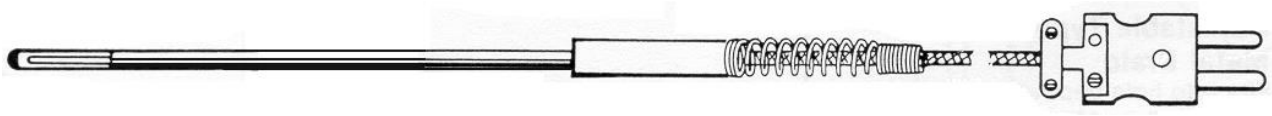
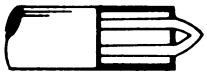
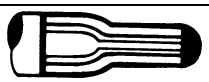
# MgO Insulated Thermocouples

An AKINSUN-MgO thermocouple assembly consists of a thermocouple element embedded in hard-packed high purity (99.4%) Magnesium Oxide mineral insulation and encased in a metal sheath. Thermocouple sheaths have been fully annealed; they can be formed into many configurations, and can be bent into a radius of twice the size of its outer sheath.

**SHEATHED BASE METAL AND NOBLE THERMOCOUPLE**



## Junctions

| TYPE | DESCRIPTION | |
|---|---|---|
| *E* | *Exposed fastest response* |  |
| *UG* | *Ungrounded Electrically Isolated* |  |
| *G* | *Grounded to cap fast response* |  |
| *DG DUG* | *Duck bill flattened for welding to surface* |  |
| *S* | *Butting junction for gradient measurement* |  |
| *FG FUG* | *High response good contact with surface* |  |
| *NG NUG* | *Neckdown for high response to fit holes and grooves* |  |

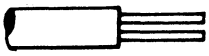
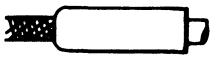
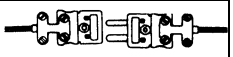
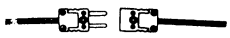
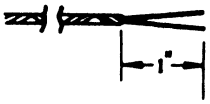
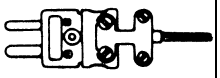
## Applications

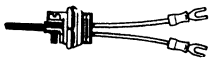
- Foundries
- Photo Processing
- Platens
- Medical
- Ovens
- Lab equipment
- Heat treating
- Incinerators
- Numerous other applications

## Features

- High-Temperature construction
- Corrosion resistant protective sheath
- Vibration resistant
- Can be bent with a radius as small as two times the tube O.D

# Termination and Style

| TYPE | DESCRIPTION |
|---|---|
| T1 | Cut and stripped available on mineral insulated thermocouple only.  |
| T2 | Potted transition to lead wire for up to 400°F operation.  |
| T3 | Male and Female plugs  |
| T4 | Miniature Male and female plugs.  |
| T5 | Cut lead  |
| T6 | Bare strip leads  |
| T7 | Male plug  |

| TYPE | DESCRIPTION |
|---|---|
| T8 | Female plug  |
| T9 | Miniature Male plug  |
| T10 | Miniature female plug  |
| T11 | Spade lugs  |
| T12 | Lugs and BX connector  |

## THERMOCOUPLE ORDERING INFORMATION

**ORDER CODE EXAMPLE**: UGK1220816T2L90600T3

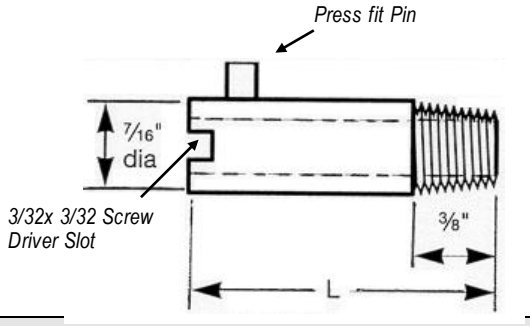
UG K 12 2 0816 T2 L9 0600 T3

- UG — Ungrounded
- K — K Calibration
- 12 — Sheath O.D. .125”
- 2 — Incoloy 600
- 0816 — Probe length 8½”
- T2 — Transition Fitting
- L9 — Metal Braid Covered Leads
- 0600 — Lead length 6”
- T3 — Termination Male and Female plugs

| FRACTION | CODE |
|---|---|
| 1/32 | 01 |
| 1/16 | 02 |
| 1/8 | 04 |
| 1/4 | 08 |
| 1/2 | 16 |
| 5/8 | 20 |
| 3/4 | 24 |

# Accessories

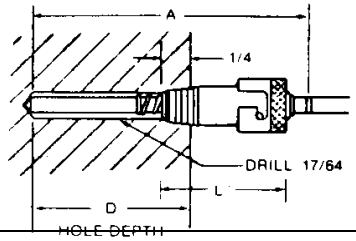
| BAYONET ADAPTER | | |
|---|---|---|
| L | 1/8-27 NPT | 3/8-24 NPT |
| 7/8" | BAI-28 | BA3-28 |
| 1" | BAI-32 | BA3-32 |
| 1¼" | BAI-108 | BA3-108 |
| 1½" | BAI-116 | BA3-116 |
| 2" | BAI-200 | BA3-200 |
| 2½" | BAI-216 | BA3-216 |




1/8-27 NPT or 3/8-24 thread (12mm metric also available)

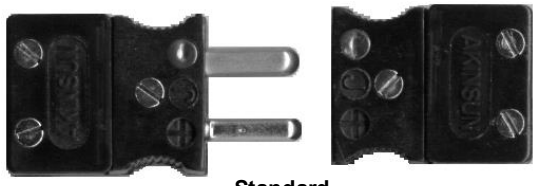
## DIMENSION SELECTION GUIDE

*Hole depth "D" determines the required 'A' dimension and threaded bayonet adapter Length 'L'*
*A = D + L*
*Round 'A' up to next ½" if in-between increments.*
*i.e.: for D = 1" and L = 1 7/8"*
*A = D + L = 2 7/8" round to 3"*

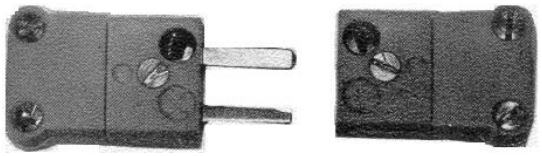



## Thermocouple Connectors

| Part No | Type | connection | color |
|---|---|---|---|
| T3J | J | Plug | Black |
| T4J | J | Jack | Black |
| T3K | K | Plug | Yellow |
| T4K | K | Jack | Yellow |
| T3T | T | Plug | Blue |
| T4T | T | Jack | Blue |
| T3E | E | Plug | Purple |
| T4E | E | Jack | Purple |




| | | | |
|---|---|---|---|
| T5J | J | Plug | Black |
| T6J | J | Jack | Black |
| T5K | K | Plug | Yellow |
| T6K | K | Jack | Yellow |
| T5T | T | Plug | Blue |
| T6T | T | Jack | Blue |
| T5E | E | Plug | Purple |
| T6E | E | Jack | Purple |



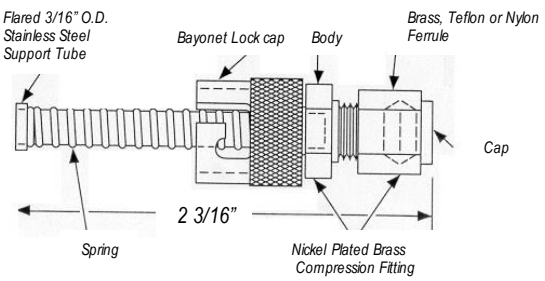

## COMPRESSION TYPE MOUNTING FITTING

*1/8", 3/16", 1/4", OD Tube x 1/8" NPT-Brass Ferrule*
*3/8" OD Tube x 1/4" NPT - Brass Ferrule*

| PART NO. | SIZE |
|---|---|
| CF132 | 1/8 NPT |
| CF232 | ¼ NPT |

## Adjustable Bayonet Compression Fitting

Used in 1/8 O.D. probes fitting with Teflon could be relocated, but brass ferrules cannot be relocated once they are set.
TH2762BR with brass ferrules
TH2762T with Teflon ferrules



# THERMOCOUPLE WIRE / SPECIFICATIONS

Insulated Duplex and Single Conductor type

Akinsun provides a reliable thermocouple-grade wire for use in industrial, research, nuclear power, automotive industry or food processing facilities and equipment Pertinent information on ANSI Letter and solid constructions, insulation types are given in the following pages.

**Color-coding of thermocouple wire**

| ANSI Type | | Magnetic | | ANSI Color-Code | | |
|---|---|---|---|---|---|---|
| T/c | Single | Yes | No | Single | Overall Extension Wire | Overall T/C Wire |
| B | BP<br>BN | | X<br>X | Grey<br>Red | Grey | - |
| E | EP<br>EN | | X<br>X | Purple<br>Red | Purple | Brown |
| J | JP<br>JN | X | <br>X | White<br>Red | Black | Brown |
| K | KP<br>KN | X | X | Yellow<br>Red | Yellow | Brown |
| N | NP<br>NN | | X<br>X | Orange<br>Red | Orange | Brown |
| R, S | RP, SP<br>RN, SN | | X<br>X | Black<br>Red | Green | Brown |
| T | TP<br>TN | | X<br>X | Blue<br>Red | Blue | Brown |

## ANSI Tolerances

All thermocouple wire and extension wire is supplied to meet Standard Tolerances of ANSI Circular MC96.1-1982.

**Initial Calibration Tolerances for Thermocouples**

| Reference Junction 0°C (32°F) | | | | |
|---|---|---|---|---|
| Thermo-couple Type | Temperature Range (°C) | (°F) | Tolerances* (whichever is greater) Standard | Special |
| B | 870-1700 | 1598-3092 | ± 0.5% | - |
| E | 0-900 | 32-1652 | ± 1.7°c or ± 0.5% | ± 1.1°C or ±0.4% |
| J | 0-750 | 32-1382 | ± 2.2°C or ± 0.75% | ± 1.1°C or ±0.4% |
| K | 0-1250 | 32-2282 | ± 2.2°C or ± 0.75% | ± 1.1°C or ±0.4% |
| N | 0-1250 | 32-2282 | ± 2.2°C or ± 0.75% | ± 1.1°C or ±0.4% |
| R or S | 0-1450 | 32-2642 | ± 1.5°c or ± 0.25% | ± 0.6°C or ±0.1% |
| T | 0-350 | 32-662 | ± 1.0°C or ± 0.75% | ± 0.5°C or ±0.4% |

* Where Tolerances are given in percent, the percentage applies to the temperature being measured in degrees Celsius. For example, the standard tolerance of type J over the temperature range 277°C to 750°C is ±0.75 percent. If the temperature being measured is 538°C, the tolerance is ± 0.75 percent of 538, or ± 4.0°C. To determine the tolerance in °F: Multiply the tolerance in °C by 9 and divide by 5.

## ANSI Letter designations

Thermocouple and extension wire are generally ordered and specified by ANSO letter designations for wire type. Positive and negative legs are identified by the appropriate letter suffixes P and N, respectively.

| ANSI Letter | Description | Popular Generic and Trade Names* |
|---|---|---|
| B | BP<br>BN | Platinum 30% Rhodium<br>Platinum 6% Rhodium |
| E | EP<br>EN | Chromel, Tophel, HAI-KP<br>Constantan, Cupron, Advance |
| J | JP<br>JN | Iron<br>Constantan, Cupron, Advance |
| K | KP<br>KN | Chromel, Tophel, HAL-KP<br>Alumel, Nial, HAO-KN |
| N | NP<br>NN | Nicrosil<br>Nisil |
| R | RP<br>RN | Platinum 13% Rhodium<br>Pure Platinum |
| S | SP<br>SN | Platinum 10% Rhodium<br>Pure Platinum |
| T | TP<br>TN | Copper<br>Constantan, Cupron, Advance |

* Trade names: Cupron, Nial and Tophel-Carpenter Technology • Advance, HAI-KP, and HAO-KN-Harrison alloys Co. • Chromel and Alumel-Hoskins Mfg. Co.

**Initial Calibration Tolerances For Thermocouple Extension Wires**

| Reference Junction 0°C (32°F) | | | | | |
|---|---|---|---|---|---|
| Thermo-Couple Type | Compen-Sating Wire Type | Temperature Range (°C) | (°F) | Tolerances* (°C) | (°F) |
| R, S | SX† | 0-200 | 32-392 | ± 7 | ± 12 |
| B | BX# | 0.100 | 32-212 | +0,-3.7 | +32,-6 |

*Due to the non-linearity of the types R,S, and B temperature-emf curves, the error introduced into a thermocouple system by the compensating wire will be variable when expressed in degrees. The degree C tolerances are based on the following measuring junction temperatures.

**Type Wire** **Measuring Junction Temperature**

SX Greater than 870 °C (1598°F)

BX Greater than 1000°C (1832°F)

† Copper (+) versus copper nickel alloy (-).

# Copper versus copper compensating extension wire, usable to 100°C (212°F) with maximum deviations as indicated, but with no significant deviation over 0°C to 50°C (32°F to 122°F) range.

**Initial Calibration Tolerances For Thermocouple Extension Wires**

| Reference Junction 0°C (32°F) | | | | |
|---|---|---|---|---|
| Extension Wire Type | Temperature Range (°C) | (°F) | Tolerances Standard (°C) | Special (°C) |
| EX | 0.200 | 32-392 | ±1.7 | ±1.0 |
| JX | 0.200 | 32.392 | ±2.2 | ±1.1 |
| KX | 0.200 | 32.392 | ±2.2 | ±1.1 |
| NX | 0.200 | 32.392 | ±2.2 | ±1.1 |
| TX | 0.100 | 32-212 | ±1.0 | ±0.5 |

# THERMOCOUPLE WIRE

## Construction and Characteristics

| Type | Single Conductor | | Duplex Conductors | | Temperature Rating | | Physical Properties | | | Notes | Appearance |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Insulation | Impreg-nation | Insulation | Impreg-nation | Continuos | Single Reading | Abrasion Resist. | Moisture Resist. | Chemical Resist. | | |
| 004 | Glass Braid | Silicone Modified Resin | Glass Braid | Silicone Modified Resin | 900°F (482°C) | 1000°F (538°C) | Fair | Good | Good | Impregnation retained to 400°F (204°C) |  |
| 305 | Double Glass Wrap | Silicone Modified Resin | Glass Braid | Silicone Modified Resin | 900°F (482°C) | 1000°F (538°C) | Fair | Good | Good | Impregnation retained to 400°F (204°C) |  |
| 321 | High Temp Glass Braid | High Temp Varnish | High Temp Glass Braid | High Temp Varnish | 1300°F (704°C) | 1600°F (871°C) | Good | Good | Good | Impregnation retained to 400°F (204°C) |  |
| 502 | Polyvinyl (PVC) | - | Polyvinyl (PVC) | - | -20 to+221°F (-29 to 105°C) | - | Good | Excellent | Good | - |  |
| 506 | FEP Extr. | - | FEP Extr. | - | 400°F (204°C) | 500°F (260°C) | Excellent | Excellent | Excellent | - |  |
| 510 | Polyvinyl (PVC) | - | Polyvinyl (PVC) | - | -20 to +221°F (-29 to 105°C) | - | Good | Excellent | Good | Aluminum/Mylar Shield with Drain Wire |  |
| 301 | Vitreous Silica Fiber | - | Vitreous Silica Fiber | - | 1600°F (871°C) | 2000°F (1093°C) | Fair | Fair | Good | - |  |
| 355 | Ceramic Fiber | - | Ceramic Fiber | - | 2200°F (1204°C) | 2600°F (1427°C) | Good | Fair | Good | - |  |

Order Code Example: J 305 20 1 S

Conductor-ANSI letter *
Designation (Calibration)
Insulation Type-Insulating & jacketing Material
(Refer to construction & Characteristic table)
Wire B & S Gauge
(Available in 16,20 & 24 Gages.)

Conductor Specs
- 1 = Thermocouple grade, solid wire
- 2 = Thermocouple grade, stranded wire
- 3 = Extension grade, solid wire
- 4 = Extension grade, stranded wire
- 5 = Thermocouple grade, solid wire special tolerance
- 6 = Thermocouple grade, stranded wire special tolerance
- 7 = Extension grade, solid wire special tolerance
- 8 = Extension grade, stranded wire special tolerance

Metal Over braid
- S = Stainless steel.
- C = Tinned copper
- G = Galvanized steel wrap
- W = Stainless steel wrap
- 0 = No Over braid

## Thermocouple Wire Ordering Information

Order code example: J305201S

***For single conductor**
Add P for positive.
Add N for Negative
Example JP305201S
Where P is positive for Iron Conductor.

# Thermocouple- Insulated Wire

### Type T Duplex Thermocouple Wire

| B & S GA | Part Number | Nom. O.A. Dimensions | Wire Type | Max.Temp. °F | Max.Temp. °C | Insulation Each Conductor | Overall Insulation |
|---|---|---|---|---|---|---|---|
| 20 | T0042010 | .060 x.106 | Solid | 900 | 482 | Glass Braid | Glass Braid |
| 20 | T5062010 | .068 x.116 | Solid | 400 | 204 | Extruded (FEP) teflon | Extruded (FEP) teflon |
| 24 | T5062410 | .056 x.092 | Solid | 400 | 204 | Extruded (FEP) teflon | Extruded (FEP) teflon |

ANSI Type T color code-Blue positive/ Red negative- Overall Brown (fiberglass w/Blue tracer)

### Type E Duplex Thermocouple Wire

| B & S GA | Part Number | Nom. O.A. Dimensions | Wire Type | Max.Temp. °F | Max.Temp. °C | Insulation Each Conductor | Overall Insulation |
|---|---|---|---|---|---|---|---|
| 20 | E0042010 | .060 X.106 | Solid | 900 | 482 | Glass Braid | Glass Braid |
| 20 | E5062010 | .060 X.104 | Solid | 500 | 260 | TFE teflon tape | TFE teflon tape |

ANSI color code-Purple positive/ Red negative-Overall E Brown (fiberglass w/Purple tracer)

# Thermocouple Extension Wire

| B & S GA | Part Number | Nom. O.A. Dimensions | Wire Type | Max.Temp. °F | Max.Temp. °C | Insulation Each Conductor | Overall Insulation |
|---|---|---|---|---|---|---|---|
| **Type JX Duplex** ANSI color code-White positive/ Red negative-overall Black | | | | | | | |
| 20 | J5022030 | .092 x.154 | Solid | 221 | 105 | Polyvinyl (PVC) | Polyvinyl (PVC) |
| 20 | J5022040 | .089 x.166 | Stranded (7/28) | 221 | 105 | Polyvinyl (PVC) | Polyvinyl (PVC) |
| 20 | J5102030 | .169 round | Solid | 221 | 105 | PVC/ twisted w/alum mylar tape shield & bare drain wire | Polyvinyl (PVC) |
| 16 | J5021630 | .111 x.192 | Solid | 221 | 105 | Polyvinyl (PVC) | Polyvinyl (PVC) |
| 16 | J5101630 | .207 round | Solid | 221 | 105 | PVC/ twisted w/alum mylar tape shield & bare drain wire | Polyvinyl (PVC) |
| **Type KX Duplex** ANSI color code-Yellow positive/ Red negative-Overall Yellow | | | | | | | |
| 20 | K5022010 | .092 x.154 | Solid | 221 | 105 | Polyvinyl (PVC) | Polyvinyl (PVC) |
| 20 | K5022020 | .098 x.166 | Stranded (7/28) | 221 | 105 | Polyvinyl (PVC) | Polyvinyl (PVC) |
| 20 | K5102010 | .169 round | Solid | 221 | 105 | PVC/ twisted w/alum mylar tape shield & bare drain wire | Polyvinyl (PVC) |
| **Type TX Duplex** ANSI color code-Blue positive/ Red negative-Overall Blue | | | | | | | |
| 20 | T5022030 | .092 x.154 | Solid | 221 | 105 | Polyvinyl (PVC) | Polyvinyl (PVC) |
| 20 | T5022040 | .098 x.166 | Stranded (7/28) | 221 | 105 | Polyvinyl (PVC) | Polyvinyl (PVC) |
| 20 | T5102030 | .169 round | Solid | 221 | 105 | PVC/ twisted w/alum mylar tape shield & bare drain wire | Polyvinyl (PVC) |
| **Type EX Duplex** ANSI color code-Purple positive/ Red negative-Overall Purple | | | | | | | |
| 20 | E5022030 | .092 x.154 | Solid | 221 | 105 | Polyvinyl (PVC) | Polyvinyl (PVC) |
| 20 | E5102030 | .169 round | Solid | 221 | 105 | PVC/ twisted w/alum mylar tape shield & bare drain wire | Polyvinyl (PVC) |