

**MAXIMUM TEMPERATURE RANGE**

**Thermocouple Grade**

-32 to 4208°F

-0 to 2320°C

**Extension Grade**

32 to 1600°F

0 to 870°C

**LIMITS OF ERROR**

(whichever is greater)

**Standard:** 4.5°C to 425°C

1.0% to 2320°C

**Special:** Not Established

**COMMENTS, BARE WIRE ENVIRONMENT:**

Vacuum, Inert; Hydrogen; Beware of

Embrittlement; Not Practical Below 750°F;

Not for Oxidizing Atmosphere

**TEMPERATURE IN DEGREES °C**

**REFERENCE JUNCTION AT 0°C**

°C  
Tungsten-  
5% Rhenium  
vs.  
Tungsten-  
26% Rhenium



Extension  
Grade

IEC color code

ANSI color code

**Revised Thermocouple  
Reference Tables**

**TYPE**  
Reference  
Tables  
N.I.S.T.  
Monograph 175  
Revised to  
ITS-90



Z

Thermoelectric Voltage in Millivolts

| °C | 0     | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    | 115 | °C  | 500   | 510   | 520   | 530   | 540   | 550   | 560   | 570   | 580   | 590   | 600   | 610 | 620 | 630   | 640   | 650   | 660   | 670   | 680   | 690   | 700   | 710   | 720   | 730   | 740 | 750 | 760   | 770   | 780   | 790   | 800   | 810   | 820   | 830   | 840   | 850   | 860   | 870 | 880 | 890   | 900   | 910   | 920   | 930   | 940   | 950   | 960   | 970   | 980   | 990   |    |     |       |       |       |       |       |       |       |       |       |       |       |     |    |       |       |       |       |       |       |       |       |       |       |       |   |     |       |       |       |       |       |       |       |       |       |       |       |     |    |       |       |       |       |       |       |       |       |       |       |       |    |     |       |       |       |       |       |       |       |       |       |       |       |     |    |  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| 0  | 0.000 | 0.013 | 0.026 | 0.040 | 0.053 | 0.067 | 0.080 | 0.094 | 0.107 | 0.120 | 0.135 | 0   | 500 | 8.655 | 8.674 | 8.694 | 8.713 | 8.733 | 8.752 | 8.772 | 8.791 | 8.810 | 8.830 | 8.849 | 500 | 10  | 0.135 | 0.148 | 0.162 | 0.176 | 0.189 | 0.203 | 0.217 | 0.231 | 0.244 | 0.258 | 0.272 | 10  | 510 | 8.849 | 8.869 | 8.888 | 8.908 | 8.927 | 8.947 | 8.966 | 8.986 | 9.005 | 9.024 | 9.044 | 510 | 20  | 0.272 | 0.286 | 0.300 | 0.314 | 0.328 | 0.342 | 0.356 | 0.370 | 0.384 | 0.398 | 0.412 | 20 | 520 | 9.044 | 9.063 | 9.083 | 9.102 | 9.122 | 9.141 | 9.161 | 9.180 | 9.200 | 9.219 | 9.239 | 520 | 30 | 0.412 | 0.426 | 0.440 | 0.454 | 0.469 | 0.483 | 0.497 | 0.511 | 0.525 | 0.540 | 0.554 | 0 | 530 | 9.239 | 9.258 | 9.278 | 9.297 | 9.317 | 9.336 | 9.356 | 9.375 | 9.395 | 9.414 | 9.434 | 530 | 40 | 0.554 | 0.568 | 0.583 | 0.597 | 0.612 | 0.626 | 0.640 | 0.655 | 0.669 | 0.684 | 0.698 | 40 | 540 | 9.434 | 9.453 | 9.473 | 9.492 | 9.512 | 9.531 | 9.551 | 9.570 | 9.590 | 9.609 | 9.629 | 540 | 50 | 0.698 | 0.713 | 0.727 | 0.742 | 0.757 | 0.771 | 0.786 | 0.801 | 0.815 | 0.830 | 0.845 | 50 | 550 | 9.629 | 9.648 | 9.668 | 9.687 | 9.707 | 9.726 | 9.746 | 9.765 | 9.785 | 9.804 | 9.824 | 550 | 60 | 0.845 | 0.860 | 0.874 | 0.889 | 0.904 | 0.919 | 0.934 | 0.948 | 0.963 | 0.978 | 0.993 | 60 | 560 | 9.824 | 9.843 | 9.863 | 9.883 | 9.902 | 9.922 | 9.941 | 9.961 | 9.980 | 10.000 | 10.019 | 560 | 70 | 0.993 | 1.008 | 1.023 | 1.038 | 1.053 | 1.068 | 1.083 | 1.098 | 1.114 | 1.129 | 1.144 | 70 | 570 | 10.019 | 10.039 | 10.058 | 10.078 | 10.097 | 10.117 | 10.137 | 10.156 | 10.176 | 10.195 | 10.215 | 570 | 80 | 1.144 | 1.159 | 1.174 | 1.189 | 1.205 | 1.220 | 1.235 | 1.250 | 1.266 | 1.281 | 1.296 | 80 | 580 | 10.215 | 10.234 | 10.254 | 10.273 | 10.293 | 10.312 | 10.332 | 10.352 | 10.371 | 10.391 | 10.410 | 580 | 90 | 1.296 | 1.312 | 1.327 | 1.342 | 1.358 | 1.373 | 1.389 | 1.404 | 1.420 | 1.435 | 1.451 | 90 | 590 | 10.410 | 10.430 | 10.449 | 10.469 | 10.488 | 10.508 | 10.528 | 10.547 | 10.567 | 10.586 | 10.606 | 590 | 600 | 1.451 | 1.466 | 1.482 | 1.497 | 1.513 | 1.529 | 1.544 | 1.560 | 1.576 | 1.591 | 1.607 | 100 | 610 | 10.606 | 10.625 | 10.645 | 10.664 | 10.684 | 10.703 | 10.723 | 10.743 | 10.762 | 10.782 | 10.801 | 610 | 110 | 1.607 | 1.623 | 1.639 | 1.654 | 1.670 | 1.686 | 1.702 | 1.718 | 1.733 | 1.749 | 1.765 | 110 | 620 | 10.801 | 10.821 | 10.840 | 10.860 | 10.879 | 10.899 | 10.919 | 10.938 | 10.958 | 10.977 | 10.997 | 620 | 120 | 1.765 | 1.781 | 1.797 | 1.813 | 1.829 | 1.845 | 1.861 | 1.877 | 1.893 | 1.909 | 1.925 | 120 | 630 | 10.997 | 11.016 | 11.036 | 11.055 | 11.075 | 11.095 | 11.114 | 11.134 | 11.153 | 11.173 | 11.192 | 630 | 130 | 1.925 | 1.941 | 1.957 | 1.973 | 1.989 | 2.006 | 2.022 | 2.038 | 2.054 | 2.070 | 2.087 | 130 | 640 | 11.192 | 11.212 | 11.231 | 11.251 | 11.270 | 11.290 | 11.310 | 11.329 | 11.349 | 11.368 | 11.388 | 640 | 140 | 2.087 | 2.103 | 2.119 | 2.135 | 2.152 | 2.168 | 2.184 | 2.201 | 2.217 | 2.233 | 2.250 | 140 | 650 | 11.388 | 11.407 | 11.427 | 11.446 | 11.466 | 11.485 | 11.505 | 11.525 | 11.544 | 11.564 | 11.583 | 650 | 150 | 2.250 | 2.266 | 2.283 | 2.299 | 2.316 | 2.332 | 2.349 | 2.365 | 2.382 | 2.398 | 2.415 | 150 | 660 | 11.583 | 11.603 | 11.622 | 11.642 | 11.661 | 11.681 | 11.700 | 11.720 | 11.739 | 11.759 | 11.778 | 660 | 160 | 2.415 | 2.431 | 2.448 | 2.464 | 2.481 | 2.498 | 2.514 | 2.531 | 2.548 | 2.564 | 2.581 | 160 | 670 | 11.778 | 11.798 | 11.817 | 11.837 | 11.857 | 11.876 | 11.896 | 11.915 | 11.935 | 11.954 | 11.974 | 670 | 170 | 2.581 | 2.598 | 2.614 | 2.631 | 2.648 | 2.665 | 2.682 | 2.698 | 2.715 | 2.732 | 2.749 | 170 | 680 | 11.974 | 11.993 | 12.013 | 12.032 | 12.052 | 12.071 | 12.091 | 12.110 | 12.130 | 12.149 | 12.169 | 680 | 180 | 2.749 | 2.766 | 2.783 | 2.800 | 2.816 | 2.833 | 2.850 | 2.867 | 2.884 | 2.901 | 2.918 | 180 | 690 | 12.169 | 12.188 | 12.208 | 12.227 | 12.247 | 12.266 | 12.286 | 12.305 | 12.325 | 12.344 | 12.364 | 690 | 190 | 2.918 | 2.935 | 2.952 | 2.969 | 2.986 | 3.003 | 3.020 | 3.038 | 3.055 | 3.072 | 3.089 | 190 | 700 | 12.364 | 12.383 | 12.403 | 12.422 | 12.442 | 12.461 | 12.481 | 12.500 | 12.519 | 12.539 | 12.558 | 700 | 200 | 3.089 | 3.106 | 3.123 | 3.140 | 3.158 | 3.175 | 3.192 | 3.209 | 3.227 | 3.244 | 3.262 | 200 | 710 | 12.558 | 12.578 | 12.597 | 12.617 | 12.636 | 12.656 | 12.675 | 12.695 | 12.714 | 12.734 | 12.753 | 710 | 210 | 3.261 | 3.278 | 3.296 | 3.313 | 3.330 | 3.348 | 3.365 | 3.382 | 3.400 | 3.417 | 3.434 | 210 | 720 | 12.753 | 12.772 | 12.792 | 12.811 | 12.831 | 12.850 | 12.870 | 12.889 | 12.909 | 12.928 | 12.947 | 720 | 220 | 3.434 | 3.452 | 3.469 | 3.487 | 3.504 | 3.522 | 3.539 | 3.557 | 3.574 | 3.592 | 3.609 | 220 | 730 | 12.947 | 12.967 | 12.986 | 13.006 | 13.025 | 13.045 | 13.064 | 13.083 | 13.103 | 13.122 | 13.142 | 730 | 230 | 3.609 | 3.627 | 3.644 | 3.662 | 3.679 | 3.697 | 3.714 | 3.732 | 3.750 | 3.767 | 3.785 | 230 | 740 | 13.142 | 13.161 | 13.180 | 13.200 | 13.219 | 13.239 | 13.258 | 13.277 | 13.297 | 13.316 | 13.336 | 740 | 240 | 3.785 | 3.803 | 3.820 | 3.838 | 3.856 | 3.873 | 3.891 | 3.909 | 3.927 | 3.944 | 3.962 | 240 | 750 | 13.336 | 13.355 | 13.374 | 13.394 | 13.413 | 13.432 | 13.452 | 13.471 | 13.491 | 13.510 | 13.529 | 750 | 250 | 3.962 | 3.980 | 3.998 | 4.015 | 4.033 | 4.051 | 4.069 | 4.087 | 4.104 | 4.122 | 4.140 | 250 | 760 | 13.529 | 13.549 | 13.568 | 13.587 | 13.607 | 13.626 | 13.645 | 13.665 | 13.684 | 13.703 | 13.723 | 760 | 260 | 4.140 | 4.158 | 4.176 | 4.194 | 4.212 | 4.230 | 4.248 | 4.266 | 4.284 | 4.301 | 4.319 | 260 | 770 | 13.723 | 13.742 | 13.761 | 13.781 | 13.800 | 13.819 | 13.839 | 13.858 | 13.877 | 13.897 | 13.916 | 770 | 270 | 4.319 | 4.337 | 4.355 | 4.373 | 4.391 | 4.410 | 4.428 | 4.446 | 4.464 | 4.482 | 4.500 | 270 | 780 | 13.916 | 13.935 | 13.955 | 13.974 | 13.993 | 14.012 | 14.032 | 14.051 | 14.070 | 14.090 | 14.109 | 780 | 280 | 4.500 | 4.518 | 4.536 | 4.554 | 4.572 | 4.590 | 4.608 | 4.627 | 4.645 | 4.663 | 4.681 | 280 | 790 | 14.109 | 14.128 | 14.147 | 14.167 | 14.186 | 14.205 | 14.224 | 14.244 | 14.263 | 14.282 | 14.302 | 790 | 290 | 4.681 | 4.699 | 4.717 | 4.736 | 4.754 | 4.772 | 4.790 | 4.809 | 4.827 | 4.845 | 4.863 | 290 | 800 | 14.302 | 14.321 | 14.340 | 14.359 | 14.378 | 14.398 | 14.417 | 14.436 | 14.455 | 14.475 | 14.494 | 800 | 300 | 4.863 | 4.882 | 4.900 | 4.918 | 4.937 | 4.955 | 4.973 | 4.992 | 5.010 | 5.028 | 5.047 | 300 | 810 | 14.494 | 14.513 | 14.532 | 14.551 | 14.571 | 14.590 | 14.609 | 14.628 | 14.647 | 14.667 | 14.686 | 810 | 310 | 5.047 | 5.065 | 5.083 | 5.102 | 5.120 | 5.139 | 5.157 | 5.175 | 5.194 | 5.212 | 5.231 | 310 | 820 | 14.686 | 14.705 | 14.724 | 14.743 | 14.762 | 14.782 | 14.801 | 14.820 | 14.839 | 14.858 | 14.877 | 820 | 320 | 5.231 | 5.249 | 5.268 | 5.286 | 5.305 | 5.323 | 5.342 | 5.360 | 5.379 | 5.397 | 5.416 | 320 | 830 | 14.877 | 14.897 | 14.916 | 14.935 | 14.954 | 14.973 | 14.992 | 15.011 | 15.030 | 15.050 | 15.069 | 830 | 330 | 5.416 | 5.434 | 5.453 | 5.471 | 5.490 | 5.508 | 5.527 | 5.546 | 5.564 | 5.583 | 5.601 | 330 | 840 | 15.069 | 15.088 | 15.107 | 15.126 | 15.145 | 15.164 | 15.183 | 15.202 | 15.221 | 15.241 | 15.260 | 840 | 340 | 5.601 | 5.620 | 5.639 | 5.657 | 5.676 | 5.695 | 5.713 | 5.732 | 5.751 | 5.769 | 5.788 | 340 | 850 | 15.260 | 15.279 | 15.298 | 15.317 | 15.336 | 15.355 | 15.374 | 15.393 | 15.412 | 15.431 | 15.450 | 850 | 350 | 5.788 | 5.807 | 5.825 | 5.844 | 5.863 | 5.882 | 5.900 | 5.919 | 5.938 | 5.956 | 5.975 | 350 | 860 | 15.450 | 15.469 | 15.488 | 15.507 | 15.526 | 15.545 | 15.564 | 15.583 | 15.602 | 15.621 | 15.640 | 860 | 360 | 5.975 | 5.994 | 6.013 | 6.032 | 6.050 | 6.069 | 6.088 | 6.107 | 6.126 | 6.144 | 6.163 | 360 | 870 | 15.640 | 15.659 | 15.678 | 15.697 | 15.716 | 15.735 | 15.754 | 15.773 | 15.792 | 15.811 | 15.830 | 870 | 370 | 6.163 | 6.182 | 6.201 | 6.220 | 6.239 | 6.257 | 6.276 | 6.295 | 6.314 | 6.333 | 6.352 | 370 | 880 | 15.830 | 15.849 | 15.868 | 15.887 | 15.906 | 15.925 | 15.944 | 15.963 | 15.982 | 16.001 | 16.020 | 880 | 380 | 6.352 | 6.371 | 6.390 | 6.409 | 6.427 | 6.446 | 6.465 | 6.484 | 6.503 | 6.522 | 6.541 | 380 | 890 | 16.020 | 16.038 | 16.057 | 16.076 | 16.095 | 16.114 | 16.133 | 16.152 | 16.171 | 16.190 | 16.208 | 890 | 390 | 6.541 | 6.560 | 6.579 | 6.598 | 6.617 | 6.636 | 6.655 | 6.674 | 6.693 | 6.712 | 6.731 | 390 | 900 | 16.208 | 16.227 | 16.246 | 16.265 | 16.284 | 16.303 | 16.322 | 16.340 | 16.359 | 16.378 | 16.397 | 900 | 400 | 6.731 | 6.750 | 6.769 | 6.788 | 6.807 | 6.826 | 6.845 | 6.864 | 6.883 | 6.90 |

# Revised Thermocouple Reference Tables

# TYPE C

Reference Tables  
N.I.S.T.  
Monograph 175  
Revised to ITS-90



ANSI color code

IEC color code



°C  
Tungsten-5% Rhenium  
vs.  
Tungsten-26% Rhenium

Extension Grade

## MAXIMUM TEMPERATURE RANGE

Thermocouple Grade

-32 to 4208°F  
-0 to 2320°C

Extension Grade

32 to 1600°F  
0 to 870°C

LIMITS OF ERROR

(whichever is greater)

Standard: 4.5°C to 425°C

1.0% to 2320°C

Special: Not Established

COMMENTS, BARE WIRE ENVIRONMENT:

Vacuum, Inert; Hydrogen; Beware of Embrittlement; Not Practical Below 750°F; Not for Oxidizing Atmosphere

TEMPERATURE IN DEGREES °C

REFERENCE JUNCTION AT 0°C

Thermoelectric Voltage in Millivolts

| °C   | 0      | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | °C   | 0    | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | °C     |      |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|
| 1000 | 18.257 | 18.275 | 18.294 | 18.312 | 18.330 | 18.349 | 18.367 | 18.385 | 18.404 | 18.422 | 18.440 | 1000 | 1500 | 26.722 | 26.738 | 26.753 | 26.768 | 26.784 | 26.799 | 26.815 | 26.830 | 26.845 | 26.861 | 26.876 | 1500 |
| 1010 | 18.440 | 18.459 | 18.477 | 18.495 | 18.513 | 18.532 | 18.550 | 18.568 | 18.587 | 18.605 | 18.623 | 1010 | 1510 | 26.876 | 26.892 | 26.907 | 26.922 | 26.938 | 26.953 | 26.968 | 26.984 | 26.999 | 27.014 | 27.030 | 1510 |
| 1020 | 18.623 | 18.641 | 18.660 | 18.678 | 18.696 | 18.714 | 18.732 | 18.751 | 18.769 | 18.787 | 18.805 | 1020 | 1520 | 27.030 | 27.045 | 27.060 | 27.076 | 27.091 | 27.106 | 27.121 | 27.137 | 27.152 | 27.167 | 27.183 | 1520 |
| 1030 | 18.805 | 18.824 | 18.842 | 18.860 | 18.878 | 18.896 | 18.914 | 18.933 | 18.951 | 18.969 | 18.987 | 1030 | 1530 | 27.183 | 27.198 | 27.213 | 27.228 | 27.244 | 27.259 | 27.274 | 27.289 | 27.304 | 27.320 | 27.335 | 1530 |
| 1040 | 18.987 | 19.005 | 19.023 | 19.041 | 19.060 | 19.078 | 19.096 | 19.114 | 19.132 | 19.150 | 19.168 | 1040 | 1540 | 27.335 | 27.350 | 27.365 | 27.380 | 27.396 | 27.411 | 27.426 | 27.441 | 27.456 | 27.471 | 27.486 | 1540 |
| 1050 | 19.168 | 19.186 | 19.204 | 19.223 | 19.241 | 19.259 | 19.277 | 19.295 | 19.313 | 19.331 | 19.349 | 1050 | 1550 | 27.486 | 27.502 | 27.517 | 27.532 | 27.547 | 27.562 | 27.577 | 27.592 | 27.607 | 27.622 | 27.637 | 1550 |
| 1060 | 19.349 | 19.367 | 19.385 | 19.403 | 19.421 | 19.439 | 19.457 | 19.475 | 19.493 | 19.511 | 19.529 | 1060 | 1560 | 27.637 | 27.653 | 27.668 | 27.683 | 27.698 | 27.713 | 27.728 | 27.743 | 27.758 | 27.773 | 27.788 | 1560 |
| 1070 | 19.529 | 19.547 | 19.565 | 19.583 | 19.601 | 19.619 | 19.637 | 19.655 | 19.673 | 19.691 | 19.709 | 1070 | 1570 | 27.788 | 27.803 | 27.818 | 27.833 | 27.848 | 27.863 | 27.878 | 27.893 | 27.908 | 27.923 | 27.938 | 1570 |
| 1080 | 19.709 | 19.727 | 19.744 | 19.762 | 19.780 | 19.798 | 19.816 | 19.834 | 19.852 | 19.870 | 19.888 | 1080 | 1580 | 27.938 | 27.953 | 27.968 | 27.983 | 27.997 | 28.012 | 28.027 | 28.042 | 28.057 | 28.072 | 28.087 | 1580 |
| 1090 | 19.888 | 19.905 | 19.923 | 19.941 | 19.959 | 19.977 | 19.995 | 20.013 | 20.030 | 20.048 | 20.066 | 1090 | 1590 | 28.087 | 28.102 | 28.117 | 28.132 | 28.146 | 28.161 | 28.176 | 28.191 | 28.206 | 28.221 | 28.236 | 1590 |
| 1100 | 20.066 | 20.084 | 20.102 | 20.120 | 20.137 | 20.155 | 20.173 | 20.191 | 20.208 | 20.226 | 20.066 | 1100 | 1600 | 28.236 | 28.250 | 28.265 | 28.280 | 28.295 | 28.310 | 28.324 | 28.339 | 28.354 | 28.369 | 28.384 | 1600 |
| 1110 | 20.244 | 20.262 | 20.279 | 20.297 | 20.315 | 20.333 | 20.350 | 20.368 | 20.386 | 20.404 | 20.421 | 1110 | 1610 | 28.384 | 28.398 | 28.413 | 28.428 | 28.443 | 28.457 | 28.472 | 28.487 | 28.502 | 28.516 | 28.531 | 1610 |
| 1120 | 20.421 | 20.439 | 20.457 | 20.474 | 20.492 | 20.510 | 20.527 | 20.545 | 20.563 | 20.580 | 20.598 | 1120 | 1620 | 28.531 | 28.546 | 28.560 | 28.575 | 28.590 | 28.604 | 28.619 | 28.634 | 28.648 | 28.663 | 28.678 | 1620 |
| 1130 | 20.598 | 20.616 | 20.633 | 20.651 | 20.669 | 20.686 | 20.704 | 20.721 | 20.739 | 20.757 | 20.774 | 1130 | 1630 | 28.678 | 28.692 | 28.707 | 28.722 | 28.736 | 28.751 | 28.765 | 28.780 | 28.795 | 28.809 | 28.824 | 1630 |
| 1140 | 20.774 | 20.792 | 20.809 | 20.827 | 20.845 | 20.862 | 20.880 | 20.897 | 20.915 | 20.932 | 20.950 | 1140 | 1640 | 28.824 | 28.838 | 28.853 | 28.868 | 28.882 | 28.897 | 28.911 | 28.926 | 28.940 | 28.955 | 28.969 | 1640 |
| 1150 | 20.950 | 20.967 | 20.985 | 21.002 | 21.020 | 21.037 | 21.055 | 21.072 | 21.090 | 21.107 | 21.125 | 1150 | 1650 | 28.969 | 28.984 | 28.998 | 29.013 | 29.027 | 29.042 | 29.056 | 29.071 | 29.085 | 29.100 | 29.114 | 1650 |
| 1160 | 21.125 | 21.142 | 21.160 | 21.177 | 21.195 | 21.212 | 21.230 | 21.247 | 21.265 | 21.282 | 21.299 | 1160 | 1660 | 29.114 | 29.129 | 29.143 | 29.158 | 29.172 | 29.187 | 29.201 | 29.215 | 29.230 | 29.244 | 29.259 | 1660 |
| 1170 | 21.299 | 21.317 | 21.334 | 21.352 | 21.369 | 21.386 | 21.404 | 21.421 | 21.439 | 21.456 | 21.473 | 1170 | 1670 | 29.259 | 29.273 | 29.287 | 29.302 | 29.316 | 29.331 | 29.345 | 29.359 | 29.374 | 29.388 | 29.402 | 1670 |
| 1180 | 21.473 | 21.491 | 21.508 | 21.525 | 21.543 | 21.560 | 21.577 | 21.595 | 21.612 | 21.629 | 21.647 | 1180 | 1680 | 29.402 | 29.417 | 29.431 | 29.445 | 29.460 | 29.474 | 29.488 | 29.503 | 29.517 | 29.531 | 29.546 | 1680 |
| 1190 | 21.647 | 21.664 | 21.681 | 21.698 | 21.716 | 21.733 | 21.750 | 21.768 | 21.785 | 21.802 | 21.819 | 1190 | 1690 | 29.546 | 29.560 | 29.574 | 29.588 | 29.603 | 29.617 | 29.631 | 29.645 | 29.660 | 29.674 | 29.688 | 1690 |
| 1200 | 21.819 | 21.837 | 21.854 | 21.871 | 21.888 | 21.905 | 21.923 | 21.940 | 21.957 | 21.974 | 21.991 | 1200 | 1700 | 29.688 | 29.702 | 29.716 | 29.731 | 29.745 | 29.759 | 29.773 | 29.787 | 29.802 | 29.816 | 29.830 | 1700 |
| 1210 | 21.991 | 22.009 | 22.026 | 22.043 | 22.060 | 22.077 | 22.094 | 22.112 | 22.129 | 22.146 | 22.163 | 1210 | 1710 | 29.830 | 29.844 | 29.858 | 29.872 | 29.886 | 29.901 | 29.915 | 29.929 | 29.943 | 29.957 | 29.971 | 1710 |
| 1220 | 22.163 | 22.180 | 22.197 | 22.214 | 22.231 | 22.249 | 22.266 | 22.283 | 22.300 | 22.317 | 22.334 | 1220 | 1720 | 29.971 | 29.985 | 29.999 | 30.013 | 30.027 | 30.041 | 30.056 | 30.070 | 30.084 | 30.098 | 30.112 | 1720 |
| 1230 | 22.334 | 22.351 | 22.368 | 22.385 | 22.402 | 22.419 | 22.436 | 22.453 | 22.470 | 22.487 | 22.504 | 1230 | 1730 | 30.112 | 30.126 | 30.140 | 30.154 | 30.168 | 30.182 | 30.196 | 30.210 | 30.224 | 30.238 | 30.252 | 1730 |
| 1240 | 22.504 | 22.521 | 22.538 | 22.555 | 22.572 | 22.589 | 22.606 | 22.623 | 22.640 | 22.657 | 22.674 | 1240 | 1740 | 30.252 | 30.266 | 30.280 | 30.294 | 30.308 | 30.321 | 30.335 | 30.349 | 30.363 | 30.377 | 30.391 | 1740 |
| 1250 | 22.674 | 22.691 | 22.708 | 22.725 | 22.742 | 22.759 | 22.776 | 22.792 | 22.809 | 22.826 | 22.843 | 1250 | 1750 | 30.391 | 30.405 | 30.419 | 30.433 | 30.447 | 30.460 | 30.474 | 30.488 | 30.502 | 30.516 | 30.530 | 1750 |
| 1260 | 22.843 | 22.860 | 22.877 | 22.894 | 22.911 | 22.928 | 22.944 | 22.961 | 22.978 | 22.995 | 23.012 | 1260 | 1760 | 30.530 | 30.544 | 30.557 | 30.571 | 30.585 | 30.599 | 30.613 | 30.627 | 30.640 | 30.654 | 30.668 | 1760 |
| 1270 | 23.012 | 23.029 | 23.045 | 23.062 | 23.079 | 23.096 | 23.113 | 23.129 | 23.146 | 23.163 | 23.180 | 1270 | 1770 | 30.668 | 30.682 | 30.695 | 30.709 | 30.723 | 30.737 | 30.750 | 30.764 | 30.778 | 30.792 | 30.805 | 1770 |
| 1280 | 23.180 | 23.196 | 23.213 | 23.230 | 23.247 | 23.263 | 23.280 | 23.297 | 23.314 | 23.330 | 23.347 | 1280 | 1780 | 30.805 | 30.819 | 30.833 | 30.846 | 30.860 | 30.874 | 30.887 | 30.901 | 30.915 | 30.928 | 30.942 | 1780 |
| 1290 | 23.347 | 23.364 | 23.380 | 23.397 | 23.414 | 23.431 | 23.447 | 23.464 | 23.481 | 23.497 | 23.514 | 1290 | 1790 | 30.942 | 30.956 | 30.969 | 30.983 | 30.997 | 31.010 | 31.024 | 31.038 | 31.051 | 31.065 | 31.078 | 1790 |
| 1300 | 23.514 | 23.530 | 23.547 | 23.564 | 23.580 | 23.597 | 23.614 | 23.630 | 23.647 | 23.663 | 23.680 | 1300 | 1800 | 31.078 | 31.092 | 31.105 | 31.119 | 31.133 | 31.146 | 31.160 | 31.173 | 31.187 | 31.200 | 31.214 | 1800 |
| 1310 | 23.680 | 23.697 | 23.713 | 23.730 | 23.746 | 23.763 | 23.779 | 23.796 | 23.812 | 23.829 | 23.846 | 1310 | 1810 | 31.214 | 31.227 | 31.241 | 31.254 | 31.268 | 31.281 | 31.295 | 31.308 | 31.322 | 31.335 | 31.349 | 1810 |
| 1320 | 23.846 | 23.862 | 23.879 | 23.895 | 23.912 | 23.928 | 23.945 | 23.961 | 23.978 | 23.994 | 24.010 | 1320 | 1820 | 31.349 | 31.362 | 31.376 | 31.389 | 31.403 | 31.416 | 31.429 | 31.443 | 31.456 | 31.470 | 31.483 | 1820 |
| 1330 | 24.010 | 24.027 | 24.043 | 24.060 | 24.076 | 24.093 | 24.109 | 24.126 | 24.142 | 24.158 | 24.175 | 1330 | 1830 | 31.483 | 31.496 | 31.510 | 31.523 | 31.536 | 31.550 | 31.563 | 31.577 | 31.590 | 31.603 | 31.617 | 1830 |
| 1340 | 24.175 | 24.191 | 24.208 | 24.224 | 24.240 | 24.257 | 24.273 | 24.290 | 24.306 | 24.322 | 24.339 | 1340 | 1840 | 31.617 | 31.630 | 31.643 | 31.656 | 31.670 | 31.683 | 31.696 | 31.710 | 31.723 | 31.736 | 31.749 | 1840 |
| 1350 | 24.339 | 24.355 | 24.371 | 24.388 | 24.404 | 24.420 | 24.437 | 24.453 | 24.46  | 24.485 | 24.502 | 1350 | 1850 | 31.749 | 31.763 | 31.776 | 31.789 | 31.802 | 31.816 | 31.829 | 31.842 | 31.855 | 31.869 | 31.882 | 1850 |
| 1360 | 24.502 | 24.518 | 24.534 | 24.551 | 24.567 | 24.583 | 24.599 | 24.616 | 24.632 | 24.648 | 24.664 | 1360 | 1860 | 31.882 | 31.895 | 31.908 | 31.921 | 31.934 | 31.948 | 31.961 | 31.974 | 31.987 | 32.000 | 32.013 | 1860 |
| 1370 | 24.664 | 24.680 | 24.697 | 24.713 | 24.729 | 24.745 | 24.762 | 24.778 | 24.794 | 24.810 | 24.826 | 1370 | 1870 | 32.013 | 32.026 | 32.040 | 32.053 | 32.066 | 32.079 | 32.092 | 32.105 | 32.118 | 32.131 | 32.144 | 1870 |
| 1380 | 24.826 | 24.842 | 24.859 | 24.875 | 24.891 | 24.907 | 24.923 | 24.939 | 24.955 | 24.971 | 24.988 | 1380 | 1880 | 32.144 | 32.157 | 32.170 | 32.183 | 32.196 | 32.209 | 32.222 | 32.235 | 32.248 | 32.261 | 32.274 | 1880 |
| 1390 |        |        |        |        |        |        |        |        |        |        |        |      |      |        |        |        |        |        |        |        |        |        |        |        |      |

**MAXIMUM TEMPERATURE RANGE**

**Thermocouple Grade**

-32 to 4208°F  
-0 to 2320°C

**Extension Grade**

32 to 1600°F  
0 to 870°C

**LIMITS OF ERROR**

(whichever is greater)

**Standard:** 4.5°C to 425°C

1.0% to 2320°C

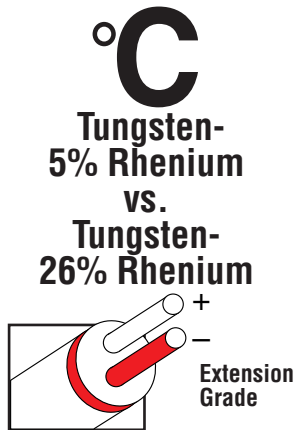
**Special:** Not Established

**COMMENTS, BARE WIRE ENVIRONMENT:**

Vacuum, Inert; Hydrogen; Beware of Embrittlement; Not Practical Below 750°F; Not for Oxidizing Atmosphere

**TEMPERATURE IN DEGREES °C**

**REFERENCE JUNCTION AT 0°C**



**Revised Thermocouple Reference Tables**

**TYPE C**  
Reference Tables  
N.I.S.T. Monograph 175  
Revised to ITS-90

IEC color code  
ANSI color code

Z

Thermoelectric Voltage in Millivolts

| °C   | 0      | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | °C   | °C   | 0      | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     | °C   | °C   |
|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|------|
| 2000 | 33.660 | 33.672 | 33.684 | 33.697 | 33.709 | 33.721 | 33.733 | 33.745 | 33.757 | 33.769 | 33.782 | 2000 | 2200 | 35.932 | 35.942 | 35.953 | 35.963 | 35.973 | 35.984 | 35.994 | 36.004 | 36.015 | 36.025 | 36.036 | 2200 | 2200 |
| 2010 | 33.782 | 33.794 | 33.806 | 33.818 | 33.830 | 33.842 | 33.854 | 33.866 | 33.878 | 33.890 | 33.902 | 2010 | 2210 | 36.036 | 36.046 | 36.056 | 36.067 | 36.077 | 36.087 | 36.097 | 36.108 | 36.118 | 36.128 | 36.138 | 2210 | 2210 |
| 2020 | 33.902 | 33.914 | 33.926 | 33.938 | 33.950 | 33.962 | 33.974 | 33.986 | 33.998 | 34.010 | 34.022 | 2020 | 2220 | 36.138 | 36.149 | 36.159 | 36.169 | 36.179 | 36.189 | 36.200 | 36.210 | 36.220 | 36.230 | 36.240 | 2220 | 2220 |
| 2030 | 34.022 | 34.034 | 34.046 | 34.058 | 34.070 | 34.082 | 34.094 | 34.106 | 34.118 | 34.130 | 34.142 | 2030 | 2230 | 36.240 | 36.250 | 36.260 | 36.271 | 36.281 | 36.291 | 36.301 | 36.311 | 36.321 | 36.331 | 36.341 | 2230 | 2230 |
| 2040 | 34.142 | 34.153 | 34.165 | 34.177 | 34.189 | 34.201 | 34.213 | 34.225 | 34.236 | 34.248 | 34.260 | 2040 | 2240 | 36.341 | 36.351 | 36.361 | 36.371 | 36.381 | 36.391 | 36.401 | 36.411 | 36.421 | 36.431 | 36.441 | 2240 | 2240 |
| 2050 | 34.260 | 34.272 | 34.284 | 34.295 | 34.307 | 34.319 | 34.331 | 34.342 | 34.354 | 34.366 | 34.378 | 2050 | 2250 | 36.441 | 36.451 | 36.460 | 36.470 | 36.480 | 36.490 | 36.500 | 36.510 | 36.520 | 36.529 | 36.539 | 2250 | 2250 |
| 2060 | 34.378 | 34.389 | 34.401 | 34.413 | 34.424 | 34.436 | 34.448 | 34.459 | 34.471 | 34.483 | 34.494 | 2060 | 2260 | 36.539 | 36.549 | 36.559 | 36.569 | 36.578 | 36.588 | 36.598 | 36.608 | 36.617 | 36.627 | 36.637 | 2260 | 2260 |
| 2070 | 34.494 | 34.506 | 34.518 | 34.529 | 34.541 | 34.552 | 34.564 | 34.576 | 34.587 | 34.599 | 34.610 | 2070 | 2270 | 36.637 | 36.646 | 36.656 | 36.666 | 36.675 | 36.685 | 36.695 | 36.704 | 36.714 | 36.723 | 36.733 | 2270 | 2270 |
| 2080 | 34.610 | 34.622 | 34.633 | 34.645 | 34.656 | 34.668 | 34.679 | 34.691 | 34.702 | 34.714 | 34.725 | 2080 | 2280 | 36.733 | 36.743 | 36.752 | 36.762 | 36.771 | 36.781 | 36.790 | 36.800 | 36.809 | 36.819 | 36.828 | 2280 | 2280 |
| 2090 | 34.725 | 34.737 | 34.748 | 34.760 | 34.771 | 34.782 | 34.794 | 34.805 | 34.817 | 34.828 | 34.839 | 2090 | 2290 | 36.828 | 36.838 | 36.847 | 36.857 | 36.866 | 36.875 | 36.885 | 36.894 | 36.903 | 36.913 | 36.922 | 2290 | 2290 |
| 2100 | 34.839 | 34.851 | 34.862 | 34.874 | 34.885 | 34.896 | 34.908 | 34.919 | 34.930 | 34.942 | 34.953 | 2100 | 2300 | 36.922 | 36.932 | 36.941 | 36.950 | 36.959 | 36.969 | 36.978 | 36.987 | 36.997 | 37.006 | 37.015 | 2300 | 2300 |
| 2110 | 34.953 | 34.964 | 34.975 | 34.987 | 34.998 | 35.009 | 35.020 | 35.032 | 35.043 | 35.054 | 35.065 | 2110 | 2310 | 37.015 | 37.024 | 37.033 | 37.043 | 37.052 | 37.061 | 37.070 | 37.079 | 37.088 | 37.097 | 37.107 | 2310 | 2310 |
| 2120 | 35.065 | 35.077 | 35.088 | 35.099 | 35.110 | 35.121 | 35.132 | 35.144 | 35.155 | 35.166 | 35.177 | 2120 |      |        |        |        |        |        |        |        |        |        |        |        |      |      |
| 2130 | 35.177 | 35.188 | 35.199 | 35.210 | 35.221 | 35.232 | 35.243 | 35.254 | 35.265 | 35.277 | 35.288 | 2130 |      |        |        |        |        |        |        |        |        |        |        |        |      |      |
| 2140 | 35.288 | 35.299 | 35.310 | 35.321 | 35.332 | 35.343 | 35.353 | 35.364 | 35.375 | 35.386 | 35.397 | 2140 |      |        |        |        |        |        |        |        |        |        |        |        |      |      |
| 2150 | 35.397 | 35.408 | 35.419 | 35.430 | 35.441 | 35.452 | 35.463 | 35.474 | 35.484 | 35.495 | 35.506 | 2150 |      |        |        |        |        |        |        |        |        |        |        |        |      |      |
| 2160 | 35.506 | 35.517 | 35.528 | 35.539 | 35.549 | 35.560 | 35.571 | 35.582 | 35.592 | 35.603 | 35.614 | 2160 |      |        |        |        |        |        |        |        |        |        |        |        |      |      |
| 2170 | 35.614 | 35.625 | 35.635 | 35.646 | 35.657 | 35.668 | 35.678 | 35.689 | 35.700 | 35.710 | 35.721 | 2170 |      |        |        |        |        |        |        |        |        |        |        |        |      |      |
| 2180 | 35.721 | 35.731 | 35.742 | 35.753 | 35.763 | 35.774 | 35.784 | 35.795 | 35.806 | 35.816 | 35.827 | 2180 |      |        |        |        |        |        |        |        |        |        |        |        |      |      |
| 2190 | 35.827 | 35.837 | 35.848 | 35.858 | 35.869 | 35.879 | 35.890 | 35.900 | 35.911 | 35.921 | 35.932 | 2190 |      |        |        |        |        |        |        |        |        |        |        |        |      |      |

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