# 1    Input ranges

## 1.1    Input type mV

1.    Range -0.5 ... 27 mV

| Zero calibration (Max = 22 mV) | | | | | Span calibration (Min = 2.6 mV, Max = 23 mV) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Range (mV) | SW2-5 | SW2-6 | SW2-7 | SW2-8 | Range (mV) | SW2-1 | SW2-2 | SW2-3 | SW2-4 |
| -0.3 | OFF | ON | OFF | OFF | 2.6 | OFF | ON | OFF | OFF |
| 1.2 | ON | ON | OFF | OFF | 3.6 | OFF | ON | ON | ON |
| 2.7 | OFF | OFF | OFF | OFF | 5.0 | OFF | ON | ON | OFF |
| 4.1 | ON | OFF | OFF | OFF | 7.0 | OFF | OFF | OFF | ON |
| 5.6 | OFF | ON | ON | OFF | 10.0 | OFF | OFF | OFF | OFF |
| 7.1 | ON | ON | ON | OFF | 13.6 | OFF | OFF | ON | ON |
| 8.6 | OFF | OFF | ON | OFF | 19.4 | OFF | OFF | ON | OFF |
| 10.0 | ON | OFF | ON | OFF | | | | | |
| 11.5 | OFF | ON | OFF | ON | | | | | |
| 13.0 | ON | ON | OFF | ON | | | | | |
| 14.5 | OFF | OFF | OFF | ON | | | | | |
| 15.9 | ON | OFF | OFF | ON | | | | | |
| 17.4 | OFF | ON | ON | ON | | | | | |
| 18.9 | ON | ON | ON | ON | | | | | |
| 20.4 | OFF | OFF | ON | ON | | | | | |
| 21.8 | ON | OFF | ON | ON | | | | | |

2.    Range -13 ... 110 mV

| Zero calibration (Max = 92 mV) | | | | | Span calibration (Min = 8 mV, Max = 100 mV) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Range (mV) | SW2-5 | SW2-6 | SW2-7 | SW2-8 | Range (mV) | SW2-1 | SW2-2 | SW2-3 | SW2-4 |
| -10 | OFF | ON | OFF | OFF | 8 | ON | ON | OFF | ON |
| -4 | ON | ON | OFF | OFF | 12 | ON | ON | OFF | OFF |
| 3 | OFF | OFF | OFF | OFF | 17 | ON | ON | ON | OFF |
| 10 | ON | OFF | OFF | OFF | 23 | ON | ON | ON | OFF |
| 17 | OFF | ON | ON | OFF | 33 | ON | OFF | OFF | ON |
| 23 | ON | ON | ON | OFF | 47 | ON | OFF | OFF | OFF |
| 30 | OFF | OFF | ON | OFF | 63 | ON | OFF | ON | ON |
| 37 | ON | OFF | ON | OFF | 90 | ON | OFF | ON | OFF |
| 44 | OFF | ON | OFF | ON | | | | | |
| 50 | ON | ON | OFF | ON | | | | | |
| 57 | OFF | OFF | OFF | ON | | | | | |
| 64 | ON | OFF | OFF | ON | | | | | |
| 71 | OFF | ON | ON | ON | | | | | |
| 77 | ON | ON | ON | ON | | | | | |
| 84 | OFF | OFF | ON | ON | | | | | |
| 91 | ON | OFF | ON | ON | | | | | |

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## 1.2 Input type thermocouple B

1. Range 0 ... 1820 °C

| Zero calibration (Max = 1600 °C) | | | | |
|---|---|---|---|---|
| °C | SW2-5 | SW2-6 | SW2-7 | SW2-8 |
| 0 | OFF | ON | OFF | OFF |
| 500 | ON | ON | OFF | OFF |
| 750 | OFF | OFF | OFF | OFF |
| 920 | ON | OFF | OFF | OFF |
| 1090 | OFF | ON | ON | OFF |
| 1250 | ON | ON | ON | OFF |
| 1370 | OFF | OFF | ON | OFF |
| 1500 | ON | OFF | ON | OFF |
| 1600 | OFF | ON | OFF | ON |

| Span calibration (Min $\cong$ 270 °C, Max = 1820 °C) | | | | |
|---|---|---|---|---|
| mV (°C) | SW2-1 | SW2-2 | SW2-3 | SW2-4 |
| 2.6 ($\cong$ 270) | OFF | ON | OFF | OFF |
| 3.6 ($\cong$ 380) | OFF | ON | ON | ON |
| 5.0 ($\cong$ 550) | OFF | ON | ON | OFF |
| 7.0 ($\cong$ 770) | OFF | OFF | OFF | ON |
| 10.0 ($\cong$ 1110) | OFF | OFF | OFF | OFF |
| 13.6 ($\cong$ 1800) | OFF | OFF | ON | ON |

The thermocouple is not linearized. The span value in °C is an average value.

Input terminals:

- 1-channel device: 1+, 8-
- 2-channel device 2+, 6-

## 1.3 Input type thermocouple E

1. Range -50 ... 335 °C

| Zero calibration (Max = 285 °C) | | | | |
|---|---|---|---|---|
| °C | SW2-5 | SW2-6 | SW2-7 | SW2-8 |
| -48 | OFF | ON | OFF | OFF |
| -23 | ON | ON | OFF | OFF |
| 3 | OFF | OFF | OFF | OFF |
| 28 | ON | OFF | OFF | OFF |
| 51 | OFF | ON | ON | OFF |
| 73 | ON | ON | ON | OFF |
| 95 | OFF | OFF | ON | OFF |
| 117 | ON | OFF | ON | OFF |
| 137 | OFF | ON | OFF | ON |
| 159 | ON | ON | OFF | ON |
| 179 | OFF | OFF | OFF | ON |
| 200 | ON | OFF | OFF | ON |
| 219 | OFF | ON | ON | ON |
| 238 | ON | ON | ON | ON |
| 258 | OFF | OFF | ON | ON |
| 278 | ON | OFF | ON | ON |

| Span calibration (Min $\cong$ 43 °C, Max = 325 °C) | | | | |
|---|---|---|---|---|
| mV (°C) | SW2-1 | SW2-2 | SW2-3 | SW2-4 |
| 2.6 ($\cong$ 43) | OFF | ON | OFF | OFF |
| 3.6 ($\cong$ 59) | OFF | ON | ON | ON |
| 5.0 ($\cong$ 80) | OFF | ON | ON | OFF |
| 7.0 ($\cong$ 110) | OFF | OFF | OFF | ON |
| 10.0 ($\cong$ 153) | OFF | OFF | OFF | OFF |
| 13.6 ($\cong$ 202) | OFF | OFF | ON | ON |
| 19.4 ($\cong$ 279) | OFF | OFF | ON | OFF |

2. Range -270 ... 1000 °C

| Zero calibration (Max = 830 °C) | | | | |
|---|---|---|---|---|
| °C | SW2-5 | SW2-6 | SW2-7 | SW2-8 |
| -145 | ON | ON | OFF | OFF |
| 0 | OFF | OFF | OFF | OFF |
| 110 | ON | OFF | OFF | OFF |
| 210 | OFF | ON | ON | OFF |
| 300 | ON | ON | ON | OFF |
| 375 | OFF | OFF | ON | OFF |
| 460 | ON | OFF | ON | OFF |
| 550 | OFF | ON | OFF | ON |
| 630 | ON | ON | OFF | ON |
| 710 | OFF | OFF | OFF | ON |
| 800 | ON | OFF | OFF | ON |

| Span calibration (Min $\cong$ 125 °C, Max = 1270 °C) | | | | |
|---|---|---|---|---|
| mV (°C) | SW2-1 | SW2-2 | SW2-3 | SW2-4 |
| 9 ($\cong$ 140) | ON | ON | OFF | ON |
| 12 ($\cong$ 180) | ON | ON | OFF | OFF |
| 17 ($\cong$ 250) | ON | ON | ON | ON |
| 23 ($\cong$ 325) | ON | ON | ON | OFF |
| 33 ($\cong$ 450) | ON | OFF | OFF | ON |
| 47 ($\cong$ 625) | ON | OFF | OFF | OFF |
| 63 ($\cong$ 825) | ON | OFF | ON | ON |
| 87 ($\cong$ 1270) | ON | OFF | ON | OFF |

The thermocouple is not linearized. The span value in °C is an average value.

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## 1.4    Input type thermocouple J

1.    Range -60 ... 435 °C

| Zero calibration (Max = 365 °C) | | | | |
|---|---|---|---|---|
| °C | SW2-5 | SW2-6 | SW2-7 | SW2-8 |
| -55 | OFF | ON | OFF | OFF |
| -26 | ON | ON | OFF | OFF |
| 4 | OFF | OFF | OFF | OFF |
| 33 | ON | OFF | OFF | OFF |
| 60 | OFF | ON | ON | OFF |
| 86 | ON | ON | ON | OFF |
| 113 | OFF | OFF | ON | OFF |
| 141 | ON | OFF | ON | OFF |
| 166 | OFF | ON | OFF | ON |
| 193 | ON | ON | OFF | ON |
| 220 | OFF | OFF | OFF | ON |
| 247 | ON | OFF | OFF | ON |
| 273 | OFF | ON | ON | ON |
| 300 | ON | ON | ON | ON |
| 327 | OFF | OFF | ON | ON |
| 354 | ON | OFF | ON | ON |

| Span calibration (Min $\cong$ 50 °C, Max = 420 °C) | | | | |
|---|---|---|---|---|
| mV (°C) | SW2-1 | SW2-2 | SW2-3 | SW2-4 |
| 2.6 ($\cong$ 50) | OFF | ON | OFF | OFF |
| 3.6 ($\cong$ 69) | OFF | ON | ON | ON |
| 5.0 ($\cong$ 95) | OFF | ON | ON | OFF |
| 7.0 ($\cong$ 132) | OFF | OFF | OFF | ON |
| 10.0 ($\cong$ 185) | OFF | OFF | OFF | OFF |
| 13.6 ($\cong$ 250) | OFF | OFF | ON | ON |
| 19.4 ($\cong$ 355) | OFF | OFF | ON | OFF |

2.    Range -210 ... 1200 °C

| Zero calibration (Max = 1025 °C) | | | | |
|---|---|---|---|---|
| °C | SW2-5 | SW2-6 | SW2-7 | SW2-8 |
| -165 | ON | ON | OFF | OFF |
| 0 | OFF | OFF | OFF | OFF |
| 130 | ON | OFF | OFF | OFF |
| 260 | OFF | ON | ON | OFF |
| 385 | ON | ON | ON | OFF |
| 495 | OFF | OFF | ON | OFF |
| 615 | ON | OFF | ON | OFF |
| 730 | OFF | ON | OFF | ON |
| 840 | ON | ON | OFF | ON |
| 935 | OFF | OFF | OFF | ON |
| 1025 | ON | OFF | OFF | ON |

| Span calibration (Min $\cong$ 150 °C, Max = 1410 °C) | | | | |
|---|---|---|---|---|
| mV (°C) | SW2-1 | SW2-2 | SW2-3 | SW2-4 |
| 9 ($\cong$ 170) | ON | ON | OFF | ON |
| 12 ($\cong$ 220) | ON | ON | OFF | OFF |
| 17 ($\cong$ 310) | ON | ON | ON | ON |
| 23 ($\cong$ 420) | ON | ON | ON | OFF |
| 33 ($\cong$ 600) | ON | OFF | OFF | ON |
| 47 ($\cong$ 825) | ON | OFF | OFF | OFF |
| 63 ($\cong$ 1085) | ON | OFF | ON | ON |
| 78 ($\cong$ 1410) | ON | OFF | ON | OFF |

The thermocouple is not linearized. The span value in °C is an average value.

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## 1.5 Input type thermocouple K

1. Range -80 ... 575 °C

| Zero calibration (Max = 480 °C) | | | | |
|---|---|---|---|---|
| °C | SW2-5 | SW2-6 | SW2-7 | SW2-8 |
| -73 | OFF | ON | OFF | OFF |
| -34 | ON | ON | OFF | OFF |
| 5 | OFF | OFF | OFF | OFF |
| 42 | ON | OFF | OFF | OFF |
| 76 | OFF | ON | ON | OFF |
| 110 | ON | ON | ON | OFF |
| 147 | OFF | OFF | ON | OFF |
| 184 | ON | OFF | ON | OFF |
| 219 | OFF | ON | OFF | ON |
| 256 | ON | ON | OFF | ON |
| 293 | OFF | OFF | OFF | ON |
| 329 | ON | OFF | OFF | ON |
| 362 | OFF | ON | ON | ON |
| 398 | ON | ON | ON | ON |
| 433 | OFF | OFF | ON | ON |
| 469 | ON | OFF | ON | ON |

| Span calibration (Min $\cong$ 64 °C, Max = 555 °C) | | | | |
|---|---|---|---|---|
| mV (°C) | SW2-1 | SW2-2 | SW2-3 | SW2-4 |
| 2.6 ($\cong$ 64) | OFF | ON | OFF | OFF |
| 3.6 ($\cong$ 88) | OFF | ON | ON | ON |
| 5.0 ($\cong$ 122) | OFF | ON | ON | OFF |
| 7.0 ($\cong$ 172) | OFF | OFF | OFF | ON |
| 10.0 ($\cong$ 246) | OFF | OFF | OFF | OFF |
| 13.6 ($\cong$ 333) | OFF | OFF | ON | ON |
| 19.4 ($\cong$ 471) | OFF | OFF | ON | OFF |

2. Range -270 ... 1372 °C

| Zero calibration (Max = 1145 °C) | | | | |
|---|---|---|---|---|
| °C | SW2-5 | SW2-6 | SW2-7 | SW2-8 |
| -270 | ON | ON | OFF | OFF |
| 0 | OFF | OFF | OFF | OFF |
| 170 | ON | OFF | OFF | OFF |
| 345 | OFF | ON | ON | OFF |
| 510 | ON | ON | ON | OFF |
| 650 | OFF | OFF | ON | OFF |
| 820 | ON | OFF | ON | OFF |
| 990 | OFF | ON | OFF | ON |
| 1145 | ON | ON | OFF | ON |

| Span calibration (Min $\cong$ 200 °C, Max = 1642 °C) | | | | |
|---|---|---|---|---|
| mV (°C) | SW2-1 | SW2-2 | SW2-3 | SW2-4 |
| 9 ($\cong$ 222) | ON | ON | OFF | ON |
| 12 ($\cong$ 295) | ON | ON | OFF | OFF |
| 17 ($\cong$ 415) | ON | ON | ON | ON |
| 23 ($\cong$ 555) | ON | ON | ON | OFF |
| 33 ($\cong$ 795) | ON | OFF | OFF | ON |
| 47 ($\cong$ 1150) | ON | OFF | OFF | OFF |
| 62 ($\cong$ 1642) | ON | OFF | ON | ON |

The thermocouple is not linearized. The span value in °C is an average value.

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## 1.6    Input type thermocouple N

1.    Range 0 ... 685 °C

| Zero calibration (Max = 585 °C) | | | | | Span calibration (Min ≅ 95 °C, Max = 660 °C) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| °C | SW2-5 | SW2-6 | SW2-7 | SW2-8 | mV (°C) | SW2-1 | SW2-2 | SW2-3 | SW2-4 |
| 8 | OFF | OFF | OFF | OFF | 2.6 (≅ 95) | OFF | ON | OFF | OFF |
| 63 | ON | OFF | OFF | OFF | 3.6 (≅ 130) | OFF | ON | ON | ON |
| 110 | OFF | ON | ON | OFF | 5.0 (≅ 170) | OFF | ON | ON | OFF |
| 155 | ON | ON | ON | OFF | 7.0 (≅ 235) | OFF | OFF | OFF | ON |
| 200 | OFF | OFF | ON | OFF | 10.0 (≅ 320) | OFF | OFF | OFF | OFF |
| 245 | ON | OFF | ON | OFF | 13.6 (≅ 445) | OFF | OFF | ON | ON |
| 290 | OFF | ON | OFF | ON | 19.4 (≅ 570) | OFF | OFF | ON | OFF |
| 330 | ON | ON | OFF | ON | | | | | |
| 370 | OFF | OFF | OFF | ON | | | | | |
| 410 | ON | OFF | OFF | ON | | | | | |
| 450 | OFF | ON | ON | ON | | | | | |
| 490 | ON | ON | ON | ON | | | | | |
| 530 | OFF | OFF | ON | ON | | | | | |
| 565 | ON | OFF | ON | ON | | | | | |

2.    Range 0 ... 1300 °C

| Zero calibration (Max = 1090 °C) | | | | | Span calibration (Min ≅ 260 °C, Max = 1300 °C) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| °C | SW2-5 | SW2-6 | SW2-7 | SW2-8 | mV (°C) | SW2-1 | SW2-2 | SW2-3 | SW2-4 |
| 0 | OFF | OFF | OFF | OFF | 9 (≅ 290) | ON | ON | OFF | ON |
| 235 | ON | OFF | OFF | OFF | 12 (≅ 375) | ON | ON | OFF | OFF |
| 430 | OFF | ON | ON | OFF | 17 (≅ 505) | ON | ON | ON | ON |
| 610 | ON | ON | ON | OFF | 23 (≅ 660) | ON | ON | ON | OFF |
| 765 | OFF | OFF | ON | OFF | 33 (≅ 915) | ON | OFF | OFF | ON |
| 940 | ON | OFF | ON | OFF | 47 (≅ 1285) | ON | OFF | OFF | OFF |
| 1090 | OFF | ON | OFF | ON | | | | | |

The thermocouple is not linearized. The span value in °C is an average value.

## 1.7    Input type thermocouple R

1.    Range -50 ... 1768 °C

| Zero calibration (Max = 1515 °C) | | | | | Span calibration (Min ≅ 320 °C, Max = 1818 °C) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| °C | SW2-5 | SW2-6 | SW2-7 | SW2-8 | mV (°C) | SW2-1 | SW2-2 | SW2-3 | SW2-4 |
| 35 | OFF | OFF | OFF | OFF | 2.6 (≅ 320) | OFF | ON | OFF | OFF |
| 225 | ON | OFF | OFF | OFF | 3.6 (≅ 420) | OFF | ON | ON | ON |
| 370 | OFF | ON | ON | OFF | 5.0 (≅ 550) | OFF | ON | ON | OFF |
| 505 | ON | ON | ON | OFF | 7.0 (≅ 720) | OFF | OFF | OFF | ON |
| 635 | OFF | OFF | ON | OFF | 10.0 (≅ 960) | OFF | OFF | OFF | OFF |
| 765 | ON | OFF | ON | OFF | 13.6 (≅ 1225) | OFF | OFF | ON | ON |
| 875 | OFF | ON | OFF | ON | 19.4 (≅ 1640) | OFF | OFF | ON | OFF |
| 990 | ON | ON | OFF | ON | | | | | |
| 1105 | OFF | OFF | OFF | ON | | | | | |
| 1215 | ON | OFF | OFF | ON | | | | | |
| 1315 | OFF | ON | ON | ON | | | | | |
| 1420 | ON | ON | ON | ON | | | | | |
| 1515 | OFF | OFF | ON | ON | | | | | |

The thermocouple is not linearized. The span value in °C is an average value.

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## 1.8    Input type thermocouple S

1.    Range -50 ... 1768 °C

| Zero calibration (Max = 1500 °C) | | | | |
|---|---|---|---|---|
| °C | SW2-5 | SW2-6 | SW2-7 | SW2-8 |
| 35 | OFF | OFF | OFF | OFF |
| 230 | ON | OFF | OFF | OFF |
| 385 | OFF | ON | ON | OFF |
| 525 | ON | ON | ON | OFF |
| 675 | OFF | OFF | ON | OFF |
| 816 | ON | OFF | ON | OFF |
| 940 | OFF | ON | OFF | ON |
| 1070 | ON | ON | OFF | ON |
| 1195 | OFF | OFF | OFF | ON |
| 1320 | ON | OFF | OFF | ON |
| 1435 | OFF | ON | ON | ON |
| 1500 | ON | ON | ON | ON |

| Span calibration (Min ≅ 330 °C, Max = 1818 °C) | | | | |
|---|---|---|---|---|
| mV (°C) | SW2-1 | SW2-2 | SW2-3 | SW2-4 |
| 2.6 (≅ 330) | OFF | ON | OFF | OFF |
| 3.6 (≅ 435) | OFF | ON | ON | ON |
| 5.0 (≅ 575) | OFF | ON | ON | OFF |
| 7.0 ( 770) | OFF | OFF | OFF | ON |
| 10.0 (≅ 1035) | OFF | OFF | OFF | OFF |
| 13.6 (≅ 1335) | OFF | OFF | ON | ON |
| 19.0 (≅ 1818) | OFF | OFF | ON | OFF |

The thermocouple is not linearized. The span value in °C is an average value.

## 1.9    Input type thermocouple T

1.    Range -85 ... 400 °C

| Zero calibration (Max = 345 °C) | | | | |
|---|---|---|---|---|
| °C | SW2-5 | SW2-6 | SW2-7 | SW2-8 |
| -77 | OFF | ON | OFF | OFF |
| -35 | ON | ON | OFF | OFF |
| 5 | OFF | OFF | OFF | OFF |
| 42 | ON | OFF | OFF | OFF |
| 74 | OFF | ON | ON | OFF |
| 105 | ON | ON | ON | OFF |
| 136 | OFF | OFF | ON | OFF |
| 166 | ON | OFF | ON | OFF |
| 193 | OFF | ON | OFF | ON |
| 221 | ON | ON | OFF | ON |
| 248 | OFF | OFF | OFF | ON |
| 275 | ON | OFF | OFF | ON |
| 299 | OFF | ON | ON | ON |
| 325 | ON | ON | ON | ON |
| 345 | OFF | OFF | ON | ON |

| Span calibration (Min ≅ 63 °C, Max = 455 °C) | | | | |
|---|---|---|---|---|
| mV (°C) | SW2-1 | SW2-2 | SW2-3 | SW2-4 |
| 2.6 (≅ 63) | OFF | ON | OFF | OFF |
| 3.6 (≅ 85) | OFF | ON | ON | ON |
| 5.0 (≅ 115) | OFF | ON | ON | OFF |
| 7.0 (≅ 155) | OFF | OFF | OFF | ON |
| 10.0 (≅ 213) | OFF | OFF | OFF | OFF |
| 13.6 (≅ 278) | OFF | OFF | ON | ON |
| 19.4 (≅ 375) | OFF | OFF | ON | OFF |

2.    Range -270 ... 400 °C

| Zero calibration (Max = 270 °C) | | | | |
|---|---|---|---|---|
| °C | SW2-5 | SW2-6 | SW2-7 | SW2-8 |
| -270 | ON | ON | OFF | OFF |
| 0 | OFF | OFF | OFF | OFF |
| 155 | ON | OFF | OFF | OFF |
| 270 | OFF | ON | ON | OFF |

| Span calibration (Min ≅ 175 °C, Max = 670 °C) | | | | |
|---|---|---|---|---|
| mV (°C) | SW2-1 | SW2-2 | SW2-3 | SW2-4 |
| 9 (≅ 195) | ON | ON | OFF | ON |
| 12 (≅ 250) | ON | ON | OFF | OFF |
| 17 (≅ 337) | ON | ON | ON | ON |
| 23 (≅ 459) | ON | ON | ON | OFF |
| 28 (≅ 670) | ON | OFF | OFF | ON |

The thermocouple is not linearized. The span value in °C is an average value.

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## 1.10 Input type thermocouple L

1. Range -45 ... 300 °C

| Zero calibration (Max = 250 °C) | | | | |
|---|---|---|---|---|
| °C | SW2-5 | SW2-6 | SW2-7 | SW2-8 |
| -45 | OFF | ON | OFF | OFF |
| -20 | ON | ON | OFF | OFF |
| 0 | OFF | OFF | OFF | OFF |
| 25 | ON | OFF | OFF | OFF |
| 47 | OFF | ON | ON | OFF |
| 68 | ON | ON | ON | OFF |
| 88 | OFF | OFF | ON | OFF |
| 100 | ON | OFF | ON | OFF |
| 125 | OFF | ON | OFF | ON |
| 145 | ON | ON | OFF | ON |
| 160 | OFF | OFF | OFF | ON |
| 180 | ON | OFF | OFF | ON |
| 195 | OFF | ON | ON | ON |
| 210 | ON | ON | ON | ON |
| 230 | OFF | OFF | ON | ON |
| 250 | ON | OFF | ON | ON |

| Span calibration (Min $\cong$ 40 °C, Max = 300 °C) | | | | |
|---|---|---|---|---|
| mV (°C) | SW2-1 | SW2-2 | SW2-3 | SW2-4 |
| 2.6 ($\cong$ 40) | OFF | ON | OFF | OFF |
| 3.6 ($\cong$ 55) | OFF | ON | ON | ON |
| 5.0 ($\cong$ 75) | OFF | ON | ON | OFF |
| 7.0 ($\cong$ 100) | OFF | OFF | OFF | ON |
| 10.0 ($\cong$ 140) | OFF | OFF | OFF | OFF |
| 13.6 ($\cong$ 185) | OFF | OFF | ON | ON |
| 19.4 ($\cong$ 260) | OFF | OFF | ON | OFF |

2. Range -200 ... 800 °C

| Zero calibration (Max = 650 °C) | | | | |
|---|---|---|---|---|
| °C | SW2-5 | SW2-6 | SW2-7 | SW2-8 |
| -140 | ON | ON | OFF | OFF |
| 0 | OFF | OFF | OFF | OFF |
| 100 | ON | OFF | OFF | OFF |
| 195 | OFF | ON | ON | OFF |
| 280 | ON | ON | ON | OFF |
| 350 | OFF | OFF | ON | OFF |
| 430 | ON | OFF | ON | OFF |
| 510 | OFF | ON | OFF | ON |
| 580 | ON | ON | OFF | ON |
| 660 | OFF | OFF | OFF | ON |

| Span calibration (Min $\cong$ 120 °C, Max = 900 °C) | | | | |
|---|---|---|---|---|
| mV (°C) | SW2-1 | SW2-2 | SW2-3 | SW2-4 |
| 9 ($\cong$ 130) | ON | ON | OFF | ON |
| 12 ($\cong$ 170) | ON | ON | OFF | OFF |
| 17 ($\cong$ 230) | ON | ON | ON | ON |
| 23 ($\cong$ 300) | ON | ON | ON | OFF |
| 33 ($\cong$ 420) | ON | OFF | OFF | ON |
| 47 ($\cong$ 575) | ON | OFF | OFF | OFF |
| 62 ($\cong$ 760) | ON | OFF | ON | ON |

The thermocouple is not linearized. The span value in °C is an average value.

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# 2    Calibration

These isolated barriers are designed for long term stable and trouble free operation. They have been factory calibrated with high accuracy, periodically certified, traceable standard calibrators operating under computer control to perform an automated final testing procedure and test data recording. Therefore they should not require, under normal operating circumstances, any calibration check or readjustment.

For input type or range modification, however is necessary re-calibrating the output scale to adjust to the new input values.

## 2.1    Equipment required

In case of calibration check or readjustment it is necessary the following equipment is required:

- 4½ digit digital multimeter
    - range 20 V, resolution 1 mV, accuracy ±0.1 % or better
    - range 20 mA resolution 10 mA, accuracy ±0.1 % or better
- mV/thermocouple calibrator
    - range 0 ... 100 mV, resolution 10 mV, accuracy ±0.05 % or better

## 2.2    Thermocouple or mV Input range modification

In case of input type changing you must configure the instrument according to the procedure given in data sheet. In case of input range changing, the input range setting DIP switches position must be changed following the procedure:

1. Find the required input type in the section input ranges (for example thermocouple type J).
2. Select the zero and span tables that better satisfy the range extension required (i. e. -210 ... 1200 °C).
3. Find on the zero table the value closest to the one to be calibrated (i. e. 0 for a range 0 ... 840 °C) and set the switches SW2 accordingly.
4. Find on the span table the value closest to the one to be calibrated (i. e. 825 °C for a range 0 ... 840 °C) and set the switches SW2 accordingly.
5. Proceed then in calibrating the front accessible trimmers for fine adjustment output value based on input signal range.
6. If the calibration is difficult, select on the zero and span tables a new range close to the previous one and repeat the calibration procedure.

## 2.3    Thermocouple input range calibration

It is well known that the thermoelectric EMF of a thermocouple is the algebraic sum of all the emission of the thermoelectric junction constituting it (usually the measuring and reference junctions).

A compensating cable must be used for the input connection and a compensation of the junction potential at the barrier input cable must accounted for. This reference junction compensation feature is already built in the barrier by means of an automatic compensator consisting of an RTD that must be putted directly on the input terminals (4 ... 8 for channel 1 and 3 ... 6 for channel 2) from the user.

When performing the instrument calibration the mV signal supplied by the calibrator must account for the reference junction emission potential for providing the correct calibration potential in mV.

Some calibrating configuration can be used to perform the input range signal calibration:

**Note**: For thermocouple type B follow the mV input range calibration section.

Subject to modifications without notice

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### 2.3.1 Copper wires calibration

To set a calibrated signal at low (L) or high (H) end of scale:

Look on the pertinent thermocouple (TC) table for the desired temperature; read the corresponding EMF voltage $V_t(L)$ or $V_t(H)$.

Using a thermometer, read the input connection cable temperature taken at the converters input terminals. Use the TC table to obtain the corresponding reference junction potential $V_r$ (the same supplied by the instruments reference junction compensating circuit).

Compute the compensated potential $V_c$:

$$V_c(L) = V_f(L) - V_r \qquad \text{or} \qquad V_c(H) = V_t(H) - V_r$$

Set the computed value on a absolute millivolts calibrator.
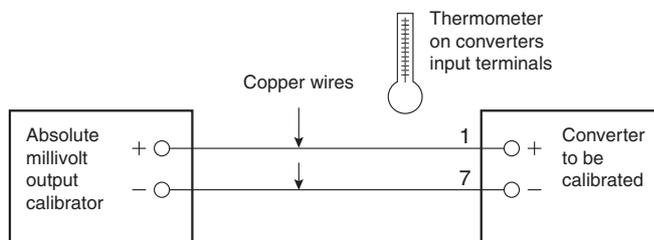


### 2.3.2 Compensating wires calibration

The procedure is a seen in section 2.3.1. In this case the temperature reading is taken at the calibrator end because there reference junction compensation takes place.
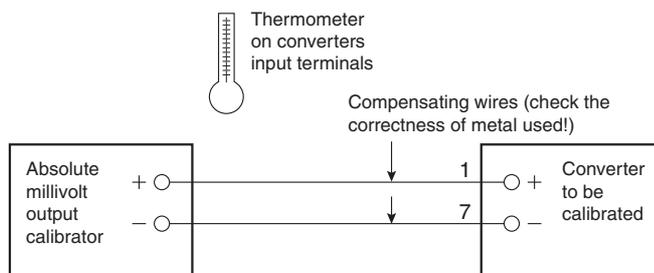


### 2.3.3 Reference junction calibration

With this configuration the reference junction is held at 0 °C (melting point of ice or electronic/electric device simulating the same effect).

The instruments compensates the reference junction at its terminals. The values $V_t(L)$ and $V_t(H)$ can be read directly from the TC table (section 2.3.1) as calibrating signal $V_c(L)$ or $V_c(H)$ since the millivolt values are referred to 0 °C reference junction.



0 °C reference junction (i. e. electronic ice bath or ice meting point bath with T. C. wires in it)

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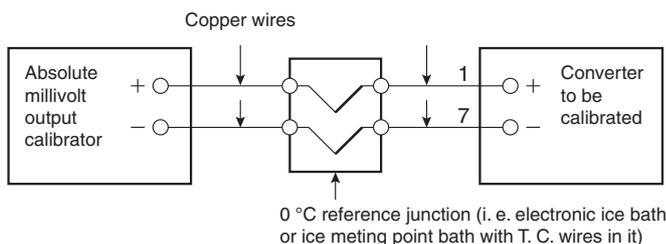
### 2.3.4 Thermocouple calibrator with auto internal RJ compensation calibration

As in section 2.3.3, no signal correction is necessary since the calibrator internally compensates for its reference junction as well as the instrument.



Compensating wires (check the correctness of metal used!)
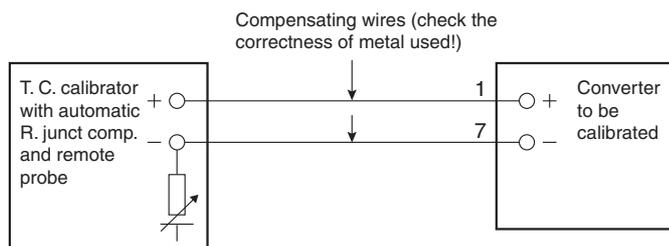
### 2.3.5 Thermocouple calibrator with auto remote RJ compensation calibration

As in section 2.3.4, no signal correction is necessary since the calibrator has no the thermoelectric junctions and compensates for the emission of the converters compensating circuit.



Copper wires

Calibrator compensating probe
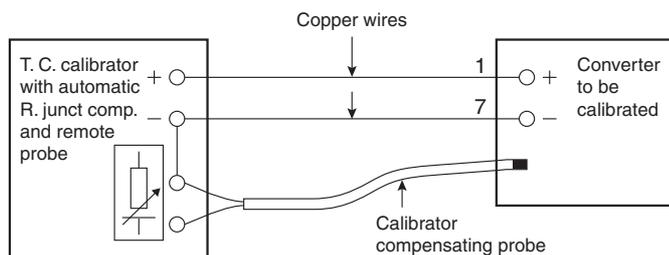
All the configurations seen are equally useful but configuration given in section 2.3.3 is the most accurate and easy to handle.

Configuration in section 2.3.1 is the simplest to set-up but less accurate. It is difficult to exactly track input terminal temperature and its fluctuations.

Note that in configuration 2.3.1 and in configuration 2.3.2 the reference junction potential subtraction becomes a sum of values with a negative sign if the calibrating temperature [i. e. $V_t(L)$] is below zero.

After noting these necessary consideration on how to generate the calibration signals, the calibration check follows the procedure:

• Connect the TC Calibrator at the input terminals of the unit and the multimeter at the output terminals (current or voltage mode dependent to the output type). Allow five minutes for warm-up the unit, then set the calibrator at low end of scale signal and check the output value. It should also be at low end of scale. Adjust if necessary, zero trimmer of the relevant channel.

• Set the calibrator for full scale value, check the output value that must also be at full scale and adjust, if necessary, the span trimmer of the relevant channel.

• Return to the low end of scale and check for shifting of calibrated value. If necessary re-adjust the output value until it comply with the specified accuracy.

If a burnout feature is specified, open the measuring line and check that the output goes beyond full scale for UP SCALE burnout or below low end of scale for DOWN SCALE burnout.

## 2.4 mV input range calibration

Connect the mV calibrator at the input terminals of the unit and the multimeter at the output terminals (current or voltage mode dependent to the output type). Allow five minutes for warm-up the unit, then set the calibrator at low end of scale signal and check the output value. It should also be at low end of scale. Adjust if necessary, zero trimmer of the relevant channel.

Set the calibrator for full scale value, check the output value that must also be at full scale and adjust, if necessary, the span trimmer of the relevant channel.

Return to the low end of scale and check for shifting of calibrated value. If necessary re-adjust the output value until it comply with the specified accuracy.

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