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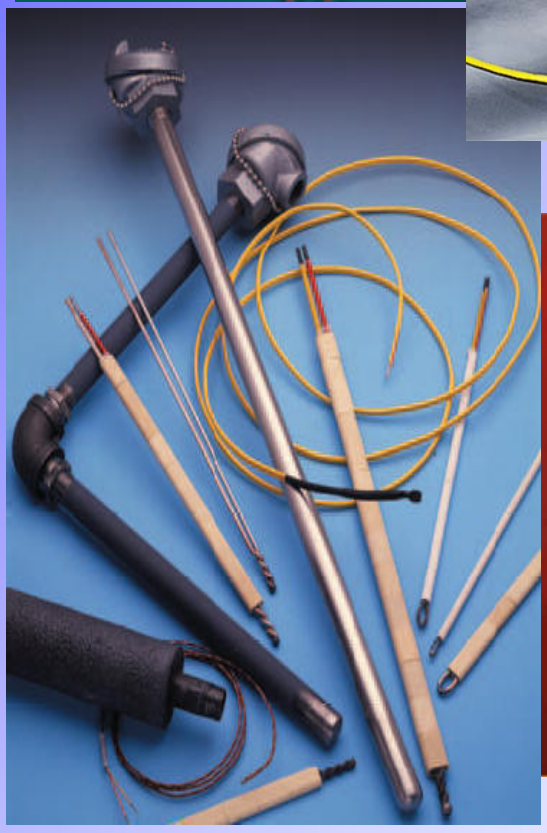
Industrial Catalog


E171827
BFU7389-1 11-06


WATLOW
EZ-ZONE
WATLOW
EZ-ZONE



EGT is a Watlow Distributor

Exhaust Gas Technologies Inc. carries the complete line of Watlow heater products, as well as sensors and controls. Our Watlow heater products include band, cable, cartridge and ceramic fiber styles as well as flexible rubber, multi cell, radiant strip and tubular heater products. We also carry Watlow thick film and flange immersion heaters. With a wide selection of heater products to choose from, we are sure to have the unit that will meet your industry's needs.

For over 85 years, Watlow has designed and manufactured a variety of temperature controller products and SCR power controls. Our line of Watlow temperature controller models and SCR power control units utilizes today's technology to provide the features and accuracy that are needed for today's applications to precisely run critical machines and equipment.

Watlow is a world class supplier of thermocouple products. They have designed and manufactured millions of general purpose and mineral insulated Watlow thermocouple units for critical process control of industrial, food, plastics and metal equipment. Numerous industries rely on Watlow thermocouple products to get the job done.

If you have any questions regarding the Watlow heater models listed on our website or need assistance finding the right Watlow sensors or controls for your application, please feel free to contact us. 1-800-348-4678

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INDEX

WELCOME!

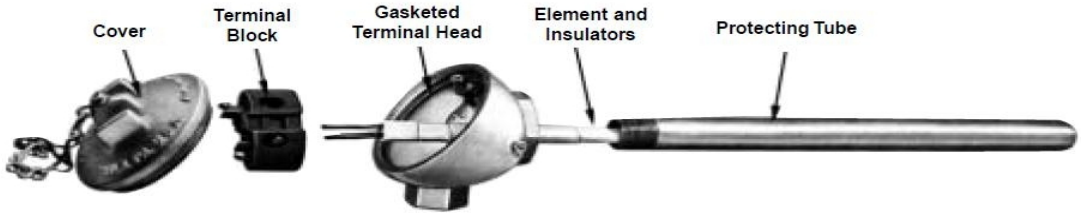
EXHAUST GAS TECHNOLOGIES manufactures a wide range of thermocouple assemblies for all types of industrial uses. Our staff has over 80 years of engineering, manufacturing and applications experience ready to serve you. Should you need special assistance in the design or application of sensors you can be assured we will respond to your needs in a fast, courteous manner. We are committed to giving our customers the service they are looking for. Our 5,000 square foot service center and manufacturing operations are fully equipped with professional staff, state of the art equipment and extensive stock of raw materials, giving us the advantage and the ability to meet any delivery requirement, (including "same day" or "next day" emergency requirements).

Our Exhaust Gas Technologies motorsports group has been supplying professional race teams for over 20 years. We currently supply sensors for the top teams in NHRA, NASCAR, IMSA, CART and Bonneville. Our sensors have helped professional teams win 226 World Championships, 2438 National Championships and 703 World Records for speed and elapsed time. We also supply every major engine testing facility in the USA. Our customers are always moving fast, so we must also move quickly to insure that you, the client, are satisfied with our products quality, price and delivery. We thank you for the opportunity to serve you.

Sincerely,
The Staff at Exhaust Gas Technologies

Call Today – Toll Free, U.S. & Canada
1– 800 – 348 – 4678
Shop On Line at www.exhaustgas.com
E-mail: sales@exhaustgas.com FAX: 909-680-3226
Visa, Master Card, Discover, PayPal, Terms OAC

EGT Thermocouple Principles



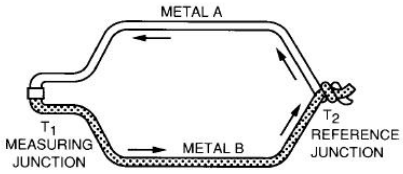


Fig 1 – Single Thermocouple Circuit.

Many years of research and field experience have gone into the design of today's EGT thermocouples – making them a product well known for top performance and reliability. Together with controlling instruments, they have provided the answer to thousands upon thousands of temperature sensing and control problems.

Basically, a thermocouple is composed of two dissimilar metal wires welded together in a circuit, as in Fig. 1. The circuit develops a small DC voltage proportional to the temperature at the measuring junction whenever a temperature difference exists between the measuring and reference junction. This EMF is the simple means whereby temperature can be measured by instrumentation and systems.

Thermocouples

Thermocouples are installed directly (usually with a protecting tube or well) in the process medium, which can be corrosive and at high temperatures. A variety of thermocouple wire types are available to cover the temperature range-184° to +2330°C (-300° to +4000°F). Thermocouple wire is selected to provide a temperature-EMF relation which is as linear as possible.

Protecting tubes or wells are used for one or more of the following reasons: (1) to protect against deleterious gases; (2) to protect against corrosive fluids; (3) to provide suitable protection for a thermocouple in a pressurized vessel; (4) to protect against mechanical damage; (5) to support the thermocouple. A wide variety of tube and well materials are available. Various types of ceramic insulators are available to support and protect the thermocouple wire within a tube or well.

Protecting tubes and wells naturally tend to cut down the speed or response of thermocouples. For applications where faster response is desirable, such assemblies as "small mass," and "exposed tip" thermocouples are available.

Instrumentation and Systems

Thermocouples are incorporated into instrumentation and systems as shown in Fig 2. The usual basic system consists of : (1) the thermocouple attached to (2) a connection head which is located near the point of the measurement and is in turn connected by (3) extension wire to (4) an instrument which incorporates internal extension wire and the thermocouple reference junction.

In addition to these basic items, thermocouple assemblies and pyrometric systems contain necessary components such as thermocouple protecting tubes or wells, ceramic insulators on the thermocouple wires within protecting tubes, and various accessory fittings.

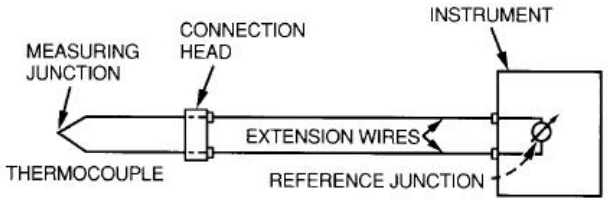


Fig 2 – Schematic Diagram of a Thermoelectric System.

Connection Heads

The purpose of the thermocouple connection or terminal head is to provide facilities for making positive electrical connections between thermocouple and extension wires and to provide a means of attachment for a protecting tube and extension wire conduit. The head contains a ceramic terminal block for all electrical connections. EGT offers a connection head for every application. Typical heads include a general purpose head for most installations; a screw cover head or our popular FLIP TOP HEAD, ideal for applications which must be completely weatherproof; and other connection means.

Extension Wire

Extension wire theoretically extends the thermocouple to the reference junction in the instrument. This wire is generally furnished in the form of a matched pair of conductors having insulation designed to meet the service needs of the particular application.

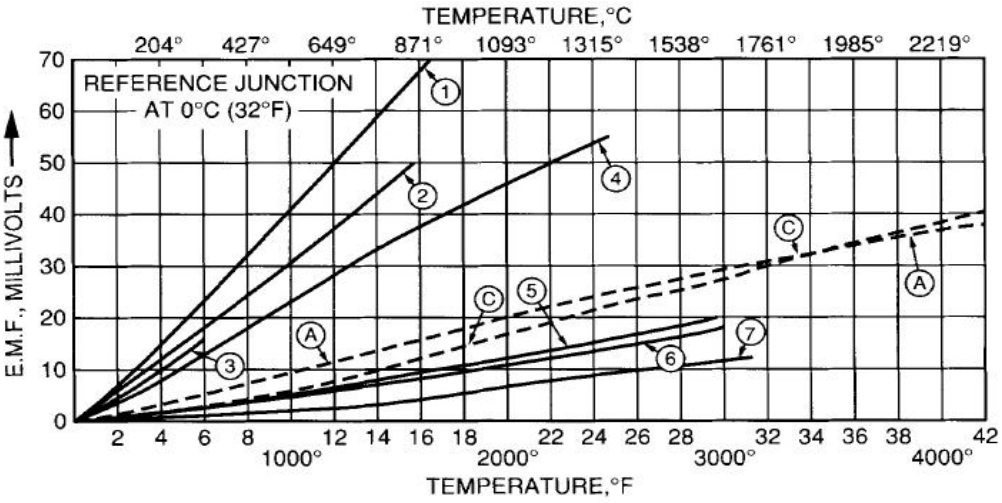
Thermocouple Types

Frequently you will have a choice of thermocouple types. Make your selection carefully, based on factors such as operating temperature, accuracy and EMF output required, and the atmosphere in which you plan to install the thermocouple.

Refer to the tables and charts listed below.

Legend

1	Type E
2	Type J
3	Type T
4	Type K
5	Type R (Platinum 13% Rhodium – Platinum)
6	Type S (Platinum 10% Rhodium – Platinum)
7	Type B Platinum 30% Rhodium Platinum 6% Rhodium
	Tentative Curves:
A	Tungsten 5% Rhenium – Tungsten 26% Rhenium
C	Tungsten – Tungsten 26% Rhenium



Type T Copper-Constantan-High resistance to corrosion from atmospheric moisture or moisture condensation. Can be used in either oxidizing or reducing atmospheres.

Type E (originally Chromel*- Constantan)- primarily for oxidizing atmospheres. Does not corrode at subzero temperature.

Type K (originally Chromel-Alumel)**- Recommended between 583°C (1000°F), and 1093°C (2000°F) in oxidizing atmospheres.

Type J Iron-Constantan- Suitable where free oxygen is deficient. As oxidation of the iron conductor increases rapidly above 583°C (1000°F) of the instrument with which it will be used. This information can usually be found on the face of the instrument.

Type R and S Platinum Rhodium-Platinum; 13% or 10% Type B Platinum 30% Rhodium-Platinum 6% Rhodium.
Recommended for use in oxidizing atmospheres. Easily contaminated in any other atmosphere, so caution should be used in these cases.

Tungsten-Tungsten 26% Rhenium| Tungsten 5% Rhenium-Tungsten 26% Rhenium
Recommended for reducing inert atmospheres or vacuum.

CAUTION: DO NOT use in the presence of FREE OXYGEN.

* Trademark, Hoskins Manufacturing Co.
**Type K thermocouple wire is manufactured under such trademarks as Chromel-Alumel (Hoskins Manufacturing Co.), Tophel-Nial (W.B. Driver Co.), T2-T2 (Driver-Harris C.),etc.

Recommended Temperature Limits for Protected Thermocouples

	Minimum Temperature		8 ga.		14 ga.		20 ga.		24 ga.		30 ga.	
			Maximum Temperature									
Thermocouple Type	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
Type T (Copper-Constantan)	–184°	–300°	–	–	–	–	260°	500°	204°	400°	204°	400°
Type J (Iron-Constantan)	–18°	0°	760°	1400°	593°	1100°	482°	900°	371°	700°	371°	700°
Type E (Chromel-Constantan)	–184°	–300°	871°	1600°	649°	1200°	538°	1000°	427°	800°	427°	800°
Type K (Chromel-Alumel)	–18°	0°	1260°	2300°	1093°	2000°	982°	1800°	871°	1600°	871°	1600°
Type R and Type S	–18°	0°	–	–	–	–	–	–	1482°	2700°	–	–
Type B	–18°	0°	–	–	–	–	–	–	1705°	3100°	–	–
Tungsten 5% Rhenium–Tungsten 26% Rhenium	–18°	0°	–	–	–	–	–	–	2330°	4200°	–	–
Tungsten-Tungsten 26% Rhenium	–18°	0°	–	–	–	–	–	–	2330°	4200°	–	–

Thermocouple Accuracy

Your control system performance depends upon the accuracy of your thermocouple. Here are five ways to get the accuracy you need with (EGT) thermocouples.

1. Standard grade thermocouple wire and extension wire conform to the limits of error listed below. These limits are equal to or better than ANSI standard limits of error as published in MC96.1-1982 (°C limits).

2. (EGT) premium grade limits of error are equal to or better than ANSI premium limits of error as published in MC96.1-1982 (°C limits). Many types of premium grade base metal thermocouples and insulated wire are available at a slight additional cost.

3. Thermocouples and thermocouple materials are normally supplied to meet the limits of error as specified in the tables below for temperatures above 0°C. For Type T, however, the same materials may not fall within the sub-zero limits of error given in the tables. If Type T materials are required to meet sub-zero limits, the purchase order must so state. Special selection of materials usually will be required.

4. Checks on thermocouples and thermocouple wire can be performed for you in EGT's wire-testing laboratory at nominal cost. A certificate listing correction data is provided when this option is ordered. Duplicated copies are available at a small additional charge.

5. N.I.S.T. certification of thermocouples can be ordered through Exhaust Gas Technologies.

*Limits apply to temperature at connection head and reference junction.
**When the limit of error is given in percent, the percentage applies to the temperature differential between temperatures at the connection head and reference junction.
*** Limits of error apply to measuring junction temperature above 0°C (32°F).
† Applies only to 4 conductor wire when used with type R thermocouples.
†† Applies only to 4 conductor wire when used with type S thermocouples.
† Limits of error apply to measuring junction temperatures above 870°C (1598°F).

Limits of Error for Standard and Premium Grade Thermocouple Wire

(NOTE: When the limit of error is given in %, the percentage applies to the temperature being measured, not the range.)

Type of Wire	Temperature Range	Limits of Error (Select whichever is greater)	
		Standard Grade	Premium Grade
Type T Copper-Constantan	–200 to 0°C 0 to 350°C	±1°C or ±1.5% ±1°C or ±0.75%	--- ±0.5°C or ±0.4%
	–300 to 32°F 32 to 700°F	±1.5°F or ±2% ±1.5°F or ±0.75%	±0.75°F or ±1% ±0.75°F ±0.38%
Type J Iron-Constantan	0 to 750°C 32 to 1400°F	±2.2°C or ±0.5% ±4°F or ±0.5%	±1.1°C or ±0.4% ±2°F or ±0.38%
Type E Chromel-Constantan	0 to 900°C 32 to 1600°F	±1.7°C or ±0.5% ±3°F or ±0.5%	±1°C or ±0.4% ±2°F or ±0.38%
Type K Chromel-Alumel	0 to 1250°C 32 to 2300°F	±2.2°C or ±0.75% ±4°F or ±0.75%	±1.1°C or ±0.4% ±2°F or ±0.38%
Type R or S Platinum-Rhodium/Platinum	0 to 1450°C 32 to 2700°F	±1.5°C or ±0.25% ±3°F or ±0.25%	--- ---
Type B Platinum 30% Rhodium/ Platinum 6% Rhodium	800 to 1700°C 1600 to 3100°F	±0.5% ±0.5%	--- ---

Limits of Error for Standard and Premium Grade Extension Wire

Type of Wire	Temperature Range*	Limits of Error**	
		Standard Grade	Premium Grade
Type TX Copper-Constantan***	–60 to 100°C –75 to 200°F	±1.0°C ±1.5°F	±0.5°C ±0.75°F
Type JX Iron-Constantan	0 to 200°C 32 to 400°F	±2.2°C ±4°F	±1.1°C ±2°F
Type EX Chromel-Constantan	0 to 200 °C 32 to 400°F	±1.7°C ±3°F	--- ---
Type KX Chromel-Alumel	0 to 200°C 32 to 400°F	±2.2°C ±4°F	--- ---
Type SX Platinum-Rhodium-Platinum	24 to 200°C 75 to 400°F	±5°C ±9°F	--- ±1.5%† ; ±2.5% ††

Metrology Laboratory

Exhaust Gas Technologies maintains a complete laboratory for testing and certification of both thermocouple and RTD temperature elements. Our "State of the Art" equipment carries full N.I.S.T. Traceable Certifications and EGT also holds many Special Industrial Certifications for demanding applications.

Our computerized laboratory boasts a system accuracy of 0.013% within a +75 F. to +2200 F. temperature range, with instrumentation resolution out six decimal places, (0.000000 F.) for the pinnacle in calibration and certification services for your demanding requirements.

Uniformity Survey Wire, Pre-Certified, for Fast Delivery:

EGT also stocks several different types of soft insulated thermocouple wire pre-certified at standard temperature points, for quick delivery.
ANSI Type J & K 20 gauge with either Teflon # 507 Series or Braided Fiberglass # 304 Series insulations in "Special Limits of Error" are stocked on 500 Ft. spools.

**See insulated wire section.

We devote several weeks per year to technical seminars for each technician's education on the proper testing techniques, procedures and documentation requirements.

In 2001, EGT made a serious financial commitment to install and implement the highest quality, most accurate certification laboratory available. Since that installation was completed, several of our vendors have duplicated that system in-order to keep pace with us.

Exhaust Gas Technologies calibrates all production and testing equipment traceable to N.I.S.T. in Washington D.C. Reference standards used to calibrate transfer and working standards insurer uniformity throughout EGT, Inc. and your facility.

SECTION 1

Thermocouples for The Oven & Plastic Industries

Micro Gage Thermocouples

CUSTOM MADE IN USA

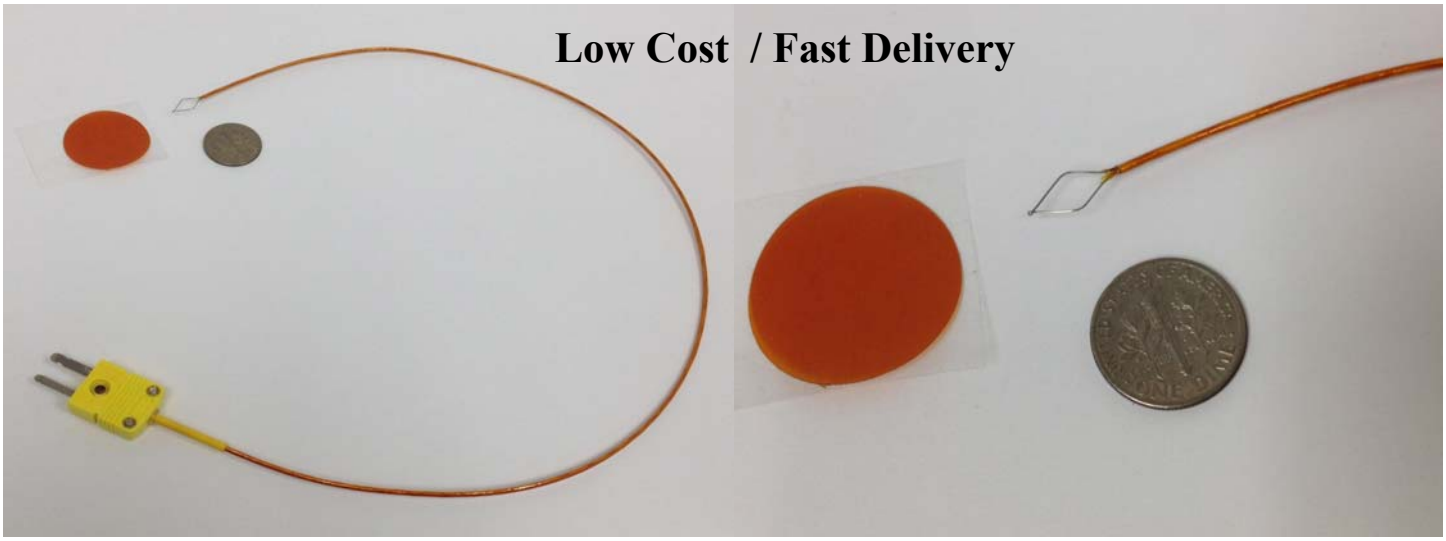
Industrial Standard for:

- **Automotive**
- **Aerospace**
- **Composites**
- **Electronics**
- **Medical**

- J, K, T and E Calibrations Available
- Made from Special Limits of Error Wire
- 20, 24, 30 and 36 AWG Available
- 30 and 36 AWG Wires with PFA Insulation. Max. Service Temp 260°C (500°F)
- 30 AWG Wires with Glass Braid Insulation. Maximum Service Temp 480°C (900°F)
- Max Service Temp for Connector Body 220°C (425°F)
- PFA, Kapton®, or Glass Braid Insulation
- Adhesive Mounting Optional
- NIST Calibration Available

Micro Gage Thermocouples

Micro gage thermocouples are used whenever fast, accurate temperature measurements are required. The small wire diameters enable accurate temperature measurements without disturbing the base temperature of the body, in which the installation is made, by keeping heat transfer via the leads to a minimum. Also, the micro junction permits accurate “pin-pointing” of the measured values. They are available in wire sized ranging from 20ga to 36ga. All micro gage thermocouples are made from carefully selected materials. To insure consistent thermoelectric properties, each sensor is made from matched pairs of wire within the same lot number. When specified, thermocouples made from the same lot number can be supplied at no extra charge.



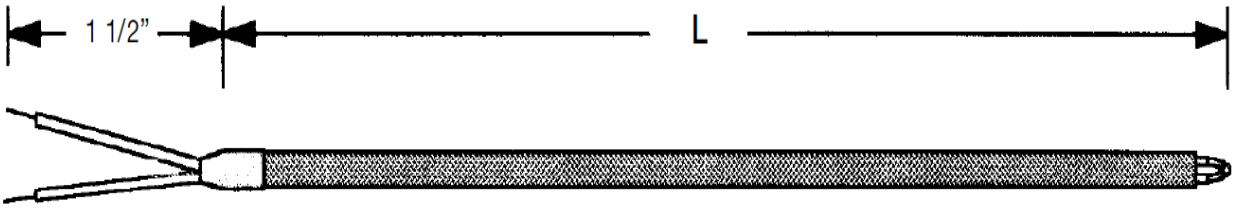
TW STYLE Flexible Wire

Features:

- Fast Response Time.
- Low Cost.
- Multiple Uses.
- Exposed Junction.
- Teflon Encapsulation Available.

General Specifications:

- Wire: Thermocouple Grade, Special Limits.
- Insulation: Teflon, Fiberglass, or PVC.
- Optional Stainless Steel Overbraid Available.
- Wide range of insulation materials to meet any temperature range, high humidity or corrosive environments.



T	W			E						

CALIBRATION

J- TYPE "J"
K-TYPE "K"
T-TYPE "T"
E-TYPE "E"
X-Other "Specify"

WIRE SIZE

2- 20 AWG
4- 24 AWG
6- 30AWG
8- 36 AWG
X- Other "Specify"

JUNCTION

E– Exposed

LEAD WIRE CONSTRUCTION

Insulation	Standard	Overbraid
PVC +220F	**P**	**-**
Teflon +500F	**T**	**B**
Fiberglass +900F	**G**	**O**

LENGTH "L"

Specify Whole Inches
Ex. **001"-999"**

TERMINATION

S-Standard 1 1/2" Split Leads
L-Split Leads w/ Spade Lugs
B-3 1/2" Split Leads
P-Standard Plug
J-Standard Jack
M-Miniature Plug
F-Miniature Jack
X-Other "Specify"

SPECIAL REQUIREMENTS

If none, Enter "0"
If required, Enter "X" & Specify.

X=_____

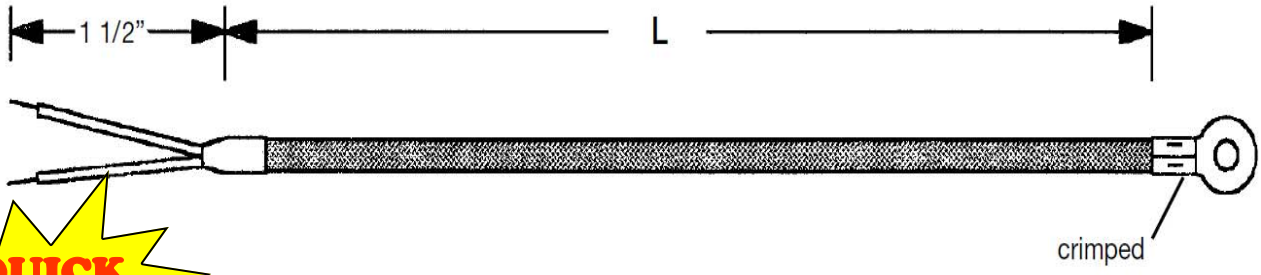
RW STYLE Ring Terminal

Features:

- Surface Temperature Measurement up to 900°F.
- Easily attached to any flat or curved surface with bolt or screw
- Large variety of ring sizes.

General Specifications:

- High temperature ring terminals
- Insulation: Teflon, Fiberglass, or PVC.
- Standard 20 AWG Teflon or Fiberglass
- T/C Wire w/ optional S/S Overbraid
- Specify Bolt size and Temperature Range
- Nickel ring terminals available.



QUICK DELIVERY

R	W									

CALIBRATION

J-TYPE "J"
K-TYPE "K"
T-TYPE "T"
E-TYPE "E"
X- Other "Specify"

JUNCTION

U– Ungrounded
G– Grounded

STUD SIZE

1– No.6 or 0.144"
2– No.8 or 0.169"
3– No.10 or 0.196"
4– 1/4 or 0.266"
5– 3/8 or 0.390"
6– 1/2 or 0.525"

LEAD WIRE CONSTRUCTION

Insulation	Standard	Overbraid
Teflon +500F	**T**	**B**
Fiberglass +900F	**G**	**O**

LENGTH "L"

Specify Whole Inches
Ex. **001"-999"**

SPECIAL REQUIREMENTS

If none, Enter "0"
If required, Enter "X" & Specify.

X=_____
_____
_____
_____
_____
_____
_____
_____
_____

TERMINATION

S-Standard 1 1/2" Split Leads
L-Split Leads w/ Spade Lugs
B-3 1/2" Split Leads
P-Standard Plug
J-Standard Jack
M-Miniature Plug
F-Miniature Jack
X-Other "Specify"

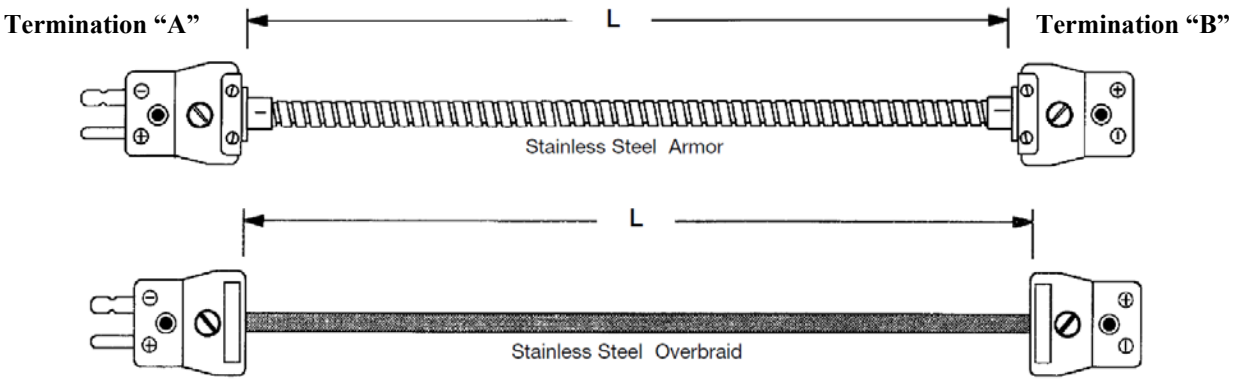
EX STYLE Flexible Extension

Features:

- Quick disconnect.
- Full protection of extension wire against harsh environments
- Fully compensated thermocouple materials to eliminate reading errors.

General Specifications:

- Extension wire: Special limits, 20 AWG, Stranded, PVC insulation
- S/S Flexible Armor or Overbraid
- Custom designed to any specification



E	X								

CALIBRATION

J-TYPE "J"
K-TYPE "K"
T-TYPE "T"
E-TYPE "E"
X- Other "Specify"

LENGTH "L"

Specify Whole Inches
Ex. **001"-999"**

TERMINATION A

S-Standard 1 1/2" Split Leads
L-Split Leads w/ Spade Lugs
B-3 1/2" Split Leads
P-Standard Plug
J-Standard Jack
M-Miniature Plug
F-Miniature Jack
X-Other "Specify"

LEAD WIRE CONSTRUCTION

Insulation	Standard	Overbraid	Flex Armor
PVC +220F	**P**	**R**	**2**
Teflon +500F	**T**	**B**	**3**
Kapton +600F	**K**	**S**	**4**
Fiberglass +900F	**G**	**O**	**1**

SPECIAL REQUIREMENTS

If none, Enter "0"
If required, Enter "X" & Specify.

X=_____

TERMINATION B

S-Standard 1 1/2" Split Leads
L-Split Leads w/ Spade Lugs
B-3 1/2" Split Leads
P-Standard Plug
J-Standard Jack
M-Miniature Plug
F-Miniature Jack
X-Other "Specify"

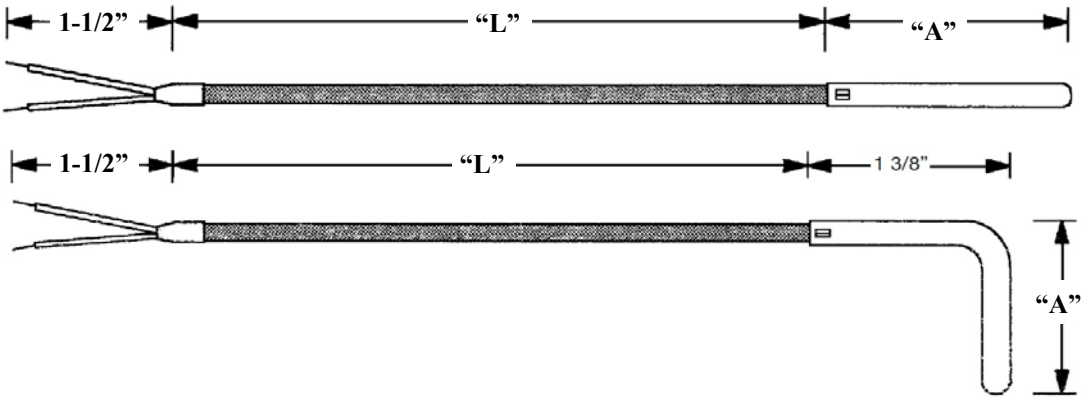
TP STYLE TUBE & WIRE

Features:

- Low Cost
- Quick Delivery
- Wide Temperature Range

General Specifications:

- Tube Material is 304 S/S
- Cold End epoxy sealed or crimped
- Select from variety of T/C wire to meet operating temperature & environment specifications



T	P											

CALIBRATION

J-TYPE "J"
K-TYPE "K"
T-TYPE "T"
E-TYPE "E"
**RTD Version see RE Style

SHEATH DIAMETER

5– 1/8"
6– 3/16"
7– 1/4"

JUNCTION

	Grounded	Exposed	Ungrounded
Single	**G**	**E**	**U**
Duplex	**D**	**T**	**C**

BEND ANGLE

0– Straight
4– 45 deg. bend
9– 90 deg. bend

TUBE LENGTH "A" (Inches)

A-0.5"	**E**-2.5"	**J**-4.5"	**N**-6.5"	**S**-8.5"	**Y**-11"
B-1.0"	**F**-3.0"	**K**-5.0"	**P**-7.0"	**T**-9.0"	**Z**-12"
C-1.5"	**G**-3.5"	**L**-5.5"	**Q**-7.5"	**U**-9.5"	
D-2.0"	**H**-4.0"	**M**-6.0"	**R**-8.0"	**W**-10"	

** See Page 81 for Mounting Options

LEAD WIRE CONST.

Insulation	Standard	Overbraid	Flex Armor
Fiberglass	**G**	**O**	**1**
Teflon	**T**	**B**	**3**

LEAD LENGTH "L"

Specify Whole Inches
Ex. **001"-999"**

TERMINATION

S-Standard 1 1/2" Split Leads
L-Split Leads w/ Spade Lugs
B-3 1/2" Split Leads w/ BX Conn & Spade Lugs
P-Standard Plug
J-Standard Jack
M-Miniature Plug
F-Miniature Jack
X-Other "Specify"

SPECIAL REQUIREMENTS

If none, Enter "0"
If required, Enter "X" & Specify.

X=_____

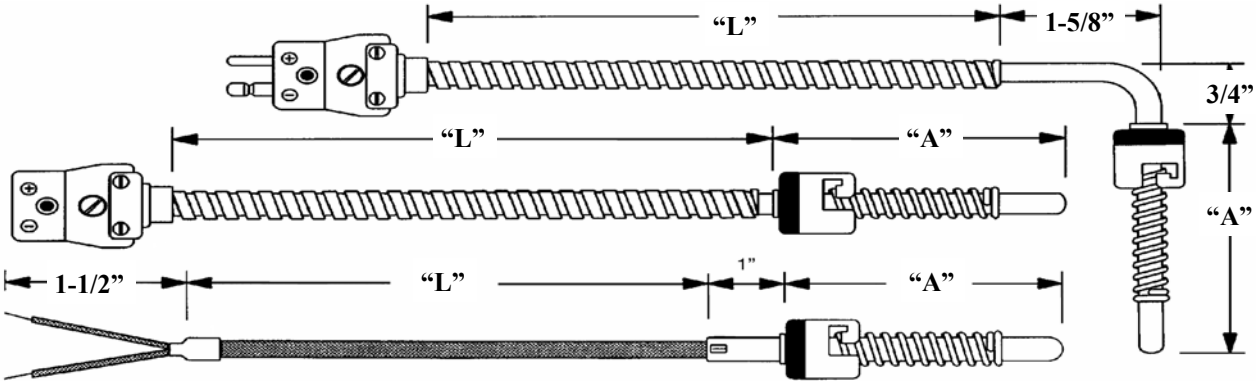
BP STYLE FIXED BAYONET

Features:

- Spring loaded to assure contact with measured surface.
- Fixed bayonet fitting for quick twist-lock install.
- Low cost & quick delivery.
- Wide temperature range.

General Specifications:

- Tube: .188”od, 304 stainless steel.
- Steel spring, nickel plated brass cap.
- Stranded wire is standard.
- Wide variety of wire insulation materials.
- Fixed immersion length.



B	P										

CALIBRATION

J-TYPE “J”
K-TYPE “K”
T-TYPE “T”
E-TYPE “E”
P–100Ω Thin Film RTD

JUNCTION

	Grounded	Ungrounded
Single	**G**	**U**
Duplex	**D**	**C**

BEND ANGLE

0– Straight
4– 45 deg. bend
9– 90 deg. bend

IMMERSION “A” (Inches)

D-2.0”	**G**-3.5”	**K**-5.0”	**N**-6.5”
E-2.5”	**H**-4.0”	**L**-5.5”	**P**-7.0”
F-3.0”	**J**-4.5”	**M**-6.0”	

LEAD WIRE CONSTRUCTION

Insulation	Standard	Overbraid	Flex Armor
Teflon +500F	**T**	**B**	**3**
Fiberglass +900F	**G**	**O**	**1**

Quantity Discounts!

SPECIAL REQUIREMENTS

If none, Enter “0”
If required, Enter “X” & Specify.

X=_____
_____
_____

TERMINATION

S-Standard 1 1/2” Split Leads
L-Split Leads w/ Spade Lugs
B-3 1/2” Split Leads
P-Standard Plug
J-Standard Jack
M-Miniature Plug
F-Miniature Jack
X-Other “Specify”

LEAD LENGTH “L”

Specify Whole Inches
Ex. **001”-999”**

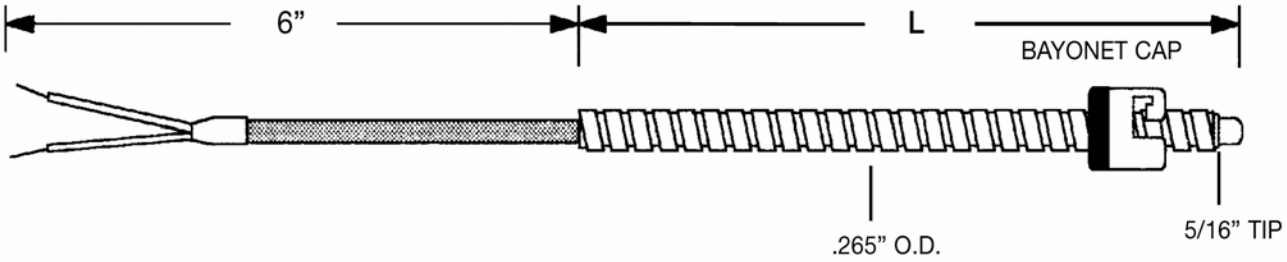
AP STYLE ARMOR ADJUSTABLE

Features:

- Bayonet Cap threads length of flex armor.
- Compression of flex armor loads tip.
- Fits standard bayonet adapters
- Stranded wire standard

General Specifications:

- .188" tube diameter –304 stainless steel.
- Leadwire available w/ Fiberglass/Teflon insulation.
- Standard Terminations available.



A	P		6	1		0						

CALIBRATION

J-TYPE "J"
K-TYPE "K"
T-TYPE "T"
E-TYPE "E"
P–100Ω Thin Film RTD

SHEATH DIAMETER

6– 3/16"

SHEATH MATERIAL

1– 304 S/S

JUNCTION

	Grounded	Ungrounded
Single	**G**	**U**
Duplex	**D**	**C**

Extreme Quality!

LEAD WIRE CONSTRUCTION

Insulation	Standard	Overbraid
Teflon +500F	**T**	**B**
Fiberglass +900F	**G**	**O**

LEAD LENGTH "L"

Specify Whole Inches
Ex. **001"-999"**

SPECIAL REQUIREMENTS

If none, Enter "0"
If required, Enter "X"
& Specify.

X=_____
_____
_____

TERMINATION

S-Standard 1 1/2" Split Leads
L-Split Leads w/ Spade Lugs
B-3 1/2" Split Leads w/ BX Conn & Spade Lugs
P-Standard Plug
J-Standard Jack
M-Miniature Plug
F-Miniature Jack
X-Other "Specify"

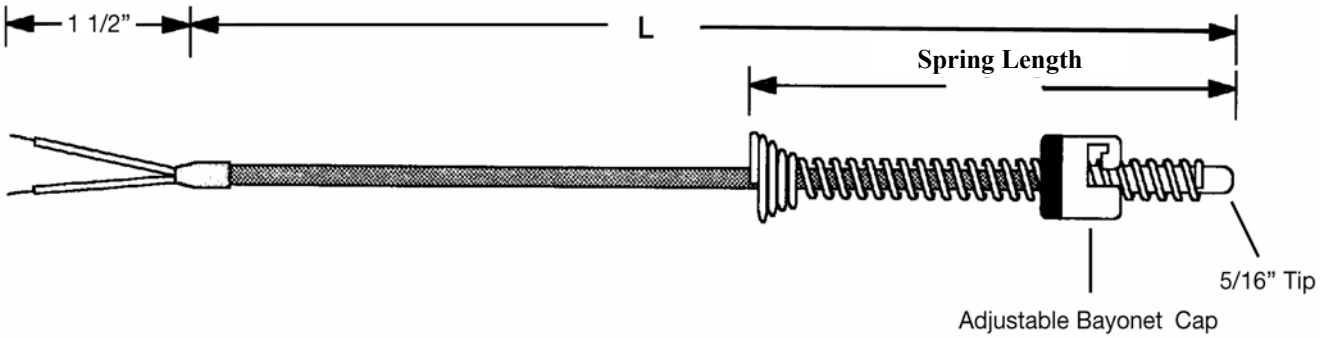
SP STYLE SPRING ADJUSTABLE

Features:

- Variable adjustable sensor fits a large range of hole depths.
- Bends to any angle.
- Eliminates immersion depth variations.

General Specifications:

- .188" od 304 stainless steel tube.
- .250" od stainless steel spring.
- Standard terminations available
- Stranded wire is standard.



S	P		6	1			1							

CALIBRATION

J-TYPE "J"
K-TYPE "K"
T-TYPE "T"
E-TYPE "E"
P–100Ω Thin Film RTD

SHEATH DIAMETER

6– 3/16"

SHEATH MATERIAL

1– 304 S/S

JUNCTION

	Grounded	Ungrounded
Single	**G**	**U**
Duplex	**D**	**C**

SPRING LENGTH

1– 6 Inch Spring
2– 8 Inch Spring
3– 12 Inch Spring

SHEATH LENGTH

1– 1" Length

LEAD WIRE CONSTRUCTION

Insulation	Standard	Overbraid
Teflon +500F	**T**	**B**
Fiberglass +900F	**G**	**O**

LEAD LENGTH "L"

Specify Whole Inches
Ex. **001"-999"**

TERMINATION

S-Standard 1 1/2" Split Leads
L-Split Leads w/ Spade Lugs
B-3 1/2" Split Leads w/ BX Conn & Spade Lugs
P-Standard Plug
J-Standard Jack
M-Miniature Plug
F-Miniature Jack
X-Other "Specify"

SPECIAL REQUIREMENTS

If none, Enter "0"
If required, Enter "X" & Specify.

X=_____
_____
_____

MB STYLE MELT BOLT

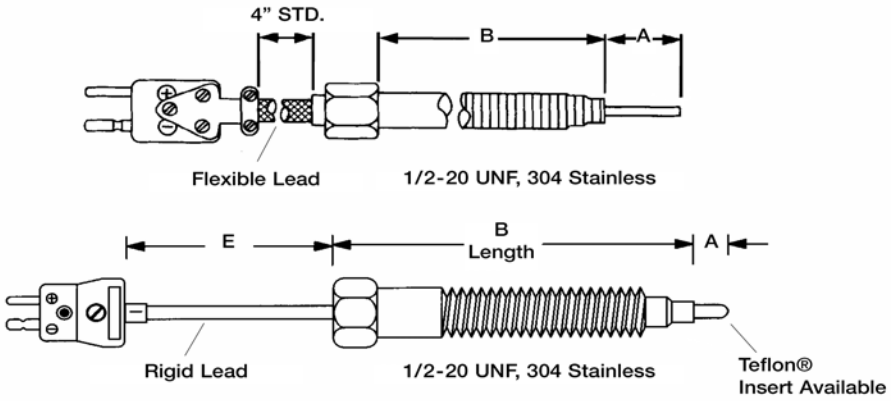
Features:

- Designed for insertion directly into molten plastic
- Available with various lead extensions
- Shown with sheath extension

General Specifications:

- .125” sheath diameter, 304 S/S sheath & melt bolt
- Melt Bolt Lengths are 3”, 4” & 6”
- High quality / long life construction.

Call For A Quote Today!



M	B		5							0		

CALIBRATION

J-TYPE “J”
K-TYPE “K”

SHEATH DIAMETER

5– 1/8” (.125”)

TIP STYLE

8– Standard Tip
9– Teflon Insert Tip

JUNCTION

	Grounded	Ungrounded
Single	**G**	**U**
Duplex	**D**	**C**

MELT BOLT LENGTH “B”

3– 3” Inch Bolt
4– 4” Inch Bolt
6– 6” Inch Bolt
X– Other

EXTENSION LENGTH

“E” Inches

1– 1” Length
2- 2” Length
3– 4” Length
4– 6” Length

IMMERSION LENGTH “A”

1– Flush
2– 1/4” Inch
3– 1/2” Inch
4– 3/4” Inch
5- 1” Inch
X– Other

LEAD STYLE

R– Rigid
F– Flexible

TERMINATION

S-Standard 1 1/2” Split Leads
L-Split Leads w/ Spade Lugs
B-3 1/2” Split Leads w/ BX Conn & Spade Lugs
P-Standard Plug
J-Standard Jack
M-Miniature Plug
F-Miniature Jack
X-Other “Specify”

SPECIAL REQUIREMENTS

If none, Enter “0”
If required, Enter “X” & Specify.

X=_____
_____
_____

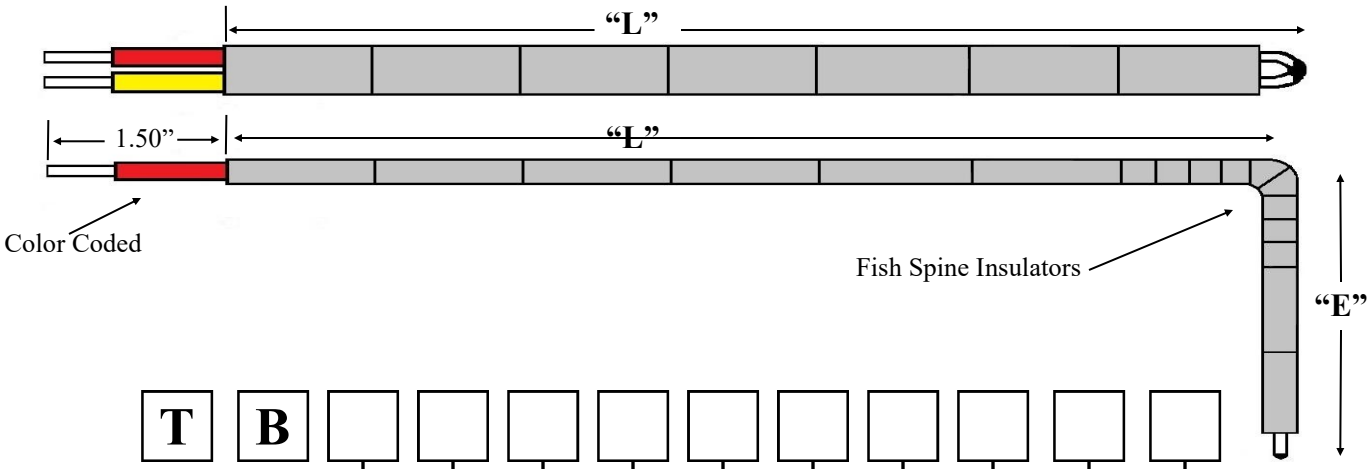
TB STYLE BEADED BASE METAL

Features:

- Low Cost
- High Temperature up to 2300F for type “K” thermocouple.
- Long life if properly protected with thermowell or protection tube

General Specifications:

- Standard thermocouple calibrations Type “J & K”
- Standard wire: 8 & 14 AWG
- Color coded for proper instrument polarity
- Select oval or round insulators
- Custom designs to meet any requirement.



T	B										

SPECIAL REQUIREMENTS

If none, Enter “0”
If required, Enter “X” & Specify.
X=_____

CALIBRATION

J-TYPE “J”
K-TYPE “K”
T-TYPE “T”
E-TYPE “E”
X–Other (Specify)

JUNCTION

Style	Twisted & Welded	Butt Welded
Single	**T**	**B**
Duplex	**D**	**W**

WIRE SIZE

1– 08 AWG
2– 14 AWG
3– 20 AWG
4– 24 AWG
X– Other (Specify)

LENGTH “E”

Specify Whole Inches
Ex. **01”-99”**
XX- Other “Specify”
**No bend enter 00

ELEMENT INSULATION

B– Bare (No Insulators)
O– Oval Ceramic
R- Round Ceramic

LENGTH “ L”

Specify Whole Inches
Ex. **01”-99”**
XX- Other “Specify”

BEND RADIUS

S– Straight No Bend
R– 90 Degree Bend
F– 45 Degree Bend
X- Other “Specify”
*** Bends have fish spine insulators**

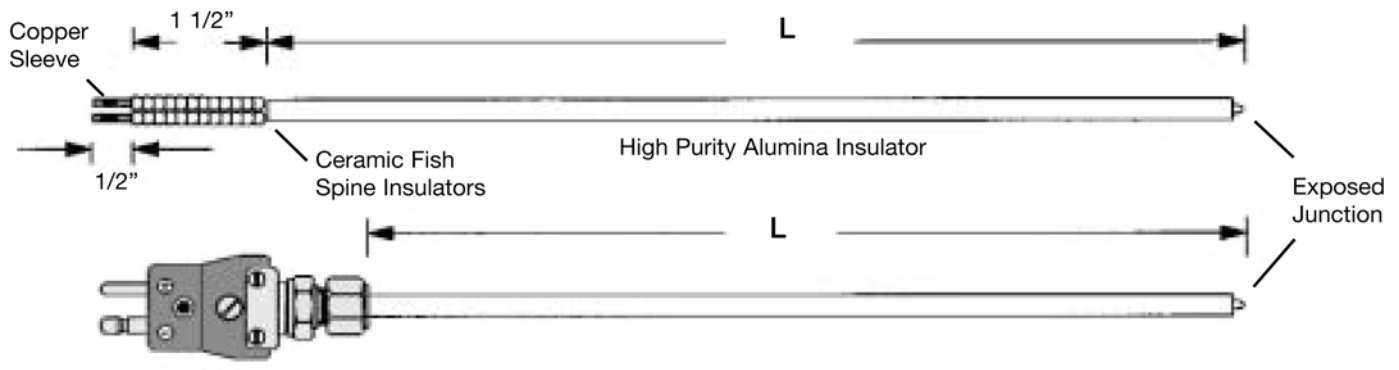
NB STYLE NOBLE METAL

Features:

- High temperature up to 3000° F.
- Most accurate of all thermocouples, standard grade R&S +/-0.25%, reference grade R&S +/-0.1%, within range of 400°-1400°C.
- Fast response time: typically under .3 sec.

General Specifications:

- Standard grade platinum wire is provided unless reference grade is requested.
- High purity alumina, 2 or 4 hole insulators.
- Standard termination is 1-1/2" leads w/ ceramic fish spine insulators & copper sleeves.



N	B						0	0	0		

CALIBRATION

S– Type S (Pt vs Pt/Rh 10%)
R– Type R (Pt vs Pt/Rh 13%)
B– Type B (Pt vs Pt/Rh 30/6%)
W–Type W (Tg vs Tg/Rh 5/26%)

ELEMENT SIZE

4– 24 AWG
6– 30 AWG

CONSTRUCTION

S– Single
D– Duplex

LENGTH "L"

Specify Whole Inches
Ex. **01"-99"**

XX- Other "Specify"

SEE "HCT" Style for Assemblies!

SPECIAL REQUIREMENTS

If none, Enter "0"
If required, Enter "X"
& Specify.

X=_____
_____
_____

TERMINATION

S-Standard 1 1/2" Split Leads
P-Standard Plug
J-Standard Jack
C-Copper Ferrule
R-High Temp Plug 800F
X-Other "Specify"

SECTION 2

MgO THERMOCOUPLES

MGO Thermocouple Assemblies

■ **DID YOU KNOW?**

In today's new process industry, TEMPERATURE MEASUREMENT has become a KEY Ingredient of a variable process. Today's expectation of a thermocouple is much higher than it was 70 years ago. The principle of a thermocouple was discovered in 1821 by Thomas Johann Seebeck, a German/Prussia Scientist. He found that when two dissimilar metals are joined in a closed circuit, an electromotive force is generated when the two junctions are maintained at different temperatures. This thermal EMF induces an electric current to flow continuously through the circuit until opened.

The success of any temperature measurement system depends not only on the capability of the system but also on how well the user understands the operation principles, advantages and limitations of its application. Some characteristics are: ACCURACY, RESPONSE TIME, TEMPERATURE RANGE, RELIABILITY and SYSTEM COST. Let's describe the thermocouples in two classifications: THERMOCOUPLES OF THE PAST and THERMOCOUPLES OF THE PRESENT.

Thermocouples of the Past

Thermocouples of the past tended to be fairly crude and simple devices. They consisted of two thermocouple elements twisted together and butt welded. Ceramic beads were used as insulating material and connected to a ceramic terminal block. These sensors usually were poked through a hole in the side of a process and into the heat chamber. So much for Thermal Engineering. This style of thermocouple is still being used today for its low cost. What many people still don't realize is that these beaded thermocouples have many more disadvantages than advantages.

ADVANTAGE

- *Easy to manufacture and low cost.*

DISADVANTAGE

- *Can not be exposed directly into process.*
- *Rapid oxidation of conductors (Type J).*
- *Rapid carbide precipitation or green rot (Type K).*
- *Slow response time.*
- *Narrow design capabilities.*
- *Poor reliability.*

Thermocouples of the Present

About 55 years ago a new method was developed by encapsulating the same matched thermocouple elements inside of stainless steel or nickel based alloy tubing and using mineral insulation, often high purity MgO. This major innovation is widely used today. Thanks to this method, a thermocouple can be constructed to be inserted directly into the process and be able to withstand the attacks of corrosive environments, high temperatures and mechanical damage from shock or movement. They can also be adapted to difficult process conditions such as pressure sensitive and/or hazardous explosive environments. This form of thermocouple can be made in a wide variety of diameters from .010" to .500" and also a wide variety of sheath materials. This allows a wide design capability that can be tailored to any application.

Typical Comparison of Beaded VS Sheathed Thermocouple

CRITERION	METAL SHEATHED	CERAMIC BEADED
Self-environment protected	Yes	No
Manufacturing	Needs special tools and tech.	Easy
Response Time	Fast	Slow
Flexibility	Yes	No
Shielding	Yes	No
Design capability	Wide	Narrow
Thermal Shock	Yes	No
Reliability	Yes	No
Cost	Higher	Lower
Accessory Hardware	Vast	Minimal

MGO Thermocouple Assemblies

Exhaust Gas Technologies' modern facilities and experienced technicians assure a quality product resulting in longer thermocouple life combined with reliability and accuracy. EGT thermocouple assemblies consist of thermocouple elements embedded in hard-packed magnesium oxide mineral insulation and encased in a metal sheath.

EGT thermocouples meet ANSI MC96-1 specifications. INSULATION: The insulation used is high purity Magnesia (98% + MgO) for industrial grade and high purity Magnesia (99.4% + MgO) in standard grade.

During the manufacturing process, the insulation is highly compacted, which excludes air from the sheath, retards moisture absorption and prevents "powdering out". The high degree of compaction achieved also ensures high thermal conductivity and maximum dielectric strength.

When ordering thermocouples and/or wire, be certain that the type (K, J, T, etc) corresponds to that of the instrument with which it will be used. This information can usually be found on the face of the instrument.

Measuring Junction Styles

Exposed Junction (E)

Thermocouple wires are butt welded. Insulation is sealed against liquid or gas penetration.

Recommended where fast response is desired and corrosive conditions are non-existent.

Grounded Junction (G)

End is welded, with the wires welded securely into the closure end of the sheath, becoming an integral part of the weld. Recommended in presence of liquids, moisture, gas or high pressure. The wire is protected from corrosive or erosive conditions.

Ungrounded Junction (U)

Thermocouple junction is fully insulated from welded sheath end.

Excellent for electrical applications that stray emf's would affect the reading and for frequent / rapid temperature cycling.

Sheath Materials:

Virtually any malleable metal can be used as sheath material. Some of the more commonly used materials and their maximum continuous operating temperature in an oxidizing atmosphere are:

Inconel 600* . . . . . .+2100°F (1149 °C)
304 Stainless Steel . . . . . .+1650°F (899 °C)
310 Stainless Steel . . . . . .+2100°F (1149 °C)
316 Stainless Steel . . . . . .+1700°F (927 °C)
*Trade name of International Nickel Co.

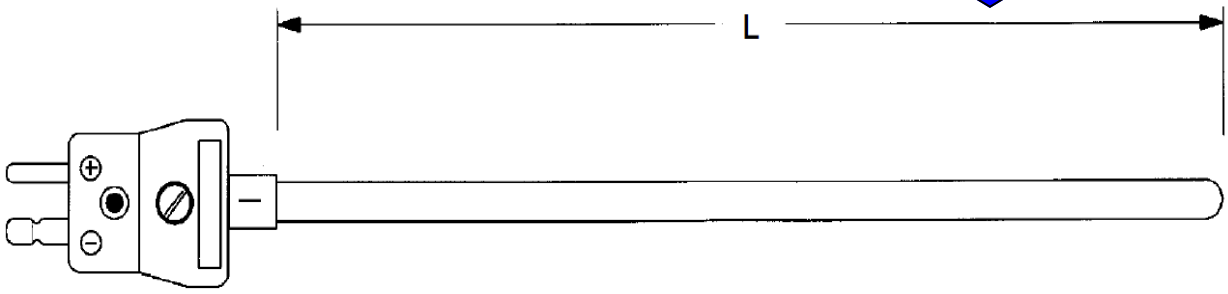
Tables on the following pages should be used to assist in the selection of sheath materials, calibrations and junction styles that are in stock and ready for immediate manufacturing. For additional information and technical assistance, consult our factory.

CM STYLE Plug & Jack Termination

General Specifications:

- Dual element available on Sheath OD's from 0.063" to 0.375".
- Standard and Miniature Connectors 400°F ambient Temperature Rating.
- High temperature glass filled thermoset to 800 F.
- Ceramic connectors also available.

Our Most Popular Sensor!



C	M									

SHEATH DIAMETER

4-.063" **7**-.250"
5-.125" **8**-.313"
6-.188" **9**-.375"

SHEATH MATERIAL

1-304 S/S **3**-316S/S
2-310S/S **6**-INC. 600
X-Other (Specify)

CALIBRATION

Std. Limits	J	K	T	E	N	R*	S*
Spl. Limits**	1	2	3	4	5	-	-
Dual Element	6	7	8	9	0	Y	Z

* Available in Loose Pack Construction only
* * Special limits 0.4% accuracy — additional cost

JUNCTION

	Grounded	Ungrounded	Exposed
Single	**G**	**U**	**E**
Dual Common	**D**	**C**	**P**
Dual Isolated	-	**S**	**T**

**** See Page 81 for Mounting Options**

LENGTH "L"

Specify Whole Inches
Ex. **01"-99"**

LENGTH Fractional Inches

1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"
4-1/2" **AR**- As Required

TERMINATION

P-Standard Plug
J-Standard Jack
M-Miniature Plug
F-Miniature Jack
H-Hi-Temp Jack
R-Hi-Temp Plug
D-Dual Plug Male
X-Other "Specify"

SPECIAL REQUIREMENTS

If none, Enter "0"
If required, Enter "X"
& Specify.

X=_____
_____
_____

CM STYLE Termination

Featuring plug or jack terminations, Style CM thermocouples can be quickly connected or disconnected. Besides saving time, this style offers advantages including low profile for insertion in hard to reach locations, assembly of circuits by inexperienced personnel using non-reversible connectors and ASTM 230 color coding specifications so you can easily determine the calibration.

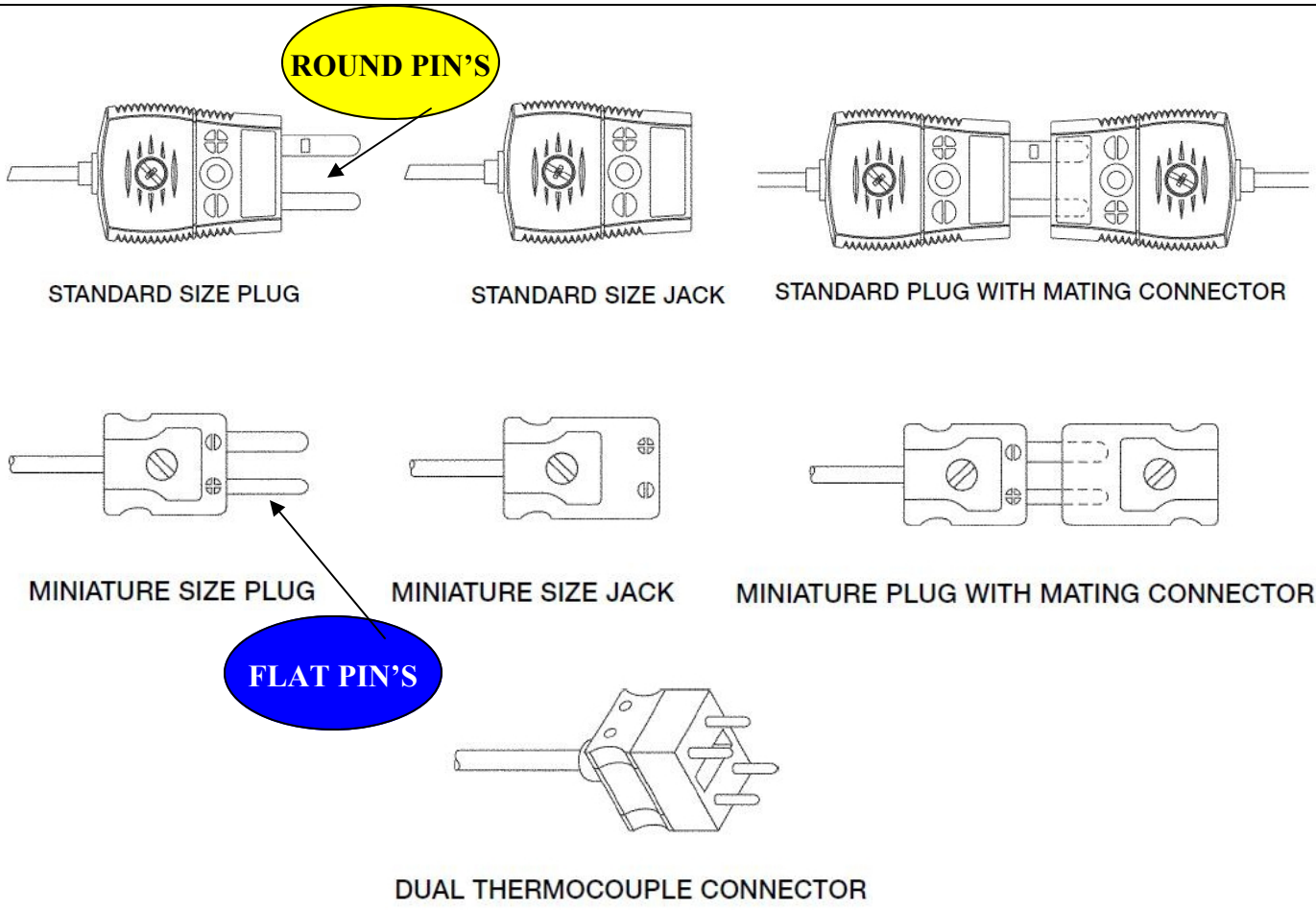
On all CM Style thermocouples except ASTM 230 Type R and S, the pins and contacts are of the same alloy as the thermocouple, resulting in higher accuracy. This technique eliminates errors due to temperature gradients across the connector. Type R and S connectors have compensating alloys.

Features

- Plugs and Jacks are easy to connect and disconnect, saving you time.
- ASTM color-coded connectors allow quick identification of the thermocouple calibration.
- Miniature connectors available with thermocouple diameters up to 0.125" (metric size 3.0mm) can be used in locations where space is minimal. The miniature plug permits quick connection to portable instrumentation.
- Matching thermocouple alloys provide higher accuracy.
- A Mounting Adapter assures the connector is mounted rigidly to the sheath, preventing the connector from turning or twisting, causing shorted sensors.

Performance Capabilities

- Ambient rating of 400 °F (200 °C) on standard and miniature connectors.
- High temperature connectors perform to 1000 °F (540 °C)



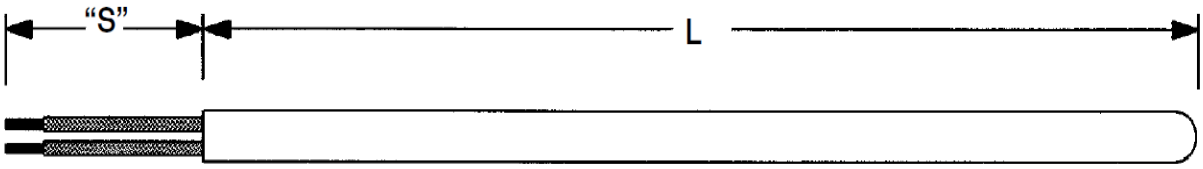
EM STYLE Cut & Strip

Features:

- Fast delivery
- Standard sheaths
- T/C material protected by sheath

General Specifications:

- Available in standard or special limits (99.6%) MgO.
- Can be supplied with 0.063" to 0.375" dia. sheath.



E	M									

SHEATH DIAMETER

4-.063" **7**-.250"
5-.125" **8**-.313"
6-.188" **9**-.375"

SHEATH MATERIAL

1-304 S/S **3**-316 S/S
2-310 S/S **6**-INC. 600
X-Other (Specify)

CALIBRATION

Std. Limits	J	K	T	E	N	R*	S*
Spl. Limits**	1	2	3	4	5	-	-
Dual Element	6	7	8	9	0	Y	Z
***							

LENGTH "L"

Specify Whole Inches
Ex. **01"-99"**

LENGTH Fractional Inches

1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"
4-1/2"

SPECIAL REQUIREMENTS

If none, Enter "0"
If required, Enter "X" & Specify.

X=_____
_____
_____

"S" STRIP LENGTH

A-1/2" **D**-2"
B-1" **E**-2 1/2"
C-1 1/2" **F**-3"

JUNCTION

	Grounded	Ungrounded	Exposed
Single	G	U	E
Dual Common	D	C	P
Dual Isolated	-	S	T

* Available in Loose Pack Construction only
** Special limits 0.4% accuracy — additional cost
*** For Triple Element Assembly Insert an X in the Special Requirements Box and Specify

**** See Page 81 for Mounting Options**

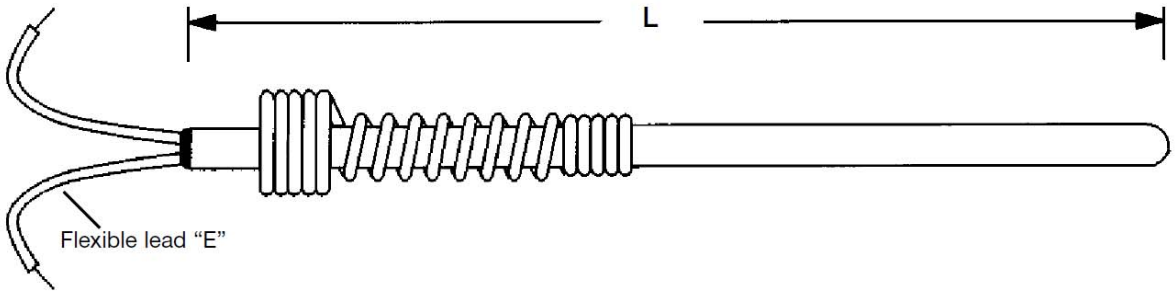
SM STYLE Spring Loaded

Features:

- Spring loaded assures contact with bottom of well
- "E" length is flexible lead to allow for expansion of well, 3" standard length
- Spring is adjustable

General Specifications:

- Standard or special limits of error -
- Hardpack MgO insulation
- Available in 1/8", 3/16" or 1/4" O.D.
- High temp spring



S	M								0	0	0	

SHEATH DIAMETER

5-.125"
6-.188"
7-.250"

SHEATH MATERIAL

1-304 S/S **3**-316S/S
2-310S/S **6**-INC. 600
X-Other (Specify)

CALIBRATION

Std. Limits	J	K	T	E	N	R*	S*
Spl. Limits**	1	2	3	4	5	-	-
Dual Element	6	7	8	9	0	Y	Z
***							

* Available in Loose Pack Construction only
** Special limits 0.4% accuracy — additional cost
*** For Triple Element Assembly Insert an X in the Special Requirements Box and Specify

LENGTH "L"

Specify Whole Inches
Ex. **01"-99"**

LENGTH Fractional Inches

1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"
4-1/2"

SPECIAL REQUIREMENTS

If none, Enter "0"
If required, Enter "X"
& Specify.

X=_____
_____
_____

JUNCTION

	Grounded	Ungrounded	Exposed
Single	G	U	E
Dual Common	D	C	P
Dual Isolated	-	S	T

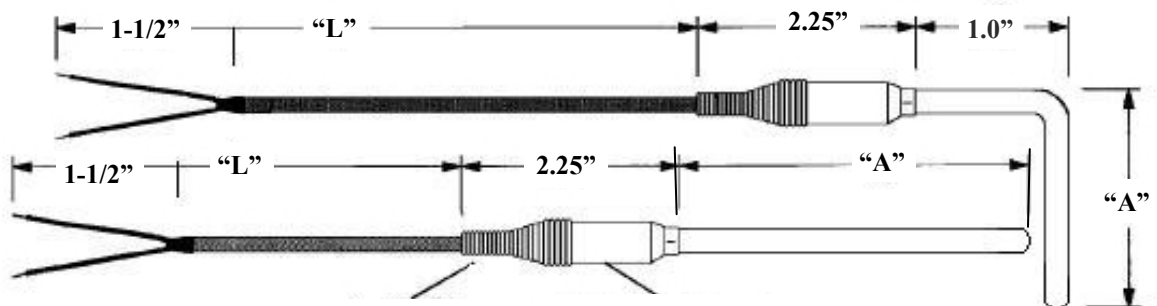
LM STYLE Metal Transition

Features:

- Metal transition provides excellent resistance to moisture penetration.
- Maximum continuous operating temperature of transition is 400°F. High temperature ceramic 1000°F available.

General Specifications:

- Coiled spring strain relief protects wire against sharp bends in transition area.
- Hard packed MgO material, 1/16" to 3/8" O.D. standard or special limits of error.
- Available in all calibrations



L **M** [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

Sheath Diameter

4-.063" **6**-.188"
5-.125" **7**-.250"

Sheath Material

1-304 S/S **3**-316 S/S
2-310 S/S **6**-INC. 600
X-Other (Specify)

Calibration

Std. Limits	J	K	T	E	N	R*	S*
Spl. Limits**	1	2	3	4	5	-	-
Dual Element	6	7	8	9	0	Y	Z
Triple Element***	P	Q	-	-	-	-	-

Length "A"

Specify Whole Inches
Ex. **01"-99"**

Length "A" Fractional Inches

0-0" **4**-1/2"
1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"

* Available in Loose Pack Construction only
** Special limits 0.4% accuracy — additional cost
***.250" OD Minimum

~See Page 81 for Mounting Options

Junction

	Grounded	Ungrounded	Exposed
Single	G	U	E
2 or 3 Common	D	C	P
2 or 3 Isolated	-	S	T

"L" Extension Length

Specify Length in Inches
Ex. **001"-999"**

Leadwire Construction

Solid:	Standard	Overbraid	S/S Flex
Fiberglass	F	B	1
PVC	P	-	2
Teflon	T	E	3
Stranded:			
Fiberglass	G	O	4
PVC	M	-	5
Teflon	H	U	6
Kapton	K	S	7

Termination

S-Striped 1-1/2" Leads
P-Standard Plug
J-Standard Jack
M-Miniature Plug
F-Miniature Jack
H-Hi-Temp Jack
R-Hi-Temp Plug

Bend Radius

R– 90 Degree Bend
S– Straight No Bend
F– 45 Degree Bend

Special Requirements "X"

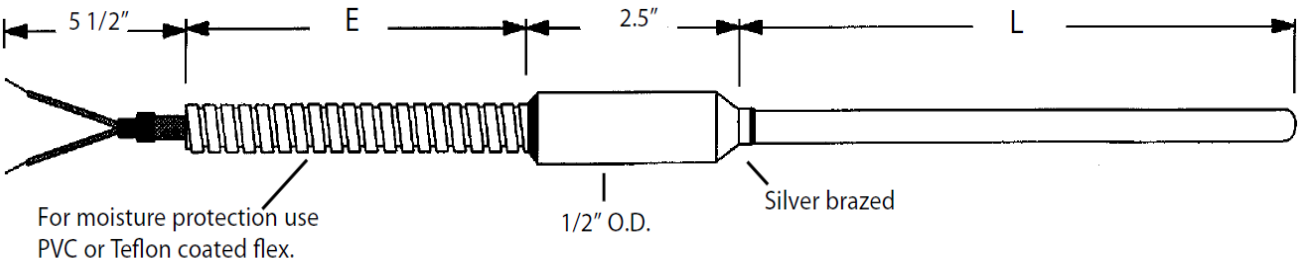
QM STYLE Large Transition

Features:

- Large transition for external armor
- PVC or Teflon coated for added protection
- Crush resistant
- Stranded wire available

General Specifications:

- 1/2" O.D. x 0.44" I.D. transition accommodates standard 3/16" I.D. x 9/32" O.D. SS flex or 1/4" I.D. x 11/32" O.D. flex
- Maximum continuous operating temperature of 400° F for large transition. (Hi-Temp available)



Q	M												

Sheath Diameter

5-.125" **8**-.313
6-.188" **9**-.375
7-.250"

Sheath Materials

1-304 S/S **3**-316 S/S
2-310 S/S **6**-INC. 600
X-Other (Specify)

Calibration

Std. Limits	**J**	**K**	**T**	**E**	**N**	**R***	**S***
Spl. Limits**	**1**	**2**	**3**	**4**	**5**	-	-
Dual Element	**6**	**7**	**8**	**9**	**0**	**Y**	**Z**
Triple Element***	**P**	**Q**	-	-	-	-	-

Length "L"

Specify Whole Inches
Ex. **01"-99"**

Length Fractional Inches

1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"
4-1/2"

~See Page 81 for Mounting Options

Special Requirements

If none, Enter "0"
If required, Enter "X"
"Specify" X=_____

Termination

S-Striped 1-1/2" Leads
P-Standard Plug
J-Standard Jack
H-Hi-Temp Jack
R-Hi-Temp Plug

"E" Length

Specify Length in **Whole Feet**
Ex. **01'-99'**

Leadwire Construction

Solid:	S/S Flex
Fiberglass	**1**
PVC	**2**
Teflon	**6**
Kapton	**7**

JUNCTION

	Grounded	Ungrounded	Exposed
Single	**G**	**U**	**E**
2 or 3 Common	**D**	**C**	**P**
2 or 3 Isolated	-	**S**	**T**

* Available in Loose Pack Construction only
** Special limits 0.4% accuracy -additional cost
***.250" OD Minimum

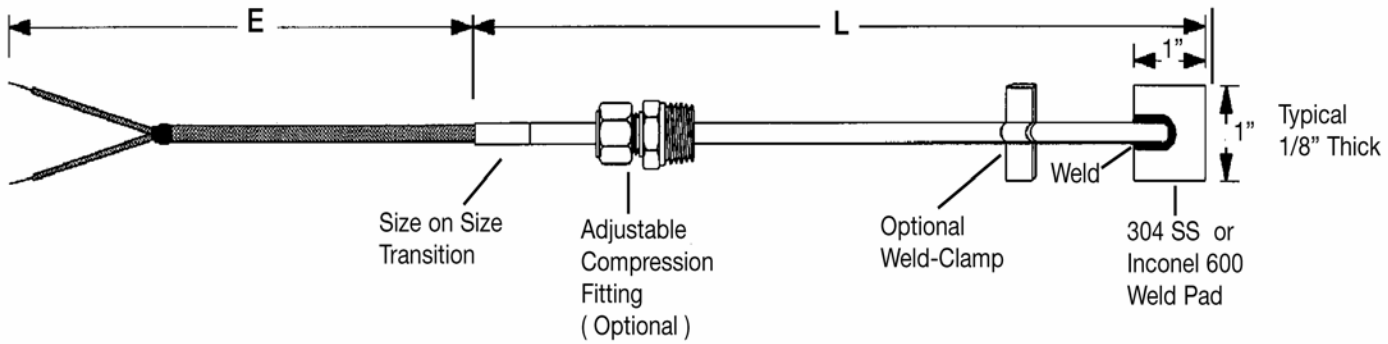
WM STYLE Weld Pad/Tubeskin

Features:

- Size on size transition allows for adjustable fitting to be installed over leads

General Specifications:

- Available in .188" and .250" diameter
- Weld pad can be mounted flat (as shown) or perpendicular



W	M												

Sheath Diameter

4-.063" **6**-.188"
5-.125" **7**-.250"

Sheath Material

1-304 S/S **3**-316 S/S
2-310 S/S **6**-INC. 600
X-Other (Specify)

Calibration

Std. Limits	J	K	T	E	N	R*	S*
Spl. Limits**	1	2	3	4	5	-	-
Dual Element	6	7	8	9	0	Y	Z
***							

Length "L"

Specify Whole Inches
Ex. **01"-99"**

Length "L" Fractional Inches

0-0" **4**-1/2"
1-1/8" **5**-5/8"
2-1/4" **6**-3/4"

* Available in Loose Pack Construction only
** Special limits 0.4% accuracy — additional cost
*** For Triple Element Assembly Insert an X in the Special Requirements Box and Specify

Quantity Discounts!

Junction

	Grounded	Ungrounded
Single	G	U
Dual Common	D	C
Dual Isolated	-	S

Special Requirements "X"

If none, Enter "0"
If required, Enter "X" Specify.
X=_____

Pad Radius

F– Flat
R-- * If Radius is required enter pipe diameter in inches.

"E" Length

Specify Length in Whole Feet
Ex. **01'-99'**

Leadwire Construction

Solid:	Standard	Overbraid
Fiberglass	F	B
PVC	P	-
Teflon	T	E

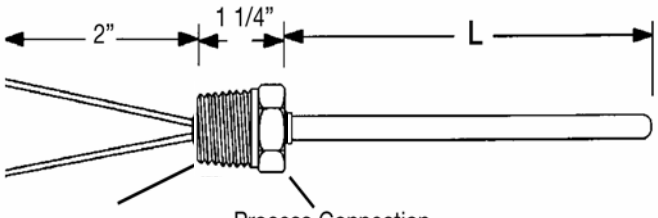
PM STYLE Fixed Fittings

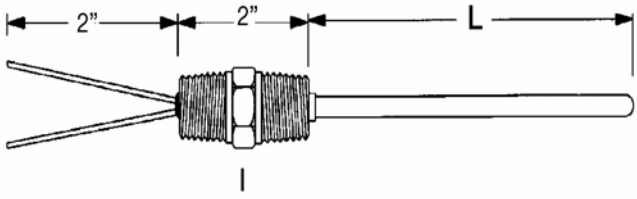
Features:

- Process connection and transition all in one
- Available in 1/4", 1/2" and 3/4" NPT connection
- Epoxy seal, 400°F
- Use in thermowells or directly in process

General Specifications:

- Standard or special limits of error hard packed MgO insulation
- 304 & 316 stainless steel process fittings available





P	M											

Sheath Diameter

5-.125" **8**-.313
6-.188" **9**-.375
7-.250"

Sheath Materials

1-304 S/S **3**-316 S/S
2-310 S/S **6**-INC. 600
X-Other (Specify)

Calibration

Std. Limits	**J**	**K**	**T**	**E**	**N**	**R***	**S***
Spl. Limits**	**1**	**2**	**3**	**4**	**5**	-	-
Dual Element	**6**	**7**	**8**	**9**	**0**	**Y**	**Z**
Triple Element	**P**	**Q**	-	-	-	-	-

Length "L"

Specify Whole Inches
Ex. **01"-99"**

Length Fractional Inches

1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"
4-1/2"

Special Requirements

If none, Enter "0"
If required, Enter "X" Specify.
X=_____

Lead Insulation

F– Fiberglass
T– Teflon
P- PVC

Process Connection

Single Thread		Dual Thread	
Q2	1/4" NPT	**D2**	1/4" NPT
Q4	1/2" NPT	**D4**	1/2" NPT
Q6	3/4" NPT	**D6**	3/4" NPT
Spring Loaded →L4			1/2" NPT

Junction

	Grounded	Ungrounded	Exposed
Single	**G**	**U**	**E**
2 or 3 Common	**D**	**C**	**P**
2 or 3 Isolated	-	**S**	**T**

* Available in Loose Pack Construction only
** Special limits 0.4% accuracy -additional cost
*** .250" OD Sheath Minimum

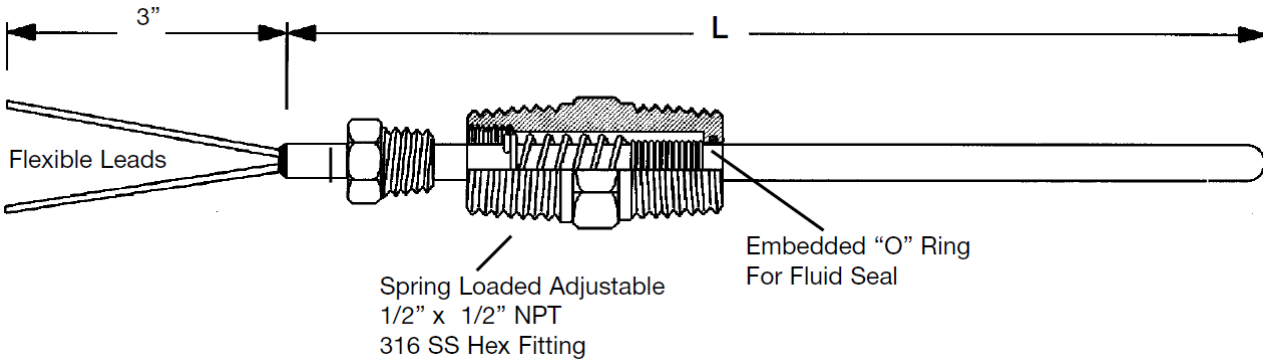
FM STYLE Spring Loaded

Features:

- Adjustable spring loaded fitting ensures direct surface contact.
- Fast response, great as bearing sensor.
- Use with Thermowell and protection head.

General Specifications:

- 1/2" x 1/2" NPT hex fitting, 316 SS
- Oil fluid seal rated 50 psi and 400° F Continuous
- Fitting adjustable spring travel of 1/2"



F	M											

Sheath Diameter

5-.125" **7**-.250"
6-.188"

Sheath Material

1-304 S/S **3**-316 S/S
2-310 S/S **6**-INC. 600
X-Other (Specify)

Calibration

Std. Limits	J	K	T	E	N	R*	S*
Spl. Limits**	1	2	3	4	5	-	-
Dual Element	6	7	8	9	0	Y	Z
***							

Length "L"

Specify Whole Inches
Ex. **01"-99"**

Length "L" Fractional Inches

0-0" **4**-1/2"
1-1/8" **5**-5/8"
2-1/4" **6**-3/4"

* Available in Loose Pack Construction only
** Special limits 0.4% accuracy — additional cost
*** For Triple Element Assembly Insert an X in the Special Requirements Box and Specify

Special Requirements "X"

If none, Enter "0"
If required, Enter "X" Specify.
X=_____

Leadwire Insulation

Solid:	Standard
Fiberglass	**F**
PVC	**P**
Teflon	**T**

Process Connection

Dual Thread	
S2	1/4" NPT
S4	1/2" NPT
S6	3/4" NPT

Junction

	Grounded	Ungrounded
Single	**G**	**U**
Dual Common	**D**	**C**
Dual Isolated	**-**	**S**

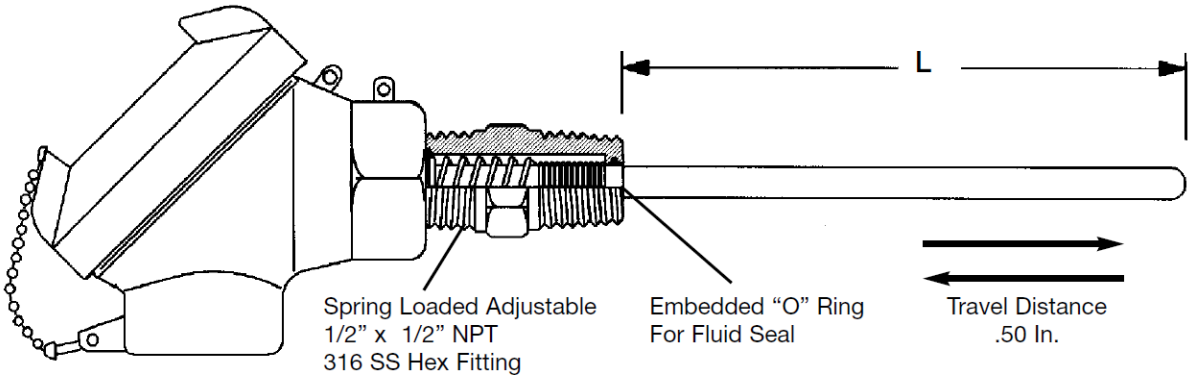
BM STYLE Fixed Fittings

Features:

- Adjustable spring loaded fitting ensures direct surface contact
- Fast response, great as bearing sensor
- Use with well and protection head

General Specifications:

- 1/2” x 1/2” NPT hex fitting, 316 SS
- Oil fluid seal rated 50 psi and 400° F Continuous
- Fitting adjustable spring travel of 1/2”



B	M											

Sheath Diameter

5-.125” **7**-.250”
6-.188”

Sheath Materials

1-304 S/S **3**-316 S/S
2-310 S/S **6**-INC. 600
X-Other (Specify)

Calibration

Std. Limits	**J**	**K**	**T**	**E**	**N**	**R***	**S***
Spl. Limits**	**1**	**2**	**3**	**4**	**5**	-	-
Dual Element	**6**	**7**	**8**	**9**	**0**	**Y**	**Z**
***							

Length “L”

Specify Whole Inches
Ex. **01”-99”**

Length Fractional Inches

1-1/8” **5**-5/8”
2-1/4” **6**-3/4”
3-3/8” **7**-7/8”
4-1/2” **AR**- As Required

Special Requirements

If none, Enter “0”
If required, Enter “X” Specify.
X=_____

Connection Head Style

1– Aluminum Flip Top
2– Std. Cast Aluminum Screw Cap
3– Std. Cast Iron Screw Cap
5– Explosion Proof Aluminum
6– Explosion Proof Cast Iron
8– Polypropylene FDA Approved Flip Top

Process Connection / Spring Loaded

DRY	Dual Thread		WET
L2	1/4” NPT	**S2**	1/4” NPT
L4	1/2” NPT	**S4**	1/2” NPT
L6	3/4” NPT	**S6**	3/4” NPT

Junction

	Grounded	Ungrounded
Single	**G**	**U**
Dual Common	**D**	**C**
Dual Isolated	-	**S**

* Available in Loose Pack Construction only
** Special limits 0.4% accuracy — additional cost
*** For Triple Element Assembly Insert an X in the Special Requirements Box and Specify

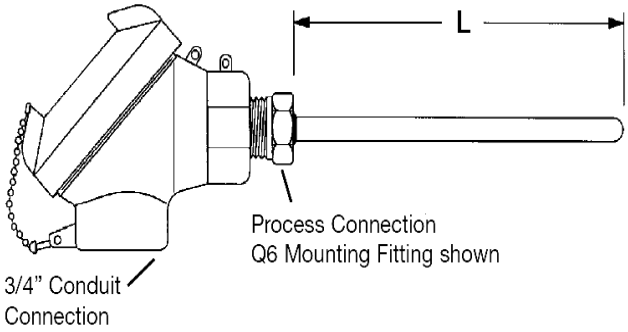
HM STYLE Head Termination

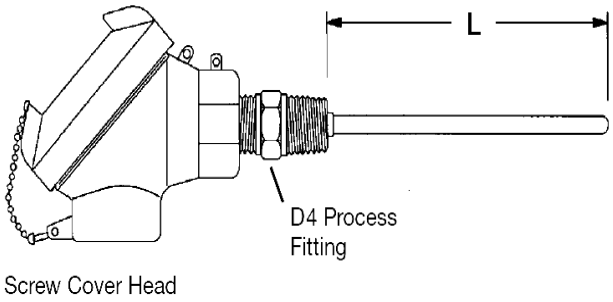
Features:

- Connection heads provide superior dust and moisture resistance, NEMA 4 rated.
- Heads are available in Aluminum, Cast Iron, S/S Explosion proof and Polypropylene.
- Optional temperature transmitters can mount inside connection head.

General Specifications:

- Sheath diameter available from .063" to .375".
- Hex fittings are made of 304 or 316 stainless steel.
- Wide Selection of head mounting styles, including Din Form B.





H	M											

Sheath Diameter

4-.063" **7**-.250"
5-.125" **8**-.313
6-.188" **9**-.375

Sheath Material

1-304 S/S **3**-316 S/S
2-310 S/S **6**-INC. 600
X-Other (Specify)

Calibration

Std. Limits	J	K	T	E	N	R*	S*
Spl. Limits**	1	2	3	4	5	-	-
Dual Element	6	7	8	9	0	Y	Z
Triple Element	P	Q	-	-	-	-	-

Length "L"

Specify Whole Inches
Ex. **01"-99"**

Length "L" Fractional Inches

0-0" **4**-1/2"
1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"

Special Requirements "X"

If none, Enter "0"
If required, Enter "X" Specify.
X=_____

Connection Head Style

1– Aluminum Flip Top
2– Std. Cast Aluminum Screw Cap
3– Std. Cast Iron Screw Cap
5– Explosion Proof Aluminum
6– Explosion Proof Cast Iron
8– Polypropylene FDA Approved Flip Top
X–Specify Head Type

Process Connection

Single Thread		Dual Thread	
Q2	1/4" NPT	D2	1/4" NPT
Q4	1/2" NPT	D4	1/2" NPT
Q6	3/4" NPT	D6	3/4" NPT
Spring Loaded →		L4	1/2" NPT

Junction

	Grounded	Ungrounded	Exposed
Single	G	U	E
2 or 3 Common	D	C	P
2 or 3 Isolated	-	S	T

* Available in Loose Pack Construction only
** Special limits 0.4% accuracy — additional cost
*** .250" OD Sheath Minimum

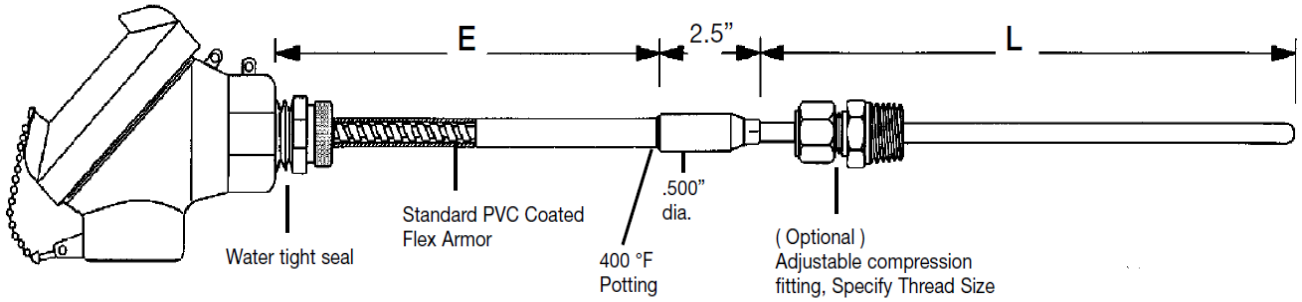
IM STYLE Industrial Remote

Features:

- Remote mounting, protects against excessive heat and vibration
- PVC covered Flex armor protects leads from moisture
- Compression fitting, for mounting in thermowell

General Specifications:

- Available in diameters, .063" to .375"
- 16 AWG lead wire
- Flex armor available in plain SS, PVC or Teflon® coating



I	M												

Sheath Diameter

6-.188"
7-.250"
8-.313"

Sheath Materials

1-304 S/S **3**-316 S/S
2-310 S/S **6**-INC. 600
X-Other (Specify)

Calibration

Std. Limits	J	K	T	E	N	R*	S*
Spl. Limits**	1	2	3	4	5	-	-
Dual Element	6	7	8	9	0	Y	Z
Triple Element	P	Q	-	-	-	-	-

Length "L"

Specify Whole Inches
Ex. **01"-99"**

Length "L" Fractional Inches

1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"
4-1/2" **AR**- As Required

Special Requirements

If none, Enter "0"
If required, Enter "X" Specify.
X=_____

Connection Head Style

1– Aluminum Flip Top
2– Std. Cast Aluminum Screw Cap
3– Std. Cast Iron Screw Cap
5– Explosion Proof Aluminum
6– Explosion Proof Cast Iron
8– Polypropylene FDA Approved Flip Top
X–Specify Head Type

"E" Length

Specify Length in Whole Feet Ex. **01'-99'**

Lead Insulation

4– Fiberglass w/ PVC Flex
5– Teflon w/ PVC Flex
6- PVC w/ PVC Flex

JUNCTION

	Grounded	Ungrounded	Exposed
Single	G	U	E
2 or 3 Common	D	C	P
2 or 3 Isolated	-	S	T

* Available in Loose Pack Construction only
** Special limits 0.4% accuracy -additional cost
*** .250" OD Sheath Minimum

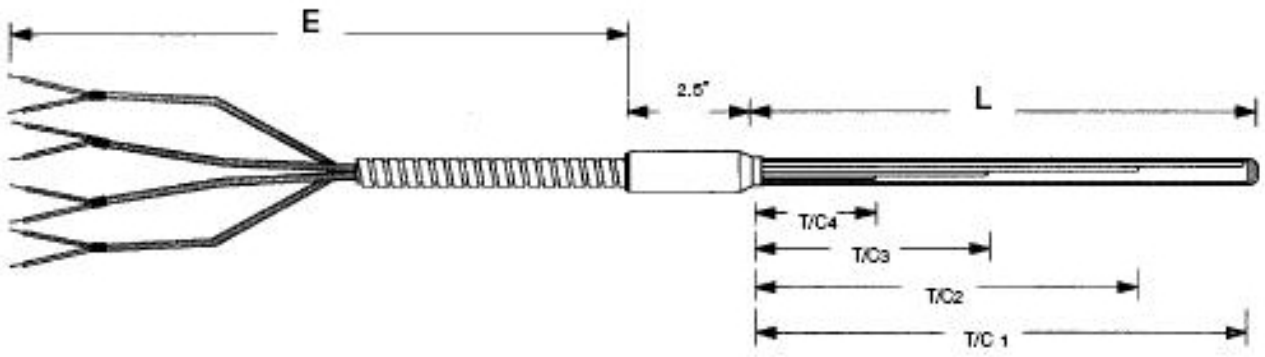
M STYLE Multipoint Type T/C

Features:

- Multipoint sensor is designed for accurately measuring temperature at various locations along its length

General Specifications:

- Individual sensors are mineral insulated
- Variety of terminations available



M													

Sheath Material

1-304 S/S **4**– 446 S/S
2-310 S/S **5**– 347 S/S
3-316 S/S **6**-INC. 600

Calibration

Std. Limits	J	K	T	E	N	R*	S*
Spl. Limits**	1	2	3	4	5	-	-
Dual Element	6	7	8	9	0	Y	Z
***							

Protection Tube Diameter

5-.125" **7**-.250"
6-.188" 8-.313"
9-.375" X-Specify

Measuring Points*

Specify Number of Points

T/C Junction

G– Grounded
U– Ungrounded

Tube Length "L"

Specify Whole Inches
Ex. **01"-99"**

Length "L" Fractional Inches

0-0" **4**-1/2"
1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"

Specify Point Lengths

Specify Multi Point Lengths:

T/C #1 _____
T/C #2 _____
T/C #3 _____
T/C #4 _____

Termination

S-Striped 1-1/2" Leads
A-Multi-Pin Connector
P-Standard Plug
J-Standard Jack
M-Miniature Plug
F-Miniature Jack

Leadwire Length "E"

Specify Length in Whole Feet Ex. **01'-99'**

Leadwire Construction

Solid:	Standard	Overbraid
Fiberglass	**F**	**B**
Teflon	**T**	**E**
PVC	**P**	**V**

* Available in Loose Pack Construction only
** Special limits 0.4% accuracy — additional cost
*** For Triple Element Assembly Insert an X in the Special Requirements Box and Specify

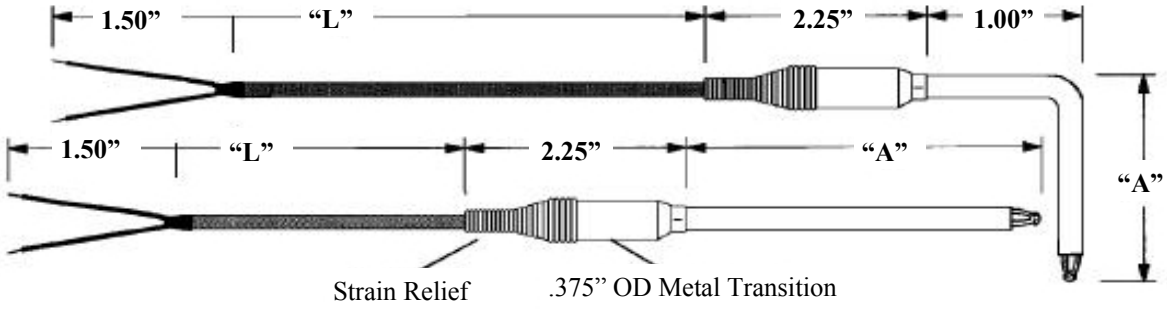
XM STYLE Engine Exhaust Probe

Features:

- Metal transition provides excellent resistance to moisture penetration
- Maximum continuous operating temperature of transition is 500°F. High temperature ceramic 1000°F available
- Special materials designed to withstand extreme exhaust temperatures and velocity

General Specifications:

- Coiled spring strain relief protects wire against sharp bends in transition area
- MgO material, 1/8" to 3/8"
- Available in J and K calibrations
- Available in two series:
  - Stinger, up to 3000 HP
  - Bullet, up to 8000 HP



X	M							E						

Sensor Series

S– Stinger Series to 3000HP
B– Bullet Series to 8000HP

Sheath Diameter

5-.125"
6-.188" *
7-.250" *

Sheath Materials

4-446 S/S **6**-INC. 600*
X-Other (Specify)

Calibration

Std. Limits*	**J**	**K**
Spl. Limits**	**1**	**2**
Dual Element	**6**	**7**

Immersion Length "A" (Inches)

E– 2.5"*	**H**-4.0"	**L**-5.5"
F– 3.0"	**J**-4.5"	**M**-6.0"
G– 3.5"	**K**-5.0"	

Bend Angle

0- Straight
4– 45 Degree Bend
9– 90 Degree Bend*

Junction

	Exposed
Single*	**E**
Dual Isolated	**T**

Special Requirements

If none, Enter "0"
If required, Enter "X" Specify.
X=_____

Cold End Termination

S-Striped 1-1/2" Leads *
P-Standard Plug
J-Standard Jack
M-Miniature Plug
F-Miniature Jack
DT-Staggered Leads w/ Ring Term.

Leadwire Length "L"

Specify Length in Whole Inches Ex. **001"-999"**

Leadwire Construction

Stranded:	Standard	Overbraid	S/S Flex
Teflon	**H**	**U**	**6**
Kapton	**K**	**S***	**7**

* Standard Materials
** Special limits 0.4% accuracy

SECTION 3

RTD Assemblies

Resistive Temperature Detectors

RTD RESISTIVE TEMPERATURE DETECTORS

An RTD sensing element consists of a wire coil or deposited film of pure metal. The element's resistance increases with temperature in a known and repeatable manner. RTD's exhibit excellent accuracy over a wide temperature range and represent the fastest growing segment among industrial temperature sensors.

Their advantages include:

- Temperature Range: Models in this catalog cover temperatures from –320 to 1220° F (-196 to 660° C).
- Repeatability and Stability.
- Sensitivity: the voltage drop across an RTD provides a much larger output than a thermocouple.
- Linearity: Platinum and copper RTD's produce a more linear response than thermocouples or thermistors. RTD non linearities can be corrected through proper design of resistive bridge networks.
- Low system cost: RTD's use ordinary copper extension leads and require no cold junction compensation.
- Standardization: Manufacturers offer RTD's to industry standard curves, most commonly 100Ω platinum with a Temperature Coefficient of Resistance of 0.00385 Ω/Ω/ °C in three tolerance classes (class A: W 0.15% @ 0 °C, class B: W 0.3% @ 0 °C, 1/3 Class B, W 0.1% @ 0 C)

Wire Wound Element

The standard RTD element used in EGT's probe assemblies are made of 99.99% pure platinum wire wound about a ceramic or glass capsule. Platinum wire was chosen as it best meets the needs of precision thermometry. It resists contamination, can be highly refined and is mechanically and electrically stable. This provides for close interchangeability between elements with negligible drift or error with age. On special request, EGT can make available RTD elements made with other wire materials.

Thin Film Element

Made by platinum being deposited as a film on a substrate and then encapsulated. This method allows for the production of small, fast response, accurate sensors.

Insulation Resistance (IR) and Characteristics of RTD's

A high and stable insulation resistance is important for the accuracy of an RTD. Typically, at room temperature insulation resistance of at least 100 megohm with 100 VDC applied between any RTD lead and the sheath is desired. As the temperature increases, the insulation resistance decreases. It is important for the insulation resistance to be much greater than that of the RTD element. A cause of RTD degradation is failure of the insulation resistance due to moisture intrusion in the sheath. A low insulation resistance causes the effective RTD resistance to be lower than normal and will result in a low temperature indication. For example, for a 100 ohm RTD operating at 300 °C, the indicated temperature will have a –0.001°C error if the insulation resistance is 100 megohm and a – 0.1°C error if the insulation resistance is reduced to 1 megohm.

In some cases there has been a wide insulation resistance variation between RTD's that have been tested. These variations are probably due to differences in properties of the insulation materials used in different RTD's and the moisture content of the same. Inadequate or loose connections in an RTD circuit can also produce additional resistances and cause incorrect readings. Another effect of low insulation resistance due to moisture in the RTD is a noisy temperature signal.

Insulation Resistance requirements per ASTM E 1137 are as follows.

Applied DC Voltage		Minimum Insulation Resistance	
Min	Max	°C	Megohms
10	50	25 +/-5	100
10	50	300 +/- 10	10
10	50	650 +/- 15	2

Insulation Resistance requirements per IEC 751 are the same with the exception of applied voltage increased to 100 VDC.

However this higher "Potential" does not improve anything except the Resolution.

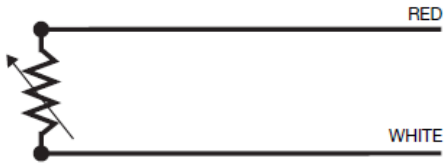
RTD Lead Configurations

Because an RTD is a resistance type sensor, resistance introduced by connecting extension wires between the RTD and control instrument will add to readings. Furthermore, this additional resistance is not consistent but increases with ambient temperature.

You can reduce leadwire error by:

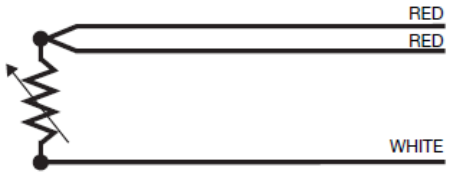
- Using larger gauge extension wires.
- Specifying an RTD with greater sensitivity.
- Employing a 3 or 4-wire resistance cancelling circuit.
- Using a 2-wire current transmitter.

Style 1



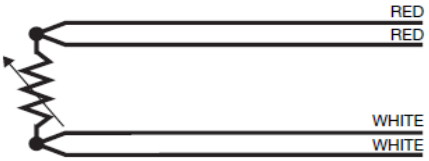
Lead configuration 1 provides one connection to each end of the sensor. This construction is suitable where the resistance of the run of the lead wire may be considered as an additive constant in the circuit, and particularly where the changes in lead resistance die to ambient temperature

Style 2 (Standard)



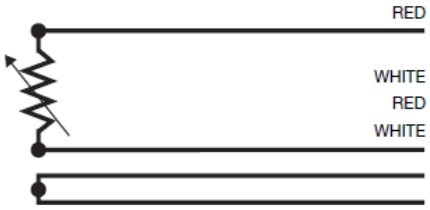
Lead configuration 2 provides one connection to one end and two to the other end of the sensor. Connected to an instrument designed to accept three wire input, compensation is achieved for lead resistance and temperature change in lead resistance. This is the most commonly used configuration.

Style 3



Lead configuration 3 provides two connections to each end of the sensor. this construction is used for measurements of the highest precision.

Style 4



Lead construction 4 is similar to Lead configuration 3 except that a separate pair of wires is provided as a loop to provide compensation for lead resistance ad ambient temperature changes in lead resistance.

Comparison of Thermocouples and Pt RTDs

CRITERION	Standard-Grade Thermocouple ISA J	ISA K	Standard DIN Pt RTD
Accuracy @			
0°C	±2.2°C	±2.2°C	±0.3°C
100°C	±2.2°C	±2.2°C	±0.5°C
500°C	±3.9°C	±3.9°C	±3.0°C
Time Constant	1.7 sec.*	1.7 sec*	5.0 sec**
Tip Sensitive	Yes	yes	No
Upper Temp.	870°C	1300°C	800°C

* 1/4" OD Probe, Grounded Junction

** 1/4" OD Probe

RTD RESISTIVE TEMPERATURE DETECTORS

Description:

Resistive Temperature Detectors operate on the principle that the electrical resistance of a metal conductor changes as a function of temperature. RTD's provide an accurate, stable and repeatable means of absolute temperature measurement. The accuracy of an RTD may be independent of the distance between the sensor and the instrument, whether it be an indicator, recorder, controller or data logger computer. Copper hook-up wire is generally used between the sensor and instrument. EGT RTD probes consist of a platinum resistance element that is encapsulated and circuited in a mineral insulated, metal sheath construction and terminated by means of bare wire, quick connectors or terminal heads. This construction provides a rugged probe that is moisture, pressure, shock and vibration resistant and also is bendable up to the element area.

General Selection Parameters:

The conditions of measurement determine the type of RTD used. Temperature, atmosphere, protection, response and service life should be considered. The following descriptions serve as a guide to selection:

The Platinum Resistance Element:

Select the RTD element that will be capable of operating in your application range. The reference resistance (100 Ohms@ 0°C- typical) and temperature coefficient (Alpha of 0.00385- typical) must match the instrumentation in your system.

Tolerance of the RTD element:

A range of limits of error elements are available (0.1%-typical). See the tolerance section for definition. In general, the better the tolerance, the more expensive the thermometer.

Sheath Alloy:

Select a sheath alloy that will withstand the temperature and possible corrosiveness of your application. 316 SS is standard.

Probe Diameter:

Use the probe diameter that will withstand the rigors of your application but with minimal effect on it. Because the element can be broken if the sheath is bent in the element area, it is recommended that a minimum of 0.187" diameter thermometer be used. Smaller diameters are available on request.

Process Connections:

In order to attach and/or seal the thermometer in your application, you can use a fitting, or braze, weld or solder it in place.

Terminal and/or Extension Type:

For connection to instruments, various termination extensions are available. Select the circuit that is required to match your instrumentation.

Calibration Tolerances for RTD:

The designation of an RTD tolerance class is based on the percent allowable variation, in ohms, of the nominal resistance value at the reference temperature. However, for convenience, this ohmic tolerance is often expressed as an equivalent °C temperature variation.

Installation:

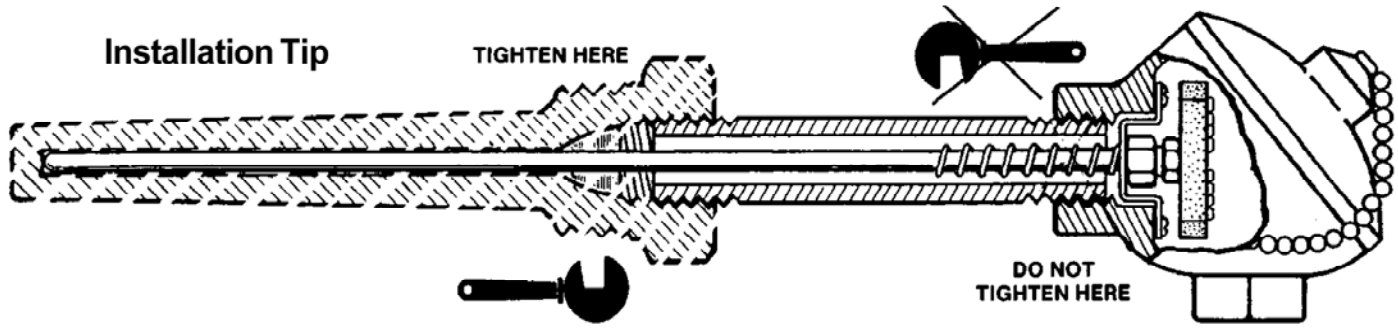
Do not attempt to mechanically connect the assembly into the process by tightening at the terminal or connecting head. Use only the process fitting or the thermowell flats for this purpose. Terminals or connecting heads that are twisted can be damaged or cause shorts that can adversely affect the operation of the RTD. Do not bend the RTD in the element area (within six inches of the end of the sheath). Bending will break the element that is in the metal sheath and the sensor will be rendered inoperative. If thermowell or protecting tube must be welded into the process, carefully remove RTD sensor before welding and be sure to handle carefully, keep clean and replace without forcing or stressing any components.

Wire Extension:

See general operation parameters and job wiring diagrams.

General Maintenance Parameters:

Regularly scheduled maintenance procedures should include inspection and calibration intervals so that life and reliability of the instrumentation is improved and the likelihood of sudden serious failure is reduced. These procedures should be set up by the responsible engineering department and performed by personnel that are familiar with the operating principles upon which the system is based. Do not lubricate.



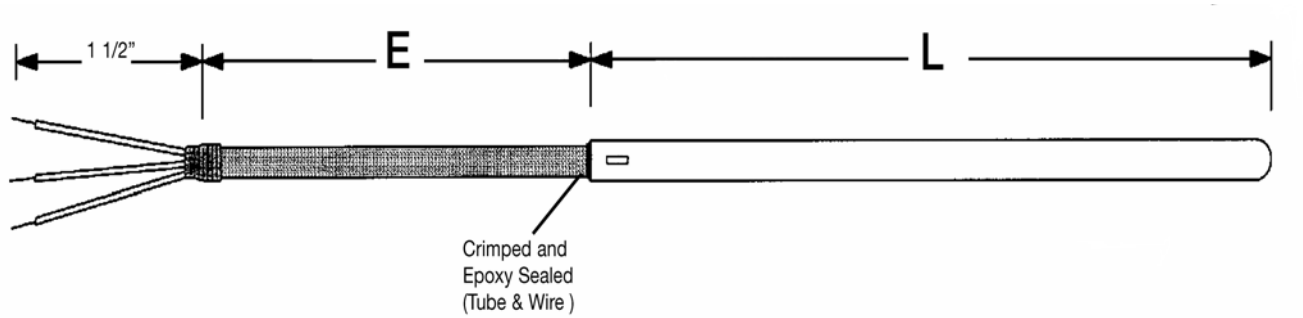
RE STYLE RTD TUBE & WIRE

Features:

- Standard industrial leads available in fiberglass, Teflon and PVC insulation
- Accurate and dependable reading
- Economical and quick delivery

General Specifications:

- Available in diameters .125" to .250"
- Tube and Wire temperature range –196C to 300C
- Epoxy sealed to resist moisture



R **E** [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

Standard PT-100 RTD .00385 DIN

Class	Wire Wound	Thin Film
Class A	**A** 0.05% W0.15	**F**
Class B	**B** 0.1% W0.3	**M**

Element	2 Wire	3Wire	4Wire
100 Ohm Single	**12**	**13**	**14***
100 Ohm Duplex	**22***	**23***	**24***

* 1/4" Dia. Only

Sheath Diameter

5-.125" **6**-.188" **7**-.250"
** *Metric sizes available

Sheath Materials	Max 300C
304 S/S	**1**
316 S/S	**3**
Inconel 600	**6**

Sheath Length "L" (Inches)

Specify Whole Inches 01"-99"

** See Page 81 for Mounting Options

Special Requirements

If none, Enter "0"
If required, Enter "X" &
Specify. X=_____

Cold End Termination

S-Striped 1-1/2" Leads
W-Standard Plug & Jack
A-3 Pin Plug
E-3 Pin Jack

Leadwire Length "E"

Specify Length in Whole Feet Ex. **01'-99'**

Leadwire Construction

	Standard	Overbraid	S/S Flex
Fiberglass	**F**	**B**	**C**
Teflon	**T**	**E**	**D**
PVC	**M**	**R**	**H**

"L" Length Fractional

0-0" **4**-1/2"
1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"

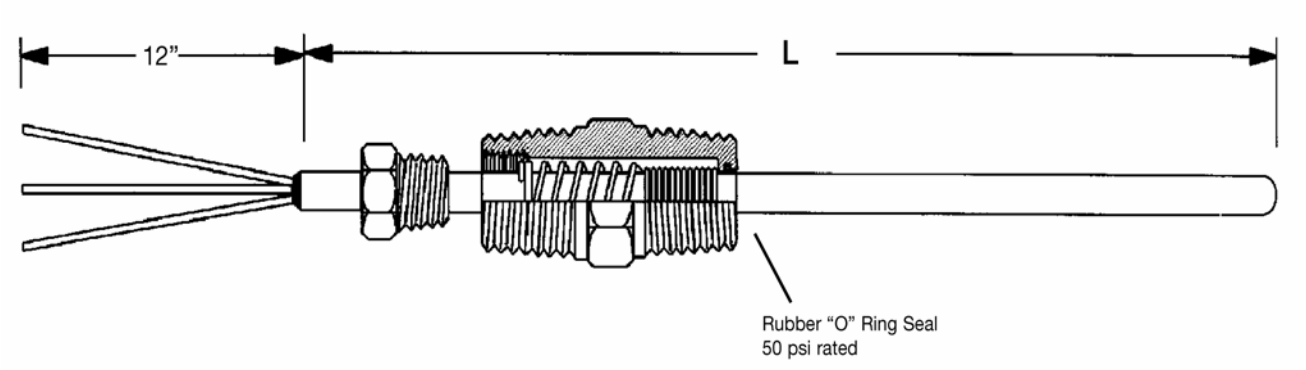
RF STYLE RTD SPRING LOADED

Features:

- Spring loaded element ensures contact with well bottom
- Oil seal rated to 50 p.s.i.

General Specifications:

- .188" & .250" sheath diameters
- 1/2"x 1/2" 316 stainless steel process threads
- Element Temperature Range –196C to 650° C (Wire Wound), Max 300C (Thin Film)



R	F											

Standard PT-100 RTD .00385 DIN

Class	Wire Wound	Thin Film
Class A	**A** 0.05% W0.15	**F**
Class B	**B** 0.1% W0.3	**M**

Element	2 Wire	3Wire	4Wire
100 Ohm Single	**12**	**13**	**14**
100 Ohm Duplex	**22**	**23***	**24***

Sheath Diameter

5-.125" **6**-.188" **7**-.250"

Sheath Materials	Tube & Wire Max 300C	MI Cable MAX 650C**
304 S/S	**1**	**A**
316 S/S	**3**	**B**
Inconel 600	**6**	**C**

Sheath Length "L" (Inches)

Specify Whole Inches 01"-99"

Special Requirements

If none, Enter "0"
If required, Enter "X" Specify.
X=_____

Leadwire Construction

	Standard
Fiberglass	**F**
Teflon	**T**

Spring Loaded Process Bushing

Dual Thread		
Part#	**Tube OD**	**Male NPT**
S4	.188"	1/2" NPT
S6	.250"	1/2" NPT

"L" Length Fractional

0-0" **4**-1/2"
1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"

* 1/4" Dia. Only ** .188" OD & Larger Single or Dual Elements

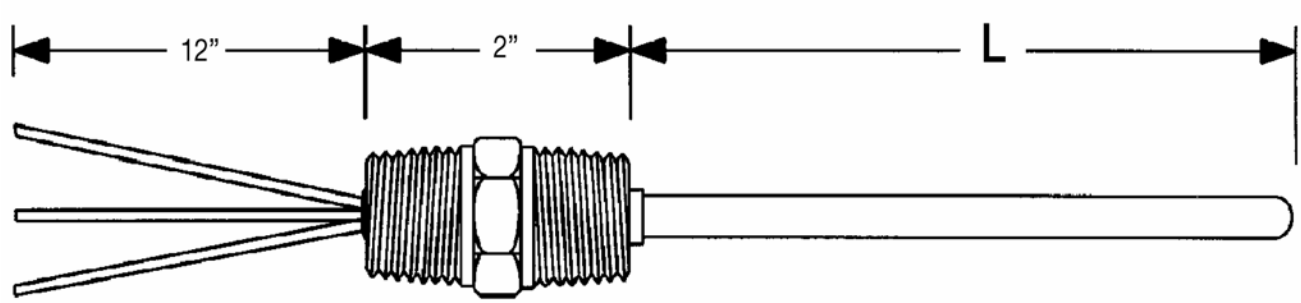
RK STYLE RTD FIXED FITTING

Features:

- Process connection designed for use with connection head
- Mineral insulation available for temperatures above 300°C

General Specifications:

- .125” to .250” O.D. sheaths available
- 316 stainless steel process fittings available in sizes 1/4” to 3/4” NPT
- Element Temperature Range –196C to 650° C (Wire Wound), Max 300C (Thin Film)



R	K												

Standard PT-100 RTD .00385 DIN

Class	Wire Wound	Thin Film
Class A	**A** 0.05% W0.15	**F**
Class B	**B** 0.1% W0.3	**M**

Element	2 Wire	3Wire	4Wire
100 Ohm Single	**12**	**13**	**14**
100 Ohm Duplex	**22**	**23***	**24***

Sheath Diameter

5-.125” **6**-.188” **7**-.250”

Sheath Materials	Max 300C	MAX 650C**
304 S/S	**1**	**A**
316 S/S	**3**	**B**
Inconel 600	**6**	**C**

Sheath Length “L” (Inches)

Specify Whole Inches 01”-99”

Special Requirements

If none, Enter “0” If required, Enter “X” Specify.
X=_____

Leadwire Construction

	Standard
Fiberglass 900F	**F**
Teflon 500F	**T**
PVC 212F	**M**

Process Fitting

Dual Thread			
Spring Loaded		Solid Mount	
Part #	Male NPT	Part #	Male NPT
L4	1/2” NPT	**D4**	1/2” NPT
L6	3/4” NPT	**D6**	3/4” NPT

“L” Length Fractional

0-0” **4**-1/2”
1-1/8” **5**-5/8”
2-1/4” **6**-3/4”
3-3/8” **7**-7/8”

* 1/4” Dia. Only ** .188” OD & Larger Single or Dual Elements

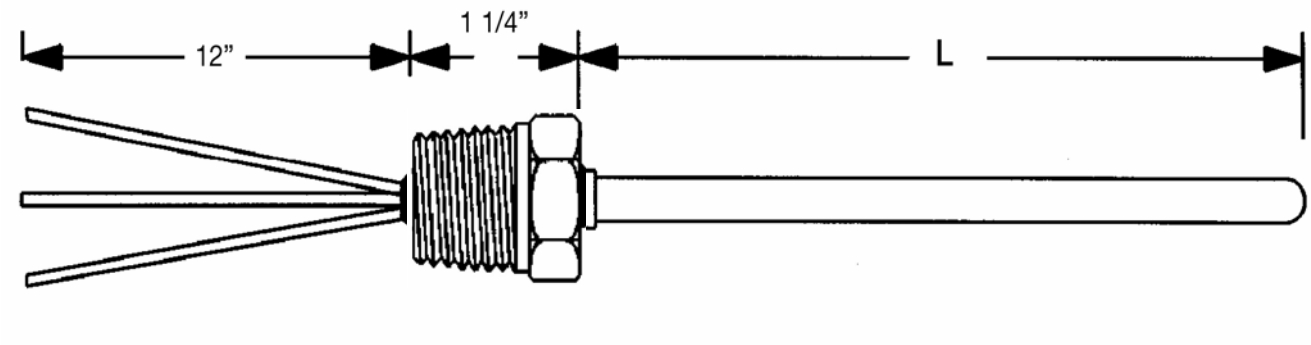
RP STYLE RTD FIXED FITTINGS

Features:

- Process connection with flexible leads
- Mineral insulation available for temperatures above 300°C

General Specifications:

- Available in .125” to .250” O.D. sheath
- Stainless steel process connection, 1/8” to 3/4” NPT available
- Element Temperature Range –196C to 650° C (Wire Wound), Max 300C (Thin Film)



R	P												

Standard PT-100 RTD .00385 DIN

Class	Wire Wound	Thin Film
Class A	**A** 0.05% W0.15	**F**
Class B	**B** 0.1% W0.3	**M**

Element	2 Wire	3Wire	4Wire
100 Ohm Single	**12**	**13**	**14**
100 Ohm Duplex	**22**	**23***	**24***

Sheath Diameter

5-.125” **6**-.188” **7**-.250”

Sheath Materials	Max 300C	MAX 650C**
304 S/S	**1**	**A**
316 S/S	**3**	**B**
Inconel 600	**6**	**C**

Sheath Length “L” (Inches)

Specify Whole Inches 01”-99”

* 1/4” Dia. Only ** .188” OD & Larger Single or Dual Elements

Special Requirements

If none, Enter “0” If required, Enter “X” Specify.

X=_____

Leadwire Construction

	Standard	Overbraid
Fiberglass 900F	**F**	**B**
Teflon 500F	**T**	**E**
PVC 212F	**M**	**R**

Process Fitting

Part#	Male NPT
Q1	1/8” NPT
Q2	1/4” NPT
Q4	1/2” NPT
Q6	3/4” NPT

“L” Length Fractional

0-0” **4**-1/2”
1-1/8” **5**-5/8”
2-1/4” **6**-3/4”
3-3/8” **7**-7/8”

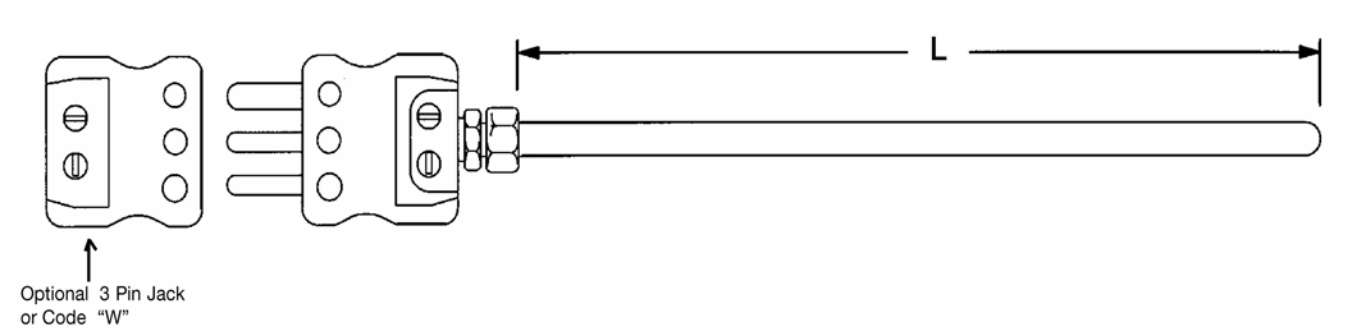
RC STYLE RTD Plug Termination

Features:

- Connector available in standard or mini sizes
- Available with mating Jack to allow for quick connect / disconnect

General Specifications:

- Available in diameters of .125” to .250”
- Dual element available
- Connector Temperature to 400°F
- Element Temperature Range –196C to 650° C (Wire Wound), Max 300C (Thin Film)



R	C												

Standard PT-100 RTD .00385 DIN

Class	Wire Wound	Thin Film
Class A	**A** 0.05% W0.15	**F**
Class B	**B** 0.1% W0.3	**M**

Element	2 Wire	3Wire
100 Ohm Single	**12**	**13**
100 Ohm Duplex	**22**	**23***

Sheath Diameter

5-.125” **6**-.188” **7**-.250”

Sheath Materials	Tube & Wire Max 300C	M.I. Cable MAX 650C**
304 S/S	**1**	**A**
316 S/S	**3**	**B**
Inconel 600	**6**	**C**

Sheath Length “L” (Inches)

Specify Whole Inches **01”-99”**

Special Requirements

If none, Enter “0”
If required, Enter “X” & Specify.
X=_____

Cold End Termination

A-3 Pin Plug
E-3 Pin Jack
W-Standard Plug & Jack

Process Fitting

Enter Two Digit Part Number from Page 81

“L” Length Fractional

0-0”	**4**-1/2”
1-1/8”	**5**-5/8”
2-1/4”	**6**-3/4”
3-3/8”	**7**-7/8”

* 1/4” Dia. Only ** .188” OD & Larger Single or Dual Elements

For Process Fittings See Page 81

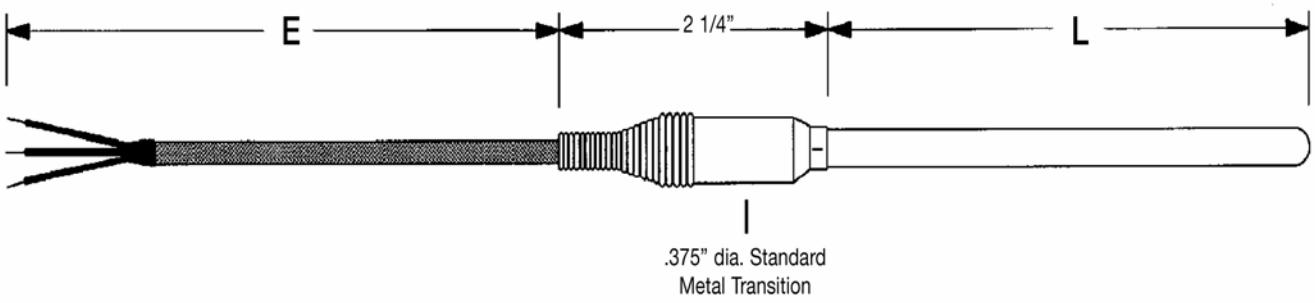
RL STYLE RTD Metal Transition

Features:

- Spring strain relief protects lead wire against sharp bends in the transition area
- See Page 81 for mounting options

General Specifications:

- Stainless steel transitions are crimped to sheath and epoxy filled for temperatures up to 400°F
- Available in .125" to .250" sheath O.D.
- Element Temperature Range –196C to 650° C (Wire Wound), Max 300C (Thin Film)



R	L													

Standard PT-100 RTD .00385 DIN

Class	Wire Wound	Thin Film
Class A	**A** 0.05% W0.15	**F**
Class B	**B** 0.1% W0.3	**M**

Element	2 Wire	3Wire	4Wire
100 Ohm Single	**12**	**13**	**14**
100 Ohm Duplex	**22**	**23***	**24***

Sheath Diameter

5-.125" **6**-.188" **7**-.250"

Sheath Materials	Max 300C	MAX 650C**
304 S/S	**1**	**A**
316 S/S	**3**	**B**
Inconel 600	**6**	**C**

Sheath Length "L" (Inches)

Specify Whole Inches **01"-99"**

Special Requirements

If none, Enter "0" If required, Enter "X" Specify.
X=_____

Cold End Termination

A-3 Pin Plug
E-3 Pin Jack
W-Standard Plug & Jack
S-Stripped Leads

"E" Length

Specify Length in Whole Feet
Ex. **01'-99'**

Leadwire Construction

Stranded	Standard	Overbraid	S/S Flex
Fiberglass 900F	**F**	**B**	**C**
Teflon 500F	**T**	**E**	**D**
PVC 212F	**M**	—	**H**

"L" Length Fractional

0-0"	**4**-1/2"
1-1/8"	**5**-5/8"
2-1/4"	**6**-3/4"
3-3/8"	**7**-7/8"

* 1/4" Dia. Only ** .188" OD & Larger Single or Dual Elements

For Process Fittings See Page 81

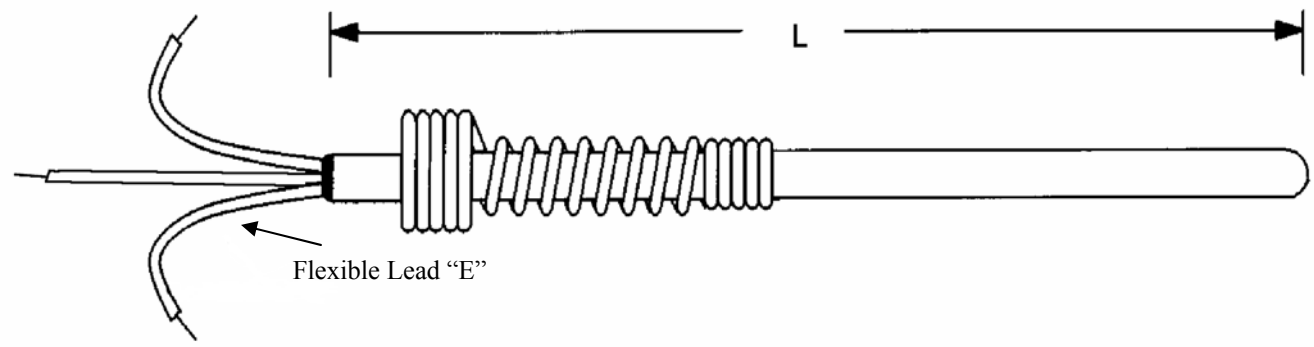
RS STYLE RTD Spring Loaded

Features:

- Spring loaded assures contact with bottom of well
- "E" length is flexible lead to allow for expansion of well

General Specifications:

- Available in 1/8", 3/16" or 1/4" O.D.
- High temp spring
- Spring is adjustable
- Element Temperature Range –196C to 650° C (Wire Wound), Max 300C (Thin Film)



R	S											

Standard PT-100 RTD .00385 DIN

Class	Wire Wound	Thin Film
Class A	**A** 0.05% W0.15	**F**
Class B	**B** 0.1% W0.3	**M**

Element	2 Wire	3Wire	4Wire
100 Ohm Single	**12**	**13**	**14**
100 Ohm Duplex	**22**	**23***	**24***

Sheath Diameter

5-.125" **6**-.188" **7**-.250"

Sheath Materials	Tube & Wire Max 300C	M.I. Cable MAX 650C**
304 S/S	**1**	**A**
316 S/S	**3**	**B**
Inconel 600	**6**	**C**

Sheath Length "L" (Inches)

Specify Whole Inches **01"-99"**

Special Requirements

If none, Enter "0"
If required, Enter "X" & Specify.
X=_____

Leadwire Construction

	Standard
Fiberglass 900F	**F**
Teflon 500F	**T**

"E" Length

A - 3" Standard
B - 4"
C - 6"

"L" Length Fractional

0-0"	**4**-1/2"
1-1/8"	**5**-5/8"
2-1/4"	**6**-3/4"
3-3/8"	**7**-7/8"

* 1/4" Dia. Only ** .188" OD & Larger Single or Dual Elements

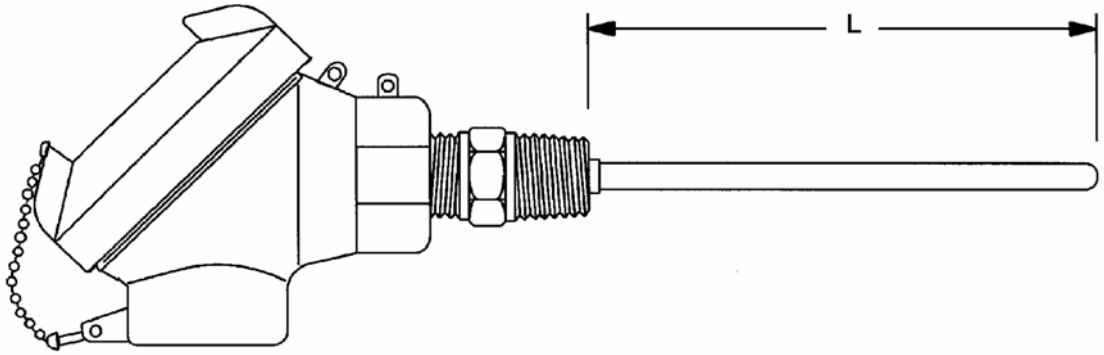
RH STYLE RTD Connection Head

Features:

- Connection heads provide superior dust and moisture resistance
- Screw top and flip-top covers available
- Single Or Dual Threaded Process Connection's

General Specifications:

- Sheath sizes of .125" to .250" O.D.
- Connection heads available in aluminum, cast iron and polypropylene
- Element Temperature Range –196C to 650° C (Wire Wound), Max 300C (Thin Film)



R	H													

Standard PT-100 RTD .00385 DIN

Class	Wire Wound	Thin Film
Class A	**A** 0.05% W0.15	**F**
Class B	**B** 0.1% W0.3	**M**

Element	2 Wire	3Wire	4Wire
100 Ohm Single	**12**	**13**	**14**
100 Ohm Duplex	**22**	**23***	**24***

Sheath Diameter

5-.125" **6**-.188" **7**-.250"

Sheath Materials	Tube & Wire Max 300C	M.I. Cable MAX 650C**
304 S/S	**1**	**A**
316 S/S	**3**	**B**
Inconel 600	**6**	**C**

Sheath Length "L" (Inches)

Specify Whole Inches **01"-99"**

"L" Length Fractional

0-0"	**4**-1/2"
1-1/8"	**5**-5/8"
2-1/4"	**6**-3/4"
3-3/8"	**7**-7/8"

Special Requirements

If none, Enter "0" If required, Enter "X" & Specify.
X=_____

Connection Head Style

1– Aluminum Flip Top
2– Std. Cast Alum Screw Cap
3– Std. Cast Iron Screw Cap
5– Explosion Proof Aluminum
6– Explosion Proof Cast Iron
8– Polypropylene FDA Approved Flip Top

Process Connection

Part#	Single Thd	Part#	Dual Thread
Q4	1/2" NPT	**D4**	1/2" NPT
Q6	3/4" NPT	**D6**	3/4" NPT
Spring Loaded →		**L4**	1/2" NPT

* 1/4" Dia. Only ** .188" OD & Larger Single or Dual Elements

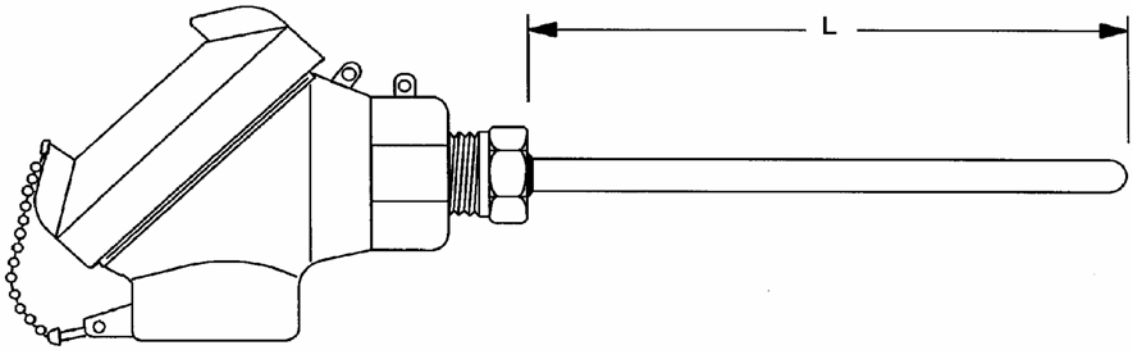
RT STYLE RTD Connection Head

Features:

- Connection head provides superior dust and moisture resistance
- Designed for use with compression fittings

General Specifications:

- Sheath construction available in low temp. max 300°C and mineral insulated 650°C max
- Connection heads available in aluminum, cast iron and polypropylene
- Element Temperature Range –196C to 650° C (Wire Wound), Max 300C (Thin Film)



R	T												

Standard PT-100 RTD .00385 DIN

Class	Wire Wound	Thin Film
Class A	**A** 0.05% W0.15	**F**
Class B	**B** 0.1% W0.3	**M**

Element	2 Wire	3Wire	4Wire
100 Ohm Single	**12**	**13**	**14**
100 Ohm Duplex	**22**	**23***	**24***

Sheath Diameter

5-.125” **6**-.188” **7**-.250”

Sheath Materials	Tube & Wire Max 300C	M.I. Cable MAX 650C**
304 S/S	**1**	**A**
316 S/S	**3**	**B**
Inconel 600	**6**	**C**

Sheath Length “L” (Inches)

Specify Whole Inches **01”-99”**

* 1/4” Dia. Only ** .188” OD & Larger Single or Dual Elements

Special Requirements

If none, Enter “0” If required, Enter “X” & Specify.

X=_____

Connection Head Style

1– Aluminum Flip Top
2– Std. Cast Alum Screw Cap
3– Std. Cast Iron Screw Cap
5– Explosion Proof Aluminum
6– Explosion Proof Cast Iron
8–Polypropylene FDA Approved

Process Connection

See Page 81 For Selection Code.

* If not needed enter “00” in Part Number

“L” Length Fractional

0-0”	**4**-1/2”
1-1/8”	**5**-5/8”
2-1/4”	**6**-3/4”
3-3/8”	**7**-7/8”

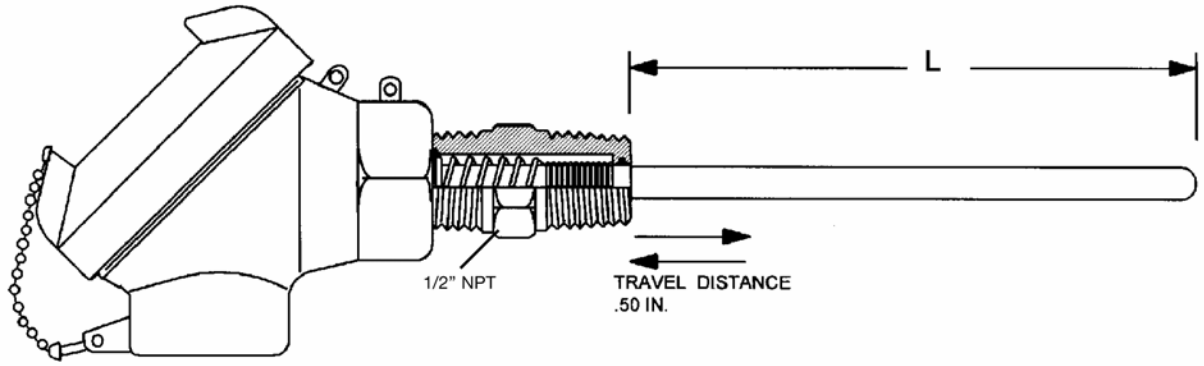
RB STYLE RTD Spring Loaded

Features:

- Spring loaded fitting ensures contact w/ bottom of well
- Connection head provides superior dust and moisture resistance

General Specifications:

- .188" & .250" sheath diameters available
- 1/2" of spring loaded travel
- 1/2" NPT 316 stainless steel process connection
- Element Temperature Range –196C to 650° C (Wire Wound), Max 300C (Thin Film)



R	B												

Standard PT-100 RTD .00385 DIN

Class	Wire Wound	Thin Film
Class A	**A** 0.05% W0.15	**F**
Class B	**B** 0.1% W0.3	**M**

Element	2 Wire	3Wire	4Wire
100 Ohm Single	**12**	**13**	**14**
100 Ohm Duplex	**22**	**23***	**24***

Sheath Diameter

5-.125" **6**-.188" **7**-.250"

Sheath Materials	Tube & Wire Max 300C	M.I. Cable MAX 650C**
304 S/S	**1**	**A**
316 S/S	**3**	**B**
Inconel 600	**6**	**C**

Sheath Length "L" (Inches)

Specify Whole Inches **01"-99"**

Special Requirements

If none, Enter "0"
If required, Enter "X" & Specify.
X=_____

Connection Head Style

1– Aluminum Flip Top
2– Std. Cast Alum Screw Cap
3– Std. Cast Iron Screw Cap
5– Explosion Proof Aluminum
6– Explosion Proof Cast Iron
8–Polypropylene FDA Approved

Process Connection

Part#	Tube O.D.	Male NPT
S4	.188	1/2" NPT-Fluid
S6	.250	1/2" NPT-Fluid
L4	.188	1/2" NPT-Dry
L6	.250	1/2" NPT-Dry

"L" Length Fractional

0-0" **4**-1/2"
1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"

* 1/4" Dia. Only ** .188" OD & Larger Single or Dual Elements

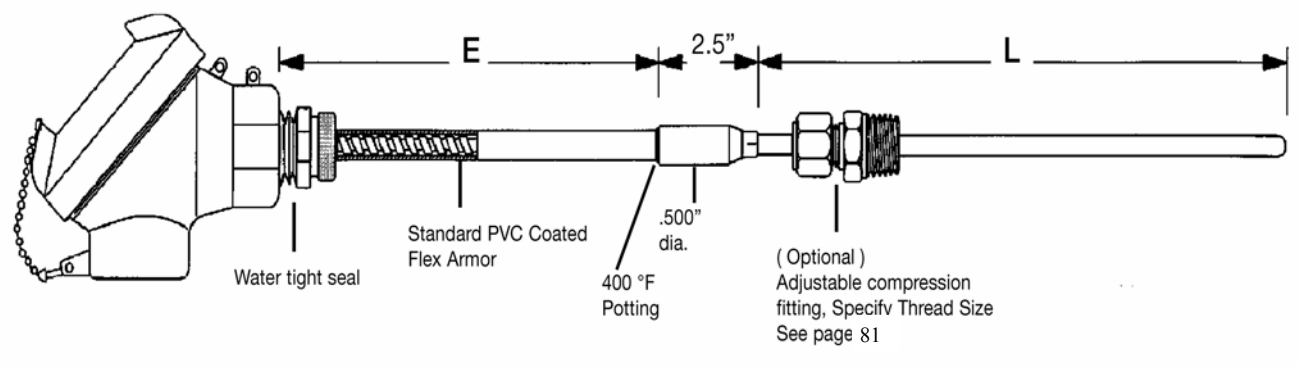
RR STYLE RTD Industrial Remote

Features:

- Remote mounting, protects against excessive heat and vibration.
- PVC covered Flex armor protects leads from moisture.
- Compression fitting, for mounting in thermowell.

General Specifications:

- Available in diameters .125" to .250"
- Flex armor available in SS, PVC or Teflon® coating
- Stranded wire is standard
- Element Temperature Range –196C to 650° C (Wire Wound), Max 300C (Thin Film)



R	R													

Standard PT-100 RTD .00385 DIN

Class	Wire Wound	Thin Film
Class A	**A** 0.05% W0.15	**F**
Class B	**B** 0.1% W0.3	**M**

Element	2 Wire	3Wire	4Wire
100 Ohm Single	**12**	**13**	**14**
100 Ohm Duplex	**22**	**23***	**24***

Sheath Diameter

5-.125" **6**-.188" **7**-.250"

Sheath Materials	Tube & Wire Max 300C	M.I. Cable MAX 650C**
304 S/S	**1**	**A**
316 S/S	**3**	**B**
Inconel 600	**6**	**C**

Sheath Length "L" (Inches)

Specify Whole Inches **01"-99"**

* 1/4" Dia. Only ** .188" OD & Larger Single or Dual Elements

"L" Length Fractional

0-0"	**4**-1/2"
1-1/8"	**5**-5/8"
2-1/4"	**6**-3/4"
3-3/8"	**7**-7/8"

Special Requirements

If none, Enter "0"
If required, Enter "X" & Specify.
X=_____

Connection Head Style

1– Aluminum Flip Top
2–Std. Cast Aluminum Screw Cap
3– Std. Cast Iron Screw Cap
5– Explosion Proof Aluminum
6– Explosion Proof Cast Iron
8– Polypropylene FDA Approved

Lead Length "E"

Enter Lead Length in whole feet **01-99'**

Leadwire Construction

4– Fiberglass w/ PVC-FLEX
5– Teflon w/ PVC-FLEX
6– PVC w/ PVC-FLEX

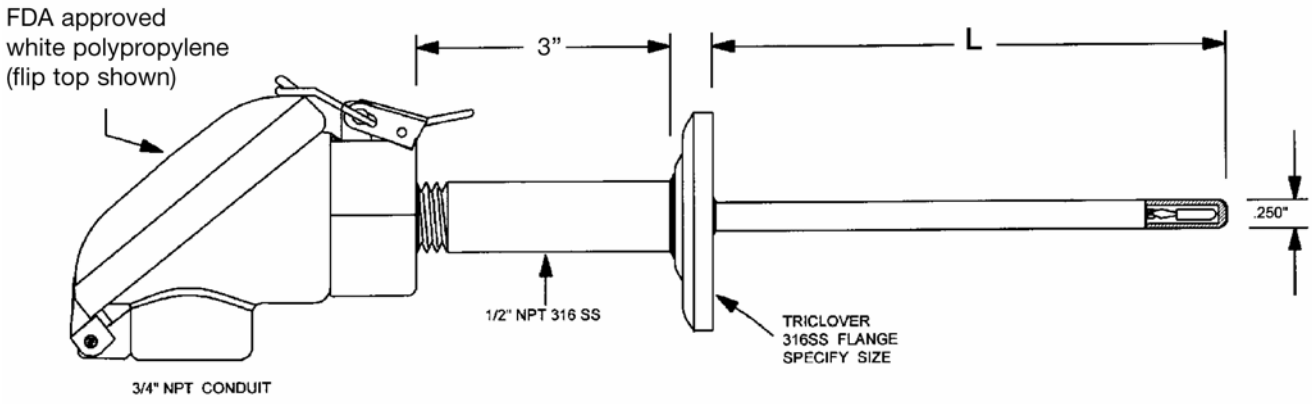
RN STYLE RTD Sanitary Head Assy

Features:

- These sensors are 3-A certified for sanitary clean -in-place applications
- Epoxy coated or polypropylene head resists harsh wash down chemicals

General Specifications:

- .250" O.D. 316 SS sheath
- Element Temperature Range –196C to 650° C (Wire Wound), Max 300C (Thin Film)



R	N				7	3				T			

Standard PT-100 RTD .00385 DIN

Class	Wire Wound	Thin Film
Class A	**A** 0.05% W0.15	**F**
Class B	**B** 0.1% W0.3	**M**

Element	2 Wire	3Wire	4Wire
100 Ohm Single	**12**	**13**	**14**
100 Ohm Duplex	**22**	**23**	**24**

Sheath Diameter

7-.250"

Sheath Materials	Tube & Wire Max 300C
316 S/S	**3**

Sheath Length "L" (Inches)

Specify Whole Inches **01"-99"**

"L" Length Fractional

0-0"	**4**-1/2"
1-1/8"	**5**-5/8"
2-1/4"	**6**-3/4"
3-3/8"	**7**-7/8"

Sanitary Cap Style

T– Tri-Clamp

Sanitary Cap Size / Tube O.D.

A - 1 1/2"
B - 2"
C - 2 1/2"
D - 3"
X - Specify

Connection Head Style

7–Polypropylene FDA Approved
8–Epoxy Coated Aluminum

Special Requirements

If none, Enter "0" If required, Enter "X" Specify.
X=_____

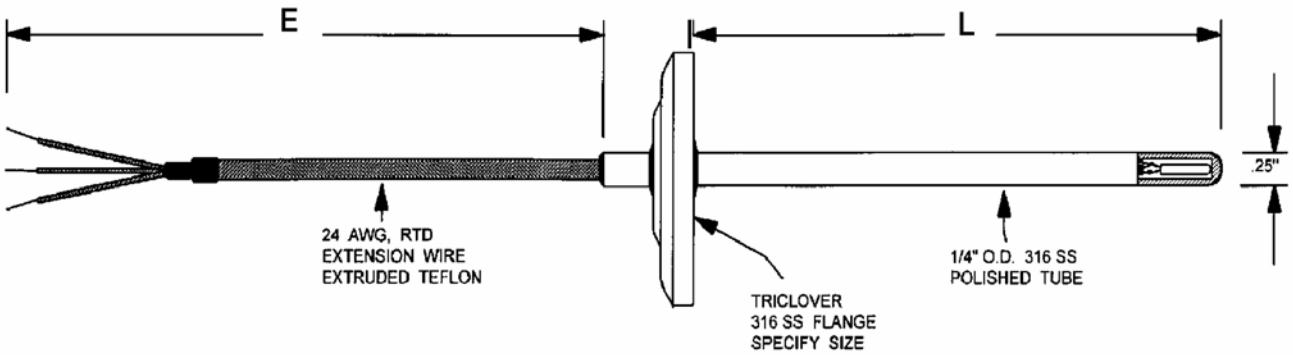
RY STYLE RTD Sanitary Assembly

Features:

- These sensors are 3-A certified for sanitary clean -in-place applications
- FEP Teflon® flexible extension

General Specifications:

- .250" O.D. sheath, polished 316 SS sheath and sanitary cap
- 100Ω / 2 , 3 and 4 wire circuits available
- Element Temperature Range –196C to 650° C (Wire Wound), Max 300C (Thin Film)



R	Y				7	3				T				

Standard PT-100 RTD .00385 DIN

Class	Wire Wound	Thin Film
Class A	**A** 0.05% W0.15	**F**
Class B	**B** 0.1% W0.3	**M**

Element	2 Wire	3Wire	4Wire
100 Ohm Single	**12**	**13**	**14**
100 Ohm Duplex	**22**	**23**	**24**

Sheath Diameter

7-.250"

Sheath Materials	Tube & Wire Max 300C
316 S/S	**3**

Sheath Length "L" (Inches)

Specify Whole Inches **01"-99"**

"L" Length Fractional

0-0"	**4**-1/2"
1-1/8"	**5**-5/8"
2-1/4"	**6**-3/4"
3-3/8"	**7**-7/8"

Sanitary Cap Style

T– Tri-Clamp

Sanitary Cap Size / Tube O.D.

A - 1 1/2"	**D** - 3"
B - 2"	**X** - Specify
C - 2 1/2"	

Leadwire Length "E"

Enter "E" Length In Whole Feet - **01-99'**

Special Requirements

If none, Enter "0"
If required, Enter "X" & Specify.
X=_____

SECTION 4

Industrial Sensors

National Pipe Sizes VS Actual Sizes in Inches

Much confusion and anger has erupted over the years when customers place orders for Industrial sensor assemblies based on Actual Measurements vs National Pipe Thread measurements that are very common in Industrial Plants like steel mills and refinery's.

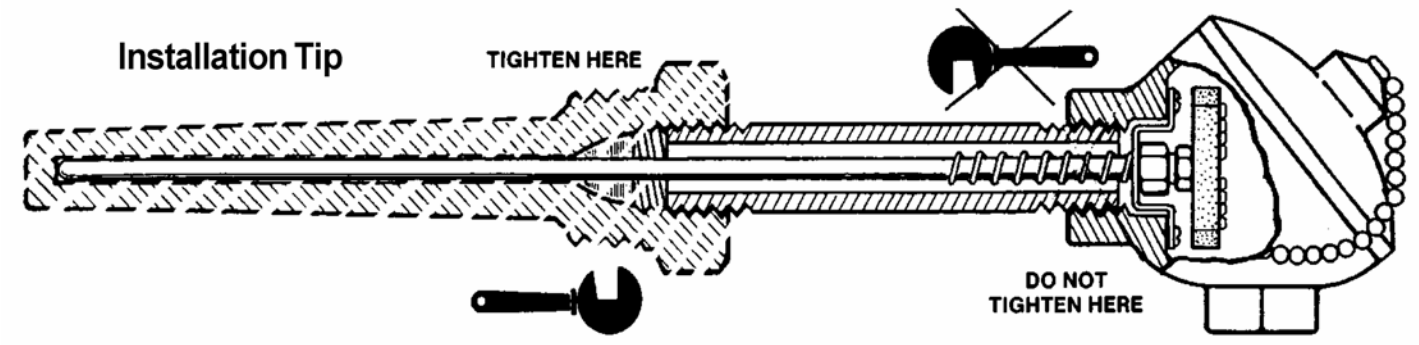
These facilities usually have many miles of piping runs to contend with, so naturally they think in the NPT sizes, which is our National Standard for pipe. The NPT size is closer to the inside dimension rather than the outside or OD dimension. As you stroll through this catalog you will notice we have listed all normal diameter dimensions in thousandths of an inch (0.000"), and pipe size dimensions as NPT. We have also listed all the important pipe size conversions for your review. Please remember that if you are purchasing a pipe size assembly that requires a mounting thread, we can only supply a thread that is cut into the pipe itself. That is to say, you can only put a 1/2" NPT pipe thread on a 1/2" NPT pipe.

You can weld a bushing to the 1/2" NPT pipe but that bushing will have to be the next size larger or 3/4" NPT size in this case. If you get confused just give us a call.

Pipe Size NPT	Threads Per Inch	O.D. In Inches	Pipe Size NPT	Threads Per Inch	O.D. In Inches
1/16	27	0.3125"	3/4	14	1.050"
1/8	27	0.405"	1	11	1.315"
1/4	18	0.540"	1-1/4	11	1.660"
3/8	18	0.675"	1-1/2	11	1.900"
1/2	14	0.840"	2	11	2.375"

Heavy Industrial Thermocouples:

Exhaust Gas Technologies offers a wide selection of industrial thermocouples and assemblies from which to choose. The most common are listed below. Should you not find your required assales agent for assistance. We manufacture specialty and one-of-a-kind assemblies on a daily basis. A detailed drawing or sketch is always appreciated and will speed the quotation process.



General Selection Parameters:
The conditions of measurement determine the type of thermocouple used. Temperature, atmosphere, protection, response and service life should be considered. The following descriptions serve as a guide to selection:

Thermocouple Type:
Select the thermocouple type that will be capable of operating in your application's temperature range and be compatible with your instrumentation.

Protecting Tube:
Select material that will withstand the temperature and possible corrosiveness of your application. (See table below for T/C-Tube Compatibility and tube information. See pages 71 and 79 for Tube Characteristics.)

Tube Size:
Use the tube size that will withstand the rigors of your application but with minimal effect on it.

Fitting or Mounting Type:
To attach and/or seal the assembly in your application, use a flange or fixed fitting.

Terminal and/or Extension Type:
For connection to instruments, various terminations are available.

General Installation Parameters:
The thermocouples should see, as closely as possible, what the product in the process is experiencing, in order to get meaningful measurements.

Location:
Locate the thermocouple junction as close to the product as possible. A rule of thumb is to have at least 10 tube diameters immersion in the hot zone. Avoid direct flame impingement of stagnant areas.

Special-Coated Wells and Protection Tubes:
Coated thermowells are recommended in applications of severe abrasion, corrosion, impact, high temperature and oxidation. The purpose of coated thermowells is to achieve longer thermowell life, better thermowell performance, and both hardness and strength. We offer coatings of Stellite* #1, Stellite* #6, chromium carbide, Teflon** and Kaynar†.

Wire Extension:
Pages 100-110 give general wire insulation characteristics; select the insulation that environmental conditions dictate. Use the correct thermocouple type through the circuit. Red color code is always negative in thermocouple circuits. Ideally, run the thermocouple circuit wires in separate conduits at least one foot away from power lines. Twisted and shielded constructions may be required to avoid noise in the thermocouple circuit. The overall impedance of the thermocouple circuit must be compatible with your instrumentation.

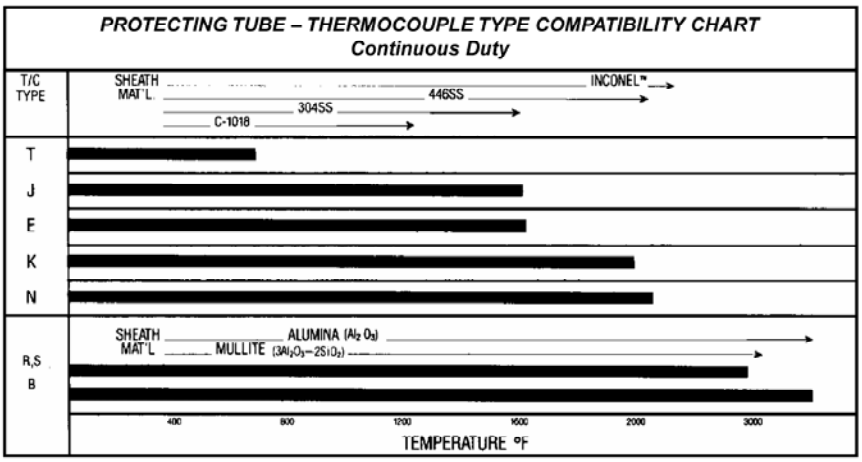
General Maintenance Parameters:
Thermocouples often deteriorate with time, exhibiting a drift from actual temperatures. Deterioration usually is more rapid at higher temperatures and depends upon the integrity of the protecting tube to isolate it from contaminates. Thermocouples should be checked at regular maintenance intervals based on recommendations or on experience.

Thermocouple DOs:
- Do check in place.
- Do replace at established, proper intervals.
- Do have good connections throughout the circuit.

Thermocouple DO NOTs:
- Don't reinsert at different immersions. (Avoid decreasing the immersion.)
- Don't use for accurate measurements at lower temperatures after being exposed to higher temperatures.
- Don't use in defective protecting tubes.
- Don't insulate with used insulators.

If there is a reversal in the thermocouple circuit, the indication will be down scale. A double-reversal in the circuit will give an upscale but erroneous reading. Keep the red color-coded leg negative throughout the circuit to avoid these reversals.

*Stellite is a trade name of Cabot Corporation. **Teflon is a registered trademark of E.I. du Pont Company. †Kaynar is a registered trademark of Pennwalt Corporation.



INDUSTRIAL ASSEMBLIES

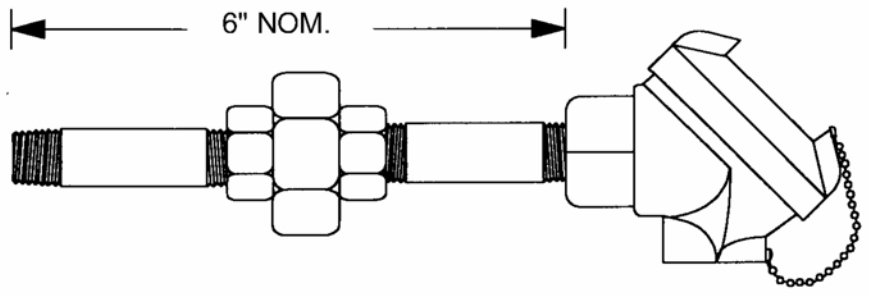
Extension Assembly

The type of extension is dependent on the requirements and accessibility of your measuring point. Extensions allow for access to the element for easy replacement and as a barrier from direct heat.

EGT offers the following assemblies:

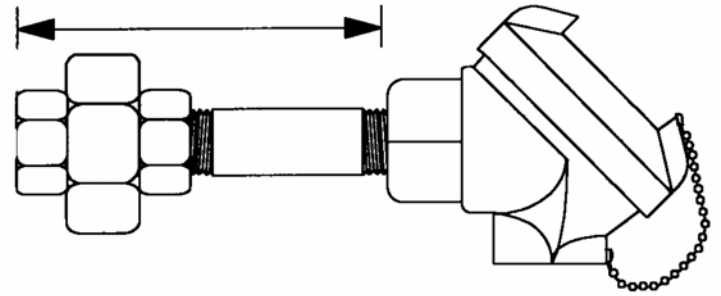
Type 1 Nipple-Union-Nipple

A type one consists of 2 three inch nipples and a union for a nominal length of 6". This type allows for the easy removal of the head and element from the well.



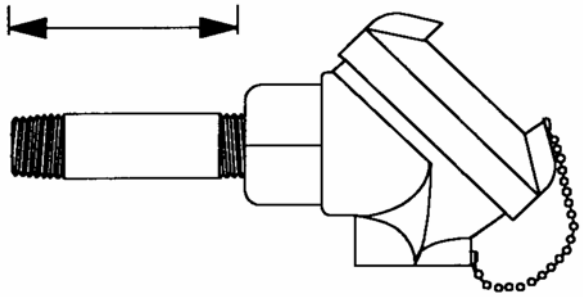
Type 2 Nipple-Union

A type two consists of 1 three inch nipple and a union for a nominal length of 4". This type is used to connect union and male pipe threads of protection tube.



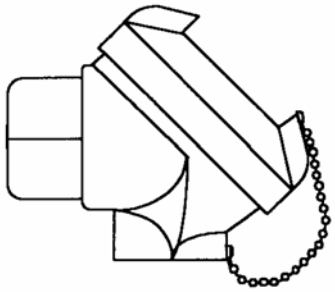
Type 3 Nipple

A type three consists of 1 three inch nipple for a nominal length of 2". This type is used to connect the head with the thermowell.



Type 4 Head

A type four is a connection head used to connect directly to protection tube.

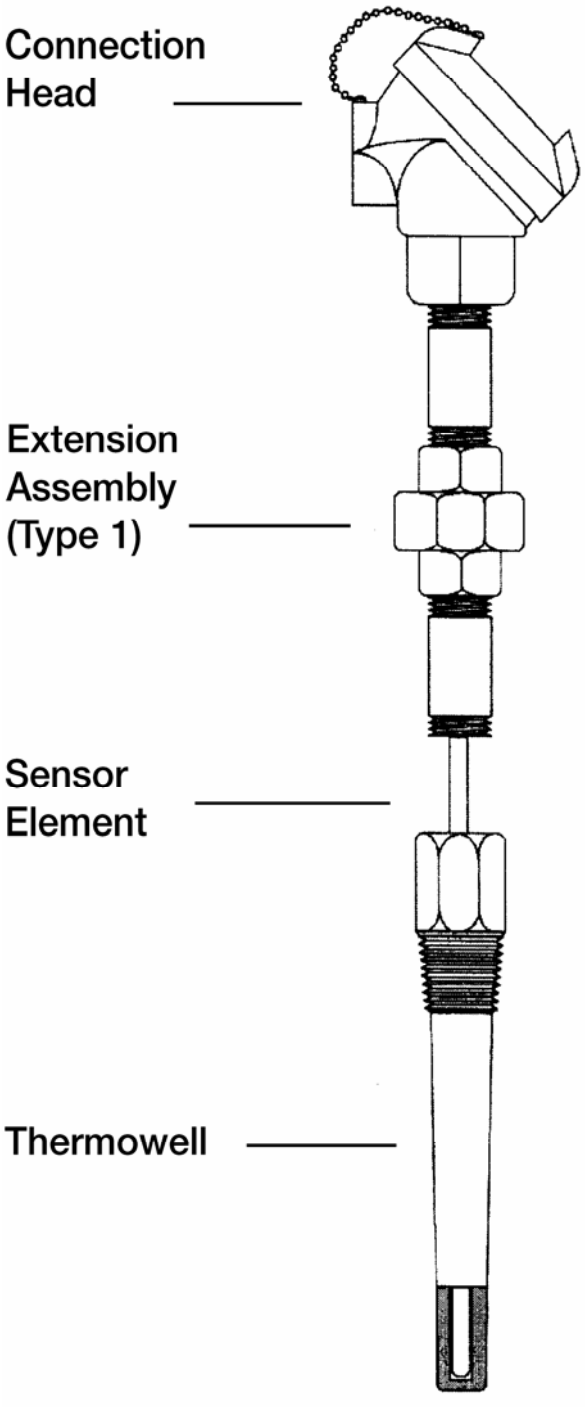


INDUSTRIAL THERMOCOUPLE & RTD ASSEMBLIES

To order a complete assembly from this section:

Step 1: Determine the part number for sensing element, extension and connection head from pages 62-66

Step 2: Determine part number of Thermowell from pages 70-78



Example: ***Well, Sensor, Extension & Connection Head.***

Part Number: MWJ71UAROY110

- Mineral insulated
- Type J
- 1/4" (0.250") O.D.
- 304 stainless steel
- Ungrounded junction
- As required element length
- Spring loaded
- Nipple-Union-Nipple extension
- General purpose Aluminum head

Example: ***Thermowell***

Part Number: TT300A045030

- Threaded, tapered thermowell
- 3/4" NPT Process connection
- .260" bore
- 4 1/2" immersion length "U"
- No lag
- 316 stainless steel
- No special requirements

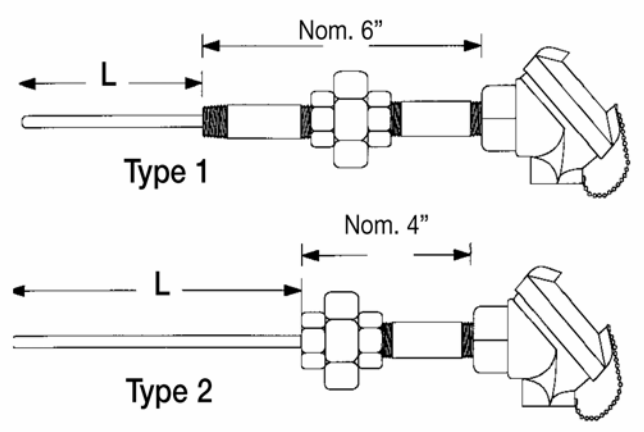
MW STYLE Industrial T/C

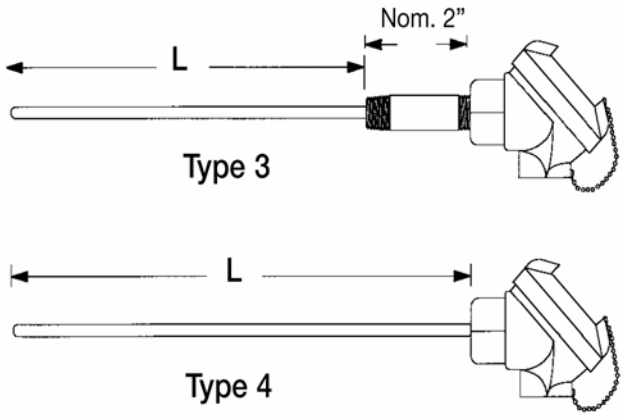
Features:

- Industrial, mineral insulated assemblies for use with thermowells

General Specifications:

- Seven varieties of connection heads
- Spring loading available





M	W											

Sheath DIA.

5-.125" **9**-.375"
6-.188" **X**-Specify
7-.250"

Sheath Material

1-304 S/S **4**-446 S/S
2-310 S/S **6**-INC. 600
3-316 S/S

Calibration

Std. Limits	**J**	**K**	**T**	**E**	**N**	**R***	**S***
Spl. Limits**	**1**	**2**	**3**	**4**	**5**	**-**	**-**
Dual Element	**6**	**7**	**8**	**9**	**0**	**Y**	**Z**
Triple Element***	**P**	**Q**	**-**	**-**	**-**	**-**	**-**

Junction

	Grounded	Ungrounded
Single	**G**	**U**
2 or 3 Common	**D**	**C**
2 or 3 Isolated	**-**	**S**

Length "L"

Specify Whole Inches Ex. **01"-99"**

Length "L" Fractional Inches

0-0" **4**-1/2"
1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"

Special Requirements

If none, Enter "0" If required, Enter "X" Specify.
X=_____

Connection Head Style

1– Aluminum Flip Top
2– Std. Cast Aluminum S/C
3– Std. Cast Iron Screw Cap
5– Explosion Proof Aluminum
6– Explosion Proof Cast Iron
8–Polypropylene FDA Approved
X–Specify Head Type

Extension Type

1-Nipple-Union-Nipple
2-Nipple-Union
3-Nipple
4-Head Only

Spring– Loaded

Y– YES **N**– NO

* Available in Loose Pack Construction only
** Special limits 0.4% accuracy — additional cost
*** .250" OD Sheath Minimum

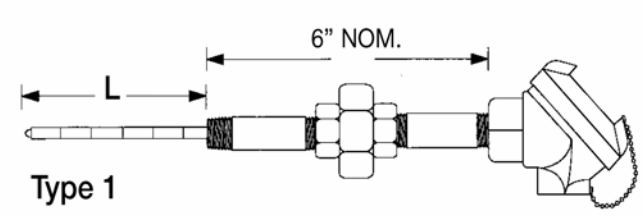
IW STYLE Industrial T/C

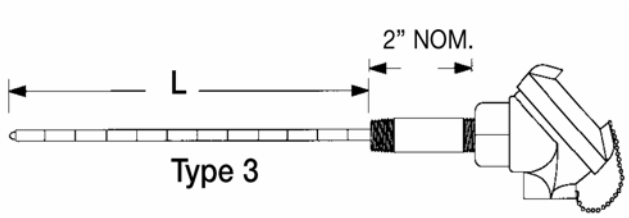
Features:

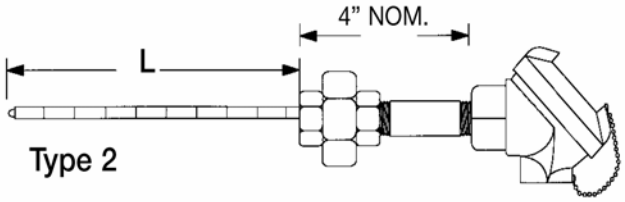
- Beaded elements for use with thermowells
- Available in four extension configurations

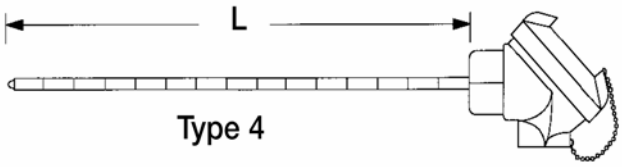
General Specifications:

- Seven connection head varieties to choose from
- Element size available from 24 AWG to 8 AWG









I	W								O			

Calibration

Std. Limits	J	K	T	E	N	R*	S*
Spl. Limits**	1	2	3	4	5	-	-
Dual Element	6	7	8	9	0	Y	Z

Element Insulation

B-Bare (No Insulators)
O-Oval Ceramic
R-Round Ceramic

Wire Size

1-08 AWG **3**-20 AWG
2-14 AWG **X**– Other (Specify)

Junction

Style	Twisted Welded	Butt Welded
Single	**T**	**B**
Duplex	**D**	**W**

Element Length "L"

Specify Whole Inches Ex. **01"-99"**

When ordering a complete assembly including Thermowell, specify "AR**" (As Required)

Special Requirements

If none, Enter "0" If required, Enter "X" & Specify.
X=_____

Connection Head Style

1– Aluminum Flip Top
2– Std. Cast Aluminum S/C
3– Std. Cast Iron Screw Cap
5– Explosion Proof Aluminum
6– Explosion Proof Cast Iron
8– Polypropylene FDA Approved
X–Specify Head Type

Extension Type

1-Nipple-Union-Nipple
2-Nipple-Union
3-Nipple
4-Head Only

Length "L" Fractional Inches

1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"
4-1/2" **0**- As Required

* Available in Loose Pack Construction only
** Special limits 0.4% accuracy — additional cost

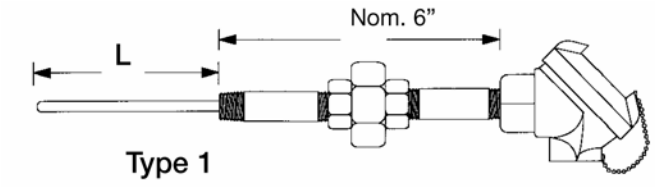
RW STYLE-RTD Industrial

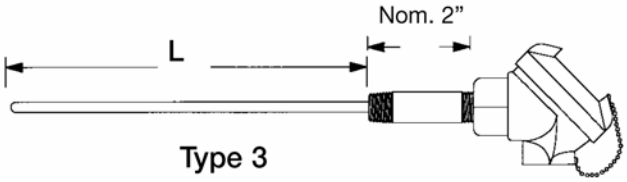
Features:

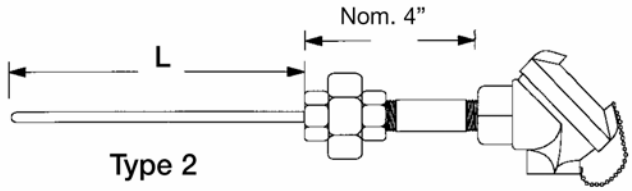
- RTD Elements for use with Thermowells
- Seven connection head varieties to choose from
- Element Temperature Range –196C to 650° C (Wire Wound), Max 300C (Thin Film)

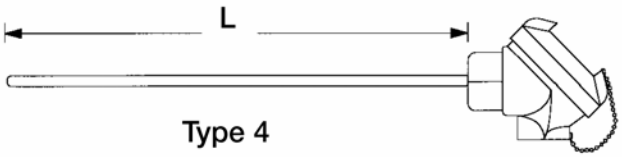
General Specifications:

- Four standard extension configurations, type 1,2,3 and 4
- Mineral insulated sheath available for temperatures to 800°C









R	W													

Standard PT-100 RTD .00385

Class	Wire Wound	Thin Film
Class A	**A** 0.05% W0.15	**F**
Class B	**B** 0.1% W0.3	**M**

Element	2 Wire	3Wire	4Wire
100 Ohm Single	**12**	**13**	**14**
100 Ohm Duplex	**22***	**23***	**24***

Sheath Diameter

5-.125" **7**-.250"
6-.188" **X**-Specify

Sheath Materials	Tube & Wire Max 300C	M.I. Cable MAX 650C**
304 S/S	**1**	**A**
316 S/S	**3**	**B**
Inconel 600	**6**	**C**

Length "L"

Specify Whole Inches Example **01"-99"**

When ordering a complete assembly including Thermowell, specify "AR**"

Length "L" Fractional Inches

0- as required **4**-1/2"
1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"

Special Requirements

If none, Enter "0" If required, Enter "X" Specify.
X=_____

Connection Head Style

1– Aluminum Flip Top
2–Std. Cast Aluminum Screw Cap
3– Std. Cast Iron Screw Cap
5– Explosion Proof Aluminum
6– Explosion Proof Cast Iron
8– Polypropylene FDA Approved
X–Specify Head Type

Extension Type

1-Nipple-Union-Nipple
2-Nipple-Union
3-Nipple
4-Head Only

Spring– Loaded

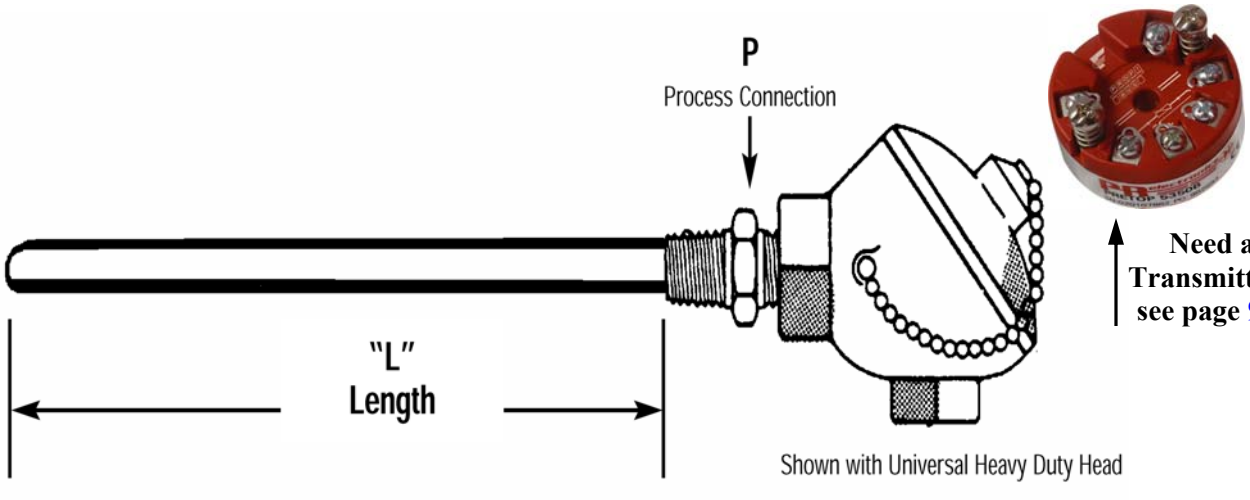
Y– YES **N**– NO

* Available in .250" Diameter Only
** Available from .188" O.D. & Larger / Single or Dual Elements

HMT STYLE T/C Assembly

Features:

- **STRAIGHT THERMOCOUPLE ASSEMBLY WITH METAL PROTECTION TUBE**



Need a Transmitter? see page 91!

H	M	T											

Calibration ***

Std. Limits	J	K	T	E	N	R*	S*
Spl. Limits**	1	2	3	4	5	-	-
Dual Element	6	7	8	9	0	Y	Z

Element Wire Size

Std. Materials	*Precious Metals**
08 - 08 AWG	**01** - .010 Dia.
14 - 14 AWG	**02** - .020 Dia
20 - 20 AWG	**03** - .032 Dia

Junction

Style	Grounded	Ungrounded
Single	**T**	**B**
Duplex	**D**	**W**

Protection Tube Material

Code	Material
1	304 S/S
3	316 S/S
4	446 S/S
6	Inconel 600
7	Cast Iron
8	Coated Cast Iron

Protection Tube Length "L"

Specify Whole Inches Ex. **01"-99"**

Protection Tube Diameter

Code	O.D.
Std. 0	Cast Iron 1.625"
1	1.00"
2	0.500"
3	0.750"

Special Requirements

If none, Enter "0" If required, Enter "X" Specify.

X=_____

Process Connection "P"
Code / Process Bushing

A	1/4" NPT	**F**	1 1/4" NPT
B	3/8" NPT	**G**	1 1/2" NPT
C	1/2" NPT	**H**	2" NPT
D	3/4" NPT	**X**	Other
E	1" NPT	**O**	NONE

Connection Head Style

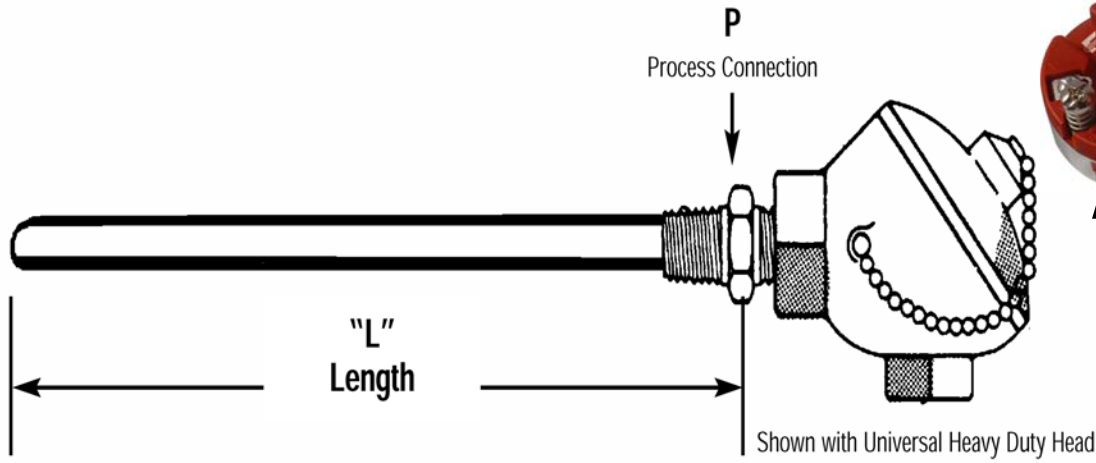
1– Aluminum Flip Top
2– Std. Cast Iron Screw Cap
3– HD Aluminum Screw Cap
4– HD Cast Iron Screw Cap
5– Explosion Proof Aluminum
6– Explosion Proof Cast Iron 90°
7– Explosion Proof Cast Iron 45°

* Available in Loose Pack Construction only
** Special Limits 0.4% accuracy– additional cost
***For triple element insert X in the special requirements box & specify

HCT STYLE T/C Assembly

Features:

- **STRAIGHT THERMOCOUPLE ASSEMBLY WITH CERAMIC PROTECTION TUBE**



Need a Transmitter? see page 91!

H	C	T											

Calibration ***

Std. Limits	**J**	**K**	**T**	**E**	**N**	**R***	**S***
Spl. Limits**	**1**	**2**	**3**	**4**	**5**	**-**	**-**
Dual Element	**6**	**7**	**8**	**9**	**0**	**Y**	**Z**

Element Wire Size

Std. Materials	*Precious Metals**
08 - 08 AWG	**01 -** .010 Dia.
14 - 14 AWG	**02 -** .020 Dia
20 - 20 AWG	**03 -** .032 Dia
XX– (Specify)	

Junction Type

Style	Grounded	Ungrounded
Single	**T**	**B**
Duplex	**D**	**W**

Protection Tube Material

Code	Material	Max. Temp
A	Alumina	3400F
M	Mullite	2750F

Protection Tube Length "L"

Specify Whole Inches Ex. **01"-99"**

Protection Tube Diameter

Code	I.D. x O.D.	Code	I.D. x O.D.
A	1/4" x 3/8"	**D**	7/16" x 11/16"
B	5/16" x 7/16"	**E**	1/2" x 3/4"
C	3/8" x 1/2"	**F**	3/4" x 1.0"

Connection Head Style

1– Aluminum Flip Top
2– Std. Cast Iron Screw Cap
3– HD Aluminum Screw Cap
4– HD Cast Iron Screw Cap
5– Explosion Proof Aluminum
6– Explosion Proof Cast Iron 90°
7– Explosion Proof Cast Iron 45°

Process Connection "P"
Code / Process Bushing

A	1/4" NPT	**F**	1 1/4" NPT
B	3/8" NPT	**G**	1 1/2" NPT
C	1/2" NPT	**H**	2" NPT
D	3/4" NPT	**X**	Other
E	1" NPT	**O**	NONE

Special Requirements

If none, Enter "0" If required, Enter "X" Specify.
X=_____

* Available in Loose Pack Construction only
** Special Limits 0.4% accuracy– additional cost
*** For Triple Element Assembly Insert an X in the Special Requirements Box and Specify

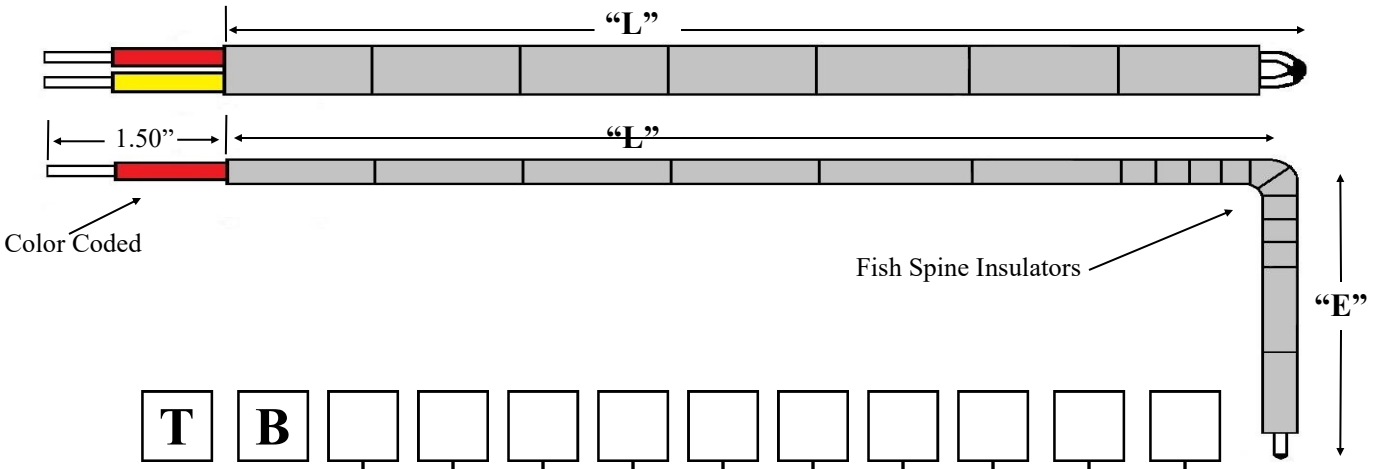
TB STYLE BEADED BASE METAL

Features:

- Low Cost
- High Temperature up to 2300F for type “K” thermocouple.
- Long life if properly protected with thermowell or protection tube

General Specifications:

- Standard thermocouple calibrations Type “J & K”
- Standard wire: 8 & 14 AWG
- Color coded for proper instrument polarity
- Select oval or round insulators
- Custom designs to meet any requirement.



T	B										

SPECIAL REQUIREMENTS

If none, Enter “0”
If required, Enter “X” & Specify.
X=_____

CALIBRATION

J-TYPE “J”
K-TYPE “K”
T-TYPE “T”
E-TYPE “E”
X–Other (Specify)

JUNCTION

Style	Twisted & Welded	Butt Welded
Single	**T**	**B**
Duplex	**D**	**W**

WIRE SIZE

1– 08 AWG
2– 14 AWG
3– 20 AWG
4– 24 AWG
X– Other (Specify)

LENGTH “E”

Specify Whole Inches
Ex. **01”-99”**
XX- Other “Specify”
**No bend enter 00

ELEMENT INSULATION

B– Bare (No Insulators)
O– Oval Ceramic
R- Round Ceramic

LENGTH “ L”

Specify Whole Inches
Ex. **01”-99”**
XX- Other “Specify”

BEND RADIUS

S– Straight No Bend
R– 90 Degree Bend
F– 45 Degree Bend
X- Other “Specify”
*** Bends have fish spine insulators**

THERMOWELLS & PROTECTION TUBES

FOR TEMPERATURE SENSING IN A PRESSURE ENVIRONMENT

EGT's quality thermowells are available in several materials. Also in built-up (2-piece) wells. Thermowells with flanges and special thermowells without mounting threads can be made for weld-in applications. Any thermowell not listed will be quoted upon receipt of full specifications.

When ordering, specify the catalog number, material, the "U" and "A" (stem) length and the "T" (lagging) length when required. Specifications on the flanged thermowell should include the size, pressure rating, type of flange and material of flange. Specify plug and chain, if needed (brass or stainless steel).

Notes:

On special materials where hex is not available, we will supply round stock with wrench flats. Complete thermocouple assemblies upon application, according to your specifications. Also available on "consult factory basis" metal tags, hydrostatic test, and dye penetrant test. Carbon steel, stainless steel and brass plug and chain are also available.

MATERIAL COMPATIBILITY CHART

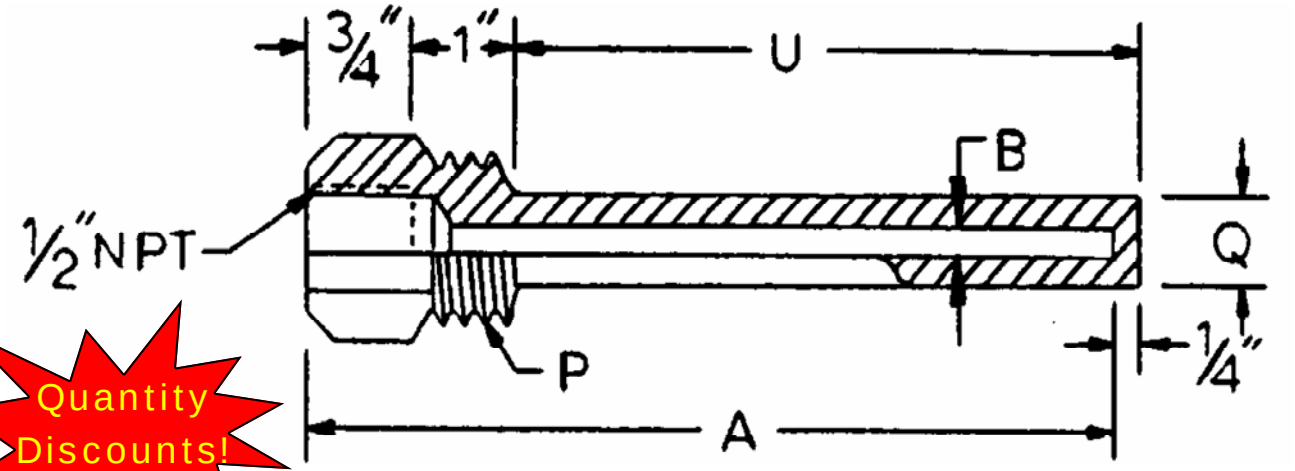
THERMOWELLS

Manufactured from drilled bar stock, EGT's thermowells provide protection from pressure, gas and liquid elements. Thick walls provide sturdy protection for the sensor against high velocity and corrosive environments. Below is a helpful guide of recommended materials for specific corrodents.

Corrodent	Temp °F	Conc. %	Recom. Material
Acetic Acid	212	ALL	Monel
Acetic Anhydride	300		Nickel
Acetone	212	ALL	304SS
Acetylene	400		304SS
Alcohols	212	ALL	304SS
Alum Potassium (or Sodium)	300	ALL	Hast. C
Aluminum Chloride	212	ALL	Hast B
Aluminum Sulfate	212	ALL	316SS
Ammonia, Dry	212	ALL	304,316SS
Ammonium Hydroxide (Ammonia, Aqua)	212	ALL	304,316SS
Ammonium Chloride	300	50%	Monel
Ammonium Nitrate	300	ALL	304SS
Ammonium Sulfate	212	ALL	316SS
Amyl Acetate	300	ALL	304SS
Aniline	25		Monel
Asphalt	250		304SS
Atmosphere (Industrial and Marine)	See Calcium		304SS
Barium Compounds	70		304SS
Beer	212		Steel
Benzene (Benzol)	212	ALL	316SS
Benzoic Acid	70	15%	Monel
	212	ALL	Brass
Bleaching Powder	200		304SS
Borax	400	ALL	316SS
Bordeaux Mixture	125	DRY	Monel
Boric Acid	400	ALL	Steel
Bromine	See Alcohols		
Butane	212		Hast. C
Butyl Alcohol	75	ALL	Hast. C
Butyric	212	ALL	Hast. C
Acid	300	20%	Hast. C
Calcium Bisulphite	See Bleaching Powder		
Calcium Chloride	See Phenol		
Calcium Hydroxide	800	ALL	Brass
Calcium Hypochlorite	212	ALL	304SS
Carbolic Acid	212		304SS
Carbon	200		304SS
Dioxide, Dry	125	ALL	Monel
Carbonated Water	100		Monel
Carbonated	100	ALL	Monel
Beverages Carbon	212	ALL	Monel
Disulphide Carbon	212		Monel
Tetrachloride Chlorine,	300	ALL	Hast. C
Dry	300	ALL	304SS
Chlorine, Moist	212	ALL	Hast. C
Chloracetic Acid	212	ALL	Hast. C
Chloroform, Dry	300	ALL	316SS
Chromic Acid			
Cider		ALL	316SS
Citric			
Acid			
Copper (10) Chloride		ALL	304SS
Copper (10) Nitrate			
Copper (10) Sulfate	300	ALL	316SS
	160		304SS
Copper Plating Solution (Cyanide)	75		304SS
Copper Plating Solution (Acid)	200		304SS
Corn Oil	200	ALL	304SS
Creosote	300		Monel
Crude Oil	See Lacquer Thinner		
Ethyl Acetate	500		Steel
Ethyl Chloride, DRY	See Alcohols		
Ethanol	212	ALL	304SS
EthyleneGlycol (Uninhibited)	75		Steel
Ethylene Oxide	500	ALL	Hast. C
Fatty Acids	75	ALL	Hast. C
Fernc Chloride	300	ALL	304SS
Ferric Sulfate	212	40%	316SS
Formaldehyde	300	ALL	316SS
Formic Acid	300		Steel
Freon	100		304SS
Flourine, Anhydrous	450		316SS
Furtural	300		Steel
Gasoline	300		304SS
Glucose	300	ALL	304SS
Glue ph 6-8	212	ALL	Brass
Glycerine	212	ALL	Hast. C
Hydrobromic Acid	225	ALL	Hast. B
Hydrochloric Acid (37 -38%)	500		304SS
Hydrogen Chloride, Dry	212	ALL	304SS
Hydrocyanic Acid	212	60%	Monel
Hydrofluoric Acid	175		Steel
Hydrogen Flouride, Dry	212	40%	Monel
Hydrofluogilicic Acid	125	10-100%	304SS
Hydrogen Peroxide	300	ALL	Steel
Kerosene	300	ALL	304SS
Lacquers & Thinners	300	ALL	316SS
Lactic Acid	212	ALL	316SS
Lime	75		Steel
Linseed Oil	212	50%	Nickel
Magnesium Chloride	75	ALL	304SS
Magnesium Hydroxide (or Oxide)	212	40%	304SS
Magnesum Sulfate	75	10%	Hast. C
Mercuric Chloride	700		Steel
Mercury	212	ALL	304SS
Methylene Chloride	75		Steel
Methyl Chloride, Dry	180		304SS
Milk fresh or sour	See Glucose		
Molasses	70		304SS
Natural Gas	75	ALL	304SS
Nitric Acid	300	ALL	316SS
Oxygen	75	ALL	Steel
Oleic Acid	See Fatty Acids		
Oxalic Acid	212	ALL	Monel
Photographic Bleaching	100	ALL	304SS
Palmitc Acid	See Fatty Acids		
Phosphoric Acid	212	ALL	316SS
Phenol	212	ALL	316SS
Potassium Compounds	See Sodium Compounds		
Propane	300		Steel
Rosin	700	100%	316SS
Sea Water	75		Monel
Soap & Detergents	212	Monel	304SS
Sodium Bicarbonate	212	20%	316SS
Sodium Bisulphite	212	20%	304SS
Sodium Bisulphate	212	20%	304SS
Sodium Carbonate	212	40%	316SS
Sodium Chloride	300	30%	Monel
Sodium Chromate	212	ALL	316SS
Salt or Brine	See Sodium Chloride		
Sodium Cyanide	212	ALL	304SS
Sodium Hydroxide	212	30%	316SS
Sodium Hypochlorite	75	10%	Hast. C
Sodium Nitrate	212	40%	304SS
Sodium Nitrate	75	20%	316SS
Sodium Phosphate	212	10%	Steel
Sodium Silicate	212	10%	Steel
Sodium Sulfide	212	30%	316SS
Sodium Sulfite	212	10%	316SS
Sodium Sulfate	212	30%	304SS
Sodium Thiosulfate	212	ALL	304SS
Steam			304SS
Stearic Acid	See Fatty Acids		
Sugar Solution	See Glucose		
Sulfur	500		304SS
Sulfur Chloride	75	DRY	316SS
Sulfur Dioxide	500	DRY	316SS
Sulfur Trioxide	500	DRY	316SS
Sulfuric Acid	212	10%	316SS
Sulfuric Acid	212	10-90%	Hast. B
Sulfuric Acid	212	90-100%	316SS
Sulfuric Acid Fuming	175		Hast. C
Sulfurous Acid	75	20%	316SS
Titanium Tetrachlonde	75	ALL	316SS
Tannic Acid	75	40%	Hast. B
Toluene	75		Steel
Trichloracetic Acid	75	ALL	Hast. B
Trichlorethylene	300	DRY	Monel
Turpentine	75		316SS
Varnish	150		Steel
Zinc Chloride	212	ALL	Hast. B
Zinc Sulfate	212	ALL	316SS

Monel® is a registered trade mark of the Inco family of companies Hastalloy
B® and Hastalloy C® are registered trade marks of Haynes International

SW STYLE Straight Drilled Thermowell



Quantity Discounts!

S	W							

Process Connection "P"

1- 1" NPT
2- 1/2" NPT
3- 3/4" NPT

Bore Diameter "B"

A-.260"
B-.385"

Immersion Length "U"

Specify Whole Inches Ex. **01"-99"**
**See below for Common Sized Thermowells

Special Requirements

If none, Enter "0" If required, Enter "X" & Specify.
X=_____

Thermowell Material

1- 304S/S
2- 310S/S
3- 316 S/S
4- 446 S/S
5- 347 S/S
6- Inconel
7- Brass
8- Hastalloy
9- Monel

Length "U" Fractional Inches

0-0.0"
1-1/8"
2-1/4"
3-3/8"
4-1/2"
5-5/8"
6-3/4"
7-7/8"

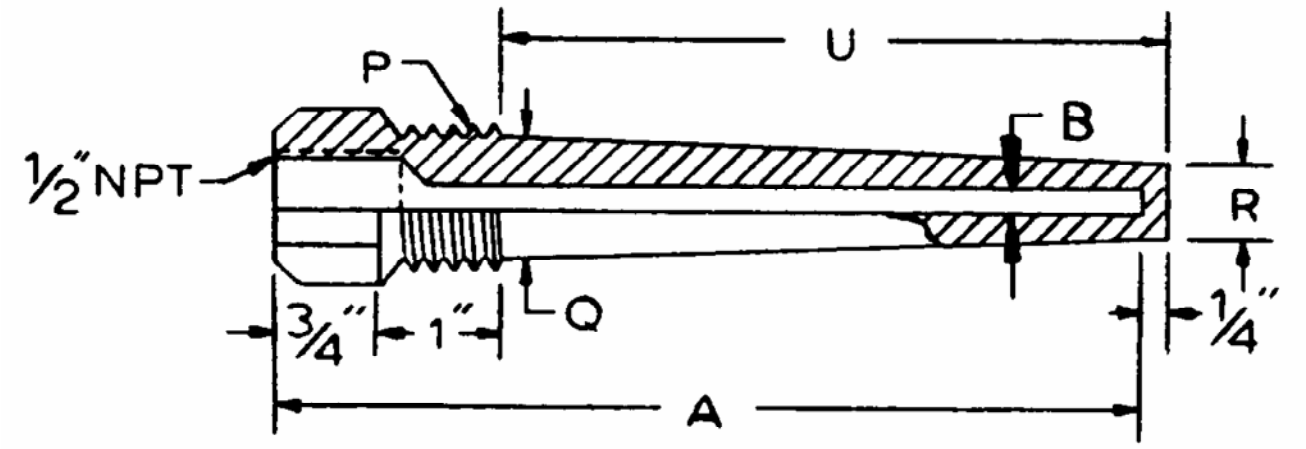
"P" NPT	"U" Dim	"A" Dim	"Q" Dim
1/2"	2 1/4"	4"	5/8"
1/2"	4 1/4"	6"	5/8"
1/2"	7 1/4"	9"	5/8"
1/2"	10 1/4"	12"	5/8"
1/2"	13 1/4"	15"	5/8"
1/2"	16 1/4"	18"	5/8"
1/2"	22 1/4"	24"	5/8"

"P" NPT	"U" Dim	"A" Dim	"Q" Dim
3/4"	2 1/2"	4"	3/4"
3/4"	4 1/2"	6"	3/4"
3/4"	7 1/2"	9"	3/4"
3/4"	10 1/2"	12"	3/4"
3/4"	13 1/2"	15"	3/4"
3/4"	16 1/2"	18"	3/4"
3/4"	22 1/2"	24"	3/4"

"P" NPT	"U" Dim	"A" Dim	"Q" Dim
1"	2 1/2"	4"	**
1"	4 1/2"	6"	**
1"	7 1/2"	9"	**
1"	10 1/2"	12"	**
1"	13 1/2"	15"	**
1"	16 1/2"	18"	**
1"	22 1/2"	24"	**

**= .260" Bore = 3/4" / .385" Bore = 7/8"

TW STYLE Tapered Drilled Thermowell



T	W							

Special Requirements

If none, Enter "0" If required, Enter "X" & Specify.
X=_____

Process Connection "P"

1- 1" NPT
2- 1/2" NPT
3- 3/4" NPT

Thermowell Material

1- 304S/S
2- 310S/S
3- 316 S/S
4- 446 S/S
5- 347 S/S
6- Inconel
7- Brass
8- Hastalloy
9- Monel

Bore Diameter "B"

A-.260"
B-.385"

Immersion Length "U"

Specify Whole Inches Ex. **01"-99"**
**See below for Common Sized Thermowells

Length "U" Fractional Inches

0-0.0"
1-1/8"
2-1/4"
3-3/8"
4-1/2"
5-5/8"
6-3/4"
7-7/8"

"P" NPT	"U" Dim	"A" Dim	"Q" Dim	"R" Dim
1/2"	2 1/4"	4"	5/8"	1/2"
1/2"	4 1/4"	6"	5/8"	1/2"
1/2"	7 1/4"	9"	5/8"	1/2"
1/2"	10 1/4"	12"	5/8"	1/2"
1/2"	13 1/4"	15"	5/8"	1/2"
1/2"	16 1/4"	18"	5/8"	1/2"
1/2"	22 1/4"	24"	5/8"	1/2"

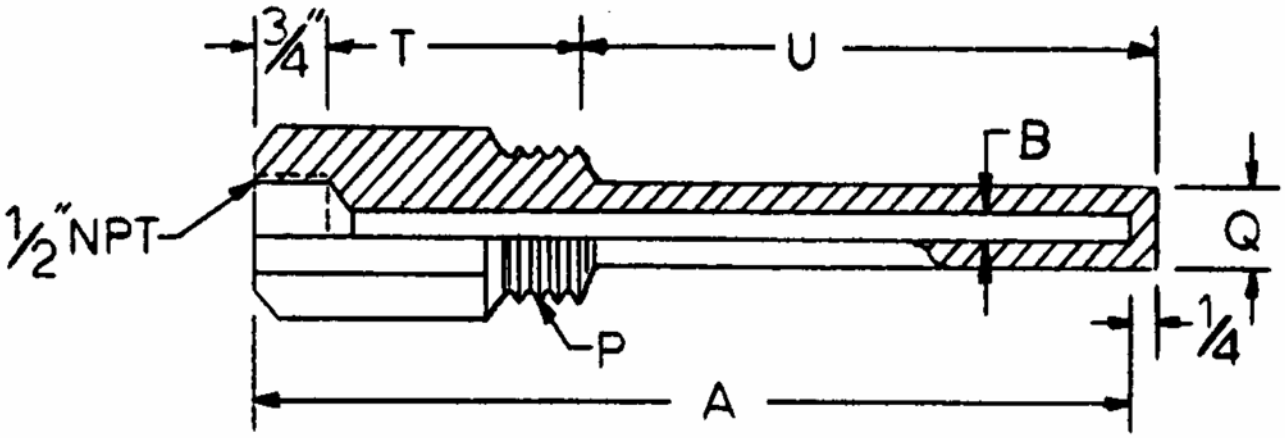
"P" NPT	"U" Dim	"A" Dim	"Q" Dim
3/4"	2 1/2"	4"	3/4"
3/4"	4 1/2"	6"	3/4"
3/4"	7 1/2"	9"	3/4"
3/4"	10 1/2"	12"	3/4"
3/4"	13 1/2"	15"	3/4"
3/4"	16 1/2"	18"	3/4"
3/4"	22 1/2"	24"	3/4"

R= .260" Bore = 5/8" / .385" Bore = 3/4"

"P" NPT	"U" Dim	"A" Dim	"Q" Dim
1"	2 1/2"	4"	1"
1"	4 1/2"	6"	1"
1"	7 1/2"	9"	1"
1"	10 1/2"	12"	1"
1"	13 1/2"	15"	1"
1"	16 1/2"	18"	1"
1"	22 1/2"	24"	1"

R = .260" Bore = 3/4" / .385" Bore = 7/8"

SL STYLE Straight/Lagging Drilled Well



S	L									

Process Connection "P"

1- 1" NPT
2- 1/2" NPT
3- 3/4" NPT

Bore Diameter "B"

A-.260"
B-.385"

Immersion Length "U"

Specify Whole Inches Ex. **01"-99"**
**See below for Common Sized Thermowells

Length "U" Fractional Inches

0-0.0" **4**-1/2"
1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"

Lag " T" (Inches)

Specify Whole Inches Ex. **01"-99"**

Thermowell Material

1- 304S/S **6**- Inconel
2- 310S/S **7**- Brass
3- 316 S/S **8**- Hastalloy
4- 446 S/S **9**- Monel
5- 347 S/S

Special Requirements

If none, Enter "0" If required, Enter "X" Specify.
X=_____

"P" NPT	"U" Dim	"T" Dim	"A" Dim	"Q" Dim
1/2"	2 1/2"	2"	6"	5/8"
1/2"	4 1/2"	3"	9"	5/8"
1/2"	7 1/2"	3"	12"	5/8"
1/2"	10 1/2"	3"	15"	5/8"
1/2"	13 1/2"	3"	18"	5/8"
1/2"	19 1/2"	3"	124"	5/8"

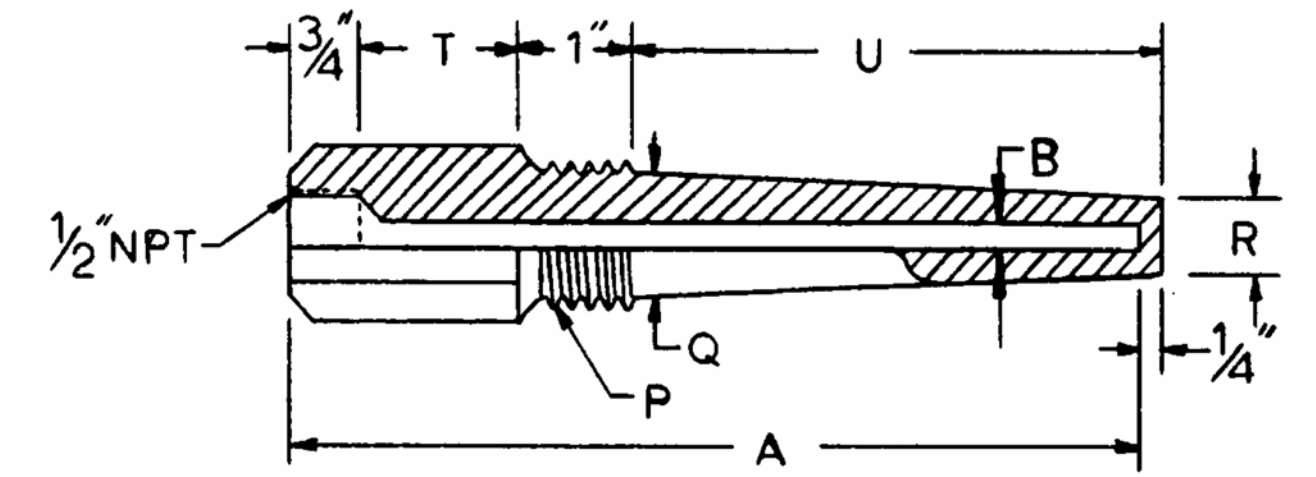
"P" NPT	"U" Dim	"T" Dim	"A" Dim	"Q" Dim
3/4"	2 1/2"	3"	6"	3/4"
3/4"	4 1/2"	3"	9"	3/4"
3/4"	7 1/2"	3"	12"	3/4"
3/4"	10 1/2"	3"	15"	3/4"
3/4"	13 1/2"	3"	18"	3/4"
3/4"	19 1/2"	3"	24"	3/4"

"P" NPT	"U" Dim	"T" Dim	"A" Dim
1"	2 1/2"	3"	4"
1"	4 1/2"	3"	6"
1"	7 1/2"	3"	9"
1"	10 1/2"	3"	12"
1"	13 1/2"	3"	15"
1"	19 1/2"	3"	18"

Q = .260" Bore = 3/4" / .385" Bore = 7/8"

*** Complete assemblies can be constructed to order, Please Consult Factory.**

TL STYLE Taper/Lagging Drilled Well



T	L									

Process Connection "P"

1- 1" NPT
2- 1/2" NPT
3- 3/4" NPT

Bore Diameter "B"

A-.260"
B-.385"

Immersion Length "U"

Specify Whole Inches Ex. **01"-99"**
**See below for Common Sized Thermowells

Length "U" Fractional Inches

0-0.0" **4**-1/2"
1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"

Special Requirements

If none, Enter "0" If required, Enter "X" Specify.

X=_____

Thermowell Material

1- 304S/S **6**- Inconel
2- 310S/S **7**- Brass
3- 316 S/S **8**- Hastalloy
4- 446 S/S **9**- Monel
5- 347 S/S

Lag " T" (Inches)

Specify Whole Inches Ex. **01"-99"**

"P" NPT	"U" Dim	"T" Dim	"A" Dim	"Q" Dim	"R" Dim
1/2"	2 1/2"	2"	6"	5/8"	1/2"
1/2"	4 1/2"	3"	9"	5/8"	1/2"
1/2"	7 1/2"	3"	12"	5/8"	1/2"
1/2"	10 1/2"	3"	15"	5/8"	1/2"
1/2"	13 1/2"	3"	18"	5/8"	1/2"
1/2"	19 1/2"	3"	24"	5/8"	1/2"

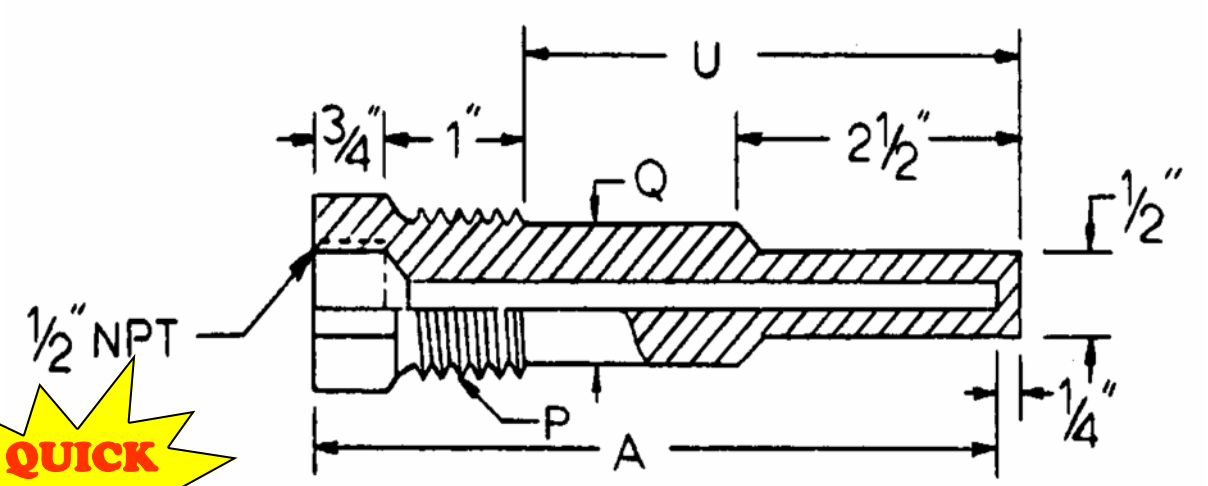
"P" NPT	"U" Dim	"T" Dim	"A" Dim	"Q" Dim	"R" Dim
3/4"	2 1/2"	3"	6"	3/4"	**
3/4"	4 1/2"	3"	9"	3/4"	**
3/4"	7 1/2"	3"	12"	3/4"	**
3/4"	10 1/2"	3"	15"	3/4"	**
3/4"	13 1/2"	3"	18"	3/4"	**
3/4"	19 1/2"	3"	24"	3/4"	**

**= .260" Bore = 5/8" / .385" Bore = 3/4"

"P" NPT	"U" Dim	"T" Dim	"A" Dim	"Q" Dim	"R" Dim
1"	2 1/2"	3"	6"	***	**
1"	4 1/2"	3"	9"	***	**
1"	7 1/2"	3"	12"	***	**
1"	10 1/2"	3"	15"	***	**
1"	13 1/2"	3"	18"	***	**
1"	19 1/2"	3"	24"	***	**

***= .260" Bore = 3/4" / .385" Bore = 7/8"

BW STYLE Stepped Drilled Thermowell



QUICK DELIVERY

B	W							

Process Connection "P"

1- 1" NPT
2- 1/2" NPT
3- 3/4" NPT

Bore Diameter "B"

A-.260"
B-.385"

Immersion Length "U"

Specify Whole Inches Ex. **01"-99"**
**See below for Common Sized Thermowells

Length "U" Fractional Inches

0-0.0"	**4**-1/2"
1-1/8"	**5**-5/8"
2-1/4"	**6**-3/4"
3-3/8"	**7**-7/8"

Thermowell Material

1- 304S/S	**6**- Inconel
2- 310S/S	**7**- Brass
3- 316 S/S	**8**- Hastalloy
4- 446 S/S	**9**- Monel
5- 347 S/S	

Special Requirements

If none, Enter "0" If required, Enter "X" & Specify.
X=_____

"P" NPT	"U" Dim	"A" Dim	"Q" Dim
1/2"	2 1/4"	4"	5/8"
1/2"	4 1/4"	6"	5/8"
1/2"	7 1/4"	9"	5/8"
1/2"	10 1/4"	12"	5/8"
1/2"	13 1/4"	15"	5/8"
1/2"	16 1/4"	18"	5/8"
1/2"	22 1/4"	24"	5/8"

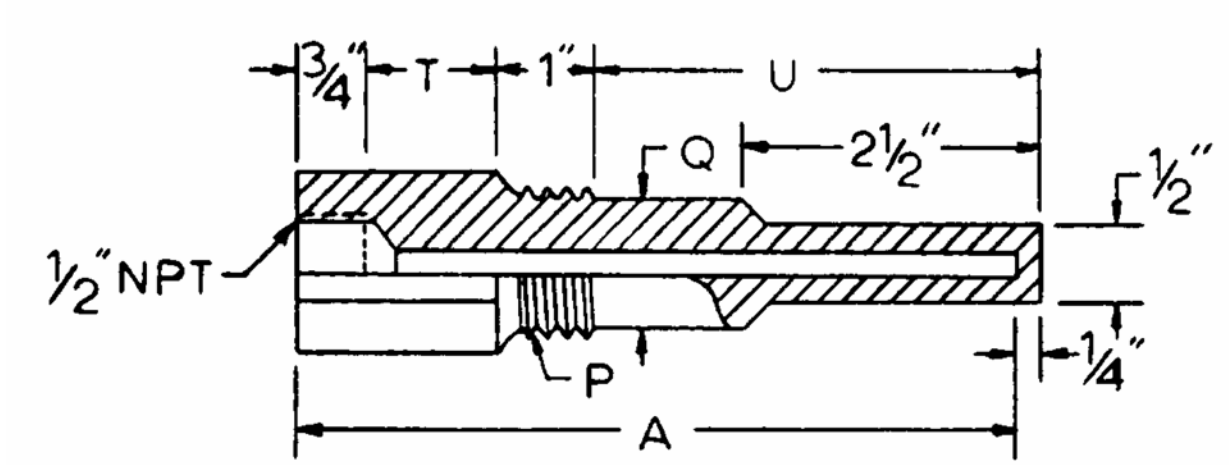
"P" NPT	"U" Dim	"A" Dim	"Q" Dim
3/4"	2 1/2"	4"	3/4"
3/4"	4 1/2"	6"	3/4"
3/4"	7 1/2"	9"	3/4"
3/4"	10 1/2"	12"	3/4"
3/4"	13 1/2"	15"	3/4"
3/4"	16 1/2"	18"	3/4"
3/4"	22 1/2"	24"	3/4"

"P" NPT	"U" Dim	"A" Dim	"Q" Dim
1"	2 1/2"	4"	**
1"	4 1/2"	6"	7/8"
1"	7 1/2"	9"	7/8"
1"	10 1/2"	12"	7/8"
1"	13 1/2"	15"	7/8"
1"	16 1/2"	18"	7/8"
1"	22 1/2"	24"	7/8"

**= .260" Bore = 3/4" / .385" Bore = 7/8"

* Complete assemblies can be constructed to order, Please Consult Factory.

BL STYLE Stepped/Lagging Drilled



B	L									

Process Connection "P"

1- 1" NPT
2- 1/2" NPT
3- 3/4" NPT

Bore Diameter "B"

A-.260"
B-.385"

Immersion Length "U"

Specify Whole Inches Ex. **01"-99"**
**See below for Common Sized Thermowells

Length "U" Fractional Inches

0-0.0" **4**-1/2"
1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"

Lag " T" (Inches)

Specify Whole Inches Ex. **01"-99"**

Thermowell Material

1- 304S/S **6**- Inconel
2- 310S/S **7**- Brass
3- 316 S/S **8**- Hastalloy
4- 446 S/S **9**- Monel
5- 347 S/S

Special Requirements

If none, Enter "0" If required, Enter "X" Specify.
X=_____

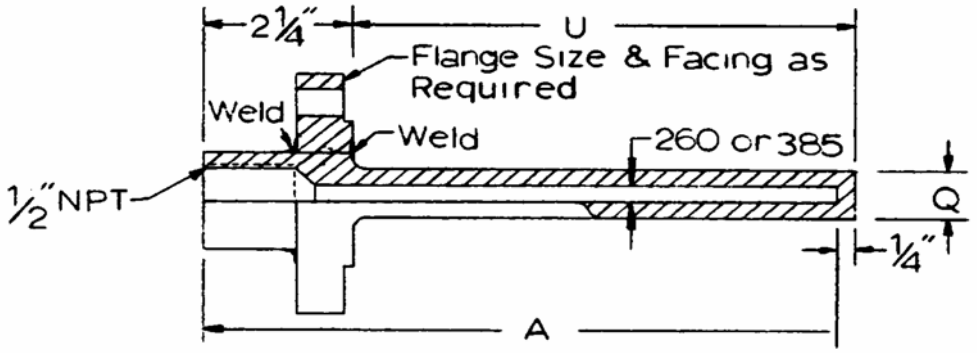
"P" NPT	"U" Dim	"T" Dim	"A" Dim	"Q" Dim
1/2"	2 1/2"	2"	6"	—
1/2"	4 1/2"	3"	9"	5/8"
1/2"	7 1/2"	3"	12"	5/8"
1/2"	10 1/2"	3"	15"	5/8"
1/2"	13 1/2"	3"	18"	5/8"
1/2"	19 1/2"	3"	24"	5/8"

"P" NPT	"U" Dim	"T" Dim	"A" Dim	"Q" Dim
3/4"	2 1/2"	2"	6"	—
3/4"	4 1/2"	3"	9"	3/4"
3/4"	7 1/2"	3"	12"	3/4"
3/4"	10 1/2"	3"	15"	3/4"
3/4"	13 1/2"	3"	18"	3/4"
3/4"	19 1/2"	3"	24"	3/4"

"P" NPT	"U" Dim	"T" Dim	"A" Dim	"Q" Dim
1"	2 1/2"	3"	6"	—
1"	4 1/2"	3"	9"	7/8"
1"	7 1/2"	3"	12"	7/8"
1"	10 1/2"	3"	15"	7/8"
1"	13 1/2"	3"	18"	7/8"
1"	19 1/2"	3"	24"	7/8"

FS STYLE Flanged Drilled Thermowell

VAN STONE & FLANGED WELLS



F	S								

Special Requirements

If none, Enter "0" If required, Enter "X" & Specify.
X=_____

Bore Diameter "B"

A-.260" **B-**.385"

Immersion Length "U"

Specify Whole Inches Ex. **01"-99"**
**See below for Common Sized Thermowells

Thermowell Material

1- 304S/S **6-** Inconel 600
2- 310S/S **7-** Inconel 800
3- 316 S/S **8-** Hastalloy
4- 446 S/S **9-** Monel
5- 347 S/S

Length "U" Fractional Inches

0-0.0" **4**-1/2"
1-1/8" **5**-5/8"
2-1/4" **6**-3/4"
3-3/8" **7**-7/8"

Flange Size & Rating

Enter Flange Code from Tables Below ↓

Flange Material

1- 304S/S **6-** Inconel 600
3- 316 S/S **8-** Hastalloy

Standard Flanged Wells / Straight Immersion

Bore	"U" Dim	"A" Dim	"Q" Dim	Code
.260"	2"	4"	3/4"	01
.260"	4"	6"	3/4"	02
.260"	7"	9"	3/4"	03
.260"	10"	12"	3/4"	04
.260"	16"	18"	3/4"	05
.260"	22"	24"	3/4"	06
.385	2"	4"	7/8"	07
.385	4"	6"	7/8"	08
.385	7"	9"	7/8"	09
.385	10"	12"	7/8"	10
.385	16"	18"	7/8"	11
.385	22"	24"	7/8"	12

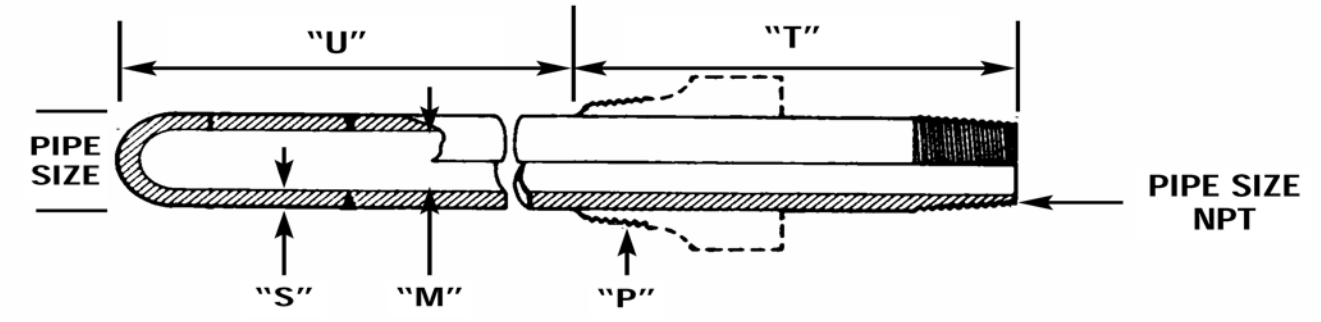
Standard Flanged Selection

Rating	Facing	Size	Code
150#	R.F. or F.F.	1 1/4"	A
150#	R.F. or F.F.	1 1/2"	B
150#	R.F. or F.F.	2"	C
150#	R.T.J.	1"	D
150#	R.T.J.	1 1/2"	E
150#	R.T.J.	2"	F
300#	R.F. or F.F.	1"	G
300#	R.F. or F.F.	1 1/2"	H
300#	R.F. or F.F.	2"	I
300#	R.T.J.	1"	J
300#	R.T.J.	1 1/2"	K
300#	R.T.J.	2"	L

Flanged Selection

Rating	Facing	Size	Code
400-600#	R.F. or F.F.	1"	M
400-600#	R.F. or F.F.	1 1/2"	N
400-600#	R.F. or F.F.	2"	O
400-600#	R.T.J.	1"	P
400-600#	R.T.J.	1 1/2"	Q
400-600#	R.T.J.	2"	R
900-1500#	R.F. or F.F.	1"	S
900-1500#	R.F. or F.F.	1 1/2"	T
900-1500#	R.F. or F.F.	2"	U
900-1500#	R.T.J.	1"	V
900-1500#	R.T.J.	1 1/2"	W
900-1500#	R.T.J.	2"	Z

STYLE – PIPE TYPE – STOCKED STANDARD MATERIAL
304 SS AND 316 SS, 446 SS AND INCONEL ALLOY'S



P														

Pipe Size "P"

Code	(NPT)	OD
A	1/4""	.540"
B	3/8"	.675"
C	1/2"	.840"
D	3/4"	1.050"
E	1"	1.315"

Pipe Type "S"

Code	
N	Schedule 40
H	Schedule 80
X	Other

Length "U" Inches

Specify Whole Inches Ex. **01"-99"**

Length "U" Fractional Inches

0-0.0"	**4**-1/2"
1-1/8"	**5**-5/8"
2-1/4"	**6**-3/4"
3-3/8"	**7**-7/8"

Process Connection Size "P" (inches)

Non-Flanged w/ Mount Bushing		Flanged / Flange Size	
A- 1/4" NPT	**E**- 1" NPT	**1**- 3/4"	**5**- 3.0"
B- 3/8" NPT	**F**- 1-1/4" NPT	**2**- 1.0"	**X**-Specify
C- 1/2" NPT	**G**-1-1/2" NPT	**3**- 1-1/2"	"**0**" = No Flange or Bushing Required
D- 3/4" NPT	**H**– 2" NPT	**4**- 2.0"	

Pipe Material

A- 304 S/S
C- 316 S/S
K- 446 S/S
I- Inconel 600
W- Inconel 601

Flange Rating (LBS)

Code / Rating	
0– No Flange	**D**- 900
A– 150	**E**– 1500
B– 300	**F**- 2500
C– 600	**X**- Other

Flange Face Type

Code / Type	
0– No Flange	**3**– Ring Joint
1- Raised Flange	**4**– Lap Joint
2- Flat Flange	**X**–Specify

Special Requirements

If none, Enter "0" If required, Enter "X" & Specify.
X=_____

Bore Dia. " M" (Inches)

Code
J– Per Pipe Size

Lag Length "T" Fractional Inches

0-0.0"	**4**-1/2"
1-1/8"	**5**-5/8"
2-1/4"	**6**-3/4"
3-3/8"	**7**-7/8"

Lag " T" (Inches)

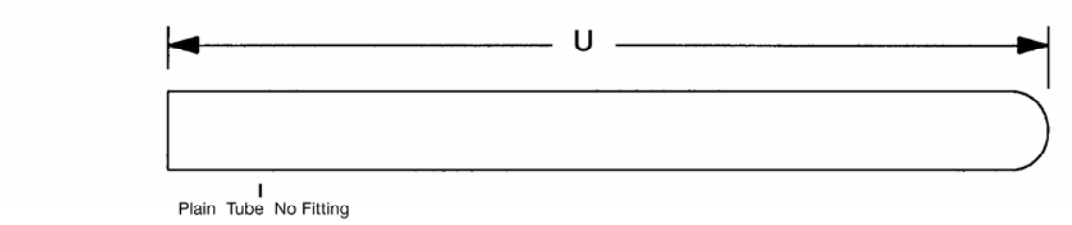
Specify Whole Inches Ex. **0"-9"**

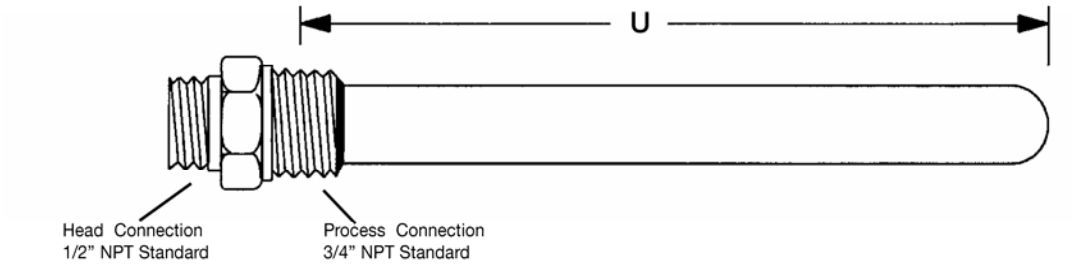
Flange or Bushing Material

0- No Flange or Bushing
A- 304 S/S
C- 316 S/S
G- Carbon Steel
K- 446 S/S
I- Inconel 600
X– Specify

NOTE: When No Bushing or Flange is Required "U" Becomes Overall Length

Ceramic Protection Tubes





C	T								

Protection Tube Diameter*

Code	I.D. x O.D.
1	1/4" x 3/8"
3	3/8" x 1/2"
5	1/2" x 3/4"
6	3/4" x 1.0"
7	1.0" x 1 1/4"

Head Connection Thread

0– None
2– 1/2" NPT
3– 3/4" NPT

Process Connection **

0– None
2– 1/2" NPT

Protection Tube Length "U"

Specify Whole Inches Ex. **01"-99"**

Special Requirements

If none, Enter "0" If required, Enter "X" Specify.

X=_____

Protection Tube Material

Code	Material	Max. Temp
A	Alumina	3400F
M	Mullite	2750F
S	Silicon Carbide	3000F

Length "U" Fractional Inches

0-0.0"	**4**-1/2"
1-1/8"	**5**-5/8"
2-1/4"	**6**-3/4"
3-3/8"	**7**-7/8"

Call Today!
800-348-4678

* Other Diameter Tubes Available
** Other Fittings & Sizes Available, Consult

SECTION 5

Sensor Hardware & Accessories

Mounting Fittings

Fixed Type Fittings

Fixed type fittings are brazed or welded to the sheath. All fittings are made of 304 or 316 stainless steel. Note that the exact immersion length of sensor (or well "stem length") must be known with this type of fitting.

Double Threaded Bushing– Process Fitting

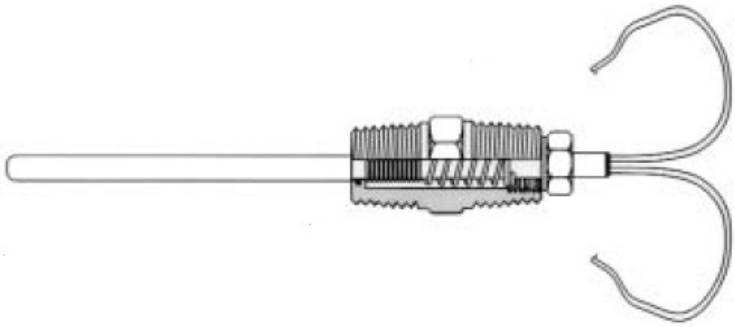
Part Number	Male NPT Thread
D2	1/4"
D4	1/2"
D6	3/4"

Single Threaded Bushing– Mounting Fitting

Part Number	Male NPT Thread
Q1	1/8"
Q2	1/4"
Q4	1/2"
Q6	3/4"

Spring Loaded Fittings have a 316 SS Body with an Inconel® 600 Spring

These spring loaded fittings feature a fluid tight seal pressure rated to 50 psi at ambient. Primarily designed for use with thermowells and ensures bottom contact.



Low cost spring loaded fittings for drilled well and non-fluid applications, see L Series.

Spring Loaded Process Bushing (Fluid)

Part Number	Tube O.D.	Male NPT
S4-125	.125"	1/2"
S4-188	.188"	1/2"
S4-250	.250"	1/2"

Spring Loaded Process Bushing (Non-Fluid)

Part Number	Tube O.D.	Male NPT
L4-125	.125"	1/2"
L4-188	.188"	1/2"
L4-250	.250"	1/2"

Compression Fittings

Re-adjustable Compression Fittings

Made entirely of 304 stainless steel, these fittings can be relocated at different positions along the sheath. Sealant glands are available in Teflon® (500°F) and Lava (1000°F). Pressure is rated up to 3,000 psi.

Re-adjustable Compression Fittings

Tube O.D.	Male NPT	Teflon Part #	Lava Part #
.063”	1/8”	T1	V1
.125”	1/8”	T2	V2
.188”	1/8”	T3	V3
.250”	1/8”	T4	V4
.125”	1/4”	T5	V5
.188”	1/4”	T6	V6
.250”	1/4”	T7	V7
.250”	1/2”	T8	V8

Non - Adjustable Compression Fittings

Non - Adjustable compression fittings available in stainless steel and brass. These fittings cannot be relocated along the sheath once tightened. The 304 stainless fittings have pressure ratings up to 10,000 psi, depending on temperature and sheath diameter.

Non - Adjustable Compression Fittings

Tube O.D.	Male NPT	S/S Part #	Brass Part #
.063”	1/8”	N1	B1
.125”	1/8”	N2	B2
.188”	1/8”	N3	B3
.250”	1/8”	N4	B4
.125”	1/4”	N5	B5
.188”	1/4”	N6	B6
.250”	1/4”	N7	B7
.250”	1/2”	N8	B8
.500”	1/2”	N9	B9

Mounting Fittings

Bushing & Plate/ Collar assembly shown separately

FLAME PATH COLLAR ASSEMBLY

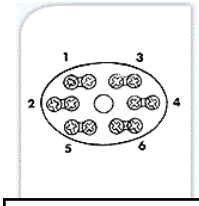
Part#	ID of Collar
TCFPA-6.1	**6.1MM**
TCFPA-8.1	**8.1MM**
TCFPA-9.6	**9.6MM**

- **Flame Collar Assembly to suit ATEX approved heads**
- **Not required for FM approved heads**
- **Material: SS304**
- **Bushing Thread: M20x1.5**
- **Suitable for 40mm & DIN size terminal blocks & transmitters**
- **Mount spring loaded terminal blocks directly on to collar plate for spring loaded assembly**

Bushing & Plate/ Collar assembly shown together. Assembly fits into ATEX rated heads

Connector Blocks for Plastic Heads

(2) Terminals
Part# EGT-CB-4-2
(3) Terminals
Part# EGT-CB-4-3



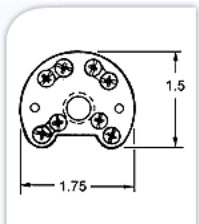
(4) Terminals
Part# EGT-CB-4-4
(6) Terminals
Part# EGT-CB-4-6

CB-4 Series

- Designed for use with #H4-1 Series plastic connection heads.
- May be used with most connection heads (except #H8 Series).
- Stepped center hole for spring loaded probes.
- Recommended wire size: #26 - #16 AWG.
- Material: Polypropylene / Max Temp 198F

CB-5 Series

- Designed for use with #H8-2 Series plastic connection head.
- May be used with most connection heads.
- Stepped center hole for spring loaded probes.
- Accepts #26 - #16 AWG
- Material: Polypropylene / Max Temp 198F



(2) Terminals
Part# EGT-CB-5-2
(3) Terminals
Part# EGT-CB-5-3

(4) Terminals
Part# EGT-CB-5-4

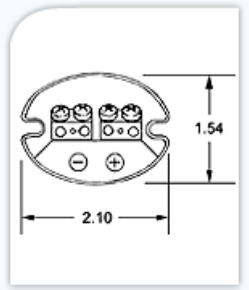
Connector Blocks for Metal Heads

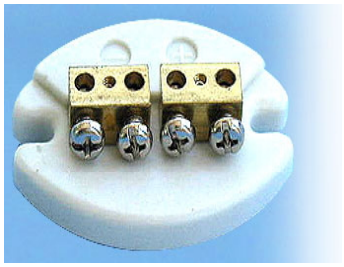
- **Connector blocks offer ceramic cast base with brass connection body and stainless steel screws.**
- **CB-3 blocks also offers a center core hole for Spring Loaded Sensor travel which is common in RTD assemblies.**

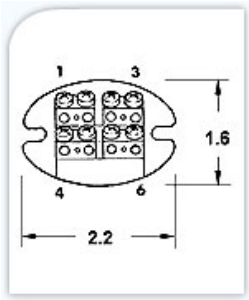
CB-1 Series

- Use with most connection heads (except #H8-2 Series).
- Brass terminals angled or straight for easy access.
- Accepts wire size: #22 - #8 AWG.
- Material: Ceramic L-5 Steatite

Part# EGT-CB-1-S (Straight Terminals)
Part# EGT-CB-1-A (Angled Terminals)







CB-2 Series

- Use with most connection heads (except #H8-2 Series).
- Brass terminals angled or straight for easy access.
- Accepts wire size: #22 - #8 AWG.
- Material: Ceramic L-5 Steatite

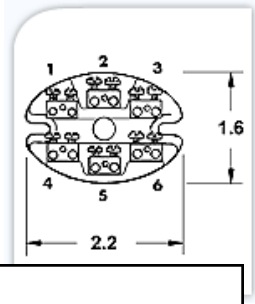
(2) Terminals
Part# EGT-CB-2-2S (Straight Terminals)
Part# EGT-CB-2-2A (Angled Terminals)

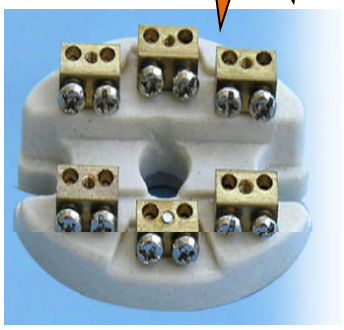
(4) Terminals
Part# EGT-CB-2-4S (Straight Terminals)
Part# EGT-CB-2-4A (Angled Terminals)

Our Most Popular!

CB-3 Series

- Use with most connection heads (except #H8-2 Series).
- Stepped center hole for spring loaded probes
- Accepts wire size: #22 - #10 AWG.
- Material: Ceramic L-5 Stealite





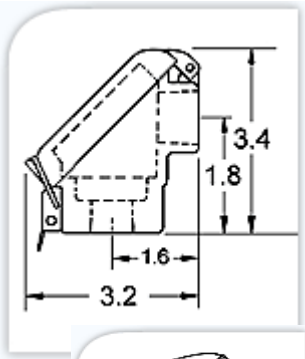
(2) Terminals
Part# EGT-CB-3-2S (Straight Terminals)
(3) Terminals
Part# EGT-CB-3-3S (Straight Terminals)

(4) Terminals
Part# EGT-CB-3-4S (Straight Terminals)
(6) Terminals
Part# EGT-CB-3-6S (Straight Terminals)

***ALSO SEE PAGES 91-92
For Programmable Transmitters!

Note: Other heads and connector block systems are available, Please consult factory.

Connection Heads



General Purpose Flip Top Head

The H2-1 Series head features a hinge-cover cap for convenience. This head will accommodate DIN standard transmitters. The polished aluminum finish and silicone gasket are corrosion resistant. A weather-tight seal offers protection from wind-blown rain and dust, and carries a NEMA 4 rating.

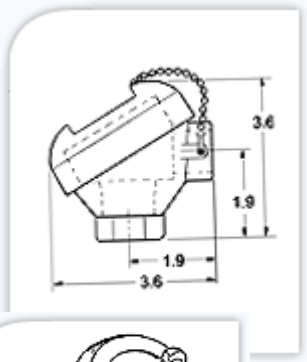
This head is ideal as a general-purpose head for customers interested in convenient access to internal instrumentation.

FEATURES

- Weather-tight seal - NEMA 4 rating.
- 2-wire DIN transmitters directly mount.
- Convenient flip-top closure
- Durable, flexible silicone gasket offers superior seal.
- Area on cap for application of private label.
- Conduit opening size: 3/4" or 1/2" NPT

General Purpose Flip Top T/C Head

Part Number	Opening NPT Size (Conduit / Process)	Materials
H2-1-1118	3/4" X 1/8"	Aluminum
H2-1-1112	3/4" X 1/2"	Aluminum
H2-1-1112X	1/2" X 1/2"	Aluminum
H2-1-1134	3/4" X 3/4"	Aluminum



General Purpose Screw Cap Head

The H3-1 Series head features a screw-closure cap for security. The polished aluminum finish and silicone gasket are corrosion resistant. A weather-tight seal offers protection from wind-blown rain and dust. NEMA 4 rating.

This head offers excellent protection for internal instrumentation and is ideal as a general-purpose head.

FEATURES

- Weather-tight seal - NEMA 4 rating.
- 2-wire transmitters directly mount.
- Fits connection blocks up to 2" diameter.
- Secure, screw-top closure
- Stainless steel hardware
- Durable, flexible silicone gasket offers superior seal.
- Epoxy coating available
- Conduit opening size: 3/4" or 1/2" NPT
- Can be modified for DIN Transmitters

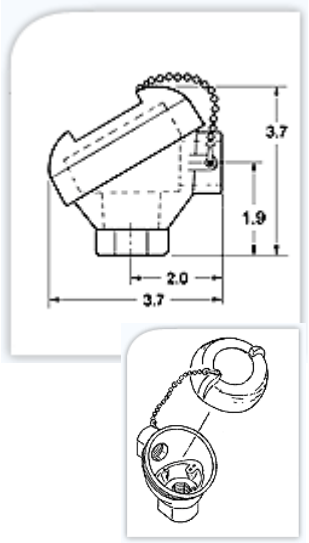
General Purpose Screw Cap T/C Head

Part Number	Opening NPT Size (Conduit / Process)	Materials
H3-1-1418	3/4" X 1/8"	Aluminum
H3-1-1412	3/4" X 1/2"	Aluminum
H3-1-1412X	1/2" X 1/2"	Aluminum
H3-1-1434	3/4" X 3/4"	Aluminum

Connection Heads

FEATURES

- Weather-tight seal - NEMA 4 rating
- Fits connection blocks up to 2" diameter.
- 2-wire transmitters directly mount
- Stainless steel hardware
- Secure, screw-top closure
- Durable, flexible silicone gasket offers superior seal.
- Area on cap for application of private label.
- Conduit opening size: 3/4" NPT
- Can be modified for DIN Transmitters



General Purpose CAST IRON H/D Screw Cap T/C Head

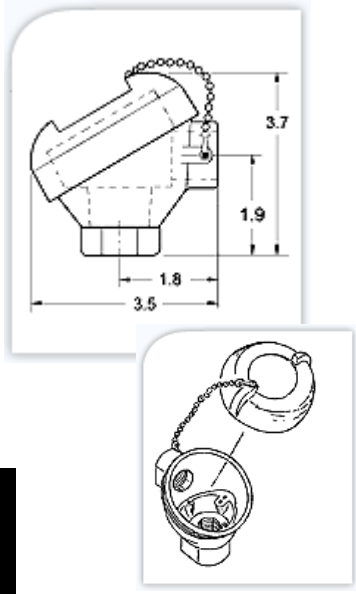
Part Number	Opening NPT Size (Conduit / Process)	Materials
H6-1-2512	3/4” X 1/2”	Cast Iron
H6-1-2534	3/4” X 3/4”	Cast Iron

Heavy Duty Cast Iron Screw Cap Head

The H6-1 Series head features a screw-closure cap for security. A durable paint is applied as a rust preventative finish. A weather-tight silicone seal offers protection from wind-blown rain and dust. This head carries a NEMA 4 rating. This head is ideal as a heavy duty head for customers

FEATURES

- Constructed of corrosion resistant 316L SS
- 2-wire transmitters directly mount.
- Fits connection blocks up to 2" diameter.
- Stainless steel hardware
- Durable, Flexible Silicone gasket offers superior seal.
- Area on cap for application of private label.
- Conduit opening size: 3/4" NPT
- Can be modified for DIN Transmitters



General Purpose Stainless Steel H/D Screw Cap T/C Head

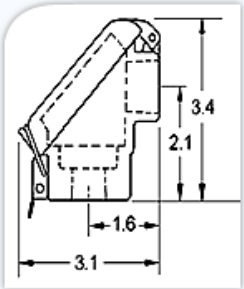
Part Number	Opening NPT Size (Conduit / Process)	Materials
H7-1-1812	3/4” X 1/2”	Stainless Steel
H7-1-1834	3/4” X 3/4”	Stainless Steel

Stainless Steel Corrosion Resistant Head

The H7-1 Series head features a screw-closure cap for security. The head is constructed of 316L stainless steel, giving it excellent chemical and corrosion resistance.

A weather-tight seal offers protection from wind-blown rain and dust. This head carries a NEMA 4X rating.

Connection Heads



FEATURES

- Molded from FDA app. white polypropylene.
- Continuous use temp. rating of 198° F.
- Weather-tight seal - NEMA 4X rating.
- Durable, flexible silicone gasket offers superior seal.
- Convenient latching closure mechanism.
- Stainless steel cotter pin provided for security.
- Area on cap for application of private label.
- Conduit opening size: 3/4" NPT

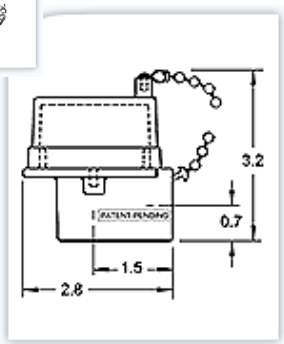
Food Service Flip Top Head

The H4-1 Series head features a hinge-cover cap for convenience. It is molded from FDA-approved white polypropylene, and is suitable for sanitary applications. A weather-tight seal offers protection from wind-blown rain and dust. This head carries a NEMA 4X rating.

This head is ideal as a general-purpose head for customers interested in convenient access to internal instrumentation.

FDA Approved Flip Top T/C Heads

Part Number	Opening NPT Size (Conduit / Process)	Material
H4-1-1218	3/4" X 1/8"	WHT Polypropylene
H4-1-1212	3/4" X 1/2"	WHT Polypropylene
H4-1-1234	3/4" X 3/4"	WHT Polypropylene
H4-1-1312*	3/4" X 1/2"	BLACK Polypropylene



FEATURES

- Molded from FDA app. white polypropylene or acetal copolymer (Duracon®)
- Standard DIN transmitters directly mount.
- Continuous use temp. rating of 198° F. (PP)
- Weather-tight seal - NEMA 4X rating.
- Durable, flexible silicone gasket offers superior seal.
- Secure, screw-top closure.
- Area on cap for application of private label.
- Conduit opening size: 3/4" NPT
- Can be modified for DIN Transmitters

FDA Approved Screw Cap T/C Heads

The H8-1 Series head features a screw-cover cap for security. It is molded from either FDA-approved white polypropylene or acetal co-polymer (Duracon®) for alternate chemical resistance. This head is suitable for sanitary applications. A weather-tight seal offers protection from wind-blown rain and dust.

This head carries a NEMA 4X rating. This head is ideal as a general-purpose head in sanitary applications requiring caustic wash down.

FDA Approved Screw Cap T/C Heads

Part Number	Opening NPT Size (Conduit / Process)	Material
H8-2-2212	3/4" X 1/2"	WHT Polypropylene
H8-2-2212D	3/4" X 1/2"	Acetal co-polymer (Duracon®)

Connection Heads

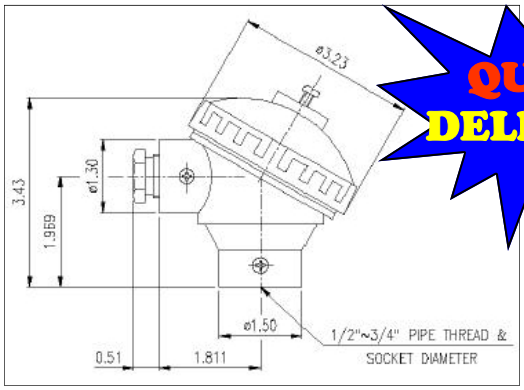
H4- Series : Polypropylene Screw Cover

H4-KTC-1234 H4-CTC-1234

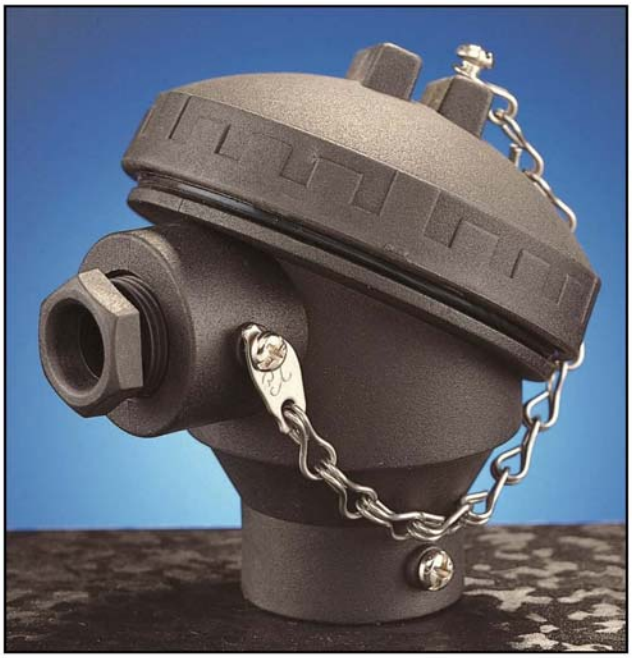
H4-KTC-1234-B H4-CTC-1234-B

- **Suits DIN Transmitters, fits most other blocks**
- **FDA Approved Polypropylene**
- **New CTC series: 1½" OD logo fits on cover**

Part#	Description
H4-KTC-1234	**1/2" NPT Process x 3/4" NPT Conduit**
H4-CTC-1234	**1/2" NPT Process x 3/4" NPT Conduit**
H4-CTC-1234-B	**1/2" NPT Process x 3/4" NPT Conduit (Black)**
H4-KTC-1234-B	**1/2" NPT Process x 3/4" NPT Conduit (Black)**

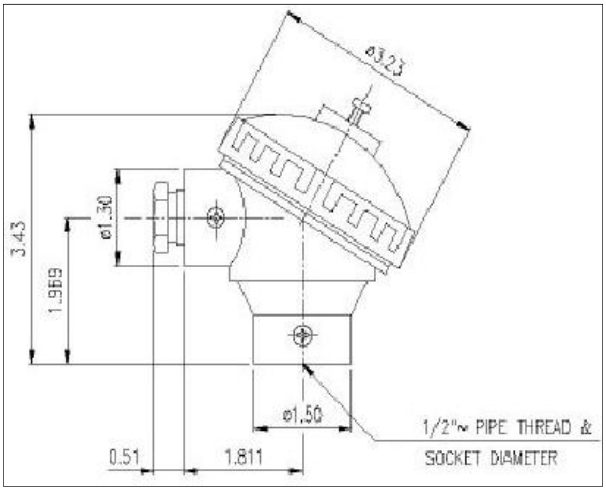


QUICK DELIVERY



H10- Series : Nylon Screw Cover

- Suits DIN Transmitters, fits most other blocks
- Rated IP65
- Other thread sizes available to special order



Part#	Description
H10-TCN-1212	**1/2" NPT Process x 1/2" NPT Conduit**

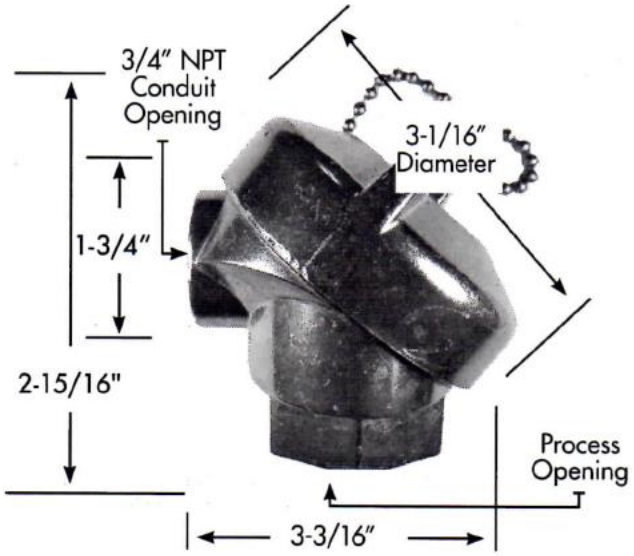
Thermocouple Heads: Explosion Proof

Heavy Duty "Explosion Proof" Screw Cap Head

The series H5-1 thermocouple and RTD connection heads listed below are UL listed and they meet the requirements listed under UL886 and CSA C22.2 for Class I Groups C, D, Division 1 and 2; Class II Groups E, F, G; Class III for use in hazardous locations as described by the National Electrical Code.

Stainless Series heads are supplied with a bright finish 316L stainless steel body and cap, and they provide excellent chemical and corrosion resistance and meets NEMA 4X requirements.

Cast Iron/Aluminum Heads are provided with a zinc-plated cast iron body and polished aluminum cap and they provide some degree of corrosion resistance. All heads are supplied with an internal ground screw, a 825°F temperature rated gasket, and they will accept most terminal blocks or standard transmitters.



Explosion Proof Screw Cover T/C Heads		
Part Number	Opening NPT Size (Conduit / Process)	Materials
H5-1-702-E	3/4" X 1/2"	Stainless Steel
H5-1-703-E	3/4" X 3/4"	Stainless Steel
H5-1-707-E	3/4" X 1/2"	Cast Iron/ Aluminum
H5-1-708-E	3/4" X 3/4"	Cast Iron/ Aluminum

Thermocouple Heads: Explosion Proof

TCA Series: Aluminum, Silver Epoxy

TCA Series: Aluminum, Blue Epoxy

TCS Series: S/S 316

XD SERIES: EXPLOSION PROOF SCREW COVER

Part#	Material	Epoxy Color	Certification	Thread Size (PExCE)
H5-TCA-1212-F	Aluminum	Sliver	FM & FMC	1/2"x 1/2" NPT
H5-TCA-1234-F	Aluminum	Sliver	FM & FMC	1/2"x 3/4" NPT
H5-TCA-3434-F	Aluminum	Sliver	FM & FMC	3/4"x 3/4" NPT
H5-TCA-1212-A	Aluminum	Blue	ATEX	1/2"x 1/2" NPT
H5-TCA-1234-A	Aluminum	Blue	ATEX	1/2"x 3/4" NPT
H5-TCA-3434-A	Aluminum	Blue	ATEX	3/4"x 3/4" NPT
H5-TCS-1212-F	S/S 316	-	FM & FMC	1/2"x 1/2" NPT
H5-TCS-1234-F	S/S 316	-	FM & FMC	1/2"x 3/4" NPT
H5-TCS-3434-F	S/S 316	-	FM & FMC	3/4"x 3/4" NPT
H5-TCS-1212-A	S/S 316	-	ATEX	1/2"x 1/2" NPT
H5-TCS-1234-A	S/S 316	-	ATEX	1/2"x 3/4" NPT
H5-TCS-3434-A	S/S 316	-	ATEX	3/4"x 3/4" NPT

FM C US APPROVED

Ex

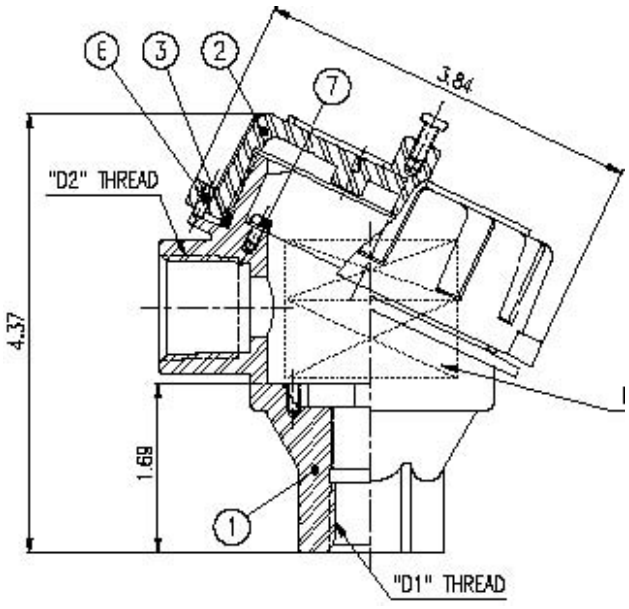
- **Certified FM & FMC (Canada) or ATEX**
- **Note: FMC conforms to all CSA Standards**
- **Available in Cast Aluminum and SS316**
- **Suitable for 40mm & DIN size terminal blocks & transmitters**
- **Supplied with Stainless Steel Chain & Screws**

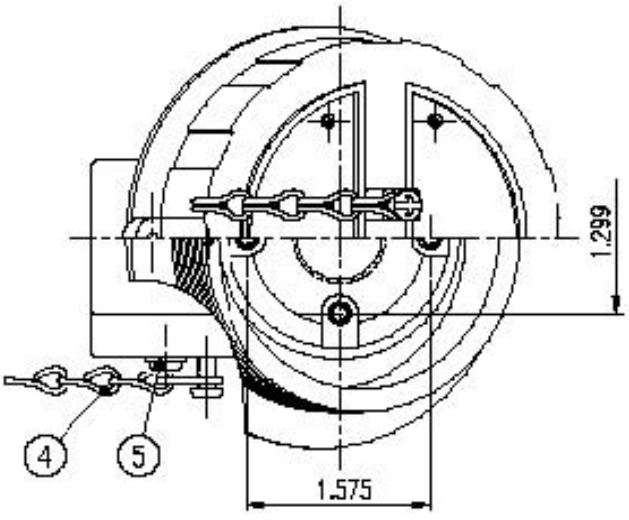
Refer to next page for specifications and drawings

Thermocouple Heads: Explosion Proof

Certification	Equipment Ratings	Compliant Approval Standards
FM	Explosion Proof for Class I, Division 1, Groups A, B, C and D;	Class 3600 1998
	and dust-ignition proof for Class II, III Division 1, Groups E, F and G,	Class 3615 2006
	hazardous (classified) locations; indoor/ outdoor	Class 3810 2005
	Aluminum: NEMA 4	ANSI/ NEMA 250
	SS316: NEMA 4X	
FMC (Canada)	Explosion Proof for Class I, Division 1, Groups A, B, C and D;	CSA-C22.2 No. 0.4 2004
	and suitable for Class II, III Division 1, Groups E, F and G,	CSA-C22.2 No. 0.5 1982
	hazardous (classified) locations; indoor/ outdoor	CSA-C22.2 No. 25 1966
	Aluminum: NEMA 4	CSA-C22.2 No. 30 1986
	SS316: NEMA 4X	CSA-C22.2 No. 94 1991
		CSA-C22.2 No. 142 1987
ATEX	Atex Directive Code: II 2 G D	BSI 07ATEX1532458U
	Standards Code: Ex d IIC T6, Ex tD A21 T100°C IP68	

Item	Description	Material
1	Body	XDA: Alloy-AL ADC12 XDS: SS316
2	Cover	XDA: Alloy-AL ADC12 XDS: SS316
3	O-Ring	EPDM
4	Chain w/ 2 Screws	SS304/ SS302
5	Screw & Locking Washer (M4x5L)	SS302/ SS304
6	Grub Screw (M3x8L)	SS302
7	Screw & Locking Washer (M3x5L)	SS302/ SS304





PR Electronic Programmable Transmitters

PR electronics is a consolidated, international company with its headquarters in Jutland Denmark. The company's core expertise is the production of high quality analogue and digital signal conditioning modules. EGT is one of the Main Distributors in Southern California.

The product range covers a wide variety of functions within signal conditioning such as displays, Ex barriers, field mounted Ex transmitters, frequency/pulse converters, trip amplifiers, isolation amplifiers, calculators, controllers, signal converters, power supplies, temperature transmitters, valve controllers, etc. All functions are grouped into five main product lines: Display, Isolation, Temperature, I.S Interfaces, Universal. PR is well known for the simple easy to program instruments that take away the nightmare & difficulty of replacing old outdated equipment.

EGT carries the entire product line, we've listed our most popular items on the following pages, Please contact us if you don't see the item your looking for! Call 1-800-348-4678.

Head Mounted Temperature Transmitters

Part#	Transmitter Input & Certification's
PRE-5334A3B	2 Wire Transmitter T/C. Input
PRE-5333A	2 Wire Transmitter RTD Input
PRE-5331A3B	2 Wire Transmitter RTD, T/C. mV & Ohm Input
PRE-5331D3B	2 Wire Transmitter RTD, T/C. mV & Ohm Input I.S-ATEX,FM,CSA
PRE-5333D	2 Wire Transmitter RTD Input I.S-ATEX,FM,CSA
PRE-5335A	2-WIRE TRANSMITTER WITH HART® PROTOCOL ATEX II 3GD
PRE-5335D	2-WIRE TRANSMITTER WITH HART® PROTOCOL I.S.-ATEX,FM,CSA
PRE-5350A	2-WIRE TRANSMITTER PROFIBUS® PA/FOUNDATION™ FIELDBUS
PRE-5350B	2-WIRE TRANSMITTER PROFIBUS® PA/FOUNDATION™ FIELDBUS I.S.

PR electronics' temperature transmitters cover every application within transmission of RTD and TC sensor signals into mA, mV, HART, PROFIBUS® PA and FOUNDATION™ Fieldbus communication. The product range includes: PRetrans 5100, PRetop 5300, PRetrans 6300, The 2200 series

PRetrans 5100, PRetop 5300 and PRetrans 6300
With the unique AUTOSWITCH, which automatically recognizes the protocol to which the transmitter is connected, these temperature transmitters can be integrated in both PROFIBUS® PA and FOUNDATION™ Fieldbus systems.

- The digital communication permits the user to carry out differential, redundancy and average measurements, PID regulation, diagnostics, etc.
- The integrated calibration function allows set up of sensor error detection.
- The transmitters are available for both standard and I.S. applications.
- The transmitters are most flexible and configurable through PR electronics' own PC program, PReset, or the common bus systems dependant on transmitter type.

PRetop 5350 and PRetrans 6350

- Bus transmitters compatible with the PROFIBUS® PA and FOUNDATION™ Fieldbus protocols.
- Level transmitters for Ohmic level sensors with potentiometers up to 100 kOhm with the standardized bus protocols PROFIBUS® PA and FOUNDATION™ Fieldbus as output.
- LAS function and PID are both integrated in the FOUNDATION™ Fieldbus transmitter.
- PRetop 5350 and PRetrans 6350 are available as standard or I.S. versions.
- PRetop can be mounted in DIN form B sensor head and is thus suitable for direct mounting at the measurement area.
- The PRetrans 6350 is for DIN rail mounting and is thus appropriate for mounting in control room.

The 2200 series

A number of low-priced temperature transmitters each covering a specific application make up the 2200 series. Some transmitters are configured from factory; others can be programmed wholly or partly through DIP-switches or front/display.

PR Electronic Programmable Transmitters

DIN Rail Transmitters

In all aspects of the design PR electronics has focused on the universality of the 4000 series. Hence, the 4 product variants cover hundreds of applications, resulting in reduced stock as well as increased flexibility and competitiveness:

- Universal supply voltage of 21.6..253 VAC / 19.2..300 VDC.
- Universal input module for the connection of mA, V, Pt100, T/C, lin. R and potentiometer.
- Universal programming by way of the display front 4501, which recognizes the module type in question and adapts the menu structure accordingly.

The communication between user and module is characterized by its simplicity and thus the configuration can be carried out without a detailed manual. The following features optimize the usability of the PReasy 4000 series:

- The menu is easily understandable as the scrolling help text guides the user through all the configuration steps.
- All configuration options can be selected from the display front without the need of a PC, DIP-switches, jumpers or special tools.

Part#	DIN Rail Transmitter / T/C -RTD Input & Certification's
PRE-4114	Universal Transmitter Din Rail Mounting
PRE-4116	Universal Transmitter w/ Relays for Din Rail Mounting
PRE-4131	Programmable Universal Trip Amplifier Din Rail Mounting
PRE-4222	Universal I/F Convertor Din Rail Mounting

EGT carry's the entire line of PR Electronics,
If you don't see the item your looking for, feel free to...
Call us @ 1-800-348-4678

Transmitter Programming Options

Display Front PRE-4501

Communications interface with front keys for modification of operational parameters in the 4000 and 9000 series. The scrolling help text in the display is available in 7 languages and guides the user effortlessly through all the configuration steps. The 4501 is easily moved from one module to another whereby the configuration can be copied to other modules of the same type. When mounted in the process, the 4501 displays process data and module status.

Loop Link PRE-5909

Loop Link 5909 is a USB communications interface for configuration and monitoring of PR electronics' PC-programmable modules. PR modules available in the configuration program PReset ver. 5.0 or higher, can be programmed by way of Loop Link 5909.

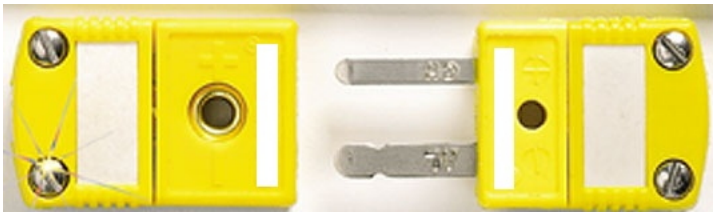
Termination & Connector Systems

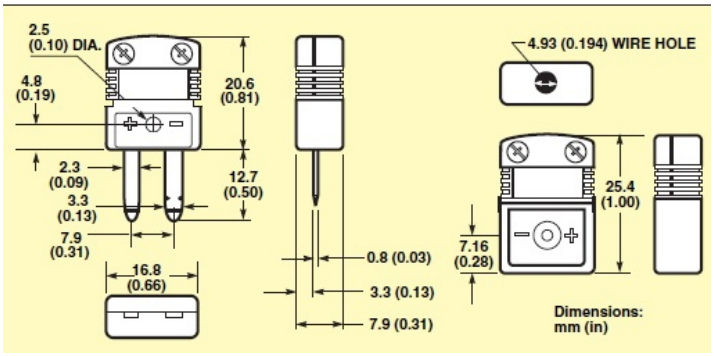
Miniature Connector Systems

Miniature connectors are becoming the most popular size. We offer two different sizes that will fill a broad range of applications. Mini's offer lower cost with ANSI calibrations and color codes as standard.

- Heavy duty construction / MADE IN USA!
- Solid flat pins for strength
- Accepts wire sizes up to 20 AWG
- Economical
- Glass filled Nylon construction is rated to 220°C (425°F)

Mini Connector	Part#	Specify Calibration
Male / Plug	P20-	*(J,K,T,E,N, R/S)*
Female / Jack	J20-	*(J,K,T,E,N, R/S)*





Mini Connector Accessories

Moisture Resistant Boots

Part# EGT-MRB– PAIR

Metal Cable Clamp

Part# EGT-MCC

Metal Safety Clip

Part# EGT-MSCL

Wire Strain Relief's

Part# EGT-SRT-532-10

Round Hole Mounting Brkt

Part# EGT-RHMB– 01

Panel Mounting Brkt

Part# EGT-PMB– 01

Crimp Brass Adapters

Part# EGT-CBA- (Specify Tube Size)

Dual Plug Tube Clamp

Part# EGT-DPTC- (Specify Tube Size)

Termination & Connector Systems

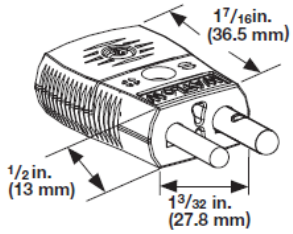
Standard Connector Systems

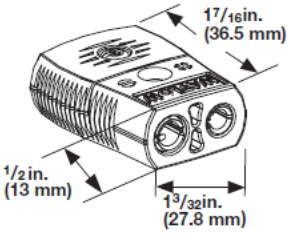
EGT's standard line of connector systems are lightweight, rugged, accurate and features a clamping mechanism that is unique in the industry. The new, easy-to-use clamping connection will replace the traditional screw and wire wrap. This new device allows a straight-in application, which squeezes the wire and forms a tight connection assuring a clean, strong signal.

Features and Benefits

- **ASTM color coded /** Assures easy identification
- **Compensated alloys /** Provides accuracy in readings
- **Glass-filled thermoplastic /** Provides high impact strength
- **Captive cap screws /** Secure connection
- **Connection hardware /** Redesigned to eliminate a number of components
- **Meets requirements for ASTM E1129 /** Ensures adequate pin spacing, dimensions and contact resistance
- **Rated to 215°C (425°F)**

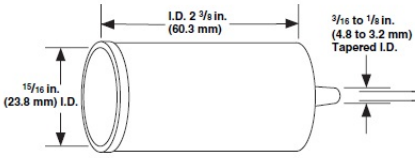
Std. Connector	Part#	Specify Calibration
Male / Plug	P10-	*(J,K,T,E,N, R/S)*
Female / Jack	J10-	*(J,K,T,E,N, R/S)*





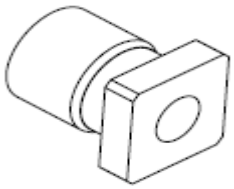
Standard Connector Accessories

Moisture Resistant Boot



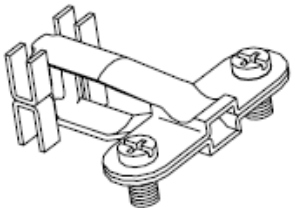
Part# EGT-MRB1– PAIR

Crimp Brass Adapter

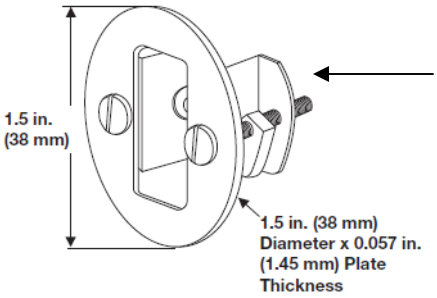


Part# EGT-CBA1-
(Specify Tube Size)

Metal Cable Clamp



Part# EGT-SAC220



Single Panel Mount Hardware, 425°F (218°C)

Designed for use with EGT's standard thermocouple connectors, these units fit panels up to 7⁄16 inch thick. Panel cutout: 1-1⁄8 inch to 1-5⁄32 inch hole. Units fit into standard 3⁄4 inch knockouts.

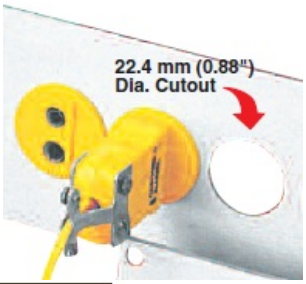
Part# EGT-SNP1

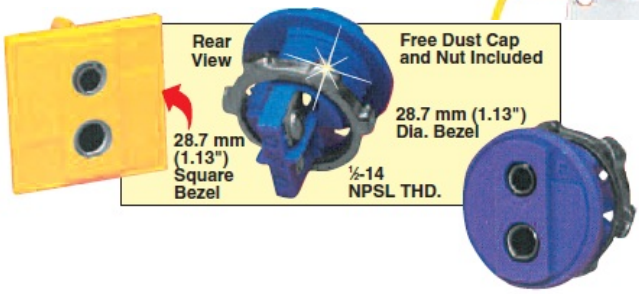
Round Hole Panel Jacks

Type RSJ—Standard Size Connectors

Easy Installation

No special tooling is required for installation. Just drill or punch a round hole in your panel and tighten the supplied nut. Ideal for single circuit applications where the connector must blend with existing instrumentation. Thermocouple circuits can be added to existing panels with only minimal interruption of operations. A choice of either square or round face is available to match the design lines of your installation. Thermocouple grade alloys used to form the contacts preserve the accuracy of the circuit even in changing ambient temperatures.



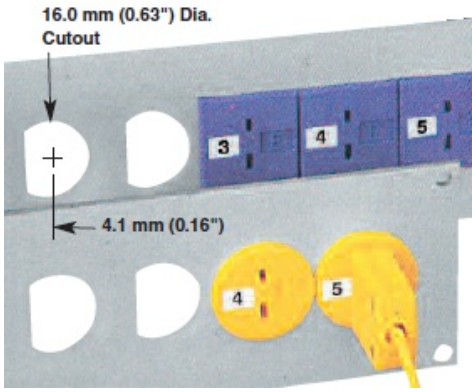


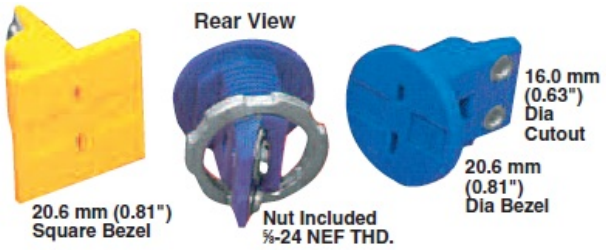
*For Standard Size Connectors

Square Face	Round Face	Specify Calibration
EGT-RSJ-S	EGT-RSJ-R	J,K,E,T,R/S

Type RMJ -Miniature Size Connectors

- **Standard Accepts All Industry Standard Size Connectors**
- **Miniature Accepts All Industry Miniature Size Connectors**
- **Mounts in Round or "D" Punch Holes**
- **Square or Round Bezel to Match Your Panel Components**
- **Heavy Duty Glass-Filled**
- **Nylon Rated to 220°C (425°F)**
- **Polarity Keyed**
- **Color-Coded**
- **No Filing Required**

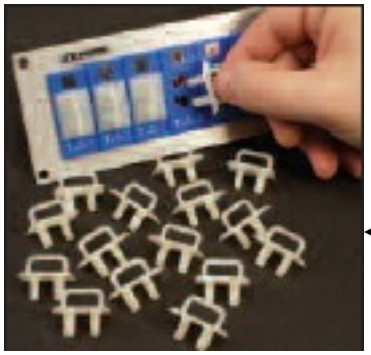




*For Miniature Size Connectors

Square Face	Round Face	Specify Calibration
EGT-RMJ-S	EGT-RMJ-R	J,K,E,T,R/S

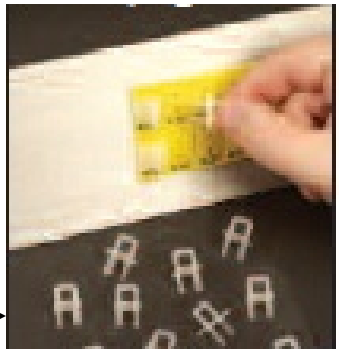
Std / Mini Connector Dust Caps



When the connector is not in use protect your investment by adding dust connector caps to keep debris / moisture out! They come in a package of 12pcs.

Part# EGT-SPJ-CAP (12 Pack) STD.

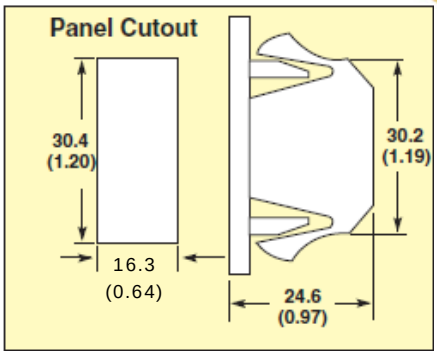
Part# EGT-MPJ-CAP (12 Pack) Mini



Standard / Mini Snap-In Panel Jacks

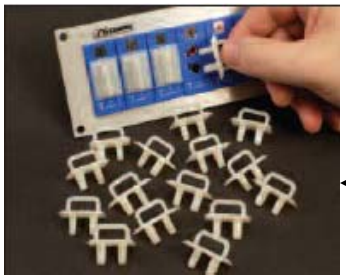
Mounting hardware has been eliminated in the SPJ-style panel jack by including retaining spring clips as part of the body design. A small tab and notch are provided to maintain straight, even rows without the need for precision matching. SPJ color-coded nylon connectors accept any standard size male thermocouple connector and are available in all ANSI calibrations as well as tungsten alloys.

- **No Installation Tools Needed**
- **Interlocking**
- **Color-Coded**
- **Numbered**
- **Reusable**
- **Accepts All Standard Size and Miniature Male Connectors**
- **Combination Phillips/Slot Screws**
- **Wire Divider**
- **Accepts Solid or Stranded Wire up to Size 14 AWG**
- **Free ID Number Labels and Dust Cap Supplied with Each Jack**



Snap Jack	Specify Calibration
EGT-SPJ-F-	J,K,E,T,R/S,N

MADE IN USA



Std / Mini Connector Dust Caps

Standard **Part# EGT-SPJ-CAP (12 Pack)**

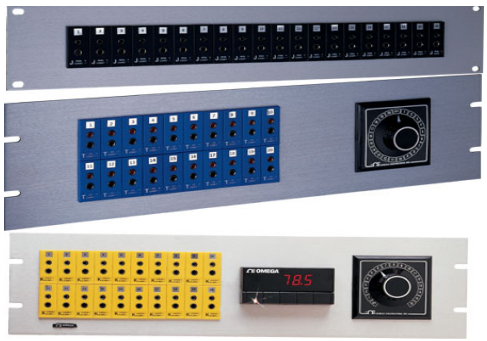
Miniature **Part# EGT-MPJ-CAP (12 Pack)**

They come in a package of 12pcs.

SPJ Removal Tool

Part# EGT-SIRT-1

For the large volume user who requires the ability to quickly remove installed connectors, the SIRT-1 removal tool is invaluable. Operating easily even in densely packed panels, the tool compresses all spring clips together allowing the TPJ to be pushed out of the panel from the rear.



Jack Panels are available from 10-40 jacks, w/or w/o instrument knockouts.

***Please consult factory for your application!**

1-800-348-4678

Termination & Connector Systems

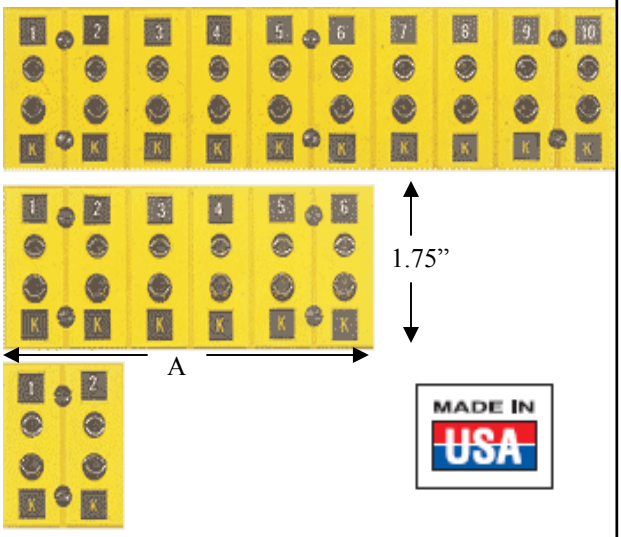
THERMOCOUPLE PANEL *Mini or Full Size, 2-Pole Stripanel®*

HI-TEMP!!

- Stripanels available in 2 to 12 circuits - Color Coded
- For cutouts - Does not require mounting frame or mounting holes.
- Stripanels can be wired and installed completely from front. Patented self-contained fastening device, "T-Nut", is permanently attached, simplifies mounting, holds tight. *Patent No. 3046515.*
- Thermocouple type and circuit numbers are marked on face of Stripanel with corresponding circuit numbers and polarity identification on the back. Stripanels are numbered starting from "1" unless specified otherwise.
- Panel bodies molded of glass filled thermoset compounds *(will not melt)* for high strength and dependability. The color coded panels will withstand ambient temperatures to 400°F (205°C) continuous and 500°F (260°C) intermittent. High-Temperature Panels (all Hi-Temp panels are color coded red) will withstand ambient temperatures to 800°F (425°C) continuous and 1000°F (540°C) intermittent.
- Inserts are spring loaded collet type to assure positive full contact with the negative insert larger making it virtually impossible to mismate.
- For corrosive applications, gold or nickel plated prongs and inserts are available. ***Caution - system errors can result from use of plated contacts if significant thermal gradients exist at connector.***

Number of Circuits	"A" Dimension Panel Length	Dimension Cutout Length	Full Size 2-Pole Panel	*Hi-Temp* Full Size 2-Pole Panel
2	1 1/2"	1 5/16"	EGT-1032-2-*	EGT-1132-2-*
3	2 1/4"	2 1/16"	EGT-1032-3-*	EGT-1132-3-*
4	3"	2 13/16"	EGT-1032-4-*	EGT-1132-4-*
5	3 3/4"	3 9/16"	EGT-1032-5-*	EGT-1132-5-*
6	4 1/2"	4 5/16"	EGT-1032-6-*	EGT-1132-6-*
7	5 1/4"	5 1/16"	EGT-1032-7-*	EGT-1132-7-*
8	6"	5 13/16"	EGT-1032-8-*	EGT-1132-8-*
9	6 3/4"	6 9/16"	EGT-1032-9-*	EGT-1132-9-*
10	7 1/2"	7 5/16"	EGT-1032-10-*	EGT-1132-10-*
11	8 1/4"	8 1/16"	EGT-1032-11-*	EGT-1132-11-*
12	9"	8 13/16"	EGT-1032-12-*	EGT-1132-12-*

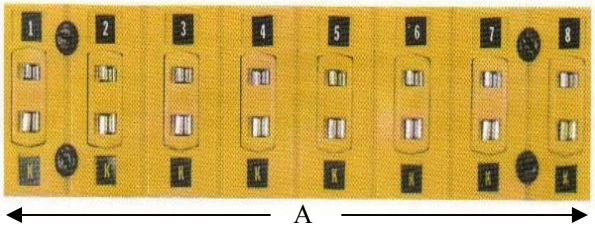
Strip Panels for Standard Connectors



MADE IN USA

***Thermocouple Type Code: J, K, T, N, E, R, S, U**

Strip Panels for Miniature Connectors



Number of Circuits	"A" Dimension Panel Length	Dimension Cutout Length	Miniature 2-Pole Panel	*Hi-Temp* Mini 2-Pole Panel
2	1.38"	1.25"	EGT-1237-2-*	EGT-1337-2-*
3	2.06"	1.94"	EGT-1237-3-*	EGT-1337-3-*
4	2.75"	2.63"	EGT-1237-4-*	EGT-1337-4-*
5	3.44"	3.31"	EGT-1237-5-*	EGT-1337-5-*
6	4.13"	4.00"	EGT-1237-6-*	EGT-1337-6-*
7	4.81"	4.69"	EGT-1237-7-*	EGT-1337-7-*
8	5.50"	5.38"	EGT-1237-8-*	EGT-1337-8-*

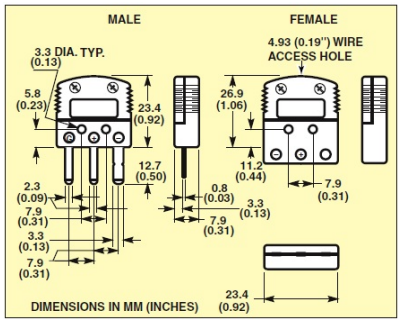
*****Also Available in 3– Pole Versions*****

Termination & Connector Systems

3-Prong Mini Flat Pin Connector for Thermocouple, RTD & 3-Wire Thermistor

Glass-Filled Nylon!

MADE IN USA



- With Shield Wire Copper Connection Pin
- Suitable for Continuing Ground Wire Through Panel Jack
- Glass-Filled Nylon, Rated to 220°C (425°F)
- Heavy Duty Construction
- Color-Coded
- Accepts Stranded or Solid Wire up to Size 20 AWG
- Combination Phillips/ Slot Screws

*** Please Specify Calibration J,K,E,T,N or RTD**

Mini-Male / Plug	EGT-MTP-M-(*)	Specify Calibration
Mini-Female / Jack	EGT-MTP-F-(*)	Specify Calibration

3-Prong Standard Size Round Pin Connector for Thermocouple, RTD & Thermistor

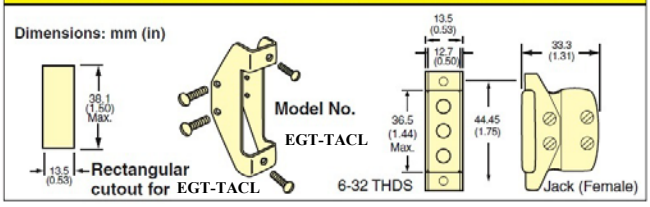
The type OTP 3-prong color-coded, quick disconnect plugs and jacks provide reliable connections between thermocouples and extension wires. The color-coded bodies are molded of high performance glass reinforced nylon. Tubular plug prongs and collet-type jack inserts have low mass and reduce temperature gradients. Negative prongs and inserts are larger than positives to insure proper polarity upon connection. This is a standard feature on all OMEGA® connectors. Recommended for most applications requiring three-wire circuits, including shielded thermocouples, thermistors, and RTD's. Will withstand ambient temperatures to 220°C (425°F). High-impact construction.

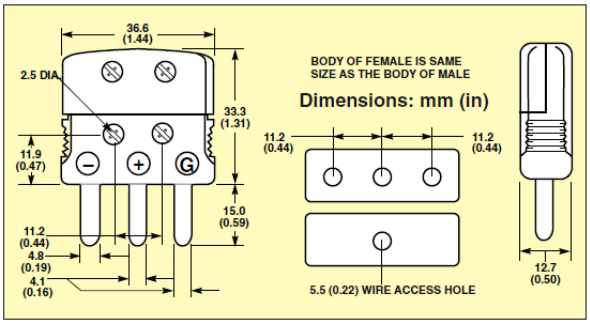
- 3 Prong / Pin Standard Design
- Thermocouple Color Coded ANSI
- White Uncompensated for RTD
- Glass Filled Nylon Rated to 425 F

*** Please Specify Calibration J,K,E,T,N or RTD**

Std. Male / Plug	EGT-OTP-M-(*)	Specify Calibration
Std. Female / Jack	EGT-OTP-F-(*)	Specify Calibration

Panel Adaptor Clips for Mounting 3-Pin Plugs and Sockets





SECTION 6

Thermocouple / RTD Wire

Thermocouple / RTD Wire

EGT Stocks Thermocouple Extension Wire for Quick Delivery!

EGT Thermocouple Wire is Offered in a Wide Selection of Insulations and Temperature Ratings!

EGT Offers Pre-Certified Uniformity Survey Wire in Several Temperature Ratings Ready for Fast Delivery!

INSULATED THERMOCOUPLE WIRE

Selection and Use of Thermocouple Extension Wire

All wire, thermocouple grade and extension grade, is manufactured to the industry-accepted standard ANSI MC 96.1, which specifies the maximum allowable thermoelectric deviation over a broad range of temperature. Thermocouple wire or thermocouple extension wire must be used to extend thermocouples to control or indication instrumentation. Base metal thermocouple extension grade wire is made from the same materials as thermocouple wire; however, its use is restricted to a lower range of temperatures. Within its range, extension grade wire maintains the same limits of error as thermocouple grade wire.

The conditions of measurements – i.e., temperature range, environment, protection, insulation requirements and response, should be considered when selecting the proper material for your application. EGT carries a wide range of thermocouple and RTD wire for all types of insulation needs that meet temperature, chemical, and moisture and abrasion resistance requirements. With insulation temperature ranges from –328 °F (-200 °C) to 2350 °F (1290 °C).

The following section gives information on specific wire construction, insulation properties along with ordering part number. The following construction styles are most common to the industry. EGT can manufacture many varieties of thermocouple wires and can often produce special custom construction orders on short notice.

Limits of Error

Tables give the standard and special limits of error for thermocouple wire in two sections – thermocouple wire and thermocouple extension wire. The limits of error for each type of thermocouple apply only over the temperature range specified. (The limits of error in the tables do not include installation or system errors.) Where limits of error are given in percent (%), the percentage applies to the °C temperature being measured. EGT stocks most calibration and insulation types. Both thermocouple and extension grade wire must meet American National Standards Institute, Inc. (ANSI) standard tolerances of error or special tolerances of error. The tolerances are available in the table below.

Initial Calibration Tolerances for EGT Wire and Cable

Thermocouple Type		°C			°F		
Wire Material	ANSI Type Symbol	Temp. Range	Stand. Limits	Special Limits	Temp. Range	Stand. Limits	Special Limits
*Iron/Constantan	J	0° to +285° +285° to +750°	±2.2°C or ±0.75%	±1.1°C or ±0.4%	32° o 545° 545° to 1400°	±4° ±.75%	±2° 0.4%
Chromel™/*Alumel™	K	−200° to −100° −110° to 0° 0° to 285° +285° to 1250°	±2% ±2.2° ±2.2° ±.75%	 ±1.1° ±0.4%	−330° to −165° −165° to +32° +32° to +545° ±545° to +2300°	±2% ±4° ±4° ±.75%	 ±2° ±0.4%
Copper/Constantan	T	−200° to −65° −65° to +130° +130° to +350°	±1.5% ±1.0% ±.75%	±0.8% ±0.5% ±0.4%	−330° to −85° ±85° to +270° +270° to +660°	±1.5% ±1.8° ±.75%	±0.8% ±0.9° +0.4%
Chromel™/Constantan	E	−200° to −170° −170° to +250° +250° to +340° +340°to +900°	±1.0% ±1.7° ±1.7° ±0.5%	±1° ±1° ±0.4% ±0.4%	−330° to −270° −270° to +480° +480° to +640° +640° to +1600°	±1% ±3° ±3° ±.5%	±1.8% ±1.8% ±0.4% ±0.4%
Nicrosil/Nisil	N	0° to +285° +285° to +1250°	±2.2° ±.75%	±1.1° ±0.4%	+32° to +545° +545° to 2300°	±4° ±.75%	±2° ±.4%
Platinum 10% Rhod. Platinum	S	0° to +285° +600° to +1450°	±1.5° ±.25%	±.6° ±.1%	+32° to +1110° +1110° to 2650°	±2.7° ±.25 %	±1.1° ±.1%
Platinum 13% Rhod. Platinum	R	0° to +285° +600° to +1450°	±1.5% ±.25%	±.6° ±.1%	+32° to +1110° +1110°to 2650°	±2.7% ±.25 %	±1.1° ±.1%
Platinum 30% Rhod. Platinum 6% Rhod.	B	+870° to +1700°	±.5%		+1600° to +3100°	+.5%	
Tungsten Tungsten 26% Rhen.	WR+	+400° to +2300°	±1%		+800° to +4200°	±1%	
Tungsten 5% Rhen. Tungsten 25% Rhen.	W3+	+400° to 2300°	±1%		+800° to +4200°	±1%	
Tungsten 5% Rhen. Tungsten 26% Rhen.	W5+	+400° to +2300°	±1%		+800° to 4200°	±1%	

A- Special tolerances for temperatures below 0° C are difficult to justify due to limited available information. However the following values for Type E and T may use as a guide.
E –200 to 0°C +/-1°C or +/- .5% whichever is greater. / T –200 to 0°C +/- .5°C or +/- .8% whichever is greater

Thermocouple Wire

Thermocouple Type	ANSI Symbol	ANSI Color Code Single	Overall Ext. Wire	Overall T/C Wire	Max. Useful Temp. Range C°	F°	Environment (Bare Wire)
Iron (+)* Constantan (–)	J	White Red	Black	Brown w/ Black Tracer	0° to 750°	32° to 1382°	Reducing, vacuum, inert, limited use in oxidizing at high temp., not recommended for low temp.
Chromel (+) TM Alumel (–) *TM	K	Yellow Red	Yellow	Brown w/ Yellow Tracer	–200° to 1250°	–328° to 2282°	Clean oxidizing and inert limited use in vacuum or reducing.
Copper (+) Constantan (–)	T	Blue Red	Blue	Brown w/ Blue Tracer	–200° to 350°	–328° to 662°	Mild oxidizing, reducing vacuum or inert. Good where moisture is present.
Chromel (+) TM Constantan (–)	E	Purple Red	Purple	Brown w/ Purple Tracer	–200° to 900°	–328° to 1652°	Oxidizing or inert. Limited use in vacuum or reducing.
Nicrosil (+) Nisel (–)	N				0° to 1250°	32° to 2300°	Oxidizing inert or dry reducing atmosphere. Must be protected from sulfurous atmospheres.
Platinum 10% Rhod (+) Platinum (–)	S	Black Red	Green		0° to 1450°	32° to 2642°	Oxidizing or inert atmospheres. Do not insert in metal tubes.
Platinum 13° Rhod (+) Platinum (–)	R	Black Red	Green		0° to 1450°	32° to 2642°	Beware of contamination.
Platinum 30° (Rhod (+) Platinum 6% (Rhod (–)	B	Grey Red	Grey		0° to 1700°	32° to 3092°	
Tungsten 3% Rhen (+) Tungsten 25% Rhen (–)	W3+	Orange Red	Orange		0° to 2320°	32° to 4208°	Vacuum,inert, hydrogen, atmosphere. Beware of embrittlement.
Tungsten 5% Rhen (+) Tungsten 26% Rhen (–)	W5+	Orange Red	Orange		0° to 2320°	0° to 4208°	

* Denotes magnetic lead

Solid vs Stranded

Solid conductors are generally the preferred and most widely used in both thermocouple grade and extension grade wire. However, when repeated stress and flexibility are a concern, stranded conductors are the best choice. Stranded conductors are made of several strands of smaller gauge wire that, when grouped together, combine for the final AWG. The tables below are helpful when calculating loop resistance for analog instruments and selecting wire size.

Nominal Resistance of Wire (Loop) Ohms per double Foot

AWG	J	T	K	N	E
14	.0899	.07413	.1466	.1948	.1751
16	.1426	.1178	.2330	.3097	.2783
18	.2279	.1874	.3707	.4926	.4427
20	.3612	.2982	.5897	.7030	.7043
24	.9133	.7534	1.490	1.980	1.779
26	1.454	1.198	2.370	3.149	2.830
28	2.312	1.905	3.768	5.006	4.500
30	3.672	3.025	5.984	7.952	7.147
36	14.76	12.17	24.08	N/A	28.76

Conductor Sizes

Wire Size B & S Gauge	Diameter inch (Solid)	Diameter Inch (Stranded)	Number of Strands	Strand Gauge
14	0.064	0.076	7	22
16	0.051	0.060	7	24
18	0.040	0.048	7	26
20	0.032	0.038	7	28
22	0.025	0.030	7	30
24	0.020	0.025	7	32
26	0.016			
28	0.013			
30	0.010			
36	0.005			

Thermocouple Wire

Extension Wire is available with twisted and shielded conductors and a copper drain wire which together minimizes EMI/RFI or electrical "noise". Multi-pair cable is also available with individual shielded pairs and an overall shield. These extension cables are available with PVC and FEP insulation's with ambient temperature rating of 220 °F (105 °C) and 400 °F (205 °C) respectively. UL Listed Thermocouple cable is also available on a limited selection basis for installation at UL required sites.

Ordering

EGT is always willing to work around your schedule. We will accept annual blanket orders and will release only the wire needed while saving your company money. Our sales staff will help you in selecting the appropriate wire and provide price and delivery. We are happy to assist you in designing custom wire constructions to fit your requirements and needs. Our "State of the Art" Certification Department can calibrate and certify your wire. EGT will issue a certificate of calibration with the exact departure from the standard curve at your selected temperature points. EGT's certification laboratory is equipped with the same system used by the National Institute of Standards and Technologies in Washington DC., N.I.S.T. (the old National Bureau of Standards). Our computerized calibration system is capable of measurements down to .00001 °F with furnace test zone stability of .02 °F for 10 minutes or longer.

Selecting A Part Number

Use the table below to help choose the correct calibration, tolerance, wire gauge and insulation series. To better serve you, the following pages include thermocouple and extension wire part numbers. ***We Offer Quantity Discounts, Contact Factory.***

K **20** – **5** – **502** – **S**

Calibration

J-TYPE "J"
K-TYPE "K"
T-TYPE "T"
E-TYPE "E"
N–TYPE "N"
R–TYPE "R"
S–TYPE "S"

Overbraid

S - Stainless Steel
C - Tinned Copper
N - Inconel (Alloy 600)
O - None
CAL- Calibration

Wire Size / B&S Gauge

14-AWG
16-AWG / Most Common
18-AWG
20-AWG / Most Common
22-AWG
24-AWG / Most Common
26-AWG
28-AWG
30-AWG
36-AWG

Insulation Type (Series)

*** See Page's (104-110) for Series**

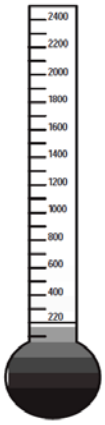
Example– 304, 502, 507 etc.

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

Thermocouple Wire

502 Series



220°F
Continuous
Temperature

Construction Details

Series 502 is an economical wire that's also available in UL listings for PLTC (Power Limited Tray Cable) applications. The primary and duplex insulation is PVC. It yields a construction that's inexpensive while performing continuously at temperatures to 220 °F (105 °C). Series 502 is often used in conduit and wiring trays where flexibility allows for easy installation. The Series 502 can be easily stripped using hand tools or mechanical methods.

Performance Capabilities

- Continuous temperature rating: 220 °F (105 °C)
- Excellent Resistance Properties to Moisture, Good Resistance to Chemicals, and Abrasion

Features and Benefits

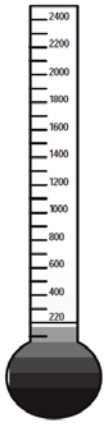
- Available as UL Listed PLTC Wire and Cable
- Extruded PVC single conductor and duplex insulation for excellent moisture resistance
- Most Popular Covering on Extension Wires
- Excellent moisture resistance, good abrasion and chemical resistance

Applications

- Laboratories
- Automotive
- Pulp/Paper
- Industrial Equipment
- Cement Curing

Series "502" Thermocouple Wire		
"Solid"	Most Common	
Part Number	AWG/Dia.	Finish Size
J20-5-502	#20/.032"	.092" X .154"
K20-5-502	#20/.032"	.092" X .154"
T20-5-502	#20/.032"	.092" X .154"
S20-5-502	#20/.032"	.092" X .154"
J16-5-502	#16/.051"	.131" X .222"
K16-5-502	#16/.051"	.131" X .222"
"Stranded"	Most Common	
Part Number	AWG/Dia.	Finish Size
J20-7-502	#20Str/.038"	.098" X .166"
K20-7-502	#20Str/.038"	.098" X .166"
T20-7-502	#20Str/.038"	.098" X .166"
J16-7-502	#16Str/.051"	.140" X .240"
K16-7-502	#16Str/.051"	.140" X .240"

510 Series



220°F
Continuous
Temperature

Construction Details

Series 510 is PVC insulated and shielded construction for systems sensitive to induced voltages and "noise." Series 510 is also available as UL Listed PLTC. The conductors are insulated with color coded PVC. The next operation twists the two insulated conductors with a copper drain wire. An aluminized polyester tape is wrapped around the wires to impart a 100 percent shield. Lastly, another layer of color-coded PVC is applied. The twisting eliminates most EMI while the shield minimizes AC "noise". For higher temperatures specify Series 509.

Performance Capabilities

- Continuous Temperature Rating: 220 ° F (105 °C)

Features and Benefits

- Extruded PVC single conductor insulation for excellent moisture protection.
- Twisted; extruded PVC overall duplex insulation.
- Available in UL Listed PLTC ■ ASTM E 230 color code.
- Excellent moisture resistance, good chemical and abrasion resistance.
- Ideal for computer data recording circuits

Applications

- Automotive
- Laboratory
- Industrial Equipment
- Anywhere electrical interference is possible

Series "510" Thermocouple Wire		
"Solid"	Most Common	
Part Number	AWG/Dia.	Finish Size
J20-5-510	#20/.032"	.164"
K20-5-510	#20/.032"	.164"
T20-5-510	#20/.032"	.164"
J16-5-510	#16/.051"	.222"
K16-5-510	#16/.051"	.222"
T16-5-510	#16/.051"	.222"
"Stranded"	Most Common	
Part Number	AWG/Dia.	Finish Size
J20-7-510	#20Str/.038"	.176"
K20-7-510	#20Str/.038"	.176"
T20-7-510	#20Str/.038"	.176"

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Thermocouple Wire

Series "507" Thermocouple Wire		
"Solid"	Most Common	
Part Number	AWG/Dia.	Finish Size
J20-1-507	#20/.032"	.068" X .120"
J24-1-507	#24/.020"	.056" X .096"
K20-1-507	#20/.032"	.068" X .120"
K24-1-507	#24/.020"	.056" X .096"
T20-1-507	#20/.032"	.068" X .120"
T24-1-507	#24/.020"	.056" X .096"
"Stranded"	Most Common	
Part Number	AWG/Dia.	Finish Size
J20-3-507	#20Str/.038"	.074" X .132"
J24-3-507	#24Str/.024"	.060" X .104"
K20-3-507	#20Str/.038"	.074" X .132"
K24-3-507	#24Str/.024"	.060" X .104"
T20-3-507	#20Str/.038"	.074" X .132"
T24-3-507	#24Str./.024"	.060" X .104"

Performance Capabilities

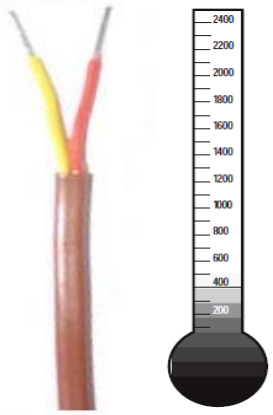
- Continuous temperature rating: 400 °F (204 °C)
- Single Short Term rating: 500 °F (260 °C)

Features and Benefits

- Extruded FEP single conductor and duplex insulation for excellent protection
- Available as UL Listed PLTC wire and cable
- ASTM E 230 color code for easy identification
- Excellent abrasion, moisture and chemical resistance
- Additional abrasion resistance with optional stainless steel and tinned copper wire overbraids
- Custom construction available

Applications

- Aerospace
- Industrial Equipment & Testing
- Food & Dairy
- Pharmaceutical
- Plastics
- Metal Treating
- Automotive Dyno Test Cells
- HVAC Installations



507 Series

400°F Continuous Temperature

Construction Details

Series 507 is the most economical fluoroplastic insulated wire construction. The Series 507 have individual conductors coated with a layer of color coded FEP. The insulated conductors are then parallel duplexed with an additional layer of FEP. The finished construction has a temperature rating of 500 °F (260 °C). Abrasion, moisture and chemical resistance is far in excess of most other insulations. This construction is widely used when pulling long lengths of wire through conduit. FEP's low friction coefficient and abrasion resistance makes it ideally suited for these applications.

Series "509" Thermocouple Wire		
"Solid"	Most Common	
Part Number	AWG/Dia.	Finish Size
J16-5-509	#16/.051"	.174"
K16-5-509	#16/.051"	.174"
T16-5-509	#16/.051"	.174"
J20-5-509	#20/.032"	.128"
K20-5-509	#20/.032"	.128"
T20-5-509	#20/.032"	.128"
"Stranded"	Most Common	
Part Number	AWG/Dia.	Finish Size
J20-7-509	#20Str/.038"	.140"
K20-7-509	#20Str/.038"	.140"
T20-7-509	#20Str/.038"	.140"

***Quantity's under 500' Require a $7.00 Respooling Charge.**

Performance Capabilities

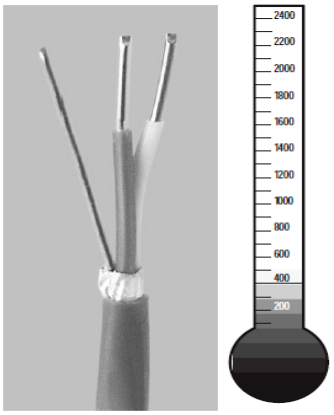
- Continuous temperature rating: 400 °F (204 °C)
- Single reading 500 °F (260 °C)

Features and Benefits

- Extruded FEP single conductor insulation for excellent protection.
- Twisted; extruded FEP overall duplex insulation to minimize electrical interference.
- Aluminum/polyester shield with drain wire reduces electrical "noise".
- ASTM E 230 color code for easy identification.
- Excellent abrasion, moisture and chemical resistance.
- Custom overbraid constructions available to improve abrasion resistance.

Applications

- Aerospace data acquisition systems
- Computer assisted molding equipment
- Food, Dairy & Pharmaceutical
- Engine Dynamometers and test stands
- Industrial testing and control equipment installations
- HVAC installations



509 Series

400°F Continuous Temperature

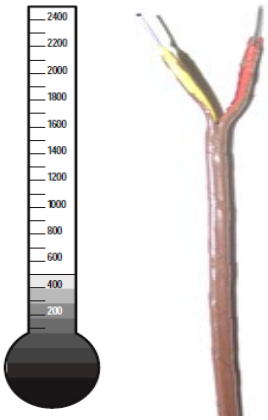
Construction Details

Series 509 was developed especially for use with microprocessor based systems. The conductors are insulated with color coded FEP. They're then twisted with a copper drain wire. An aluminized polyester tape is wrapped around the conductors and drain wire. Finally, FEP is applied as an overall outer jacket. The finished construction can withstand temperatures in excess of 400 °F (204 °C) Twisted conductors minimize EMI and the taped shield eliminates most problems associated with AC "noise". Available in both thermocouple and thermocouple extension grade constructions is ideal for a wide variety of applications. When better abrasion resistance is required, specify an overall metallic braid.

Thermocouple Wire

508 Series

500°F Continuous Temperature



Construction Details

Series 508 offers both primary and duplex insulation of fused TFE tape. The tape is spirally applied to the conductors and heated in a continuous bonding oven. This process, called sintering, forms the tape into a homogeneous layer. When sintered, the tape exhibits all of the advantages of extruded TFE insulation, while eliminating the concentricity problems associated with TFE extrusions. One of the benefits of the TFE tape insulation is the smaller overall insulation thickness. The 508 TFE/TFE insulation exhibits excellent moisture and chemical resistance and good abrasion resistance.

Performance Capabilities

- Continuous temperature rating: 500 °F (260 °C)
- Single reading: 600 °F (315 °C)

Features and Benefits

- Fused TFE tape single conductor and duplex insulation to eliminate concentricity problems
- Excellent moisture and chemical resistance, good abrasion resistance
- ASTM E 230 color code for easy identification
- Additional abrasion resistance with optional stainless steel or tinned copper wire overbraids

Applications

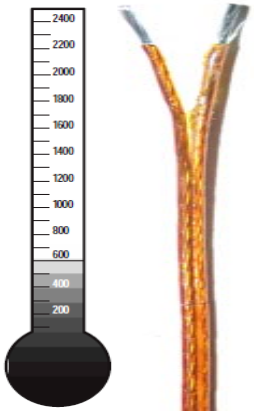
- Petroleum plants
- Plating operations
- Aircraft composite and repair bonding
- Food industry, Washdown safe, Bake ovens

Series "508" Thermocouple Wire		
"Solid"	Most Common	
Part Number	AWG/Dia.	Finish Size
J20-1-508	#20/.032"	.060" X .106"
J24-1-508	#24/.020"	.047" X .077"
K20-1-508	#20/.032"	.060" X .106"
K24-1-508	#24/.020"	.047" X .077"
T20-1-508	#20/.032"	.060" X .106"
T24-1-508	#24/.020"	.047" X .077"
"Stranded"	Most Common	
Part Number	AWG/Dia.	Finish Size
J20-3-508	#20Str/.038"	.064" X .112"
K20-3-508	#20Str/.038"	.064" X .112"

The Series 508 is fully color coded and capable of continuous operation in excess of 500 °F (260 °C). Because the fusing process causes the duplex tape to fuse with the primary insulation, Series 508 is not recommended for applications where it's necessary to remove the outer tape while leaving the conductor insulation intact. When higher temperature capabilities are required, specify polyimide-insulated constructions. See Series 511 and Series 512. For improved abrasion resistance, consider a stainless steel overbraid.

511 Series

600°F Continuous Temperature



Performance Capabilities

- Continuous temperature rating: 600 °F (315 °C)
- Single reading: 800 °F (430 °C)

Features and Benefits

- Fused polyimide tape single conductor insulation for excellent Dielectric Strength
- Duplex construction via twisted single conductors
- Both legs have ASTM E 230 color-coded tracers for easy identification
- Excellent abrasion, moisture and chemical resistance

Applications

- Cryogenic applications
- Aerospace and Composite industries
- Electric power plants
- Petrochemical installations
- High exposure to U.V., Chemicals and Acids
- Food Processing plants

Note: Special Limits Available, Consult

Series "511" Thermocouple Wire		
"Solid"	Most Common	
Part Number	AWG/Dia.	Finish Size
K20-1-511	#20/.032"	.084"
K24-1-511	#24/.020"	.060"
J20-1-511	#20/.032"	.084"

Construction Details

Series 511 is the most economical polyimide taped construction. The polyimide film applied to the conductors is considered to be the ultimate "soft" insulation. The Series 511 also offers excellent electrical insulating properties with 6900 Volts per mil Dielectric Strength. The polyimide film maintains its strength at temperatures to 600 °F (315 °C). The FEP laminate serves as a moisture barrier and allows the tape to be fused with itself. The finished construction will not unravel when cut. The Series 511 conductors are wrapped with the polyimide tape that is .005" thick with a 75% overlay and is then fused in a continuous oven process. Each conductor is color coded with a colored thread under the tape. The final operation is twisting the insulated conductors into a duplex construction, thereby eliminating the overall duplex insulation and minimizing cost.

Thermocouple Wire

Series "512" Thermocouple Wire		
"Solid"	Most Common	
Part Number	AWG/Dia.	Finish Size
J20-1-512	#20/.032"	.048" X .088"
K20-1-512	#20/.032"	.048" X .088"

"Stranded"	Most Common	
Part Number	AWG/Dia.	Finish Size
J20-3-512	#20Str/.038"	.056" X .098"
K20-3-512	#20Str/.038"	.056" X .098"
K20-3-512-S	#20Str/.038"	.081" X .112"
T20-3-512	#20Str/.038"	.081" X .098"

***Quantity's under 500' Require a $7.00 Respooling Charge.**

Performance Capabilities

- Continuous temperature rating: 600 ° F (315 °C)
- Single reading: 800 °F (430 °C)

Features and Benefits

- Fused polyimide tape single conductor and duplex insulation for excellent protection
- Both legs have ASTM E 230 color code tracers for easy identification
- Excellent abrasion, moisture and chemical resistance
- Additional abrasion resistance with optional stainless steel overbraid
- Part Number K20-3-512-S is always STOCK in 100, 250, 500 and 1000-ft. spools

Applications

- Petrochemical plants
- Electric power plants
- Glass, ceramic & brick manufacturing
- Cryogenic applications
- Aerospace & Composite industry
- Automotive testing & Dynamometers

512 Series

600°F Continuous Temperature

Construction Details

The Series 512 is a heavier duty version of our 511 Series construction, using the same polyimide insulation. Color coding is accomplished using the same colored thread "tracers". However, the Series 512 has a duplex insulation of polyimide tape. The extra wall of tape yields a construction with increased electrical and abrasion resistance. For higher temperature requirements, choose one of our fiberglass-insulated wires.

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Performance Capabilities

- Continuous temperature rating: 1800 °F (980 °C)
- Single reading 2000 °F (1095 °C)

Features and Benefits

- Braided vitreous silica yarn single conductor and duplex insulation provides high temperature performance.
- Good chemical resistance, fair abrasion and moisture resistance.
- Additional abrasion resistance with stainless steel or alloy 600 wire overbraids.

Applications

- Furnace Survey Work
- Heat Treating
- Conveyorized Furnace Profiling
- Heat Treating Load and Limit Thermocouples

301 Series

1800°F Continuous Temperature

Construction Details

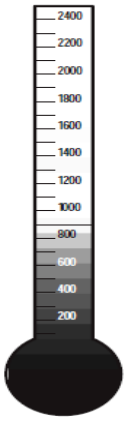
Series 301 uses vitreous silica yarn as the insulation on both the single conductors and the overall covering. The "Old Timers" referred to this material a "Refisil". This yarn retains its flexibility after exposure to high temperatures. The vitreous silica yarn's purity performs better at high temperatures than other fibrous glass products. Testing has indicated that "contamination" will compromise this material's upper use temperature. For this reason, our standard offering is supplied without color-coding or impregnations; therefore the cut ends tend to flare. For higher temperatures, consider Series 350.

Series "301" Thermocouple Wire		
"Solid"	Most Common	
Part Number	AWG/Dia.	Finish Size
K20-2-301	#20/.032"	.098" X .154"

**Special Limits. Other Constructions Available, Consult Factory*

Thermocouple Wire

304 Series



900°F
Continuous
Temperature

Construction Details

Series 304 is an economical braided glass that offers uniform quality for general applications requiring moderate abrasion and moisture resistance, with wide temperature capabilities. Each conductor is covered with a color coded glass braid. This braid is impregnated to enhance abrasion resistance and reduce fraying. The insulated single conductors are laid parallel and covered with another layer of woven glass. A final impregnation is then applied to the glass. For better moisture resistance, consider Series 307. For higher temperatures, consider Series 321. For better abrasion resistance, choose stainless steel overbraid.

Performance Capabilities

- Continuous temperature rating: 900 °F (480 °C)
- Single Reading: 1000 °F (540 °C)

Features and Benefits

- Fiberglass braided single conductor and duplex insulation impregnated with modified resin to enhance abrasion resistance
- Impregnation retained to 400 °F (204 °C)
- ASTM E 230 color-coded for easy identification
- Good moisture and chemical resistance, fair abrasion resistance
- Additional abrasion resistance with optional stainless steel or tinned copper overbraids

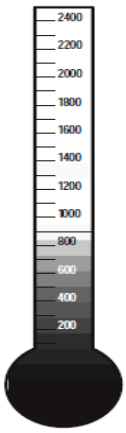
Applications

- Heat Treating, Furnace Survey Work, Foundries, Glass and Ceramic plants
- Plastics Industry; Extrusion, Injection Molding, Vacuum Molding

Series "304" Thermocouple Wire		
"Solid"	Most Common	
Part Number	AWG/Dia.	Finish Size
J20-1-304	#20/.032"	.056" X .096"
J24-1-304	#24/.020"	.045" X .072"
K20-1-304	#20/.032"	.056" X .096"
K24-1-304	#24/.020"	.045" X .072"
T20-1-304	#20/.032"	.056" X .096"
T24-1-304	#24/.020"	.045" X .072"
S24-5-304	#24/.020"	.045" X .072"
"Stranded"	Most Common	
Part Number	AWG/Dia.	Finish Size
J20-3-304	#20Str/.038"	.064" X .112"
J24-3-304	#24Str/.024"	.048" X .080"
K20-3-304	#20Str/.038"	.064" X .112"
K24-3-304	#24Str/.024"	.048" X .080"

***Quantity's under 500' Require a $7.00 Respooling Charge.**

307 Series



900°F
Continuous
Temperature

Series "307" Thermocouple Wire		
"Solid"	Most Common	
Part Number	AWG/Dia.	Finish Size
J20-1-307	#20/.032"	.072" X .118"
K20-1-307	#20/.032"	.072" X .118"

Performance Capabilities

- Continuous fiberglass temperature rating: 900 °F (480 °C)
- Continuous TFE temperature rating: 500 °F (260 °C)
- Single reading: 1000 °F (540 °C)

Features and Benefits

- Non-fused TFE tape and TFE coated fiberglass single conductor insulation provides excellent moisture and chemical resistance
- TFE coated fiberglass braid duplex insulation adds to moisture and chemical resistance
- TFE retained to 600 °F (315 °C).
- ASTM E 230 color coded for easy identification
- Excellent moisture and chemical resistance, good abrasion resistance
- Additional abrasion resistance with optional stainless steel overbraid

Construction Details

The 307 Series is designed for applications where a possibility of moisture along the unheated portion exists. While fiberglass has little moisture resistance, the use of TFE tape on the conductors provides moisture protection – even after short-term exposure to temperatures of 600 °F (315 °C).The Series 307 is constructed by first wrapping each conductor with TFE tape. Each conductor is then braided with TFE impregnated fiberglass. The two insulated conductors are then laid parallel and braided again with TFE impregnated fiberglass. The final operation involves heating the entire construction to fuse the insulations.

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Thermocouple Wire

Series "321" Thermocouple Wire		
"Solid"	Most Common	
Part Number	AWG/Dia.	Finish Size
J20-1-321	#20/.032"	.082" X .140"
K20-1-321	#20/.032"	.082" X .140"

Construction Details

Series 321 incorporates High Temperature Glass in an economical braided construction for use in general applications. The braided high temperature yarn is applied in a unique manner that allows Series 321 to be competitively priced with other fiberglass constructions. It produces a finished, color-coded wire that performs at temperatures to 1600 °F (870 °C). Each conductor is covered with a color-coded high temperature fiberglass braid. This braid is then impregnated to enhance abrasion resistance and reduce fraying. The insulated single conductors are laid parallel and covered with another braid of high temperature fiberglass and impregnation.

Performance Capabilities

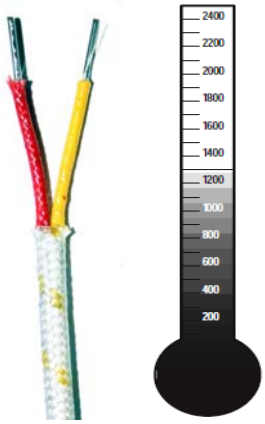
- Continuous temperature rating: 1300 °F (705 °C)
- Single reading 1600 °F (870 °C)

Features and Benefits

- High temperature fiberglass braid single conductor and duplex insulation impregnated with modified resin for added abrasion resistance.
- Impregnation retained to 400 °F (204 °C).
- ASTM E 230 color coded for easy identification.
- Good abrasion, moisture and chemical resistance.
- Additional abrasion resistance with optional overbraids.

Application

- Heat Treating
- Furnace Survey Work
- Steel and Aluminum Plants



321 Series

1300°F Continuous Temperature

***The Series 321 is available with a full range of metallic coverings for improved abrasion resistance.**

Series "350" Thermocouple Wire		
"Solid"	Most Common	
Part Number	AWG/Dia.	Finish Size
K20-2-350	#20/.032"	.100"X.154"

Construction Details

Series 350 uses the ultimate high temperature flexible insulating system. The ceramic fiber yarn's upper temperature limit often exceeds the melting point of the material it's insulating. When an application requires flexible insulation, while pushing Type "K" or Type "N" to their extreme limits, ceramic fiber insulation is the ultimate choice. While Series 350 can be manufactured to your specifications, EGT supplies standard Series 350 without color-coding or impregnations. This minimizes contamination to the pure ceramic fiber yarn. Laboratory testing indicates that the introduction of even small amounts of impregnation can decrease the upper use temperature by as much as 1000 ° F (540 °C) in high temperature equipment. Each conductor is braided and laid parallel and covered with another layer of ceramic fiber braid overall.

Performance Capabilities

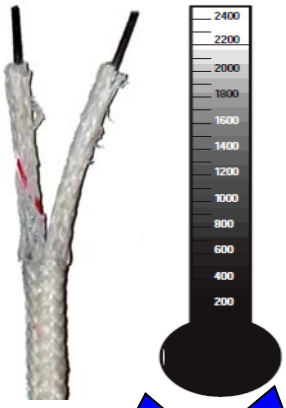
- Continuous temperature rating: 2200 °F (1205 °C)
- Single reading : 2600 °F (1430 °C)

Features and Benefits

- Ceramic fiber braid single conductors and duplex insulation; no impregnation for contamination free operation.
- Good abrasion and chemical resistance, fair moisture resistance.
- Additional abrasion resistance with optional alloy 600 wire overbraid.

Applications

- Steel and Aluminum Plants
- Heat Treating Uniformity Surveys
- Powdered Metal Sintering



350 Series

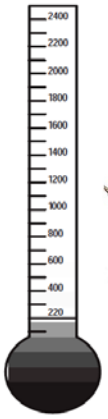
2220°F Continuous Temperature

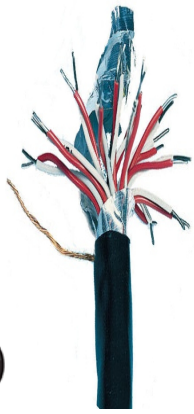
Certified Survey Wire!

Multi-Thermocouple / RTD Extension Wire

900 Series

220°F
Continuous
Temperature





Construction Details

Series 900 is the classification for our family of overall shielded multi-pair cables. Series 900 is also available in UL Listings for PLTC (Power Limited Tray Cable) Applications.
Series 900 cable starts by insulating conductors with 220 °F (105 °C) PVC. For identification, one conductor of each pair is numbered and twisted with its counterpart. These "twisted pairs" are cabled with an additional insulated copper wire for communication use. The entire cable is wrapped with clear polyester tape to minimize the chance of short circuits to the cable's shield. under the final jacket of color-coded PVC.

Performance Capabilities

- Continuous temperature rating: 220 °F (105 °C)
- Other Insulations available for higher temperature rating. Minimum quantity 1000 Ft. (305 m)

Features and Benefits

- Extruded PVC Single Conductor and overall insulation
- Available in UL PLTC
- Aluminum/polyester shield with drain wire provides "noise" protection
- ASTM E 230 color coded
- Excellent moisture resistance, good abrasion and chemical resistance

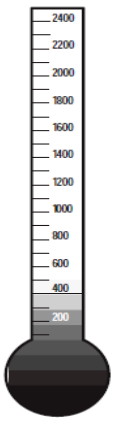
NOTE: Other configurations available, consult factory.

Series "900" Multi-Thermocouple Wire		
"Solid"	Most Common	
Part Number	AWG/Dia.	Finish Size
J20-5-904	#20/.032"	.350"/ 4 Pair
J20-5-908	#20/.032"	.440"/8 Pair
J20-5-912	#20/.032"	.535"/12 pair
K20-5-904	#20/.032"	.350"/4 Pair
K20-5-908	#20/.032"	.440"/8 Pair
K20-5-912	#20/.032"	.535"/12 Pair
K20-5-916	#20/.032"	.610"/16 Pair
K20-5-924	#20/.032"	.710"/24 Pair
T20-5-908	#20/.032"	.440"/8 Pair
T20-5-912	#20/.032"	.535"/12 Pair
T20-5-924	#20/.032"	.710"/24 Pair

An aluminized polyester tape shield is then spirally applied. A copper drain wire and heavy ripcord are longitudinally applied. We also offer this construction with the addition of spirally wrapped aluminized polyester tape and drain wire protecting each twisted pair of conductors.

700 Series

400°F
Continuous
Temperature



Series 700 RTD Wire		
"Solid"	Most Common	
Part Number	# of Wires	Insulation
RT3-22-4-701	3	PVC / 220F
RT3-22-8-704	3	FEP / 400F
RT3-24-4-704	3	FEP / 400F
RT3-24-8-705	3	Glass / 900F

Performance Capabilities

- Continuous temperature rating: 400 °F (204 °C)
- Single Short Term rating: 500 °F (260 °C)

Features and Benefits

- Extruded FEP single conductor and duplex insulation for excellent protection
- Available as UL Listed PLTC wire and cable
- ASTM E 230 color code for easy identification
- Excellent abrasion, moisture and chemical resistance
- Additional abrasion resistance with optional stainless steel and tinned copper wire overbraids
- Custom construction available

Applications

- Aerospace
- Industrial Equipment & Testing
- Food & Dairy
- Pharmaceutical
- Plastics
- Metal Treating

Construction Details

This three-strand RTD wire features excellent resistance to abrasion, chemicals, and moisture. Each silver-plated copper strand is color-coded with fluorinated ethylene propylene (FEP). The strands are twisted to increase flexibility and minimize electromagnetic noise, then jacketed in white FEP. The FEP insulation provides temperature resistance up to 400°F, and chemical resistance to solvents, acids, and oils. Additionally, the insulation protects the wire from thermal aging, while maintaining its strength and flexibility.

EGT has Custom Wire Construction with a minimum purchase of 2000 feet! We can end the search…

Call Today for a Free Quote

1-800-348-4678

NOTES

SECTION 7

Thermocouple Reference Tables

GRADE:

IRON VS. COPPER-NICKEL

TEMPERATURE IN DEGREES °C
REFERENCE JUNCTION AT 0°C

TYPE "J" THERMOCOUPLE REFERENCE TABLES °C

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

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
32	to	1382°F	32	to	392°F
0	to	750°C	0	to	200°C

LIMITS OF ERROR
(Whichever is Greater)

Standard:			Special:		
2.2°C	or	0.75%	1.1°C	or	0.4%

Thermoelectric Voltage in Millivolts

°C	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°C
-200	-8.095	-8.076	-8.057	-8.037	-8.017	-7.996	-7.976	-7.955	-7.934	-7.912	-7.890	-200
-190	-7.890	-7.868	-7.846	-7.824	-7.801	-7.778	-7.755	-7.731	-7.707	-7.683	-7.659	-190
-180	-7.659	-7.634	-7.610	-7.585	-7.559	-7.534	-7.508	-7.482	-7.456	-7.429	-7.403	-180
-170	-7.403	-7.376	-7.348	-7.321	-7.293	-7.265	-7.237	-7.209	-7.181	-7.152	-7.123	-170
-160	-7.123	-7.094	-7.064	-7.035	-7.005	-6.975	-6.944	-6.914	-6.883	-6.853	-6.821	-160
-150	-6.821	-6.790	-6.759	-6.727	-6.695	-6.663	-6.631	-6.598	-6.566	-6.533	-6.500	-150
-140	-6.500	-6.467	-6.433	-6.400	-6.366	-6.332	-6.298	-6.263	-6.229	-6.194	-6.159	-140
-130	-6.159	-6.124	-6.089	-6.054	-6.018	-5.982	-5.946	-5.910	-5.874	-5.838	-5.801	-130
-120	-5.801	-5.764	-5.727	-5.690	-5.653	-5.616	-5.578	-5.541	-5.503	-5.465	-5.426	-120
-110	-5.426	-5.388	-5.350	-5.311	-5.272	-5.233	-5.194	-5.155	-5.116	-5.076	-5.037	-110
-100	-5.037	-4.997	-4.957	-4.917	-4.877	-4.836	-4.796	-4.755	-4.714	-4.674	-4.633	-100
-90	-4.633	-4.591	-4.550	-4.509	-4.467	-4.425	-4.384	-4.342	-4.300	-4.257	-4.215	-90
-80	-4.215	-4.173	-4.130	-4.088	-4.045	-4.002	-3.959	-3.916	-3.872	-3.829	-3.786	-80
-70	-3.786	-3.742	-3.698	-3.654	-3.610	-3.566	-3.522	-3.478	-3.434	-3.389	-3.344	-70
-60	-3.344	-3.300	-3.255	-3.210	-3.165	-3.120	-3.075	-3.029	-2.984	-2.938	-2.893	-60
-50	-2.893	-2.847	-2.801	-2.755	-2.709	-2.663	-2.617	-2.571	-2.524	-2.478	-2.431	-50
-40	-2.431	-2.385	-2.338	-2.291	-2.244	-2.197	-2.150	-2.103	-2.055	-2.008	-1.961	-40
-30	-1.961	-1.913	-1.865	-1.818	-1.770	-1.722	-1.674	-1.626	-1.578	-1.530	-1.482	-30
-20	-1.482	-1.433	-1.385	-1.336	-1.288	-1.239	-1.190	-1.142	-1.093	-1.044	-0.995	-20
-10	-0.995	-0.946	-0.896	-0.847	-0.798	-0.749	-0.699	-0.650	-0.600	-0.550	-0.501	-10
0	-0.501	-0.451	-0.401	-0.351	-0.301	-0.251	-0.201	-0.151	-0.101	-0.050	0.000	0
0	0.000	0.050	0.101	0.151	0.202	0.253	0.303	0.354	0.405	0.456	0.507	0
10	0.507	0.558	0.609	0.660	0.711	0.762	0.814	0.865	0.916	0.968	1.019	10
20	1.019	1.071	1.122	1.174	1.226	1.277	1.329	1.381	1.433	1.485	1.537	20
30	1.537	1.589	1.641	1.693	1.745	1.797	1.849	1.902	1.954	2.006	2.059	30
40	2.059	2.111	2.164	2.216	2.269	2.322	2.374	2.427	2.480	2.532	2.585	40
50	2.585	2.638	2.691	2.744	2.797	2.850	2.903	2.956	3.009	3.062	3.116	50
60	3.116	3.169	3.222	3.275	3.329	3.382	3.436	3.489	3.543	3.596	3.650	60
70	3.650	3.703	3.757	3.810	3.864	3.918	3.971	4.025	4.079	4.133	4.187	70
80	4.187	4.240	4.294	4.348	4.402	4.456	4.510	4.564	4.618	4.672	4.726	80
90	4.726	4.781	4.835	4.889	4.943	4.997	5.052	5.106	5.160	5.215	5.269	90
100	5.269	5.323	5.378	5.432	5.487	5.541	5.595	5.650	5.705	5.759	5.814	100
110	5.814	5.868	5.923	5.977	6.032	6.087	6.141	6.196	6.251	6.306	6.360	110
120	6.360	6.415	6.470	6.525	6.579	6.634	6.689	6.744	6.799	6.854	6.909	120
130	6.909	6.964	7.019	7.074	7.129	7.184	7.239	7.294	7.349	7.404	7.459	130
140	7.459	7.514	7.569	7.624	7.679	7.734	7.789	7.844	7.900	7.955	8.010	140
150	8.010	8.065	8.120	8.175	8.231	8.286	8.341	8.396	8.452	8.507	8.562	150
160	8.562	8.618	8.673	8.728	8.783	8.839	8.894	8.949	9.005	9.060	9.115	160
170	9.115	9.171	9.226	9.282	9.337	9.392	9.448	9.503	9.559	9.614	9.669	170
180	9.669	9.725	9.780	9.836	9.891	9.947	10.002	10.057	10.113	10.168	10.224	180
190	10.224	10.279	10.335	10.390	10.446	10.501	10.557	10.612	10.668	10.723	10.779	190
200	10.779	10.834	10.890	10.945	11.001	11.056	11.112	11.167	11.223	11.278	11.334	200
210	11.334	11.389	11.445	11.501	11.556	11.612	11.667	11.723	11.778	11.834	11.889	210
220	11.889	11.945	12.000	12.056	12.111	12.167	12.222	12.278	12.334	12.389	12.445	220
230	12.445	12.500	12.556	12.611	12.667	12.722	12.778	12.833	12.889	12.944	13.000	230
240	13.000	13.056	13.111	13.167	13.222	13.278	13.333	13.389	13.444	13.500	13.555	240
250	13.555	13.611	13.666	13.722	13.777	13.833	13.888	13.944	13.999	14.055	14.110	250
260	14.110	14.166	14.221	14.277	14.332	14.388	14.443	14.499	14.554	14.609	14.665	260
270	14.665	14.720	14.776	14.831	14.887	14.942	14.998	15.053	15.109	15.164	15.219	270
280	15.219	15.275	15.330	15.386	15.441	15.496	15.552	15.607	15.663	15.718	15.773	280
290	15.773	15.829	15.884	15.940	15.995	16.050	16.106	16.161	16.216	16.272	16.327	290
300	16.327	16.383	16.438	16.493	16.549	16.604	16.659	16.715	16.770	16.825	16.881	300
310	16.881	16.936	16.991	17.046	17.102	17.157	17.212	17.268	17.323	17.378	17.434	310
320	17.434	17.489	17.544	17.599	17.655	17.710	17.765	17.820	17.876	17.931	17.986	320
330	17.986	18.041	18.097	18.152	18.207	18.262	18.318	18.373	18.428	18.483	18.538	330
340	18.538	18.594	18.649	18.704	18.759	18.814	18.870	18.925	18.980	19.035	19.090	340
350	19.090	19.146	19.201	19.256	19.311	19.366	19.422	19.477	19.532	19.587	19.642	350
360	19.642	19.697	19.753	19.808	19.863	19.918	19.973	20.028	20.083	20.139	20.194	360
370	20.194	20.249	20.304	20.359	20.414	20.469	20.525	20.580	20.635	20.690	20.745	370
380	20.745	20.800	20.855	20.911	20.966	21.021	21.076	21.131	21.186	21.241	21.297	380
390	21.297	21.352	21.407	21.462	21.517	21.572	21.627	21.683	21.738	21.793	21.848	390
400	21.848	21.903	21.958	22.014	22.069	22.124	22.179	22.234	22.289	22.345	22.400	400
410	22.400	22.455	22.510	22.565	22.620	22.676	22.731	22.786	22.841	22.896	22.952	410
420	22.952	23.007	23.062	23.117	23.172	23.228	23.283	23.338	23.393	23.449	23.504	420
430	23.504	23.559	23.614	23.670	23.725	23.780	23.835	23.891	23.946	24.001	24.057	430
440	24.057	24.112	24.167	24.223	24.278	24.333	24.389	24.444	24.499	24.555	24.610	440
450	24.610	24.665	24.721	24.776	24.832	24.887	24.943	24.998	25.053	25.109	25.164	450
460	25.164	25.220	25.275	25.331	25.386	25.442	25.497	25.553	25.608	25.664	25.720	460
470	25.720	25.775	25.831	25.886	25.942	25.998	26.053	26.109	26.165	26.220	26.276	470
480	26.276	26.332	26.387	26.443	26.499	26.555	26.610	26.666	26.722	26.778	26.834	480
490	26.834	26.889	26.945	27.001	27.057	27.113	27.169	27.225	27.281	27.337	27.393	490
°C	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°C

Thermoelectric Voltage in Millivolts

°C	0	1	2	3	4	5	6	7	8	9	10	°C
500	27.393	27.449	27.505	27.561	27.617	27.673	27.729	27.785	27.841	27.897	27.953	500
510	27.953	28.010	28.066	28.122	28.178	28.234	28.291	28.347	28.403	28.460	28.516	510
520	28.516	28.572	28.629	28.685	28.741	28.798	28.854	28.911	28.967	29.024	29.080	520
530	29.080	29.137	29.194	29.250	29.307	29.363	29.420	29.477	29.534	29.590	29.647	530
540	29.647	29.704	29.761	29.818	29.874	29.931	29.988	30.045	30.102	30.159	30.216	540
550	30.216	30.273	30.330	30.387	30.444	30.502	30.559	30.616	30.673	30.730	30.788	550
560	30.788	30.845	30.902	30.960	31.017	31.074	31.132	31.189	31.247	31.304	31.362	560
570	31.362	31.419	31.477	31.535	31.592	31.650	31.708	31.766	31.823	31.881	31.939	570
580	31.939	31.997	32.055	32.113	32.171	32.229	32.287	32.345	32.403	32.461	32.519	580
590	32.519	32.577	32.636	32.694	32.752	32.810	32.869	32.927	32.985	33.044	33.102	590
600	33.102	33.161	33.219	33.278	33.337	33.395	33.454	33.513	33.571	33.630	33.689	600
610	33.689	33.748	33.807	33.866	33.925	33.984	34.043	34.102	34.161	34.220	34.279	610
620	34.279	34.338	34.397	34.457	34.516	34.575	34.635	34.694	34.754	34.813	34.873	620
630	34.873	34.932	34.992	35.051	35.111	35.171	35.230	35.290	35.350	35.410	35.470	630
640	35.470	35.530	35.590	35.650	35.710	35.770	35.830	35.890	35.950	36.010	36.071	640
650	36.071	36.131	36.191	36.252	36.312	36.373	36.433	36.494	36.554	36.615	36.675	650
660	36.675	36.736	36.797	36.858	36.918	36.979	37.040	37.101	37.162	37.223	37.284	660
670	37.284	37.345	37.406	37.467	37.528	37.590	37.651	37.712	37.773	37.835	37.896	670
680	37.896	37.958	38.019	38.081	38.142	38.204	38.265	38.327	38.389	38.450	38.512	680
690	38.512	38.574	38.636	38.698	38.760	38.822	38.884	38.946	39.008	39.070	39.132	690
700	39.132	39.194	39.256	39.318	39.381	39.443	39.505	39.568	39.630	39.693	39.755	700
710	39.755	39.818	39.880	39.943	40.005	40.068	40.131	40.193	40.256	40.319	40.382	710
720	40.382	40.445	40.508	40.570	40.633	40.696	40.759	40.822	40.886	40.949	41.012	720
730	41.012	41.075	41.138	41.201	41.265	41.328	41.391	41.455	41.518	41.581	41.645	730
740	41.645	41.708	41.772	41.835	41.899	41.962	42.026	42.090	42.153	42.217	42.281	740
750	42.281	42.344	42.408	42.472	42.536	42.599	42.663	42.727	42.791	42.855	42.919	750
760	42.919	42.983	43.047	43.111	43.175	43.239	43.303	43.367	43.431	43.495	43.559	760
770	43.559	43.624	43.688	43.752	43.817	43.881	43.945	44.010	44.074	44.139	44.203	770
780	44.203	44.267	44.332	44.396	44.461	44.525	44.590	44.655	44.719	44.784	44.848	780
790	44.848	44.913	44.977	45.042	45.107	45.171	45.236	45.301	45.365	45.430	45.494	790
800	45.494	45.559	45.624	45.688	45.753	45.818	45.882	45.947	46.011	46.076	46.141	800
810	46.141	46.205	46.270	46.334	46.399	46.464	46.528	46.593	46.657	46.722	46.786	810
820	46.786	46.851	46.915	46.980	47.044	47.109	47.173	47.238	47.302	47.367	47.431	820
830	47.431	47.495	47.560	47.624	47.688	47.753	47.817	47.881	47.946	48.010	48.074	830
840	48.074	48.138	48.202	48.267	48.331	48.395	48.459	48.523	48.587	48.651	48.715	840
850	48.715	48.779	48.843	48.907	48.971	49.034	49.098	49.162	49.226	49.290	49.353	850
860	49.353	49.417	49.481	49.544	49.608	49.672	49.735	49.799	49.862	49.926	49.989	860
870	49.989	50.052	50.116	50.179	50.243	50.306	50.369	50.432	50.495	50.559	50.622	870
880	50.622	50.685	50.748	50.811	50.874	50.937	51.000	51.063	51.126	51.188	51.251	880
890	51.251	51.314	51.377	51.439	51.502	51.565	51.627	51.690	51.752	51.815	51.877	890
900	51.877	51.940	52.002	52.064	52.127	52.189	52.251	52.314	52.376	52.438	52.500	900
910	52.500	52.562	52.624	52.686	52.748	52.810	52.872	52.934	52.996	53.057	53.119	910
920	53.119	53.181	53.243	53.304	53.366	53.427	53.489	53.550	53.612	53.673	53.735	920
930	53.735	53.796	53.857	53.919	53.980	54.041	54.102	54.164	54.225	54.286	54.347	930
940	54.347	54.408	54.469	54.530	54.591	54.652	54.713	54.773	54.834	54.895	54.956	940
950	54.956	55.016	55.077	55.138	55.198	55.259	55.319	55.380	55.440	55.501	55.561	950
960	55.561	55.622	55.682	55.742	55.803	55.863	55.923	55.983	56.043	56.104	56.164	960
970	56.164	56.224	56.284	56.344	56.404	56.464	56.524	56.584	56.643	56.703	56.763	970
980	56.763	56.823	56.883	56.942	57.002	57.062	57.121	57.181	57.240	57.300	57.360	980
990	57.360	57.419	57.479	57.538	57.597	57.657	57.716	57.776	57.835	57.894	57.953	990
1000	57.953	58.013	58.072	58.131	58.190	58.249	58.309	58.368	58.427	58.486	58.545	1000
1010	58.545	58.604	58.663	58.722	58.781	58.840	58.899	58.957	59.016	59.075	59.134	1010
1020	59.134	59.193	59.252	59.310	59.369	59.428	59.487	59.545	59.604	59.663	59.721	1020
1030	59.721	59.780	59.838	59.897	59.956	60.014	60.073	60.131	60.190	60.248	60.307	1030
1040	60.307	60.365	60.423	60.482	60.540	60.599	60.657	60.715	60.774	60.832	60.890	1040
1050	60.890	60.949	61.007	61.065	61.123	61.182	61.240	61.298	61.356	61.415	61.473	1050
1060	61.473	61.531	61.589	61.647	61.705	61.763	61.822	61.880	61.938	61.996	62.054	1060
1070	62.054	62.112	62.170	62.228	62.286	62.344	62.402	62.460	62.518	62.576	62.634	1070
1080	62.634	62.692	62.750	62.808	62.866	62.924	62.982	63.040	63.098	63.156	63.214	1080
1090	63.214	63.271	63.329	63.387	63.445	63.503	63.561	63.619	63.677	63.734	63.792	1090
1100	63.792	63.850	63.908	63.966	64.024	64.081	64.139	64.197	64.255	64.313	64.370	1100
1110	64.370	64.428	64.486	64.544	64.602	64.659	64.717	64.775	64.833	64.890	64.948	1110
1120	64.948	65.006	65.064	65.121	65.179	65.237	65.295	65.352	65.410	65.468	65.525	1120
1130	65.525	65.583	65.641	65.699	65.756	65.814	65.872	65.929	65.987	66.045	66.102	1130
1140	66.102	66.160	66.218	66.275	66.333	66.391	66.448	66.506	66.564	66.621	66.679	1140
1150	66.679	66.737	66.794	66.852	66.910	66.967	67.025	67.082	67.140	67.198	67.255	1150
1160	67.255	67.313	67.370	67.428	67.486	67.543	67.601	67.658	67.716	67.773	67.831	1160
1170	67.831	67.888	67.946	68.003	68.061	68.119	68.176	68.234	68.291	68.348	68.406	1170
1180	68.406	68.463	68.521	68.578	68.636	68.693	68.751	68.808	68.865	68.923	68.980	1180
1190	68.980	69.037	69.095	69.152	69.209	69.267	69.324	69.381	69.439	69.496	69.553	1190
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type "J" Thermocouple Reference Tables °F

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

GRADE:

IRON VS. COPPER-NICKEL

TEMPERATURE IN DEGREES °F
REFERENCE JUNCTION AT 32°F

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
32	to	1382°F	32	to	392°F
0	to	750°C	0	to	200°C

LIMITS OF ERROR
(Whichever is Greater)

Standard:			Special:		
2.2°C	or	0.75%	1.1°C	or	0.4%

Thermoelectric Voltage in Millivolts

°F	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°F
-340					-8.095	-8.085	-8.074	-8.063	-8.052	-8.041	-8.030	-340
-330	-8.030	-8.019	-8.008	-7.996	-7.985	-7.973	-7.962	-7.950	-7.938	-7.927	-7.915	-330
-320	-7.915	-7.903	-7.890	-7.878	-7.866	-7.854	-7.841	-7.829	-7.816	-7.804	-7.791	-320
-310	-7.791	-7.778	-7.765	-7.752	-7.739	-7.726	-7.713	-7.699	-7.686	-7.672	-7.659	-310
-300	-7.659	-7.645	-7.632	-7.618	-7.604	-7.590	-7.576	-7.562	-7.548	-7.534	-7.519	-300
-290	-7.519	-7.505	-7.491	-7.476	-7.462	-7.447	-7.432	-7.417	-7.403	-7.388	-7.373	-290
-280	-7.373	-7.357	-7.342	-7.327	-7.312	-7.296	-7.281	-7.265	-7.250	-7.234	-7.219	-280
-270	-7.219	-7.203	-7.187	-7.171	-7.155	-7.139	-7.123	-7.107	-7.090	-7.074	-7.058	-270
-260	-7.058	-7.041	-7.025	-7.008	-6.991	-6.975	-6.958	-6.941	-6.924	-6.907	-6.890	-260
-250	-6.890	-6.873	-6.856	-6.839	-6.821	-6.804	-6.787	-6.769	-6.752	-6.734	-6.716	-250
-240	-6.716	-6.699	-6.681	-6.663	-6.645	-6.627	-6.609	-6.591	-6.573	-6.555	-6.536	-240
-230	-6.536	-6.518	-6.500	-6.481	-6.463	-6.444	-6.426	-6.407	-6.388	-6.370	-6.351	-230
-220	-6.351	-6.332	-6.313	-6.294	-6.275	-6.256	-6.236	-6.217	-6.198	-6.179	-6.159	-220
-210	-6.159	-6.140	-6.120	-6.101	-6.081	-6.061	-6.042	-6.022	-6.002	-5.982	-5.962	-210
-200	-5.962	-5.942	-5.922	-5.902	-5.882	-5.862	-5.842	-5.821	-5.801	-5.781	-5.760	-200
-190	-5.760	-5.740	-5.719	-5.699	-5.678	-5.657	-5.637	-5.616	-5.595	-5.574	-5.553	-190
-180	-5.553	-5.532	-5.511	-5.490	-5.469	-5.448	-5.426	-5.405	-5.384	-5.363	-5.341	-180
-170	-5.341	-5.320	-5.298	-5.277	-5.255	-5.233	-5.212	-5.190	-5.168	-5.146	-5.125	-170
-160	-5.125	-5.103	-5.081	-5.059	-5.037	-5.015	-4.992	-4.970	-4.948	-4.926	-4.903	-160
-150	-4.903	-4.881	-4.859	-4.836	-4.814	-4.791	-4.769	-4.746	-4.724	-4.701	-4.678	-150
-140	-4.678	-4.655	-4.633	-4.610	-4.587	-4.564	-4.541	-4.518	-4.495	-4.472	-4.449	-140
-130	-4.449	-4.425	-4.402	-4.379	-4.356	-4.332	-4.309	-4.286	-4.262	-4.239	-4.215	-130
-120	-4.215	-4.192	-4.168	-4.144	-4.121	-4.097	-4.073	-4.050	-4.026	-4.002	-3.978	-120
-110	-3.978	-3.954	-3.930	-3.906	-3.882	-3.858	-3.834	-3.810	-3.786	-3.761	-3.737	-110
-100	-3.737	-3.713	-3.688	-3.664	-3.640	-3.615	-3.591	-3.566	-3.542	-3.517	-3.493	-100
-90	-3.493	-3.468	-3.443	-3.419	-3.394	-3.369	-3.344	-3.320	-3.295	-3.270	-3.245	-90
-80	-3.245	-3.220	-3.195	-3.170	-3.145	-3.120	-3.095	-3.070	-3.044	-3.019	-2.994	-80
-70	-2.994	-2.969	-2.943	-2.918	-2.893	-2.867	-2.842	-2.817	-2.791	-2.766	-2.740	-70
-60	-2.740	-2.714	-2.689	-2.663	-2.638	-2.612	-2.586	-2.560	-2.535	-2.509	-2.483	-60
-50	-2.483	-2.457	-2.431	-2.405	-2.379	-2.353	-2.327	-2.301	-2.275	-2.249	-2.223	-50
-40	-2.223	-2.197	-2.171	-2.145	-2.118	-2.092	-2.066	-2.040	-2.013	-1.987	-1.961	-40
-30	-1.961	-1.934	-1.908	-1.881	-1.855	-1.828	-1.802	-1.775	-1.749	-1.722	-1.695	-30
-20	-1.695	-1.669	-1.642	-1.615	-1.589	-1.562	-1.535	-1.508	-1.482	-1.455	-1.428	-20
-10	-1.428	-1.401	-1.374	-1.347	-1.320	-1.293	-1.266	-1.239	-1.212	-1.185	-1.158	-10
0	-1.158	-1.131	-1.104	-1.076	-1.049	-1.022	-0.995	-0.967	-0.940	-0.913	-0.886	0
0	-0.886	-0.858	-0.831	-0.803	-0.776	-0.749	-0.721	-0.694	-0.666	-0.639	-0.611	0
10	-0.611	-0.583	-0.556	-0.528	-0.501	-0.473	-0.445	-0.418	-0.390	-0.362	-0.334	10
20	-0.334	-0.307	-0.279	-0.251	-0.223	-0.195	-0.168	-0.140	-0.112	-0.084	-0.056	20
30	-0.056	-0.028	0.000	0.028	0.056	0.084	0.112	0.140	0.168	0.196	0.225	30
40	0.225	0.253	0.281	0.309	0.337	0.365	0.394	0.422	0.450	0.478	0.507	40
50	0.507	0.535	0.563	0.592	0.620	0.649	0.677	0.705	0.734	0.762	0.791	50
60	0.791	0.819	0.848	0.876	0.905	0.933	0.962	0.991	1.019	1.048	1.076	60
70	1.076	1.105	1.134	1.162	1.191	1.220	1.249	1.277	1.306	1.335	1.364	70
80	1.364	1.392	1.421	1.450	1.479	1.508	1.537	1.566	1.594	1.623	1.652	80
90	1.652	1.681	1.710	1.739	1.768	1.797	1.826	1.855	1.884	1.913	1.942	90
100	1.942	1.972	2.001	2.030	2.059	2.088	2.117	2.146	2.175	2.205	2.234	100
110	2.234	2.263	2.292	2.322	2.351	2.380	2.409	2.439	2.468	2.497	2.527	110
120	2.527	2.556	2.585	2.615	2.644	2.673	2.703	2.732	2.762	2.791	2.821	120
130	2.821	2.850	2.880	2.909	2.938	2.968	2.997	3.027	3.057	3.086	3.116	130
140	3.116	3.145	3.175	3.204	3.234	3.264	3.293	3.323	3.353	3.382	3.412	140
150	3.412	3.442	3.471	3.501	3.531	3.560	3.590	3.620	3.650	3.679	3.709	150
160	3.709	3.739	3.769	3.798	3.828	3.858	3.888	3.918	3.948	3.977	4.007	160
170	4.007	4.037	4.067	4.097	4.127	4.157	4.187	4.217	4.246	4.276	4.306	170
180	4.306	4.336	4.366	4.396	4.426	4.456	4.486	4.516	4.546	4.576	4.606	180
190	4.606	4.636	4.666	4.696	4.726	4.757	4.787	4.817	4.847	4.877	4.907	190
200	4.907	4.937	4.967	4.997	5.028	5.058	5.088	5.118	5.148	5.178	5.209	200
210	5.209	5.239	5.269	5.299	5.329	5.360	5.390	5.420	5.450	5.480	5.511	210
220	5.511	5.541	5.571	5.602	5.632	5.662	5.692	5.723	5.753	5.783	5.814	220
230	5.814	5.844	5.874	5.905	5.935	5.965	5.996	6.026	6.056	6.087	6.117	230
240	6.117	6.147	6.178	6.208	6.239	6.269	6.299	6.330	6.360	6.391	6.421	240
250	6.421	6.452	6.482	6.512	6.543	6.573	6.604	6.634	6.665	6.695	6.726	250
260	6.726	6.756	6.787	6.817	6.848	6.878	6.909	6.939	6.970	7.000	7.031	260
270	7.031	7.061	7.092	7.122	7.153	7.184	7.214	7.245	7.275	7.306	7.336	270
280	7.336	7.367	7.398	7.428	7.459	7.489	7.520	7.550	7.581	7.612	7.642	280
290	7.642	7.673	7.704	7.734	7.765	7.795	7.826	7.857	7.887	7.918	7.949	290
300	7.949	7.979	8.010	8.041	8.071	8.102	8.133	8.163	8.194	8.225	8.255	300
310	8.255	8.286	8.317	8.347	8.378	8.409	8.439	8.470	8.501	8.532	8.562	310
320	8.562	8.593	8.624	8.654	8.685	8.716	8.747	8.777	8.808	8.839	8.869	320
330	8.869	8.900	8.931	8.962	8.992	9.023	9.054	9.085	9.115	9.146	9.177	330
340	9.177	9.208	9.238	9.269	9.300	9.331	9.362	9.392	9.423	9.454	9.485	340
°F	10	9	8	7	6	5	4	3	2	1	0	°F

Thermoelectric Voltage in Millivolts

°F	10	9	8	7	6	5	4	3	2	1	0	°F
350	9.485	9.515	9.546	9.577	9.608	9.639	9.669	9.700	9.731	9.762	9.793	350
360	9.793	9.823	9.854	9.885	9.916	9.947	9.977	10.008	10.039	10.070	10.101	360
370	10.101	10.131	10.162	10.193	10.224	10.255	10.285	10.316	10.347	10.378	10.409	370
380	10.409	10.440	10.470	10.501	10.532	10.563	10.594	10.625	10.655	10.686	10.717	380
390	10.717	10.748	10.779	10.810	10.840	10.871	10.902	10.933	10.964	10.995	11.025	390
400	11.025	11.056	11.087	11.118	11.149	11.180	11.211	11.241	11.272	11.303	11.334	400
410	11.334	11.365	11.396	11.426	11.457	11.488	11.519	11.550	11.581	11.612	11.642	410
420	11.642	11.673	11.704	11.735	11.766	11.797	11.828	11.858	11.889	11.920	11.951	420
430	11.951	11.982	12.013	12.044	12.074	12.105	12.136	12.167	12.198	12.229	12.260	430
440	12.260	12.290	12.321	12.352	12.383	12.414	12.445	12.476	12.506	12.537	12.568	440
450	12.568	12.599	12.630	12.661	12.691	12.722	12.753	12.784	12.815	12.846	12.877	450
460	12.877	12.907	12.938	12.969	13.000	13.031	13.062	13.093	13.123	13.154	13.185	460
470	13.185	13.216	13.247	13.278	13.308	13.339	13.370	13.401	13.432	13.463	13.494	470
480	13.494	13.524	13.555	13.586	13.617	13.648	13.679	13.709	13.740	13.771	13.802	480
490	13.802	13.833	13.864	13.894	13.925	13.956	13.987	14.018	14.049	14.079	14.110	490
500	14.110	14.141	14.172	14.203	14.233	14.264	14.295	14.326	14.357	14.388	14.418	500
510	14.418	14.449	14.480	14.511	14.542	14.573	14.603	14.634	14.665	14.696	14.727	510
520	14.727	14.757	14.788	14.819	14.850	14.881	14.911	14.942	14.973	15.004	15.035	520
530	15.035	15.065	15.096	15.127	15.158	15.189	15.219	15.250	15.281	15.312	15.343	530
540	15.343	15.373	15.404	15.435	15.466	15.496	15.527	15.558	15.589	15.620	15.650	540
550	15.650	15.681	15.712	15.743	15.773	15.804	15.835	15.866	15.897	15.927	15.958	550
560	15.958	15.989	16.020	16.050	16.081	16.112	16.143	16.173	16.204	16.235	16.266	560
570	16.266	16.296	16.327	16.358	16.389	16.419	16.450	16.481	16.512	16.542	16.573	570
580	16.573	16.604	16.635	16.665	16.696	16.727	16.758	16.788	16.819	16.850	16.881	580
590	16.881	16.911	16.942	16.973	17.003	17.034	17.065	17.096	17.126	17.157	17.188	590
600	17.188	17.219	17.249	17.280	17.311	17.341	17.372	17.403	17.434	17.464	17.495	600
610	17.495	17.526	17.556	17.587	17.618	17.649	17.679	17.710	17.741	17.771	17.802	610
620	17.802	17.833	17.863	17.894	17.925	17.955	17.986	18.017	18.048	18.078	18.109	620
630	18.109	18.140	18.170	18.201	18.232	18.262	18.293	18.324	18.354	18.385	18.416	630
640	18.416	18.446	18.477	18.508	18.538	18.569	18.600	18.630	18.661	18.692	18.722	640
650	18.722	18.753	18.784	18.814	18.845	18.876	18.906	18.937	18.968	18.998	19.029	650
660	19.029	19.060	19.090	19.121	19.152	19.182	19.213	19.244	19.274	19.305	19.336	660
670	19.336	19.366	19.397	19.428	19.458	19.489	19.520	19.550	19.581	19.612	19.642	670
680	19.642	19.673	19.704	19.734	19.765	19.795	19.826	19.857	19.887	19.918	19.949	680
690	19.949	19.979	20.010	20.041	20.071	20.102	20.132	20.163	20.194	20.224	20.255	690
700	20.255	20.286	20.316	20.347	20.378	20.408	20.439	20.469	20.500	20.531	20.561	700
710	20.561	20.592	20.623	20.653	20.684	20.715	20.745	20.776	20.806	20.837	20.868	710
720	20.868	20.898	20.929	20.960	20.990	21.021	21.052	21.082	21.113	21.143	21.174	720
730	21.174	21.205	21.235	21.266	21.297	21.327	21.358	21.389	21.419	21.450	21.480	730
740	21.480	21.511	21.542	21.572	21.603	21.634	21.664	21.695	21.726	21.756	21.787	740
750	21.787	21.817	21.848	21.879	21.909	21.940	21.971	22.001	22.032	22.063	22.093	750
760	22.093	22.124	22.154	22.185	22.216	22.246	22.277	22.308	22.338	22.369	22.400	760
770	22.400	22.430	22.461	22.492	22.522	22.553	22.584	22.614	22.645	22.676	22.706	770
780	22.706	22.737	22.768	22.798	22.829	22.860	22.890	22.921	22.952	22.982	23.013	780
790	23.013	23.044	23.074	23.105	23.136	23.166	23.197	23.228	23.258	23.289	23.320	790
800	23.320	23.350	23.381	23.412	23.442	23.473	23.504	23.535	23.565	23.596	23.627	800
810	23.627	23.657	23.688	23.719	23.749	23.780	23.811	23.842	23.872	23.903	23.934	810
820	23.934	23.964	23.995	24.026	24.057	24.087	24.118	24.149	24.180	24.210	24.241	820
830	24.241	24.272	24.303	24.333	24.364	24.395	24.426	24.456	24.487	24.518	24.549	830
840	24.549	24.579	24.610	24.641	24.672	24.702	24.733	24.764	24.795	24.826	24.856	840
850	24.856	24.887	24.918	24.949	24.979	25.010	25.041	25.072	25.103	25.134	25.164	850
860	25.164	25.195	25.226	25.257	25.288	25.318	25.349	25.380	25.411	25.442	25.473	860
870	25.473	25.504	25.534	25.565	25.596	25.627	25.658	25.689	25.720	25.750	25.781	870
880	25.781	25.812	25.843	25.874	25.905	25.936	25.967	25.998	26.028	26.059	26.090	880
890	26.090	26.121	26.152	26.183	26.214	26.245	26.276	26.307	26.338	26.369	26.400	890
900	26.400	26.431	26.462	26.493	26.524	26.555	26.586	26.617	26.648	26.679	26.710	900
910	26.710	26.741	26.772	26.803	26.834	26.865	26.896	26.927	26.958	26.989	27.020	910
920	27.020	27.051	27.082	27.113	27.144	27.175	27.206	27.237	27.268	27.299	27.330	920
930	27.330	27.362	27.393	27.424	27.455	27.486	27.517	27.548	27.579	27.610	27.642	930
940	27.642	27.673	27.704	27.735	27.766	27.797	27.829	27.860	27.891	27.922	27.953	940
950	27.953	27.985	28.016	28.047	28.078	28.109	28.141	28.172	28.203	28.234	28.266	950
960	28.266	28.297	28.328	28.359	28.391	28.422	28.453	28.485	28.516	28.547	28.579	960
970	28.579	28.610	28.641	28.672	28.704	28.735	28.767	28.798	28.829	28.861	28.892	970
980	28.892	28.923	28.955	28.986	29.018	29.049	29.080	29.112	29.143	29.175	29.206	980
990	29.206	29.238	29.269	29.301	29.332	29.363	29.395	29.426	29.458	29.489	29.521	990
1000	29.521	29.552	29.584	29.616	29.647	29.679	29.710	29.742	29.773	29.805	29.836	1000
1010	29.836	29.868	29.900	29.931	29.963	29.995	30.026	30.058	30.089	30.121	30.153	1010
1020	30.153	30.184	30.216	30.248	30.279	30.311	30.343	30.375	30.406	30.438	30.470	1020
1030	30.470	30.502	30.533	30.565	30.597	30.629	30.660	30.692	30.724	30.756	30.788	1030
1040	30.788	30.819	30.851	30.883	30.915	30.947	30.979	31.011	31.043	31.074	31.106	1040
°F	10	9	8	7	6	5	4	3	2	1	0	°F

GRADE:

IRON VS. COPPER-NICKEL

TEMPERATURE IN DEGREES °F
REFERENCE JUNCTION AT 32°F

TYPE "J" THERMOCOUPLE REFERENCE TABLES °F

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

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
32	to	1382°F	32	to	392°F
0	to	750°C	0	to	200°C

LIMITS OF ERROR
(Whichever is Greater)

Standard:			Special:		
2.2°C	or	0.75%	1.1°C	or	0.4%

Thermoelectric Voltage in Millivolts

°F	10	9	8	7	6	5	4	3	2	1	0	°F
1050	31.106	31.138	31.170	31.202	31.234	31.266	31.298	31.330	31.362	31.394	31.426	1050
1060	31.426	31.458	31.490	31.522	31.554	31.586	31.618	31.650	31.682	31.714	31.746	1060
1070	31.746	31.778	31.811	31.843	31.875	31.907	31.939	31.971	32.003	32.035	32.068	1070
1080	32.068	32.100	32.132	32.164	32.196	32.229	32.261	32.293	32.325	32.358	32.390	1080
1090	32.390	32.422	32.455	32.487	32.519	32.551	32.584	32.616	32.648	32.681	32.713	1090
1100	32.713	32.746	32.778	32.810	32.843	32.875	32.908	32.940	32.973	33.005	33.037	1100
1110	33.037	33.070	33.102	33.135	33.167	33.200	33.232	33.265	33.298	33.330	33.363	1110
1120	33.363	33.395	33.428	33.460	33.493	33.526	33.558	33.591	33.624	33.656	33.689	1120
1130	33.689	33.722	33.754	33.787	33.820	33.853	33.885	33.918	33.951	33.984	34.016	1130
1140	34.016	34.049	34.082	34.115	34.148	34.180	34.213	34.246	34.279	34.312	34.345	1140
1150	34.345	34.378	34.411	34.444	34.476	34.509	34.542	34.575	34.608	34.641	34.674	1150
1160	34.674	34.707	34.740	34.773	34.806	34.840	34.873	34.906	34.939	34.972	35.005	1160
1170	35.005	35.038	35.071	35.104	35.138	35.171	35.204	35.237	35.270	35.304	35.337	1170
1180	35.337	35.370	35.403	35.437	35.470	35.503	35.536	35.570	35.603	35.636	35.670	1180
1190	35.670	35.703	35.736	35.770	35.803	35.837	35.870	35.903	35.937	35.970	36.004	1190
1200	36.004	36.037	36.071	36.104	36.138	36.171	36.205	36.238	36.272	36.305	36.339	1200
1210	36.339	36.373	36.406	36.440	36.473	36.507	36.541	36.574	36.608	36.642	36.675	1210
1220	36.675	36.709	36.743	36.777	36.810	36.844	36.878	36.912	36.945	36.979	37.013	1220
1230	37.013	37.047	37.081	37.114	37.148	37.182	37.216	37.250	37.284	37.318	37.352	1230
1240	37.352	37.386	37.420	37.454	37.488	37.522	37.556	37.590	37.624	37.658	37.692	1240
1250	37.692	37.726	37.760	37.794	37.828	37.862	37.896	37.930	37.964	37.999	38.033	1250
1260	38.033	38.067	38.101	38.135	38.169	38.204	38.238	38.272	38.306	38.341	38.375	1260
1270	38.375	38.409	38.444	38.478	38.512	38.546	38.581	38.615	38.650	38.684	38.718	1270
1280	38.718	38.753	38.787	38.822	38.856	38.890	38.925	38.959	38.994	39.028	39.063	1280
1290	39.063	39.097	39.132	39.166	39.201	39.235	39.270	39.305	39.339	39.374	39.408	1290
1300	39.408	39.443	39.478	39.512	39.547	39.582	39.616	39.651	39.686	39.720	39.755	1300
1310	39.755	39.790	39.825	39.859	39.894	39.929	39.964	39.998	40.033	40.068	40.103	1310
1320	40.103	40.138	40.173	40.207	40.242	40.277	40.312	40.347	40.382	40.417	40.452	1320
1330	40.452	40.487	40.522	40.556	40.591	40.626	40.661	40.696	40.731	40.766	40.801	1330
1340	40.801	40.836	40.872	40.907	40.942	40.977	41.012	41.047	41.082	41.117	41.152	1340
1350	41.152	41.187	41.222	41.258	41.293	41.328	41.363	41.398	41.433	41.469	41.504	1350
1360	41.504	41.539	41.574	41.610	41.645	41.680	41.715	41.751	41.786	41.821	41.856	1360
1370	41.856	41.892	41.927	41.962	41.998	42.033	42.068	42.104	42.139	42.174	42.210	1370
1380	42.210	42.245	42.281	42.316	42.351	42.387	42.422	42.458	42.493	42.528	42.564	1380
1390	42.564	42.599	42.635	42.670	42.706	42.741	42.777	42.812	42.848	42.883	42.919	1390
1400	42.919	42.954	42.990	43.025	43.061	43.096	43.132	43.167	43.203	43.239	43.274	1400
1410	43.274	43.310	43.346	43.381	43.417	43.452	43.488	43.524	43.559	43.595	43.631	1410
1420	43.631	43.667	43.702	43.738	43.774	43.809	43.845	43.881	43.917	43.953	43.988	1420
1430	43.988	44.024	44.060	44.096	44.131	44.167	44.203	44.239	44.275	44.310	44.346	1430
1440	44.346	44.382	44.418	44.454	44.490	44.525	44.561	44.597	44.633	44.669	44.705	1440
1450	44.705	44.741	44.777	44.812	44.848	44.884	44.920	44.956	44.992	45.028	45.064	1450
1460	45.064	45.099	45.135	45.171	45.207	45.243	45.279	45.315	45.351	45.387	45.423	1460
1470	45.423	45.458	45.494	45.530	45.566	45.602	45.638	45.674	45.710	45.746	45.782	1470
1480	45.782	45.818	45.853	45.889	45.925	45.961	45.997	46.033	46.069	46.105	46.141	1480
1490	46.141	46.177	46.212	46.248	46.284	46.320	46.356	46.392	46.428	46.464	46.500	1490
1500	46.500	46.535	46.571	46.607	46.643	46.679	46.715	46.751	46.786	46.822	46.858	1500
1510	46.858	46.894	46.930	46.966	47.001	47.037	47.073	47.109	47.145	47.181	47.216	1510
1520	47.216	47.252	47.288	47.324	47.359	47.395	47.431	47.467	47.503	47.538	47.574	1520
1530	47.574	47.610	47.646	47.681	47.717	47.753	47.788	47.824	47.860	47.896	47.931	1530
1540	47.931	47.967	48.003	48.038	48.074	48.110	48.145	48.181	48.217	48.252	48.288	1540
1550	48.288	48.324	48.359	48.395	48.430	48.466	48.502	48.537	48.573	48.608	48.644	1550
1560	48.644	48.679	48.715	48.750	48.786	48.822	48.857	48.893	48.928	48.964	48.999	1560
1570	48.999	49.034	49.070	49.105	49.141	49.176	49.212	49.247	49.283	49.318	49.353	1570
1580	49.353	49.389	49.424	49.460	49.495	49.530	49.566	49.601	49.636	49.672	49.707	1580
1590	49.707	49.742	49.778	49.813	49.848	49.883	49.919	49.954	49.989	50.024	50.060	1590
1600	50.060	50.095	50.130	50.165	50.200	50.235	50.271	50.306	50.341	50.376	50.411	1600
1610	50.411	50.446	50.481	50.517	50.552	50.587	50.622	50.657	50.692	50.727	50.762	1610
1620	50.762	50.797	50.832	50.867	50.902	50.937	50.972	51.007	51.042	51.077	51.112	1620
1630	51.112	51.147	51.181	51.216	51.251	51.286	51.321	51.356	51.391	51.425	51.460	1630
1640	51.460	51.495	51.530	51.565	51.599	51.634	51.669	51.704	51.738	51.773	51.808	1640
°F	10	9	8	7	6	5	4	3	2	1	0	°F

Thermoelectric Voltage in Millivolts

°F	10	9	8	7	6	5	4	3	2	1	0	°F
1650	51.808	51.843	51.877	51.912	51.947	51.981	52.016	52.051	52.085	52.120	52.154	1650
1660	52.154	52.189	52.224	52.258	52.293	52.327	52.362	52.396	52.431	52.465	52.500	1660
1670	52.500	52.534	52.569	52.603	52.638	52.672	52.707	52.741	52.776	52.810	52.844	1670
1680	52.844	52.879	52.913	52.947	52.982	53.016	53.050	53.085	53.119	53.153	53.188	1680
1690	53.188	53.222	53.256	53.290	53.325	53.359	53.393	53.427	53.462	53.496	53.530	1690
1700	53.530	53.564	53.598	53.632	53.667	53.701	53.735	53.769	53.803	53.837	53.871	1700
1710	53.871	53.905	53.939	53.973	54.007	54.041	54.075	54.109	54.143	54.177	54.211	1710
1720	54.211	54.245	54.279	54.313	54.347	54.381	54.415	54.449	54.483	54.516	54.550	1720
1730	54.550	54.584	54.618	54.652	54.686	54.719	54.753	54.787	54.821	54.855	54.888	1730
1740	54.888	54.922	54.956	54.990	55.023	55.057	55.091	55.124	55.158	55.192	55.225	1740
1750	55.225	55.259	55.293	55.326	55.360	55.393	55.427	55.461	55.494	55.528	55.561	1750
1760	55.561	55.595	55.628	55.662	55.695	55.729	55.762	55.796	55.829	55.863	55.896	1760
1770	55.896	55.930	55.963	55.997	56.030	56.063	56.097	56.130	56.164	56.197	56.230	1770
1780	56.230	56.264	56.297	56.330	56.364	56.397	56.430	56.464	56.497	56.530	56.564	1780
1790	56.564	56.597	56.630	56.663	56.697	56.730	56.763	56.796	56.829	56.863	56.896	1790
1800	56.896	56.929	56.962	56.995	57.028	57.062	57.095	57.128	57.161	57.194	57.227	1800
1810	57.227	57.260	57.293	57.326	57.360	57.393	57.426	57.459	57.492	57.525	57.558	1810
1820	57.558	57.591	57.624	57.657	57.690	57.723	57.756	57.789	57.822	57.855	57.888	1820
1830	57.888	57.920	57.953	57.986	58.019	58.052	58.085	58.118	58.151	58.184	58.217	1830
1840	58.217	58.249	58.282	58.315	58.348	58.381	58.414	58.446	58.479	58.512	58.545	1840
1850	58.545	58.578	58.610	58.643	58.676	58.709	58.741	58.774	58.807	58.840	58.872	1850
1860	58.872	58.905	58.938	58.971	59.003	59.036	59.069	59.101	59.134	59.167	59.199	1860
1870	59.199	59.232	59.265	59.297	59.330	59.363	59.395	59.428	59.460	59.493	59.526	1870
1880	59.526	59.558	59.591	59.623	59.656	59.689	59.721	59.754	59.786	59.819	59.851	1880
1890	59.851	59.884	59.916	59.949	59.982	60.014	60.047	60.079	60.112	60.144	60.177	1890
1900	60.177	60.209	60.242	60.274	60.307	60.339	60.371	60.404	60.436	60.469	60.501	1900
1910	60.501	60.534	60.566	60.599	60.631	60.663	60.696	60.728	60.761	60.793	60.826	1910
1920	60.826	60.858	60.890	60.923	60.955	60.987	61.020	61.052	61.085	61.117	61.149	1920
1930	61.149	61.182	61.214	61.246	61.279	61.311	61.343	61.376	61.408	61.440	61.473	1930
1940	61.473	61.505	61.537	61.570	61.602	61.634	61.667	61.699	61.731	61.763	61.796	1940
1950	61.796	61.828	61.860	61.893	61.925	61.957	61.989	62.022	62.054	62.086	62.118	1950
1960	62.118	62.151	62.183	62.215	62.247	62.280	62.312	62.344	62.376	62.409	62.441	1960
1970	62.441	62.473	62.505	62.537	62.570	62.602	62.634	62.666	62.699	62.731	62.763	1970
1980	62.763	62.795	62.827	62.860	62.892	62.924	62.956	62.988	63.020	63.053	63.085	1980
1990	63.085	63.117	63.149	63.181	63.214	63.246	63.278	63.310	63.342	63.374	63.406	1990
2000	63.406	63.439	63.471	63.503	63.535	63.567	63.599	63.632	63.664	63.696	63.728	2000
2010	63.728	63.760	63.792	63.824	63.856	63.889	63.921	63.953	63.985	64.017	64.049	2010
2020	64.049	64.081	64.113	64.146	64.178	64.210	64.242	64.274	64.306	64.338	64.370	2020
2030	64.370	64.402	64.435	64.467	64.499	64.531	64.563	64.595	64.627	64.659	64.691	2030
2040	64.691	64.723	64.756	64.788	64.820	64.852	64.884	64.916	64.948	64.980	65.012	2040
2050	65.012	65.044	65.076	65.109	65.141	65.173	65.205	65.237	65.269	65.301	65.333	2050
2060	65.333	65.365	65.397	65.429	65.461	65.493	65.525	65.557	65.590	65.622	65.654	2060
2070	65.654	65.686	65.718	65.750	65.782	65.814	65.846	65.878	65.910	65.942	65.974	2070
2080	65.974	66.006	66.038	66.070	66.102	66.134	66.166	66.199	66.231	66.263	66.295	2080
2090	66.295	66.327	66.359	66.391	66.423	66.455	66.487	66.519	66.551	66.583	66.615	2090
2100	66.615	66.647	66.679	66.711	66.743	66.775	66.807	66.839	66.871	66.903	66.935	2100
2110	66.935	66.967	66.999	67.031	67.063	67.095	67.127	67.159	67.191	67.223	67.255	2110
2120	67.255	67.287	67.319	67.351	67.383	67.415	67.447	67.479	67.511	67.543	67.575	2120
2130	67.575	67.607	67.639	67.671	67.703	67.735	67.767	67.799	67.831	67.863	67.895	2130
2140	67.895	67.927	67.959	67.991	68.023	68.055	68.087	68.119	68.150	68.182	68.214	2140
2150	68.214	68.246	68.278	68.310	68.342	68.374	68.406	68.438	68.470	68.502	68.534	2150
2160	68.534	68.566	68.597	68.629	68.661	68.693	68.725	68.757	68.789	68.821	68.853	2160
2170	68.853	68.884	68.916	68.948	68.980	69.012	69.044	69.076	69.108	69.139	69.171	2170
2180	69.171	69.203	69.235	69.267	69.299	69.330	69.362	69.394	69.426	69.458	69.490	2180
2190	69.490	69.521	69.553									2190
°F	10	9	8	7	6	5	4	3	2	1	0	°F

Type "K" Thermocouple Reference Tables °C

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

GRADE:

NICKEL-CHROMIUM VS. NICKEL-ALUMINUM

TEMPERATURE IN DEGREES °C
REFERENCE JUNCTION AT 0°C

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
-328	to	2282°F	32	to	392°F
-200	to	1250°C	0	to	200°C

LIMITS OF ERROR (Whichever is Greater)

Standard:			Special:		
2.2°C	or	0.75% Above 0°C	1.1°C	or	0.4%
2.2°C	or	2.0% Below 0°C			

Thermoelectric Voltage in Millivolts

°C	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°C
-260	-6.458	-6.457	-6.456	-6.455	-6.453	-6.452	-6.450	-6.448	-6.446	-6.444	-6.441	-260
-250	-6.441	-6.438	-6.435	-6.432	-6.429	-6.425	-6.421	-6.417	-6.413	-6.408	-6.404	-250
-240	-6.404	-6.399	-6.393	-6.388	-6.382	-6.377	-6.370	-6.364	-6.358	-6.351	-6.344	-240
-230	-6.344	-6.337	-6.329	-6.322	-6.314	-6.306	-6.297	-6.289	-6.280	-6.271	-6.262	-230
-220	-6.262	-6.252	-6.243	-6.233	-6.223	-6.213	-6.202	-6.192	-6.181	-6.170	-6.158	-220
-210	-6.158	-6.147	-6.135	-6.123	-6.111	-6.099	-6.087	-6.074	-6.061	-6.048	-6.035	-210
-200	-6.035	-6.021	-6.007	-5.994	-5.980	-5.965	-5.951	-5.936	-5.922	-5.907	-5.891	-200
-190	-5.891	-5.876	-5.861	-5.845	-5.829	-5.813	-5.797	-5.780	-5.763	-5.747	-5.730	-190
-180	-5.730	-5.713	-5.695	-5.678	-5.660	-5.642	-5.624	-5.606	-5.588	-5.569	-5.550	-180
-170	-5.550	-5.531	-5.512	-5.493	-5.474	-5.454	-5.435	-5.415	-5.395	-5.374	-5.354	-170
-160	-5.354	-5.333	-5.313	-5.292	-5.271	-5.250	-5.228	-5.207	-5.185	-5.163	-5.141	-160
-150	-5.141	-5.119	-5.097	-5.074	-5.052	-5.029	-5.006	-4.983	-4.960	-4.936	-4.913	-150
-140	-4.913	-4.889	-4.865	-4.841	-4.817	-4.793	-4.768	-4.744	-4.719	-4.694	-4.669	-140
-130	-4.669	-4.644	-4.618	-4.593	-4.567	-4.542	-4.516	-4.490	-4.463	-4.437	-4.411	-130
-120	-4.411	-4.384	-4.357	-4.330	-4.303	-4.276	-4.249	-4.221	-4.194	-4.166	-4.138	-120
-110	-4.138	-4.110	-4.082	-4.054	-4.025	-3.997	-3.968	-3.939	-3.911	-3.882	-3.852	-110
-100	-3.852	-3.823	-3.794	-3.764	-3.734	-3.705	-3.675	-3.645	-3.614	-3.584	-3.554	-100
-90	-3.554	-3.523	-3.492	-3.462	-3.431	-3.400	-3.368	-3.337	-3.306	-3.274	-3.243	-90
-80	-3.243	-3.211	-3.179	-3.147	-3.115	-3.083	-3.050	-3.018	-2.986	-2.953	-2.920	-80
-70	-2.920	-2.887	-2.854	-2.821	-2.788	-2.755	-2.721	-2.688	-2.654	-2.620	-2.587	-70
-60	-2.587	-2.553	-2.519	-2.485	-2.450	-2.416	-2.382	-2.347	-2.312	-2.278	-2.243	-60
-50	-2.243	-2.208	-2.173	-2.138	-2.103	-2.067	-2.032	-1.996	-1.961	-1.925	-1.889	-50
-40	-1.889	-1.854	-1.818	-1.782	-1.745	-1.709	-1.673	-1.637	-1.600	-1.564	-1.527	-40
-30	-1.527	-1.490	-1.453	-1.417	-1.380	-1.343	-1.305	-1.268	-1.231	-1.194	-1.156	-30
-20	-1.156	-1.119	-1.081	-1.043	-1.006	-0.968	-0.930	-0.892	-0.854	-0.816	-0.778	-20
-10	-0.778	-0.739	-0.701	-0.663	-0.624	-0.586	-0.547	-0.508	-0.470	-0.431	-0.392	-10
0	-0.392	-0.353	-0.314	-0.275	-0.236	-0.197	-0.157	-0.118	-0.079	-0.039	0.000	0
0	0.000	0.039	0.079	0.119	0.158	0.198	0.238	0.277	0.317	0.357	0.397	0
10	0.397	0.437	0.477	0.517	0.557	0.597	0.637	0.677	0.718	0.758	0.798	10
20	0.798	0.838	0.879	0.919	0.960	1.000	1.041	1.081	1.122	1.163	1.203	20
30	1.203	1.244	1.285	1.326	1.366	1.407	1.448	1.489	1.530	1.571	1.612	30
40	1.612	1.653	1.694	1.735	1.776	1.817	1.858	1.899	1.941	1.982	2.023	40
50	2.023	2.064	2.106	2.147	2.188	2.230	2.271	2.312	2.354	2.395	2.436	50
60	2.436	2.478	2.519	2.561	2.602	2.644	2.685	2.727	2.768	2.810	2.851	60
70	2.851	2.893	2.934	2.976	3.017	3.059	3.100	3.142	3.184	3.225	3.267	70
80	3.267	3.308	3.350	3.391	3.433	3.474	3.516	3.557	3.599	3.640	3.682	80
90	3.682	3.723	3.765	3.806	3.848	3.889	3.931	3.972	4.013	4.055	4.096	90
100	4.096	4.138	4.179	4.220	4.262	4.303	4.344	4.385	4.427	4.468	4.509	100
110	4.509	4.550	4.591	4.633	4.674	4.715	4.756	4.797	4.838	4.879	4.920	110
120	4.920	4.961	5.002	5.043	5.084	5.124	5.165	5.206	5.247	5.288	5.328	120
130	5.328	5.369	5.410	5.450	5.491	5.532	5.572	5.613	5.653	5.694	5.735	130
140	5.735	5.775	5.815	5.856	5.896	5.937	5.977	6.017	6.058	6.098	6.138	140
150	6.138	6.179	6.219	6.259	6.299	6.339	6.380	6.420	6.460	6.500	6.540	150
160	6.540	6.580	6.620	6.660	6.701	6.741	6.781	6.821	6.861	6.901	6.941	160
170	6.941	6.981	7.021	7.060	7.100	7.140	7.180	7.220	7.260	7.300	7.340	170
180	7.340	7.380	7.420	7.460	7.500	7.540	7.579	7.619	7.659	7.699	7.739	180
190	7.739	7.779	7.819	7.859	7.899	7.939	7.979	8.019	8.059	8.099	8.138	190
200	8.138	8.178	8.218	8.258	8.298	8.338	8.378	8.418	8.458	8.499	8.539	200
210	8.539	8.579	8.619	8.659	8.699	8.739	8.779	8.819	8.860	8.900	8.940	210
220	8.940	8.980	9.020	9.061	9.101	9.141	9.181	9.222	9.262	9.302	9.343	220
230	9.343	9.383	9.423	9.464	9.504	9.545	9.585	9.626	9.666	9.707	9.747	230
240	9.747	9.788	9.828	9.869	9.909	9.950	9.991	10.031	10.072	10.113	10.153	240
250	10.153	10.194	10.235	10.276	10.316	10.357	10.398	10.439	10.480	10.520	10.561	250
260	10.561	10.602	10.643	10.684	10.725	10.766	10.807	10.848	10.889	10.930	10.971	260
270	10.971	11.012	11.053	11.094	11.135	11.176	11.217	11.259	11.300	11.341	11.382	270
280	11.382	11.423	11.465	11.506	11.547	11.588	11.630	11.671	11.712	11.753	11.795	280
290	11.795	11.836	11.877	11.919	11.960	12.001	12.043	12.084	12.126	12.167	12.209	290
300	12.209	12.250	12.291	12.333	12.374	12.416	12.457	12.499	12.540	12.582	12.624	300
310	12.624	12.665	12.707	12.748	12.790	12.831	12.873	12.915	12.956	12.998	13.040	310
320	13.040	13.081	13.123	13.165	13.206	13.248	13.290	13.331	13.373	13.415	13.457	320
330	13.457	13.498	13.540	13.582	13.624	13.665	13.707	13.749	13.791	13.833	13.874	330
340	13.874	13.916	13.958	14.000	14.042	14.084	14.126	14.167	14.209	14.251	14.293	340
350	14.293	14.335	14.377	14.419	14.461	14.503	14.545	14.587	14.629	14.671	14.713	350
360	14.713	14.755	14.797	14.839	14.881	14.923	14.965	15.007	15.049	15.091	15.133	360
370	15.133	15.175	15.217	15.259	15.301	15.343	15.385	15.427	15.469	15.511	15.554	370
380	15.554	15.596	15.638	15.680	15.722	15.764	15.806	15.849	15.891	15.933	15.975	380
390	15.975	16.017	16.059	16.102	16.144	16.186	16.228	16.270	16.313	16.355	16.397	390
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Thermoelectric Voltage in Millivolts

°C	0	1	2	3	4	5	6	7	8	9	10	°C
400	16.397	16.439	16.482	16.524	16.566	16.608	16.651	16.693	16.735	16.778	16.820	400
410	16.820	16.862	16.904	16.947	16.989	17.031	17.074	17.116	17.158	17.201	17.243	410
420	17.243	17.285	17.328	17.370	17.413	17.455	17.497	17.540	17.582	17.624	17.667	420
430	17.667	17.709	17.752	17.794	17.837	17.879	17.921	17.964	18.006	18.049	18.091	430
440	18.091	18.134	18.176	18.218	18.261	18.303	18.346	18.388	18.431	18.473	18.516	440
450	18.516	18.558	18.601	18.643	18.686	18.728	18.771	18.813	18.856	18.898	18.941	450
460	18.941	18.983	19.026	19.068	19.111	19.154	19.196	19.239	19.281	19.324	19.366	460
470	19.366	19.409	19.451	19.494	19.537	19.579	19.622	19.664	19.707	19.750	19.792	470
480	19.792	19.835	19.877	19.920	19.962	20.005	20.048	20.090	20.133	20.175	20.218	480
490	20.218	20.261	20.303	20.346	20.389	20.431	20.474	20.516	20.559	20.602	20.644	490
500	20.644	20.687	20.730	20.772	20.815	20.857	20.900	20.943	20.985	21.028	21.071	500
510	21.071	21.113	21.156	21.199	21.241	21.284	21.326	21.369	21.412	21.454	21.497	510
520	21.497	21.540	21.582	21.625	21.668	21.710	21.753	21.796	21.838	21.881	21.924	520
530	21.924	21.966	22.009	22.052	22.094	22.137	22.179	22.222	22.265	22.307	22.350	530
540	22.350	22.393	22.435	22.478	22.521	22.563	22.606	22.649	22.691	22.734	22.776	540
550	22.776	22.819	22.862	22.904	22.947	22.990	23.032	23.075	23.117	23.160	23.203	550
560	23.203	23.245	23.288	23.331	23.373	23.416	23.458	23.501	23.544	23.586	23.629	560
570	23.629	23.671	23.714	23.757	23.799	23.842	23.884	23.927	23.970	24.012	24.055	570
580	24.055	24.097	24.140	24.182	24.225	24.267	24.310	24.353	24.395	24.438	24.480	580
590	24.480	24.523	24.565	24.608	24.650	24.693	24.735	24.778	24.820	24.863	24.905	590
600	24.905	24.948	24.990	25.033	25.075	25.118	25.160	25.203	25.245	25.288	25.330	600
610	25.330	25.373	25.415	25.458	25.500	25.543	25.585	25.627	25.670	25.712	25.755	610
620	25.755	25.797	25.840	25.882	25.924	25.967	26.009	26.052	26.094	26.136	26.179	620
630	26.179	26.221	26.263	26.306	26.348	26.390	26.433	26.475	26.517	26.560	26.602	630
640	26.602	26.644	26.687	26.729	26.771	26.814	26.856	26.898	26.940	26.983	27.025	640
650	27.025	27.067	27.109	27.152	27.194	27.236	27.278	27.320	27.363	27.405	27.447	650
660	27.447	27.489	27.531	27.574	27.616	27.658	27.700	27.742	27.784	27.826	27.869	660
670	27.869	27.911	27.953	27.995	28.037	28.079	28.121	28.163	28.205	28.247	28.289	670
680	28.289	28.332	28.374	28.416	28.458	28.500	28.542	28.584	28.626	28.668	28.710	680
690	28.710	28.752	28.794	28.835	28.877	28.919	28.961	29.003	29.045	29.087	29.129	690
700	29.129	29.171	29.213	29.255	29.297	29.338	29.380	29.422	29.464	29.506	29.548	700
710	29.548	29.589	29.631	29.673	29.715	29.757	29.798	29.840	29.882	29.924	29.965	710
720	29.965	30.007	30.049	30.090	30.132	30.174	30.216	30.257	30.299	30.341	30.382	720
730	30.382	30.424	30.466	30.507	30.549	30.590	30.632	30.674	30.715	30.757	30.798	730
740	30.798	30.840	30.881	30.923	30.964	31.006	31.047	31.089	31.130	31.172	31.213	740
750	31.213	31.255	31.296	31.338	31.379	31.421	31.462	31.504	31.545	31.586	31.628	750
760	31.628	31.669	31.710	31.752	31.793	31.834	31.876	31.917	31.958	32.000	32.041	760
770	32.041	32.082	32.124	32.165	32.206	32.247	32.289	32.330	32.371	32.412	32.453	770
780	32.453	32.495	32.536	32.577	32.618	32.659	32.700	32.742	32.783	32.824	32.865	780
790	32.865	32.906	32.947	32.988	33.029	33.070	33.111	33.152	33.193	33.234	33.275	790
800	33.275	33.316	33.357	33.398	33.439	33.480	33.521	33.562	33.603	33.644	33.685	800
810	33.685	33.726	33.767	33.808	33.848	33.889	33.930	33.971	34.012	34.053	34.093	810
820	34.093	34.134	34.175	34.216	34.257	34.297	34.338	34.379	34.420	34.460	34.501	820
830	34.501	34.542	34.582	34.623	34.664	34.704	34.745	34.786	34.826	34.867	34.908	830
840	34.908	34.948	34.989	35.029	35.070	35.110	35.151	35.192	35.232	35.273	35.313	840
850	35.313	35.354	35.394	35.435	35.475	35.516	35.556	35.596	35.637	35.677	35.718	850
860	35.718	35.758	35.798	35.839	35.879	35.920	35.960	36.000	36.041	36.081	36.121	860
870	36.121	36.162	36.202	36.242	36.282	36.323	36.363	36.403	36.443	36.484	36.524	870
880	36.524	36.564	36.604	36.644	36.685	36.725	36.765	36.805	36.845	36.885	36.925	880
890	36.925	36.965	37.006	37.046	37.086	37.126	37.166	37.206	37.246	37.286	37.326	890
900	37.326	37.366	37.406	37.446	37.486	37.526	37.566	37.606	37.646	37.686	37.725	900
910	37.725	37.765	37.805	37.845	37.885	37.925	37.965	38.005	38.044	38.084	38.124	910
920	38.124	38.164	38.204	38.243	38.283	38.323	38.363	38.402	38.442	38.482	38.522	920
930	38.522	38.561	38.601	38.641	38.680	38.720	38.760	38.799	38.839	38.878	38.918	930
940	38.918	38.958	38.997	39.037	39.076	39.116	39.155	39.195	39.235	39.274	39.314	940
950	39.314	39.353	39.393	39.432	39.471	39.511	39.550	39.590	39.629	39.669	39.708	950
960	39.708	39.747	39.787	39.826	39.866	39.905	39.944	39.984	40.023	40.062	40.101	960
970	40.101	40.141	40.180	40.219	40.259	40.298	40.337	40.376	40.415	40.455	40.494	970
980	40.494	40.533	40.572	40.611	40.651	40.690	40.729	40.768	40.807	40.846	40.885	980
990	40.885	40.924	40.963	41.002	41.042	41.081	41.120	41.159	41.198	41.237	41.276	990
1000	41.276	41.315	41.354	41.393	41.431	41.470	41.509	41.548	41.587	41.626	41.665	1000
1010	41.665	41.704	41.743	41.781	41.820	41.859	41.898	41.937	41.976	42.014	42.053	1010
1020	42.053	42.092	42.131	42.169	42.208	42.247	42.286	42.324	42.363	42.402	42.440	1020
1030	42.440	42.479	42.518	42.556	42.595	42.633	42.672	42.711	42.749	42.788	42.826	1030
1040	42.826	42.865	42.903	42.942	42.980	43.019	43.057	43.096	43.134	43.173	43.211	1040
1050	43.211	43.250	43.288	43.327	43.365	43.403	43.442	43.480	43.518	43.557	43.595	1050
1060	43.595	43.633	43.672	43.710	43.748	43.787	43.825	43.863	43.901	43.940	43.978	1060
1070	43.978	44.016	44.054	44.092	44.130	44.169	44.207	44.245	44.283	44.321	44.359	1070
1080	44.359	44.397	44.435	44.473	44.512	44.550	44.588	44.626	44.664	44.702	44.740	1080
1090	44.740	44.778	44.816	44.853	44.891	44.929	44.967	45.005	45.043	45.081	45.119	1090
°C	0	1	2	3	4	5	6	7	8	9	10	°C

GRADE:

NICKEL-CHROMIUM VS.NICKEL-ALUMINUM

TEMPERATURE IN DEGREES °C REFERENCE JUNCTION AT 0°C

Type "K" Thermocouple Reference Tables °C

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

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
-328	to	2282°F	32	to	392°F
-200	to	1250°C	0	to	200°C

LIMITS OF ERROR (Whichever is Greater)

Standard:			Special:		
2.2°C	or	0.75% Above 0°C	1.1°C	or	0.4%
2.2°C	or	2.0% Below 0°C			

Thermoelectric Voltage in Millivolts

°C	0	1	2	3	4	5	6	7	8	9	10	°C
1100	45.119	45.157	45.194	45.232	45.270	45.308	45.346	45.383	45.421	45.459	45.497	1100
1110	45.497	45.534	45.572	45.610	45.647	45.685	45.723	45.760	45.798	45.836	45.873	1110
1120	45.873	45.911	45.948	45.986	46.024	46.061	46.099	46.136	46.174	46.211	46.249	1120
1130	46.249	46.286	46.324	46.361	46.398	46.436	46.473	46.511	46.548	46.585	46.623	1130
1140	46.623	46.660	46.697	46.735	46.772	46.809	46.847	46.884	46.921	46.958	46.995	1140
1150	46.995	47.033	47.070	47.107	47.144	47.181	47.218	47.256	47.293	47.330	47.367	1150
1160	47.367	47.404	47.441	47.478	47.515	47.552	47.589	47.626	47.663	47.700	47.737	1160
1170	47.737	47.774	47.811	47.848	47.884	47.921	47.958	47.995	48.032	48.069	48.105	1170
1180	48.105	48.142	48.179	48.216	48.252	48.289	48.326	48.363	48.399	48.436	48.473	1180
1190	48.473	48.509	48.546	48.582	48.619	48.656	48.692	48.729	48.765	48.802	48.838	1190
1200	48.838	48.875	48.911	48.948	48.984	49.021	49.057	49.093	49.130	49.166	49.202	1200
1210	49.202	49.239	49.275	49.311	49.348	49.384	49.420	49.456	49.493	49.529	49.565	1210
1220	49.565	49.601	49.637	49.674	49.710	49.746	49.782	49.818	49.854	49.890	49.926	1220
1230	49.926	49.962	49.998	50.034	50.070	50.106	50.142	50.178	50.214	50.250	50.286	1230
1240	50.286	50.322	50.358	50.393	50.429	50.465	50.501	50.537	50.572	50.608	50.644	1240
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Thermoelectric Voltage in Millivolts

°C	0	1	2	3	4	5	6	7	8	9	10	°C
1250	50.644	50.680	50.715	50.751	50.787	50.822	50.858	50.894	50.929	50.965	51.000	1250
1260	51.000	51.036	51.071	51.107	51.142	51.178	51.213	51.249	51.284	51.320	51.355	1260
1270	51.355	51.391	51.426	51.461	51.497	51.532	51.567	51.603	51.638	51.673	51.708	1270
1280	51.708	51.744	51.779	51.814	51.849	51.885	51.920	51.955	51.990	52.025	52.060	1280
1290	52.060	52.095	52.130	52.165	52.200	52.235	52.270	52.305	52.340	52.375	52.410	1290
1300	52.410	52.445	52.480	52.515	52.550	52.585	52.620	52.654	52.689	52.724	52.759	1300
1310	52.759	52.794	52.828	52.863	52.898	52.932	52.967	53.002	53.037	53.071	53.106	1310
1320	53.106	53.140	53.175	53.210	53.244	53.279	53.313	53.348	53.382	53.417	53.451	1320
1330	53.451	53.486	53.520	53.555	53.589	53.623	53.658	53.692	53.727	53.761	53.795	1330
1340	53.795	53.830	53.864	53.898	53.932	53.967	54.001	54.035	54.069	54.104	54.138	1340
1350	54.138	54.172	54.206	54.240	54.274	54.308	54.343	54.377	54.411	54.445	54.479	1350
1360	54.479	54.513	54.547	54.581	54.615	54.649	54.683	54.717	54.751	54.785	54.819	1360
1370	54.819	54.852	54.886									1370
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type "K" Thermocouple Reference Tables °F

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

GRADE:

NICKEL-CHROMIUM VS. NICKEL-ALUMINUM

TEMPERATURE IN DEGREES °F
REFERENCE JUNCTION AT 32°F

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
-328	to	2282°F	32	to	392°F
-200	to	1250°C	0	to	200°C

LIMITS OF ERROR (Whichever is Greater)

Standard:			Special:		
2.2°C	or	0.75% Above 0°C	1.1°C	or	0.4%
2.2°C	or	2.0% Below 0°C			

Thermoelectric Voltage in Millivolts

°F	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°F
-450							-6.458	-6.457	-6.457	-6.456	-6.456	-450
-440	-6.456	-6.455	-6.454	-6.454	-6.453	-6.452	-6.451	-6.450	-6.449	-6.448	-6.446	-440
-430	-6.446	-6.445	-6.444	-6.443	-6.441	-6.440	-6.438	-6.436	-6.435	-6.433	-6.431	-430
-420	-6.431	-6.429	-6.427	-6.425	-6.423	-6.421	-6.419	-6.416	-6.414	-6.411	-6.409	-420
-410	-6.409	-6.406	-6.404	-6.401	-6.398	-6.395	-6.392	-6.389	-6.386	-6.383	-6.380	-410
-400	-6.380	-6.377	-6.373	-6.370	-6.366	-6.363	-6.359	-6.355	-6.352	-6.348	-6.344	-400
-390	-6.344	-6.340	-6.336	-6.332	-6.328	-6.323	-6.319	-6.315	-6.310	-6.306	-6.301	-390
-380	-6.301	-6.296	-6.292	-6.287	-6.282	-6.277	-6.272	-6.267	-6.262	-6.257	-6.251	-380
-370	-6.251	-6.246	-6.241	-6.235	-6.230	-6.224	-6.218	-6.213	-6.207	-6.201	-6.195	-370
-360	-6.195	-6.189	-6.183	-6.177	-6.171	-6.165	-6.158	-6.152	-6.146	-6.139	-6.133	-360
-350	-6.133	-6.126	-6.119	-6.113	-6.106	-6.099	-6.092	-6.085	-6.078	-6.071	-6.064	-350
-340	-6.064	-6.057	-6.049	-6.042	-6.035	-6.027	-6.020	-6.012	-6.004	-5.997	-5.989	-340
-330	-5.989	-5.981	-5.973	-5.965	-5.957	-5.949	-5.941	-5.933	-5.925	-5.917	-5.908	-330
-320	-5.908	-5.900	-5.891	-5.883	-5.874	-5.866	-5.857	-5.848	-5.840	-5.831	-5.822	-320
-310	-5.822	-5.813	-5.804	-5.795	-5.786	-5.776	-5.767	-5.758	-5.749	-5.739	-5.730	-310
-300	-5.730	-5.720	-5.711	-5.701	-5.691	-5.682	-5.672	-5.662	-5.652	-5.642	-5.632	-300
-290	-5.632	-5.622	-5.612	-5.602	-5.592	-5.581	-5.571	-5.561	-5.550	-5.540	-5.529	-290
-280	-5.529	-5.519	-5.508	-5.497	-5.487	-5.476	-5.465	-5.454	-5.443	-5.432	-5.421	-280
-270	-5.421	-5.410	-5.399	-5.388	-5.377	-5.365	-5.354	-5.343	-5.331	-5.320	-5.308	-270
-260	-5.308	-5.296	-5.285	-5.273	-5.261	-5.250	-5.238	-5.226	-5.214	-5.202	-5.190	-260
-250	-5.190	-5.178	-5.166	-5.153	-5.141	-5.129	-5.117	-5.104	-5.092	-5.079	-5.067	-250
-240	-5.067	-5.054	-5.042	-5.029	-5.016	-5.003	-4.991	-4.978	-4.965	-4.952	-4.939	-240
-230	-4.939	-4.926	-4.913	-4.900	-4.886	-4.873	-4.860	-4.847	-4.833	-4.820	-4.806	-230
-220	-4.806	-4.793	-4.779	-4.766	-4.752	-4.738	-4.724	-4.711	-4.697	-4.683	-4.669	-220
-210	-4.669	-4.655	-4.641	-4.627	-4.613	-4.599	-4.584	-4.570	-4.556	-4.542	-4.527	-210
-200	-4.527	-4.513	-4.498	-4.484	-4.469	-4.455	-4.440	-4.425	-4.411	-4.396	-4.381	-200
-190	-4.381	-4.366	-4.351	-4.336	-4.321	-4.306	-4.291	-4.276	-4.261	-4.246	-4.231	-190
-180	-4.231	-4.215	-4.200	-4.185	-4.169	-4.154	-4.138	-4.123	-4.107	-4.091	-4.076	-180
-170	-4.076	-4.060	-4.044	-4.029	-4.013	-3.997	-3.981	-3.965	-3.949	-3.933	-3.917	-170
-160	-3.917	-3.901	-3.885	-3.869	-3.852	-3.836	-3.820	-3.803	-3.787	-3.771	-3.754	-160
-150	-3.754	-3.738	-3.721	-3.705	-3.688	-3.671	-3.655	-3.638	-3.621	-3.604	-3.587	-150
-140	-3.587	-3.571	-3.554	-3.537	-3.520	-3.503	-3.486	-3.468	-3.451	-3.434	-3.417	-140
-130	-3.417	-3.400	-3.382	-3.365	-3.348	-3.330	-3.313	-3.295	-3.278	-3.260	-3.243	-130
-120	-3.243	-3.225	-3.207	-3.190	-3.172	-3.154	-3.136	-3.119	-3.101	-3.083	-3.065	-120
-110	-3.065	-3.047	-3.029	-3.011	-2.993	-2.975	-2.957	-2.938	-2.920	-2.902	-2.884	-110
-100	-2.884	-2.865	-2.847	-2.829	-2.810	-2.792	-2.773	-2.755	-2.736	-2.718	-2.699	-100
-90	-2.699	-2.680	-2.662	-2.643	-2.624	-2.605	-2.587	-2.568	-2.549	-2.530	-2.511	-90
-80	-2.511	-2.492	-2.473	-2.454	-2.435	-2.416	-2.397	-2.378	-2.359	-2.339	-2.320	-80
-70	-2.320	-2.301	-2.282	-2.262	-2.243	-2.223	-2.204	-2.185	-2.165	-2.146	-2.126	-70
-60	-2.126	-2.106	-2.087	-2.067	-2.048	-2.028	-2.008	-1.988	-1.969	-1.949	-1.929	-60
-50	-1.929	-1.909	-1.889	-1.869	-1.850	-1.830	-1.810	-1.790	-1.770	-1.749	-1.729	-50
-40	-1.729	-1.709	-1.689	-1.669	-1.649	-1.628	-1.608	-1.588	-1.568	-1.547	-1.527	-40
-30	-1.527	-1.507	-1.486	-1.466	-1.445	-1.425	-1.404	-1.384	-1.363	-1.343	-1.322	-30
-20	-1.322	-1.301	-1.281	-1.260	-1.239	-1.218	-1.198	-1.177	-1.156	-1.135	-1.114	-20
-10	-1.114	-1.094	-1.073	-1.052	-1.031	-1.010	-0.989	-0.968	-0.947	-0.926	-0.905	-10
0	-0.905	-0.883	-0.862	-0.841	-0.820	-0.799	-0.778	-0.756	-0.735	-0.714	-0.692	0
0	-0.692	-0.671	-0.650	-0.628	-0.607	-0.586	-0.564	-0.543	-0.521	-0.500	-0.478	0
10	-0.478	-0.457	-0.435	-0.413	-0.392	-0.370	-0.349	-0.327	-0.305	-0.284	-0.262	10
20	-0.262	-0.240	-0.218	-0.197	-0.175	-0.153	-0.131	-0.109	-0.088	-0.066	-0.044	20
30	-0.044	-0.022	0.000	0.022	0.044	0.066	0.088	0.110	0.132	0.154	0.176	30
40	0.176	0.198	0.220	0.242	0.264	0.286	0.308	0.330	0.353	0.375	0.397	40
50	0.397	0.419	0.441	0.463	0.486	0.508	0.530	0.552	0.575	0.597	0.619	50
60	0.619	0.642	0.664	0.686	0.709	0.731	0.753	0.776	0.798	0.821	0.843	60
70	0.843	0.865	0.888	0.910	0.933	0.955	0.978	1.000	1.023	1.045	1.068	70
80	1.068	1.090	1.113	1.136	1.158	1.181	1.203	1.226	1.249	1.271	1.294	80
90	1.294	1.316	1.339	1.362	1.384	1.407	1.430	1.453	1.475	1.498	1.521	90
°F	0	1	2	3	4	5	6	7	8	9	10	°F

Thermoelectric Voltage in Millivolts

°F	0	1	2	3	4	5	6	7	8	9	10	°F
100	1.521	1.543	1.566	1.589	1.612	1.635	1.657	1.680	1.703	1.726	1.749	100
110	1.749	1.771	1.794	1.817	1.840	1.863	1.886	1.909	1.931	1.954	1.977	110
120	1.977	2.000	2.023	2.046	2.069	2.092	2.115	2.138	2.161	2.184	2.207	120
130	2.207	2.230	2.253	2.276	2.298	2.321	2.344	2.367	2.390	2.413	2.436	130
140	2.436	2.459	2.483	2.506	2.529	2.552	2.575	2.598	2.621	2.644	2.667	140
150	2.667	2.690	2.713	2.736	2.759	2.782	2.805	2.828	2.851	2.874	2.897	150
160	2.897	2.920	2.944	2.967	2.990	3.013	3.036	3.059	3.082	3.105	3.128	160
170	3.128	3.151	3.174	3.197	3.220	3.244	3.267	3.290	3.313	3.336	3.359	170
180	3.359	3.382	3.405	3.428	3.451	3.474	3.497	3.520	3.544	3.567	3.590	180
190	3.590	3.613	3.636	3.659	3.682	3.705	3.728	3.751	3.774	3.797	3.820	190
200	3.820	3.843	3.866	3.889	3.912	3.935	3.958	3.981	4.004	4.027	4.050	200
210	4.050	4.073	4.096	4.119	4.142	4.165	4.188	4.211	4.234	4.257	4.280	210
220	4.280	4.303	4.326	4.349	4.372	4.395	4.417	4.440	4.463	4.486	4.509	220
230	4.509	4.532	4.555	4.578	4.601	4.623	4.646	4.669	4.692	4.715	4.738	230
240	4.738	4.760	4.783	4.806	4.829	4.852	4.874	4.897	4.920	4.943	4.965	240
250	4.965	4.988	5.011	5.034	5.056	5.079	5.102	5.124	5.147	5.170	5.192	250
260	5.192	5.215	5.238	5.260	5.283	5.306	5.328	5.351	5.374	5.396	5.419	260
270	5.419	5.441	5.464	5.487	5.509	5.532	5.554	5.577	5.599	5.622	5.644	270
280	5.644	5.667	5.690	5.712	5.735	5.757	5.779	5.802	5.824	5.847	5.869	280
290	5.869	5.892	5.914	5.937	5.959	5.982	6.004	6.026	6.049	6.071	6.094	290
300	6.094	6.116	6.138	6.161	6.183	6.205	6.228	6.250	6.272	6.295	6.317	300
310	6.317	6.339	6.362	6.384	6.406	6.429	6.451	6.473	6.496	6.518	6.540	310
320	6.540	6.562	6.585	6.607	6.629	6.652	6.674	6.696	6.718	6.741	6.763	320
330	6.763	6.785	6.807	6.829	6.852	6.874	6.896	6.918	6.941	6.963	6.985	330
340	6.985	7.007	7.029	7.052	7.074	7.096	7.118	7.140	7.163	7.185	7.207	340
350	7.207	7.229	7.251	7.273	7.296	7.318	7.340	7.362	7.384	7.407	7.429	350
360	7.429	7.451	7.473	7.495	7.517	7.540	7.562	7.584	7.606	7.628	7.650	360
370	7.650	7.673	7.695	7.717	7.739	7.761	7.783	7.806	7.828	7.850	7.872	370
380	7.872	7.894	7.917	7.939	7.961	7.983	8.005	8.027	8.050	8.072	8.094	380
390	8.094	8.116	8.138	8.161	8.183	8.205	8.227	8.250	8.272	8.294	8.316	390
400	8.316	8.338	8.361	8.383	8.405	8.427	8.450	8.472	8.494	8.516	8.539	400
410	8.539	8.561	8.583	8.605	8.628	8.650	8.672	8.694	8.717	8.739	8.761	410
420	8.761	8.784	8.806	8.828	8.851	8.873	8.895	8.918	8.940	8.962	8.985	420
430	8.985	9.007	9.029	9.052	9.074	9.096	9.119	9.141	9.163	9.186	9.208	430
440	9.208	9.231	9.253	9.275	9.298	9.320	9.343	9.365	9.388	9.410	9.432	440
450	9.432	9.455	9.477	9.500	9.522	9.545	9.567	9.590	9.612	9.635	9.657	450
460	9.657	9.680	9.702	9.725	9.747	9.770	9.792	9.815	9.837	9.860	9.882	460
470	9.882	9.905	9.927	9.950	9.973	9.995	10.018	10.040	10.063	10.086	10.108	470
480	10.108	10.131	10.153	10.176	10.199	10.221	10.244	10.267	10.289	10.312	10.334	480
490	10.334	10.357	10.380	10.402	10.425	10.448	10.471	10.493	10.516	10.539	10.561	490
500	10.561	10.584	10.607	10.629	10.652	10.675	10.698	10.720	10.743	10.766	10.789	500
510	10.789	10.811	10.834	10.857	10.880	10.903	10.925	10.948	10.971	10.994	11.017	510
520	11.017	11.039	11.062	11.085	11.108	11.131	11.154	11.176	11.199	11.222	11.245	520
530	11.245	11.268	11.291	11.313	11.336	11.359	11.382	11.405	11.428	11.451	11.474	530
540	11.474	11.497	11.519	11.542	11.565	11.588	11.611	11.634	11.657	11.680	11.703	540
550	11.703	11.726	11.749	11.772	11.795	11.818	11.841	11.864	11.887	11.910	11.933	550
560	11.933	11.956	11.978	12.001	12.024	12.047	12.070	12.093	12.116	12.140	12.163	560
570	12.163	12.186	12.209	12.232	12.255	12.278	12.301	12.324	12.347	12.370	12.393	570
580	12.393	12.416	12.439	12.462	12.485	12.508	12.531	12.554	12.577	12.600	12.624	580
590	12.624	12.647	12.670	12.693	12.716	12.739	12.762	12.785	12.808	12.831	12.855	590
600	12.855	12.878	12.901	12.924	12.947	12.970	12.993	13.016	13.040	13.063	13.086	600
610	13.086	13.109	13.132	13.155	13.179	13.202	13.225	13.248	13.271	13.294	13.318	610
620	13.318	13.341	13.364	13.387	13.410	13.433	13.457	13.480	13.503	13.526	13.549	620
630	13.549	13.573	13.596	13.619	13.642	13.665	13.689	13.712	13.735	13.758	13.782	630
640	13.782	13.805	13.828	13.851	13.874	13.898	13.921	13.944	13.967	13.991	14.014	640
650	14.014	14.037	14.060	14.084	14.107	14.130	14.154	14.177	14.200	14.223	14.247	650
660	14.247	14.270	14.293	14.316	14.340	14.363	14.386	14.410	14.433	14.456	14.479	660
670	14.479	14.503	14.526	14.549	14.573	14.596	14.619	14.643	14.666	14.689	14.713	670
680	14.713	14.736	14.759	14.783	14.806	14.829	14.853	14.876	14.899	14.923	14.946	680
690	14.946	14.969	14.993	15.016	15.039	15.063	15.086	15.109	15.133	15.156	15.179	690
°F	0	1	2	3	4	5	6	7	8	9	10	°F

GRADE:

NICKEL-CHROMIUM VS.NICKEL-ALUMINUM

TEMPERATURE IN DEGREES °F REFERENCE JUNCTION AT 32°F

Type "K" Thermocouple Reference Tables °F

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

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
-328	to	2282°F	32	to	392°F
-200	to	1250°C	0	to	200°C

LIMITS OF ERROR (Whichever is Greater)

Standard:			Special:		
2.2°C	or	0.75% Above 0°C	1.1°C	or	0.4%
2.2°C	or	2.0% Below 0°C			

Thermoelectric Voltage in Millivolts

°F	0	1	2	3	4	5	6	7	8	9	10	°F
700	15.179	15.203	15.226	15.250	15.273	15.296	15.320	15.343	15.366	15.390	15.413	700
710	15.413	15.437	15.460	15.483	15.507	15.530	15.554	15.577	15.600	15.624	15.647	710
720	15.647	15.671	15.694	15.717	15.741	15.764	15.788	15.811	15.834	15.858	15.881	720
730	15.881	15.905	15.928	15.952	15.975	15.998	16.022	16.045	16.069	16.092	16.116	730
740	16.116	16.139	16.163	16.186	16.209	16.233	16.256	16.280	16.303	16.327	16.350	740
750	16.350	16.374	16.397	16.421	16.444	16.468	16.491	16.514	16.538	16.561	16.585	750
760	16.585	16.608	16.632	16.655	16.679	16.702	16.726	16.749	16.773	16.796	16.820	760
770	16.820	16.843	16.867	16.890	16.914	16.937	16.961	16.984	17.008	17.031	17.055	770
780	17.055	17.078	17.102	17.125	17.149	17.173	17.196	17.220	17.243	17.267	17.290	780
790	17.290	17.314	17.337	17.361	17.384	17.408	17.431	17.455	17.478	17.502	17.526	790
800	17.526	17.549	17.573	17.596	17.620	17.643	17.667	17.690	17.714	17.738	17.761	800
810	17.761	17.785	17.808	17.832	17.855	17.879	17.902	17.926	17.950	17.973	17.997	810
820	17.997	18.020	18.044	18.068	18.091	18.115	18.138	18.162	18.185	18.209	18.233	820
830	18.233	18.256	18.280	18.303	18.327	18.351	18.374	18.398	18.421	18.445	18.469	830
840	18.469	18.492	18.516	18.539	18.563	18.587	18.610	18.634	18.657	18.681	18.705	840
850	18.705	18.728	18.752	18.776	18.799	18.823	18.846	18.870	18.894	18.917	18.941	850
860	18.941	18.965	18.988	19.012	19.035	19.059	19.083	19.106	19.130	19.154	19.177	860
870	19.177	19.201	19.224	19.248	19.272	19.295	19.319	19.343	19.366	19.390	19.414	870
880	19.414	19.437	19.461	19.485	19.508	19.532	19.556	19.579	19.603	19.626	19.650	880
890	19.650	19.674	19.697	19.721	19.745	19.768	19.792	19.816	19.839	19.863	19.887	890
900	19.887	19.910	19.934	19.958	19.981	20.005	20.029	20.052	20.076	20.100	20.123	900
910	20.123	20.147	20.171	20.194	20.218	20.242	20.265	20.289	20.313	20.336	20.360	910
920	20.360	20.384	20.407	20.431	20.455	20.479	20.502	20.526	20.550	20.573	20.597	920
930	20.597	20.621	20.644	20.668	20.692	20.715	20.739	20.763	20.786	20.810	20.834	930
940	20.834	20.857	20.881	20.905	20.929	20.952	20.976	21.000	21.023	21.047	21.071	940
950	21.071	21.094	21.118	21.142	21.165	21.189	21.213	21.236	21.260	21.284	21.308	950
960	21.308	21.331	21.355	21.379	21.402	21.426	21.450	21.473	21.497	21.521	21.544	960
970	21.544	21.568	21.592	21.616	21.639	21.663	21.687	21.710	21.734	21.758	21.781	970
980	21.781	21.805	21.829	21.852	21.876	21.900	21.924	21.947	21.971	21.995	22.018	980
990	22.018	22.042	22.066	22.089	22.113	22.137	22.160	22.184	22.208	22.232	22.255	990
1000	22.255	22.279	22.303	22.326	22.350	22.374	22.397	22.421	22.445	22.468	22.492	1000
1010	22.492	22.516	22.540	22.563	22.587	22.611	22.634	22.658	22.682	22.705	22.729	1010
1020	22.729	22.753	22.776	22.800	22.824	22.847	22.871	22.895	22.919	22.942	22.966	1020
1030	22.966	22.990	23.013	23.037	23.061	23.084	23.108	23.132	23.155	23.179	23.203	1030
1040	23.203	23.226	23.250	23.274	23.297	23.321	23.345	23.368	23.392	23.416	23.439	1040
1050	23.439	23.463	23.487	23.510	23.534	23.558	23.581	23.605	23.629	23.652	23.676	1050
1060	23.676	23.700	23.723	23.747	23.771	23.794	23.818	23.842	23.865	23.889	23.913	1060
1070	23.913	23.936	23.960	23.984	24.007	24.031	24.055	24.078	24.102	24.126	24.149	1070
1080	24.149	24.173	24.197	24.220	24.244	24.267	24.291	24.315	24.338	24.362	24.386	1080
1090	24.386	24.409	24.433	24.457	24.480	24.504	24.527	24.551	24.575	24.598	24.622	1090
1100	24.622	24.646	24.669	24.693	24.717	24.740	24.764	24.787	24.811	24.835	24.858	1100
1110	24.858	24.882	24.905	24.929	24.953	24.976	25.000	25.024	25.047	25.071	25.094	1110
1120	25.094	25.118	25.142	25.165	25.189	25.212	25.236	25.260	25.283	25.307	25.330	1120
1130	25.330	25.354	25.377	25.401	25.425	25.448	25.472	25.495	25.519	25.543	25.566	1130
1140	25.566	25.590	25.613	25.637	25.660	25.684	25.708	25.731	25.755	25.778	25.802	1140
1150	25.802	25.825	25.849	25.873	25.896	25.920	25.943	25.967	25.990	26.014	26.037	1150
1160	26.037	26.061	26.084	26.108	26.132	26.155	26.179	26.202	26.226	26.249	26.273	1160
1170	26.273	26.296	26.320	26.343	26.367	26.390	26.414	26.437	26.461	26.484	26.508	1170
1180	26.508	26.532	26.555	26.579	26.602	26.626	26.649	26.673	26.696	26.720	26.743	1180
1190	26.743	26.767	26.790	26.814	26.837	26.861	26.884	26.907	26.931	26.954	26.978	1190
1200	26.978	27.001	27.025	27.048	27.072	27.095	27.119	27.142	27.166	27.189	27.213	1200
1210	27.213	27.236	27.259	27.283	27.306	27.330	27.353	27.377	27.400	27.424	27.447	1210
1220	27.447	27.471	27.494	27.517	27.541	27.564	27.588	27.611	27.635	27.658	27.681	1220
1230	27.681	27.705	27.728	27.752	27.775	27.798	27.822	27.845	27.869	27.892	27.915	1230
1240	27.915	27.939	27.962	27.986	28.009	28.032	28.056	28.079	28.103	28.126	28.149	1240
1250	28.149	28.173	28.196	28.219	28.243	28.266	28.289	28.313	28.336	28.360	28.383	1250
1260	28.383	28.406	28.430	28.453	28.476	28.500	28.523	28.546	28.570	28.593	28.616	1260
1270	28.616	28.640	28.663	28.686	28.710	28.733	28.756	28.780	28.803	28.826	28.849	1270
1280	28.849	28.873	28.896	28.919	28.943	28.966	28.989	29.013	29.036	29.059	29.082	1280
1290	29.082	29.106	29.129	29.152	29.176	29.199	29.222	29.245	29.269	29.292	29.315	1290
°F	0	1	2	3	4	5	6	7	8	9	10	°F

Thermoelectric Voltage in Millivolts

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1300	29.315	29.338	29.362	29.385	29.408	29.431	29.455	29.478	29.501	29.524	29.548	1300
1310	29.548	29.571	29.594	29.617	29.640	29.664	29.687	29.710	29.733	29.757	29.780	1310
1320	29.780	29.803	29.826	29.849	29.873	29.896	29.919	29.942	29.965	29.989	30.012	1320
1330	30.012	30.035	30.058	30.081	30.104	30.128	30.151	30.174	30.197	30.220	30.243	1330
1340	30.243	30.267	30.290	30.313	30.336	30.359	30.382	30.405	30.429	30.452	30.475	1340
1350	30.475	30.498	30.521	30.544	30.567	30.590	30.613	30.637	30.660	30.683	30.706	1350
1360	30.706	30.729	30.752	30.775	30.798	30.821	30.844	30.868	30.891	30.914	30.937	1360
1370	30.937	30.960	30.983	31.006	31.029	31.052	31.075	31.098	31.121	31.144	31.167	1370
1380	31.167	31.190	31.213	31.236	31.260	31.283	31.306	31.329	31.352	31.375	31.398	1380
1390	31.398	31.421	31.444	31.467	31.490	31.513	31.536	31.559	31.582	31.605	31.628	1390
1400	31.628	31.651	31.674	31.697	31.720	31.743	31.766	31.789	31.812	31.834	31.857	1400
1410	31.857	31.880	31.903	31.926	31.949	31.972	31.995	32.018	32.041	32.064	32.087	1410
1420	32.087	32.110	32.133	32.156	32.179	32.202	32.224	32.247	32.270	32.293	32.316	1420
1430	32.316	32.339	32.362	32.385	32.408	32.431	32.453	32.476	32.499	32.522	32.545	1430
1440	32.545	32.568	32.591	32.614	32.636	32.659	32.682	32.705	32.728	32.751	32.774	1440
1450	32.774	32.796	32.819	32.842	32.865	32.888	32.911	32.933	32.956	32.979	33.002	1450
1460	33.002	33.025	33.047	33.070	33.093	33.116	33.139	33.161	33.184	33.207	33.230	1460
1470	33.230	33.253	33.275	33.298	33.321	33.344	33.366	33.389	33.412	33.435	33.458	1470
1480	33.458	33.480	33.503	33.526	33.548	33.571	33.594	33.617	33.639	33.662	33.685	1480
1490	33.685	33.708	33.730	33.753	33.776	33.798	33.821	33.844	33.867	33.889	33.912	1490
1500	33.912	33.935	33.957	33.980	34.003	34.025	34.048	34.071	34.093	34.116	34.139	1500
1510	34.139	34.161	34.184	34.207	34.229	34.252	34.275	34.297	34.320	34.343	34.365	1510
1520	34.365	34.388	34.410	34.433	34.456	34.478	34.501	34.524	34.546	34.569	34.591	1520
1530	34.591	34.614	34.637	34.659	34.682	34.704	34.727	34.750	34.772	34.795	34.817	1530
1540	34.817	34.840	34.862	34.885	34.908	34.930	34.953	34.975	34.998	35.020	35.043	1540
1550	35.043	35.065	35.088	35.110	35.133	35.156	35.178	35.201	35.223	35.246	35.268	1550
1560	35.268	35.291	35.313	35.336	35.358	35.381	35.403	35.426	35.448	35.471	35.493	1560
1570	35.493	35.516	35.538	35.560	35.583	35.605	35.628	35.650	35.673	35.695	35.718	1570
1580	35.718	35.740	35.763	35.785	35.807	35.830	35.852	35.875	35.897	35.920	35.942	1580
1590	35.942	35.964	35.987	36.009	36.032	36.054	36.076	36.099	36.121	36.144	36.166	1590
1600	36.166	36.188	36.211	36.233	36.256	36.278	36.300	36.323	36.345	36.367	36.390	1600
1610	36.390	36.412	36.434	36.457	36.479	36.501	36.524	36.546	36.568	36.591	36.613	1610
1620	36.613	36.635	36.658	36.680	36.702	36.725	36.747	36.769	36.792	36.814	36.836	1620
1630	36.836	36.859	36.881	36.903	36.925	36.948	36.970	36.992	37.014	37.037	37.059	1630
1640	37.059	37.081	37.104	37.126	37.148	37.170	37.193	37.215	37.237	37.259	37.281	1640
1650	37.281	37.304	37.326	37.348	37.370	37.393	37.415	37.437	37.459	37.481	37.504	1650
1660	37.504	37.526	37.548	37.570	37.592	37.615	37.637	37.659	37.681	37.703	37.725	1660
1670	37.725	37.748	37.770	37.792	37.814	37.836	37.858	37.881	37.903	37.925	37.947	1670
1680	37.947	37.969	37.991	38.013	38.036	38.058	38.080	38.102	38.124	38.146	38.168	1680
1690	38.168	38.190	38.212	38.235	38.257	38.279	38.301	38.323	38.345	38.367	38.389	1690
1700	38.389	38.411	38.433	38.455	38.477	38.499	38.522	38.544	38.566	38.588	38.610	1700
1710	38.610	38.632	38.654	38.676	38.698	38.720	38.742	38.764	38.786	38.808	38.830	1710
1720	38.830	38.852	38.874	38.896	38.918	38.940	38.962	38.984	39.006	39.028	39.050	1720
1730	39.050	39.072	39.094	39.116	39.138	39.160	39.182	39.204	39.226	39.248	39.270	1730
1740	39.270	39.292	39.314	39.335	39.357	39.379	39.401	39.423	39.445	39.467	39.489	1740
1750	39.489	39.511	39.533	39.555	39.577	39.599	39.620	39.642	39.664	39.686	39.708	1750
1760	39.708	39.730	39.752	39.774	39.796	39.817	39.839	39.861	39.883	39.905	39.927	1760
1770	39.927	39.949	39.970	39.992	40.014	40.036	40.058	40.080	40.101	40.123	40.145	1770
1780	40.145	40.167	40.189	40.211	40.232	40.254	40.276	40.298	40.320	40.341	40.363	1780
1790	40.363	40.385	40.407	40.429	40.450	40.472	40.494	40.516	40.537	40.559	40.581	1790
1800	40.581	40.603	40.624	40.646	40.668	40.690	40.711	40.733	40.755	40.777	40.798	1800
1810	40.798	40.820	40.842	40.864	40.885	40.907	40.929	40.950	40.972	40.994	41.015	1810
1820	41.015	41.037	41.059	41.081	41.102	41.124	41.146	41.167	41.189	41.211	41.232	1820
1830	41.232	41.254	41.276	41.297	41.319	41.341	41.362	41.384	41.405	41.427	41.449	1830
1840	41.449	41.470	41.492	41.514	41.535	41.557	41.578	41.600	41.622	41.643	41.665	1840
1850	41.665	41.686	41.708	41.730	41.751	41.773	41.794	41.816	41.838	41.859	41.881	1850
1860	41.881	41.902	41.924	41.945	41.967	41.988	42.010	42.032	42.053	42.075	42.096	1860
1870	42.096	42.118	42.139	42.161	42.182	42.204	42.225	42.247	42.268	42.290	42.311	1870
1880	42.311	42.333	42.354	42.376	42.397	42.419	42.440	42.462	42.483	42.505	42.526	1880
1890	42.526	42.548	42.569	42.591	42.612	42.633	42.655	42.676	42.698	42.719	42.741	1890
°F	0	1	2	3	4	5	6	7	8	9	10	°F

Type "K" Thermocouple Reference Tables °F

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

GRADE:

NICKEL-CHROMIUM VS. NICKEL-ALUMINUM

TEMPERATURE IN DEGREES °F
REFERENCE JUNCTION AT 32°F

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
-328	to	2282°F	32	to	392°F
-200	to	1250°C	0	to	200°C

LIMITS OF ERROR (Whichever is Greater)

Standard:			Special:		
2.2°C	or	0.75% Above 0°C	1.1°C	or	0.4%
2.2°C	or	2.0% Below 0°C			

Thermoelectric Voltage in Millivolts

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1900	42.741	42.762	42.783	42.805	42.826	42.848	42.869	42.891	42.912	42.933	42.955	1900
1910	42.955	42.976	42.998	43.019	43.040	43.062	43.083	43.104	43.126	43.147	43.169	1910
1920	43.169	43.190	43.211	43.233	43.254	43.275	43.297	43.318	43.339	43.361	43.382	1920
1930	43.382	43.403	43.425	43.446	43.467	43.489	43.510	43.531	43.552	43.574	43.595	1930
1940	43.595	43.616	43.638	43.659	43.680	43.701	43.723	43.744	43.765	43.787	43.808	1940
1950	43.808	43.829	43.850	43.872	43.893	43.914	43.935	43.957	43.978	43.999	44.020	1950
1960	44.020	44.041	44.063	44.084	44.105	44.126	44.147	44.169	44.190	44.211	44.232	1960
1970	44.232	44.253	44.275	44.296	44.317	44.338	44.359	44.380	44.402	44.423	44.444	1970
1980	44.444	44.465	44.486	44.507	44.528	44.550	44.571	44.592	44.613	44.634	44.655	1980
1990	44.655	44.676	44.697	44.719	44.740	44.761	44.782	44.803	44.824	44.845	44.866	1990
2000	44.866	44.887	44.908	44.929	44.950	44.971	44.992	45.014	45.035	45.056	45.077	2000
2010	45.077	45.098	45.119	45.140	45.161	45.182	45.203	45.224	45.245	45.266	45.287	2010
2020	45.287	45.308	45.329	45.350	45.371	45.392	45.413	45.434	45.455	45.476	45.497	2020
2030	45.497	45.518	45.539	45.560	45.580	45.601	45.622	45.643	45.664	45.685	45.706	2030
2040	45.706	45.727	45.748	45.769	45.790	45.811	45.832	45.852	45.873	45.894	45.915	2040
2050	45.915	45.936	45.957	45.978	45.999	46.019	46.040	46.061	46.082	46.103	46.124	2050
2060	46.124	46.145	46.165	46.186	46.207	46.228	46.249	46.269	46.290	46.311	46.332	2060
2070	46.332	46.353	46.373	46.394	46.415	46.436	46.457	46.477	46.498	46.519	46.540	2070
2080	46.540	46.560	46.581	46.602	46.623	46.643	46.664	46.685	46.706	46.726	46.747	2080
2090	46.747	46.768	46.789	46.809	46.830	46.851	46.871	46.892	46.913	46.933	46.954	2090
2100	46.954	46.975	46.995	47.016	47.037	47.057	47.078	47.099	47.119	47.140	47.161	2100
2110	47.161	47.181	47.202	47.223	47.243	47.264	47.284	47.305	47.326	47.346	47.367	2110
2120	47.367	47.387	47.408	47.429	47.449	47.470	47.490	47.511	47.531	47.552	47.573	2120
2130	47.573	47.593	47.614	47.634	47.655	47.675	47.696	47.716	47.737	47.757	47.778	2130
2140	47.778	47.798	47.819	47.839	47.860	47.880	47.901	47.921	47.942	47.962	47.983	2140
2150	47.983	48.003	48.024	48.044	48.065	48.085	48.105	48.126	48.146	48.167	48.187	2150
2160	48.187	48.208	48.228	48.248	48.269	48.289	48.310	48.330	48.350	48.371	48.391	2160
2170	48.391	48.411	48.432	48.452	48.473	48.493	48.513	48.534	48.554	48.574	48.595	2170
2180	48.595	48.615	48.635	48.656	48.676	48.696	48.717	48.737	48.757	48.777	48.798	2180
2190	48.798	48.818	48.838	48.859	48.879	48.899	48.919	48.940	48.960	48.980	49.000	2190
2200	49.000	49.021	49.041	49.061	49.081	49.101	49.122	49.142	49.162	49.182	49.202	2200
2210	49.202	49.223	49.243	49.263	49.283	49.303	49.323	49.344	49.364	49.384	49.404	2210
2220	49.404	49.424	49.444	49.465	49.485	49.505	49.525	49.545	49.565	49.585	49.605	2220
2230	49.605	49.625	49.645	49.666	49.686	49.706	49.726	49.746	49.766	49.786	49.806	2230
2240	49.806	49.826	49.846	49.866	49.886	49.906	49.926	49.946	49.966	49.986	50.006	2240
°F	0	1	2	3	4	5	6	7	8	9	10	°F

Thermoelectric Voltage in Millivolts

°F	0	1	2	3	4	5	6	7	8	9	10	°F
2250	50.006	50.026	50.046	50.066	50.086	50.106	50.126	50.146	50.166	50.186	50.206	2250
2260	50.206	50.226	50.246	50.266	50.286	50.306	50.326	50.346	50.366	50.385	50.405	2260
2270	50.405	50.425	50.445	50.465	50.485	50.505	50.525	50.545	50.564	50.584	50.604	2270
2280	50.604	50.624	50.644	50.664	50.684	50.703	50.723	50.743	50.763	50.783	50.802	2280
2290	50.802	50.822	50.842	50.862	50.882	50.901	50.921	50.941	50.961	50.981	51.000	2290
2300	51.000	51.020	51.040	51.060	51.079	51.099	51.119	51.139	51.158	51.178	51.198	2300
2310	51.198	51.217	51.237	51.257	51.276	51.296	51.316	51.336	51.355	51.375	51.395	2310
2320	51.395	51.414	51.434	51.453	51.473	51.493	51.512	51.532	51.552	51.571	51.591	2320
2330	51.591	51.611	51.630	51.650	51.669	51.689	51.708	51.728	51.748	51.767	51.787	2330
2340	51.787	51.806	51.826	51.845	51.865	51.885	51.904	51.924	51.943	51.963	51.982	2340
2350	51.982	52.002	52.021	52.041	52.060	52.080	52.099	52.119	52.138	52.158	52.177	2350
2360	52.177	52.197	52.216	52.235	52.255	52.274	52.294	52.313	52.333	52.352	52.371	2360
2370	52.371	52.391	52.410	52.430	52.449	52.468	52.488	52.507	52.527	52.546	52.565	2370
2380	52.565	52.585	52.604	52.623	52.643	52.662	52.681	52.701	52.720	52.739	52.759	2380
2390	52.759	52.778	52.797	52.817	52.836	52.855	52.875	52.894	52.913	52.932	52.952	2390
2400	52.952	52.971	52.990	53.010	53.029	53.048	53.067	53.087	53.106	53.125	53.144	2400
2410	53.144	53.163	53.183	53.202	53.221	53.240	53.260	53.279	53.298	53.317	53.336	2410
2420	53.336	53.355	53.375	53.394	53.413	53.432	53.451	53.470	53.490	53.509	53.528	2420
2430	53.528	53.547	53.566	53.585	53.604	53.623	53.643	53.662	53.681	53.700	53.719	2430
2440	53.719	53.738	53.757	53.776	53.795	53.814	53.833	53.852	53.871	53.890	53.910	2440
2450	53.910	53.929	53.948	53.967	53.986	54.005	54.024	54.043	54.062	54.081	54.100	2450
2460	54.100	54.119	54.138	54.157	54.176	54.195	54.214	54.233	54.252	54.271	54.289	2460
2470	54.289	54.308	54.327	54.346	54.365	54.384	54.403	54.422	54.441	54.460	54.479	2470
2480	54.479	54.498	54.517	54.536	54.554	54.573	54.592	54.611	54.630	54.649	54.668	2480
2490	54.668	54.687	54.705	54.724	54.743	54.762	54.781	54.800	54.819	54.837	54.856	2490
2500	54.856	54.875	54.894									2500
°F	0	1	2	3	4	5	6	7	8	9	10	°F

GRADE:

PLATINUM-13% RHODIUM VS. PLATINUM

TEMPERATURE IN DEGREES °C
REFERENCE JUNCTION AT 0°C

Type "R" Thermocouple Reference Tables °C

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

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
32	to	2642°F	32	to	300°F
0	to	1450°C	0	to	150°C

LIMITS OF ERROR
(Whichever is Greater)

Standard:			Special:		
1.5°C	or	0.25%	0.6°C	or	0.1%

Thermoelectric Voltage in Millivolts

°C	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°C
-40	-0.226	-0.223	-0.219	-0.215	-0.211	-0.208	-0.204	-0.200	-0.196	-0.192	-0.188	-40
-30	-0.188	-0.184	-0.180	-0.175	-0.171	-0.167	-0.163	-0.158	-0.154	-0.150	-0.145	-30
-20	-0.145	-0.141	-0.137	-0.132	-0.128	-0.123	-0.119	-0.114	-0.109	-0.105	-0.100	-20
-10	-0.100	-0.095	-0.091	-0.086	-0.081	-0.076	-0.071	-0.066	-0.061	-0.056	-0.051	-10
0	-0.051	-0.046	-0.041	-0.036	-0.031	-0.026	-0.021	-0.016	-0.011	-0.005	0.000	0
0	0.000	0.005	0.011	0.016	0.021	0.027	0.032	0.038	0.043	0.049	0.054	0
10	0.054	0.060	0.065	0.071	0.077	0.082	0.088	0.094	0.100	0.105	0.111	10
20	0.111	0.117	0.123	0.129	0.135	0.141	0.147	0.153	0.159	0.165	0.171	20
30	0.171	0.177	0.183	0.189	0.195	0.201	0.207	0.214	0.220	0.226	0.232	30
40	0.232	0.239	0.245	0.251	0.258	0.264	0.271	0.277	0.284	0.290	0.296	40
50	0.296	0.303	0.310	0.316	0.323	0.329	0.336	0.343	0.349	0.356	0.363	50
60	0.363	0.369	0.376	0.383	0.390	0.397	0.403	0.410	0.417	0.424	0.431	60
70	0.431	0.438	0.445	0.452	0.459	0.466	0.473	0.480	0.487	0.494	0.501	70
80	0.501	0.508	0.516	0.523	0.530	0.537	0.544	0.552	0.559	0.566	0.573	80
90	0.573	0.581	0.588	0.595	0.603	0.610	0.618	0.625	0.632	0.640	0.647	90
100	0.647	0.655	0.662	0.670	0.677	0.685	0.693	0.700	0.708	0.715	0.723	100
110	0.723	0.731	0.738	0.746	0.754	0.761	0.769	0.777	0.785	0.792	0.800	110
120	0.800	0.808	0.816	0.824	0.832	0.839	0.847	0.855	0.863	0.871	0.879	120
130	0.879	0.887	0.895	0.903	0.911	0.919	0.927	0.935	0.943	0.951	0.959	130
140	0.959	0.967	0.976	0.984	0.992	1.000	1.008	1.016	1.025	1.033	1.041	140
150	1.041	1.049	1.058	1.066	1.074	1.082	1.091	1.099	1.107	1.116	1.124	150
160	1.124	1.132	1.141	1.149	1.158	1.166	1.175	1.183	1.191	1.200	1.208	160
170	1.208	1.217	1.225	1.234	1.242	1.251	1.260	1.268	1.277	1.285	1.294	170
180	1.294	1.303	1.311	1.320	1.329	1.337	1.346	1.355	1.363	1.372	1.381	180
190	1.381	1.389	1.398	1.407	1.416	1.425	1.433	1.442	1.451	1.460	1.469	190
200	1.469	1.477	1.486	1.495	1.504	1.513	1.522	1.531	1.540	1.549	1.558	200
210	1.558	1.567	1.575	1.584	1.593	1.602	1.611	1.620	1.629	1.639	1.648	210
220	1.648	1.657	1.666	1.675	1.684	1.693	1.702	1.711	1.720	1.729	1.739	220
230	1.739	1.748	1.757	1.766	1.775	1.784	1.794	1.803	1.812	1.821	1.831	230
240	1.831	1.840	1.849	1.858	1.868	1.877	1.886	1.895	1.905	1.914	1.923	240
250	1.923	1.933	1.942	1.951	1.961	1.970	1.980	1.989	1.998	2.008	2.017	250
260	2.017	2.027	2.036	2.046	2.055	2.064	2.074	2.083	2.093	2.102	2.112	260
270	2.112	2.121	2.131	2.140	2.150	2.159	2.169	2.179	2.188	2.198	2.207	270
280	2.207	2.217	2.226	2.236	2.246	2.255	2.265	2.275	2.284	2.294	2.304	280
290	2.304	2.313	2.323	2.333	2.342	2.352	2.362	2.371	2.381	2.391	2.401	290
300	2.401	2.410	2.420	2.430	2.440	2.449	2.459	2.469	2.479	2.488	2.498	300
310	2.498	2.508	2.518	2.528	2.538	2.547	2.557	2.567	2.577	2.587	2.597	310
320	2.597	2.607	2.617	2.626	2.636	2.646	2.656	2.666	2.676	2.686	2.696	320
330	2.696	2.706	2.716	2.726	2.736	2.746	2.756	2.766	2.776	2.786	2.796	330
340	2.796	2.806	2.816	2.826	2.836	2.846	2.856	2.866	2.876	2.886	2.896	340
350	2.896	2.906	2.916	2.926	2.937	2.947	2.957	2.967	2.977	2.987	2.997	350
360	2.997	3.007	3.018	3.028	3.038	3.048	3.058	3.068	3.079	3.089	3.099	360
370	3.099	3.109	3.119	3.130	3.140	3.150	3.160	3.171	3.181	3.191	3.201	370
380	3.201	3.212	3.222	3.232	3.242	3.253	3.263	3.273	3.284	3.294	3.304	380
390	3.304	3.315	3.325	3.335	3.346	3.356	3.366	3.377	3.387	3.397	3.408	390
400	3.408	3.418	3.428	3.439	3.449	3.460	3.470	3.480	3.491	3.501	3.512	400
410	3.512	3.522	3.533	3.543	3.553	3.564	3.574	3.585	3.595	3.606	3.616	410
420	3.616	3.627	3.637	3.648	3.658	3.669	3.679	3.690	3.700	3.711	3.721	420
430	3.721	3.732	3.742	3.753	3.764	3.774	3.785	3.795	3.806	3.816	3.827	430
440	3.827	3.838	3.848	3.859	3.869	3.880	3.891	3.901	3.912	3.922	3.933	440
450	3.933	3.944	3.954	3.965	3.976	3.986	3.997	4.008	4.018	4.029	4.040	450
460	4.040	4.050	4.061	4.072	4.083	4.093	4.104	4.115	4.125	4.136	4.147	460
470	4.147	4.158	4.168	4.179	4.190	4.201	4.211	4.222	4.233	4.244	4.255	470
480	4.255	4.265	4.276	4.287	4.298	4.309	4.319	4.330	4.341	4.352	4.363	480
490	4.363	4.373	4.384	4.395	4.406	4.417	4.428	4.439	4.449	4.460	4.471	490
500	4.471	4.482	4.493	4.504	4.515	4.526	4.537	4.548	4.558	4.569	4.580	500
510	4.580	4.591	4.602	4.613	4.624	4.635	4.646	4.657	4.668	4.679	4.690	510
520	4.690	4.701	4.712	4.723	4.734	4.745	4.756	4.767	4.778	4.789	4.800	520
530	4.800	4.811	4.822	4.833	4.844	4.855	4.866	4.877	4.888	4.899	4.910	530
540	4.910	4.922	4.933	4.944	4.955	4.966	4.977	4.988	4.999	5.010	5.021	540
550	5.021	5.033	5.044	5.055	5.066	5.077	5.088	5.099	5.111	5.122	5.133	550
560	5.133	5.144	5.155	5.166	5.178	5.189	5.200	5.211	5.222	5.234	5.245	560
570	5.245	5.256	5.267	5.279	5.290	5.301	5.312	5.323	5.335	5.346	5.357	570
580	5.357	5.369	5.380	5.391	5.402	5.414	5.425	5.436	5.448	5.459	5.470	580
590	5.470	5.481	5.493	5.504	5.515	5.527	5.538	5.549	5.561	5.572	5.583	590
600	5.583	5.595	5.606	5.618	5.629	5.640	5.652	5.663	5.674	5.686	5.697	600
610	5.697	5.709	5.720	5.731	5.743	5.754	5.766	5.777	5.789	5.800	5.812	610
620	5.812	5.823	5.834	5.846	5.857	5.869	5.880	5.892	5.903	5.915	5.926	620
630	5.926	5.938	5.949	5.961	5.972	5.984	5.995	6.007	6.018	6.030	6.041	630
640	6.041	6.053	6.065	6.076	6.088	6.099	6.111	6.122	6.134	6.146	6.157	640
°C	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°C

Thermoelectric Voltage in Millivolts

°C	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°C
650	6.157	6.169	6.180	6.192	6.204	6.215	6.227	6.238	6.250	6.262	6.273	650
660	6.273	6.285	6.297	6.308	6.320	6.332	6.343	6.355	6.367	6.378	6.390	660
670	6.390	6.402	6.413	6.425	6.437	6.448	6.460	6.472	6.484	6.495	6.507	670
680	6.507	6.519	6.531	6.542	6.554	6.566	6.578	6.589	6.601	6.613	6.625	680
690	6.625	6.636	6.648	6.660	6.672	6.684	6.695	6.707	6.719	6.731	6.743	690
700	6.743	6.755	6.766	6.778	6.790	6.802	6.814	6.826	6.838	6.849	6.861	700
710	6.861	6.873	6.885	6.897	6.909	6.921	6.933	6.945	6.956	6.968	6.980	710
720	6.980	6.992	7.004	7.016	7.028	7.040	7.052	7.064	7.076	7.088	7.100	720
730	7.100	7.112	7.124	7.136	7.148	7.160	7.172	7.184	7.196	7.208	7.220	730
740	7.220	7.232	7.244	7.256	7.268	7.280	7.292	7.304	7.316	7.328	7.340	740
750	7.340	7.352	7.364	7.376	7.389	7.401	7.413	7.425	7.437	7.449	7.461	750
760	7.461	7.473	7.485	7.498	7.510	7.522	7.534	7.546	7.558	7.570	7.583	760
770	7.583	7.595	7.607	7.619	7.631	7.644	7.656	7.668	7.680	7.692	7.705	770
780	7.705	7.717	7.729	7.741	7.753	7.766	7.778	7.790	7.802	7.815	7.827	780
790	7.827	7.839	7.851	7.864	7.876	7.888	7.901	7.913	7.925	7.938	7.950	790
800	7.950	7.962	7.974	7.987	7.999	8.011	8.024	8.036	8.048	8.061	8.073	800
810	8.073	8.086	8.098	8.110	8.123	8.135	8.147	8.160	8.172	8.185	8.197	810
820	8.197	8.209	8.222	8.234	8.247	8.259	8.272	8.284	8.296	8.309	8.321	820
830	8.321	8.334	8.346	8.359	8.371	8.384	8.396	8.409	8.421	8.434	8.446	830
840	8.446	8.459	8.471	8.484	8.496	8.509	8.521	8.534	8.546	8.559	8.571	840
850	8.571	8.584	8.597	8.609	8.622	8.634	8.647	8.659	8.672	8.685	8.697	850
860	8.697	8.710	8.722	8.735	8.748	8.760	8.773	8.785	8.798	8.811	8.823	860
870	8.823	8.836	8.849	8.861	8.874	8.887	8.899	8.912	8.925	8.937	8.950	870
880	8.950	8.963	8.975	8.988	9.001	9.014	9.026	9.039	9.052	9.065	9.077	880
890	9.077	9.090	9.103	9.115	9.128	9.141	9.154	9.167	9.179	9.192	9.205	890
900	9.205	9.218	9.230	9.243	9.256	9.269	9.282	9.294	9.307	9.320	9.333	900
910	9.333	9.346	9.359	9.371	9.384	9.397	9.410	9.423	9.436	9.449	9.461	910
920	9.461	9.474	9.487	9.500	9.513	9.526	9.539	9.552	9.565	9.578	9.590	920
930	9.590	9.603	9.616	9.629	9.642	9.655	9.668	9.681	9.694	9.707	9.720	930
940	9.720	9.733	9.746	9.759	9.772	9.785	9.798	9.811	9.824	9.837	9.850	940
950	9.850	9.863	9.876	9.889	9.902	9.915	9.928	9.941	9.954	9.967	9.980	950
960	9.980	9.993	10.006	10.019	10.032	10.046	10.059	10.072	10.085	10.098	10.111	960
970	10.111	10.124	10.137	10.150	10.163	10.177	10.190	10.203	10.216	10.229	10.242	970
980	10.242	10.255	10.268	10.282	10.295	10.308	10.321	10.334	10.347	10.361	10.374	980
990	10.374	10.387	10.400	10.413	10.427	10.440	10.453	10.466	10.480	10.493	10.506	990
1000	10.506	10.519	10.532	10.546	10.559	10.572	10.585	10.599	10.612	10.625	10.638	1000
1010	10.638	10.652	10.665	10.678	10.692	10.705	10.718	10.731	10.745	10.758	10.771	1010
1020	10.771	10.785	10.798	10.811	10.825	10.838	10.851	10.865	10.878	10.891	10.905	1020
1030	10.905	10.918	10.932	10.945	10.958	10.972	10.985	10.998	11.012	11.025	11.039	1030
1040	11.039	11.052	11.065	11.079	11.092	11.106	11.119	11.132	11.146	11.159	11.173	1040
1050	11.173	11.186	11.200	11.213	11.227	11.240	11.253	11.267	11.280	11.294	11.307	1050
1060	11.307	11.321	11.334	11.348	11.361	11.375	11.388	11.402	11.415	11.429	11.442	1060
1070	11.442	11.456	11.469	11.483	11.496	11.510	11.524	11.537	11.551	11.564	11.578	1070
1080	11.578	11.591	11.605	11.618	11.632	11.646	11.659	11.673	11.686	11.700	11.714	1080
1090	11.714	11.727	11.741	11.754	11.768	11.782	11.795	11.809	11.822	11.836	11.850	1090
1100	11.850	11.863	11.877	11.891	11.904	11.918	11.931	11.945	11.959	11.972	11.986	1100
1110	11.986	12.000	12.013	12.027	12.041	12.054	12.068	12.082	12.096	12.109	12.123	1110
1120	12.123	12.137	12.150	12.164	12.178	12.191	12.205	12.219	12.233	12.246	12.260	1120
1130	12.260	12.274	12.288	12.301	12.315	12.329	12.342	12.356	12.370	12.384	12.397	1130
1140	12.397	12.411	12.425	12.439	12.453	12.466	12.480	12.494	12.508	12.521	12.535	1140
1150	12.535	12.549	12.563	12.577	12.590	12.604	12.618	12.632	12.646	12.659	12.673	1150
1160	12.673	12.687	12.701	12.715	12.729	12.742	12.756	12.770	12.784	12.798	12.812	1160
1170	12.812	12.825	12.839	12.853	12.867	12.881	12.895	12.909	12.922	12.936	12.950	1170
1180	12.950	12.964	12.978	12.992	13.006	13.019	13.033	13.047	13.061	13.075	13.089	1180
1190	13.089	13.103	13.117	13.131	13.145	13.158	13.172	13.186	13.200	13.214	13.228	1190
1200	13.228	13.242	13.256	13.270	13.284	13.298	13.311	13.325	13.339	13.353	13.367	1200
1210	13.367	13.381	13.395	13.409	13.423	13.437	13.451	13.465	13.479	13.493	13.507	1210
1220	13.507	13.521	13.535	13.549	13.563	13.577	13.590	13.604	13.618	13.632	13.646	1220
1230	13.646	13.660	13.674	13.688	13.702	13.716	13.730	13.744	13.758	13.772	13.786	1230
1240	13.786	13.800	13.814	13.828	13.842	13.856	13.870	13.884	13.898	13.912	13.926	1240
1250	13.926	13.940	13.954	13.968	13.982	13.996	14.010	14.024	14.038	14.052	14.066	1250
1260	14.066	14.081	14.095	14.109	14.123	14.137	14.151	14.165	14.179	14.193	14.207	1260
1270	14.207	14.221	14.235	14.249	14.263	14.277	14.291	14.305	14.319	14.333	14.347	1270
1280	14.347	14.361	14.375	14.390	14.404	14.418	14.432	14.446	14.460	14.474	14.488	1280
1290	14.488	14.502	14.516	14.530	14.544	14.558	14.572	14.586	14.601	14.615	14.629	1290
1300	14.629	14.643	14.657	14.671	14.685	14.699	14.713	14.727	14.741	14.755	14.770	1300
1310	14.770	14.784	14.798	14.812	14.826	14.840	14.854	14.868	14.882	14.896	14.911	1310
1320	14.911	14.925	14.939	14.953	14.967	14.981	14.995	15.009	15.023	15.037	15.052	1320
1330	15.052	15.066	15.080	15.094	15.108	15.122	15.136	15.150	15.164	15.179	15.193	1330
1340	15.193	15.207	15.221	15.235	15.249	15.263	15.277	15.291	15.306	15.320	15.334	1340
°C	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°C

Type "R" Thermocouple Reference Tables °C

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

GRADE:

PLATINUM-13% RHODIUM VS. PLATINUM

TEMPERATURE IN DEGREES °C
REFERENCE JUNCTION AT 0°C

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
32	to	2642°F	32	to	300°F
0	to	1450°C	0	to	150°C

LIMITS OF ERROR
(Whichever is Greater)

Standard:			Special:		
1.5°C	or	0.25%	0.6°C	or	0.1%

Thermoelectric Voltage in Millivolts

°C	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°C
1350	15.334	15.348	15.362	15.376	15.390	15.404	15.419	15.433	15.447	15.461	15.475	1350
1360	15.475	15.489	15.503	15.517	15.531	15.546	15.560	15.574	15.588	15.602	15.616	1360
1370	15.616	15.630	15.645	15.659	15.673	15.687	15.701	15.715	15.729	15.743	15.758	1370
1380	15.758	15.772	15.786	15.800	15.814	15.828	15.842	15.856	15.871	15.885	15.899	1380
1390	15.899	15.913	15.927	15.941	15.955	15.969	15.984	15.998	16.012	16.026	16.040	1390
1400	16.040	16.054	16.068	16.082	16.097	16.111	16.125	16.139	16.153	16.167	16.181	1400
1410	16.181	16.196	16.210	16.224	16.238	16.252	16.266	16.280	16.294	16.309	16.323	1410
1420	16.323	16.337	16.351	16.365	16.379	16.393	16.407	16.422	16.436	16.450	16.464	1420
1430	16.464	16.478	16.492	16.506	16.520	16.534	16.549	16.563	16.577	16.591	16.605	1430
1440	16.605	16.619	16.633	16.647	16.662	16.676	16.690	16.704	16.718	16.732	16.746	1440
1450	16.746	16.760	16.774	16.789	16.803	16.817	16.831	16.845	16.859	16.873	16.887	1450
1460	16.887	16.901	16.915	16.930	16.944	16.958	16.972	16.986	17.000	17.014	17.028	1460
1470	17.028	17.042	17.056	17.071	17.085	17.099	17.113	17.127	17.141	17.155	17.169	1470
1480	17.169	17.183	17.197	17.211	17.225	17.240	17.254	17.268	17.282	17.296	17.310	1480
1490	17.310	17.324	17.338	17.352	17.366	17.380	17.394	17.408	17.423	17.437	17.451	1490
1500	17.451	17.465	17.479	17.493	17.507	17.521	17.535	17.549	17.563	17.577	17.591	1500
1510	17.591	17.605	17.619	17.633	17.647	17.661	17.676	17.690	17.704	17.718	17.732	1510
1520	17.732	17.746	17.760	17.774	17.788	17.802	17.816	17.830	17.844	17.858	17.872	1520
1530	17.872	17.886	17.900	17.914	17.928	17.942	17.956	17.970	17.984	17.998	18.012	1530
1540	18.012	18.026	18.040	18.054	18.068	18.082	18.096	18.110	18.124	18.138	18.152	1540
1550	18.152	18.166	18.180	18.194	18.208	18.222	18.236	18.250	18.264	18.278	18.292	1550
1560	18.292	18.306	18.320	18.334	18.348	18.362	18.376	18.390	18.404	18.417	18.431	1560
1570	18.431	18.445	18.459	18.473	18.487	18.501	18.515	18.529	18.543	18.557	18.571	1570
1580	18.571	18.585	18.599	18.613	18.627	18.640	18.654	18.668	18.682	18.696	18.710	1580
1590	18.710	18.724	18.738	18.752	18.766	18.779	18.793	18.807	18.821	18.835	18.849	1590
°C	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°C

Thermoelectric Voltage in Millivolts

°C	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°C
1600	18.849	18.863	18.877	18.891	18.904	18.918	18.932	18.946	18.960	18.974	18.988	1600
1610	18.988	19.002	19.015	19.029	19.043	19.057	19.071	19.085	19.098	19.112	19.126	1610
1620	19.126	19.140	19.154	19.168	19.181	19.195	19.209	19.223	19.237	19.250	19.264	1620
1630	19.264	19.278	19.292	19.306	19.319	19.333	19.347	19.361	19.375	19.388	19.402	1630
1640	19.402	19.416	19.430	19.444	19.457	19.471	19.485	19.499	19.512	19.526	19.540	1640
1650	19.540	19.554	19.567	19.581	19.595	19.609	19.622	19.636	19.650	19.663	19.677	1650
1660	19.677	19.691	19.705	19.718	19.732	19.746	19.759	19.773	19.787	19.800	19.814	1660
1670	19.814	19.828	19.841	19.855	19.869	19.882	19.896	19.910	19.923	19.937	19.951	1670
1680	19.951	19.964	19.978	19.992	20.005	20.019	20.032	20.046	20.060	20.073	20.087	1680
1690	20.087	20.100	20.114	20.127	20.141	20.154	20.168	20.181	20.195	20.208	20.222	1690
1700	20.222	20.235	20.249	20.262	20.275	20.289	20.302	20.316	20.329	20.342	20.356	1700
1710	20.356	20.369	20.382	20.396	20.409	20.422	20.436	20.449	20.462	20.475	20.488	1710
1720	20.488	20.502	20.515	20.528	20.541	20.554	20.567	20.581	20.594	20.607	20.620	1720
1730	20.620	20.633	20.646	20.659	20.672	20.685	20.698	20.711	20.724	20.736	20.749	1730
1740	20.749	20.762	20.775	20.788	20.801	20.813	20.826	20.839	20.852	20.864	20.877	1740
1750	20.877	20.890	20.902	20.915	20.928	20.940	20.953	20.965	20.978	20.990	21.003	1750
1760	21.003	21.015	21.027	21.040	21.052	21.065	21.077	21.089	21.101			1760
°C	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°C

GRADE:

PLATINUM-13% RHODIUM VS. PLATINUM

TEMPERATURE IN DEGREES °F
REFERENCE JUNCTION AT 32°F

Type "R" Thermocouple Reference Tables °F

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

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
32	to	2642°F	32	to	300°F
0	to	1450°C	0	to	150°C

LIMITS OF ERROR
(Whichever is Greater)

Standard:			Special:		
1.5°C	or	0.25%	0.6°C	or	0.1%

Thermoelectric Voltage in Millivolts

°F	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°F
-50			-0.226	-0.224	-0.222	-0.220	-0.218	-0.216	-0.214	-0.212	-0.210	-50
-40	-0.210	-0.208	-0.205	-0.203	-0.201	-0.199	-0.197	-0.194	-0.192	-0.190	-0.188	-40
-30	-0.188	-0.185	-0.183	-0.181	-0.179	-0.176	-0.174	-0.172	-0.169	-0.167	-0.165	-30
-20	-0.165	-0.162	-0.160	-0.158	-0.155	-0.153	-0.150	-0.148	-0.145	-0.143	-0.141	-20
-10	-0.141	-0.138	-0.136	-0.133	-0.131	-0.128	-0.126	-0.123	-0.121	-0.118	-0.116	-10
0	-0.116	-0.113	-0.110	-0.108	-0.105	-0.103	-0.100	-0.097	-0.095	-0.092	-0.090	0
0	-0.090	-0.087	-0.084	-0.082	-0.079	-0.076	-0.073	-0.071	-0.068	-0.065	-0.063	0
10	-0.063	-0.060	-0.057	-0.054	-0.051	-0.049	-0.046	-0.043	-0.040	-0.037	-0.035	10
20	-0.035	-0.032	-0.029	-0.026	-0.023	-0.020	-0.017	-0.015	-0.012	-0.009	-0.006	20
30	-0.006	-0.003	0.000	0.003	0.006	0.009	0.012	0.015	0.018	0.021	0.024	30
40	0.024	0.027	0.030	0.033	0.036	0.039	0.042	0.045	0.048	0.051	0.054	40
50	0.054	0.057	0.060	0.064	0.067	0.070	0.073	0.076	0.079	0.082	0.086	50
60	0.086	0.089	0.092	0.095	0.098	0.102	0.105	0.108	0.111	0.114	0.118	60
70	0.118	0.121	0.124	0.127	0.131	0.134	0.137	0.141	0.144	0.147	0.151	70
80	0.151	0.154	0.157	0.161	0.164	0.167	0.171	0.174	0.177	0.181	0.184	80
90	0.184	0.188	0.191	0.194	0.198	0.201	0.205	0.208	0.212	0.215	0.218	90
100	0.218	0.222	0.225	0.229	0.232	0.236	0.239	0.243	0.246	0.250	0.254	100
110	0.254	0.257	0.261	0.264	0.268	0.271	0.275	0.278	0.282	0.286	0.289	110
120	0.289	0.293	0.296	0.300	0.304	0.307	0.311	0.315	0.318	0.322	0.326	120
130	0.326	0.329	0.333	0.337	0.340	0.344	0.348	0.352	0.355	0.359	0.363	130
140	0.363	0.366	0.370	0.374	0.378	0.382	0.385	0.389	0.393	0.397	0.400	140
150	0.400	0.404	0.408	0.412	0.416	0.420	0.423	0.427	0.431	0.435	0.439	150
160	0.439	0.443	0.447	0.450	0.454	0.458	0.462	0.466	0.470	0.474	0.478	160
170	0.478	0.482	0.486	0.489	0.493	0.497	0.501	0.505	0.509	0.513	0.517	170
180	0.517	0.521	0.525	0.529	0.533	0.537	0.541	0.545	0.549	0.553	0.557	180
190	0.557	0.561	0.565	0.569	0.573	0.578	0.582	0.586	0.590	0.594	0.598	190
200	0.598	0.602	0.606	0.610	0.614	0.618	0.623	0.627	0.631	0.635	0.639	200
210	0.639	0.643	0.647	0.652	0.656	0.660	0.664	0.668	0.672	0.677	0.681	210
220	0.681	0.685	0.689	0.693	0.698	0.702	0.706	0.710	0.715	0.719	0.723	220
230	0.723	0.727	0.732	0.736	0.740	0.744	0.749	0.753	0.757	0.761	0.766	230
240	0.766	0.770	0.774	0.779	0.783	0.787	0.792	0.796	0.800	0.805	0.809	240
250	0.809	0.813	0.818	0.822	0.826	0.831	0.835	0.839	0.844	0.848	0.853	250
260	0.853	0.857	0.861	0.866	0.870	0.875	0.879	0.883	0.888	0.892	0.897	260
270	0.897	0.901	0.906	0.910	0.915	0.919	0.923	0.928	0.932	0.937	0.941	270
280	0.941	0.946	0.950	0.955	0.959	0.964	0.968	0.973	0.977	0.982	0.986	280
290	0.986	0.991	0.995	1.000	1.005	1.009	1.014	1.018	1.023	1.027	1.032	290
300	1.032	1.036	1.041	1.046	1.050	1.055	1.059	1.064	1.069	1.073	1.078	300
310	1.078	1.082	1.087	1.092	1.096	1.101	1.105	1.110	1.115	1.119	1.124	310
320	1.124	1.129	1.133	1.138	1.143	1.147	1.152	1.157	1.161	1.166	1.171	320
330	1.171	1.175	1.180	1.185	1.190	1.194	1.199	1.204	1.208	1.213	1.218	330
340	1.218	1.223	1.227	1.232	1.237	1.242	1.246	1.251	1.256	1.261	1.265	340
350	1.265	1.270	1.275	1.280	1.284	1.289	1.294	1.299	1.304	1.308	1.313	350
360	1.313	1.318	1.323	1.328	1.332	1.337	1.342	1.347	1.352	1.356	1.361	360
370	1.361	1.366	1.371	1.376	1.381	1.386	1.390	1.395	1.400	1.405	1.410	370
380	1.410	1.415	1.420	1.425	1.429	1.434	1.439	1.444	1.449	1.454	1.459	380
390	1.459	1.464	1.469	1.473	1.478	1.483	1.488	1.493	1.498	1.503	1.508	390
400	1.508	1.513	1.518	1.523	1.528	1.533	1.538	1.543	1.548	1.553	1.558	400
410	1.558	1.563	1.568	1.572	1.577	1.582	1.587	1.592	1.597	1.602	1.607	410
420	1.607	1.612	1.617	1.622	1.627	1.632	1.638	1.643	1.648	1.653	1.658	420
430	1.658	1.663	1.668	1.673	1.678	1.683	1.688	1.693	1.698	1.703	1.708	430
440	1.708	1.713	1.718	1.723	1.728	1.733	1.739	1.744	1.749	1.754	1.759	440
450	1.759	1.764	1.769	1.774	1.779	1.784	1.790	1.795	1.800	1.805	1.810	450
460	1.810	1.815	1.820	1.825	1.831	1.836	1.841	1.846	1.851	1.856	1.861	460
470	1.861	1.867	1.872	1.877	1.882	1.887	1.892	1.898	1.903	1.908	1.913	470
480	1.913	1.918	1.923	1.929	1.934	1.939	1.944	1.949	1.955	1.960	1.965	480
490	1.965	1.970	1.975	1.981	1.986	1.991	1.996	2.002	2.007	2.012	2.017	490
500	2.017	2.022	2.028	2.033	2.038	2.043	2.049	2.054	2.059	2.064	2.070	500
510	2.070	2.075	2.080	2.085	2.091	2.096	2.101	2.107	2.112	2.117	2.122	510
520	2.122	2.128	2.133	2.138	2.144	2.149	2.154	2.159	2.165	2.170	2.175	520
530	2.175	2.181	2.186	2.191	2.197	2.202	2.207	2.213	2.218	2.223	2.229	530
540	2.229	2.234	2.239	2.245	2.250	2.255	2.261	2.266	2.271	2.277	2.282	540
550	2.282	2.287	2.293	2.298	2.304	2.309	2.314	2.320	2.325	2.330	2.336	550
560	2.336	2.341	2.347	2.352	2.357	2.363	2.368	2.374	2.379	2.384	2.390	560
570	2.390	2.395	2.401	2.406	2.411	2.417	2.422	2.428	2.433	2.438	2.444	570
580	2.444	2.449	2.455	2.460	2.466	2.471	2.477	2.482	2.487	2.493	2.498	580
590	2.498	2.504	2.509	2.515	2.520	2.526	2.531	2.537	2.542	2.547	2.553	590
°F	0	1	2	3	4	5	6	7	8	9	10	°F

Thermoelectric Voltage in Millivolts

°F	0	1	2	3	4	5	6	7	8	9	10	°F
600	2.553	2.558	2.564	2.569	2.575	2.580	2.586	2.591	2.597	2.602	2.608	600
610	2.608	2.613	2.619	2.624	2.630	2.635	2.641	2.646	2.652	2.657	2.663	610
620	2.663	2.668	2.674	2.679	2.685	2.690	2.696	2.701	2.707	2.713	2.718	620
630	2.718	2.724	2.729	2.735	2.740	2.746	2.751	2.757	2.762	2.768	2.773	630
640	2.773	2.779	2.785	2.790	2.796	2.801	2.807	2.812	2.818	2.824	2.829	640
650	2.829	2.835	2.840	2.846	2.851	2.857	2.863	2.868	2.874	2.879	2.885	650
660	2.885	2.891	2.896	2.902	2.907	2.913	2.919	2.924	2.930	2.935	2.941	660
670	2.941	2.947	2.952	2.958	2.964	2.969	2.975	2.980	2.986	2.992	2.997	670
680	2.997	3.003	3.009	3.014	3.020	3.026	3.031	3.037	3.042	3.048	3.054	680
690	3.054	3.059	3.065	3.071	3.076	3.082	3.088	3.093	3.099	3.105	3.110	690
700	3.110	3.116	3.122	3.127	3.133	3.139	3.144	3.150	3.156	3.161	3.167	700
710	3.167	3.173	3.179	3.184	3.190	3.196	3.201	3.207	3.213	3.218	3.224	710
720	3.224	3.230	3.236	3.241	3.247	3.253	3.258	3.264	3.270	3.276	3.281	720
730	3.281	3.287	3.293	3.298	3.304	3.310	3.316	3.321	3.327	3.333	3.339	730
740	3.339	3.344	3.350	3.356	3.362	3.367	3.373	3.379	3.385	3.390	3.396	740
750	3.396	3.402	3.408	3.413	3.419	3.425	3.431	3.437	3.442	3.448	3.454	750
760	3.454	3.460	3.465	3.471	3.477	3.483	3.489	3.494	3.500	3.506	3.512	760
770	3.512	3.517	3.523	3.529	3.535	3.541	3.546	3.552	3.558	3.564	3.570	770
780	3.570	3.576	3.581	3.587	3.593	3.599	3.605	3.610	3.616	3.622	3.628	780
790	3.628	3.634	3.640	3.645	3.651	3.657	3.663	3.669	3.675	3.680	3.686	790
800	3.686	3.692	3.698	3.704	3.710	3.716	3.721	3.727	3.733	3.739	3.745	800
810	3.745	3.751	3.757	3.762	3.768	3.774	3.780	3.786	3.792	3.798	3.803	810
820	3.803	3.809	3.815	3.821	3.827	3.833	3.839	3.845	3.851	3.856	3.862	820
830	3.862	3.868	3.874	3.880	3.886	3.892	3.898	3.904	3.909	3.915	3.921	830
840	3.921	3.927	3.933	3.939	3.945	3.951	3.957	3.963	3.969	3.975	3.980	840
850	3.980	3.986	3.992	3.998	4.004	4.010	4.016	4.022	4.028	4.034	4.040	850
860	4.040	4.046	4.052	4.058	4.064	4.069	4.075	4.081	4.087	4.093	4.099	860
870	4.099	4.105	4.111	4.117	4.123	4.129	4.135	4.141	4.147	4.153	4.159	870
880	4.159	4.165	4.171	4.177	4.183	4.189	4.195	4.201	4.207	4.213	4.219	880
890	4.219	4.225	4.231	4.237	4.243	4.249	4.255	4.261	4.267	4.273	4.279	890
900	4.279	4.285	4.291	4.297	4.303	4.309	4.315	4.321	4.327	4.333	4.339	900
910	4.339	4.345	4.351	4.357	4.363	4.369	4.375	4.381	4.387	4.393	4.399	910
920	4.399	4.405	4.411	4.417	4.423	4.429	4.435	4.441	4.447	4.453	4.459	920
930	4.459	4.465	4.471	4.477	4.483	4.489	4.495	4.502	4.508	4.514	4.520	930
940	4.520	4.526	4.532	4.538	4.544	4.550	4.556	4.562	4.568	4.574	4.580	940
950	4.580	4.586	4.593	4.599	4.605	4.611	4.617	4.623	4.629	4.635	4.641	950
960	4.641	4.647	4.653	4.659	4.666	4.672	4.678	4.684	4.690	4.696	4.702	960
970	4.702	4.708	4.714	4.720	4.727	4.733	4.739	4.745	4.751	4.757	4.763	970
980	4.763	4.769	4.775	4.782	4.788	4.794	4.800	4.806	4.812	4.818	4.824	980
990	4.824	4.831	4.837	4.843	4.849	4.855	4.861	4.867	4.874	4.880	4.886	990
1000	4.886	4.892	4.898	4.904	4.910	4.917	4.923	4.929	4.935	4.941	4.947	1000
1010	4.947	4.954	4.960	4.966	4.972	4.978	4.984	4.991	4.997	5.003	5.009	1010
1020	5.009	5.015	5.021	5.028	5.034	5.040	5.046	5.052	5.059	5.065	5.071	1020
1030	5.071	5.077	5.083	5.090	5.096	5.102	5.108	5.114	5.121	5.127	5.133	1030
1040	5.133	5.139	5.145	5.152	5.158	5.164	5.170	5.176	5.183	5.189	5.195	1040
1050	5.195	5.201	5.207	5.214	5.220	5.226	5.232	5.239	5.245	5.251	5.257	1050
1060	5.257	5.264	5.270	5.276	5.282	5.289	5.295	5.301	5.307	5.313	5.320	1060
1070	5.320	5.326	5.332	5.338	5.345	5.351	5.357	5.364	5.370	5.376	5.382	1070
1080	5.382	5.389	5.395	5.401	5.407	5.414	5.420	5.426	5.432	5.439	5.445	1080
1090	5.445	5.451	5.458	5.464	5.470	5.476	5.483	5.489	5.495	5.502	5.508	1090
1100	5.508	5.514	5.520	5.527	5.533	5.539	5.546	5.552	5.558	5.565	5.571	1100
1110	5.571	5.577	5.583	5.590	5.596	5.602	5.609	5.615	5.621	5.628	5.634	1110
1120	5.634	5.640	5.647	5.653	5.659	5.666	5.672	5.678	5.685	5.691	5.697	1120
1130	5.697	5.704	5.710	5.716	5.723	5.729	5.735	5.742	5.748	5.754	5.761	1130
1140	5.761	5.767	5.773	5.780	5.786	5.792	5.799	5.805	5.812	5.818	5.824	1140
1150	5.824	5.831	5.837	5.843	5.850	5.856	5.862	5.869	5.875	5.882	5.888	1150
1160	5.888	5.894	5.901	5.907	5.913	5.920	5.926	5.933	5.939	5.945	5.952	1160
1170	5.952	5.958	5.965	5.971	5.977	5.984	5.990	5.997	6.003	6.009	6.016	1170
1180	6.016	6.022	6.029	6.035	6.041	6.048	6.054	6.061	6.067	6.074	6.080	1180
1190	6.080	6.086	6.093	6.099	6.106	6.112	6.119	6.125	6.131	6.138	6.144	1190
1200	6.144	6.151	6.157	6.164	6.170	6.176	6.183	6.189	6.196	6.202	6.209	1200
1210	6.209	6.215	6.222	6.228	6.235	6.241	6.247	6.254	6.260	6.267	6.273	1210
1220	6.273	6.280	6.286	6.293	6.299	6.306	6.312	6.319	6.325	6.332	6.338	1220
1230	6.338	6.345	6.351	6.358	6.364	6.370	6.377	6.383	6.390	6.396	6.403	1230
1240	6.403	6.409	6.416	6.422	6.429	6.435	6.442	6.448	6.455	6.461	6.468	1240
1250	6.468	6.474	6.481	6.488	6.494	6.501	6.507	6.514	6.520	6.527	6.533	1250
1260	6.533	6.540	6.546	6.553	6.559	6.566	6.572	6.579	6.585	6.592	6.598	1260
1270	6.598	6.605	6.612	6.618	6.625	6.631	6.638	6.644	6.651	6.657	6.664	1270
1280	6.664	6.671	6.677	6.684	6.690	6.697	6.703	6.710	6.716	6.723	6.730	1280
1290	6.730	6.736	6.743	6.749	6.756	6.762	6.769	6.776	6.782	6.789	6.795	1290
°F	0	1	2	3	4	5	6	7	8	9	10	°F

Type "R" Thermocouple Reference Tables °F

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

GRADE:

PLATINUM-13% RHODIUM VS. PLATINUM

TEMPERATURE IN DEGREES °F
REFERENCE JUNCTION AT 32°F

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
32	to	2642°F	32	to	300°F
0	to	1450°C	0	to	150°C

LIMITS OF ERROR
(Whichever is Greater)

Standard:			Special:		
1.5°C	or	0.25%	0.6°C	or	0.1%

Thermoelectric Voltage in Millivolts

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1300	6.795	6.802	6.809	6.815	6.822	6.828	6.835	6.841	6.848	6.855	6.861	1300
1310	6.861	6.868	6.874	6.881	6.888	6.894	6.901	6.907	6.914	6.921	6.927	1310
1320	6.927	6.934	6.941	6.947	6.954	6.960	6.967	6.974	6.980	6.987	6.994	1320
1330	6.994	7.000	7.007	7.013	7.020	7.027	7.033	7.040	7.047	7.053	7.060	1330
1340	7.060	7.067	7.073	7.080	7.086	7.093	7.100	7.106	7.113	7.120	7.126	1340
1350	7.126	7.133	7.140	7.146	7.153	7.160	7.166	7.173	7.180	7.186	7.193	1350
1360	7.193	7.200	7.206	7.213	7.220	7.226	7.233	7.240	7.247	7.253	7.260	1360
1370	7.260	7.267	7.273	7.280	7.287	7.293	7.300	7.307	7.313	7.320	7.327	1370
1380	7.327	7.334	7.340	7.347	7.354	7.360	7.367	7.374	7.381	7.387	7.394	1380
1390	7.394	7.401	7.407	7.414	7.421	7.428	7.434	7.441	7.448	7.454	7.461	1390
1400	7.461	7.468	7.475	7.481	7.488	7.495	7.502	7.508	7.515	7.522	7.529	1400
1410	7.529	7.535	7.542	7.549	7.556	7.562	7.569	7.576	7.583	7.589	7.596	1410
1420	7.596	7.603	7.610	7.616	7.623	7.630	7.637	7.644	7.650	7.657	7.664	1420
1430	7.664	7.671	7.677	7.684	7.691	7.698	7.705	7.711	7.718	7.725	7.732	1430
1440	7.732	7.739	7.745	7.752	7.759	7.766	7.772	7.779	7.786	7.793	7.800	1440
1450	7.800	7.807	7.813	7.820	7.827	7.834	7.841	7.847	7.854	7.861	7.868	1450
1460	7.868	7.875	7.882	7.888	7.895	7.902	7.909	7.916	7.922	7.929	7.936	1460
1470	7.936	7.943	7.950	7.957	7.964	7.970	7.977	7.984	7.991	7.998	8.005	1470
1480	8.005	8.011	8.018	8.025	8.032	8.039	8.046	8.053	8.059	8.066	8.073	1480
1490	8.073	8.080	8.087	8.094	8.101	8.108	8.114	8.121	8.128	8.135	8.142	1490
1500	8.142	8.149	8.156	8.163	8.169	8.176	8.183	8.190	8.197	8.204	8.211	1500
1510	8.211	8.218	8.225	8.232	8.238	8.245	8.252	8.259	8.266	8.273	8.280	1510
1520	8.280	8.287	8.294	8.301	8.308	8.314	8.321	8.328	8.335	8.342	8.349	1520
1530	8.349	8.356	8.363	8.370	8.377	8.384	8.391	8.398	8.405	8.411	8.418	1530
1540	8.418	8.425	8.432	8.439	8.446	8.453	8.460	8.467	8.474	8.481	8.488	1540
1550	8.488	8.495	8.502	8.509	8.516	8.523	8.530	8.537	8.544	8.551	8.557	1550
1560	8.557	8.564	8.571	8.578	8.585	8.592	8.599	8.606	8.613	8.620	8.627	1560
1570	8.627	8.634	8.641	8.648	8.655	8.662	8.669	8.676	8.683	8.690	8.697	1570
1580	8.697	8.704	8.711	8.718	8.725	8.732	8.739	8.746	8.753	8.760	8.767	1580
1590	8.767	8.774	8.781	8.788	8.795	8.802	8.809	8.816	8.823	8.830	8.837	1590
1600	8.837	8.844	8.852	8.859	8.866	8.873	8.880	8.887	8.894	8.901	8.908	1600
1610	8.908	8.915	8.922	8.929	8.936	8.943	8.950	8.957	8.964	8.971	8.978	1610
1620	8.978	8.985	8.992	8.999	9.007	9.014	9.021	9.028	9.035	9.042	9.049	1620
1630	9.049	9.056	9.063	9.070	9.077	9.084	9.091	9.098	9.106	9.113	9.120	1630
1640	9.120	9.127	9.134	9.141	9.148	9.155	9.162	9.169	9.176	9.184	9.191	1640
1650	9.191	9.198	9.205	9.212	9.219	9.226	9.233	9.240	9.248	9.255	9.262	1650
1660	9.262	9.269	9.276	9.283	9.290	9.297	9.304	9.312	9.319	9.326	9.333	1660
1670	9.333	9.340	9.347	9.354	9.361	9.369	9.376	9.383	9.390	9.397	9.404	1670
1680	9.404	9.411	9.419	9.426	9.433	9.440	9.447	9.454	9.461	9.469	9.476	1680
1690	9.476	9.483	9.490	9.497	9.504	9.512	9.519	9.526	9.533	9.540	9.547	1690
1700	9.547	9.555	9.562	9.569	9.576	9.583	9.590	9.598	9.605	9.612	9.619	1700
1710	9.619	9.626	9.634	9.641	9.648	9.655	9.662	9.670	9.677	9.684	9.691	1710
1720	9.691	9.698	9.706	9.713	9.720	9.727	9.734	9.742	9.749	9.756	9.763	1720
1730	9.763	9.770	9.778	9.785	9.792	9.799	9.806	9.814	9.821	9.828	9.835	1730
1740	9.835	9.843	9.850	9.857	9.864	9.872	9.879	9.886	9.893	9.900	9.908	1740
1750	9.908	9.915	9.922	9.929	9.937	9.944	9.951	9.958	9.966	9.973	9.980	1750
1760	9.980	9.987	9.995	10.002	10.009	10.016	10.024	10.031	10.038	10.046	10.053	1760
1770	10.053	10.060	10.067	10.075	10.082	10.089	10.096	10.104	10.111	10.118	10.126	1770
1780	10.126	10.133	10.140	10.147	10.155	10.162	10.169	10.177	10.184	10.191	10.198	1780
1790	10.198	10.206	10.213	10.220	10.228	10.235	10.242	10.250	10.257	10.264	10.271	1790
1800	10.271	10.279	10.286	10.293	10.301	10.308	10.315	10.323	10.330	10.337	10.345	1800
1810	10.345	10.352	10.359	10.367	10.374	10.381	10.389	10.396	10.403	10.411	10.418	1810
1820	10.418	10.425	10.433	10.440	10.447	10.455	10.462	10.469	10.477	10.484	10.491	1820
1830	10.491	10.499	10.506	10.513	10.521	10.528	10.535	10.543	10.550	10.557	10.565	1830
1840	10.565	10.572	10.580	10.587	10.594	10.602	10.609	10.616	10.624	10.631	10.638	1840
1850	10.638	10.646	10.653	10.661	10.668	10.675	10.683	10.690	10.698	10.705	10.712	1850
1860	10.712	10.720	10.727	10.734	10.742	10.749	10.757	10.764	10.771	10.779	10.786	1860
1870	10.786	10.794	10.801	10.808	10.816	10.823	10.831	10.838	10.845	10.853	10.860	1870
1880	10.860	10.868	10.875	10.883	10.890	10.897	10.905	10.912	10.920	10.927	10.934	1880
1890	10.934	10.942	10.949	10.957	10.964	10.972	10.979	10.986	10.994	11.001	11.009	1890
1900	11.009	11.016	11.024	11.031	11.039	11.046	11.053	11.061	11.068	11.076	11.083	1900
1910	11.083	11.091	11.098	11.106	11.113	11.121	11.128	11.135	11.143	11.150	11.158	1910
1920	11.158	11.165	11.173	11.180	11.188	11.195	11.203	11.210	11.218	11.225	11.233	1920
1930	11.233	11.240	11.247	11.255	11.262	11.270	11.277	11.285	11.292	11.300	11.307	1930
1940	11.307	11.315	11.322	11.330	11.337	11.345	11.352	11.360	11.367	11.375	11.382	1940
1950	11.382	11.390	11.397	11.405	11.412	11.420	11.427	11.435	11.442	11.450	11.457	1950
1960	11.457	11.465	11.472	11.480	11.487	11.495	11.502	11.510	11.518	11.525	11.533	1960
1970	11.533	11.540	11.548	11.555	11.563	11.570	11.578	11.585	11.593	11.600	11.608	1970
1980	11.608	11.615	11.623	11.631	11.638	11.646	11.653	11.661	11.668	11.676	11.683	1980
1990	11.683	11.691	11.698	11.706	11.714	11.721	11.729	11.736	11.744	11.751	11.759	1990
°F	0	1	2	3	4	5	6	7	8	9	10	°F

Thermoelectric Voltage in Millivolts

°F	0	1	2	3	4	5	6	7	8	9	10	°F
2000	11.759	11.766	11.774	11.782	11.789	11.797	11.804	11.812	11.819	11.827	11.834	2000
2010	11.834	11.842	11.850	11.857	11.865	11.872	11.880	11.888	11.895	11.903	11.910	2010
2020	11.910	11.918	11.925	11.933	11.941	11.948	11.956	11.963	11.971	11.979	11.986	2020
2030	11.986	11.994	12.001	12.009	12.016	12.024	12.032	12.039	12.047	12.054	12.062	2030
2040	12.062	12.070	12.077	12.085	12.092	12.100	12.108	12.115	12.123	12.131	12.138	2040
2050	12.138	12.146	12.153	12.161	12.169	12.176	12.184	12.191	12.199	12.207	12.214	2050
2060	12.214	12.222	12.230	12.237	12.245	12.252	12.260	12.268	12.275	12.283	12.291	2060
2070	12.291	12.298	12.306	12.313	12.321	12.329	12.336	12.344	12.352	12.359	12.367	2070
2080	12.367	12.375	12.382	12.390	12.397	12.405	12.413	12.420	12.428	12.436	12.443	2080
2090	12.443	12.451	12.459	12.466	12.474	12.482	12.489	12.497	12.505	12.512	12.520	2090
2100	12.520	12.528	12.535	12.543	12.551	12.558	12.566	12.574	12.581	12.589	12.597	2100
2110	12.597	12.604	12.612	12.620	12.627	12.635	12.643	12.650	12.658	12.666	12.673	2110
2120	12.673	12.681	12.689	12.696	12.704	12.712	12.719	12.727	12.735	12.742	12.750	2120
2130	12.750	12.758	12.765	12.773	12.781	12.788	12.796	12.804	12.812	12.819	12.827	2130
2140	12.827	12.835	12.842	12.850	12.858	12.865	12.873	12.881	12.889	12.896	12.904	2140
2150	12.904	12.912	12.919	12.927	12.935	12.942	12.950	12.958	12.966	12.973	12.981	2150
2160	12.981	12.989	12.996	13.004	13.012	13.019	13.027	13.035	13.043	13.050	13.058	2160
2170	13.058	13.066	13.073	13.081	13.089	13.097	13.104	13.112	13.120	13.128	13.135	2170
2180	13.135	13.143	13.151	13.158	13.166	13.174	13.182	13.189	13.197	13.205	13.213	2180
2190	13.213	13.220	13.228	13.236	13.243	13.251	13.259	13.267	13.274	13.282	13.290	2190
2200	13.290	13.298	13.305	13.313	13.321	13.329	13.336	13.344	13.352	13.359	13.367	2200
2210	13.367	13.375	13.383	13.390	13.398	13.406	13.414	13.421	13.429	13.437	13.445	2210
2220	13.445	13.452	13.460	13.468	13.476	13.483	13.491	13.499	13.507	13.514	13.522	2220
2230	13.522	13.530	13.538	13.545	13.553	13.561	13.569	13.577	13.584	13.592	13.600	2230
2240	13.600	13.608	13.615	13.623	13.631	13.639	13.646	13.654	13.662	13.670	13.677	2240
2250	13.677	13.685	13.693	13.701	13.709	13.716	13.724	13.732	13.740	13.747	13.755	2250
2260	13.755	13.763	13.771	13.778	13.786	13.794	13.802	13.810	13.817	13.825	13.833	2260
2270	13.833	13.841	13.848	13.856	13.864	13.872	13.880	13.887	13.895	13.903	13.911	2270
2280	13.911	13.919	13.926	13.934	13.942	13.950	13.957	13.965	13.973	13.981	13.989	2280
2290	13.989	13.996	14.004	14.012	14.020	14.028	14.035	14.043	14.051	14.059	14.066	2290
2300	14.066	14.074	14.082	14.090	14.098	14.105	14.113	14.121	14.129	14.137	14.144	2300
2310	14.144	14.152	14.160	14.168	14.176	14.183	14.191	14.199	14.207	14.215	14.222	2310
2320	14.222	14.230	14.238	14.246	14.254	14.261	14.269	14.277	14.285	14.293	14.300	2320
2330	14.300	14.308	14.316	14.324	14.332	14.340	14.347	14.355	14.363	14.371	14.379	2330
2340	14.379	14.386	14.394	14.402	14.410	14.418	14.425	14.433	14.441	14.449	14.457	2340
2350	14.457	14.465	14.472	14.480	14.488	14.496	14.504	14.511	14.519	14.527	14.535	2350
2360	14.535	14.543	14.551	14.558	14.566	14.574	14.582	14.590	14.597	14.605	14.613	2360
2370	14.613	14.621	14.629	14.637	14.644	14.652	14.660	14.668	14.676	14.683	14.691	2370
2380	14.691	14.699	14.707	14.715	14.723	14.730	14.738	14.746	14.754	14.762	14.770	2380
2390	14.770	14.777	14.785	14.793	14.801	14.809	14.817	14.824	14.832	14.840	14.848	2390
2400	14.848	14.856	14.864	14.871	14.879	14.887	14.895	14.903	14.911	14.918	14.926	2400
2410	14.926	14.934	14.942	14.950	14.958	14.965	14.973	14.981	14.989	14.997	15.005	2410
2420	15.005	15.012	15.020	15.028	15.036	15.044	15.052	15.059	15.067	15.075	15.083	2420
2430	15.083	15.091	15.099	15.106	15.114	15.122	15.130	15.138	15.146	15.153	15.161	2430
2440	15.161	15.169	15.177	15.185	15.193	15.200	15.208	15.216	15.224	15.232	15.240	2440
2450	15.240	15.248	15.255	15.263	15.271	15.279	15.287	15.295	15.302	15.310	15.318	2450
2460	15.318	15.326	15.334	15.342	15.349	15.357	15.365	15.373	15.381	15.389	15.397	2460
2470	15.397	15.404	15.412	15.420	15.428	15.436	15.444	15.451	15.459	15.467	15.475	2470
2480	15.475	15.483	15.491	15.499	15.506	15.514	15.522	15.530	15.538	15.546	15.553	2480
2490	15.553	15.561	15.569	15.577	15.585	15.593	15.601	15.608	15.616	15.624	15.632	2490
2500	15.632	15.640	15.648	15.655	15.663	15.671	15.679	15.687	15.695	15.703	15.710	2500
2510	15.710	15.718	15.726	15.734	15.742	15.750	15.758	15.765	15.773	15.781	15.789	2510
2520	15.789	15.797	15.805	15.812	15.820	15.828	15.836	15.844	15.852	15.860	15.867	2520
2530	15.867	15.875	15.883	15.891	15.899	15.907	15.915	15.922	15.930	15.938	15.946	2530
2540	15.946	15.954	15.962	15.969	15.977	15.985	15.993	16.001	16.009	16.017	16.024	2540
2550	16.024	16.032	16.040	16.048	16.056	16.064	16.071	16.079	16.087	16.095	16.103	2550
2560	16.103	16.111	16.119	16.126	16.134	16.142	16.150	16.158	16.166	16.174	16.181	2560
2570	16.181	16.189	16.197	16.205	16.213	16.221	16.228	16.236	16.244	16.252	16.260	2570
2580	16.260	16.268	16.276	16.283	16.291	16.299	16.307	16.315	16.323	16.330	16.338	2580
2590	16.338	16.346	16.354	16.362	16.370	16.378	16.385	16.393	16.401	16.409	16.417	2590
2600	16.417	16.425	16.432	16.440	16.448	16.456	16.464	16.472	16.480	16.487	16.495	2600
2610	16.495	16.503	16.511	16.519	16.527	16.534	16.542	16.550	16.558	16.566	16.574	2610
2620	16.574	16.582	16.589	16.597	16.605	16.613	16.621	16.629	16.636	16.644	16.652	2620
2630	16.652	16.660	16.668	16.676	16.683	16.691	16.699	16.707	16.715	16.723	16.731	2630
2640	16.731	16.738	16.746	16.754	16.762	16.770	16.778	16.785	16.793	16.801	16.809	2640
2650	16.809	16.817	16.825	16.832	16.840	16.848	16.856	16.864	16.872	16.879	16.887	2650
2660	16.887	16.895	16.903	16.911	16.919	16.926	16.934	16.942	16.950	16.958	16.966	2660
2670	16.966	16.973	16.981	16.989	16.997	17.005	17.013	17.020	17.028	17.036	17.044	2670
2680	17.044	17.052	17.060	17.067	17.075	17.083	17.091	17.099	17.107	17.114	17.122	2680
2690	17.122	17.130	17.138	17.146	17.154	17.161	17.169	17.177	17.185	17.193	17.200	2690
°F	0	1	2	3	4	5	6	7	8	9	10	°F

GRADE:

PLATINUM-13% RHODIUM VS. PLATINUM

TEMPERATURE IN DEGREES °F
REFERENCE JUNCTION AT 32°F

Type "R" Thermocouple Reference Tables °F

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

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
32	to	2642°F	32	to	300°F
0	to	1450°C	0	to	150°C

LIMITS OF ERROR
(Whichever is Greater)

Standard:			Special:		
1.5°C	or	0.25%	0.6°C	or	0.1%

Thermoelectric Voltage in Millivolts

°F	0	1	2	3	4	5	6	7	8	9	10	°F
2700	17.200	17.208	17.216	17.224	17.232	17.240	17.247	17.255	17.263	17.271	17.279	2700
2710	17.279	17.286	17.294	17.302	17.310	17.318	17.326	17.333	17.341	17.349	17.357	2710
2720	17.357	17.365	17.373	17.380	17.388	17.396	17.404	17.412	17.419	17.427	17.435	2720
2730	17.435	17.443	17.451	17.458	17.466	17.474	17.482	17.490	17.498	17.505	17.513	2730
2740	17.513	17.521	17.529	17.537	17.544	17.552	17.560	17.568	17.576	17.583	17.591	2740
2750	17.591	17.599	17.607	17.615	17.622	17.630	17.638	17.646	17.654	17.661	17.669	2750
2760	17.669	17.677	17.685	17.693	17.700	17.708	17.716	17.724	17.732	17.739	17.747	2760
2770	17.747	17.755	17.763	17.771	17.778	17.786	17.794	17.802	17.810	17.817	17.825	2770
2780	17.825	17.833	17.841	17.849	17.856	17.864	17.872	17.880	17.888	17.895	17.903	2780
2790	17.903	17.911	17.919	17.926	17.934	17.942	17.950	17.958	17.965	17.973	17.981	2790
2800	17.981	17.989	17.997	18.004	18.012	18.020	18.028	18.035	18.043	18.051	18.059	2800
2810	18.059	18.067	18.074	18.082	18.090	18.098	18.105	18.113	18.121	18.129	18.137	2810
2820	18.137	18.144	18.152	18.160	18.168	18.175	18.183	18.191	18.199	18.206	18.214	2820
2830	18.214	18.222	18.230	18.238	18.245	18.253	18.261	18.269	18.276	18.284	18.292	2830
2840	18.292	18.300	18.307	18.315	18.323	18.331	18.338	18.346	18.354	18.362	18.369	2840
2850	18.369	18.377	18.385	18.393	18.400	18.408	18.416	18.424	18.431	18.439	18.447	2850
2860	18.447	18.455	18.462	18.470	18.478	18.486	18.493	18.501	18.509	18.517	18.524	2860
2870	18.524	18.532	18.540	18.548	18.555	18.563	18.571	18.579	18.586	18.594	18.602	2870
2880	18.602	18.610	18.617	18.625	18.633	18.640	18.648	18.656	18.664	18.671	18.679	2880
2890	18.679	18.687	18.695	18.702	18.710	18.718	18.725	18.733	18.741	18.749	18.756	2890
2900	18.756	18.764	18.772	18.779	18.787	18.795	18.803	18.810	18.818	18.826	18.834	2900
2910	18.834	18.841	18.849	18.857	18.864	18.872	18.880	18.887	18.895	18.903	18.911	2910
2920	18.911	18.918	18.926	18.934	18.941	18.949	18.957	18.965	18.972	18.980	18.988	2920
2930	18.988	18.995	19.003	19.011	19.018	19.026	19.034	19.042	19.049	19.057	19.065	2930
2940	19.065	19.072	19.080	19.088	19.095	19.103	19.111	19.118	19.126	19.134	19.141	2940
2950	19.141	19.149	19.157	19.165	19.172	19.180	19.188	19.195	19.203	19.211	19.218	2950
2960	19.218	19.226	19.234	19.241	19.249	19.257	19.264	19.272	19.280	19.287	19.295	2960
2970	19.295	19.303	19.310	19.318	19.326	19.333	19.341	19.349	19.356	19.364	19.372	2970
2980	19.372	19.379	19.387	19.395	19.402	19.410	19.418	19.425	19.433	19.440	19.448	2980
2990	19.448	19.456	19.463	19.471	19.479	19.486	19.494	19.502	19.509	19.517	19.525	2990
°F	0	1	2	3	4	5	6	7	8	9	10	°F

Thermoelectric Voltage in Millivolts

°F	0	1	2	3	4	5	6	7	8	9	10	°F
3000	19.525	19.532	19.540	19.547	19.555	19.563	19.570	19.578	19.586	19.593	19.601	3000
3010	19.601	19.609	19.616	19.624	19.631	19.639	19.647	19.654	19.662	19.670	19.677	3010
3020	19.677	19.685	19.692	19.700	19.708	19.715	19.723	19.730	19.738	19.746	19.753	3020
3030	19.753	19.761	19.769	19.776	19.784	19.791	19.799	19.807	19.814	19.822	19.829	3030
3040	19.829	19.837	19.845	19.852	19.860	19.867	19.875	19.882	19.890	19.898	19.905	3040
3050	19.905	19.913	19.920	19.928	19.936	19.943	19.951	19.958	19.966	19.973	19.981	3050
3060	19.981	19.989	19.996	20.004	20.011	20.019	20.026	20.034	20.041	20.049	20.056	3060
3070	20.056	20.064	20.072	20.079	20.087	20.094	20.102	20.109	20.117	20.124	20.132	3070
3080	20.132	20.139	20.147	20.154	20.162	20.169	20.177	20.184	20.192	20.199	20.207	3080
3090	20.207	20.214	20.222	20.229	20.237	20.244	20.252	20.259	20.266	20.274	20.281	3090
3100	20.281	20.289	20.296	20.304	20.311	20.319	20.326	20.333	20.341	20.348	20.356	3100
3110	20.356	20.363	20.371	20.378	20.385	20.393	20.400	20.407	20.415	20.422	20.430	3110
3120	20.430	20.437	20.444	20.452	20.459	20.466	20.474	20.481	20.488	20.496	20.503	3120
3130	20.503	20.510	20.518	20.525	20.532	20.540	20.547	20.554	20.562	20.569	20.576	3130
3140	20.576	20.583	20.591	20.598	20.605	20.612	20.620	20.627	20.634	20.641	20.649	3140
3150	20.649	20.656	20.663	20.670	20.678	20.685	20.692	20.699	20.706	20.714	20.721	3150
3160	20.721	20.728	20.735	20.742	20.749	20.756	20.764	20.771	20.778	20.785	20.792	3160
3170	20.792	20.799	20.806	20.813	20.821	20.828	20.835	20.842	20.849	20.856	20.863	3170
3180	20.863	20.870	20.877	20.884	20.891	20.898	20.905	20.912	20.919	20.926	20.933	3180
3190	20.933	20.940	20.947	20.954	20.961	20.968	20.975	20.982	20.989	20.996	21.003	3190
3200	21.003	21.010	21.016	21.023	21.030	21.037	21.044	21.051	21.058	21.065	21.071	3200
3210	21.071	21.078	21.085	21.092	21.099							3210
°F	0	1	2	3	4	5	6	7	8	9	10	°F

Type "S" Thermocouple Reference Tables °C

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

GRADE:

PLATINUM-10% RHODIUM VS. PLATINUM

TEMPERATURE IN DEGREES °C
REFERENCE JUNCTION AT 0°C

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
32	to	2642°F	32	to	300°F
0	to	1450°C	0	to	150°C

LIMITS OF ERROR
(Whichever is Greater)

Standard:			Special:		
1.5°C	or	0.25%	0.6°C	or	0.1%

Thermoelectric Voltage in Millivolts

°C	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°C
-40	-0.236	-0.232	-0.228	-0.224	-0.219	-0.215	-0.211	-0.207	-0.203	-0.199	-0.194	-40
-30	-0.194	-0.190	-0.186	-0.181	-0.177	-0.173	-0.168	-0.164	-0.159	-0.155	-0.150	-30
-20	-0.150	-0.146	-0.141	-0.136	-0.132	-0.127	-0.122	-0.117	-0.113	-0.108	-0.103	-20
-10	-0.103	-0.098	-0.093	-0.088	-0.083	-0.078	-0.073	-0.068	-0.063	-0.058	-0.053	-10
0	-0.053	-0.048	-0.042	-0.037	-0.032	-0.027	-0.021	-0.016	-0.011	-0.005	0.000	0
0	0.000	0.005	0.011	0.016	0.022	0.027	0.033	0.038	0.044	0.050	0.055	0
10	0.055	0.061	0.067	0.072	0.078	0.084	0.090	0.095	0.101	0.107	0.113	10
20	0.113	0.119	0.125	0.131	0.137	0.143	0.149	0.155	0.161	0.167	0.173	20
30	0.173	0.179	0.185	0.191	0.197	0.204	0.210	0.216	0.222	0.229	0.235	30
40	0.235	0.241	0.248	0.254	0.260	0.267	0.273	0.280	0.286	0.292	0.299	40
50	0.299	0.305	0.312	0.319	0.325	0.332	0.338	0.345	0.352	0.358	0.365	50
60	0.365	0.372	0.378	0.385	0.392	0.399	0.405	0.412	0.419	0.426	0.433	60
70	0.433	0.440	0.446	0.453	0.460	0.467	0.474	0.481	0.488	0.495	0.502	70
80	0.502	0.509	0.516	0.523	0.530	0.538	0.545	0.552	0.559	0.566	0.573	80
90	0.573	0.580	0.588	0.595	0.602	0.609	0.617	0.624	0.631	0.639	0.646	90
100	0.646	0.653	0.661	0.668	0.675	0.683	0.690	0.698	0.705	0.713	0.720	100
110	0.720	0.727	0.735	0.743	0.750	0.758	0.765	0.773	0.780	0.788	0.795	110
120	0.795	0.803	0.811	0.818	0.826	0.834	0.841	0.849	0.857	0.865	0.872	120
130	0.872	0.880	0.888	0.896	0.903	0.911	0.919	0.927	0.935	0.942	0.950	130
140	0.950	0.958	0.966	0.974	0.982	0.990	0.998	1.006	1.013	1.021	1.029	140
150	1.029	1.037	1.045	1.053	1.061	1.069	1.077	1.085	1.094	1.102	1.110	150
160	1.110	1.118	1.126	1.134	1.142	1.150	1.158	1.167	1.175	1.183	1.191	160
170	1.191	1.199	1.207	1.216	1.224	1.232	1.240	1.249	1.257	1.265	1.273	170
180	1.273	1.282	1.290	1.298	1.307	1.315	1.323	1.332	1.340	1.348	1.357	180
190	1.357	1.365	1.373	1.382	1.390	1.399	1.407	1.415	1.424	1.432	1.441	190
200	1.441	1.449	1.458	1.466	1.475	1.483	1.492	1.500	1.509	1.517	1.526	200
210	1.526	1.534	1.543	1.551	1.560	1.569	1.577	1.586	1.594	1.603	1.612	210
220	1.612	1.620	1.629	1.638	1.646	1.655	1.663	1.672	1.681	1.690	1.698	220
230	1.698	1.707	1.716	1.724	1.733	1.742	1.751	1.759	1.768	1.777	1.786	230
240	1.786	1.794	1.803	1.812	1.821	1.829	1.838	1.847	1.856	1.865	1.874	240
250	1.874	1.882	1.891	1.900	1.909	1.918	1.927	1.936	1.944	1.953	1.962	250
260	1.962	1.971	1.980	1.989	1.998	2.007	2.016	2.025	2.034	2.043	2.052	260
270	2.052	2.061	2.070	2.078	2.087	2.096	2.105	2.114	2.123	2.132	2.141	270
280	2.141	2.151	2.160	2.169	2.178	2.187	2.196	2.205	2.214	2.223	2.232	280
290	2.232	2.241	2.250	2.259	2.268	2.277	2.287	2.296	2.305	2.314	2.323	290
300	2.323	2.332	2.341	2.350	2.360	2.369	2.378	2.387	2.396	2.405	2.415	300
310	2.415	2.424	2.433	2.442	2.451	2.461	2.470	2.479	2.488	2.497	2.507	310
320	2.507	2.516	2.525	2.534	2.544	2.553	2.562	2.571	2.581	2.590	2.599	320
330	2.599	2.609	2.618	2.627	2.636	2.646	2.655	2.664	2.674	2.683	2.692	330
340	2.692	2.702	2.711	2.720	2.730	2.739	2.748	2.758	2.767	2.776	2.786	340
350	2.786	2.795	2.805	2.814	2.823	2.833	2.842	2.851	2.861	2.870	2.880	350
360	2.880	2.889	2.899	2.908	2.917	2.927	2.936	2.946	2.955	2.965	2.974	360
370	2.974	2.983	2.993	3.002	3.012	3.021	3.031	3.040	3.050	3.059	3.069	370
380	3.069	3.078	3.088	3.097	3.107	3.116	3.126	3.135	3.145	3.154	3.164	380
390	3.164	3.173	3.183	3.192	3.202	3.212	3.221	3.231	3.240	3.250	3.259	390
400	3.259	3.269	3.279	3.288	3.298	3.307	3.317	3.326	3.336	3.346	3.355	400
410	3.355	3.365	3.374	3.384	3.394	3.403	3.413	3.423	3.432	3.442	3.451	410
420	3.451	3.461	3.471	3.480	3.490	3.500	3.509	3.519	3.529	3.538	3.548	420
430	3.548	3.558	3.567	3.577	3.587	3.596	3.606	3.616	3.626	3.635	3.645	430
440	3.645	3.655	3.664	3.674	3.684	3.694	3.703	3.713	3.723	3.732	3.742	440
450	3.742	3.752	3.762	3.771	3.781	3.791	3.801	3.810	3.820	3.830	3.840	450
460	3.840	3.850	3.859	3.869	3.879	3.889	3.898	3.908	3.918	3.928	3.938	460
470	3.938	3.947	3.957	3.967	3.977	3.987	3.997	4.006	4.016	4.026	4.036	470
480	4.036	4.046	4.056	4.065	4.075	4.085	4.095	4.105	4.115	4.125	4.134	480
490	4.134	4.144	4.154	4.164	4.174	4.184	4.194	4.204	4.213	4.223	4.233	490
500	4.233	4.243	4.253	4.263	4.273	4.283	4.293	4.303	4.313	4.323	4.332	500
510	4.332	4.342	4.352	4.362	4.372	4.382	4.392	4.402	4.412	4.422	4.432	510
520	4.432	4.442	4.452	4.462	4.472	4.482	4.492	4.502	4.512	4.522	4.532	520
530	4.532	4.542	4.552	4.562	4.572	4.582	4.592	4.602	4.612	4.622	4.632	530
540	4.632	4.642	4.652	4.662	4.672	4.682	4.692	4.702	4.712	4.722	4.732	540
550	4.732	4.742	4.752	4.762	4.772	4.782	4.793	4.803	4.813	4.823	4.833	550
560	4.833	4.843	4.853	4.863	4.873	4.883	4.893	4.904	4.914	4.924	4.934	560
570	4.934	4.944	4.954	4.964	4.974	4.984	4.995	5.005	5.015	5.025	5.035	570
580	5.035	5.045	5.055	5.066	5.076	5.086	5.096	5.106	5.116	5.127	5.137	580
590	5.137	5.147	5.157	5.167	5.178	5.188	5.198	5.208	5.218	5.228	5.239	590
600	5.239	5.249	5.259	5.269	5.280	5.290	5.300	5.310	5.320	5.331	5.341	600
610	5.341	5.351	5.361	5.372	5.382	5.392	5.402	5.413	5.423	5.433	5.443	610
620	5.443	5.454	5.464	5.474	5.485	5.495	5.505	5.515	5.526	5.536	5.546	620
630	5.546	5.557	5.567	5.577	5.588	5.598	5.608	5.618	5.629	5.639	5.649	630
640	5.649	5.660	5.670	5.680	5.691	5.701	5.712	5.722	5.732	5.743	5.753	640
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Thermoelectric Voltage in Millivolts

°C	0	1	2	3	4	5	6	7	8	9	10	°C
650	5.753	5.763	5.774	5.784	5.794	5.805	5.815	5.826	5.836	5.846	5.857	650
660	5.857	5.867	5.878	5.888	5.898	5.909	5.919	5.930	5.940	5.950	5.961	660
670	5.961	5.971	5.982	5.992	6.003	6.013	6.024	6.034	6.044	6.055	6.065	670
680	6.065	6.076	6.086	6.097	6.107	6.118	6.128	6.139	6.149	6.160	6.170	680
690	6.170	6.181	6.191	6.202	6.212	6.223	6.233	6.244	6.254	6.265	6.275	690
700	6.275	6.286	6.296	6.307	6.317	6.328	6.338	6.349	6.360	6.370	6.381	700
710	6.381	6.391	6.402	6.412	6.423	6.434	6.444	6.455	6.465	6.476	6.486	710
720	6.486	6.497	6.508	6.518	6.529	6.539	6.550	6.561	6.571	6.582	6.593	720
730	6.593	6.603	6.614	6.624	6.635	6.646	6.656	6.667	6.678	6.688	6.699	730
740	6.699	6.710	6.720	6.731	6.742	6.752	6.763	6.774	6.784	6.795	6.806	740
750	6.806	6.817	6.827	6.838	6.849	6.859	6.870	6.881	6.892	6.902	6.913	750
760	6.913	6.924	6.934	6.945	6.956	6.967	6.977	6.988	6.999	7.010	7.020	760
770	7.020	7.031	7.042	7.053	7.064	7.074	7.085	7.096	7.107	7.117	7.128	770
780	7.128	7.139	7.150	7.161	7.172	7.182	7.193	7.204	7.215	7.226	7.236	780
790	7.236	7.247	7.258	7.269	7.280	7.291	7.302	7.312	7.323	7.334	7.345	790
800	7.345	7.356	7.367	7.378	7.388	7.399	7.410	7.421	7.432	7.443	7.454	800
810	7.454	7.465	7.476	7.487	7.497	7.508	7.519	7.530	7.541	7.552	7.563	810
820	7.563	7.574	7.585	7.596	7.607	7.618	7.629	7.640	7.651	7.662	7.673	820
830	7.673	7.684	7.695	7.706	7.717	7.728	7.739	7.750	7.761	7.772	7.783	830
840	7.783	7.794	7.805	7.816	7.827	7.838	7.849	7.860	7.871	7.882	7.893	840
850	7.893	7.904	7.915	7.926	7.937	7.948	7.959	7.970	7.981	7.992	8.003	850
860	8.003	8.014	8.026	8.037	8.048	8.059	8.070	8.081	8.092	8.103	8.114	860
870	8.114	8.125	8.137	8.148	8.159	8.170	8.181	8.192	8.203	8.214	8.226	870
880	8.226	8.237	8.248	8.259	8.270	8.281	8.293	8.304	8.315	8.326	8.337	880
890	8.337	8.348	8.360	8.371	8.382	8.393	8.404	8.416	8.427	8.438	8.449	890
900	8.449	8.460	8.472	8.483	8.494	8.505	8.517	8.528	8.539	8.550	8.562	900
910	8.562	8.573	8.584	8.595	8.607	8.618	8.629	8.640	8.652	8.663	8.674	910
920	8.674	8.685	8.697	8.708	8.719	8.731	8.742	8.753	8.765	8.776	8.787	920
930	8.787	8.798	8.810	8.821	8.832	8.844	8.855	8.866	8.878	8.889	8.900	930
940	8.900	8.912	8.923	8.935	8.946	8.957	8.969	8.980	8.991	9.003	9.014	940
950	9.014	9.025	9.037	9.048	9.060	9.071	9.082	9.094	9.105	9.117	9.128	950
960	9.128	9.139	9.151	9.162	9.174	9.185	9.197	9.208	9.219	9.231	9.242	960
970	9.242	9.254	9.265	9.277	9.288	9.300	9.311	9.323	9.334	9.345	9.357	970
980	9.357	9.368	9.380	9.391	9.403	9.414	9.426	9.437	9.449	9.460	9.472	980
990	9.472	9.483	9.495	9.506	9.518	9.529	9.541	9.552	9.564	9.576	9.587	990
1000	9.587	9.599	9.610	9.622	9.633	9.645	9.656	9.668	9.680	9.691	9.703	1000
1010	9.703	9.714	9.726	9.737	9.749	9.761	9.772	9.784	9.795	9.807	9.819	1010
1020	9.819	9.830	9.842	9.853	9.865	9.877	9.888	9.900	9.911	9.923	9.935	1020
1030	9.935	9.946	9.958	9.970	9.981	9.993	10.005	10.016	10.028	10.040	10.051	1030
1040	10.051	10.063	10.075	10.086	10.098	10.110	10.121	10.133	10.145	10.156	10.168	1040
1050	10.168	10.180	10.191	10.203	10.215	10.227	10.238	10.250	10.262	10.273	10.285	1050
1060	10.285	10.297	10.309	10.320	10.332	10.344	10.356	10.367	10.379	10.391	10.403	1060
1070	10.403	10.414	10.426	10.438	10.450	10.461	10.473	10.485	10.497	10.509	10.520	1070
1080	10.520	10.532	10.544	10.556	10.567	10.579	10.591	10.603	10.615	10.626	10.638	1080
1090	10.638	10.650	10.662	10.674	10.686	10.697	10.709	10.721	10.733	10.745	10.757	1090
1100	10.757	10.768	10.780	10.792	10.804	10.816	10.828	10.839	10.851	10.863	10.875	1100
1110	10.875	10.887	10.899	10.911	10.922	10.934	10.946	10.958	10.970	10.982	10.994	1110
1120	10.994	11.006	11.017	11.029	11.041	11.053	11.065	11.077	11.089	11.101	11.113	1120
1130	11.113	11.125	11.136	11.148	11.160	11.172	11.184	11.196	11.208	11.220	11.232	1130
1140	11.232	11.244	11.256	11.268	11.280	11.291	11.303	11.315	11.327	11.339	11.351	1140
1150	11.351	11.363	11.375	11.387	11.399	11.411	11.423	11.435	11.447	11.459	11.471	1150
1160	11.471	11.483	11.495	11.507	11.519	11.531	11.542	11.554	11.566	11.578	11.590	1160
1170	11.590	11.602	11.614	11.626	11.638	11.650	11.662	11.674	11.686	11.698	11.710	1170
1180	11.710	11.722	11.734	11.746	11.758	11.770	11.782	11.794	11.806	11.818	11.830	1180
1190	11.830	11.842	11.854	11.866	11.878	11.890	11.902	11.914	11.926	11.939	11.951	1190
1200	11.951	11.963	11.975	11.987	11.999	12.011	12.023	12.035	12.047	12.059	12.071	1200
1210	12.071	12.083	12.095	12.107	12.119	12.131	12.143	12.155	12.167	12.179	12.191	1210
1220	12.191	12.203	12.216	12.228	12.240	12.252	12.264	12.276	12.288	12.300	12.312	1220
1230	12.312	12.324	12.336	12.348	12.360	12.372	12.384	12.397	12.409	12.421	12.433	1230
1240	12.433	12.445	12.457	12.469	12.481	12.493	12.505	12.517	12.529	12.542	12.554	1240
1250	12.554	12.566	12.578	12.590	12.602	12.614	12.626	12.638	12.650	12.662	12.675	1250
1260	12.675	12.687	12.699	12.711	12.723	12.735	12.747	12.759	12.771	12.783	12.796	1260
1270	12.796	12.808	12.820	12.832	12.844	12.856	12.868	12.880	12.892	12.905	12.917	1270
1280	12.917	12.929	12.941	12.953	12.965	12.977	12.989	13.001	13.014	13.026	13.038	1280
1290	13.038	13.050	13.062	13.074	13.086	13.098	13.111	13.123	13.135	13.147	13.159	1290
1300	13.159	13.171	13.183	13.195	13.208	13.220	13.232	13.244	13.256	13.268	13.280	1300
1310	13.280	13.292	13.305	13.317	13.329	13.341	13.353	13.365	13.377	13.390	13.402	1310
1320	13.402	13.414	13.426	13.438	13.450	13.462	13.474	13.487	13.499	13.511	13.523	1320
1330	13.523	13.535	13.547	13.559	13.572	13.584	13.596	13.608	13.620	13.632	13.644	1330
1340	13.644	13.657	13.669	13.681	13.693	13.705	13.717	13.729	13.742	13.754	13.766	1340
°C	0	1	2	3	4	5	6	7	8	9	10	°C

GRADE:

PLATINUM-10% RHODIUM VS. PLATINUM

TEMPERATURE IN DEGREES °C
REFERENCE JUNCTION AT 0°C

Type "S" Thermocouple Reference Tables °C

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

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
32	to	1382°F	32	to	392°F
0	to	750°C	0	to	200°C

LIMITS OF ERROR
(Whichever is Greater)

Standard:			Special:		
2.2°C	or	0.75%	1.1°C	or	0.4%

Thermoelectric Voltage in Millivolts

°C	0	1	2	3	4	5	6	7	8	9	10	°C
1350	13.766	13.778	13.790	13.802	13.814	13.826	13.839	13.851	13.863	13.875	13.887	1350
1360	13.887	13.899	13.911	13.924	13.936	13.948	13.960	13.972	13.984	13.996	14.009	1360
1370	14.009	14.021	14.033	14.045	14.057	14.069	14.081	14.094	14.106	14.118	14.130	1370
1380	14.130	14.142	14.154	14.166	14.178	14.191	14.203	14.215	14.227	14.239	14.251	1380
1390	14.251	14.263	14.276	14.288	14.300	14.312	14.324	14.336	14.348	14.360	14.373	1390
1400	14.373	14.385	14.397	14.409	14.421	14.433	14.445	14.457	14.470	14.482	14.494	1400
1410	14.494	14.506	14.518	14.530	14.542	14.554	14.567	14.579	14.591	14.603	14.615	1410
1420	14.615	14.627	14.639	14.651	14.664	14.676	14.688	14.700	14.712	14.724	14.736	1420
1430	14.736	14.748	14.760	14.773	14.785	14.797	14.809	14.821	14.833	14.845	14.857	1430
1440	14.857	14.869	14.881	14.894	14.906	14.918	14.930	14.942	14.954	14.966	14.978	1440
1450	14.978	14.990	15.002	15.015	15.027	15.039	15.051	15.063	15.075	15.087	15.099	1450
1460	15.099	15.111	15.123	15.135	15.148	15.160	15.172	15.184	15.196	15.208	15.220	1460
1470	15.220	15.232	15.244	15.256	15.268	15.280	15.292	15.304	15.317	15.329	15.341	1470
1480	15.341	15.353	15.365	15.377	15.389	15.401	15.413	15.425	15.437	15.449	15.461	1480
1490	15.461	15.473	15.485	15.497	15.509	15.521	15.534	15.546	15.558	15.570	15.582	1490
1500	15.582	15.594	15.606	15.618	15.630	15.642	15.654	15.666	15.678	15.690	15.702	1500
1510	15.702	15.714	15.726	15.738	15.750	15.762	15.774	15.786	15.798	15.810	15.822	1510
1520	15.822	15.834	15.846	15.858	15.870	15.882	15.894	15.906	15.918	15.930	15.942	1520
1530	15.942	15.954	15.966	15.978	15.990	16.002	16.014	16.026	16.038	16.050	16.062	1530
1540	16.062	16.074	16.086	16.098	16.110	16.122	16.134	16.146	16.158	16.170	16.182	1540
1550	16.182	16.194	16.205	16.217	16.229	16.241	16.253	16.265	16.277	16.289	16.301	1550
1560	16.301	16.313	16.325	16.337	16.349	16.361	16.373	16.385	16.396	16.408	16.420	1560
1570	16.420	16.432	16.444	16.456	16.468	16.480	16.492	16.504	16.516	16.527	16.539	1570
1580	16.539	16.551	16.563	16.575	16.587	16.599	16.611	16.623	16.634	16.646	16.658	1580
1590	16.658	16.670	16.682	16.694	16.706	16.718	16.729	16.741	16.753	16.765	16.777	1590
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Thermoelectric Voltage in Millivolts

°C	0	1	2	3	4	5	6	7	8	9	10	°C
1600	16.777	16.789	16.801	16.812	16.824	16.836	16.848	16.860	16.872	16.883	16.895	1600
1610	16.895	16.907	16.919	16.931	16.943	16.954	16.966	16.978	16.990	17.002	17.013	1610
1620	17.013	17.025	17.037	17.049	17.061	17.072	17.084	17.096	17.108	17.120	17.131	1620
1630	17.131	17.143	17.155	17.167	17.178	17.190	17.202	17.214	17.225	17.237	17.249	1630
1640	17.249	17.261	17.272	17.284	17.296	17.308	17.319	17.331	17.343	17.355	17.366	1640
1650	17.366	17.378	17.390	17.401	17.413	17.425	17.437	17.448	17.460	17.472	17.483	1650
1660	17.483	17.495	17.507	17.518	17.530	17.542	17.553	17.565	17.577	17.588	17.600	1660
1670	17.600	17.612	17.623	17.635	17.647	17.658	17.670	17.682	17.693	17.705	17.717	1670
1680	17.717	17.728	17.740	17.751	17.763	17.775	17.786	17.798	17.809	17.821	17.832	1680
1690	17.832	17.844	17.855	17.867	17.878	17.890	17.901	17.913	17.924	17.936	17.947	1690
1700	17.947	17.959	17.970	17.982	17.993	18.004	18.016	18.027	18.039	18.050	18.061	1700
1710	18.061	18.073	18.084	18.095	18.107	18.118	18.129	18.140	18.152	18.163	18.174	1710
1720	18.174	18.185	18.196	18.208	18.219	18.230	18.241	18.252	18.263	18.274	18.285	1720
1730	18.285	18.297	18.308	18.319	18.330	18.341	18.352	18.362	18.373	18.384	18.395	1730
1740	18.395	18.406	18.417	18.428	18.439	18.449	18.460	18.471	18.482	18.493	18.503	1740
1750	18.503	18.514	18.525	18.535	18.546	18.557	18.567	18.578	18.588	18.599	18.609	1750
1760	18.609	18.620	18.630	18.641	18.651	18.661	18.672	18.682	18.693			1760
°C	0	1	2	3	4	5	6	7	8	9	10	°C

TYPE "S" THERMOCOUPLE REFERENCE TABLES °F

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

GRADE:

PLATINUM-10% RHODIUM VS. PLATINUM

TEMPERATURE IN DEGREES °F
REFERENCE JUNCTION AT 32°F

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade: 32 to 2642°F / 0 to 1450°C

Extension Grade: 32 to 300°F / 0 to 150°C

LIMITS OF ERROR
(Whichever is Greater)

Standard: 1.5°C or 0.25%

Special: 0.6°C or 0.1%

Thermoelectric Voltage in Millivolts

°F	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°F
-50			-0.236	-0.233	-0.231	-0.229	-0.227	-0.224	-0.222	-0.220	-0.218	-50
-40	-0.218	-0.215	-0.213	-0.211	-0.208	-0.206	-0.204	-0.201	-0.199	-0.197	-0.194	-40
-30	-0.194	-0.192	-0.190	-0.187	-0.185	-0.182	-0.180	-0.178	-0.175	-0.173	-0.170	-30
-20	-0.170	-0.168	-0.165	-0.163	-0.160	-0.158	-0.155	-0.153	-0.150	-0.148	-0.145	-20
-10	-0.145	-0.142	-0.140	-0.137	-0.135	-0.132	-0.129	-0.127	-0.124	-0.122	-0.119	-10
0	-0.119	-0.116	-0.114	-0.111	-0.108	-0.106	-0.103	-0.100	-0.097	-0.095	-0.092	0
0	-0.092	-0.089	-0.086	-0.084	-0.081	-0.078	-0.075	-0.073	-0.070	-0.067	-0.064	0
10	-0.064	-0.061	-0.058	-0.056	-0.053	-0.050	-0.047	-0.044	-0.041	-0.038	-0.035	10
20	-0.035	-0.033	-0.030	-0.027	-0.024	-0.021	-0.018	-0.015	-0.012	-0.009	-0.006	20
30	-0.006	-0.003	0.000	0.003	0.006	0.009	0.012	0.015	0.018	0.021	0.024	30
40	0.024	0.027	0.030	0.033	0.037	0.040	0.043	0.046	0.049	0.052	0.055	40
50	0.055	0.058	0.062	0.065	0.068	0.071	0.074	0.077	0.081	0.084	0.087	50
60	0.087	0.090	0.093	0.097	0.100	0.103	0.106	0.110	0.113	0.116	0.119	60
70	0.119	0.123	0.126	0.129	0.133	0.136	0.139	0.143	0.146	0.149	0.153	70
80	0.153	0.156	0.159	0.163	0.166	0.169	0.173	0.176	0.180	0.183	0.186	80
90	0.186	0.190	0.193	0.197	0.200	0.204	0.207	0.210	0.214	0.217	0.221	90
100	0.221	0.224	0.228	0.231	0.235	0.238	0.242	0.245	0.249	0.252	0.256	100
110	0.256	0.260	0.263	0.267	0.270	0.274	0.277	0.281	0.285	0.288	0.292	110
120	0.292	0.295	0.299	0.303	0.306	0.310	0.313	0.317	0.321	0.324	0.328	120
130	0.328	0.332	0.335	0.339	0.343	0.346	0.350	0.354	0.357	0.361	0.365	130
140	0.365	0.369	0.372	0.376	0.380	0.384	0.387	0.391	0.395	0.399	0.402	140
150	0.402	0.406	0.410	0.414	0.417	0.421	0.425	0.429	0.433	0.436	0.440	150
160	0.440	0.444	0.448	0.452	0.456	0.459	0.463	0.467	0.471	0.475	0.479	160
170	0.479	0.483	0.487	0.490	0.494	0.498	0.502	0.506	0.510	0.514	0.518	170
180	0.518	0.522	0.526	0.530	0.534	0.538	0.541	0.545	0.549	0.553	0.557	180
190	0.557	0.561	0.565	0.569	0.573	0.577	0.581	0.585	0.589	0.593	0.597	190
200	0.597	0.601	0.605	0.609	0.613	0.617	0.622	0.626	0.630	0.634	0.638	200
210	0.638	0.642	0.646	0.650	0.654	0.658	0.662	0.666	0.670	0.675	0.679	210
220	0.679	0.683	0.687	0.691	0.695	0.699	0.703	0.708	0.712	0.716	0.720	220
230	0.720	0.724	0.728	0.732	0.737	0.741	0.745	0.749	0.753	0.758	0.762	230
240	0.762	0.766	0.770	0.774	0.779	0.783	0.787	0.791	0.795	0.800	0.804	240
250	0.804	0.808	0.812	0.817	0.821	0.825	0.829	0.834	0.838	0.842	0.847	250
260	0.847	0.851	0.855	0.859	0.864	0.868	0.872	0.877	0.881	0.885	0.889	260
270	0.889	0.894	0.898	0.902	0.907	0.911	0.915	0.920	0.924	0.928	0.933	270
280	0.933	0.937	0.942	0.946	0.950	0.955	0.959	0.963	0.968	0.972	0.977	280
290	0.977	0.981	0.985	0.990	0.994	0.998	1.003	1.007	1.012	1.016	1.021	290
300	1.021	1.025	1.029	1.034	1.038	1.043	1.047	1.052	1.056	1.061	1.065	300
310	1.065	1.069	1.074	1.078	1.083	1.087	1.092	1.096	1.101	1.105	1.110	310
320	1.110	1.114	1.119	1.123	1.128	1.132	1.137	1.141	1.146	1.150	1.155	320
330	1.155	1.159	1.164	1.168	1.173	1.177	1.182	1.186	1.191	1.196	1.200	330
340	1.200	1.205	1.209	1.214	1.218	1.223	1.227	1.232	1.237	1.241	1.246	340
350	1.246	1.250	1.255	1.260	1.264	1.269	1.273	1.278	1.283	1.287	1.292	350
360	1.292	1.296	1.301	1.306	1.310	1.315	1.319	1.324	1.329	1.333	1.338	360
370	1.338	1.343	1.347	1.352	1.357	1.361	1.366	1.371	1.375	1.380	1.385	370
380	1.385	1.389	1.394	1.399	1.403	1.408	1.413	1.417	1.422	1.427	1.431	380
390	1.431	1.436	1.441	1.445	1.450	1.455	1.460	1.464	1.469	1.474	1.478	390
400	1.478	1.483	1.488	1.493	1.497	1.502	1.507	1.512	1.516	1.521	1.526	400
410	1.526	1.531	1.535	1.540	1.545	1.550	1.554	1.559	1.564	1.569	1.573	410
420	1.573	1.578	1.583	1.588	1.592	1.597	1.602	1.607	1.612	1.616	1.621	420
430	1.621	1.626	1.631	1.636	1.640	1.645	1.650	1.655	1.660	1.664	1.669	430
440	1.669	1.674	1.679	1.684	1.689	1.693	1.698	1.703	1.708	1.713	1.718	440
450	1.718	1.722	1.727	1.732	1.737	1.742	1.747	1.752	1.756	1.761	1.766	450
460	1.766	1.771	1.776	1.781	1.786	1.790	1.795	1.800	1.805	1.810	1.815	460
470	1.815	1.820	1.825	1.829	1.834	1.839	1.844	1.849	1.854	1.859	1.864	470
480	1.864	1.869	1.874	1.878	1.883	1.888	1.893	1.898	1.903	1.908	1.913	480
490	1.913	1.918	1.923	1.928	1.933	1.938	1.942	1.947	1.952	1.957	1.962	490
500	1.962	1.967	1.972	1.977	1.982	1.987	1.992	1.997	2.002	2.007	2.012	500
510	2.012	2.017	2.022	2.027	2.032	2.037	2.042	2.047	2.052	2.057	2.062	510
520	2.062	2.067	2.072	2.076	2.081	2.086	2.091	2.096	2.101	2.106	2.111	520
530	2.111	2.116	2.121	2.126	2.131	2.136	2.141	2.147	2.152	2.157	2.162	530
540	2.162	2.167	2.172	2.177	2.182	2.187	2.192	2.197	2.202	2.207	2.212	540
550	2.212	2.217	2.222	2.227	2.232	2.237	2.242	2.247	2.252	2.257	2.262	550
560	2.262	2.267	2.272	2.277	2.283	2.288	2.293	2.298	2.303	2.308	2.313	560
570	2.313	2.318	2.323	2.328	2.333	2.338	2.343	2.348	2.354	2.359	2.364	570
580	2.364	2.369	2.374	2.379	2.384	2.389	2.394	2.399	2.404	2.410	2.415	580
590	2.415	2.420	2.425	2.430	2.435	2.440	2.445	2.450	2.455	2.461	2.466	590
°F	0	1	2	3	4	5	6	7	8	9	10	°F

Thermoelectric Voltage in Millivolts

°F	0	1	2	3	4	5	6	7	8	9	10	°F
600	2.466	2.471	2.476	2.481	2.486	2.491	2.496	2.502	2.507	2.512	2.517	600
610	2.517	2.522	2.527	2.532	2.537	2.543	2.548	2.553	2.558	2.563	2.568	610
620	2.568	2.574	2.579	2.584	2.589	2.594	2.599	2.604	2.610	2.615	2.620	620
630	2.620	2.625	2.630	2.635	2.641	2.646	2.651	2.656	2.661	2.666	2.672	630
640	2.672	2.677	2.682	2.687	2.692	2.697	2.703	2.708	2.713	2.718	2.723	640
650	2.723	2.729	2.734	2.739	2.744	2.749	2.755	2.760	2.765	2.770	2.775	650
660	2.775	2.781	2.786	2.791	2.796	2.801	2.807	2.812	2.817	2.822	2.827	660
670	2.827	2.833	2.838	2.843	2.848	2.854	2.859	2.864	2.869	2.874	2.880	670
680	2.880	2.885	2.890	2.895	2.901	2.906	2.911	2.916	2.922	2.927	2.932	680
690	2.932	2.937	2.943	2.948	2.953	2.958	2.964	2.969	2.974	2.979	2.985	690
700	2.985	2.990	2.995	3.000	3.006	3.011	3.016	3.021	3.027	3.032	3.037	700
710	3.037	3.042	3.048	3.053	3.058	3.063	3.069	3.074	3.079	3.085	3.090	710
720	3.090	3.095	3.100	3.106	3.111	3.116	3.122	3.127	3.132	3.137	3.143	720
730	3.143	3.148	3.153	3.159	3.164	3.169	3.174	3.180	3.185	3.190	3.196	730
740	3.196	3.201	3.206	3.212	3.217	3.222	3.227	3.233	3.238	3.243	3.249	740
750	3.249	3.254	3.259	3.265	3.270	3.275	3.281	3.286	3.291	3.297	3.302	750
760	3.302	3.307	3.313	3.318	3.323	3.329	3.334	3.339	3.345	3.350	3.355	760
770	3.355	3.361	3.366	3.371	3.377	3.382	3.387	3.393	3.398	3.403	3.409	770
780	3.409	3.414	3.419	3.425	3.430	3.435	3.441	3.446	3.451	3.457	3.462	780
790	3.462	3.468	3.473	3.478	3.484	3.489	3.494	3.500	3.505	3.510	3.516	790
800	3.516	3.521	3.527	3.532	3.537	3.543	3.548	3.553	3.559	3.564	3.570	800
810	3.570	3.575	3.580	3.586	3.591	3.596	3.602	3.607	3.613	3.618	3.623	810
820	3.623	3.629	3.634	3.640	3.645	3.650	3.656	3.661	3.667	3.672	3.677	820
830	3.677	3.683	3.688	3.694	3.699	3.704	3.710	3.715	3.721	3.726	3.731	830
840	3.731	3.737	3.742	3.748	3.753	3.758	3.764	3.769	3.775	3.780	3.786	840
850	3.786	3.791	3.796	3.802	3.807	3.813	3.818	3.823	3.829	3.834	3.840	850
860	3.840	3.845	3.851	3.856	3.862	3.867	3.872	3.878	3.883	3.889	3.894	860
870	3.894	3.900	3.905	3.910	3.916	3.921	3.927	3.932	3.938	3.943	3.949	870
880	3.949	3.954	3.959	3.965	3.970	3.976	3.981	3.987	3.992	3.998	4.003	880
890	4.003	4.009	4.014	4.020	4.025	4.030	4.036	4.041	4.047	4.052	4.058	890
900	4.058	4.063	4.069	4.074	4.080	4.085	4.091	4.096	4.102	4.107	4.113	900
910	4.113	4.118	4.123	4.129	4.134	4.140	4.145	4.151	4.156	4.162	4.167	910
920	4.167	4.173	4.178	4.184	4.189	4.195	4.200	4.206	4.211	4.217	4.222	920
930	4.222	4.228	4.233	4.239	4.244	4.250	4.255	4.261	4.266	4.272	4.277	930
940	4.277	4.283	4.288	4.294	4.299	4.305	4.310	4.316	4.321	4.327	4.332	940
950	4.332	4.338	4.343	4.349	4.355	4.360	4.366	4.371	4.377	4.382	4.388	950
960	4.388	4.393	4.399	4.404	4.410	4.415	4.421	4.426	4.432	4.437	4.443	960
970	4.443	4.449	4.454	4.460	4.465	4.471	4.476	4.482	4.487	4.493	4.498	970
980	4.498	4.504	4.510	4.515	4.521	4.526	4.532	4.537	4.543	4.548	4.554	980
990	4.554	4.559	4.565	4.571	4.576	4.582	4.587	4.593	4.598	4.604	4.610	990
1000	4.610	4.615	4.621	4.626	4.632	4.637	4.643	4.648	4.654	4.660	4.665	1000
1010	4.665	4.671	4.676	4.682	4.688	4.693	4.699	4.704	4.710	4.715	4.721	1010
1020	4.721	4.727	4.732	4.738	4.743	4.749	4.755	4.760	4.766	4.771	4.777	1020
1030	4.777	4.782	4.788	4.794	4.799	4.805	4.810	4.816	4.822	4.827	4.833	1030
1040	4.833	4.838	4.844	4.850	4.855	4.861	4.866	4.872	4.878	4.883	4.889	1040
1050	4.889	4.895	4.900	4.906	4.911	4.917	4.923	4.928	4.934	4.939	4.945	1050
1060	4.945	4.951	4.956	4.962	4.968	4.973	4.979	4.984	4.990	4.996	5.001	1060
1070	5.001	5.007	5.013	5.018	5.024	5.030	5.035	5.041	5.046	5.052	5.058	1070
1080	5.058	5.063	5.069	5.075	5.080	5.086	5.092	5.097	5.103	5.109	5.114	1080
1090	5.114	5.120	5.125	5.131	5.137	5.142	5.148	5.154	5.159	5.165	5.171	1090
1100	5.171	5.176	5.182	5.188	5.193	5.199	5.205	5.210	5.216	5.222	5.227	1100
1110	5.227	5.233	5.239	5.244	5.250	5.256	5.261	5.267	5.273	5.278	5.284	1110
1120	5.284	5.290	5.295	5.301	5.307	5.312	5.318	5.324	5.330	5.335	5.341	1120
1130	5.341	5.347	5.352	5.358	5.364	5.369	5.375	5.381	5.386	5.392	5.398	1130
1140	5.398	5.404	5.409	5.415	5.421	5.426	5.432	5.438	5.443	5.449	5.455	1140
1150	5.455	5.461	5.466	5.472	5.478	5.483	5.489	5.495	5.501	5.506	5.512	1150
1160	5.512	5.518	5.523	5.529	5.535	5.541	5.546	5.552	5.558	5.563	5.569	1160
1170	5.569	5.575	5.581	5.586	5.592	5.598	5.604	5.609	5.615	5.621	5.627	1170
1180	5.627	5.632	5.638	5.644	5.649	5.655	5.661	5.667	5.672	5.678	5.684	1180
1190	5.684	5.690	5.695	5.701	5.707	5.713	5.718	5.724	5.730	5.736	5.741	1190
1200	5.741	5.747	5.753	5.759	5.764	5.770	5.776	5.782	5.788	5.793	5.799	1200
1210	5.799	5.805	5.811	5.816	5.822	5.828	5.834	5.839	5.845	5.851	5.857	1210
1220	5.857	5.863	5.868	5.874	5.880	5.886	5.891	5.897	5.903	5.909	5.915	1220
1230	5.915	5.920	5.926	5.932	5.938	5.944	5.949	5.955	5.961	5.967	5.972	1230
1240	5.972	5.978	5.984	5.990	5.996	6.001	6.007	6.013	6.019	6.025	6.030	1240
1250	6.030	6.036	6.042	6.048	6.054	6.060	6.065	6.071	6.077	6.083	6.089	1250
1260	6.089	6.094	6.100	6.106	6.112	6.118	6.124	6.129	6.135	6.141	6.147	1260
1270	6.147	6.153	6.158	6.164	6.170	6.176	6.182	6.188	6.193	6.199	6.205	1270
1280	6.205	6.211	6.217	6.223	6.228	6.234	6.240	6.246	6.252	6.258	6.264	1280
1290	6.264	6.269	6.275	6.281	6.287	6.293	6.299	6.305	6.310	6.316	6.322	1290
°F	0	1	2	3	4	5	6	7	8	9	10	°F

GRADE:

PLATINUM - 10% RHODIUM VS. PLATINUM

TEMPERATURE IN DEGREES °F
REFERENCE JUNCTION AT 32°F

TYPE "S" THERMOCOUPLE REFERENCE TABLES °F

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

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
32	to	2642°F	32	to	300°F
0	to	1450°C	0	to	150°C

LIMITS OF ERROR
(Whichever is Greater)

Standard:			Special:		
1.5°C	or	0.25%	0.6°C	or	0.1%

Thermoelectric Voltage in Millivolts

°F	0	1	2	3	4	5	6	7	8	9	10	°F
1300	6.322	6.328	6.334	6.340	6.346	6.351	6.357	6.363	6.369	6.375	6.381	1300
1310	6.381	6.387	6.392	6.398	6.404	6.410	6.416	6.422	6.428	6.434	6.439	1310
1320	6.439	6.445	6.451	6.457	6.463	6.469	6.475	6.481	6.486	6.492	6.498	1320
1330	6.498	6.504	6.510	6.516	6.522	6.528	6.534	6.539	6.545	6.551	6.557	1330
1340	6.557	6.563	6.569	6.575	6.581	6.587	6.593	6.598	6.604	6.610	6.616	1340
1350	6.616	6.622	6.628	6.634	6.640	6.646	6.652	6.658	6.664	6.669	6.675	1350
1360	6.675	6.681	6.687	6.693	6.699	6.705	6.711	6.717	6.723	6.729	6.735	1360
1370	6.735	6.741	6.746	6.752	6.758	6.764	6.770	6.776	6.782	6.788	6.794	1370
1380	6.794	6.800	6.806	6.812	6.818	6.824	6.830	6.836	6.842	6.847	6.853	1380
1390	6.853	6.859	6.865	6.871	6.877	6.883	6.889	6.895	6.901	6.907	6.913	1390
1400	6.913	6.919	6.925	6.931	6.937	6.943	6.949	6.955	6.961	6.967	6.973	1400
1410	6.973	6.979	6.985	6.991	6.997	7.003	7.008	7.014	7.020	7.026	7.032	1410
1420	7.032	7.038	7.044	7.050	7.056	7.062	7.068	7.074	7.080	7.086	7.092	1420
1430	7.092	7.098	7.104	7.110	7.116	7.122	7.128	7.134	7.140	7.146	7.152	1430
1440	7.152	7.158	7.164	7.170	7.176	7.182	7.188	7.194	7.200	7.206	7.212	1440
1450	7.212	7.218	7.224	7.230	7.236	7.242	7.249	7.255	7.261	7.267	7.273	1450
1460	7.273	7.279	7.285	7.291	7.297	7.303	7.309	7.315	7.321	7.327	7.333	1460
1470	7.333	7.339	7.345	7.351	7.357	7.363	7.369	7.375	7.381	7.387	7.393	1470
1480	7.393	7.399	7.405	7.411	7.418	7.424	7.430	7.436	7.442	7.448	7.454	1480
1490	7.454	7.460	7.466	7.472	7.478	7.484	7.490	7.496	7.502	7.508	7.514	1490
1500	7.514	7.521	7.527	7.533	7.539	7.545	7.551	7.557	7.563	7.569	7.575	1500
1510	7.575	7.581	7.587	7.593	7.600	7.606	7.612	7.618	7.624	7.630	7.636	1510
1520	7.636	7.642	7.648	7.654	7.660	7.667	7.673	7.679	7.685	7.691	7.697	1520
1530	7.697	7.703	7.709	7.715	7.721	7.728	7.734	7.740	7.746	7.752	7.758	1530
1540	7.758	7.764	7.770	7.776	7.783	7.789	7.795	7.801	7.807	7.813	7.819	1540
1550	7.819	7.825	7.832	7.838	7.844	7.850	7.856	7.862	7.868	7.874	7.881	1550
1560	7.881	7.887	7.893	7.899	7.905	7.911	7.917	7.923	7.930	7.936	7.942	1560
1570	7.942	7.948	7.954	7.960	7.966	7.973	7.979	7.985	7.991	7.997	8.003	1570
1580	8.003	8.010	8.016	8.022	8.028	8.034	8.040	8.047	8.053	8.059	8.065	1580
1590	8.065	8.071	8.077	8.083	8.090	8.096	8.102	8.108	8.114	8.121	8.127	1590
1600	8.127	8.133	8.139	8.145	8.151	8.158	8.164	8.170	8.176	8.182	8.189	1600
1610	8.189	8.195	8.201	8.207	8.213	8.219	8.226	8.232	8.238	8.244	8.250	1610
1620	8.250	8.257	8.263	8.269	8.275	8.281	8.288	8.294	8.300	8.306	8.312	1620
1630	8.312	8.319	8.325	8.331	8.337	8.343	8.350	8.356	8.362	8.368	8.375	1630
1640	8.375	8.381	8.387	8.393	8.399	8.406	8.412	8.418	8.424	8.431	8.437	1640
1650	8.437	8.443	8.449	8.455	8.462	8.468	8.474	8.480	8.487	8.493	8.499	1650
1660	8.499	8.505	8.512	8.518	8.524	8.530	8.537	8.543	8.549	8.555	8.562	1660
1670	8.562	8.568	8.574	8.580	8.587	8.593	8.599	8.605	8.612	8.618	8.624	1670
1680	8.624	8.630	8.637	8.643	8.649	8.655	8.662	8.668	8.674	8.680	8.687	1680
1690	8.687	8.693	8.699	8.706	8.712	8.718	8.724	8.731	8.737	8.743	8.749	1690
1700	8.749	8.756	8.762	8.768	8.775	8.781	8.787	8.793	8.800	8.806	8.812	1700
1710	8.812	8.819	8.825	8.831	8.837	8.844	8.850	8.856	8.863	8.869	8.875	1710
1720	8.875	8.882	8.888	8.894	8.900	8.907	8.913	8.919	8.926	8.932	8.938	1720
1730	8.938	8.945	8.951	8.957	8.964	8.970	8.976	8.983	8.989	8.995	9.001	1730
1740	9.001	9.008	9.014	9.020	9.027	9.033	9.039	9.046	9.052	9.058	9.065	1740
1750	9.065	9.071	9.077	9.084	9.090	9.096	9.103	9.109	9.115	9.122	9.128	1750
1760	9.128	9.134	9.141	9.147	9.153	9.160	9.166	9.172	9.179	9.185	9.192	1760
1770	9.192	9.198	9.204	9.211	9.217	9.223	9.230	9.236	9.242	9.249	9.255	1770
1780	9.255	9.261	9.268	9.274	9.281	9.287	9.293	9.300	9.306	9.312	9.319	1780
1790	9.319	9.325	9.331	9.338	9.344	9.351	9.357	9.363	9.370	9.376	9.382	1790
1800	9.382	9.389	9.395	9.402	9.408	9.414	9.421	9.427	9.434	9.440	9.446	1800
1810	9.446	9.453	9.459	9.465	9.472	9.478	9.485	9.491	9.497	9.504	9.510	1810
1820	9.510	9.517	9.523	9.529	9.536	9.542	9.549	9.555	9.561	9.568	9.574	1820
1830	9.574	9.581	9.587	9.594	9.600	9.606	9.613	9.619	9.626	9.632	9.638	1830
1840	9.638	9.645	9.651	9.658	9.664	9.671	9.677	9.683	9.690	9.696	9.703	1840
1850	9.703	9.709	9.716	9.722	9.728	9.735	9.741	9.748	9.754	9.761	9.767	1850
1860	9.767	9.773	9.780	9.786	9.793	9.799	9.806	9.812	9.819	9.825	9.831	1860
1870	9.831	9.838	9.844	9.851	9.857	9.864	9.870	9.877	9.883	9.889	9.896	1870
1880	9.896	9.902	9.909	9.915	9.922	9.928	9.935	9.941	9.948	9.954	9.961	1880
1890	9.961	9.967	9.973	9.980	9.986	9.993	9.999	10.006	10.012	10.019	10.025	1890
1900	10.025	10.032	10.038	10.045	10.051	10.058	10.064	10.071	10.077	10.084	10.090	1900
1910	10.090	10.097	10.103	10.110	10.116	10.123	10.129	10.136	10.142	10.149	10.155	1910
1920	10.155	10.162	10.168	10.175	10.181	10.188	10.194	10.201	10.207	10.214	10.220	1920
1930	10.220	10.227	10.233	10.240	10.246	10.253	10.259	10.266	10.272	10.279	10.285	1930
1940	10.285	10.292	10.298	10.305	10.311	10.318	10.324	10.331	10.337	10.344	10.350	1940
1950	10.350	10.357	10.363	10.370	10.376	10.383	10.390	10.396	10.403	10.409	10.416	1950
1960	10.416	10.422	10.429	10.435	10.442	10.448	10.455	10.461	10.468	10.475	10.481	1960
1970	10.481	10.488	10.494	10.501	10.507	10.514	10.520	10.527	10.533	10.540	10.547	1970
1980	10.547	10.553	10.560	10.566	10.573	10.579	10.586	10.592	10.599	10.606	10.612	1980
1990	10.612	10.619	10.625	10.632	10.638	10.645	10.651	10.658	10.665	10.671	10.678	1990
°F	0	1	2	3	4	5	6	7	8	9	10	°F

Thermoelectric Voltage in Millivolts

°F	0	1	2	3	4	5	6	7	8	9	10	°F
2000	10.678	10.684	10.691	10.697	10.704	10.711	10.717	10.724	10.730	10.737	10.743	2000
2010	10.743	10.750	10.757	10.763	10.770	10.776	10.783	10.789	10.796	10.803	10.809	2010
2020	10.809	10.816	10.822	10.829	10.836	10.842	10.849	10.855	10.862	10.868	10.875	2020
2030	10.875	10.882	10.888	10.895	10.901	10.908	10.915	10.921	10.928	10.934	10.941	2030
2040	10.941	10.948	10.954	10.961	10.967	10.974	10.981	10.987	10.994	11.000	11.007	2040
2050	11.007	11.014	11.020	11.027	11.033	11.040	11.047	11.053	11.060	11.066	11.073	2050
2060	11.073	11.080	11.086	11.093	11.099	11.106	11.113	11.119	11.126	11.132	11.139	2060
2070	11.139	11.146	11.152	11.159	11.166	11.172	11.179	11.185	11.192	11.199	11.205	2070
2080	11.205	11.212	11.219	11.225	11.232	11.238	11.245	11.252	11.258	11.265	11.272	2080
2090	11.272	11.278	11.285	11.291	11.298	11.305	11.311	11.318	11.325	11.331	11.338	2090
2100	11.338	11.345	11.351	11.358	11.364	11.371	11.378	11.384	11.391	11.398	11.404	2100
2110	11.404	11.411	11.418	11.424	11.431	11.437	11.444	11.451	11.457	11.464	11.471	2110
2120	11.471	11.477	11.484	11.491	11.497	11.504	11.511	11.517	11.524	11.531	11.537	2120
2130	11.537	11.544	11.550	11.557	11.564	11.570	11.577	11.584	11.590	11.597	11.604	2130
2140	11.604	11.610	11.617	11.624	11.630	11.637	11.644	11.650	11.657	11.664	11.670	2140
2150	11.670	11.677	11.684	11.690	11.697	11.704	11.710	11.717	11.724	11.730	11.737	2150
2160	11.737	11.744	11.750	11.757	11.764	11.770	11.777	11.784	11.790	11.797	11.804	2160
2170	11.804	11.810	11.817	11.824	11.830	11.837	11.844	11.850	11.857	11.864	11.870	2170
2180	11.870	11.877	11.884	11.890	11.897	11.904	11.910	11.917	11.924	11.931	11.937	2180
2190	11.937	11.944	11.951	11.957	11.964	11.971	11.977	11.984	11.991	11.997	12.004	2190
2200	12.004	12.011	12.017	12.024	12.031	12.037	12.044	12.051	12.058	12.064	12.071	2200
2210	12.071	12.078	12.084	12.091	12.098	12.104	12.111	12.118	12.124	12.131	12.138	2210
2220	12.138	12.145	12.151	12.158	12.165	12.171	12.178	12.185	12.191	12.198	12.205	2220
2230	12.205	12.211	12.218	12.225	12.232	12.238	12.245	12.252	12.258	12.265	12.272	2230
2240	12.272	12.278	12.285	12.292	12.299	12.305	12.312	12.319	12.325	12.332	12.339	2240
2250	12.339	12.346	12.352	12.359	12.366	12.372	12.379	12.386	12.392	12.399	12.406	2250
2260	12.406	12.413	12.419	12.426	12.433	12.439	12.446	12.453	12.460	12.466	12.473	2260
2270	12.473	12.480	12.486	12.493	12.500	12.507	12.513	12.520	12.527	12.533	12.540	2270
2280	12.540	12.547	12.554	12.560	12.567	12.574	12.580	12.587	12.594	12.601	12.607	2280
2290	12.607	12.614	12.621	12.627	12.634	12.641	12.648	12.654	12.661	12.668	12.675	2290
2300	12.675	12.681	12.688	12.695	12.701	12.708	12.715	12.722	12.728	12.735	12.742	2300
2310	12.742	12.748	12.755	12.762	12.769	12.775	12.782	12.789	12.796	12.802	12.809	2310
2320	12.809	12.816	12.822	12.829	12.836	12.843	12.849	12.856	12.863	12.870	12.876	2320
2330	12.876	12.883	12.890	12.896	12.903	12.910	12.917	12.923	12.930	12.937	12.944	2330
2340	12.944	12.950	12.957	12.964	12.971	12.977	12.984	12.991	12.997	13.004	13.011	2340
2350	13.011	13.018	13.024	13.031	13.038	13.045	13.051	13.058	13.065	13.072	13.078	2350
2360	13.078	13.085	13.092	13.098	13.105	13.112	13.119	13.125	13.132	13.139	13.146	2360
2370	13.146	13.152	13.159	13.166	13.173	13.179	13.186	13.193	13.199	13.206	13.213	2370
2380	13.213	13.220	13.226	13.233	13.240	13.247	13.253	13.260	13.267	13.274	13.280	2380
2390	13.280	13.287	13.294	13.301	13.307	13.314	13.321	13.328	13.334	13.341	13.348	2390
2400	13.348	13.354	13.361	13.368	13.375	13.381	13.388	13.395	13.402	13.408	13.415	2400
2410	13.415	13.422	13.429	13.435	13.442	13.449	13.456	13.462	13.469	13.476	13.483	2410
2420	13.483	13.489	13.496	13.503	13.510	13.516	13.523	13.530	13.537	13.543	13.550	2420
2430	13.550	13.557	13.563	13.570	13.577	13.584	13.590	13.597	13.604	13.611	13.617	2430
2440	13.617	13.624	13.631	13.638	13.644	13.651	13.658	13.665	13.671	13.678	13.685	2440
2450	13.685	13.692	13.698	13.705	13.712	13.719	13.725	13.732	13.739	13.746	13.752	2450
2460	13.752	13.759	13.766	13.773	13.779	13.786	13.793	13.800	13.806	13.813	13.820	2460
2470	13.820	13.826	13.833	13.840	13.847	13.853	13.860	13.867	13.874	13.880	13.887	2470
2480	13.887	13.894	13.901	13.907	13.914	13.921	13.928	13.934	13.941	13.948	13.955	2480
2490	13.955	13.961	13.968	13.975	13.982	13.988	13.995	14.002	14.009	14.015	14.022	2490
2500	14.022	14.029	14.036	14.042	14.049	14.056	14.063	14.069	14.076	14.083	14.089	2500
2510	14.089	14.096	14.103	14.110	14.116	14.123	14.130	14.137	14.143	14.150	14.157	2510
2520	14.157	14.164	14.170	14.177	14.184	14.191	14.197	14.204	14.211	14.218	14.224	2520
2530	14.224	14.231	14.238	14.245	14.251	14.258	14.265	14.272	14.278	14.285	14.292	2530
2540	14.292	14.298	14.305	14.312	14.319	14.325	14.332	14.339	14.346	14.352	14.359	2540
2550	14.359	14.366	14.373	14.379	14.386	14.393	14.400	14.406	14.413	14.420	14.426	2550
2560	14.426	14.433	14.440	14.447	14.453	14.460	14.467	14.474	14.480	14.487	14.494	2560
2570	14.494	14.501	14.507	14.514	14.521	14.528	14.534	14.541	14.548	14.554	14.561	2570
2580	14.561	14.568	14.575	14.581	14.588	14.595	14.602	14.608	14.615	14.622	14.629	2580
2590	14.629	14.635	14.642	14.649	14.655	14.662	14.669	14.676	14.682	14.689	14.696	2590
2600	14.696	14.703	14.709	14.716	14.723	14.729	14.736	14.743	14.750	14.756	14.763	2600
2610	14.763	14.770	14.777	14.783	14.790	14.797	14.803	14.810	14.817	14.824	14.830	2610
2620	14.830	14.837	14.844	14.851	14.857	14.864	14.871	14.877	14.884	14.891	14.898	2620
2630	14.898	14.904	14.911	14.918	14.925	14.931	14.938	14.945	14.951	14.958	14.965	2630
2640	14.965	14.972	14.978	14.985	14.992	14.998	15.005	15.012	15.019	15.025	15.032	2640
2650	15.032	15.039	15.045	15.052	15.059	15.066	15.072	15.079	15.086	15.092	15.099	2650
2660	15.099	15.106	15.113	15.119	15.126	15.133	15.139	15.146	15.153	15.160	15.166	2660
2670	15.166	15.173	15.180	15.186	15.193	15.200	15.207	15.213	15.220	15.227	15.233	2670
2680	15.233	15.240	15.247	15.254	15.260	15.267	15.274	15.280	15.287	15.294	15.300	2680
2690	15.300	15.307	15.314	15.321	15.327	15.334	15.341	15.347	15.354	15.361	15.367	2690
°F	0	1	2	3	4	5	6	7	8	9	10	°F

TYPE "S" THERMOCOUPLE REFERENCE TABLES °F

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

GRADE:

PLATINUM -10% RHODIUM VS. PLATINUM

TEMPERATURE IN DEGREES °F
REFERENCE JUNCTION AT 32°F

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
32	to	2642°F	32	to	300°F
0	to	1450°C	0	to	150°C

LIMITS OF ERROR
(Whichever is Greater)

Standard:			Special:		
1.5°C	or	0.25%	0.6°C	or	0.1%

Thermoelectric Voltage in Millivolts

°F	0	1	2	3	4	5	6	7	8	9	10	°F
2700	15.367	15.374	15.381	15.388	15.394	15.401	15.408	15.414	15.421	15.428	15.434	2700
2710	15.434	15.441	15.448	15.455	15.461	15.468	15.475	15.481	15.488	15.495	15.501	2710
2720	15.501	15.508	15.515	15.521	15.528	15.535	15.542	15.548	15.555	15.562	15.568	2720
2730	15.568	15.575	15.582	15.588	15.595	15.602	15.608	15.615	15.622	15.628	15.635	2730
2740	15.635	15.642	15.649	15.655	15.662	15.669	15.675	15.682	15.689	15.695	15.702	2740
2750	15.702	15.709	15.715	15.722	15.729	15.735	15.742	15.749	15.755	15.762	15.769	2750
2760	15.769	15.775	15.782	15.789	15.795	15.802	15.809	15.815	15.822	15.829	15.835	2760
2770	15.835	15.842	15.849	15.855	15.862	15.869	15.875	15.882	15.889	15.895	15.902	2770
2780	15.902	15.909	15.915	15.922	15.929	15.935	15.942	15.949	15.955	15.962	15.969	2780
2790	15.969	15.975	15.982	15.989	15.995	16.002	16.009	16.015	16.022	16.029	16.035	2790
2800	16.035	16.042	16.049	16.055	16.062	16.069	16.075	16.082	16.089	16.095	16.102	2800
2810	16.102	16.108	16.115	16.122	16.128	16.135	16.142	16.148	16.155	16.162	16.168	2810
2820	16.168	16.175	16.182	16.188	16.195	16.202	16.208	16.215	16.221	16.228	16.235	2820
2830	16.235	16.241	16.248	16.255	16.261	16.268	16.275	16.281	16.288	16.294	16.301	2830
2840	16.301	16.308	16.314	16.321	16.328	16.334	16.341	16.347	16.354	16.361	16.367	2840
2850	16.367	16.374	16.381	16.387	16.394	16.400	16.407	16.414	16.420	16.427	16.434	2850
2860	16.434	16.440	16.447	16.453	16.460	16.467	16.473	16.480	16.486	16.493	16.500	2860
2870	16.500	16.506	16.513	16.520	16.526	16.533	16.539	16.546	16.553	16.559	16.566	2870
2880	16.566	16.572	16.579	16.586	16.592	16.599	16.605	16.612	16.619	16.625	16.632	2880
2890	16.632	16.638	16.645	16.652	16.658	16.665	16.671	16.678	16.685	16.691	16.698	2890
2900	16.698	16.704	16.711	16.718	16.724	16.731	16.737	16.744	16.751	16.757	16.764	2900
2910	16.764	16.770	16.777	16.783	16.790	16.797	16.803	16.810	16.816	16.823	16.829	2910
2920	16.829	16.836	16.843	16.849	16.856	16.862	16.869	16.876	16.882	16.889	16.895	2920
2930	16.895	16.902	16.908	16.915	16.922	16.928	16.935	16.941	16.948	16.954	16.961	2930
2940	16.961	16.967	16.974	16.981	16.987	16.994	17.000	17.007	17.013	17.020	17.026	2940
2950	17.026	17.033	17.040	17.046	17.053	17.059	17.066	17.072	17.079	17.085	17.092	2950
2960	17.092	17.099	17.105	17.112	17.118	17.125	17.131	17.138	17.144	17.151	17.157	2960
2970	17.157	17.164	17.171	17.177	17.184	17.190	17.197	17.203	17.210	17.216	17.223	2970
2980	17.223	17.229	17.236	17.242	17.249	17.255	17.262	17.268	17.275	17.282	17.288	2980
2990	17.288	17.295	17.301	17.308	17.314	17.321	17.327	17.334	17.340	17.347	17.353	2990
°F	0	1	2	3	4	5	6	7	8	9	10	°F

Thermoelectric Voltage in Millivolts

°F	0	1	2	3	4	5	6	7	8	9	10	°F
3000	17.353	17.360	17.366	17.373	17.379	17.386	17.392	17.399	17.405	17.412	17.418	3000
3010	17.418	17.425	17.431	17.438	17.444	17.451	17.457	17.464	17.470	17.477	17.483	3010
3020	17.483	17.490	17.496	17.503	17.509	17.516	17.522	17.529	17.535	17.542	17.548	3020
3030	17.548	17.555	17.561	17.568	17.574	17.581	17.587	17.594	17.600	17.607	17.613	3030
3040	17.613	17.620	17.626	17.633	17.639	17.645	17.652	17.658	17.665	17.671	17.678	3040
3050	17.678	17.684	17.691	17.697	17.704	17.710	17.717	17.723	17.729	17.736	17.742	3050
3060	17.742	17.749	17.755	17.762	17.768	17.775	17.781	17.787	17.794	17.800	17.807	3060
3070	17.807	17.813	17.819	17.826	17.832	17.839	17.845	17.852	17.858	17.864	17.871	3070
3080	17.871	17.877	17.884	17.890	17.896	17.903	17.909	17.915	17.922	17.928	17.935	3080
3090	17.935	17.941	17.947	17.954	17.960	17.966	17.973	17.979	17.985	17.992	17.998	3090
3100	17.998	18.004	18.011	18.017	18.023	18.030	18.036	18.042	18.049	18.055	18.061	3100
3110	18.061	18.068	18.074	18.080	18.086	18.093	18.099	18.105	18.112	18.118	18.124	3110
3120	18.124	18.130	18.137	18.143	18.149	18.155	18.162	18.168	18.174	18.180	18.187	3120
3130	18.187	18.193	18.199	18.205	18.211	18.218	18.224	18.230	18.236	18.242	18.248	3130
3140	18.248	18.255	18.261	18.267	18.273	18.279	18.285	18.292	18.298	18.304	18.310	3140
3150	18.310	18.316	18.322	18.328	18.334	18.341	18.347	18.353	18.359	18.365	18.371	3150
3160	18.371	18.377	18.383	18.389	18.395	18.401	18.407	18.413	18.419	18.425	18.431	3160
3170	18.431	18.437	18.443	18.449	18.455	18.461	18.467	18.473	18.479	18.485	18.491	3170
3180	18.491	18.497	18.503	18.509	18.515	18.521	18.527	18.533	18.539	18.545	18.551	3180
3190	18.551	18.557	18.562	18.568	18.574	18.580	18.586	18.592	18.598	18.603	18.609	3190
3200	18.609	18.615	18.621	18.627	18.633	18.638	18.644	18.650	18.656	18.661	18.667	3200
3210	18.667	18.673	18.679	18.684	18.690							3210
°F	0	1	2	3	4	5	6	7	8	9	10	°F

GRADE:

COPPER VS. COPPER-NICKEL

TEMPERATURE IN DEGREES °C
REFERENCE JUNCTION AT 0°C

Type "T" Thermocouple Reference Tables °C

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

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
-328	to	662°F	-76	to	212°F
-200	to	350°C	-60	to	100°C

LIMITS OF ERROR (Whichever is Greater)

Standard:		Special:		
1.0°C	or	0.75% Above 0°C	0.5°C	or 0.4%
1.0°C	or	1.50% Below 0°C		

Thermoelectric Voltage in Millivolts

°C	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°C
-260	-6.258	-6.256	-6.255	-6.253	-6.251	-6.248	-6.245	-6.242	-6.239	-6.236	-6.232	-260
-250	-6.232	-6.228	-6.223	-6.219	-6.214	-6.209	-6.204	-6.198	-6.193	-6.187	-6.180	-250
-240	-6.180	-6.174	-6.167	-6.160	-6.153	-6.146	-6.138	-6.130	-6.122	-6.114	-6.105	-240
-230	-6.105	-6.096	-6.087	-6.078	-6.068	-6.059	-6.049	-6.038	-6.028	-6.017	-6.007	-230
-220	-6.007	-5.996	-5.985	-5.973	-5.962	-5.950	-5.938	-5.926	-5.914	-5.901	-5.888	-220
-210	-5.888	-5.876	-5.863	-5.850	-5.836	-5.823	-5.809	-5.795	-5.782	-5.767	-5.753	-210
-200	-5.753	-5.739	-5.724	-5.710	-5.695	-5.680	-5.665	-5.650	-5.634	-5.619	-5.603	-200
-190	-5.603	-5.587	-5.571	-5.555	-5.539	-5.523	-5.506	-5.489	-5.473	-5.456	-5.439	-190
-180	-5.439	-5.421	-5.404	-5.387	-5.369	-5.351	-5.334	-5.316	-5.297	-5.279	-5.261	-180
-170	-5.261	-5.242	-5.224	-5.205	-5.186	-5.167	-5.148	-5.128	-5.109	-5.089	-5.070	-170
-160	-5.070	-5.050	-5.030	-5.010	-4.989	-4.969	-4.949	-4.928	-4.907	-4.886	-4.865	-160
-150	-4.865	-4.844	-4.823	-4.802	-4.780	-4.759	-4.737	-4.715	-4.693	-4.671	-4.648	-150
-140	-4.648	-4.626	-4.604	-4.581	-4.558	-4.535	-4.512	-4.489	-4.466	-4.443	-4.419	-140
-130	-4.419	-4.395	-4.372	-4.348	-4.324	-4.300	-4.275	-4.251	-4.226	-4.202	-4.177	-130
-120	-4.177	-4.152	-4.127	-4.102	-4.077	-4.052	-4.026	-4.000	-3.975	-3.949	-3.923	-120
-110	-3.923	-3.897	-3.871	-3.844	-3.818	-3.791	-3.765	-3.738	-3.711	-3.684	-3.657	-110
-100	-3.657	-3.629	-3.602	-3.574	-3.547	-3.519	-3.491	-3.463	-3.435	-3.407	-3.379	-100
-90	-3.379	-3.350	-3.322	-3.293	-3.264	-3.235	-3.206	-3.177	-3.148	-3.118	-3.089	-90
-80	-3.089	-3.059	-3.030	-3.000	-2.970	-2.940	-2.910	-2.879	-2.849	-2.818	-2.788	-80
-70	-2.788	-2.757	-2.726	-2.695	-2.664	-2.633	-2.602	-2.571	-2.539	-2.507	-2.476	-70
-60	-2.476	-2.444	-2.412	-2.380	-2.348	-2.316	-2.283	-2.251	-2.218	-2.186	-2.153	-60
-50	-2.153	-2.120	-2.087	-2.054	-2.021	-1.987	-1.954	-1.920	-1.887	-1.853	-1.819	-50
-40	-1.819	-1.785	-1.751	-1.717	-1.683	-1.648	-1.614	-1.579	-1.545	-1.510	-1.475	-40
-30	-1.475	-1.440	-1.405	-1.370	-1.335	-1.299	-1.264	-1.228	-1.192	-1.157	-1.121	-30
-20	-1.121	-1.085	-1.049	-1.013	-0.976	-0.940	-0.904	-0.867	-0.830	-0.794	-0.757	-20
-10	-0.757	-0.720	-0.683	-0.646	-0.608	-0.571	-0.534	-0.496	-0.459	-0.421	-0.383	-10
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	0.000	0.039	0.078	0.117	0.156	0.195	0.234	0.273	0.312	0.352	0.391	0
10	0.391	0.431	0.470	0.510	0.549	0.589	0.629	0.669	0.709	0.749	0.790	10
20	0.790	0.830	0.870	0.911	0.951	0.992	1.033	1.074	1.114	1.155	1.196	20
30	1.196	1.238	1.279	1.320	1.362	1.403	1.445	1.486	1.528	1.570	1.612	30
40	1.612	1.654	1.696	1.738	1.780	1.823	1.865	1.908	1.950	1.993	2.036	40
50	2.036	2.079	2.122	2.165	2.208	2.251	2.294	2.338	2.381	2.425	2.468	50
60	2.468	2.512	2.556	2.600	2.643	2.687	2.732	2.776	2.820	2.864	2.909	60
70	2.909	2.953	2.998	3.043	3.087	3.132	3.177	3.222	3.267	3.312	3.358	70
80	3.358	3.403	3.448	3.494	3.539	3.585	3.631	3.677	3.722	3.768	3.814	80
90	3.814	3.860	3.907	3.953	3.999	4.046	4.092	4.138	4.185	4.232	4.279	90
100	4.279	4.325	4.372	4.419	4.466	4.513	4.561	4.608	4.655	4.702	4.750	100
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Thermoelectric Voltage in Millivolts

°C	0	1	2	3	4	5	6	7	8	9	10	°C
110	4.750	4.798	4.845	4.893	4.941	4.988	5.036	5.084	5.132	5.180	5.228	110
120	5.228	5.277	5.325	5.373	5.422	5.470	5.519	5.567	5.616	5.665	5.714	120
130	5.714	5.763	5.812	5.861	5.910	5.959	6.008	6.057	6.107	6.156	6.206	130
140	6.206	6.255	6.305	6.355	6.404	6.454	6.504	6.554	6.604	6.654	6.704	140
150	6.704	6.754	6.805	6.855	6.905	6.956	7.006	7.057	7.107	7.158	7.209	150
160	7.209	7.260	7.310	7.361	7.412	7.463	7.515	7.566	7.617	7.668	7.720	160
170	7.720	7.771	7.823	7.874	7.926	7.977	8.029	8.081	8.133	8.185	8.237	170
180	8.237	8.289	8.341	8.393	8.445	8.497	8.550	8.602	8.654	8.707	8.759	180
190	8.759	8.812	8.865	8.917	8.970	9.023	9.076	9.129	9.182	9.235	9.288	190
200	9.288	9.341	9.395	9.448	9.501	9.555	9.608	9.662	9.715	9.769	9.822	200
210	9.822	9.876	9.930	9.984	10.038	10.092	10.146	10.200	10.254	10.308	10.362	210
220	10.362	10.417	10.471	10.525	10.580	10.634	10.689	10.743	10.798	10.853	10.907	220
230	10.907	10.962	11.017	11.072	11.127	11.182	11.237	11.292	11.347	11.403	11.458	230
240	11.458	11.513	11.569	11.624	11.680	11.735	11.791	11.846	11.902	11.958	12.013	240
250	12.013	12.069	12.125	12.181	12.237	12.293	12.349	12.405	12.461	12.518	12.574	250
260	12.574	12.630	12.687	12.743	12.799	12.856	12.912	12.969	13.026	13.082	13.139	260
270	13.139	13.196	13.253	13.310	13.366	13.423	13.480	13.537	13.595	13.652	13.709	270
280	13.709	13.766	13.823	13.881	13.938	13.995	14.053	14.110	14.168	14.226	14.283	280
290	14.283	14.341	14.399	14.456	14.514	14.572	14.630	14.688	14.746	14.804	14.862	290
300	14.862	14.920	14.978	15.036	15.095	15.153	15.211	15.270	15.328	15.386	15.445	300
310	15.445	15.503	15.562	15.621	15.679	15.738	15.797	15.856	15.914	15.973	16.032	310
320	16.032	16.091	16.150	16.209	16.268	16.327	16.387	16.446	16.505	16.564	16.624	320
330	16.624	16.683	16.742	16.802	16.861	16.921	16.980	17.040	17.100	17.159	17.219	330
340	17.219	17.279	17.339	17.399	17.458	17.518	17.578	17.638	17.698	17.759	17.819	340
350	17.819	17.879	17.939	17.999	18.060	18.120	18.180	18.241	18.301	18.362	18.422	350
360	18.422	18.483	18.543	18.604	18.665	18.725	18.786	18.847	18.908	18.969	19.030	360
370	19.030	19.091	19.152	19.213	19.274	19.335	19.396	19.457	19.518	19.579	19.641	370
380	19.641	19.702	19.763	19.825	19.886	19.947	20.009	20.070	20.132	20.193	20.255	380
390	20.255	20.317	20.378	20.440	20.502	20.563	20.625	20.687	20.748	20.810	20.872	390
°C	0	1	2	3	4	5	6	7	8	9	10	°C

Type "T" Thermocouple Reference Tables °F

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

GRADE:

COPPER VS. COPPER-NICKEL

TEMPERATURE IN DEGREES °F
REFERENCE JUNCTION AT 32°F

MAXIMUM TEMPERATURE GRADE

Thermocouple Grade:			Extension Grade:		
-328	to	662°F	-76	to	212°F
-200	to	350°C	-60	to	100°C

LIMITS OF ERROR (Whichever is Greater)

Standard:			Special:		
1.0°C	or	0.75% Above 0°C	0.5°C	or	0.4%
1.0°C	or	1.50% Below 0°C			

Thermoelectric Voltage in Millivolts

°F	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	°F
-450							-6.258	-6.257	-6.256	-6.255	-6.254	-450
-440	-6.254	-6.253	-6.252	-6.251	-6.250	-6.248	-6.247	-6.245	-6.243	-6.242	-6.240	-440
-430	-6.240	-6.238	-6.236	-6.234	-6.232	-6.230	-6.227	-6.225	-6.222	-6.220	-6.217	-430
-420	-6.217	-6.215	-6.212	-6.209	-6.206	-6.203	-6.200	-6.197	-6.194	-6.191	-6.187	-420
-410	-6.187	-6.184	-6.180	-6.177	-6.173	-6.170	-6.166	-6.162	-6.158	-6.154	-6.150	-410
-400	-6.150	-6.146	-6.141	-6.137	-6.133	-6.128	-6.124	-6.119	-6.115	-6.110	-6.105	-400
-390	-6.105	-6.100	-6.095	-6.090	-6.085	-6.080	-6.075	-6.069	-6.064	-6.059	-6.053	-390
-380	-6.053	-6.047	-6.042	-6.036	-6.030	-6.025	-6.019	-6.013	-6.007	-6.001	-5.994	-380
-370	-5.994	-5.988	-5.982	-5.976	-5.969	-5.963	-5.956	-5.950	-5.943	-5.937	-5.930	-370
-360	-5.930	-5.923	-5.916	-5.909	-5.902	-5.896	-5.888	-5.881	-5.874	-5.867	-5.860	-360
-350	-5.860	-5.853	-5.845	-5.838	-5.830	-5.823	-5.815	-5.808	-5.800	-5.792	-5.785	-350
-340	-5.785	-5.777	-5.769	-5.761	-5.753	-5.745	-5.737	-5.729	-5.721	-5.713	-5.705	-340
-330	-5.705	-5.697	-5.688	-5.680	-5.672	-5.663	-5.655	-5.646	-5.638	-5.629	-5.620	-330
-320	-5.620	-5.612	-5.603	-5.594	-5.585	-5.577	-5.568	-5.559	-5.550	-5.541	-5.532	-320
-310	-5.532	-5.523	-5.513	-5.504	-5.495	-5.486	-5.476	-5.467	-5.458	-5.448	-5.439	-310
-300	-5.439	-5.429	-5.420	-5.410	-5.400	-5.391	-5.381	-5.371	-5.361	-5.351	-5.341	-300
-290	-5.341	-5.332	-5.322	-5.312	-5.301	-5.291	-5.281	-5.271	-5.261	-5.250	-5.240	-290
-280	-5.240	-5.230	-5.219	-5.209	-5.198	-5.188	-5.177	-5.167	-5.156	-5.145	-5.135	-280
-270	-5.135	-5.124	-5.113	-5.102	-5.091	-5.081	-5.070	-5.059	-5.048	-5.036	-5.025	-270
-260	-5.025	-5.014	-5.003	-4.992	-4.980	-4.969	-4.958	-4.946	-4.935	-4.923	-4.912	-260
-250	-4.912	-4.900	-4.889	-4.877	-4.865	-4.854	-4.842	-4.830	-4.818	-4.806	-4.794	-250
-240	-4.794	-4.783	-4.771	-4.759	-4.746	-4.734	-4.722	-4.710	-4.698	-4.685	-4.673	-240
-230	-4.673	-4.661	-4.648	-4.636	-4.624	-4.611	-4.599	-4.586	-4.573	-4.561	-4.548	-230
-220	-4.548	-4.535	-4.523	-4.510	-4.497	-4.484	-4.471	-4.458	-4.445	-4.432	-4.419	-220
-210	-4.419	-4.406	-4.393	-4.380	-4.366	-4.353	-4.340	-4.326	-4.313	-4.300	-4.286	-210
-200	-4.286	-4.273	-4.259	-4.246	-4.232	-4.218	-4.205	-4.191	-4.177	-4.163	-4.149	-200
-190	-4.149	-4.136	-4.122	-4.108	-4.094	-4.080	-4.066	-4.052	-4.037	-4.023	-4.009	-190
-180	-4.009	-3.995	-3.980	-3.966	-3.952	-3.937	-3.923	-3.908	-3.894	-3.879	-3.865	-180
-170	-3.865	-3.850	-3.836	-3.821	-3.806	-3.791	-3.777	-3.762	-3.747	-3.732	-3.717	-170
-160	-3.717	-3.702	-3.687	-3.672	-3.657	-3.642	-3.626	-3.611	-3.596	-3.581	-3.565	-160
-150	-3.565	-3.550	-3.535	-3.519	-3.504	-3.488	-3.473	-3.457	-3.441	-3.426	-3.410	-150
-140	-3.410	-3.394	-3.379	-3.363	-3.347	-3.331	-3.315	-3.299	-3.283	-3.267	-3.251	-140
-130	-3.251	-3.235	-3.219	-3.203	-3.187	-3.171	-3.154	-3.138	-3.122	-3.105	-3.089	-130
-120	-3.089	-3.072	-3.056	-3.040	-3.023	-3.006	-2.990	-2.973	-2.956	-2.940	-2.923	-120
-110	-2.923	-2.906	-2.889	-2.873	-2.856	-2.839	-2.822	-2.805	-2.788	-2.771	-2.754	-110
-100	-2.754	-2.737	-2.719	-2.702	-2.685	-2.668	-2.651	-2.633	-2.616	-2.598	-2.581	-100
-90	-2.581	-2.564	-2.546	-2.529	-2.511	-2.493	-2.476	-2.458	-2.440	-2.423	-2.405	-90
-80	-2.405	-2.387	-2.369	-2.351	-2.334	-2.316	-2.298	-2.280	-2.262	-2.244	-2.225	-80
-70	-2.225	-2.207	-2.189	-2.171	-2.153	-2.134	-2.116	-2.098	-2.079	-2.061	-2.043	-70
-60	-2.043	-2.024	-2.006	-1.987	-1.969	-1.950	-1.931	-1.913	-1.894	-1.875	-1.857	-60
-50	-1.857	-1.838	-1.819	-1.800	-1.781	-1.762	-1.743	-1.724	-1.705	-1.686	-1.667	-50
-40	-1.667	-1.648	-1.629	-1.610	-1.591	-1.572	-1.552	-1.533	-1.514	-1.494	-1.475	-40
-30	-1.475	-1.456	-1.436	-1.417	-1.397	-1.378	-1.358	-1.338	-1.319	-1.299	-1.279	-30
-20	-1.279	-1.260	-1.240	-1.220	-1.200	-1.181	-1.161	-1.141	-1.121	-1.101	-1.081	-20
-10	-1.081	-1.061	-1.041	-1.021	-1.001	-0.980	-0.960	-0.940	-0.920	-0.900	-0.879	-10
0	-0.879	-0.859	-0.839	-0.818	-0.798	-0.777	-0.757	-0.736	-0.716	-0.695	-0.675	0
0	-0.675	-0.654	-0.633	-0.613	-0.592	-0.571	-0.550	-0.530	-0.509	-0.488	-0.467	0
10	-0.467	-0.446	-0.425	-0.404	-0.383	-0.362	-0.341	-0.320	-0.299	-0.278	-0.256	10
20	-0.256	-0.235	-0.214	-0.193	-0.171	-0.150	-0.129	-0.107	-0.086	-0.064	-0.043	20
30	-0.043	-0.022	0.000	0.022	0.043	0.065	0.086	0.108	0.130	0.151	0.173	30
40	0.173	0.195	0.216	0.238	0.260	0.282	0.303	0.325	0.347	0.369	0.391	40
50	0.391	0.413	0.435	0.457	0.479	0.501	0.523	0.545	0.567	0.589	0.611	50
60	0.611	0.634	0.656	0.678	0.700	0.723	0.745	0.767	0.790	0.812	0.834	60
70	0.834	0.857	0.879	0.902	0.924	0.947	0.969	0.992	1.015	1.037	1.060	70
80	1.060	1.083	1.105	1.128	1.151	1.174	1.196	1.219	1.242	1.265	1.288	80
90	1.288	1.311	1.334	1.357	1.380	1.403	1.426	1.449	1.472	1.496	1.519	90
100	1.519	1.542	1.565	1.588	1.612	1.635	1.658	1.682	1.705	1.729	1.752	100
110	1.752	1.776	1.799	1.823	1.846	1.870	1.893	1.917	1.941	1.964	1.988	110
120	1.988	2.012	2.036	2.060	2.083	2.107	2.131	2.155	2.179	2.203	2.227	120
130	2.227	2.251	2.275	2.299	2.323	2.347	2.371	2.395	2.420	2.444	2.468	130
140	2.468	2.492	2.517	2.541	2.565	2.590	2.614	2.639	2.663	2.687	2.712	140
°F	0	1	2	3	4	5	6	7	8	9	10	°F

Thermoelectric Voltage in Millivolts

°F	0	1	2	3	4	5	6	7	8	9	10	°F
150	2.712	2.737	2.761	2.786	2.810	2.835	2.860	2.884	2.909	2.934	2.958	150
160	2.958	2.983	3.008	3.033	3.058	3.082	3.107	3.132	3.157	3.182	3.207	160
170	3.207	3.232	3.257	3.282	3.307	3.333	3.358	3.383	3.408	3.433	3.459	170
180	3.459	3.484	3.509	3.534	3.560	3.585	3.610	3.636	3.661	3.687	3.712	180
190	3.712	3.738	3.763	3.789	3.814	3.840	3.866	3.891	3.917	3.943	3.968	190
200	3.968	3.994	4.020	4.046	4.071	4.097	4.123	4.149	4.175	4.201	4.227	200
210	4.227	4.253	4.279	4.305	4.331	4.357	4.383	4.409	4.435	4.461	4.487	210
220	4.487	4.513	4.540	4.566	4.592	4.618	4.645	4.671	4.697	4.724	4.750	220
230	4.750	4.776	4.803	4.829	4.856	4.882	4.909	4.935	4.962	4.988	5.015	230
240	5.015	5.042	5.068	5.095	5.122	5.148	5.175	5.202	5.228	5.255	5.282	240
250	5.282	5.309	5.336	5.363	5.389	5.416	5.443	5.470	5.497	5.524	5.551	250
260	5.551	5.578	5.605	5.632	5.660	5.687	5.714	5.741	5.768	5.795	5.823	260
270	5.823	5.850	5.877	5.904	5.932	5.959	5.986	6.014	6.041	6.068	6.096	270
280	6.096	6.123	6.151	6.178	6.206	6.233	6.261	6.288	6.316	6.343	6.371	280
290	6.371	6.399	6.426	6.454	6.482	6.510	6.537	6.565	6.593	6.621	6.648	290
300	6.648	6.676	6.704	6.732	6.760	6.788	6.816	6.844	6.872	6.900	6.928	300
310	6.928	6.956	6.984	7.012	7.040	7.068	7.096	7.124	7.152	7.181	7.209	310
320	7.209	7.237	7.265	7.294	7.322	7.350	7.378	7.407	7.435	7.463	7.492	320
330	7.492	7.520	7.549	7.577	7.606	7.634	7.663	7.691	7.720	7.748	7.777	330
340	7.777	7.805	7.834	7.863	7.891	7.920	7.949	7.977	8.006	8.035	8.064	340
350	8.064	8.092	8.121	8.150	8.179	8.208	8.237	8.266	8.294	8.323	8.352	350
360	8.352	8.381	8.410	8.439	8.468	8.497	8.526	8.555	8.585	8.614	8.643	360
370	8.643	8.672	8.701	8.730	8.759	8.789	8.818	8.847	8.876	8.906	8.935	370
380	8.935	8.964	8.994	9.023	9.052	9.082	9.111	9.141	9.170	9.200	9.229	380
390	9.229	9.259	9.288	9.318	9.347	9.377	9.406	9.436	9.466	9.495	9.525	390
400	9.525	9.555	9.584	9.614	9.644	9.673	9.703	9.733	9.763	9.793	9.822	400
410	9.822	9.852	9.882	9.912	9.942	9.972	10.002	10.032	10.062	10.092	10.122	410
420	10.122	10.152	10.182	10.212	10.242	10.272	10.302	10.332	10.362	10.392	10.423	420
430	10.423	10.453	10.483	10.513	10.543	10.574	10.604	10.634	10.664	10.695	10.725	430
440	10.725	10.755	10.786	10.816	10.847	10.877	10.907	10.938	10.968	10.999	11.029	440
450	11.029	11.060	11.090	11.121	11.151	11.182	11.213	11.243	11.274	11.304	11.335	450
460	11.335	11.366	11.396	11.427	11.458	11.489	11.519	11.550	11.581	11.612	11.643	460
470	11.643	11.673	11.704	11.735	11.766	11.797	11.828	11.859	11.890	11.920	11.951	470
480	11.951	11.982	12.013	12.044	12.075	12.106	12.138	12.169	12.200	12.231	12.262	480
490	12.262	12.293	12.324	12.355	12.386	12.418	12.449	12.480	12.511	12.543	12.574	490
500	12.574	12.605	12.636	12.668	12.699	12.730	12.762	12.793	12.824	12.856	12.887	500
510	12.887	12.919	12.950	12.982	13.013	13.045	13.076	13.108	13.139	13.171	13.202	510
520	13.202	13.234	13.265	13.297	13.328	13.360	13.392	13.423	13.455	13.487	13.518	520
530	13.518	13.550	13.582	13.614	13.645	13.677	13.709	13.741	13.772	13.804	13.836	530
540	13.836	13.868	13.900	13.932	13.964	13.995	14.027	14.059	14.091	14.123	14.155	540
550	14.155	14.187	14.219	14.251	14.283	14.315	14.347	14.379	14.411	14.444	14.476	550
560	14.476	14.508	14.540	14.572	14.604	14.636	14.669	14.701	14.733	14.765	14.797	560
570	14.797	14.830	14.862	14.894	14.926	14.959	14.991	15.023	15.056	15.088	15.121	570
580	15.121	15.153	15.185	15.218	15.250	15.283	15.315	15.347	15.380	15.412	15.445	580
590	15.445	15.477	15.510	15.543	15.575	15.608	15.640	15.673	15.705	15.738	15.771	590
600	15.771	15.803	15.836	15.869	15.901	15.934	15.967	15.999	16.032	16.065	16.098	600
610	16.098	16.130	16.163	16.196	16.229	16.262	16.295	16.327	16.360	16.393	16.426	610
620	16.426	16.459	16.492	16.525	16.558	16.591	16.624	16.657	16.690	16.723	16.756	620
630	16.756	16.789	16.822	16.855	16.888	16.921	16.954	16.987	17.020	17.053	17.086	630
640	17.086	17.120	17.153	17.186	17.219	17.252	17.286	17.319	17.352	17.385	17.418	640
650	17.418	17.452	17.485	17.518	17.552	17.585	17.618	17.652	17.685	17.718	17.752	650
660	17.752	17.785	17.819	17.852	17.886	17.919	17.952	17.986	18.019	18.053	18.086	660
670	18.086	18.120	18.153	18.187	18.221	18.254	18.288	18.321	18.355	18.389	18.422	670
680	18.422	18.456	18.490	18.523	18.557	18.591	18.624	18.658	18.692	18.725	18.759	680
690	18.759	18.793	18.827	18.861	18.894	18.928	18.962	18.996	19.030	19.064	19.097	690
700	19.097	19.131	19.165	19.199	19.233	19.267	19.301	19.335	19.369	19.403	19.437	700
710	19.437	19.471	19.505	19.539	19.573	19.607	19.641	19.675	19.709	19.743	19.777	710
720	19.777	19.811	19.845	19.879	19.913	19.947	19.982	20.016	20.050	20.084	20.118	720
730	20.118	20.152	20.187	20.221	20.255	20.289	20.323	20.358	20.392	20.426	20.460	730
740	20.460	20.495	20.529	20.563	20.597	20.632	20.666	20.700	20.735	20.769	20.803	740
750	20.803	20.838	20.872									750
°F	0	1	2	3	4	5	6	7	8	9	10	°F

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EGT Supports Our Troops

SUPPORTING OUR TROOPS

In 2008, Exhaust Gas Technologies joined forces with Kenny Bernstein Racing, Ringer Manufacturing, MONSTER Energy Drinks, and Main Gate Incorporated in providing needed equipment and refreshments for the 257th Transportation Maintenance Company stationed at Camp Arijan, Kuwait. These men and woman are in charge of maintenance and repair of all types of military vehicles coming out of Iraq. The Army was having intermittent supply issues securing quality mechanics gloves for the troops of the 257th. In addition, they were tearing their hands up working 24/7 on the damaged vehicles, slowing the return of equipment back to Baghdad. We heard of the problem in June and by mid-July shipped the needed supplies directly from Kenny Bernstein Racing to Kuwait. Captain, Valeria A. Anderson, Company Commander of the 257th., accepted the shipment and dispersed the supplies to her troops. As you can see, they surly seemed pleased with our support.

We want to thank Captain Valeria Anderson and the 257th. for the opportunity to assist our troops, while they are serving our country in Kuwait. We salute you and your soldiers, for supporting our American Forces in the middle of the desert.

Just a side note, as I write this in mid-August, the weather in Kuwait is 131 F., Winds NW 29 MPH, Heavy Blowing Widespread Dust and Humidity of 14%. It is rarely under 100F, between Mid July and late September, day or night!

MACcc-400 Mobile Aircraft Composite Control Center

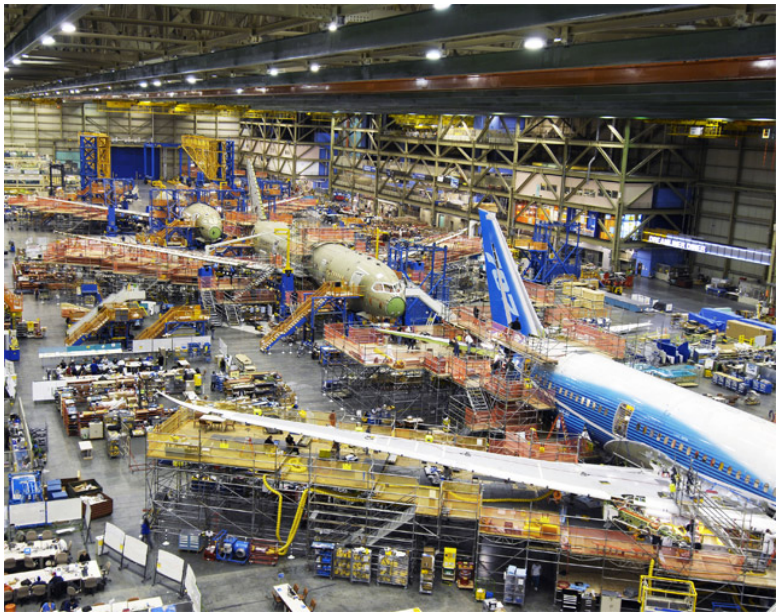
In case you have not noticed, the Commercial Aircraft Industry has undergone some dramatic technological changes lately. These new aircraft are more eco-friendly by being lighter, stronger, faster, and quieter plus 20% more fuel-efficient. If that was not enough to tweak your Green brain cells, there are even more technologies to ponder. These planes are being constructed using the latest advancements in composites. Using carbon fiber webbing and super epoxies that are impregnated into the fabric materials, manufacturers have developed surfaces that are smooth and near fastener-free. Wings, fuselages, decks and bulkheads are all "Bonded" together into a one-piece plane can produce wondrous benefits for customer comforts, greater aircraft longevity at lower cost per year of service and dramatically different maintenance procedures.

Boeing's new 787 Dreamliner program is one step closer to accomplishing all this and more. What "more" would you want or possibly need? With the new planes comes a completely new procedure to maintain and repair all aspects of this generation of aircraft. In the case of the 787 Dreamliner, maintenance procedures needed to be designed, developed, tested and retested to assure the highest level of serviceability coupled with repair integrity beyond anything in existence before. Ground crews have always had incidences with aircraft that requires either major or minor repairs before returning the plane to service. Wing damage, fuselage dents or collisions with ground service equipment have challenged repair teams on metal aircraft. A composite aircraft has greater resistance to damage but composites change everything that is needed to perform these same repair services.

Instead of metal and fasteners, the new technologies require a complete supply of pre-impregnated and vacuum-bagging materials, tapes, tools, heaters and temperature sensors to monitor and control the repair process. Additionally, specially designed equipment that supervise all the temperature points, vacuum levels, ramp-up and cool-down programs, plus complex data analysis needed to be developed. This repair system needed to handle 240 volts with four hundred amperes, enough power to handle multiple repairs simultaneously, while producing enough deep vacuum supply to handle a 100 square foot repair area. The data collection network needed to cohabitate in the repair area with high voltage heaters, motors and generators, and still offer quantitative data that is free of electrical distortion. One last requirement stated that this system needed to be easy enough to set-up and run, so that regular repair personnel could accomplish the required repair task. Years of engineering research and design, has led to the development of the MACcc – 400, Mobile Aircraft Composite Control Center by Exhaust Gas Technologies in Chino, California. EGT has assembled an impressive staff of multitalented engineers offering over 40 years of successful industrial thermal processing equipment, plus over 30 years of award winning data acquisition technologies that have revolutionized the Motorsports industry.

The technology incorporated within the MACcc-400, ensures quantitative data collection regardless of the level of outside distortions in the repair area. With the MACcc- 400, every possible data point is controlled, monitored and recorded. Power levels, vacuum levels, valve positions, time of repair start, through repair completion, down to the second are stored for later analysis. High alarms, low alarms, rate of rise and fall alarms watch over every aspect of the work. Time is monitored over every segment of the repair, so the repair crews know if something is slower or faster than normal, or different from programmed, they need to search the cause before proceeding. There are over 24,000 lines of code consuming more than 3,000 engineering hours and introducing CANbus technology for multiplex inputs, reducing external wiring for the system by 94% were achieved. With continual feedback from top technicians in the field, engineers are able to refine data screens so that technicians have everything readily available, and additional, more complex screens are available for supervisors and engineers. Memory is stored in multiple locations to eliminate the possibility of data loss. The MAC – 400 systems manages over 80,000 watts of total power and 72,000 watts feeding the custom electric flexible heaters maintaining control accuracy down to two degrees Fahrenheit, at 350 F. The engineering staff at EGT has developed composite curing systems since 1988 and has assembled support sources that represent the best of the best.

Specialty teams including ground personnel, engineers and experienced technicians have been trained and retrained to perform every level of repair necessary to maintain these aircraft in top working condition. Not only does the repair area need to be equal or better than the original, it must be cosmetically perfect to the rest of the plane. If you were the owner of these planes, you would not tolerate a blotchy multi-patch appearance, so perfection is the only acceptable goal. With new technologies come new procedures, new equipment and new standards of performance and safety. This is the most technologically advanced and powerful, portable composite data control system in existence today. The Boeing 787 Dreamliner incorporates years of research by thousands of dedicated employees and vendors to achieve the vision of a truly futuristic air travel experience for you, the customer.



If you would like more information on what the MACcc-400 can do for your application, feel free to contact us.

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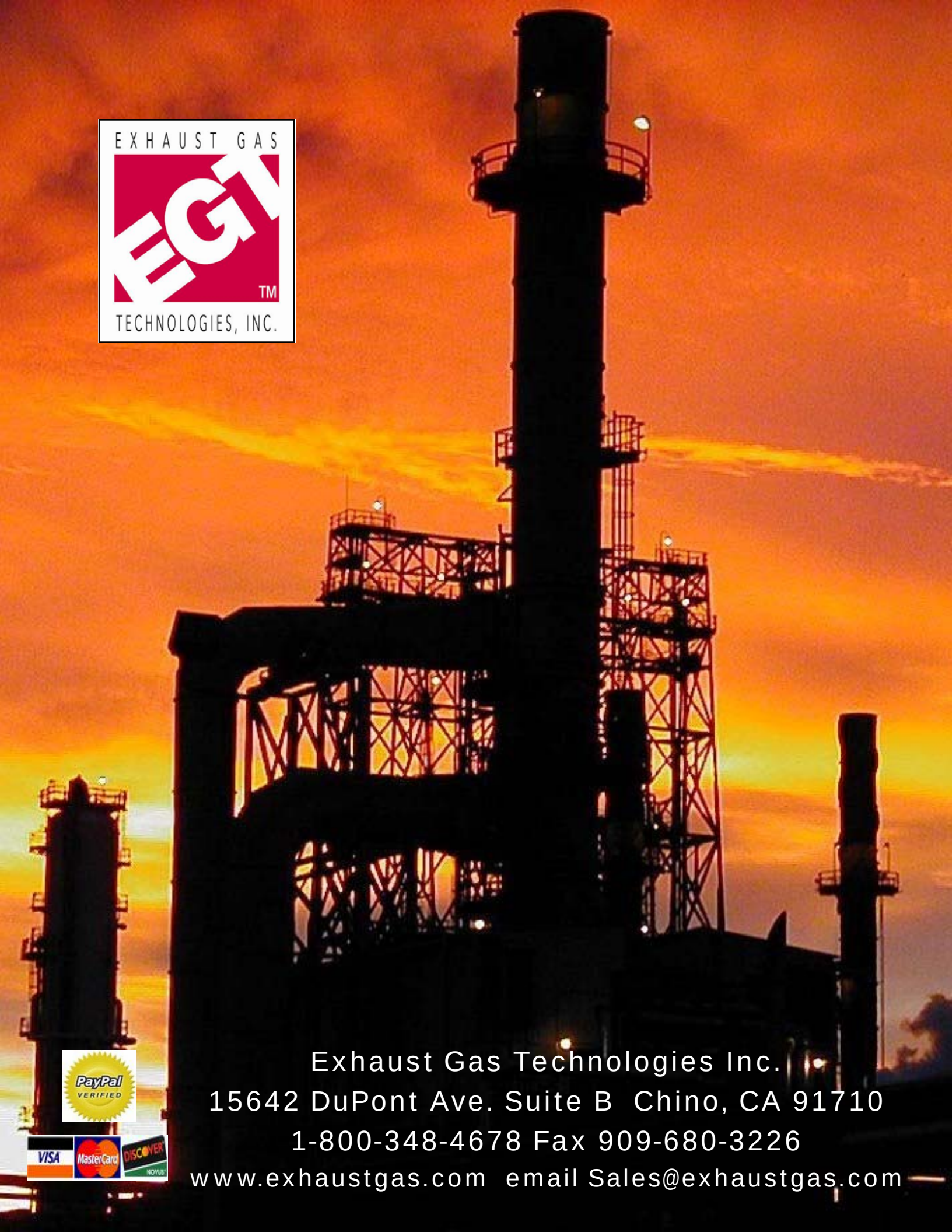
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