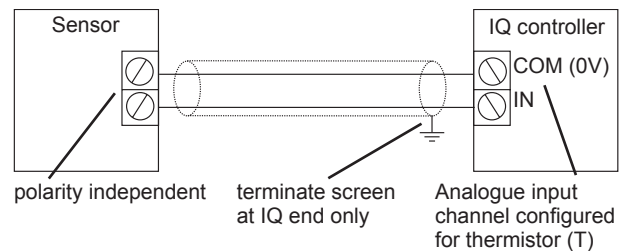
Mark the position of the 2 mounting holes with 85 mm (3.35") mounting centres. Drill holes in the positions marked. Mount the sensor on the wall using suitable wall plugs and 2 off No 6 screws.

**CONNECTIONS**

**Electrical**

Connect to the IQ controller is as below:

- (1) Remove quarter turn quick release lid.
- (2) Insert cable through cable gland and connect signal wires as shown using either polarity.
- (3) The cable screen should be terminated at the controller.




Full installation details are given in the individual installation instructions numbered as follows:

- TB/TO Outside Air Thermistor Temperature Sensor Installation Instructions - (TG200725)
- TB/TC Clamp-on Thermistor Temperature Sensor Installation Instructions - (TG200726)
- TB/TI Insertion Thermistor Temperature Sensor Installation Instructions - (TG200727)

**ORDER CODES**

<b>TB/TO</b>	Outside Air Thermistor Temperature Sensor
<b>TB/TI/S</b>	Insertion Thermistor Temperature Sensor (for duct or immersion use) with foam gasket fitted (short - 150 mm, 5.91")
<b>TB/TI/L</b>	Insertion Thermistor Temperature Sensor (for duct use) with foam gasket fitted (long - 400 mm, 15.75")
<b>TB/TC</b>	Clamp-on Thermistor Temperature Sensor supplied with jubilee clip
<b>WS150</b>	6 mm stainless steel pocket for TB/TI (immersion use)
<b>WB150</b>	6 mm brass pocket for TB/TI (immersion use)
<b>ACC/UF</b>	Universal fitting kit (retrofit to existing pockets) for TB/TI (immersion use)
<b>ACC/DF</b>	Adjustable depth flange for TB/TI (duct use)
<b>TB/TI-S/BOX12</b>	Pack of 12 TB/TI/S
<b>TB/TI-L/BOX12</b>	Pack of 12 TB/TI/L

**DISPOSAL**



**WEEE Directive :**

At the end of their useful life the packaging and product should be disposed of by a suitable recycling centre.

**Do not dispose of with normal household waste.**

Do not burn.

**SPECIFICATIONS**

Sensing element :Thermistor 10 kΩ at 25 °C  
 Thermistor accuracy  
 -10 °C to +40 °C :±0.43 °C (14 °F to +104 °F, ±0.77 °F)  
 -30 °C to +50 °C :±0.59 °C (-22 °F to +122 °F, ±1.06 °F)  
 -30 °C to +100 °C :±1.11 °C (-22 °F to +212 °F, ±2.0 °F)  
 -30 °C to +110 °C :±1.28 °C (-22 °F to +230 °F, ±2.30 °F)  
 Ambient limits  
 box :-40 °C to +50 °C (-40 °F to +122 °F)  
 /TC probe :-40 °C to +100 °C (-40 °F to +212 °F)  
 /TI probe :-40 °C to +110 °C (-40 °F to +230 °F)  
 Humidity :0 to 95 %RH  
 Measurement ranges  
 /TO :-30 °C to +50 °C (-22 °F to +122 °F)  
 /TC :-30 °C to +100 °C (-22 °F to +212 °F)  
 /TI :-30 °C to +110 °C (-22 °F to +230 °F)  
 Cable entry :M20 conduit with M16 cable gland  
 Connections :1 part screw terminals for 0.5 to 2.5 mm<sup>2</sup> cross section (20 to 14 AWG) cable  
 Pockets :Spring compression  
 WS150 :Maximum pressure 25 bar  
 WB150 :Maximum pressure 13 bar  
 Dimensions  
 /TC :57 mm (2.24") x 117 mm (4.61") max diameter, cable 2 m (6'6")  
 /TO :57 mm (2.24") x 102 mm (4.02") max diameter  
 /TI :-(box)57 mm (2.24") x 105 mm (4.13"), /S probe 150 mm (5.91") x 6 mm (0.24") /L probe 400 mm (15.75") x 6 mm (0.24")  
 Material  
 Enclosure :Impact resistant ABS  
 /TI, /TO probes :Brass  
 /TC probe :Plated copper  
 WS150 :pocket, stainless steel  
 WB150 :pocket, brass  
 Environmental Protection:IP67 (NEMA6)  
 EMC :EN61326-1:2006

**Input channels and sensor scaling**

For IQ controllers link input channel for thermistor, T, and set up the sensor type scaling; the recommended method of setting the sensor type scaling is to use SET.  
 For all IQ2 series controllers with firmware of version 2.1 or greater, or IQ3/4 series controllers, one of the following SET Unique Sensor References should be used:

- Thermistor TBTO** (-10 °C to +40 °C)
- Thermistor TBTO F** (+14 °F to +104 °F)
- Thermistor TBTC** (-30 °C to +100 °C)
- Thermistor TBTC F** (-22 °F to +212 °F)
- Thermistor TBTI** (-30 °C to +110 °C)
- Thermistor TBTI F** (-22 °F to +230 °F)

Alternatively use sensor scaling mode 5, characterise, and enter the scaling manually as defined in the tables below. Note that for IQ3/4 the scaling mode and exponent (E) don't need to be set up.

-30 °C to +110 °C (-22 °F to +230 °F)      -30 °C to +100 °C (-22 °F to +212 °F)

Units:		°C	°F
Y	Input type	1 (therm V)	
E	Exponent	3	
U	Upper	115	239
L	Lower	-35	-31
P	Points	20	
x	lx	Ox	
1	0.480	110	230
2	0.549	105	220
3	0.630	100	212
4	0.724	95	203
5	0.833	9	194
6	0.961	85	185
7	1.110	80	176
8	1.484	70	158
9	1.985	60	140
10	2.641	50	122
11	3.470	40	104
12	4.460	30	86
13	6.663	10	50
14	7.668	0	32
15	8.102	-5	23
16	8.482	-10	14
17	8.807	-15	5
18	9.078	-20	-4
19	9.299	-25	-13
20	9.476	-30	-22

-30 °C to +50 °C (-22 °F to +122 °F)

Units:		°C	°F
Y	Input type	1 (therm V)	
E	Exponent	3	
U	Upper	55	131
L	Lower	-35	-31
P	Points	11	
x	lx	Ox	
1	2.641	50	122
2	3.470	40	104
3	4.460	30	86
4	6.663	10	50
5	7.668	0	32
6	8.102	-5	23
7	8.482	-10	14
8	8.807	-15	5
9	9.078	-20	-4
10	9.299	-25	-13
11	9.476	-30	-22

For all other IQ controllers see the Sensor Scaling Reference Card, TB100521A.

-30 °C to +100 °C (-22 °F to +212 °F)

Units:		°C	°F
Y	Input type	1 (therm V)	
E	Exponent	3	
U	Upper	105	221
L	Lower	-35	-31
P	Points	18	
x	lx	Ox	
1	0.630	100	212
2	0.724	95	203
3	0.833	90	194
4	0.961	85	185
5	1.110	80	176
6	1.484	70	158
7	1.985	60	140
8	2.641	50	122
9	3.470	40	104
10	4.460	30	86
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13	8.102	-5	23
14	8.482	-10	14
15	8.807	-15	5
16	9.078	-20	-4
17	9.299	-25	-13
18	9.476	-30	-22

-10 °C to +40 °C (14 °F to +104 °F)

Units:		°C	°F
Y	Input type	1 (therm V)	
E	Exponent	3	
U	Upper	45	113
L	Lower	-15	-5
P	Points	6	
x	lx	Ox	
1	3.470	40	104
2	4.460	30	86
3	6.663	10	50
4	7.668	0	32
5	8.102	-5	23
6	8.482	-10	14

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**Trend Control Systems Limited**

Albery House, Springfield Road, Horsham, West Sussex, RH12 2PQ, UK. Tel:+44 (0)1403 211888 Fax:+44 (0)1403 241608 www.trendcontrols.com