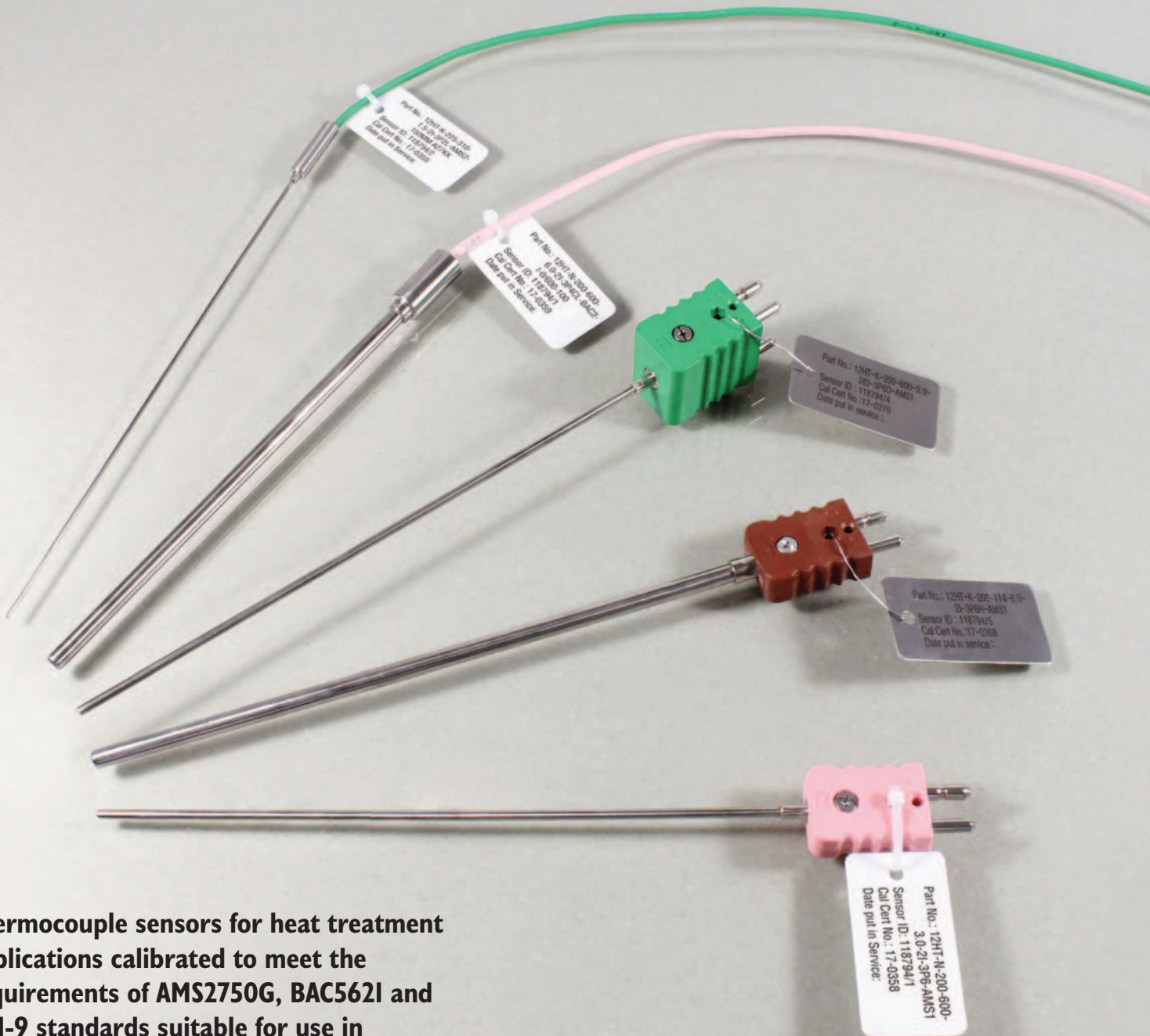




## Calibrated Thermocouples for Heat Treatment Applications - Type 12HT



**Thermocouple sensors for heat treatment applications calibrated to meet the requirements of AMS2750G, BAC562I and CQI-9 standards suitable for use in Temperature Uniformity Surveys (TUS), System Accuracy Tests (SAT) and as Control, Monitoring and Load Sensors**

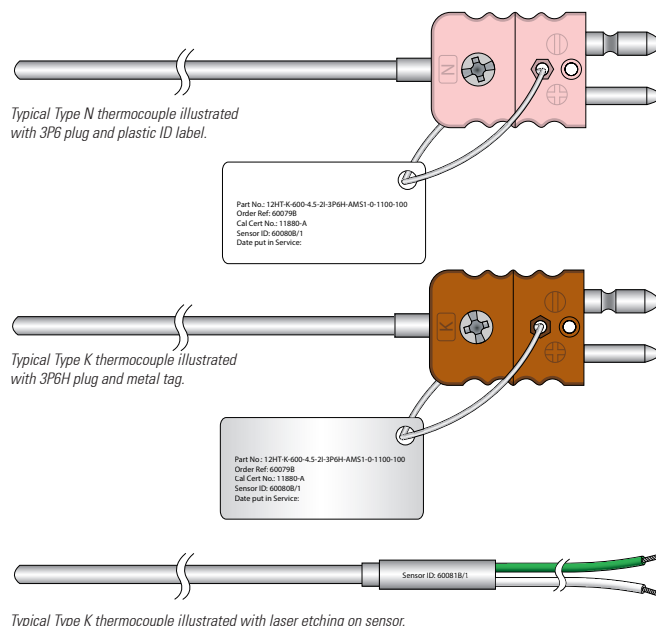
# Type 12HT Calibrated Heat Treatment Thermocouples

## Calibrated Mineral Insulated Thermocouples

Our range of **AMS2750G**, **BAC5621** or **CQI-9** Compliant mineral insulated thermocouples are designed to meet the high quality and accuracies demanded for heat treatment applications within the Aerospace industry. Through careful material selection and a comprehensive calibration program in our ISO17025 UKAS accredited laboratory, we can offer a wide range of sheath diameters and materials from stock with quick manufacture times. Their semi rigid construction allows them to be bent and formed to suit particular applications without impairing performance.

- Calibrated in line with **AMS2750G**, **BAC5621** or **CQI-9** requirements
- Suitable for use in **Temperature Uniformity Surveys (TUS)**, **System Accuracy Tests (SAT)** or as **Control, Recording & Monitoring** and **Load** sensors
- Certification designed to satisfy the common requirements from **NADCAP** audits
- Batch calibration certificate supplied as standard
- Sensors are individually tagged and numbered for full traceability
- Available in thermocouple types **N**, **K**, **T** and **J**
- Wide range of sheath diameters and materials

**AMS2750G,  
BAC5621 or CQI-9  
certified**



| SECTION 1 | Thermocouple Type                            | Temperature Range |                 |
|-----------|----------------------------------------------|-------------------|-----------------|
|           |                                              | (continuous)      | (short term)    |
|           | <b>N</b> Nicrosil vs Nisil                   | 0°C to +1200°C    | -270 to +1300°C |
|           | <b>K</b> Nickel Chromium vs Nickel Aluminium | 0°C to +1100°C    | -180 to +1350°C |
|           | <b>T</b> Copper vs Constantan                | -185°C to +400°C  | -250 to +400°C  |
|           | <b>J</b> Iron vs Constantan                  | +50°C to +700°C   | -180 to +750°C  |

| SECTION 2 | Sheath Specifications                                                                                         | Operational Properties                                                                                                                                                                                          | Maximum Temperature |
|-----------|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
|           | <b>600</b> Inconel 600*<br>Nickel/Chromium/Iron alloy<br>To BS 3074 : 1974, Werkstoff No : 2.4816             | Used in severely corrosive atmospheres to elevated temperatures. Has good resistance to oxidation. Do not use in sulphur bearing atmospheres above 550°C.                                                       | <b>1100°C</b>       |
|           | <b>114</b> Microtherm D™<br>Nickel/Chromium/Silicon/Molybdenum<br>73/22/1.4/3                                 | For high temperature Type 'K' and almost all Type 'N'. Very good high temperature strength. Excellent in oxidising, carburising, reducing and vacuum atmospheres. Do not use in sulphur containing atmospheres. | <b>1250°C</b>       |
|           | <b>310</b> Grade 310 Stainless Steel<br>25/20 Nickel/Chromium<br>To BS 970 Part 4 : 1970                      | Good high temperature corrosion resistance and suitable for use in sulphur bearing atmospheres. Has high oxidation resistance which is maintained if subsequent manipulation is strictly limited.               | <b>1100°C</b>       |
|           | <b>321</b> Grade 321 Stainless Steel<br>18/8/1 Nickel/Chromium/Titanium Stabilised<br>To BS 970 Part 4 : 1970 | Very good corrosion resistance throughout the operating temperature range. Suited to a wide range of industrial applications. High ductility.                                                                   | <b>800°C</b>        |

| SECTION 3 | Standard Sizes | Sheath Diameter (mm) | Sheath Diameter (inches) |
|-----------|----------------|----------------------|--------------------------|
|           |                | 1.5mm                | 0.059"                   |
|           |                | 1.6mm (1/16")        | 0.063"                   |
|           |                | 2.0mm                | 0.079"                   |
|           |                | 3.0mm                | 0.118"                   |
|           |                | 3.2mm (1/8")         | 0.125"                   |
|           |                | 4.5mm                | 0.177"                   |
|           |                | 6.0mm                | 0.236"                   |
|           |                | 6.35mm (1/4")        | 0.250"                   |
|           |                | 8.0mm                | 0.315"                   |

| SECTION 4 | Types of Sensing Junction |                                                                                                                                                                                                                                     |
|-----------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | <b>2I</b>                 | <b>Insulated</b><br>The hot (measuring) junction is insulated from the sheath and this gives a floating output with a typical insulation resistance in excess of 100 megohms. Enter <b>2I</b> for simplex or <b>2ID</b> for duplex. |
|           | <b>2ID</b>                |                                                                                                                                                                                                                                     |

| SECTION 5 | Tagging   |                                                                                                                                          |
|-----------|-----------|------------------------------------------------------------------------------------------------------------------------------------------|
|           | <b>PL</b> | <br><b>Plastic ID Label</b><br>Rated 70°C. For use with all end seals.                                                                   |
|           | <b>ML</b> | <br><b>Laser Etched Metal Tag</b><br>For use with all end seals above 250°C.                                                             |
|           | <b>EL</b> | <br><b>Laser Etching on Sensor</b><br>Laser etch of serial number. This can be instead of or in addition to either of the options above. |

| SECTION 6 | Calibration Accuracies |                                                                                                                |                                                                                                                            |                                                                                                                                                                                                                                                                                                                              |
|-----------|------------------------|----------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | Standard               | Accuracy Supplied                                                                                              | Permitted Applications                                                                                                     | Certification                                                                                                                                                                                                                                                                                                                |
|           | <b>AMS1</b> AMS2750G   | ±1.1°C or 0.4% of reading (whichever is greater). End to end deviation of material batch no greater than 1.1°C | Temperature Uniformity Survey (TUS)<br>System Accuracy Test (SAT)<br>Control, Monitoring & Recording (Class 1 & 2)         | An in-house 3 page report for the start/end of batch, with all the information NADCAP auditors require (please refer to the Calibration Details section for a detailed explanation). The temperature ranges of each thermocouple type are listed below.<br><br>Types K and N: 0-1200°C<br>Type T: 0-300°C<br>Type J: 0-700°C |
|           | <b>BAC2</b> BAC5621    | ±1.1°C <538°C or 0.4% of reading >538°C. End to end deviation of material batch no greater than 0.6°C          | Secondary/Field Test Sensor                                                                                                |                                                                                                                                                                                                                                                                                                                              |
|           | <b>CQI1</b> CQI-9      | ±1.1°C or 0.4% of reading (whichever is greater). End to end deviation of material batch no greater than 1.1°C | Temperature Uniformity Survey (TUS)<br>System Accuracy Test (SAT)<br>Control, Monitoring & Recording (Class 1 & 2)<br>Load | Please note: UKAS calibration and individual point calibration is available on request. Please contact us for details.                                                                                                                                                                                                       |

# Calibrated Heat Treatment Thermocouples Type 12HT

| SECTION 7 | Types of End Seal Configuration |                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                |
|-----------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | Diagram                         | Specification                                                                                                                                                                                                                                                                                                                                                                                                                                  | Diagram | Specification                                                                                                                                                                                                                                  |
| 3P1       |                                 | <b>Internal Seal with Bare Conductors</b><br>for all sheath diameters<br><br><b>3P1</b> Maximum end seal temperature 135°C<br><b>3P1B</b> Maximum end seal temperature 300°C                                                                                                                                                                                                                                                                   |         | <b>Standard 2-pin (round) Plug</b><br>for sheath diameters between 1.5mm & 8.0mm<br><br><b>3P6</b> Plug rated to 220°C<br><b>3P6H</b> Plug rated to 300°C<br><b>3P6UH</b> Plug rated to 425°C<br><b>3P6C</b> Plug rated to 600°C               |
|           |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                |
| 3P2L      |                                 | <b>Crimp on Stainless Steel Pot Seal</b><br>for sheath diameters up to 3.0mm<br><br><b>3P2L</b> Pot Seal rated to 135°C<br><b>3P2LA</b> Pot Seal rated to 235°C<br><b>3P2LB</b> Pot Seal rated to 300°C<br><i>see section 9 if extension leads are required</i>                                                                                                                                                                                |         | <b>Miniature 2-pin (flat) Plug</b><br>for sheath diameters between 1.5mm & 3.0mm<br><br><b>3P6M</b> Plug rated to 220°C<br><b>3P6MH</b> Plug rated to 300°C<br><b>3P6MUH</b> Plug rated to 425°C<br><b>3P6MC</b> Plug rated to 600°C           |
|           |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                |
| 3P2TRL    |                                 | <b>Stainless Steel Pot Seal with Anti Chafe Spring</b><br>for sheath diameters up to 3.0mm<br><br><b>3P2TRL</b> Pot Seal rated to 135°C<br><b>3P2TRLA</b> Pot Seal rated to 235°C<br><b>3P2TRLB</b> Pot Seal rated to 300°C<br><i>see section 9 if extension leads are required</i><br><br><small>* It is unlikely that any benefit would be derived from specifying this type of pot seal with the standard 100mm tails.</small>              |         | <b>Standard 2-pin (round) Socket</b><br>for sheath diameters between 1.5mm & 8.0mm<br><br><b>3P7</b> Socket rated to 220°C<br><b>3P7H</b> Socket rated to 300°C<br><b>3P7UH</b> Socket rated to 425°C<br><b>3P7C</b> Socket rated to 600°C     |
|           |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                |
| 3P4CL     |                                 | <b>Crimp on Stainless Steel Pot Seal</b><br>for sheath diameters between 3.0mm & 8.0mm<br><br><b>3P4CL</b> Pot Seal rated to 135°C<br><b>3P4CLA</b> Pot Seal rated to 235°C<br><b>3P4CLB</b> Pot Seal rated to 300°C<br><i>see section 9 if extension leads are required</i>                                                                                                                                                                   |         | <b>Miniature 2-pin (flat) Socket</b><br>for sheath diameters between 1.5mm & 3.0mm<br><br><b>3P7M</b> Socket rated to 220°C<br><b>3P7MH</b> Socket rated to 300°C<br><b>3P7MUH</b> Socket rated to 425°C<br><b>3P7MC</b> Socket rated to 600°C |
|           |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                |
| 3P4CTRL   |                                 | <b>Stainless Steel Pot Seal with Anti Chafe Spring</b><br>for sheath diameters between 3.0mm & 8.0mm<br><br><b>3P4CTRL</b> Pot Seal rated to 135°C<br><b>3P4CTRLA</b> Pot Seal rated to 235°C<br><b>3P4CTRLB</b> Pot Seal rated to 300°C<br><i>see section 9 if extension leads are required</i><br><br><small>* It is unlikely that any benefit would be derived from specifying this type of pot seal with the standard 100mm tails.</small> |         | <b>Standard DUPLEX 2-pin (round) Plug</b><br>for sheath diameters 6.0mm & 8.0mm<br><br><b>3P6D</b> Plug rated to 220°C<br><b>3P6DH</b> Plug rated to 300°C<br><b>3P6DUH</b> Plug rated to 425°C<br><b>3P6DC</b> Plug rated to 600°C            |
|           |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                |         |                                                                                                                                                                                                                                                |

| SECTION 8 | Extension Cables |                                                                                                                                                                                                        |         |                                                                                                                                                                                                                                                                                                    |
|-----------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | Diagram          | Specification                                                                                                                                                                                          | Diagram | Specification                                                                                                                                                                                                                                                                                      |
| A30       |                  | <b>HR PVC Flat Twin (105°C)</b><br>One pair of 7/0.2mm stranded conductors HR PVC insulated. Pair laid flat and HR PVC sheathed overall.                                                               |         | <b>Fibreglass Flat Twin (480°C)</b><br>One pair of solid 1/0.5mm conductors. Cores double glass fibre lapped, braided and silicone varnished. Pair laid flat, glass fibre braided overall and silicone varnished.                                                                                  |
|           |                  |                                                                                                                                                                                                        |         |                                                                                                                                                                                                                                                                                                    |
| A27       |                  | <b>HR PVC Twisted Pair with Screen (105°C)</b><br>One pair of 7/0.2mm stranded conductors HR PVC insulated. Pair twisted, screened with Mylar® aluminium tape and drain wire. HR PVC sheathed overall. |         | <b>Fibreglass Flat Twin (480°C)</b><br>One pair of 7/0.2mm stranded conductors double glass fibre lapped, braided and varnished. Pair laid flat, glass fibre braided and varnished.                                                                                                                |
|           |                  |                                                                                                                                                                                                        |         |                                                                                                                                                                                                                                                                                                    |
| B20       |                  | <b>PFA Flat Twin (250°C)</b><br>One pair of 1/0.5mm solid conductors PFA insulated. Pair laid flat. PFA sheathed overall.                                                                              |         | <b>Fibreglass Flat Twin with Steel Braid (480°C)</b><br>One pair of 7/0.2mm stranded conductors double glass fibre lapped, braided and varnished. Pair laid flat, glass fibre braided and varnished. Stainless steel wire braided overall.                                                         |
|           |                  |                                                                                                                                                                                                        |         |                                                                                                                                                                                                                                                                                                    |
| B50       |                  | <b>PFA Flat Twin (250°C)</b><br>One pair of 7/0.2mm stranded conductors PFA insulated. Pair laid flat. PFA sheathed overall.                                                                           |         | <b>PVC 2-Pair - for Duplex Sensors (105°C)</b><br>Two pairs of 7/0.2mm stranded conductors FR PVC insulated. Pairs twisted and individually screened with Mylar® aluminium tape with a drainwire. Pairs laid up and screened overall with Mylar® aluminium tape with a drainwire. FR PVC sheathed. |
|           |                  |                                                                                                                                                                                                        |         |                                                                                                                                                                                                                                                                                                    |
| B80       |                  | <b>PFA Twisted Pair with Screen (250°C)</b><br>One pair of 7/0.2mm stranded conductors PFA insulated. Pair twisted, screened with Mylar® aluminium tape and drain wire with a PFA sheath overall.      |         | <b>PFA 2-Pair - for Duplex Sensors (250°C)</b><br>Two pairs of 7/0.2mm stranded conductors PFA insulated. Pairs twisted and bunched and screened with Mylar® aluminium tape with a drainwire. PFA sheathed.                                                                                        |
|           |                  |                                                                                                                                                                                                        |         |                                                                                                                                                                                                                                                                                                    |

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.

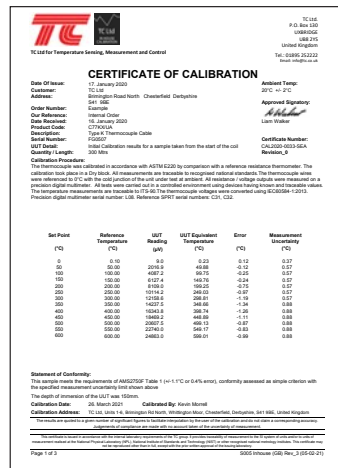
'HR' = Heat Resistant, 'FR' = Flame Retardant

| Order Code - Example |                                      |   |                          |                                    |   |                                    |                                     |     |                                         |    |                                    |                                         |
|----------------------|--------------------------------------|---|--------------------------|------------------------------------|---|------------------------------------|-------------------------------------|-----|-----------------------------------------|----|------------------------------------|-----------------------------------------|
| Style No.            | Thermocouple Type<br>(see section 1) |   | Sheath Length<br>(in mm) | Sheath Material<br>(see section 2) |   | Sheath Diameter<br>(see section 3) | Sensing Junction<br>(see section 4) |     | End Seal Termination<br>(see section 7) |    | Extension Cable<br>(see section 8) | Calibration Accuracy<br>(see section 6) |
| 12HT                 | -                                    | N | -                        | 2000                               | - | 600                                | -                                   | 3.0 | -                                       | 2I | -                                  | 3P4CLA - 1 MTR B50NX - AMS1             |

| Alternative Calibration Details (Optional)*                               |                             |                                         |                                              |          |   |     |
|---------------------------------------------------------------------------|-----------------------------|-----------------------------------------|----------------------------------------------|----------|---|-----|
| Batch Calibration<br>(standard) (BC)<br>or<br>Individual Calibration (IC) | UKAS (U) /<br>In House (IH) | Calibration<br>Range<br>(see section 6) | Interval /<br>Custom Temperatures<br>(in °C) |          |   |     |
| BC                                                                        | -                           | U                                       | -                                            | 500/1200 | - | 100 |

\*See section 6 and page 4 for further details of our standard calibration report.

| Tagging Options                     |    |                                    |   |                                     |
|-------------------------------------|----|------------------------------------|---|-------------------------------------|
| Plastic ID Label<br>(see section 5) |    | Metal Tag Label<br>(see section 5) |   | Etched on Sensor<br>(see section 5) |
| PL                                  | or | ML                                 | - | EL                                  |

[illegible]

| Set Point<br>(°C) | Reference<br>Temperature<br>(°C) | UUT<br>Reading<br>(μV) | UUT Equivalent<br>Temperature<br>(°C) | Error<br>(°C) | Measurement<br>Uncertainty<br>(°C) |
|-------------------|----------------------------------|------------------------|---------------------------------------|---------------|------------------------------------|
| 0                 | 0.10                             | 8.0                    | 0.20                                  | 0.10          | 0.37                               |
| 50                | 50.00                            | 2017.7                 | 49.90                                 | -0.10         | 0.57                               |
| 100               | 100.00                           | 4089.9                 | 99.82                                 | -0.18         | 0.57                               |
| 150               | 150.00                           | 6129.1                 | 149.80                                | -0.20         | 0.57                               |
| 200               | 200.00                           | 8111.2                 | 199.30                                | -0.70         | 0.57                               |
| 250               | 250.00                           | 10116.7                | 249.09                                | -0.91         | 0.57                               |
| 300               | 300.00                           | 12161.6                | 298.88                                | -1.12         | 0.57                               |
| 350               | 350.00                           | 14241.1                | 348.74                                | -1.26         | 0.88                               |
| 400               | 400.00                           | 16347.3                | 398.83                                | -1.17         | 0.88                               |
| 450               | 450.00                           | 18473.1                | 448.98                                | -1.02         | 0.88                               |
| 500               | 500.00                           | 20612.4                | 499.24                                | -0.76         | 0.88                               |
| 550               | 550.00                           | 22745.3                | 549.30                                | -0.70         | 0.88                               |
| 600               | 600.00                           | 24869.0                | 599.15                                | -0.85         | 0.88                               |

