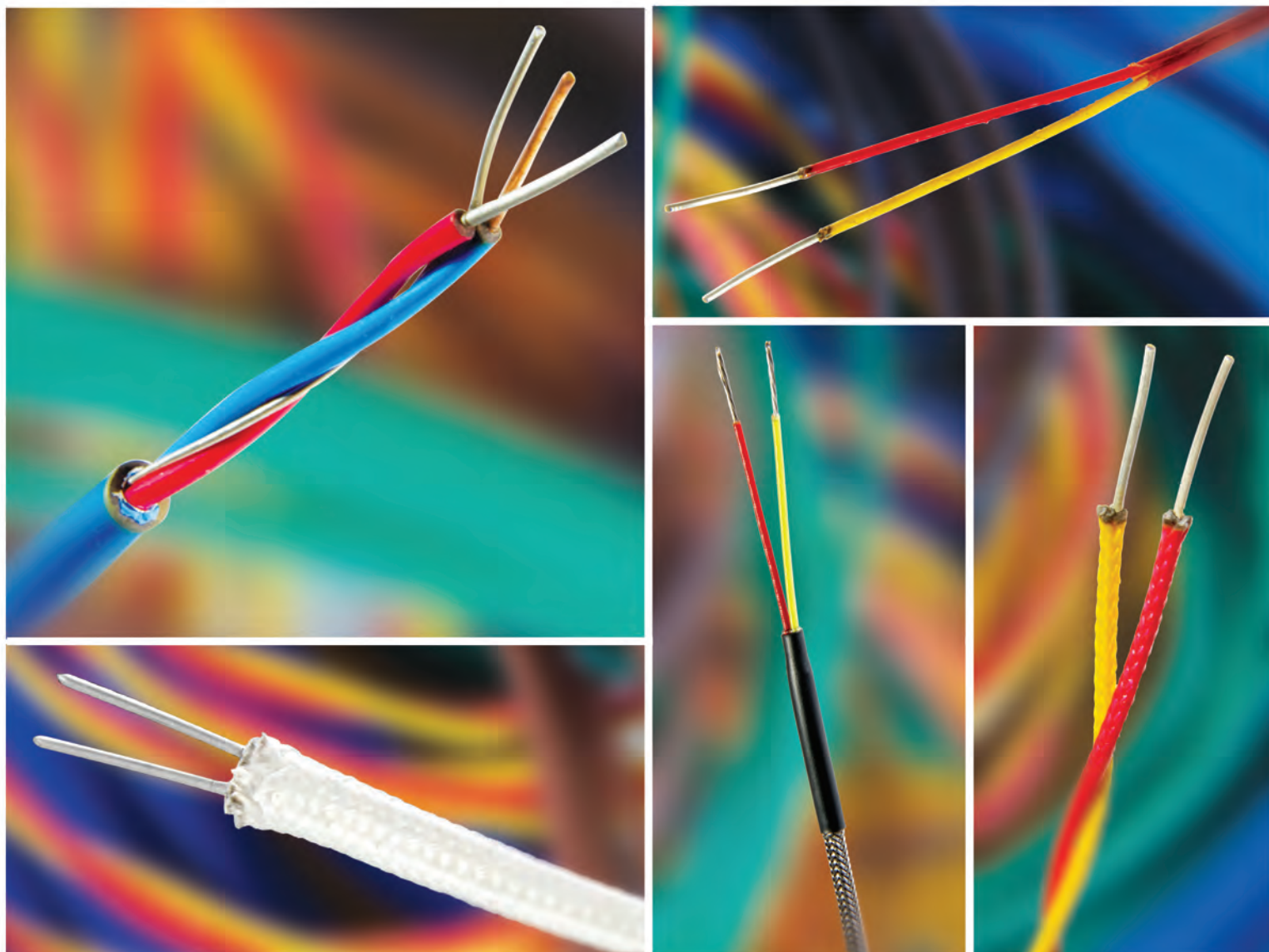


SERV-RITE® Wire



heaters | sensors | controllers



Proven Capabilities

Since 1914, SERV-RITE® thermocouple wire and thermocouple extension wire from Watlow® have been known for premium performance and reliability.

All SERV-RITE wire is manufactured under rigid quality control. It is manufactured under ISO 9001 quality standards. Some wire can even be shipped next day for your convenience.

All testing has National Institute of Standards Technology (NIST), formally National Bureau of Standards (NBS), traceability. Unless otherwise specified, all SERV-RITE thermocouple wire and extension wire are supplied to meet standard tolerances of ASTM E 230. Special tolerances are also available.

Watlow provides:

- Same day shipment on hundreds of stock items
- Temperature range capability from -328 to 2600°F (-200 to 1427°C)
- Superior products and technical support delivered worldwide
- State-of-the-art, in-house laboratory services including calibration, end-to-end uniformity testing, drift testing, base metal, platinum and standard platinum resistance thermometer (SPRT) standards with traceability to NIST
- NIST certifications of conformance and calibration
- Multitude of overbraids, wraps and insulations available including electrical noise shields and wraps
- Full range of resistance temperature detector (RTD) wire (not listed in this publication)
- ASTM E 230 tolerances from $\pm 0.9^\circ\text{F}$ ($\pm 0.5^\circ\text{C}$) or ± 0.4 percent
- ISO 17025 accredited lab

Features and Benefits

Type E, J, K, N and T thermocouple wire

- Fits virtually all applications

Type EX, JX, KX, NX, TX extension wire

- Matches thermocouple type

Compensation extension wire for Type R and S thermocouples

- Permits fine tuning of temperature measuring circuit

Solid or stranded wire construction

- Meets specific application requirements

Wide selection of insulation types

- Meets temperature, chemical, moisture and abrasion resistance objectives

Color coding

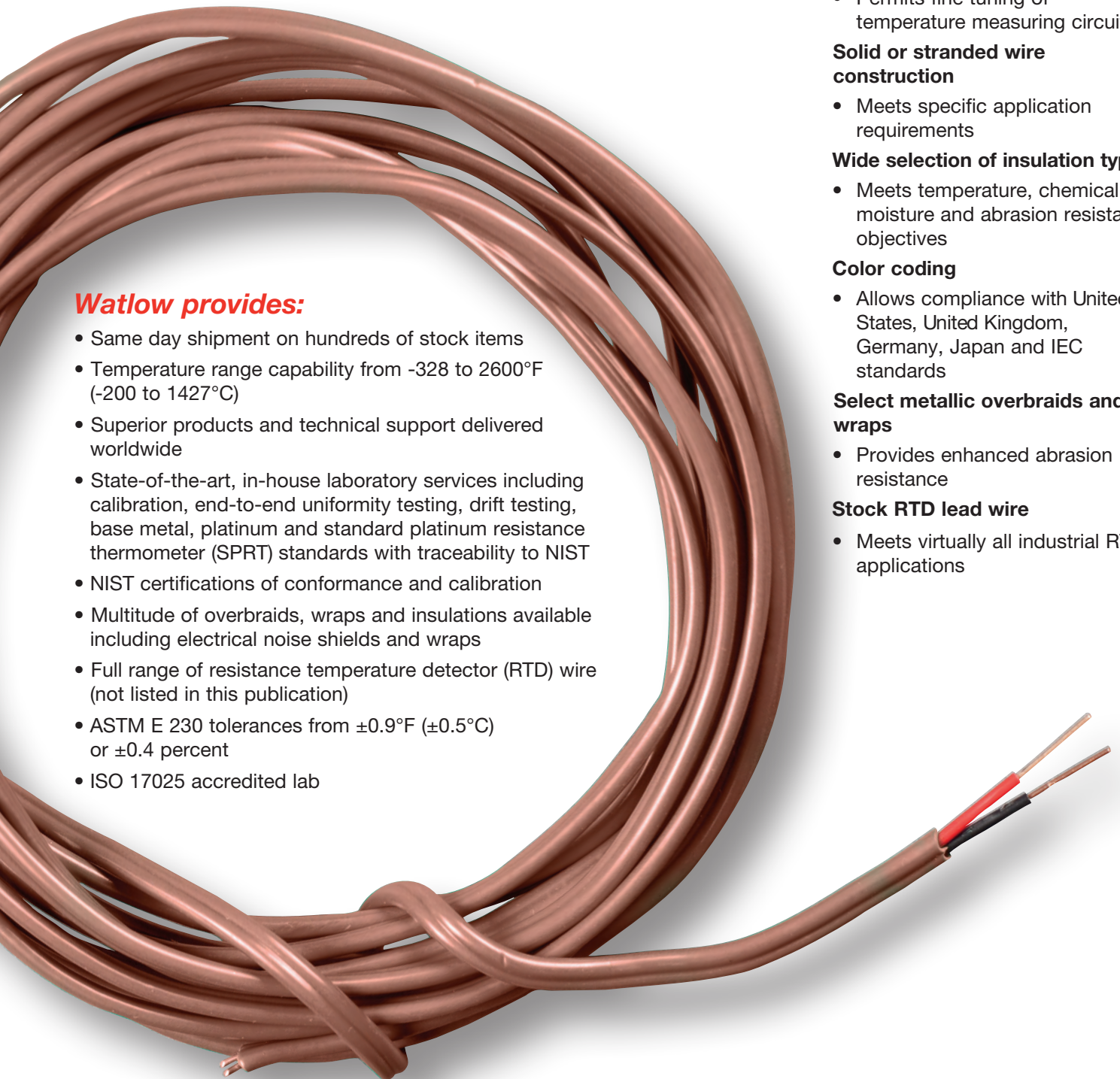
- Allows compliance with United States, United Kingdom, Germany, Japan and IEC standards

Select metallic overbraids and wraps

- Provides enhanced abrasion resistance

Stock RTD lead wire

- Meets virtually all industrial RTD applications



SERV-RITE Wire and Cable

Nominal Resistance for Thermocouple Alloys in Ohms per Double Feet at 68°F (20°C)

| B and S Gauge | Diameter | | E | J | K | N | RX, SX | T |
|---------------|----------|-------|--------|--------|--------|--------|--------|--------|
| | in. | (mm) | | | | | | |
| 2 | 0.258 | (6.5) | 0.011 | 0.006 | 0.009 | 0.012 | | |
| 4 | 0.204 | (5.2) | 0.017 | 0.009 | 0.014 | 0.019 | | |
| 6 | 0.162 | (4.1) | 0.028 | 0.014 | 0.023 | 0.030 | | |
| 8 | 0.129 | (3.3) | 0.044 | 0.023 | 0.036 | 0.048 | | |
| 10 | 0.102 | (2.6) | 0.070 | 0.036 | 0.058 | 0.077 | | |
| 12 | 0.081 | (2.1) | 0.111 | 0.057 | 0.092 | 0.123 | 0.006 | 0.048 |
| 14 | 0.064 | (1.6) | 0.177 | 0.091 | 0.147 | 0.195 | 0.010 | 0.076 |
| 16 | 0.051 | (1.3) | 0.281 | 0.145 | 0.233 | 0.310 | 0.016 | 0.120 |
| 18 | 0.040 | (1.0) | 0.453 | 0.234 | 0.376 | 0.500 | 0.025 | 0.194 |
| 20 | 0.032 | (0.8) | 0.709 | 0.367 | 0.589 | 0.783 | 0.040 | 0.304 |
| 22 | 0.025 | (0.7) | 1.129 | 0.584 | 0.937 | 1.245 | 0.063 | 0.483 |
| 24 | 0.020 | (0.5) | 1.795 | 0.928 | 1.490 | 1.980 | 0.100 | 0.768 |
| 26 | 0.016 | (0.4) | 2.853 | 1.476 | 2.369 | 3.148 | 0.159 | 1.221 |
| 28 | 0.013 | (0.3) | 4.537 | 2.347 | 3.767 | 5.006 | 0.253 | 1.942 |
| 30 | 0.010 | (0.3) | 7.214 | 3.731 | 5.990 | 7.960 | 0.402 | 3.088 |
| 32 | 0.008 | (0.2) | 11.470 | 5.933 | 9.524 | 12.656 | 0.639 | 4.910 |
| 34 | 0.006 | (0.2) | 18.239 | 9.434 | 15.145 | 20.126 | 1.016 | 7.808 |
| 36 | 0.005 | (0.1) | 29.000 | 15.000 | 24.080 | 32.000 | 1.615 | 12.415 |
| 14 Stranded | 0.076 | (1.9) | 0.161 | 0.083 | 0.134 | 0.178 | 0.009 | 0.069 |
| 16 Stranded | 0.060 | (1.5) | 0.256 | 0.133 | 0.213 | 0.283 | 0.014 | 0.110 |
| 18 Stranded | 0.048 | (1.2) | 0.408 | 0.211 | 0.338 | 0.450 | 0.023 | 0.174 |
| 20 Stranded | 0.038 | (1.0) | 0.648 | 0.335 | 0.538 | 0.715 | 0.036 | 0.277 |
| 22 Stranded | 0.030 | (0.8) | 1.031 | 0.533 | 0.856 | 1.137 | 0.057 | 0.441 |
| 24 Stranded | 0.024 | (0.6) | 1.639 | 0.848 | 1.361 | 1.808 | 0.091 | 0.701 |

Conductor Size

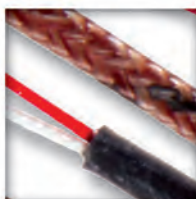
| B and S Gauge | Solid Diameter | | Stranded Diameter | | Number of Strands | Stranding Gauge |
|---------------|----------------|-------|-------------------|-------|-------------------|-----------------|
| | in. | (mm) | in. | (mm) | | |
| 14 | 0.064 | (1.6) | 0.076 | (1.9) | 7 | 22 |
| 16 | 0.051 | (1.3) | 0.060 | (1.5) | 7 | 24 |
| 18 | 0.040 | (1.0) | 0.048 | (1.2) | 7 | 26 |
| 20 | 0.032 | (0.8) | 0.038 | (1.0) | 7 | 28 |
| 22 | 0.025 | (0.6) | 0.030 | (0.8) | 7 | 30 |
| 24 | 0.020 | (0.5) | 0.024 | (0.6) | 7 | 32 |
| 26 | 0.016 | (0.4) | | | | |
| 28 | 0.013 | (0.3) | | | | |
| 30 | 0.010 | (0.3) | | | | |
| 32 | 0.008 | (0.2) | | | | |
| 34 | 0.006 | (0.2) | | | | |
| 36 | 0.005 | (0.1) | | | | |

Thermocouple Calibration Types

| ANSI Code | Conductor | Popular Generic and Trade Names | Maximum Useful Temperature Ranges* | Limits of Error (whichever is greater) | |
|------------|-----------|---------------------------------|---|---|------------------------|
| | | | | Standard | Special |
| B | BP | Platinum 30% Rhodium | T/C grade 1600 to 3100°F (870 to 1700°C) | 0.5% | ±0.25% |
| | BN | Platinum 6% Rhodium | Extension grade 1600 to 3100°F (870 to 1700°C) | 1.0% | |
| E | EP | Chromel® | T/C grade -328 to 1650°F (-200 to 900°C) | Above 32°F (0°C) ±3.0°F (1.7°C) or 0.5% | ±1.8°F (1.0°C) or 0.4% |
| | EN | Constantan | Extension grade 32 to 392°F (0 to 200°C) | Below 32°F (0°C) ±3.0°F (1.7°C) or 1.0% | |
| J | JP | Iron | T/C grade 32 to 1400°F (0 to 760°C) | ±4.0°F (2.2°C) or 0.75% | ±2.0°F (1.1°C) or 0.4% |
| | JN | Constantan | Extension grade 32 to 392°F (0 to 200°C) | | |
| K | KP | Chromel® | T/C grade -328 to 2300°F (-200 to 1260°C) | Above 32°F (0°C) ±4.0°F (2.2°C) or 0.75% | ±2.0°F (1.1°C) or 0.4% |
| | KN | Alumel® | Extension grade 32 to 392°F (0 to 200°C) | Below 32°F (0°C) ±4.0°F (2.2°C) or 2.0% | |
| N | NP | Nicrosil | T/C grade 32 to 2300°F (0 to 1260°C) | Above 32°F (0°C) ±4.0°F (2.2°C) or 0.75% | ±2.0°F (1.1°C) or 0.4% |
| | NN | Nisil | Extension grade 32 to 392°F (0 to 200°C) | | |
| R** | RP | Copper | Extension grade 32 to 392°F (0 to 200°C) | ±9.0°F (±5.0°C) | ±1.1°F (0.6°C) or 0.1% |
| | RN | #11 Alloy | | | |
| S** | SP | Copper | Extension grade 32 to 392°F (0 to 200°C) | ±9.0°F (±5.0°C) | ±1.1°F (0.6°C) or 0.1% |
| | SN | #11 Alloy | | | |
| T | TP | Copper | T/C grade -328 to 660°F (-200 to 350°C) | Above 32°F (0°C) ±1.8°F (1.0°C) or 0.75% | ±1.1°F (0.6°C) or 0.4% |
| | TN | Constantan | Extension grade 32 to 212°F (0 to 100°C) | Below 32°F (0°C) ±1.8°F (1.0°C) or 1.5% | |

* **Note:** Conductor gauge size may limit upper temperature ranges. Contact a Watlow representative for additional information.

****Note:** Compensating alloys used for extension wire applications.



International Color Codes

| ANSI/ASTM T/C | ANSI/ASTM Exten. | BS 1843 (Britain) | DIN 43714 (Germany) | JIS C1610-1981 (Japan) | IEC 584-3 (Europe) | Common Uses |
|------------------|---------------------|-------------------------|---------------------------|------------------------------|--------------------------|--|
| | | | | | | Suitable for use in an oxidizing or inert atmosphere. Do not insert in metal tubes. Beware of contamination at high temperatures. Not suitable for use below 122°F (50°C). |
| | | | | | | Suitable for use in an oxidizing or inert atmosphere. Limited use in vacuum or reducing atmosphere. Suitable for sub zero. |
| | | | | | | Reducing vacuum, inert atmosphere. Limited use in oxidizing above 1004°F (540°C). Not recommended for sub zero. |
| | | | | | | Suitable for use in an oxidizing or inert atmosphere. Limited use in vacuum or reducing atmosphere. Suitable for sub zero. |
| | | | | | | Alternative to Type K. More stable at high temperatures. |
| | | | | | | Suitable for use in an oxidizing or inert atmosphere. Do not insert in metal tubes. Beware of contamination at high temperatures. |
| | | | | | | Suitable for use in an oxidizing or inert atmosphere. Do not insert in metal tubes. Beware of contamination at high temperatures. |
| | | | | | | Mild oxidizing, reducing vacuum or inert atmosphere. Good where moisture is present. Low temperature and cryogenic applications. |
| | | | Type U | | | |



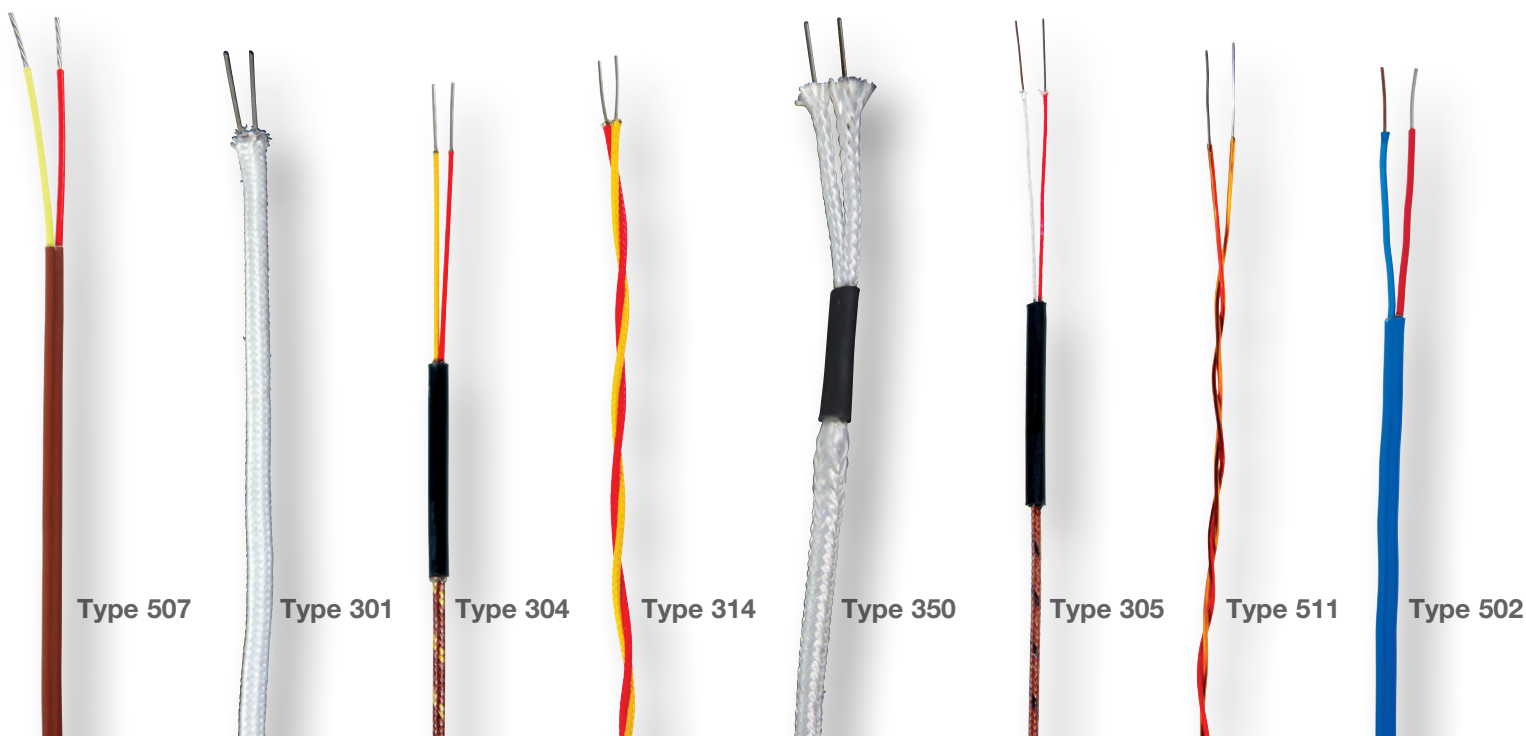
Braided Insulations

| Insulation Series Number | Insulations | | Temperature Range | | Abrasion | Moisture | Chemical |
|--------------------------|-------------------|-----------------|--------------------|------------------------|----------|----------|----------|
| | Primary | Secondary | Continuous °F (°C) | Single Reading °F (°C) | | | |
| 301 | Vitreous Silica | Vitreous Silica | 1800 (982) | 2000 (1093) | F | F | G |
| 304 | Glass | Glass | 900 (482) | 1000 (538) | F | G | G |
| 305 | Double Glass Wrap | Glass | 900 (482) | 1000 (538) | F | G | G |
| 314 | Glass | Twisted | 1300 (704) | 1600 (871) | G | G | G |
| 321 | Glass | Glass | 1300 (704) | 1600 (871) | G | G | G |
| 350 | Ceramic Fiber | Ceramic Fiber | 2200 (1204) | 2600 (1427) | G | F | G |
| 355 | Ceramic Fiber | Ceramic Fiber | 2200 (1204) | 2600 (1427) | G | F | G |
| 365 | Vitreous Silica | Vitreous Silica | 1800 (982) | 2000 (1093) | F | F | G |

Tape and Extruded Insulations

| Insulation Series Number | Insulation Construction | | | Temperature Range | | Abrasion | Moisture | Chemical |
|--------------------------|-------------------------|--------|----------------|--------------------|------------------------|----------|----------|----------|
| | Single | Shield | Jacket | Continuous °F (°C) | Single Reading °F (°C) | | | |
| 502 | PVC | | PVC | 221 (105) | 221 (105) | E | E | G |
| 505 | PVC | | Ripcord | 221 (105) | 221 (105) | G | E | G |
| 506 | FEP | | FEP (<26 AWG) | 400 (204) | 500 (260) | E | E | E |
| 507 | FEP | | FEP | 400 (204) | 500 (260) | E | E | E |
| 508 | TFE Tape | | TFE Tape | 500 (260) | 600 (316) | G | E | E |
| 509 | FEP | Shield | FEP | 400 (204) | 500 (260) | E | E | E |
| 510 | PVC | Shield | PVC | 221 (105) | 221 (105) | G | E | G |
| 511 | Polyimide Tape | | Twisted | 600 (316) | 800 (427) | E | E | E |
| 512 | Polyimide Tape | | Polyimide Tape | 600 (316) | 800 (427) | E | E | E |
| 516 | PFA | | PFA | 500 (260) | 550 (288) | G | E | E |

F = Fair, G = Good, E = Excellent



Type 507

Type 301

Type 304

Type 314

Type 350

Type 305

Type 511

Type 502

Ordering Information*

Part Number

| ① | ② ③ | ④ | ⑤ | ⑥ ⑦ ⑧ | ⑨ ⑩ ⑪ |
|------------------|---------------|--------------------------|--------------------------------|-------------------|-------------|
| ANSI Calibration | B and S Gauge | Conductor Type/Tolerance | Metallic Overbraids (Optional) | Insulation Series | Color Codes |
| | | | | | |

| ① | ANSI Calibration |
|--|------------------|
| B = | Type B |
| E = | Type E |
| J = | Type J |
| K = | Type K |
| N = | Type N |
| R = | Type R |
| S = | Type S |
| T = | Type T |
| Note: Color coding will be to ANSI standards, unless specified. | |

| ② ③ | B and S Gauge |
|-------|---------------|
| 14-36 | |

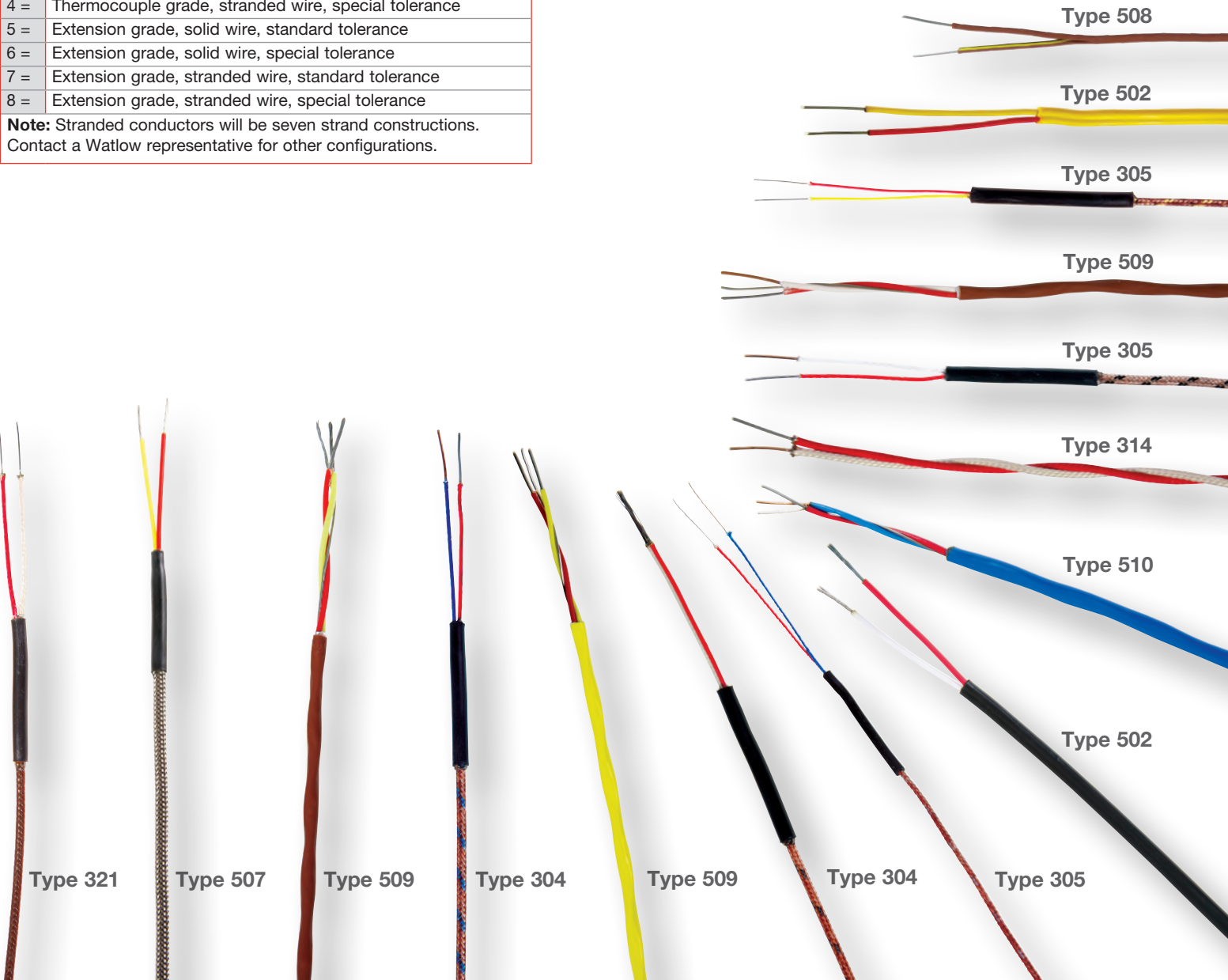
| ④ | Conductor Type/Tolerance |
|--|---|
| 1 = | Thermocouple grade, solid wire, standard tolerance |
| 2 = | Thermocouple grade, solid wire, special tolerance |
| 3 = | Thermocouple grade, stranded wire, standard tolerance |
| 4 = | Thermocouple grade, stranded wire, special tolerance |
| 5 = | Extension grade, solid wire, standard tolerance |
| 6 = | Extension grade, solid wire, special tolerance |
| 7 = | Extension grade, stranded wire, standard tolerance |
| 8 = | Extension grade, stranded wire, special tolerance |
| Note: Stranded conductors will be seven strand constructions. Contact a Watlow representative for other configurations. | |

| ⑤ | Metallic Overbraids (optional) |
|-----|--------------------------------|
| S = | Stainless steel |
| N = | Alloy 600 |
| C = | Tinned copper |

| ⑥ ⑦ ⑧ | Insulation Series |
|---|-------------------|
| Refer to insulation chart on previous page. | |

| ⑨ ⑩ ⑪ | Color Codes |
|---------|---------------------------------------|
| Blank = | ANSI/ASTM E230 (formerly ANSI MC96.1) |
| BSC = | BS 1843 |
| DIN = | DIN 43710 |
| JIS = | JIS C 1610-1981 |
| IEC = | IEC 584-3 |

* Product normally shipped in 1,000 foot spools. Contact a Watlow representative for special packaging.





Find out more about Watlow and how we can provide thermal solutions for your company:

Phone: 1-800-WATLOW2 (1-800-928-5692)

Email: inquiry@watlow.com

Website: www.watlow.com

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| Italy | +39 02 4588841 |
| Spain | +34 91 675 1292 |
| United Kingdom | +44 (0) 115 964 0777 |

Latin American Technical Support & Sales Office

| | |
|--------|------------------|
| Mexico | +52 442 256 2200 |
|--------|------------------|

About Watlow

Watlow provides best-in-class engineering expertise and leading thermal products that enable customers to thrive. Our world-class technology is offered in industrial heaters, temperature sensors and electronics and communications. Watlow engineers solutions that give our customers a competitive advantage in their respective markets.

Watlow brings its experience to numerous industries, including semiconductor processing, diesel emissions, energy processes, foodservice equipment and life sciences to name a few.

Since 1922, Watlow has grown in product capability, market experience and global reach. The company holds more than 450 patents and employs 2,200 people working globally through eight manufacturing facilities and three advanced technology centers. Headquartered in St. Louis, Missouri with sales offices in 16 countries around the world, Watlow continues to grow. Our pride and confidence stems from thrilling our customers with our products and the Watlow experience.

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