Ready-to-Install TDY, TDZ, RIY, & TIY Temperature Transmitter & Display Assemblies

October 2000

### We're Your One Stop Temp Shop

Why waste valuable time searching around for temperature assembly pieces and parts? Our fully-tested, ready-to-install temperature transmitter with display assemblies feature:

- Universal TDY PC-Programmable, TDZ Smart HART®, and RIY & TIY Site-Programmable Temperature Transmitters with Displays.
- General location, hazardous area, and explosionproof connection heads.
- Wide variety of RTD and thermocouple sensors.
- Spring-loaded fittings allow you to easily separate the sensor and transmitter from the thermowell.
- Industrial-strength stainless steel thermowells, flanges, and fittings in the sizes you need most.
- Factory Mutual (FM) approved explosion-proof temperature transmitter and connection head combinations.
- Remarkable accuracy of up to ±0.014°C (±0.025°F) using a TDZ and our Calibration Suite.
- Complete NIST-traceable calibration records available from our Calibration Suite.

## **One Ordering Number**

Specify your complete temperature transmitter assembly using one simple table and ordering number.

#### Certifications

TDY & TDZ PC-Programmable Temperature Transmitters:



Factory Mutual Research Corporation (FMRC) Global Explosion-Proof\*- [HP in BH]

Class I, Division 1, Groups A, B, C, D

Class II & III, Division 1, Groups E, F, & G;

NEMA 4X; IP66; T6 @ 60°C<sub>Max. Amb.</sub>

Max. Amb.

**CE Conformant**, EMC Directive 89/336/EEC EN 50081-2, 1993 and EN 50082-2, 1995

RIY & TIY Site-Programmable Temperature Transmitters:



Factory Mutual Research Corporation (FMRC) Global Explosion-Proof\* – [HP in BH]

Class I, Division 1, Groups A, B, C, D

**Dust Ignition-Proof** – [HP in BH] Class II & III, Division 1, Groups E, F, & G;



Canadian Standards Association (CSA) Non-Incendive – [HP] Class I, Div. 2, Groups A, B, C, D Suitable For – [HP] Class II, Div. 2, Class III, Divs. 1 & 2

**CE Conformant,** EMC Directive 89/336/EEC EN 50081-2, 1993 and EN 50082-2, 1995

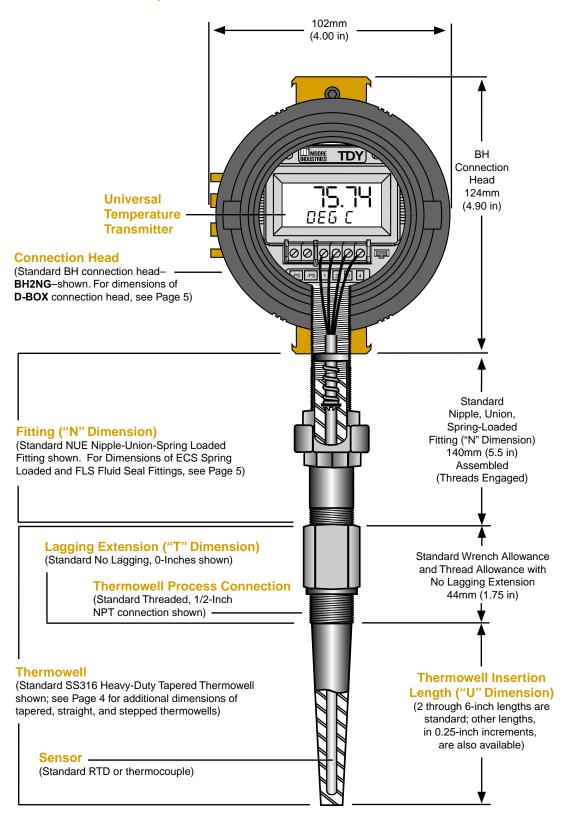
Optional Approvals: FMRC Non-Incendive, CSA Explosion-Proof, and SAA, FMRC, ATEX, and NEPSI Intrinsically Safe are also available. Consult factory for details.

\*Factory Mutual Explosion-Proof certifications apply to the temperature transmitter (TDY, TDZ, RIY, TIY) and Connection Head combination. Sensor, Thermowell and Fixed Immersion Sensor assembly components are not included in the certifications. For Group A, seal all conduits within 18".



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# Standard Temperature Assemblies with Sensor and Thermowell



## Select one from each category to order a Temperature Assembly with Sensor and Thermowell:

#### Universal Temperature Transmitter (See Page 8, and the TDY, TDZ, RIY, and TIY Data Sheets for Specifications) TDY Isolated, PC-Programmable Temperature Transmitter with Display (standard) TDZ Isolated, PC-Programmable Smart HART® Temperature Transmitter with Display (standard) RIY Isolated, Site-Programmable RTD Transmitter (standard) TIY Isolated, Site-Programmable Thermocouple Transmitter (standard) Thermowell Type (See Page 4 for Descriptions and Dimensions) Heavy-Duty Threaded, Tapered Well (standard) Standard-Duty Threaded, Straight Well (standard) Standard-Duty Threaded, Stepped Well Sanitary Well Thermowell Process Connection Size (See Page 2) Threaded, ½-Inch NPT (standard) Threaded, 3/4-Inch NPT (standard) **P3** Threaded, 1-Inch NPT Flanged Well, replace "?" with ordering code from Table 1 on Page 5 SW? Welded, replace "?" with size: SW1= 1-inch, SW2 = ½-inch, SW3 = ¾-inch, SW4 = 1¼-inch D? Sanitary well, replace "?" with cap diameter, 1-Inch, 2-Inch, etc. (consult factory for dimensions) Thermowell Insertion Length ("U" Dimension) (See Page 2) U? Replace "?" with any Insertion Length in 0.25-Inch increments (2 through 6-inch lengths are standard) Lagging Extension Length ("T" Dimension) (See Page 2) T0 No Lagging, 0 Inches (standard) Replace "?" with length in 0.25-Inch increments Thermowell Material **\$304** \$\$304 (standard) **S316** SS316 (standard) CS Carbon Steel (standard) BR Brass (standard) Fitting Type ("N" Dimension) (See Pages 2 and 5 for Descriptions and Dimensions) Nipple-Union Spring-Loaded Fitting (standard) 26-ECS Spring Loaded Fitting 26-FLS Fluid Seal Fitting **Sensor Type** (See Page 8 for Specifications) Platinum RTD; 3- and 4-Wire; 100 ohm; $\alpha$ =0.00385 (standard) **PT104\*** Platinum RTD; 3- and 4-Wire; 1000 ohm; $\alpha$ =0.00385 (standard) CU4\* Copper RTD; 3- and 4-Wire; 10 ohm Don't See What You Need? N4\* Nickel RTD; 3- and 4-Wire; 120 ohm This bulletin features just a sample of the wide TCJU<sup>‡</sup> J-Type Thermocouple; Ungrounded (standard) range of temperature assembly choices we offer. TCKU<sup>‡</sup> K-Type Thermocouple; Ungrounded (standard) Whatever your temperature assembly needs are, TC?U<sup>‡</sup> Replace "?" with other T/C type E, T, R, S, N, B, or C; Ungrounded our temperature interface solution experts are Note: Other RTD types and grounded T/Cs are also available. Consult factory for details. ready to help! **Options** (See Page 7 for Descriptions) High accuracy temp, system calibration with NIST test data report -VTD Standard factory calibration with NIST test data report Remote-Mounted terminal block; replace "?" with Connection head type for the terminal block, i.e. -RMLH2NS. See Page 7 for details. **Connection Head** (See Pages 2 and 5 for Dimensions) BH2NG Aluminum Body with Clear Glass Cover, explosion-proof D2LC Aluminum Body with Clear Valox Cover, NEMA 4X, IP66 NOTE: All listed connection heads are standard. Other heads available. TDY C - P2 U4 - T0 S304 - 26 - NUE - PT14 - VTB [BH2NG] (Ordering Number Example)

\*RTD Sensors are not available with the TIY. ‡Thermocouple Sensors are not available with the RIY.

## Thermowell Selection

Figure 1. Heavy-Duty Threaded, Tapered Thermowells (Standard) are convenient to install and replace. Being heavy-duty, they will withstand a high force and high velocity factor from process fluid flow. They are easy to weld or braze for applications which require sealing.

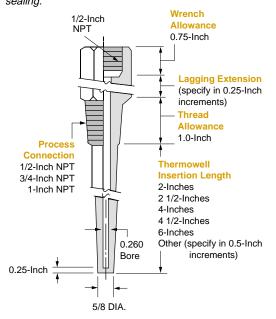


Figure 2. Standard-Duty Threaded, Straight Thermowells (Standard), convenient to install and replace, will withstand a high force and high velocity factor from the process fluid flow, but less than that of the heavy duty well because of lower natural frequency. They are easy to weld or braze for applications which require sealing.

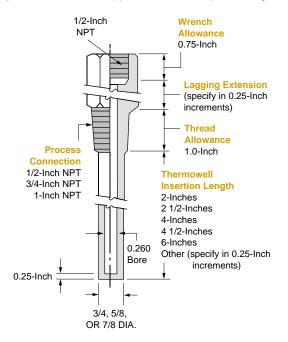


Figure 3. Standard-Duty Threaded, Stepped Thermowells (Standard), also convenient to install and replace, deliver a faster response time than tapered or straight wells, but less stength and capability to withstand high force and high velocity from the process fluid flow. They are easy to weld or braze for applications which require sealing.

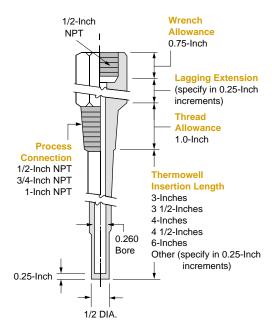
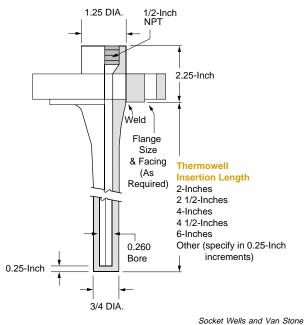


Figure 4. Flanged Thermowells provide easy removal and high pressure resistance (shown with a Straight Thermowell). Tapered and Stepped Thermowell can also be ordered as Flanged Wells. See Table 1 for available process connection flange sizes.



Wells are also available.
Contact the factory for more information.

Figure 5. Dimensions for the D-BOX, a NEMA 4X, IP66 certified enclosure.

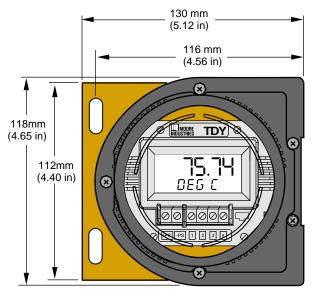


Table 1. Process Connection Flange Sizes.

Table 1. FIU	cess Connection Flange Sizes.
Ordering	Flange
Code	Size
F1	1-Inch, 150#, Flat Facing
F2	1-Inch, 150#, Raised Facing
F3	1-Inch, 150#, Ring Type Joint
F4	1 1/2-Inch, 150#, Flat Facing
F5	1 1/2-Inch, 150#, Raised Facing
F6	1 1/2-Inch, 150#, Ring Type Joint
F7	2-Inch, 150#, Flat Facing
F8	2-Inch, 150#, Raised Facing
F9	2-Inch, 150#, Ring Type Joint
F10	1-Inch, 300#, Flat Facing
F11	1-Inch, 300#, Raised Facing
F12	1-Inch, 300#, Ring Type Joint
F13	1 1/2-Inch, 300#, Flat Facing
F14	1 1/2-Inch, 300#, Raised Facing
F15	1 1/2-Inch, 300#, Ring Type Joint
F16	2-Inch, 300#, Flat Facing
F17	2-Inch, 300#, Raised Facing
F18	2-Inch, 300#, Ring Type Joint
F19	1-Inch, 400-600#, Flat Facing
F20	1-Inch, 400-600#, Raised Facing
F21	1-Inch, 400-600#, Ring Type Joint
F22	1 1/2-Inch, 400-600#, Flat Facing
F23	1 1/2-Inch, 400-600#, Raised Facing
F24	1 1/2-Inch, 400-600#, Ring Type Joint
F25	2-Inch, 400-600#, Flat Facing
F26 F27	2-Inch, 400-600#, Raised Facing
F27	2-Inch, 400-600#, Ring Type Joint 1-Inch, 900-1500#, Flat Facing
F29	1-Inch, 900-1500#, Flat Facing
F30	1-Inch, 900-1500#, Raised Facing
F31	1 1/2-Inch, 900-1500#, Flat Facing
F32	1 1/2-Inch, 900-1500#, Plat Facing
F33	1 1/2-Inch, 900-1500#, Ring Type Joint
F34	2-Inch, 900-1500#, Flat Facing
F35	2-Inch, 900-1500#, Raised Facing
F36	2-Inch, 900-1500#, Ring Type Joint
	, , 3 /

# **Fitting Selection**

Figure 6. NUE Nipple, Union, Spring-Loaded Fitting (Standard) combination fitting uses a union to allow easy assembly of the entire system. It can be adjusted as many times as required.

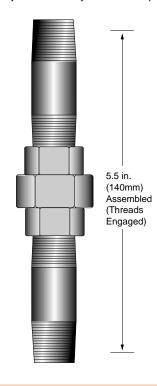
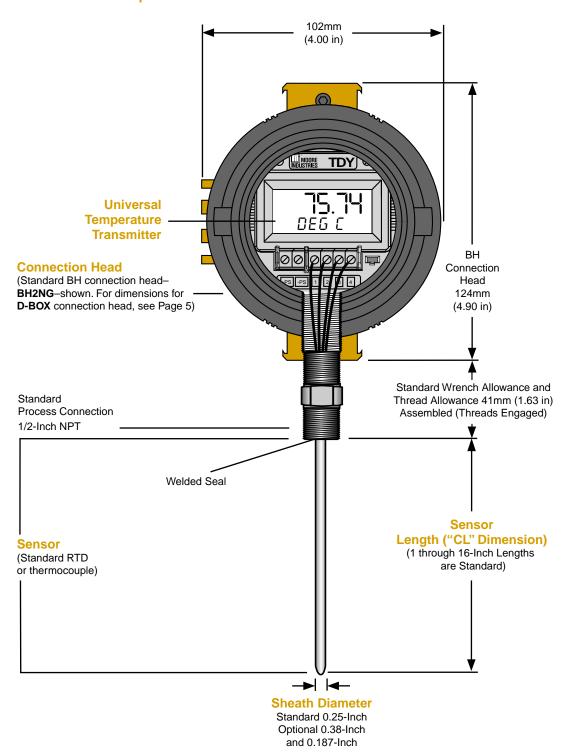


Figure 7. FLS Fluid Seal Fitting is used for transmitter assemblies with thermowells and assemblies with fixed immersion sensors. It prevents fluid leak along the sensor sheath so it's ideal for using heat transfer fluid in the thermowell and for air duct applications. Although the FLS provides adjustment precision, it crimps the sensor sheath, and can therefore be adjusted only once (up to 0.5 inch).

1.5 in.
(38mm)
Assembled
(Threads
Engaged)

Figure 8. ECS Spring-Loaded Fittings assure a good thermal connection between the sensor and thermowell offering a quick response time.

# Standard Temperature Assemblies with Fixed Immersion Sensor



## Select one from each category to order a Temperature Assembly with Fixed Immersion Sensor:

Universal Temperature Transmitter (See Page 8 and TDY, TDZ, RIY, & TIY Data Sheets for Specifications) Isolated, PC-Programmable Temperature Transmitter with Display (standard) Isolated, PC-Programmable Smart HART® Temperature Transmitter with Display (standard) RIY Isolated, Site-Programmable RTD Transmitter (standard) TIY Isolated, Site-Programmable Thermocouple Transmitter (standard) Sensor Length ("CL" Dimension) (See Page 6) CL? Replace "?" with any Sensor Length (e.g., CL2.75, CL6) in 0.25-inch increments (2 through 16-inch lengths are standard) **Sensor Sheath Diameter** 0.187-Inch Diameter (standard) D25 0.25-Inch Diameter (standard) Don't See What D38 0.38-Inch Diameter You Need? **Sensor Sheath Material** This bulletin features just a sample of the wide S304 SS304 (standard) range of temperature S316 SS316(standard) assembly choices we **Sensor Type** (See Pages 7 & 8 for Specifications) offer. Whatever your temperature assembly PT1C4\* Platinum RTD; for 3- and 4-Wire; 100 ohm;  $\alpha$ =0.00385 (standard) needs are, our tempera-Platinum RTD; for 3- and 4-Wire; 1000 ohm;  $\alpha$ =0.00385 (standard) PT10C4\* ture interface solution CUC4\* Copper RTD; 2-, 3-, 4-Wire; 10 ohm experts are ready to help! Nickel RTD; 2-, 3-, 4-Wire; 120 ohm NC4\* TCCJU<sup>‡</sup> J-Type Thermocouple; Ungrounded (standard) TCCKU<sup>‡</sup> K-Type Thermocouple; Ungrounded (standard) \*RTD Sensors are not available with the TIY TCC?U<sup>‡</sup> Replace "?" with other T/C type E, T, R, S, N, B, or C ‡Thermocouple Sensors are not available with the RIY. **Options** (See Page 7 for Descriptions) High accuracy temperature system calibration with NIST test data report Standard factory calibration with NIST test data report -RM? Remote-Mounted terminal block; replace "?" with connection head type for the terminal block, i.e. -RMLH2NS. See Remote-Mounted Terminal Block below for details. Connection Head (See Pages 5 and 6 for Dimensions) **BH2NG** Aluminum Body with Clear Glass Cover, explosion-proof (standard) D2LC Aluminum Body with Clear Valox Cover, NEMA 4X, IP66 (standard) TDZ / CL6 / D25 / S316 /-TCCJU –VTB [BH2NG] (Ordering Number Example)

## **Factory Calibration Available**

Sensor-to-Transmitter Trimming—Our state-of-the-art Calibration Suite provides exceptional accuracy by immersing the system's sensor in a precision calibration bath, then using the transmitter to "capture" the sensor's true readings. This method effectively compensates for errors caused by inherent sensor inaccuracies. The system is delivered configured, calibrated, and ready for installation. NIST traceable test data is supplied with each system. To order, specify option –VTB in the model number.

NIST Traceable Test Report—Moore Industries will configure the temperature transmitter and calibrate zero and span points with customer-supplied values using a precision simulated sensor input. NIST traceable test data indicating actual recorded values is supplied with each instrument. To order, specify option –VTD in the model number.

## **Remote-Mounted Terminal Block**

Remove the Display From the Process—Position your sensor in the heart of your process while keeping the transmitter in an easily accessible area with our Remote-Mounted Terminal Block option. Add the -RM? option to your temperature assembly and receive a transmitter in the specified housing, and a sensor and terminal block mounted inside an additional housing. Sensor extension wiring (not included) connects the terminal block to the transmitter.



Ready-to-Install TDY, TDZ, RIY, & TIY Temperature Transmitter & Display Assemblies

# Temperature Transmitter Specifications

#### **Basic RIY & TIY Specifications:**

Temperature Assemblies Come with Transmitter Model Numbers:

RIY/R0/4-20MA/12-42DC/[HOUSING CHOICE] TIY/J1/4-20MA/12-42DC/[HOUSING CHOICE]

Input: See Table 2

Output: 4-20mA output is accurate to within ±0.05% of input span

Power: 12-42Vdc (loop-powered on output side)

RJC Accuracy (TIY T/C only): ±0.25°C

**Isolation:** RIY: 1000VDC input to output to case; TIY: 500Vrms between input and output terminals

RFI/EMI Protection: RIY: 20V/m when tested to SAMA 33.1 ABC

0.1%/ $\Omega$ ; TIY: 10V/m - ABC  $\leq$  0.1% of maximum span

Operating and Storage Range:  $-40^{\circ}$ C to  $+82^{\circ}$ C  $(-40^{\circ}$ F to  $+180^{\circ}$ F) Ambient Temperature Effect on Accuracy: RIY:  $\pm 0.006\%$  of span/°C change  $\pm 10$ ppm of ohm reading/°C; TIY:  $\pm 0.01\%$  of span/°C

Ambient Temperature Effect on RJC (TIY T/C only):

±0.75°C/°.50C change in temperature

For detailed specifications, see the RIY Data Sheet (#3.38) or

TIY Data Sheet (#3.85)

Table 2. RIY & TIY Input Specifications

Table 21 Tall a TT Input openingations				
Input Type	Range	Accuracy		
RIY Site-Programmable Temperature Transmitter				
<b>PT14</b> Platinum RTD; 3- and 4-Wire; 100 ohm, $\alpha = 0.00385$ (standard)	-200 to +850°C (-328 to +1562°F)	±0.2°C ±0.36°F		
<b>PT104</b> Platinum RTD; 3- and 4-Wire; 1000 ohm, $\alpha = 0.00385$ (standard)	-200 to +630°C (-328 to +1166°F)	±0.1°C ±0.18°F		
<b>CU4</b> Copper RTD; 3- and 4-Wire; 10 ohm, $\alpha = 0.00427 @ 0^{\circ}C$	-50 to +250°C (-58 to +482°F)	±1.6°C ±2.88°F		
<b>N4</b> Nickel RTD; 3- and 4-Wire; 120 ohm, α = 0.00672 @ 0°C	-80 to +320°C (-112 to +608°F)	±0.14°C ±0.25°F		
TIY Site-Programmable Temperature Transmitter				
TCJU J-Type T/C; Ungrounded (standard)	-50 to +760°C (-58 to +1400°F)	±0.25°C ±0.45°F		
TCKU K-Type T/C; Ungrounded (standard)	-50 to +1370°C (-58 to +2498°F)	±0.30°C ±0.54°F		

# **Sensor Specifications**

**Number of Lead Wires (RTDs):** All temperature assemblies are supplied with 4-wire RTDs that inherently avoid lead wire resistance imbalances caused by wire corrosion and aging.

Lead Wires: Teflon insulated, hermetically sealed

**Sheath Material:** Stainless steel 316 (other materials available) **Accuracy:** RTD: ±0.12% at 0°C (high accuracy RTDs also available);

Consult factory for thermocouple tolerances

**Pressure:** 12,000 psig (-20 to 100°C, -29 to 37°C) for 0.25" dia. **Response Time:** RTD, <5 seconds to 63.2% temperature change; Thermocouple, 4.5 sec. for ungrounded, typical; 2.0 sec. for grounded to 63.2% temperature change

**Vibration Limit:** 10 G over a frequency range of 10–500Hz **Stability:** RTD, 0.2°C after 10,000 hrs. at maximum temperature

(1 year, 51 days, 16 hours continuous)

#### **Basic TDY Specifications:**

Temperature Assemblies Come with Transmitter Model Number:

TDY/PRG/4-20MA/10-42DC/[HOUSING CHOICE]

Input: See Table 3

Output: 4-20mA output is accurate to within ±0.03% of input span

Power: 10-42Vdc (loop-powered on output side)
RJC Accuracy (T/C inputs only): ±0.45°C
Isolation: 500VAC/1000VDC input to output to case

RFI/EMI Protection: 20V/m @20-1000MHz

Operating and Storage Range: Transmitter: -40°C to +85°C (-40°F to +185°F); Display: -20°C to +65°C (-4°F to +149°F)

Ambient Temperature Effect on Accuracy: ±0.015% of span per °C change, maximum (+0.001% of ohm reading for RTD inputs)

Amb. Temperature Effect on RJC (T/C only): ±0.015°C/°C change For detailed specifications, see the TDY Data Sheet (#3.75)

#### **Basic TDZ Specifications:**

Temperature Assemblies Come with Transmitter Model Number:

TDZ/PRG/4-20MA/12-42DC/[HOUSING CHOICE]

Input: See Table 3

Output: 4-20mA output is accurate to within ±0.015% of input span

**Power:** 12-42Vdc (loop-powered on output side) **RJC Accuracy (T/C inputs only):** ±0.45°C

**Isolation:** 500Vrms input to output

RFI/EMI Protection: 20V/m according to SAMA 33.1 abc
Operating and Storage Range: -40°C to +85°C (-40°F to +185°F)
Amb. Temperature Effect on Accuracy: 0.003% of span/°C change
Ambient Temperature Effect on RJC: ±0.005°C/°C change from 25°C
For detailed specifications, see the TDZ Data Sheet (#3.76)

Table 3. TDY & TDZ Input Specifications

Input Type	Range	Accuracy		
TDY PC-Programmable Temperature Transmitters				
<b>PT14</b> Platinum RTD; 3- and 4-Wire; 100 ohm, $\alpha = 0.00385$ (standard)	-200 to +850°C (-328 to +1562°F)	±0.21°C ±0.38°F		
<b>PT104</b> Platinum RTD; 3- and 4-Wire; 1000 ohm, $\alpha = 0.00385$ (standard)	-50 to +500°C (-58 to +932°F)	±0.21°C ±0.38°F		
<b>CU4</b> Copper RTD; 3- and 4-Wire; 10 ohm, $\alpha = 0.00427 @ 0^{\circ}C$	−50 to +250°C (−58 to +482°F)	±1.2°C ±2.16°F		
<b>N4</b> Nickel RTD; 3- and 4-Wire; 120 ohm, α = 0.00672 @ 0°C	-80 to +320°C (-112 to +608°F)	±0.16°C ±0.29°F		
TCJU J-Type T/C; Ungrounded (standard)	-180 to +770°C (-292 to +1418°F)	±0.28°C ±0.5°F		
TCKU K-Type T/C; Ungrounded (standard)	-150 to +1372°C (-238 to +2502°F)	±0.3°C ±0.54°F		
TDZ Smart HART® Ten	nperature Transmitte	r		
<b>PT14</b> Platinum RTD; 3- and 4-Wire; 100 ohm, $\alpha$ = 0.00385 (standard)	-200 to +850°C (-328 to +1562°F)	±0.1°C ±0.18°F		
<b>PT104</b> Platinum RTD; 3- and 4-Wire; 1000 ohm, $\alpha = 0.00385$ (standard)	-200 to +320°C (-328 to +608°F)	±0.1°C ±0.18°F		
<b>N4</b> Nickel RTD; 3- and 4-Wire; 120 ohm, α = 0.00618 @ 0°C	-50 to +250°C (-58 to +482°F)	±0.1°C ±0.18°F		
TCJU J-Type T/C; Ungrounded (standard)	-200 to +1000°C (-328 to +1832°F)	±0.25°C ±0.45°F		
TCKU K-Type T/C; Ungrounded (standard)	-230 to +1370°C (-382 to +2498°F)	±0.3°C ±0.54°F		

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