

Termopara typu T

Typ T jest bardzo stabilną termoparą i jest często używany w zastosowaniach o ekstremalnie niskich temperaturach, takich jak urządzenia kriogeniczne.

Tolerancje błędów zgodnie z normą PN-EN 60584-1

| Klasa dokładności | Zakres temperatury | | Dopuszczalny błąd |
|-------------------|--------------------|-----------|-------------------|
| | 1 | -40°C ... | |
| +125°C ... | | +350°C | ± 0.0040 × t |
| 2 | -40°C ... | +133°C | ± 2.5°C |
| | +133°C ... | +350°C | ± 0.0075 × t |



Oznaczenia barwne według norm międzynarodowych

| Typ termopary | Oznaczenie przewodów kompensacyjnych i przedłużających | | IEC /EN 60584-3 | ANSI MC 96.1 | BS 1843 | NFC 42324 | DIN 43714 | JIS C 1610 |
|---------------|--|-----------------------|-----------------|--------------|---------|-----------|-----------|------------|
| | Przewód przedt. | Przewód kompensacyjny | | | | | | |
| Cu vs. CuNi | | | | | | | | |
| T | TX | - | | | | | | |

Tabela ITS-90 dla termopar typu T (spoina odniesienia 0°C) - siła elektromotoryczna emf [mV]

| °C | -10 | -9 | -8 | -7 | -6 | -5 | -4 | -3 | -2 | -1 | 0 |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| -260 | -6.258 | -6.256 | -6.255 | -6.253 | -6.251 | -6.248 | -6.245 | -6.242 | -6.239 | -6.236 | -6.232 |
| -250 | -6.232 | -6.228 | -6.223 | -6.219 | -6.214 | -6.209 | -6.204 | -6.198 | -6.193 | -6.187 | -6.180 |
| -240 | -6.180 | -6.174 | -6.167 | -6.160 | -6.153 | -6.146 | -6.138 | -6.130 | -6.122 | -6.114 | -6.105 |
| -230 | -6.105 | -6.096 | -6.087 | -6.078 | -6.068 | -6.059 | -6.049 | -6.038 | -6.028 | -6.017 | -6.007 |
| -220 | -6.007 | -5.996 | -5.985 | -5.973 | -5.962 | -5.950 | -5.938 | -5.926 | -5.914 | -5.901 | -5.888 |
| -210 | -5.888 | -5.876 | -5.863 | -5.850 | -5.836 | -5.823 | -5.809 | -5.795 | -5.782 | -5.767 | -5.753 |
| -200 | -5.753 | -5.739 | -5.724 | -5.710 | -5.695 | -5.680 | -5.665 | -5.650 | -5.634 | -5.619 | -5.603 |
| -190 | -5.603 | -5.587 | -5.571 | 5.555 | -5.539 | -5.523 | -5.506 | -5.489 | -5.473 | -5.456 | -5.439 |
| -180 | -5.439 | -5.421 | -5.404 | 5.387 | -5.369 | -5.351 | -5.334 | -5.316 | -5.297 | -5.279 | -5.261 |
| -170 | -5.261 | -5.242 | -5.224 | 5.205 | -5.186 | -5.167 | -5.148 | -5.128 | -5.109 | -5.089 | -5.070 |
| -160 | -5.070 | -5.050 | -5.030 | 5.010 | -4.989 | -4.969 | -4.949 | -4.928 | -4.907 | -4.886 | -4.865 |
| -150 | -4.865 | -4.844 | -4.823 | 4.802 | -4.780 | -4.759 | -4.737 | -4.715 | -4.693 | -4.671 | -4.648 |
| -140 | -4.648 | -4.626 | -4.604 | -4.581 | -4.558 | -4.535 | -4.512 | -4.489 | -4.466 | -4.443 | -4.419 |
| -130 | -4.419 | -4.395 | -4.372 | -4.348 | -4.324 | -4.300 | -4.275 | -4.251 | -4.226 | -4.202 | -4.177 |
| -120 | -4.177 | -4.152 | -4.127 | -4.102 | -4.077 | -4.052 | -4.026 | -4.000 | -3.975 | -3.949 | -3.923 |
| -110 | -3.923 | -3.897 | -3.871 | -3.844 | -3.818 | -3.791 | -3.765 | -3.738 | -3.711 | -3.684 | -3.657 |
| -100 | -3.657 | -3.629 | -3.602 | -3.574 | -3.547 | -3.519 | -3.491 | -3.463 | -3.435 | -3.407 | -3.379 |
| -90 | -3.379 | -3.350 | -3.322 | -3.293 | -3.264 | -3.235 | -3.206 | -3.177 | -3.148 | -3.118 | -3.089 |
| -80 | -3.089 | -3.059 | -3.030 | -3.000 | -2.970 | -2.940 | -2.910 | -2.879 | -2.849 | -2.818 | -2.788 |
| -70 | -2.788 | -2.757 | -2.726 | -2.695 | -2.664 | -2.633 | -2.602 | -2.571 | -2.539 | -2.507 | -2.476 |
| -60 | -2.476 | -2.444 | -2.412 | -2.380 | -2.348 | -2.316 | -2.283 | -2.251 | -2.218 | -2.186 | -2.153 |
| -50 | -2.153 | -2.120 | -2.087 | -2.054 | -2.021 | -1.987 | -1.954 | -1.920 | -1.887 | -1.853 | -1.819 |
| °C | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Tabela ITS-90 dla termopar typu T (spoina odniesienia 0°C) – siła elektromotoryczna emf [mV]

| °C | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-----|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| -40 | -1.819 | -1.785 | -1.751 | -1.717 | -1.683 | -1.648 | -1.614 | -1.579 | -1.545 | -1.510 | -1.475 |
| -30 | -1.475 | -1.440 | -1.405 | -1.370 | -1.335 | -1.299 | -1.264 | -1.228 | -1.192 | -1.157 | -1.121 |
| -20 | -1.121 | -1.085 | -1.049 | -1.013 | -0.976 | -0.940 | -0.904 | -0.867 | -0.830 | -0.794 | -0.757 |
| -10 | -0.757 | -0.720 | -0.683 | -0.646 | -0.608 | -0.571 | -0.534 | -0.496 | -0.459 | -0.421 | -0.383 |
| 0 | -0.383 | -0.345 | -0.307 | -0.269 | -0.231 | -0.193 | -0.154 | -0.116 | -0.077 | -0.039 | 0.000 |
| 0 | 0.000 | 0.039 | 0.078 | 0.117 | 0.156 | 0.195 | 0.234 | 0.273 | 0.312 | 0.352 | 0.391 |
| 10 | 0.391 | 0.431 | 0.470 | 0.510 | 0.549 | 0.589 | 0.629 | 0.669 | 0.709 | 0.749 | 0.790 |
| 20 | 0.790 | 0.830 | 0.870 | 0.911 | 0.951 | 0.992 | 1.033 | 1.074 | 1.114 | 1.155 | 1.196 |
| 30 | 1.196 | 1.238 | 1.279 | 1.320 | 1.362 | 1.403 | 1.445 | 1.486 | 1.528 | 1.570 | 1.612 |
| 40 | 1.612 | 1.654 | 1.696 | 1.738 | 1.780 | 1.823 | 1.865 | 1.908 | 1.950 | 1.993 | 2.036 |
| 50 | 2.036 | 2.079 | 2.122 | 2.165 | 2.208 | 2.251 | 2.294 | 2.338 | 2.381 | 2.425 | 2.468 |
| 60 | 2.468 | 2.512 | 2.556 | 2.600 | 2.643 | 2.687 | 2.732 | 2.776 | 2.820 | 2.864 | 2.909 |
| 70 | 2.909 | 2.953 | 2.998 | 3.043 | 3.087 | 3.132 | 3.177 | 3.222 | 3.267 | 3.312 | 3.358 |
| 80 | 3.358 | 3.403 | 3.448 | 3.494 | 3.539 | 3.585 | 3.631 | 3.677 | 3.722 | 3.768 | 3.814 |
| 90 | 3.814 | 3.860 | 3.907 | 3.953 | 3.999 | 4.046 | 4.092 | 4.138 | 4.185 | 4.232 | 4.279 |
| 100 | 4.279 | 4.325 | 4.372 | 4.419 | 4.466 | 4.513 | 4.561 | 4.608 | 4.655 | 4.702 | 4.750 |
| 110 | 4.750 | 4.798 | 4.845 | 4.893 | 4.941 | 4.988 | 5.036 | 5.084 | 5.132 | 5.180 | 5.228 |
| 120 | 5.228 | 5.277 | 5.325 | 5.373 | 5.422 | 5.470 | 5.519 | 5.567 | 5.616 | 5.665 | 5.714 |
| 130 | 5.714 | 5.763 | 5.812 | 5.861 | 5.910 | 5.959 | 6.008 | 6.057 | 6.107 | 6.156 | 6.206 |
| 140 | 6.206 | 6.255 | 6.305 | 6.355 | 6.404 | 6.454 | 6.504 | 6.554 | 6.604 | 6.654 | 6.704 |
| 150 | 6.704 | 6.754 | 6.805 | 6.855 | 6.905 | 6.956 | 7.006 | 7.057 | 7.107 | 7.158 | 7.209 |
| 160 | 7.209 | 7.260 | 7.310 | 7.361 | 7.412 | 7.463 | 7.515 | 7.566 | 7.617 | 7.668 | 7.720 |
| 170 | 7.720 | 7.771 | 7.823 | 7.874 | 7.926 | 7.977 | 8.029 | 8.081 | 8.133 | 8.185 | 8.237 |
| 180 | 8.237 | 8.289 | 8.341 | 8.393 | 8.445 | 8.497 | 8.550 | 8.602 | 8.654 | 8.707 | 8.759 |
| 190 | 8.759 | 8.812 | 8.865 | 8.917 | 8.970 | 9.023 | 9.076 | 9.129 | 9.182 | 9.235 | 9.288 |
| 200 | 9.288 | 9.341 | 9.395 | 9.448 | 9.501 | 9.555 | 9.608 | 9.662 | 9.715 | 9.769 | 9.822 |
| 210 | 9.822 | 9.876 | 9.930 | 9.984 | 10.038 | 10.092 | 10.146 | 10.200 | 10.254 | 10.308 | 10.362 |
| 220 | 10.362 | 10.417 | 10.471 | 10.525 | 10.580 | 10.634 | 10.689 | 10.743 | 10.798 | 10.853 | 10.907 |
| 230 | 10.907 | 10.962 | 11.017 | 11.072 | 11.127 | 11.182 | 11.237 | 11.292 | 11.347 | 11.403 | 11.458 |
| 240 | 11.458 | 11.513 | 11.569 | 11.624 | 11.680 | 11.735 | 11.791 | 11.846 | 11.902 | 11.958 | 12.013 |
| 250 | 12.013 | 12.069 | 12.125 | 12.181 | 12.237 | 12.293 | 12.349 | 12.405 | 12.461 | 12.518 | 12.574 |
| 260 | 12.574 | 12.630 | 12.687 | 12.743 | 12.799 | 12.856 | 12.912 | 12.969 | 13.026 | 13.082 | 13.139 |
| 270 | 13.139 | 13.196 | 13.253 | 13.310 | 13.366 | 13.423 | 13.480 | 13.537 | 13.595 | 13.652 | 13.709 |
| 280 | 13.709 | 13.766 | 13.823 | 13.881 | 13.938 | 13.995 | 14.053 | 14.110 | 14.168 | 14.226 | 14.283 |
| 290 | 14.283 | 14.341 | 14.399 | 14.456 | 14.514 | 14.572 | 14.630 | 14.688 | 14.746 | 14.804 | 14.862 |
| 300 | 14.862 | 14.920 | 14.978 | 15.036 | 15.095 | 15.153 | 15.211 | 15.270 | 15.328 | 15.386 | 15.445 |
| 310 | 15.445 | 15.503 | 15.562 | 15.621 | 15.679 | 15.738 | 15.797 | 15.856 | 15.914 | 15.973 | 16.032 |
| 320 | 16.032 | 16.091 | 16.150 | 16.209 | 16.268 | 16.327 | 16.387 | 16.446 | 16.505 | 16.564 | 16.624 |
| 330 | 16.624 | 16.683 | 16.742 | 16.802 | 16.861 | 16.921 | 16.980 | 17.040 | 17.100 | 17.159 | 17.219 |
| 340 | 17.219 | 17.279 | 17.339 | 17.399 | 17.458 | 17.518 | 17.578 | 17.638 | 17.698 | 17.759 | 17.819 |
| °C | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Tabela ITS-90 dla termopar typu T (spoina odniesienia 0°C) - siła elektromotoryczna emf [mV]

| °C | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
| 350 | 17.819 | 17.879 | 17.939 | 17.999 | 18.060 | 18.120 | 18.180 | 18.241 | 18.301 | 18.362 | 18.422 |
| 360 | 18.422 | 18.483 | 18.543 | 18.604 | 18.665 | 18.725 | 18.786 | 18.847 | 18.908 | 18.969 | 19.030 |
| 370 | 19.030 | 19.091 | 19.152 | 19.213 | 19.274 | 19.335 | 19.396 | 19.457 | 19.518 | 19.579 | 19.641 |
| 380 | 19.641 | 19.702 | 19.763 | 19.825 | 19.886 | 19.947 | 20.009 | 20.070 | 20.132 | 20.193 | 20.255 |
| 390 | 20.255 | 20.317 | 20.378 | 20.440 | 20.502 | 20.563 | 20.625 | 20.687 | 20.748 | 20.810 | 20.872 |
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| °C | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |