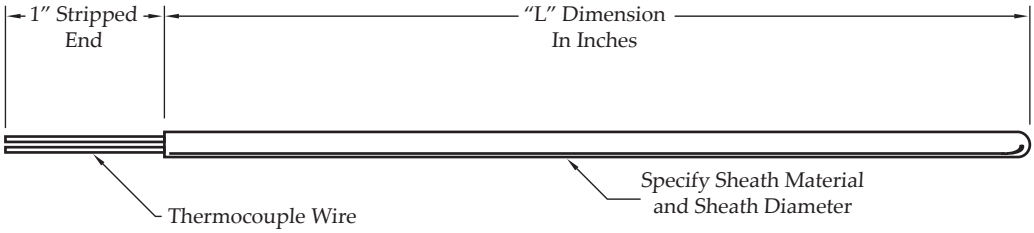
SHEATHED MgO THERMOCOUPLE ASSEMBLY WITH STRIPPED END

The TDC2 Style Thermocouple features an MgO insulated element which is junctioned and terminated with a standard 1″ long strip. This style is designed for field replacement or addition of other termination options.



STYLE TDC2 - Stripped End MgO Thermocouple

Table 1: Thermocouple Type

Thermocouple Type Codes				Limits of Error
E	J	K	T	Standard Limits
2	3	4	8	Special Limits

Table 2: Junction Type

Code	Single Junction	Code	Dual Junction
G	Grounded	H	Grounded
U	Ungrounded	L	Ungrounded Isolated
C	Exposed	V	Ungrounded Common
		W	Exposed

Table 3: Sheath Material

Code	Metal Type
1	310 Stainless Steel
2	321 Stainless Steel
3	330 Stainless Steel
4	304 Stainless Steel
5	446 Stainless Steel
6	316 Stainless Steel
7	347 Stainless Steel
8	Inconel® 600 (Alloy 600)
A	Alloy 601

Table 4: Sheath Diameter

Code	O.D. Size
T	.020″ O.D.
Y	.032″ or 1/32″ O.D.
W	.040″ O.D.
A	.062″ or 1/16″ O.D.
B	.125″ or 1/8″ O.D.
V	.156″ or 5/32″ O.D.
C	.188″ or 3/16″ O.D.
D	.250″ or 1/4″ O.D.
E	.313″ or 5/16″ O.D.
F	.375″ or 3/8″ O.D.
H	.500″ or 1/2″ O.D.

Table 5: "L" Dimension

Specify in inches. See table on page 27 for codes.

Part Number Sequence

TDC2-JG-4F100

TDC2	-	J	G	-	4	F	100
TDC2		Table 1	Table 2		Table 3	Table 4	Table 5
Sensor Type & Style No.		Thermocouple Type	Junction Type		Sheath Material	Sheath Diameter	"L" Dimension

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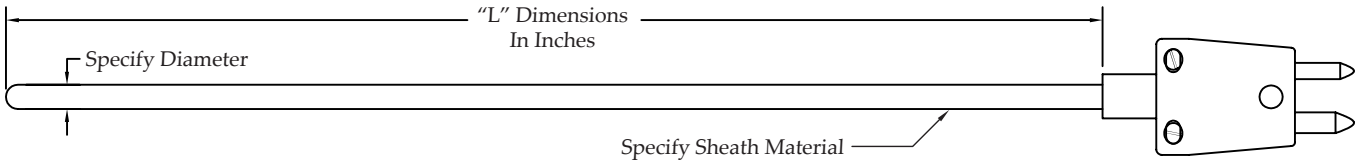
SHEATHED MgO THERMOCOUPLE ASSEMBLY WITH PLUG

The TDC3 Style Thermocouple features an MgO insulated element with universal disconnect plug for reliable connections. Plugs are available in standard (400°F), high temperature (800°F), and ceramic (1200°F) materials.



STYLE TDC3 - MgO Thermocouple with Plug

Table 1: Thermocouple Type

Thermocouple Type Codes				Limits of Error
E	J	K	T	Standard Limits
2	3	4	8	Special Limits

Table 2: Junction Type

Code	Single Junction	Code	Dual Junction
G	Grounded	H	Grounded
U	Ungrounded	L	Ungrounded Isolated
C	Exposed	V	Ungrounded Common
		W	Exposed

Table 3: Sheath Material

Code	Metal Type
1	310 Stainless Steel
2	321 Stainless Steel
3	330 Stainless Steel
5	446 Stainless Steel
6	316 Stainless Steel
7	347 Stainless Steel
8	Inconel® 600 (Alloy 600)
A	Alloy 601

Table 4: Sheath Diameter

Code	O.D. Size
T	.020″ O.D.
Y	.032″ or 1/32″ O.D.
W	.040″ O.D.
A	.062″ or 1/16″ O.D.
B	.125″ or 1/8″ O.D.
V	.156″ or 5/32″ O.D.
C	.188″ or 3/16″ O.D.
D	.250″ or 1/4″ O.D.
E	.313″ or 5/16″ O.D.
F	.375″ or 3/8″ O.D.
H	.500″ or 1/2″ O.D.

Table 5: "L" Dimension

Specify in inches. See table on page 27 for codes.

Table 6: Terminal Connector

Code	Termination Style
3	Standard Molded Plug
6	Standard Plug with Brazing Adapter
7	Standard Plug with Tube Adapter
8	High Temperature Plug with Crimp Adapter
9	Ceramic Plug with Tube Adapter
F	Mini Molded Plug
M	Mini Plug with Crimp Adapter
X	Special, Specify

Part Number Sequence

TDC3-JG-4F12F-3

TDC3	-	J	G	-	4	F	12F	-	3
TDC3		Table 1	Table 2		Table 3	Table 4	Table 5		Table 6
Sensor Type & Style No.		Thermocouple Type	Junction Type		Sheath Material	Sheath Diameter	"L" Dimension		Terminal Connector

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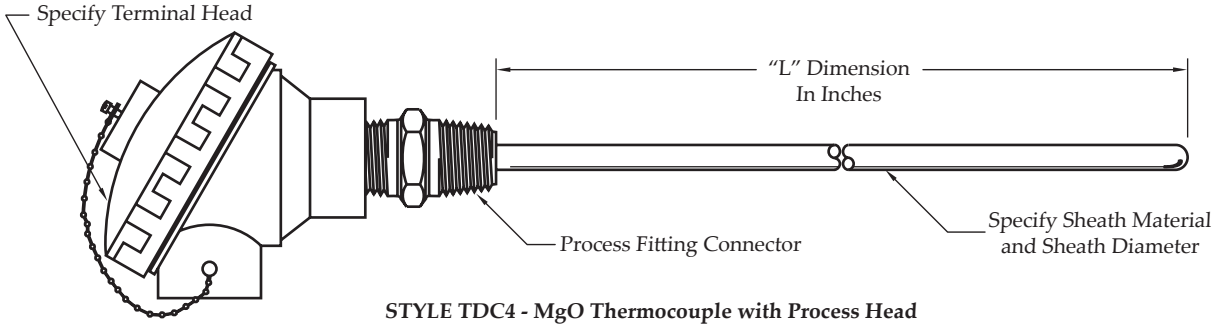
Industrial Process Thermocouples

SHEATHED MgO THERMOCOUPLE ASSEMBLY WITH PROCESS HEAD

The TDC4 Style Thermocouple features an MgO insulated element with a protective terminal housing and process connector. This style can be manufactured as spring loaded for direct field replacement into existing thermowells.



STYLE TDC4 - MgO Thermocouple with Process Head

Table 1: Thermocouple Type

Thermocouple Type Codes				Limits of Error
E	J	K	T	Standard Limits
2	3	4	8	Special Limits

Table 2: Junction Type

Code	Single Junction	Code	Dual Junction
G	Grounded	H	Grounded
U	Ungrounded	L	Ungrounded Isolated
C	Exposed	V	Ungrounded Common
		W	Exposed

Table 3: Sheath Material

Code	Metal Type
1	310 Stainless Steel
2	321 Stainless Steel
4	304 Stainless Steel
5	446 Stainless Steel
6	316 Stainless Steel
7	347 Stainless Steel
8	Inconel® 600 (Alloy 600)
A	Alloy 601

Table 4: Sheath Diameter

Code	O.D. Size
T	.020" O.D.
Y	.032" or 1/32" O.D.
W	.040" O.D.
A	.062" or 1/16" O.D.
B	.125" or 1/8" O.D.
V	.156" or 5/32" O.D.
C	.188" or 3/16" O.D.
D	.250" or 1/4" O.D.
E	.313" or 5/16" O.D.
F	.375" or 3/8" O.D.
H	.500" or 1/2" O.D.

Table 5: "L" Dimension

Specify in inches. See table on page 27 for codes.

Table 6: Fitting Options

Code	Process Size
0	No Process Connection
6	1/2" NPT Stainless Steel Hex Nipple
8	3/4" NPT Stainless Steel Hex Nipple
G	1/2" NPT Brass Hex Bushing
H	1/2" NPT Stainless Steel Hex Bushing

Table 7: Spring Loaded Option

Code	Probe Tip Style
1	Fixed
2	Spring Loaded

Table 8: Screw Cover Terminal Heads

Code	Screw Cover Head Materials
A	1/2" NPT Conduit, Aluminum Head
B	3/4" NPT Conduit, Aluminum Head
C	1/2" NPT Conduit, Cast Iron Head
D	3/4" NPT Conduit, Cast Iron Head
M	1/4" NPT Conduit Connection, Miniature Plastic Head
P	1/2" NPT Conduit, Grey Delrin Head
R	3/4" NPT Conduit, Grey Delrin Head
W	1/2" NPT Conduit, White Polypropylene Head
V	3/4" NPT Conduit, White Polypropylene Head
Z	1/2" NPT Conduit, Explosion Proof Aluminum Head
Y	3/4" NPT Conduit, Explosion Proof Aluminum Head

Part Number Sequence

TDC4-JG-6C060-61A0

TDC4	-	J	G	-	6	C	060	-	6	1	A	0
TDC4		Table 1	Table 2		Table 3	Table 4	Table 5		Table 6	Table 7	Table 8	Table 6
Sensor Type & Style No.		Thermocouple Type	Junction Type		Sheath Material	Sheath Diameter	"L" Dimension		Fitting Options Into Head	Spring Loaded Option	Terminal Heads	Fitting Options On Probe

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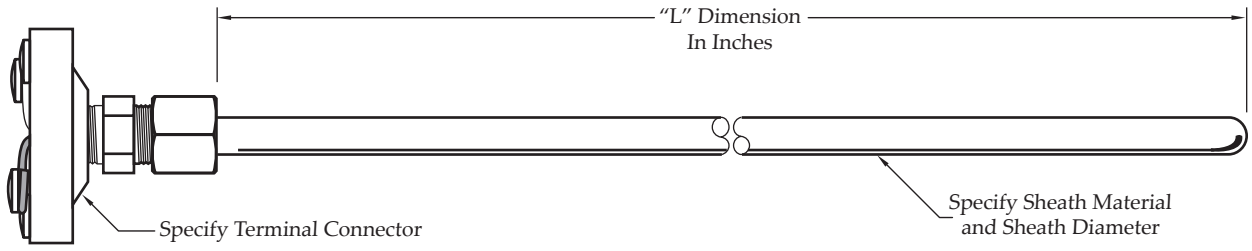
SHEATHED MgO THERMOCOUPLE ASSEMBLY WITH OPEN TERMINAL DISC

The TDC5 Style Thermocouple features an MgO insulated element with an open terminal disc design. This design allows greater accessibility in wiring for space restricted areas.



STYLE TDC5 - MgO Thermocouple with Open Terminal Disc

Table 1: Thermocouple Type

Thermocouple Type Codes				Limits of Error
E	J	K	T	Standard Limits
2	3	4	8	Special Limits

Table 2: Junction Type

Code	Single Junction	Code	Dual Junction
G	Grounded	H	Grounded
U	Ungrounded	L	Ungrounded Isolated
C	Exposed	V	Ungrounded Common
		W	Exposed

Table 3: Sheath Material

Code	Metal Type
1	310 Stainless Steel
2	321 Stainless Steel
4	304 Stainless Steel
5	446 Stainless Steel
6	316 Stainless Steel
7	347 Stainless Steel
8	Inconel® 600 (Alloy 600)
A	Alloy 601

Table 4: Sheath Diameter

Code	O.D. Size
T	.020" O.D.
Y	.032" or 1/32" O.D.
W	.040" O.D.
A	.062" or 1/16" O.D.
B	.125" or 1/8" O.D.
V	.156" or 5/32" O.D.
C	.188" or 3/16" O.D.
D	.250" or 1/4" O.D.
E	.313" or 5/16" O.D.
F	.375" or 3/8" O.D.
H	.500" or 1/2" O.D.

Table 5: "L" Dimension

Specify in inches. See table on page 27 for codes.

Table 6: Terminal Connector

Code	Termination Style
J	Circular Terminal Block, Ceramic
K	Circular Terminal Block, Glass Cloth
X	Special, Specify

Part Number Sequence

TDC5-KG-4D09D-K

TDC5	-	K	G	-	4	D	09D	-	K
TDC5		Table 1	Table 2		Table 3	Table 4	Table 5		Table 6
Sensor Type & Style No.		Thermocouple Type	Junction Type		Sheath Material	Sheath Diameter	"L" Dimension		Terminal Connector

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SHEATHED MgO THERMOCOUPLE ASSEMBLY WITH INSULATED LEADWIRE

The TDC6 Style Thermocouple features an MgO insulated element that is terminated to an insulated extension wire. An optional terminal connector can be added to the extension wire.

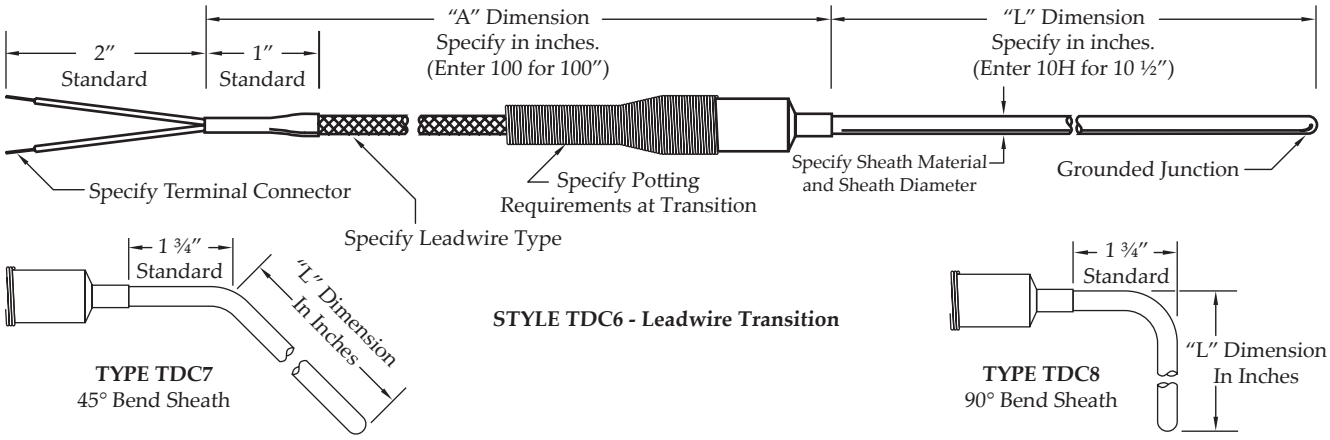

Table 1: Thermocouple Type

Thermocouple Type Codes				Limits of Error
E	J	K	T	Standard Limits
2	3	4	8	Special Limits

Table 2: Junction Type

Code	Single Junction	Code	Dual Junction
G	Grounded	H	Grounded
U	Ungrounded	L	Ungrounded Isolated
C	Exposed	V	Ungrounded Common
		W	Exposed

Table 3: Sheath Material

Code	Metal Type
1	310 Stainless Steel
2	321 Stainless Steel
4	304 Stainless Steel
5	446 Stainless Steel
6	316 Stainless Steel
7	347 Stainless Steel
8	Inconel® 600 (Alloy 600)
A	Alloy 601

Table 4: Sheath Diameter

Code	O.D. Size
T	.020" O.D.
Y	.032" or 1/32" O.D.
W	.040" O.D.
A	.062" or 1/16" O.D.
B	.125" or ⅛" O.D.
V	.156" or 5/32" O.D.
C	.188" or 3/16" O.D.
D	.250" or ¼" O.D.
E	.313" or 5/16" O.D.
F	.375" or ⅜" O.D.
H	.500" or ½" O.D.

Table 5: "L" Dimension

Specify in inches. See table on page 27 for codes.

Table 6: "A" Dimension

Specify in inches. See table on page 27 for codes.

Table 7: Leadwire Type & Construction

Insulation Type	Conductor Type	Standard	Stainless Steel Overbraid	Stainless Steel Armor
Fiberglass	Solid	A	B	C
Teflon	Solid	D	E	F
Fiberglass	Stranded	G	H	J
Teflon	Stranded	K	L	M
Kapton	Solid	N	P	Q
PVC	Solid	R	S	T
PVC	Stranded	W	Y	Z

Table 8: Terminal Connector

Code	Termination Style
0	Split Leads, 2" Length Standard
1	3/16" Spade Lugs
3	Standard Plug
4	Standard Jack
M	Mini Plug
N	Mini Jack
X	Special, Specify

Table 9: Potting Requirements

Code	Maximum Temperatures
L	500°F
M	1000°F

Part Number Sequence

TDC6-TG-6D08M-024C0M

TDC6	-	T	G	-	6	D	08M	-	024	C	0	M
TDC6		Table 1	Table 2		Table 3	Table 4	Table 5		Table 6	Table 7	Table 8	Table 9
Sensor Type & Style No.		Thermocouple Type	Junction Type		Sheath Material	Sheath Diameter	"L" Dimension		"A" Dimension	Leadwire Construction	Terminal Connector	Potting Requirements

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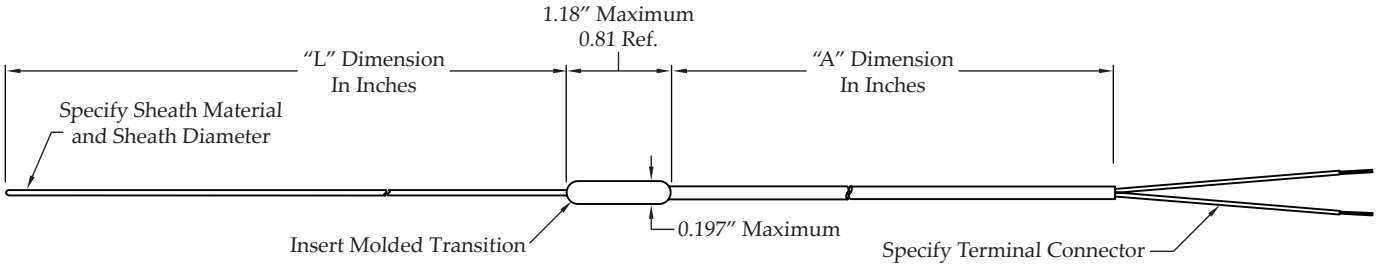
SHEATHED MgO MINI THERMOCOUPLE ASSEMBLY WITH MOLDED TRANSITION

The TDC9 Style Thermocouple features an MgO insulated element that is terminated to an insulated extension wire and encapsulated in a plastic injection molded "mini" transition using insert mold technology and a Liquid Crystal Polymer. Transition can withstand continuous exposure to temperatures up to 562°F.



STYLE TDC9 - Injection Molded Transition

Table 1: Thermocouple Type

Thermocouple Type Codes				Limits of Error
E	J	K	T	Standard Limits
2	3	4	8	Special Limits

Table 2: Junction Type

Code	Single Junction
G	Grounded
U	Ungrounded
C	Exposed

Table 3: Sheath Material

Code	Metal Type
4	304 Stainless Steel
6	316 Stainless Steel
8	Inconel® 600 (Alloy 600)

Table 4: Sheath Diameter

Code	O.D. Size
T	.020" O.D.
Y	.032" or 1/32" O.D.
W	.040" O.D.
A	.062" or 1/16" O.D.
X	Special, Specify

Table 5: "L" Dimension

Specify in inches. See table on page 27 for codes.

Table 6: "A" Dimension

Specify in inches. See table on page 27 for codes.

Table 7: Leadwire Type & Construction

Insulation Type	Conductor Type	Standard
Fiberglass	Solid	A
Teflon	Solid	D
Fiberglass	Stranded	G
Teflon	Stranded	K
Kapton	Solid	N

Table 8: Terminal Connector

Code	Termination Style
0	Split Leads, 2" Length Standard
1	#6 Spade Lugs
3	Standard Plug
4	Standard Jack
X	Special, Specify

Part Number Sequence

TDC9-TG-6T08M-024A0L

TDC9	-	T	G	-	6	T	08M	-	024	A	0
TDC9		Table 1	Table 2		Table 3	Table 4	Table 5		Table 6	Table 7	Table 8
Sensor Type & Style No.		Thermocouple Type	Junction Type		Sheath Material	Sheath Diameter	"L" Dimension		"A" Dimension	Leadwire Construction	Terminal Connector

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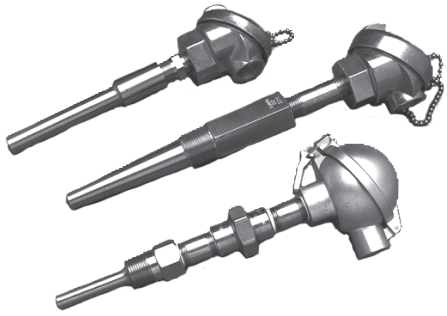
Industrial Process Thermocouples

THERMOCOUPLE CALIBRATION

Durex offers testing at standard temperatures for determination of initial calibration tolerances for thermocouples. All calibration tests are fully traceable to the National Institute of Standards and Technology (NIST). Calibration is also available for application temperatures other than the standard points in a range from -100°F to 3000°F (-79°C to 1650°C) depending on material. Certificates are supplied for all items calibrated.

Calibration (T/C Type)	Temperatures Available	Applicable Specifications
E, J, K, N, T	32°F to 2300°F (0°C to 1250°C)	ASTM E 207 ASTM E 220
B, R, S	32°F to 3000°F (0°C to 1649°C)	ASTM E 230 ANSI MC 96.1
E, K, N, T	-320°F & -110°F to 23°F (-196°C & -79°C to 0°C)	



Durex manufactures thermocouple assemblies in the following calibrations:

ANSI Letter	Durex Code and Calibration	Calibration Description
Type E	**E** Chromel P-Constantan®	Standard Limits 32°F to 1652°F (0°C to 900°C) ± 1.7°C or ± 0.5% Tol. Special Limits 32°F to 1652°F (0°C to 900°C) ± 1.0°C or ± 0.4% Tol.
Type J	**J** Iron - Constantan®	Standard Limits 32°F to 1382°F (0°C to 750°C) ± 2.2°C or ± 0.75% Tol. Special Limits 32°F to 1382°F (0°C to 750°C) ± 1.1°C or ± 0.4% Tol.
Type K	**K** Chromel P-Alumel®	Standard Limits 32°F to 2282°F (0°C to 1250°C) ± 2.2°C or ± 0.75% Tol. Special Limits 32°F to 2282°F (0°C to 1250°C) ± 1.1°C or ± 0.4% Tol.
Type T	**T** Copper-Constantan®	Standard Limits 32°F to 662°F (0°C to 350°C) ± 1.0°C or ± 0.75% Tol. Special Limits 32°F to 662°F (0°C to 350°C) ± 0.5°C or ± 0.4% Tol.
Type N	**N** Nicrosil-NISIL	Standard Limits 32°F to 2282°F (0°C to 1250°C) ± 2.2°C or ± 0.75% Tol. Special Limits 32°F to 2282°F (0°C to 1250°C) ± 1.1°C or ± 0.4% Tol.
Type R	**R** Pt 13% Rhodium-Platinum	Standard Limits 32°F to 2642°F (0°C to 1450°C) ± 1.5°C or ± 0.25% Tol. Special Limits 32°F to 2642°F (0°C to 1450°C) ± 0.6°C or ± 0.1% Tol.
Type S	**S** Pt 10% Rhodium-Platinum	Standard Limits 32°F to 2642°F (0°C to 1450°C) ± 1.5°C or ± 0.25% Tol. Special Limits 32°F to 2642°F (0°C to 1450°C) ± 0.6°C or ± 0.1% Tol.
Type B	**B** Pt 30% Rhodium-Platinum 6% Rhodium	Standard Limits 1598°F to 3092°F (870°C to 1700°C) ± 0.5% Tol.

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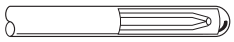
DUREX INDUSTRIES
closing the loop on thermal solutions

Industrial Process Thermocouples

JUNCTION TYPES

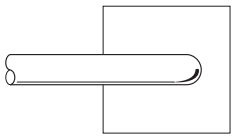
EXPOSED (E)
Joined and welded wires.
Specified where fast response is required.

GROUNDED (G)
Junction is seal welded integrally to the sheath.
Protects wire from corrosive conditions.



UNGROUNDED (U)
Junction is electrically insulated from seal welded sheath. Design helps prevent stray EMF's.

NECKDOWN (N)
Neckdown provides faster response.
Junction can be single or dual circuit and grounded or ungrounded.



PAD (P)
Pad is designed for welding directly to boiler or process tubes for sensing skin temperatures.

SHEATH DIAMETERS

Sheath Code	T	Y	W	A	B	V	C	D	E	F	H
Sheath Diameter	.020″	.032″	.040″	.062″	.125″	.156″	.188″	.250″	.313″	.375″	.500″
Wire Guage	38	34	33	30	24	22	20	18	16	15	11
Max. Length	100′	150′	200′	400′	250′	200′	175′	100′	55′	40′	30′

PART NUMBER CODE DEFINITIONS

<table>
<tr><th colspan="4">"L" Dimensions & "U" Dimensions</th><th colspan="2">"A" Dimensions</th><th colspan="4">Fractional Dimension Letter Code</th></tr>
<tr><td colspan="4" rowspan="2">"L" and "U" dimensions are specified in whole inches and use a letter Code for the fraction.
(Enter 0 when there is no fraction)
Enter the three digit code per examples below:</td><td colspan="2" rowspan="2">"A" dimensions are specified in whole inches only.
Enter the three digit code as follows:</td><td>1/16″</td><td>A</td><td>11/16″</td><td>L</td></tr>
<tr><td>1/8″</td><td>B</td><td>3/4″</td><td>M</td></tr>
<tr><td>3/16″</td><td>C</td><td>13/16″</td><td>N</td></tr>
<tr><td>1/4″</td><td>D</td><td>7/8″</td><td>P</td></tr>
<tr><td>5/16″</td><td>E</td><td>15/16″</td><td>R</td></tr>
<tr><td>3″</td><td>030</td><td>10 5/8″</td><td>10K</td><td colspan="2" rowspan="5"></td><td>3/8″</td><td>F</td><td>1″</td><td>S</td></tr>
<tr><td>4 1/2″</td><td>04H</td><td>12″</td><td>120</td><td>9″</td><td>009</td><td>7/16″</td><td>G</td><td>0</td><td rowspan="5">No Fraction</td></tr>
<tr><td>6 1/4″</td><td>06D</td><td>15 3/8″</td><td>15F</td><td>12″</td><td>012</td><td>1/2″</td><td>H</td></tr>
<tr><td>7 7/8″</td><td>07P</td><td>17 3/4″</td><td>17M</td><td>36″</td><td>036</td><td>9/16″</td><td>J</td></tr>
<tr><td>9 5/8″</td><td>09K</td><td>22 1/8″</td><td>22B</td><td>144″</td><td>144</td><td>5/8″</td><td>K</td></tr>
</table>

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Rev 1/28/15

Industrial Process Thermocouples

SPECIFICATIONS

Sheath

Materials: 304 Stainless Steel & Incoloy® 600 are most commonly used. See sheath materials tables on the following pages for the metal types used and their codes.
Tolerances: Outside diameter ± 0.002″ of nominal size.

Finish

Bright annealed, 32 micro-inch or better.

Insulation

High purity magnesium oxide is standard; ultra high purity magnesium oxide and alumina oxide are available.

Configurations

Sheath diameters available from 0.020″ to 0.500″.
Two wire (single circuit) and four wire (double circuit) configurations are standard in most diameters.

Formability

Minimum radiums: 2X sheath diameter for most thermocouple materials. Consult Durex Industries if special forming is required.

Weldability

Thermocouple sheath can be brazed, soldered, or welded without loss of insulation resistance. Welding of special sheath materials by the customer is not recommended.

Physical Testing

- Dimensional and visual
- Helium leak
- Radiographic (X-Ray)
- Dye penetration
- Metallurgical per ASTM E-2, E-3, and E-112
- Compaction density per RDT C2-IT

Electrical Testing

- Calibration per ASTM E-220 traceable to NIST
- Insulation resistance
- Wire resistance (ohms per foot loop)
- Time response per RDT C2-3T
- Thermal cycling per ASTM E-225

ASTM Testing

Sheathed thermocouple material and sheathed thermocouples are tested using the following specifications:

ASTM E585	Standard specifications for sheathed based-metal thermocouple materials.
ASTM E608	Standard specifications for metal-sheathed base-metal thermocouples.
ASTM E780	Standard method for measuring the insulation resistance of sheathed thermocouple-material at room temperature.
ASTM E839	Standard test methods for sheathed thermocouples and sheathed thermocouple material.

Insulation Resistance

Nominal Sheath Outside Diameter	Applied D.C. Voltage (min.)	Insulation Resistance MegΩ
.030″ Diameter and smaller	50	100
.030″ to .059″ Diameter	50	500
.062″ Diameter and larger	500	1000

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