



SACARDANDE ENGINEERS PVT. LTD. Thermocouple Wire Specifications

| ANSI Color Code for Thermocouple and Thermocouple Extension Wire | | | | | | |
|--|---|-------------------------|------------|--------------------------|------------|---------|
| ANSI Type | Wire Alloys | Thermocouple Wire Color | | T/C Extension Wire Color | | |
| | | Polarity | Individual | Overall | Individual | Overall |
| T | Copper Constantan | +TP | Blue | Brown | Blue | Blue |
| | | -TN | Red | | Red | |
| J | Iron Constantan | +JP | White | Brown | White | Black |
| | | -JN | Red | | Red | |
| E | Chromel Constantan | +EP | Purple | Brown | Purple | Purple |
| | | -EN | Red | | Red | |
| K | Chromel Alumel | +KP | Yellow | Brown | Yellow | Yellow |
| | | -KN | Red | | Red | |
| R | Platinum 13% Rhodium Platinum | +RP | | | Black | Green |
| | | -RN | | | Red | |
| S | Platinum 10% Rhodium Platinum | +SP | | | Black | Green |
| | | -SN | | | Red | |
| B | Platinum 30% Rhodium Platinum 6% Rhodium | +BP | | | Grey | Grey |
| | | -BN | | | Red | |

| American Wire Gauge (AWG) | Size Dia. Inches |
|---------------------------|------------------|
| 7/0 | — |
| 6/0 | 0.5800 |
| 5/0 | 0.5165 |
| 4/0 | 0.4600 |
| 3/0 | 0.4096 |
| 2/0 | 0.3648 |
| 1/0 | 0.3249 |
| 1 | 0.2893 |
| 2 | 0.2576 |
| 3 | 0.2294 |
| 4 | 0.2043 |
| 5 | 0.1819 |
| 6 | 0.1620 |
| 7 | 0.1443 |
| 8 | 0.1285 |
| 9 | 0.1144 |
| 10 | 0.1019 |
| 11 | 0.0907 |
| 12 | 0.0808 |
| 13 | 0.0720 |
| 14 | 0.0641 |
| 15 | 0.0571 |
| 16 | 0.0508 |
| 17 | 0.0453 |
| 18 | 0.0403 |
| 19 | 0.0359 |
| 20 | 0.0320 |
| 21 | 0.0285 |
| 22 | 0.0253 |
| 23 | 0.0226 |
| 24 | 0.0201 |
| 25 | 0.0179 |
| 26 | 0.0159 |
| 27 | 0.0142 |
| 28 | 0.0126 |
| 29 | 0.0113 |
| 30 | 0.0100 |
| 31 | 0.00893 |
| 32 | 0.00795 |
| 33 | 0.00708 |
| 34 | 0.00630 |
| 35 | 0.00561 |
| 36 | 0.00500 |
| 37 | 0.00445 |
| 38 | 0.00396 |
| 39 | 0.00353 |
| 40 | 0.00314 |
| 41 | 0.00280 |
| 42 | 0.00249 |
| 43 | 0.00222 |
| 44 | 0.00198 |
| 45 | 0.00176 |
| 46 | 0.00157 |
| 47 | 0.00140 |
| 48 | 0.00124 |
| 49 | 0.00111 |
| 50 | 0.00099 |

| Bare Thermocouple Wire Approximate Weight feet/lb | | | | | | | | | |
|---|----------------|----------|----------------|-------------|------------|------------|----------------|-------------|----------------|
| Wire Ga B & S | Wire Size Dia. | Type J | | Type K | | Type T | | Type E | |
| | | Iron +JP | Constantan -JN | Chromel +KP | Alumel -KN | Copper +TP | Constantan -TN | Chromel +EP | Constantan -EN |
| 6 | .162 | 14.2 | 12.6 | 13 | 13 | 12.6 | 12.6 | 13 | 12.6 |
| 7 | .144 | 18.0 | | | | | | | |
| 8 | .128 | 22.8 | 20.2 | 21 | 21 | 19.8 | 20.2 | 21 | 20.2 |
| 14 | .064 | 91.2 | 80.9 | 83 | 83 | 80.5 | 80.9 | 83 | 80.9 |
| 16 | .050 | 144.0 | 127 | 130 | 130 | 128 | 127 | 130 | 127 |
| 18 | .040 | 233.0 | 207 | 212 | 212 | 203 | 207 | 212 | 207 |
| 20 | .032 | 365.0 | 324 | 331 | 331 | 324 | 324 | 331 | 324 |
| 24 | .020 | 925.0 | 821 | 838 | 838 | 820 | 821 | 838 | 821 |
| 26 | .015 | 1478.0 | 1312 | 1340 | 1340 | 1299 | 1312 | 1340 | 1312 |
| 28 | .012 | 2353.0 | 2089 | 2130 | 2130 | 2062 | 2089 | 2130 | 2089 |
| 30 | .010 | 3736.0 | 3316 | 3370 | 3370 | 3294 | 3316 | 3370 | 3316 |
| 36 | .005 | 14940.0 | 13260 | 13500 | 13500 | 13250 | 13260 | 13500 | 13260 |

| Nominal Thermocouple Resistance Ohms per Double Foot @ 68°F (20°C) | | | | | | | | | |
|--|----------------|------------|--------|--------|--------|-------|-------|-------|--|
| Wire Ga B & S | Wire Size Dia. | ANSI Types | | | | | | | |
| | | J | K | T | E | S | R | B | |
| 6 | .162 | .014 | .023 | .012 | .027 | .007 | .007 | .008 | |
| *7 | .144 | .021 | | | | | | | |
| 8 | .128 | .022 | .036 | .019 | .044 | .010 | .010 | .013 | |
| 14 | .064 | .089 | .147 | .074 | .176 | .044 | .044 | .054 | |
| 16 | .050 | .141 | .232 | .117 | .277 | .069 | .069 | .086 | |
| 18 | .040 | .229 | .377 | .190 | .450 | .112 | .113 | .139 | |
| 20 | .032 | .357 | .588 | .297 | .702 | .175 | .178 | .218 | |
| 24 | .020 | .905 | 1.488 | .754 | 1.778 | .449 | .453 | .550 | |
| 26 | .015 | 1.441 | 2.450 | 1.200 | 2.840 | .701 | .708 | .875 | |
| 28 | .012 | 2.297 | 3.590 | 1.920 | 4.330 | 1.062 | 1.073 | 1.392 | |
| 30 | .010 | 3.650 | 6.020 | 2.940 | 7.190 | 1.794 | 1.813 | 2.213 | |
| 36 | .005 | 14.660 | 24.080 | 12.220 | 28.800 | 7.150 | 7.226 | 8.897 | |

* Double feet 7 Ga Type J= 7 Ga Iron/8 Ga Constantan



SACARDANDE ENGINEERS PVT. LTD. Thermocouple Wire Specifications

Thermocouple Wire Specifications (continued)

Selection and Use of Thermocouple and Thermocouple Extension Wire

Thermocouple wire can be fabricated into accurate and dependable thermocouples by joining the thermoelements together at the sensing end. Thermocouple wire or thermocouple extension wire must be used to extend thermocouples to indication or control instrumentation. The conditions of measurement determine the type of thermocouple wire and insulation to be used. Temperature range, environment, protection, insulation requirements, response,

and service life should be considered. The following parameters serve as a guide to the selection of wire. For a basic application study, refer to Maclin literature "Applying the Systems Concept to Thermocouple Installations," an ISA reprint.

Temperature Limits for Thermocouple Wire

Temperature limits for standard thermocouples that are protected with a closed end protecting tube are shown. These limits are suggested for continuous temperature sensing where insulation is not a factor. For unprotected thermocouples where fast response is required, these limits should be reduced for equivalent service life.

| Upper Temperature Limits for Thermocouples | | | | | | |
|--|------------------|------------------|-----------------|-----------------|-----------------|----------------|
| Thermocouple Type | ANSI TYPE SYMBOL | WIRE GAUGE (AWG) | | | | |
| | | 8 Gal | 14 Gal | 20 Gal | 24 Gal | 30 Gal |
| Copper-Constantan | T | | 370°C (700°F) | 260°C (500°F) | 200°C (400°F) | 150°C (300°F) |
| *Iron-Constantan | J | 760°C (1400°F) | 600°C (1100°F) | 500°C (900°F) | 370°C (700°F) | 320°C (600°F) |
| Chromel™-Constantan | E | 870°C (1600°F) | 650°C (1200°F) | 550°C (1000°F) | 430°C (800°F) | 430°C (800°F) |
| Chromel™-Alumel™ | K | 1260°C (2300°F) | 1100°C (2000°F) | 1000°C (1800°F) | 870°C (1600°F) | 760°C (1400°F) |
| Nicrosil-Nisil | N | 1260°C (2300°F) | 1100°C (2000°F) | 1000°C (1800°F) | 870°C (1600°F) | 760°C (1400°F) |
| Platinum—10% Rhodium | S | | | | 1480°C (2700°F) | |
| Platinum—13% Rhodium | R | | | | 1480°C (2700°F) | |
| Platinum—30% vs. 6% Rhodium | B | | | | 1700°C (3100°F) | |
| Tungsten—26% Rhenium | WR | | | | 2300°C (4200°F) | |
| Tungsten—3% vs. 25% Rhenium | W3 | | | | 2300°C (4200°F) | |
| Tungsten—5% vs. 26% Rhenium | W5 | | | | 2300°C (4200°F) | |

* Magnetic ™ Trade Mark Hoskins Mfg. Co. = Not ANSI Symbol

| Insulation Characteristics | | | | | |
|----------------------------|---|-----------------------------------|-----------------------------------|-----------------------|---------------------|
| Insu. Code | Insulation Description Individual/Overall | Continuous Use Temperature Limits | Single Exposure Temperature Limit | Moisture Resistance | Abrasion Resistance |
| 601 | PVC/PVC | -20 to +221°F | 221°F | Excellent | Good |
| 603 | PVC Rip Cord | -29 to +105°C | 105°C | " | " |
| 605 | Polyvinyl/Polyvinyl Twisted & Shielded | -20 to +176°F -29 to 80°C | 176°F 80°C | Excellent | Good |
| 606 | Nylon/Nylon | 350°F | — | Fair | Excellent |
| 607 | Teflon on Singles (FEP) | 400°F | 600°F | Excellent | Excellent |
| 608 | Teflon/Teflon (FEP ext.) | 204°C | 316°C | " | " |
| 609 | Teflon/Teflon TFE Tape | -90 to 500°F -68 to 260°C | 600°F 316°C | Excellent | Very Good |
| 610 | Teflon/Teflon FEP Twisted & Shielded | 400°F 204°C | 600°F 316°C | Excellent | Excellent |
| 611 | TFE, Synthetic Fiber/Synthetic Fiber | 500°F 260°C | 700°F 371°C | Good | Good |
| 612 | FEP, Fiberglass/Fiberglass | 400°F 204°C | 600°F 316°C | Good | Good |
| 618 | Ceramic Fiber/Ceramic Fiber | 2600°F 1430°C | 2600°F 1430°C | Fair | Fair |
| 620 | Vitreous Silica Fiber/Vitreous Silica Fiber | 1600°F 871°C | 2000°F 1093°C | Fair | Fair |
| 622 | High Temp. Glass/High Temp. Glass | 1300°F 704°C | 1600°F 871°C | Fair | Fair |
| 623 | High Temp. Fiberglass Twisted | 1300°F 704°C | 1300°F 704°C | Fair | Fair |
| 628 | Fiberglass/Fiberglass | 900°F 482°C | 1000°F 538°C | Good to 400°F (204°C) | Fair |
| S | SS Overbraid | — | — | — | Excellent |