



## Features and Benefits

- Weatherproof Housing
- Wide range of sensing element types
- Shaped Dia-cast zinc probe
- Enables temperature sensing in pipe work systems where immersion sensors are not practical
- Hinged lid with the facility of tamper proofing

## Technical Overview

The TT-C range of temperature strap-on sensors are used on pipe work systems to detect liquid temperature where fitting an immersion sensor is not practical. The sensing element is housed shaped dia-cast zinc probe ensuring excellent surface contact with the pipe 2 meters of PTFE cable is supplied as standard connecting the probe to the housing. Units contain either a high quality thermistor, Nickel or Platinum sensing element.

The -CVO active output option combines 4 pre-set ranges and selectable output mode, customised output range scaling enabling a choice of outputs and ranges on one unit.

## Product Codes

### TT-C Clamp-on Sensor

Sensing Element (add type to above code)

Passive output:

- A (10K3A1) Trend, Cylon, Distech
- B (10K4A1) Andover, Delta Controls
- C (20K6A1) Honeywell
- D (PT100a) Serck
- E (PT1000a) Cylon
- F (NI1000a) Sauter
- G (Ni1000a/TCR(LAN1)) Siemens
- H (SAT1) Satchwell
- L (TAC1) TAC
- M (2.2K3A1) Johnson Controls
- N (3K3A1) Alerton
- P (30K6A1) Drayton
- Q (50K6A1)
- R (100K6A1) York >40°C
- S (SAT2) Satchwell
- T (SAT3) Satchwell
- W (SIE1) Siebe
- Y (STA2) Landis & Staefa
- Z (10K NTC) Carel

Active output:

- CVO 4-20mA/0-10Vdc selectable output
- CVO-C 4-20mA/0-10Vdc selectable output with custom temp. scaling -10 to +100°C

Suffix (at extra cost):

- 5M 5m cable

## Specification

|                             |                     |   |
|-----------------------------|---------------------|---|
| Output types:               | Passive             | Resistive   |
|                             | Active (selectable) | Current 4-20mA or Voltage 0-10Vdc                     |
| Accuracy:                   | Thermistor          | ±0.2°C 0 to 70°C                                      |
|                             | PT100a              | ±0.2°C @ 25°C   |
|                             | PT1000a             | ±0.2°C @ 25°C   |
|                             | NI1000              | ±0.4°C @ 0°C  |
|                             | -CVO                | ±0.4°C @ 25°C   |
| Probe material              |                     | Die-cast zinc   |
| Cable length                |                     | 2 meters  |
| Housing:                    | Material            | PC/GF (Halogen free, flame retardant & UV stabilized) |
|                             | Dimensions          | 80 x 79 x 44mm  |
| Protection                  |                     | IP65  |
| Environmental:              | Housing:            | -30 to 70°C   |
|                             | Media:              | 0 to 95% non-condensing<br>-30 to +100°C              |
| Weight                      |                     | 200g  |
| Country of origin           |                     | UK  |
| Conformity (CVO types only) |                     | EMC, CE & UKCA Marked                                 |

### WEEE Directive:



At the end of the products useful life please dispose as per the local regulations. Do not dispose of with normal household waste. Do not burn.



## Installation

1. Select a location in the system where the liquid temperature is to be measured, where the probe lug will make good contact with the surface of the pipe.
2. Secure the lug to the surface to the pipe using the clip provided. Wrap the clip around the pipe and place the lug under the strap and tighten the clip. It is good practice to ensure that good contact is made between the lug and the pipe, and apply insulation over the pipe and lug.

**Note:** If an installation requires contact between galvanized materials (such as zinc) and copper in a moist or humid environment, rapid corrosion of the zinc lug may occur. Even runoff water from copper or brass surfaces can contain enough dissolved copper to cause rapid corrosion. If the use of copper in contact with galvanized items is unavoidable, precautions should be taken to prevent electrical contact between the two metals.

It is recommended that a fine layer of heat transfer compound between the 2 surfaces.

3. Using the main housing as a template mark the hole centres, drill and fix the housing to a suitable surface. The housing is designed to make it easy for an electric screwdriver to be used if desired and release the snap-fit lid by gently squeezing the locking tab.
4. Feed the cable through the waterproof gland and terminate the cores at the terminal block (see below & page 4 for connection details). Leaving some slack inside the unit, tighten the cable gland onto the cable to ensure water tightness.
5. If the sensor is to be mounted outside, it is recommended that the unit be mounted with the cable entry at the bottom. If the cable is fed from above then into the cable gland at the bottom, it is recommended that a rain loop be placed in the cable before entry into the sensor.
6. Snap shut the lid after the connections have been made.

## Connections

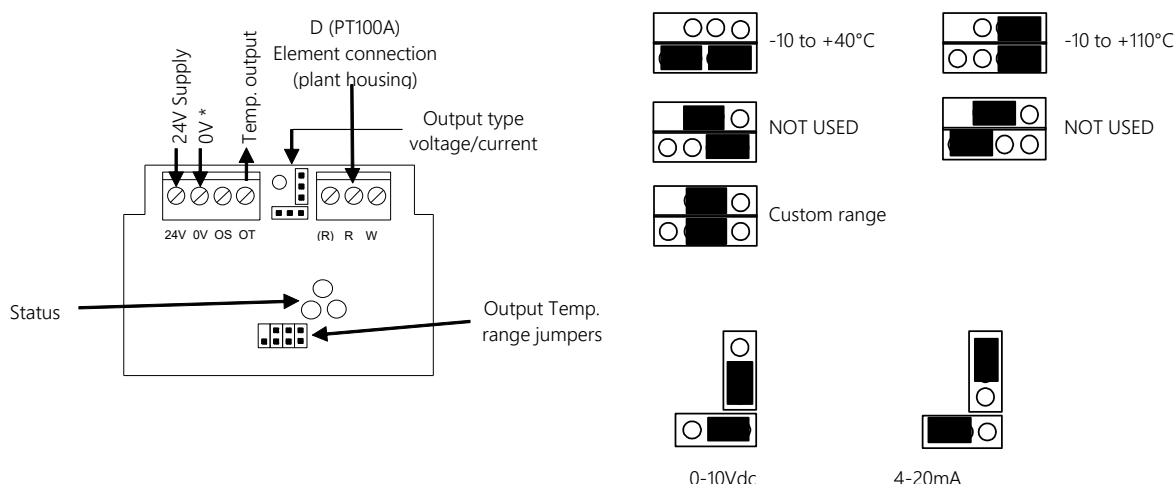
All connections to BEMS controllers, data recorders etc. should be made using screened cable. Normally, the screen should be earthed at one end only (usually the controller end) to avoid earth hum loops which can create noise. Low voltage signal and supply cables should be routed separately from high voltage or mains cabling. Separate conduit or cable trays should be used. Where possible, the controller's earth should be connected to a FUNCTIONAL EARTH, rather than the mains safety earth. This will provide better immunity to high frequency noise. Most modern buildings have a separate earth for this purpose.

Passive output:



Connections are made via the 2-way terminal block. Connections for thermistor, platinum and nickel sensing elements are polarity independent.

Active output:



\* Not required with 4-20mA output

Notes: Voltage output Nominal voltage 24Vac/dc.  
Current output If using in current output mode, the sensor must only be used with a 24Vdc supply. The sensor may be damaged if supplied with AC.

The selectable output temperature ranges are dependent on sensor type, ambient and application.

For full connection and specification please refer to the TT-CVO data sheet.

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**Temperature vs Resistance Charts**

|     | A       | B      | C      | D      | E       | F      | G      | H    | K    | L    | M       | N      |
|-----|---------|--------|--------|--------|---------|--------|--------|------|------|------|---------|--------|
|     | 10K3A1  | 10K4A1 | 20K6A1 | PT100A | PT1000A | NI1000 | LAN1   | SAT1 | STA1 | TAC1 | 2.2K3A1 | 3K3A1  |
| °C  | Ω       | Ω      | Ω      | Ω      | Ω       | Ω      | Ω      | Ω    | Ω    | Ω    | Ω       | Ω      |
| -50 | 6678528 | 441667 | -      | 80.3   | 803     | 743    | 790.8  | 9719 | -    | -    | 150395  | 200348 |
| -40 | 335671  | 239831 | -      | 84.3   | 843     | 791    | 826.8  | 9584 | -    | -    | 75593   | 100701 |
| -30 | 176683  | 135233 | -      | 88.2   | 882     | 842    | 871.7  | 9349 | -    | -    | 39789   | 53005  |
| -20 | 96974   | 78930  | -      | 92.2   | 921     | 893    | 913.4  | 8968 | -    | -    | 21839   | 29092  |
| -15 | 72895   | 61030  | -      | -      | -       | -      | 934.7  | 8708 | -    | -    | 16416   | 21868  |
| -10 | 55298   | 47549  | -      | 96.1   | 961     | 946    | 856.2  | 8396 | -    | -    | 12453   | 16589  |
| -5  | 42314   | 37316  | -      | -      | -       | -      | 978.0  | 8031 | -    | -    | 9529    | 12694  |
| 0   | 32650   | 29490  | 70204  | 100.0  | 1000    | 1000   | 1000.0 | 7614 | 2226 | 5085 | 7353    | 9795   |
| 1   | 31030   | 28157  | 66525  | -      | -       | -      | 1004.4 | 7525 | 2236 | -    | 6988    | 9309   |
| 2   | 29500   | 26891  | 63059  | -      | -       | -      | 1008.9 | 7434 | 2246 | -    | 6643    | 8850   |
| 3   | 28054   | 25689  | 59793  | -      | -       | -      | 1013.3 | 7341 | 2256 | -    | 6318    | 8416   |
| 4   | 26688   | 24547  | 56713  | -      | -       | -      | 1017.8 | 7246 | 2266 | -    | 6010    | 8006   |
| 5   | 25396   | 23462  | 53809  | -      | -       | -      | 1022.3 | 7150 | 2276 | 4078 | 5719    | 7619   |
| 6   | 24173   | 22430  | 51070  | -      | -       | -      | 1026.7 | 7053 | 2286 | -    | 5444    | 7252   |
| 7   | 23016   | 21450  | 48484  | -      | -       | -      | 1031.2 | 6954 | 2298 | -    | 5183    | 6905   |
| 8   | 21921   | 20517  | 46044  | -      | -       | -      | 1035.8 | 6853 | 2306 | -    | 4937    | 6577   |
| 9   | 20885   | 19631  | 43739  | -      | -       | -      | 1040.3 | 6752 | 2316 | -    | 4703    | 6266   |
| 10  | 19904   | 18787  | 41563  | 103.9  | 1039    | 1056   | 1044.8 | 6649 | 2326 | 3294 | 4482    | 5971   |
| 11  | 18974   | 17983  | 39506  | -      | -       | -      | 1049.3 | 6545 | 2337 | -    | 4273    | 5692   |
| 12  | 18092   | 17219  | 37562  | -      | -       | -      | 1053.9 | 6440 | 2347 | -    | 4075    | 5428   |
| 13  | 17257   | 16490  | 35724  | -      | -       | -      | 1058.4 | 6334 | 2357 | -    | 3886    | 5177   |
| 14  | 16465   | 15797  | 33986  | -      | -       | -      | 1063.0 | 6228 | 2367 | -    | 3708    | 4940   |
| 15  | 15714   | 15136  | 32342  | -      | -       | -      | 1067.6 | 6121 | 2377 | 2676 | 3539    | 4714   |
| 16  | 15001   | 14507  | 30786  | -      | -       | -      | 1072.2 | 6013 | 2388 | -    | 3378    | 4500   |
| 17  | 14325   | 13906  | 29213  | -      | -       | -      | 1076.8 | 5905 | 2398 | -    | 3226    | 4297   |
| 18  | 13623   | 13334  | 27918  | -      | -       | -      | 1081.4 | 5796 | 2408 | -    | 3081    | 4105   |
| 19  | 13053   | 12788  | 26598  | -      | -       | -      | 1086.0 | 5684 | 2418 | -    | 2940    | 3916   |
| 20  | 12494   | 12268  | 25346  | 107.8  | 1078    | 1112   | 1090.7 | 5580 | 2429 | 2188 | 2814    | 3748   |
| 21  | 11943   | 11771  | 24160  | -      | -       | -      | 1095.3 | 5471 | 2439 | -    | 2690    | 3583   |
| 22  | 11420   | 11297  | 23036  | -      | -       | -      | 1100.0 | 5362 | 2449 | -    | 2572    | 3426   |
| 23  | 10923   | 10845  | 21970  | -      | -       | -      | 1104.6 | 5254 | 2460 | -    | 2460    | 3277   |
| 24  | 10450   | 10413  | 20959  | -      | -       | -      | 1109.3 | 5147 | 2470 | -    | 2353    | 3135   |
| 25  | 10000   | 10000  | 20000  | 109.8  | 1098    | -      | 1114.0 | 5039 | 2480 | 1800 | 2252    | 3000   |
| 26  | 9572    | 9606   | 19090  | -      | -       | -      | 1120.0 | 4933 | 2491 | -    | 2156    | 2871   |
| 27  | 9165    | 9229   | 18226  | -      | -       | -      | 1123.4 | 4827 | 2501 | -    | 2064    | 2749   |
| 28  | 8777    | 8869   | 17405  | -      | -       | -      | 1127.1 | 4721 | 2512 | -    | 1977    | 2633   |
| 29  | 8408    | 8525   | 16626  | -      | -       | -      | 1132.9 | 4617 | 2522 | -    | 1893    | 2522   |
| 30  | 8056    | 8197   | 15886  | 111.7  | 1117    | 1171   | 1137.6 | 4513 | 2532 | 1488 | 1814    | 2417   |
| 35  | 6530    | 6754   | 12697  | -      | -       | -      | 1161.5 | 4012 | 2585 | 1237 | 1471    | 1959   |
| 40  | 5325    | 5594   | 10211  | 115.5  | 1155    | 1230   | 1185.7 | 3545 | 2638 | 1034 | 1199    | 1598   |
| 45  | 4367    | 4656   | 8260   | -      | -       | -      | 1210.2 | 3117 | -    | -    | 983.4   | 1310   |
| 50  | 3601    | 3893   | 6719   | 119.4  | 1194    | 1291   | 1235.0 | 2730 | -    | 740  | 810.9   | 1080   |
| 55  | 2985    | 3271   | 5496   | -      | -       | -      | 1260.1 | 2386 | -    | -    | 672.2   | 895.5  |
| 60  | 2487    | 2760   | 4518   | 123.2  | 1232    | 1353   | 1285.4 | 2082 | -    | 540  | 560.1   | 746.2  |
| 65  | 2082    | 2339   | -      | -      | -       | -      | 1311.1 | 1816 | -    | -    | 468.9   | 624.7  |
| 70  | 1751    | 1990   | -      | 127.1  | 1271    | 1417   | 1337.1 | 1585 | -    | 400  | 394.5   | 525.5  |
| 75  | 1480    | 1700   | -      | -      | -       | -      | 1363.5 | 1385 | -    | -    | 333.3   | 444.0  |
| 80  | 1256    | 1458   | -      | 130.9  | 1309    | 1483   | 1390.1 | 1213 | -    | 300  | 282.9   | 376.9  |
| 85  | 1070    | 1255   | -      | -      | -       | -      | 1417.1 | 1064 | -    | -    | 241.1   | 321.2  |
| 90  | 916.1   | 1084   | -      | 134.7  | 1347    | 1549   | 1444.4 | 937  | -    | 230  | 206.3   | 274.8  |
| 95  | 787.0   | 939.6  | -      | -      | -       | -      | 1472.0 | 828  | -    | -    | 177.2   | 236.1  |
| 100 | 678.6   | 817.2  | -      | 138.5  | 1385    | 1618   | 1500.0 | 734  | -    | 180  | 152.8   | 203.6  |
| 105 | 587.3   | 713.0  | -      | -      | -       | -      | 1528.3 | 654  | -    | -    | 132.3   | 176.2  |
| 110 | 510.1   | 624.1  | -      | 142.3  | 1423    | 1688   | 1557.0 | 585  | -    | -    | 114.9   | 153.0  |
| 115 | 444.5   | 547.9  | -      | -      | -       | -      | 1586.0 | 525  | -    | -    | 100.1   | 133.3  |
| 120 | 388.6   | 482.5  | -      | 146.1  | 1461    | 1760   | 1625.4 | 474  | -    | -    | 87.51   | 116.6  |
| 125 | 340.8   | 426.0  | -      | -      | -       | -      | -      | 429  | -    | -    | 76.75   | 102.2  |
| 130 | 300.0   | 377.2  | -      | 149.8  | 1498    | 1833   | -      | 391  | -    | -    | 67.52   | 89.95  |
| 140 | 234.1   | 298.1  | -      | 153.6  | 1536    | 1909   | -      | 329  | -    | -    | 52.72   | 70.23  |
| 150 | 184.8   | 238.0  | -      | 157.3  | 1573    | 1987   | -      | 281  | -    | -    | 41.61   | 55.44  |
| 200 | -       | -      | -      | 157.8  | 1758    | -      | -      | -    | -    | -    | -       | -      |
| 250 | -       | -      | -      | 194.1  | 1941    | -      | -      | -    | -    | -    | -       | -      |
| 300 | -       | -      | -      | 212.0  | 2121    | -      | -      | -    | -    | -    | -       | -      |
| 350 | -       | -      | -      | 229.7  | 2297    | -      | -      | -    | -    | -    | -       | -      |
| 400 | -       | -      | -      | 247.0  | 2470    | -      | -      | -    | -    | -    | -       | -      |

**Temperature vs Resistance Charts (Continued)**

|           | <b>P</b>      | <b>Q</b>      | <b>S</b>    | <b>T</b>    | <b>W</b>    | <b>Y</b>    | <b>Z</b>       |
|-----------|---------------|---------------|-------------|-------------|-------------|-------------|----------------|
|           | <b>30K6A1</b> | <b>50K6A1</b> | <b>SAT2</b> | <b>SAT3</b> | <b>SIE1</b> | <b>STA2</b> | <b>10K NTC</b> |
| <b>°C</b> | <b>Ω</b>      | <b>Ω</b>      | <b>Ω</b>    | <b>Ω</b>    | <b>Ω</b>    | <b>Ω</b>    | <b>Ω</b>       |
| -50       | 2497k         | 4168k         | -           | -           | 10732       | -           | -              |
| -40       | 1219k         | 2033k         | -           | -           | 10517       | -           | -              |
| -30       | 622911        | 1038k         | -           | -           | 10172       | -           | -              |
| -20       | 331876        | 553243        | -           | -           | 9654        | -           | -              |
| -15       | 24785         | 409689        | -           | -           | 6320        | -           | -              |
| -10       | 183697        | 306183        | -           | -           | 8933        | -           | 42218          |
| -5        | 138502        | 230842        | -           | -           | 8496        | -           | 33784          |
| 0         | 105305        | 175508        | 2094        | -           | 8044        | 7490        | 27197          |
| 1         | 99787         | 166310        | 2079        | -           | 7910        | -           | -              |
| 2         | 94588         | 157644        | 2061        | -           | 7807        | -           | -              |
| 3         | 89689         | 149480        | 2046        | -           | 7702        | -           | -              |
| 4         | 85069         | 141779        | 2027        | -           | 7596        | -           | -              |
| 5         | 60713         | 134521        | 2010        | -           | 7489        | 6340        | 22023          |
| 6         | 76604         | 127669        | 1992        | -           | 7381        | -           | -              |
| 7         | 72726         | 121207        | 1973        | -           | 7271        | -           | -              |
| 8         | 69064         | 115105        | 1951        | -           | 7161        | -           | -              |
| 9         | 65608         | 109344        | 1934        | -           | 7050        | -           | -              |
| 10        | 62347         | 103903        | 1911        | -           | 6938        | 5360        | 17933          |
| 11        | 59257         | 98761         | 1897        | -           | 6825        | -           | -              |
| 12        | 56346         | 93901         | 1872        | -           | 5712        | -           | -              |
| 13        | 53585         | 89307         | 1851        | -           | 6598        | -           | -              |
| 14        | 50978         | 84962         | 1810        | -           | 6485        | -           | -              |
| 15        | 45811         | 80851         | 1809        | -           | 6370        | 4540        | 14684          |
| 16        | 46178         | 76961         | 1787        | -           | 6256        | -           | -              |
| 17        | 43969         | 73280         | 1764        | -           | 6141        | -           | -              |
| 18        | 41877         | 69794         | 1740        | -           | 6028        | -           | -              |
| 19        | 39895         | 66492         | 1716        | -           | 5913        | -           | -              |
| 20        | 38019         | 63364         | 1690        | 2708        | 5798        | 3840        | 12087          |
| 21        | 36240         | 60400         | 1667        | 2681        | 5686        | -           | -              |
| 22        | 34554         | 57589         | 1644        | 2659        | 5573        | -           | -              |
| 23        | 32955         | 54925         | 1621        | 2618        | 5461        | -           | -              |
| 24        | 31438         | 52398         | 1598        | 2616        | 5349        | -           | -              |
| 25        | 30000         | 50000         | 1574        | 2592        | 5238        | 3250        | 10000          |
| 26        | 28635         | 47724         | 1549        | 2567        | 5128        | -           | -              |
| 27        | 27339         | 45564         | 1524        | 2544        | 5019        | -           | -              |
| 28        | 26108         | 43513         | 1500        | 2520        | 4910        | -           | -              |
| 29        | 24939         | 41565         | 1476        | 2496        | 4803        | -           | -              |
| 30        | 23828         | 39714         | 1452        | 2474        | 4696        | 2750        | 8315           |
| 35        | 19046         | 31744         | 1336        | 2346        | 4135        | 2320        | 6947           |
| 40        | 15317         | 25529         | 1219        | 2216        | 3707        | -           | 5831           |
| 45        | 12390         | 20650         | 1113        | 2086        | 3271        | -           | 4916           |
| 50        | 10079         | 16799         | 1011        | 1850        | 2875        | -           | 4163           |
| 55        | 8243          | 13740         | -           | 1818        | 2521        | -           | 3540           |
| 60        | 6777          | 11297         | -           | 1694        | 2203        | -           | 3023           |
| 65        | 5600          | 9334          | -           | 1758        | 1929        | -           | 2591           |
| 70        | 4650          | 7751          | -           | 1461        | 1685        | -           | 2230           |
| 75        | 3879          | 6466          | -           | 1353        | 1472        | -           | 1926           |
| 80        | 3251          | 5419          | -           | 1258        | 1287        | -           | 1669           |
| 85        | 2737          | 4560          | -           | 1171        | 1127        | -           | 1451           |
| 90        | 2313          | 3855          | -           | 1089        | 986         | -           | 1266           |
| 95        | 1963          | 3271          | -           | 1020        | 866         | -           | 1109           |
| 100       | 1672          | 2787          | -           | 950         | 760         | -           | 973            |
| 105       | 1430          | 22384         | -           | -           | 670         | -           | -              |
| 110       | 1228          | 2046          | -           | -           | 590         | -           | -              |
| 115       | 1058          | 1962          | -           | -           | 522         | -           | -              |
| 120       | 914.6         | 1523          | -           | -           | 462         | -           | -              |
| 125       | 793.2         | 1321          | -           | -           | 410         | -           | -              |
| 130       | 690.2         | 1149          | -           | -           | 365         | -           | -              |
| 140       | 527.4         | 878.2         | -           | -           | 290         | -           | -              |
| 150       | 407.7         | 678.8         | -           | -           | 233         | -           | -              |
| 200       | -             | -             | -           | -           | -           | -           | -              |
| 250       | -             | -             | -           | -           | -           | -           | -              |
| 300       | -             | -             | -           | -           | -           | -           | -              |
| 350       | -             | -             | -           | -           | -           | -           | -              |
| 400       | -             | -             | -           | -           | -           | -           | -              |

Whilst every effort has been made to ensure the accuracy of this specification, Sontay cannot accept responsibility for damage, injury, loss or expense resulting from errors or omissions. In the interest of technical improvement, this specification may be altered without notice.