MOORE INDUSTRIES WORLDWIDE

# THZ² & TDZ²

Smart HART® Temperature Transmitters and Signal Isolators

March 2015

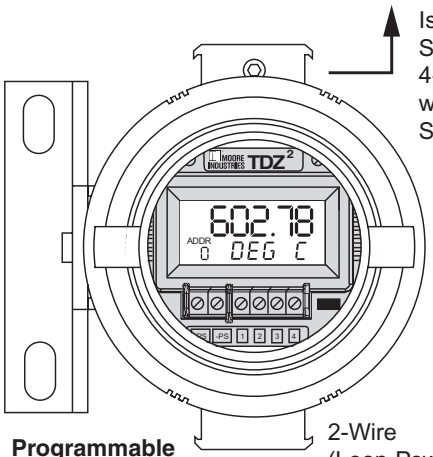
## Description

Moore Industries' Smart HART® Temperature Transmitters and Signal Isolators configure in minutes to accept a direct signal input from a wide array of sensors and analog devices:

- **14 RTD Types**
- **9 Thermocouple Types**
- **Current and Voltage Signals**
- **Resistance and Potentiometer Devices**
- **Direct Millivolt Sources**

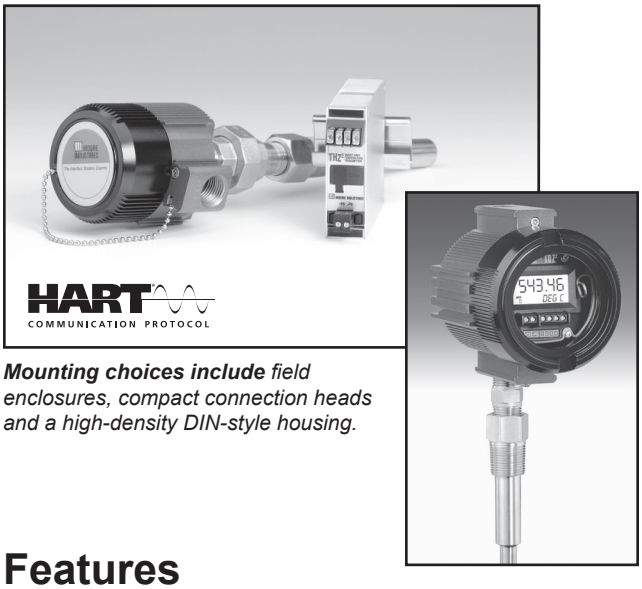
These 2-wire (loop-powered) transmitters provide an isolated and linear 4-20mA output proportional to the input. This signal is ready for direct interface with HART or non-HART based DCS, PLC and other computer-based SCADA systems.

***Figure 1.*** *Available models provide programmable inputs with a fully-isolated and linear analog output.*




***Certifications (see Page 16 for details)***

FM C APPROVED US IECEx ANZEx Ex CE CSA C US




***Mounting choices include*** *field enclosures, compact connection heads and a high-density DIN-style housing.*

## Features

- **Input-to-output analog accuracy of up to ±0.014°C (±0.025°F)*** is the absolute best in the industry.
- **20-bit input resolution delivers exceptional digital accuracy** of ±0.1°C (±0.18°F) with all Pt RTDs, or up to ±0.05°C (±0.09°F)* for Pt1000 RTD.
- **Set up with HART Communicator, HART-based system, or PC** (a HART modem is not needed for PC set up) allows you to check the status, or perform parameter changes, from the control room or any field termination point on the wires.
- **Long-term stability** provides up to 5 years between scheduled calibrations.
- **Standard integral display on the model TDZ² shows real-time process status** and valuable loop diagnostic information.
- **Advanced RFI/EMI protection and ambient temperature compensation** guard against environmental factors that can quickly degrade measurement accuracy.



*High-accuracy measurements are achieved by using a 4-wire, 1000 ohm platinum RTD with a span of 100°F (50°F minimum) calibrated in our sensor-matching calibration bath.

# THZ$^2$ & TDZ$^2$

Smart HART® Temperature Transmitters
and Signal Isolators

## Set Up with HART Communicator, DCS, Asset Management System (AMS) or PC (No HART Modem Required)

Our Smart HART Transmitters can be programmed in minutes, and interrogated at any time, from anywhere on the 4-20mA loop (see Figure 2). You can use a standard hand-held HART Communicator, a HART-based control system, an Asset Management System (AMS) or Moore Industries' Intelligent PC Configuration Software to:

- **Program Input Type and Range—**Span, zero and input type values are all programmable.
- **Adjust Sensor Trim Offset—**Set an offset to compensate for measurement errors that are caused when a temperature sensor is not performing to its rated curve specifications.
- **Set Damping Time—**Eliminate imprecise readings caused by noise and other insignificant process fluctuations by setting a damping time between 1-30 seconds.
- **View Real-Time Process Values—**View the existing process value (in the appropriate engineering unit), lower and upper range values, actual output current and output current as a percentage of output span.
- **Choose Sensor Failure Mode—**If the input is lost, you have the choice of the output going upscale (to 23.6mA), downscale (to 3.6mA) or holding its last value.
- **Select Device Identification and Data—**Tag number (8 characters), configuration date, unit location code (16 characters), a message (32 characters) and polling address (0-15) are selectable.
- **Fix Output Current (Loop Test)—**To assist in calibrating your system, the transmitter's current output can be fixed to a known value so you can check it against the value being read by your receiving device.

### Non-Volatile Memory

If power to the transmitter is lost, the unit resumes normal operation using the parameters that were configured, upon reapplication of power.

## Point-to-Point Loops Deliver Analog Simplicity with Remote Programmability

In the majority of applications, the THZ$^2$ or TDZ$^2$ is installed on a point-to-point 4-20mA process loop like a regular analog transmitter (Figure 2). A HART Communicator, HART-based system or PC is used to configure and view the transmitter's operating parameters and diagnostic data from any point on the loop.

***Figure 2.*** *From any termination point on the 4-20mA loop, you can view, test and change the transmitter's operating parameters using a HART Communicator or from a PC using our Intelligent PC Configuration Software (a HART modem is not required for PC setup).*

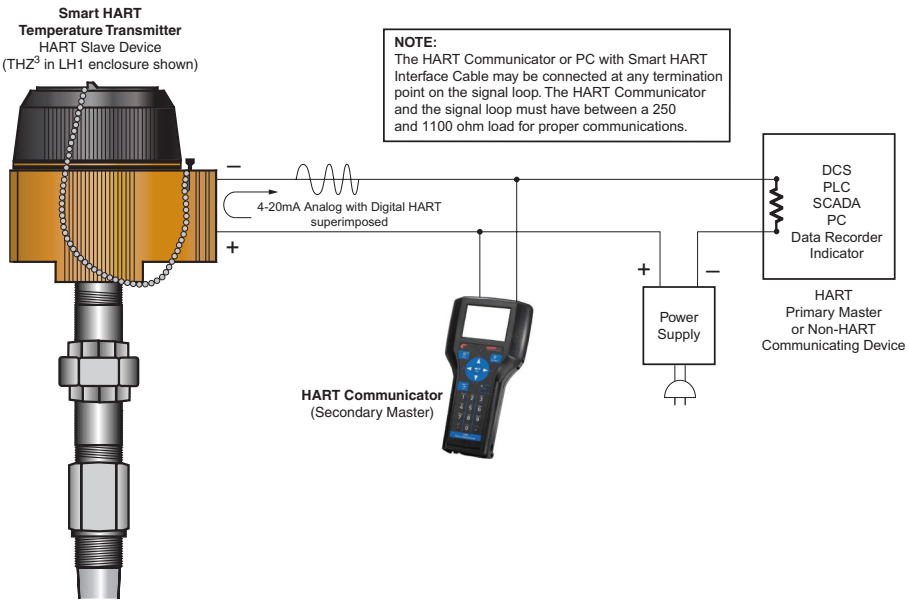
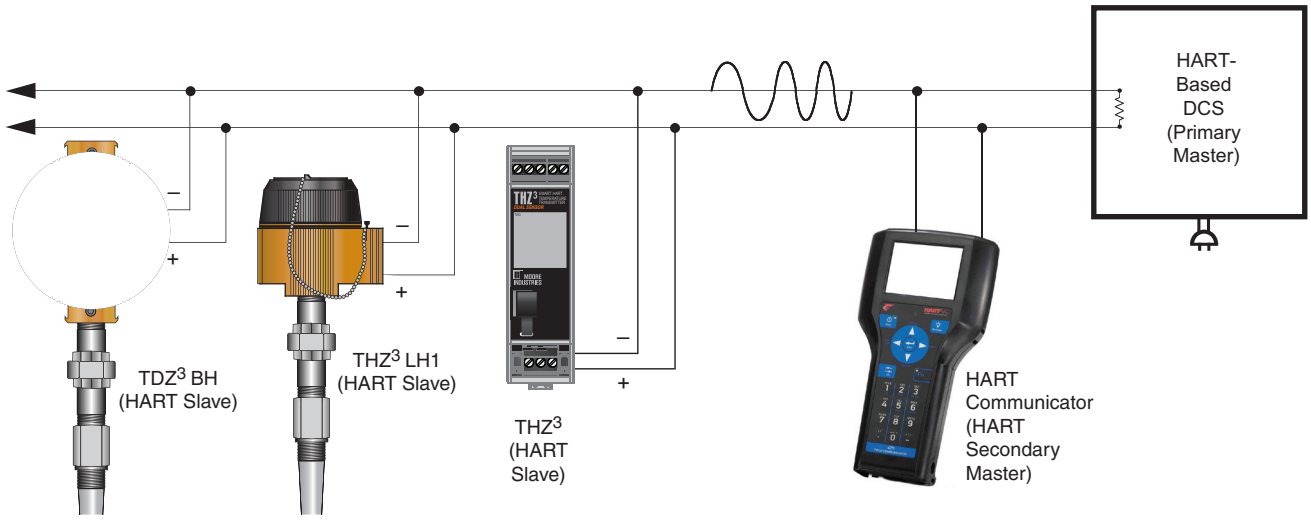


***Figure 3.*** *Save time and money by networking up to 15 of our Smart HART transmitters onto a single digital data link.*




## Multidrop Networks Save Wiring Costs

Any combination of up to 15 THZ² and TDZ² smart transmitters connect in parallel onto a HART digital communication link (Figure 3). This means you can use a single loop, instead of 15 separate loops, to connect multiple transmitters. In a multidrop network, the transmitter's measured process variable is output digitally, so the 4-20mA signal (set to 4mA) is not used.

A HART-based control system uses each transmitter's individual address (1-15) to configure or view the transmitter's data. A HART Communicator or a PC can be used in this configuration to access information from, or transmit configuration information to, the transmitter from anywhere on the HART loop.

## HART Master/Slave Structure

To implement two-way communications between the transmitter and the device configuring or receiving its information, the transmitter operates in a HART Master/Slave structure.

The THZ² or TDZ² is a Slave (or Slaves in a multidrop network). There can be two Masters per system: a Primary Master and a Secondary Master. In the majority of applications, the Master is a HART Hand-Held Communicator, but it can also be a HART-based control system. Operating in HART's Poll/Response (Normal) Mode, the HART Master polls the transmitter two times per second to access the current process variable status, send setup data to the transmitter, or remotely view its identification, configuration and diagnostic data.

## THZ² & TDZ² Device Description (DD)

Moore Industries' Device Description (DD) is the device-specific programming information that is loaded into a standard HART Communicator. It allows access to all of the unit's programming functions except the custom linearization table function.

### How to Determine if Your HART Communicator Has a THZ²/TDZ² Device Driver

Hand-held HART Communicators typically feature a list of companies in a DD library. The "THZ²/TDZ²" will appear if you have the proper DD installed. If the hand-held does not have the proper DD, contact the Moore Industries Interface Solution Center nearest you.

**IMPORTANT NOTE:** Moore Industries' previous version of HART transmitters used the Device Description "THZ/TDZ". This DD is NOT compatible for use with the THZ² or TDZ².

### Also Programs with the Generic HART DD

Even if your communicator is not up to date, most of the important programming features can be accessed without the THZ²/TDZ² DD by using the "Generic" HART DD available on HART Communicators. Or you can order the unit factory-configured by Moore Industries with the THZ²/TDZ² DD.

# THZ² & TDZ²

Smart HART® Temperature Transmitters
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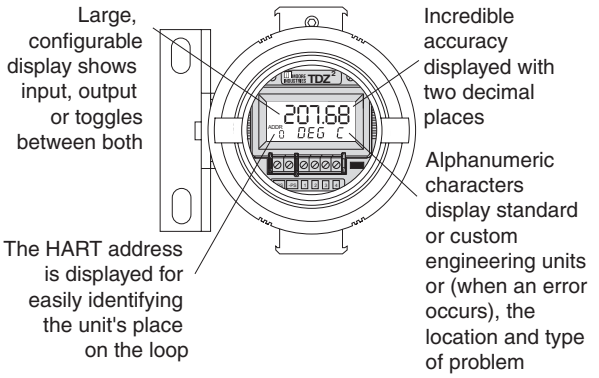
## Easy-to-Read, Customizable Display

The TDZ² transmitter comes standard with a large display that features easy-to-read alphanumeric characters. Set the display to show input status, output status or toggle between both. It can even be custom-scaled to display an engineering unit of your choice (Figure 4).

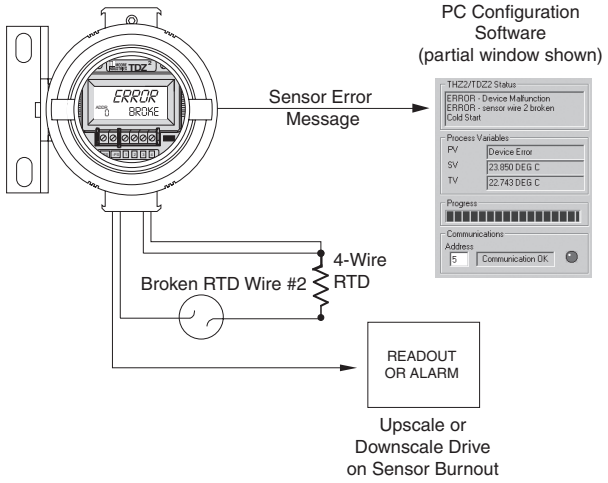
***Figure 4.*** *The TDZ² features a standard process display that shows input, output or toggles intermittently between the two.*




## Total Sensor Diagnostics

These transmitters perform continuous sensor diagnostics (Figure 5). This patented Moore Industries feature can save you from costly lost production time and hours of troubleshooting. If the sensor breaks or otherwise stops sending a signal during operation, the transmitter sends the output upscale or downscale to warn of trouble, and provides a HART digital error message that can be read by a HART communicator, computer-based system or PC. If the sensor being utilized is a RTD, the THZ² or TDZ² instantly displays the type and location of the error.

***Figure 5.*** *Patented Total Sensor Diagnostics saves troubleshooting time.*



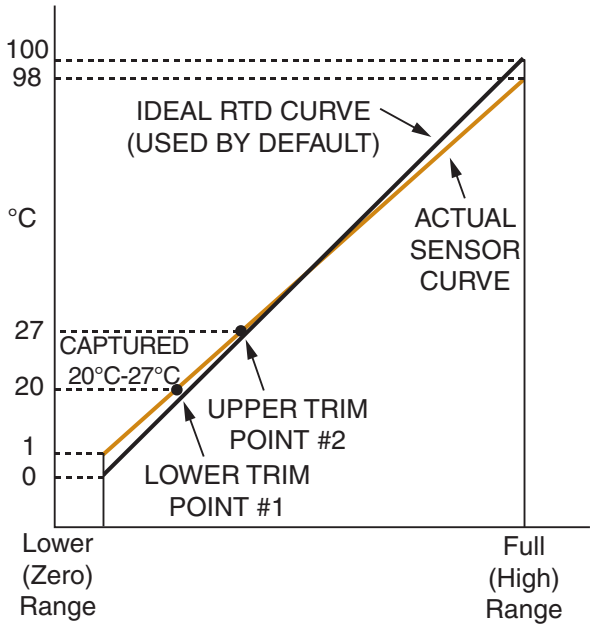

## Trims to Respond to Specific Sensor Curve Segments

Most transmitters' zero and span values can be calibrated to measure a specific range within a sensor's overall curve capability. However, for even greater measurement accuracy, our transmitter trim capabilities go much further.

The THZ² and TDZ² can be trimmed with two data points within the selected zero and span measurement range (Figure 6). This advantage allows a complete process range to be monitored, while placing measurement emphasis on a specific segment of the range most critical to the process.

In the figure below, the actual sensor curve is used in place of the ideal RTD curve between 20°C and 27°C. This provides incredible precision over a limited portion of span, while measuring the remainder of the span with the THZ² or TDZ²'s usual outstanding accuracy.

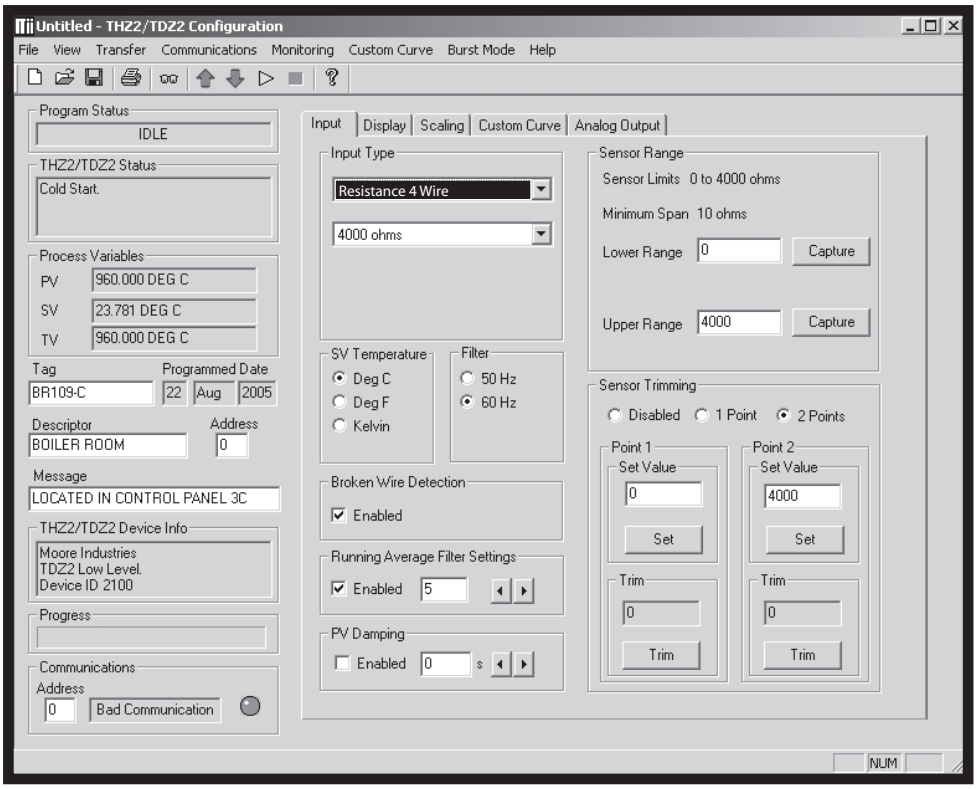
***Figure 6.*** *The THZ² and TDZ² can be set to measure the segment most critical to the process.*




## Precise Linearization and RJC

The THZ² and TDZ² use an advanced linearization method to minimize the conformance error. Its Reference (Cold) Junction Compensation techniques produce stable readings even in fluctuating ambient temperature conditions. For non-linear inputs, create custom linearization curves using our Intelligent PC Configuration Software.

## One Window. One Minute. One Set Up.




### FREE Intelligent PC Configuration Software with Versatile Programming Options

Our FREE Intelligent PC Configuration Software allows you to set up all transmitter settings from one PC window, in about one minute.

**No HART Modem Required—**Using the Moore Industries PC Interface Cable, the transmitter is programmed via a communication port located on the front of the unit. A HART modem is not required to connect the PC to the transmitter.

**Remote PC Programming With a HART Modem—**For programming from any access point on the loop, a HART-to-RS232 Smart Interface Cable (modem) can be purchased separately (see Ordering Information for details) to access the THZ² and TDZ² programming options. The HART modem can also be connected directly to the transmitter.

Once a setup is created, it can be downloaded to multiple transmitters. Just a few of the time saving and performance enhancing features include:

**Set Up Safeguards—**It is nearly impossible to make incompatible configuration selections.

**Transmitter/Configuration Auto Recognition—**The program software automatically recognizes the transmitter model and its configuration parameters.

**Toolbar for Frequently Used Commands—**A conveniently located toolbar provides quick access to often used configuration functions.

**Real-Time Process Readout—**The process measurement and the communication status between the transmitter and PC is continually shown on the software window.

**Precise Digital Output Trimming—**This essentially eliminates the impact of measurement errors introduced by inaccurate readout devices.

**Selectable Under Range, Over Range and Sensor Failure Values—**By setting different default values for each condition, you can distinguish between the failure modes when they occur.

**Store and Print Files—**The configuration record you've created may be downloaded to any number of transmitters, stored for recordkeeping or printed.

# THZ² & TDZ²

Smart HART® Temperature Transmitters
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## Specifications (TPRG: RTD, T/C, Ohm, mV and Potentiometer Input Model)

**HART Specifications**

**Address Range:** 0-15 (1-15 are for multidrop loops)
**Transmission Speed:** 1200 bps
**Character Format:** 1 Start Bit - 8 Data Bits - 1 Odd Parity Bit - 1 Stop Bit

**Performance**

**Input Accuracy:** Refer to Table 1
**Output Range:** 4-20mA
**Analog Output Accuracy:** ±0.01% of maximum span
**Overall Accuracy:** The overall accuracy of the unit is the combined input and output accuracy. It includes the combined effects of linearity, hysteresis, repeatability and adjustment resolution. It does not include ambient temperature effect. For T/C input only, add the Reference Junction Compensation error
**Reference (Cold) Junction Compensation:** ±0.45°C (±0.81°F)
**Stability:** Refer to Table 2
**Isolation:** THZ²: HPP, 1500Vrms between input and output continuous; DIN, 500Vrms between input and output continuous; TDZ²: 500Vrms input-to-output continuous, and will withstand a 500Vac dielectric strength test for one minute with no breakdown
**Response (Rise) Time:** 100msec maximum for the output to change from 10% to 90% for an input step change of 0% to 100%
**Step Response Time:** 500msec maximum, 256msec typical from the time an input is applied until the output reaches 90% of its final value
**Ripple:** 10mVp-p measured across a 250 ohm load resistor at frequencies up to 120Hz
**Over-voltage Protection:** ±5Vdc peak, maximum
**Digital Input Filter:** User-programmable; 50/60Hz
**Power Supply Effect:** ±0.002% of span per 1V change

**Performance (Continued)**

**Load Effect:** Negligible within specified power limits
**Load Capability:** (500 ohms@24V)

$$\frac{\text{Supply Voltage - 12V}}{0.024\text{A}} = \text{Ohms}$$

**Burnout Protection:** User-programmable, Upscale 20 to 23.6mA; Downscale 3.6 to 4.0mA
**Output Current Limiting:** User-programmable, 3.6 to 4.0mA and 20 to 23.6mA for input under/over range; 25mA, maximum (hardware limit)
**T/C Input Impedance:** 40Mohms, nominal
**RTD & Ohms Excitation:** 250 microamps, ±10%
**RTD Lead Wire Resistance Maximum:** RTD resistance + 2X lead wire resistance < 4000 ohms; Recommended lead wire resistance for three wire connections: <35 ohms/wire; 10 ohms copper sensor <5 ohms
**Damping:** User set; 0-30 seconds
**Resolution:** Input, 20-bit; Output, 16-bit
**Power Supply Requirement:** 12-30Vdc for I.S. version; 12-42Vdc for standard version

**Display (TDZ² only)**
**Display (TDZ² only, continued)**

**Type:** TDZ²; Top Row, 10mm (0.4 in) high black digits on a reflective background; Bottom Row, 6mm (0.225 in) high digits on a reflective background; Two-digit HART address indicator
**Format:** Two rows of five alphanumeric characters
**Decimal Points:** Can be user-set to enable automatic adjustment of decimal point to 2 decimal places; Allowed decimal places: Auto, 1, 2 or 3
**Range:** -99999 to 99999
**Minimum Display Span:** 1.00

**Ambient Temperature**

**Operating Range:** -40°C to +85°C (-40°F to +185°F)
**Storage Range:** -40°C to +85°C (-40°F to +185°F)
**Relative Humidity:** 0-95%, non-condensing
**Ambient Temperature Effect:** See Table 3
**Effect on Reference (Cold) Junction Compensation:** ±0.005°C per °C change of ambient temperature
**Startup Time:** <0.5sec, maximum
**Noise Rejection:** Common mode, 100dB@50/60Hz; Normal Mode: Refer to Table 4
**RFI/EMI Immunity:** THZ²: HPP and DIN 10V/m@80-1000MHz, 1kHz AM, when tested according to IEC 61326 with 0.5% of span or less error; With -RF DIN Option: 20V/m@80-1000MHz, 1kHz AM, when tested according to IEC 61326 with 0.5% of span or less error; TDZ²: 20V/m when tested according to IEC 61326 with 0.5% of span or less error

**Weight**

**THZ² DIN:** 221g (7.9 oz)
**THZ² HPP:** 91g (3.2 oz)
**THZ² HPP in LH1:** 423g (15.1 oz)
**THZ² HPP in LH2:** 644g (22.9 oz)
**TDZ² HP:** 182g (6.4 oz)
**TDZ² HP in BH:** 1.4kg (50.2 oz)
**TDZ² HP in D-Box:** 672g (23.4 oz)
**TDZ² HP in SB:** 3.2kg (113 oz)

***Table 1.*** *Input and Accuracy Table (TPRG: RTD, T/C, Ohm, mV and Potentiometer Input Model)*

| Input | Type | α* | Ohms | Conformance Range | Minimum Span | Input Accuracy | Maximum Range |
|---|---|---|---|---|---|---|---|
| **RTD** (2-, 3-, 4-Wire) | **Platinum** | 0.003850 | 100 | -200 to 850°C<br>-328 to 1562°F | 10°C<br>(18°F) | ±0.1°C<br>(±0.18°F) | -240 to 960°C<br>-400 to 1760°F |
| | | | 200 | | | | |
| | | | 300 | | | | |
| | | | 400 | | | | |
| | | | 500 | | | | |
| | | | 1000 | | | | |
| | | 0.003902 | 100 | -100 to 650°C<br>-148 to 1202°F | | | -150 to 720°C<br>-238 to 1328°F |
| | | | 200 | | | | |
| | | | 400 | | | | |
| | | | 500 | | | | |
| | | | 1000 | | | | |
| | | 0.003916 | 100 | -200 to 510°C<br>-328 to 950°F | | | -240 to 580°C<br>-400 to 1076°F |
| | **Nickel** | 0.00672 | 120 | -80 to 320°C<br>-112 to 608°F | | | -100 to 360°C<br>-148 to 680°F |
| | **Copper** | 0.00427 | 9.035 | -50 to 250°C<br>-58 to 482°F | | ±0.85°C<br>(±1.53°F) | -65 to 280°C<br>-85 to 536°F |
| **Ohms** | **Direct Resistance** | n/a | 0-4000 ohms | 0-4000 ohms | 10 ohms | ±0.4 ohms | 0-4000 ohms |
| | **Potentiometer** | | 4000 ohms | 0-100% | 10% | ±0.1% | 0-100% |
| **T/C** | **J** | n/a | n/a | -180 to 760°C<br>-292 to 1400°F | 35°C<br>63°F | ±0.25°C<br>(±0.45°F) | -210 to 770°C<br>-346 to 1418°F |
| | **K** | n/a | n/a | -150 to 1370°C<br>-238 to 2498°F | 40°C<br>72°F | ±0.3°C<br>(±0.54°F) | -270 to 1390°C<br>-454 to 2534°F |
| | **E** | n/a | n/a | -170 to 1000°C<br>-274 to 1832°F | 35°C<br>63°F | ±0.2°C<br>(±0.36°F) | -270 to 1013°C<br>-454 to 1855.4°F |
| | **T** | n/a | n/a | -170 to 400°C<br>-274 to 752°F | 35°C<br>63°F | ±0.25°C<br>(±0.45°F) | -270 to 407°C<br>-454 to 764.6°F |
| | **R** | n/a | n/a | 0 to 1760°C<br>32 to 3200°F | 50°C<br>90°F | ±0.55°C<br>(±0.99°F) | -50 to 1786°C<br>-58 to 3246.8°F |
| | **S** | n/a | n/a | 0 to 1760°C<br>32 to 3200°F | 50°C<br>90°F | ±0.55°C<br>(±0.99°F) | -50 to 1786°C<br>-58 to 3246.8°F |
| | **B** | n/a | n/a | 400 to 1820°C<br>752 to 3308°F | 75°C<br>135°F | ±0.75°C<br>(±1.35°F) | 200 to 1836°C<br>392 to 3336.8°F |
| | **N** | n/a | n/a | -130 to 1300°C<br>-202 to 2372°F | 45°C<br>81°F | ±0.4°C<br>(±0.72°F) | -270 to 1316°C<br>-454 to 2400.8°F |
| | **C** | n/a | n/a | 0 to 2300°C<br>32 to 4172°F | 100°C<br>180°F | ±0.8°C<br>(±1.44°F) | 0 to 2338°C<br>32 to 4240.4°F |
| **mV** | **DC** | n/a | n/a | -50 to 1000mV | 4mV | 15 microvolts | -50 to 1000mV |

| Sensor-to-Transmitter Matching |
|---|
| Up to ±0.014°C (±0.025°F) system accuracy*. |

*High-accuracy measurements are achieved by using a 4-wire, 1000 ohm platinum RTD with a span of 100°F (50°F minimum) calibrated in our sensor-matching calibration bath. See page 5 or contact our factory for additional information.

***Table 2.*** *Long-Term Stability Table (TPRG: RTD, T/C, Ohm, mV and Potentiometer Input Model)*

| Stability (% of maximum span) | Input to Output | | | Input to HART | | |
|---|---|---|---|---|---|---|
| | 1 yr | 3 yrs | 5 yrs | 1 yr | 3 yrs | 5 yrs |
| T/C, mV | 0.08 | 0.14 | 0.18 | 0.008 | 0.015 | 0.019 |
| RTD, Ohm, Potentiometer | 0.09 | 0.16 | 0.21 | 0.047 | 0.081 | 0.104 |

***Table 3.*** *Ambient Temperature Effects Table (TPRG: RTD, T/C, Ohm, mV and Potentiometer Input Model)*

| Sensor Type | Digital Accuracy per 1°C (1.8°F) change in Ambient | Analog Accuracy per 1°C (1.8°F) change in Ambient |
|---|---|---|
| RTD | 0.003°C | 0.004% of span (16mA) |
| T/C | 0.003°C + 0.005% of reading | 0.004% of span (16mA) |
| Millivolt | 0.005mV + 0.005% of reading | 0.004% of span (16mA) |
| Ohm | 0.002 ohms + 0.005% of reading | 0.004% of span (16mA) |

***Table 4.*** *Normal Mode Rejection Ratio Table (TPRG: RTD, T/C, Ohm, mV and Potentiometer Input Models)*

| Sensor Type | | Max. p-p Voltage Injection for 70dB at 50/60Hz |
|---|---|---|
| T/C: J, K, N, C, E | | 150mV |
| T/C: T, R, S, B | | 80mV |
| Pt RTD: 100, 200, 300 ohms | | 250mV |
| Pt RTD: 400, 500, 1000 ohms | | 1V |
| Ni: 120 ohms | | 500mV |
| Cu: 9.03 ohms | | 100mV |
| **Resistance** | **mV** | |
| 1-4kohms | 250-1000 | 1V |
| 0.25-1kohms | 62.5-250 | 250mV |
| 0.125-0.25kohms | 31.25-62.5 | 100mV |

## Complete Temperature Assemblies

Free yourself from the hassle of looking around for pieces and parts by ordering a complete assembly.

To complement our high-quality transmitters, we carry complete lines of RTDs, thermocouples, thermowells, connection heads and fittings. Get the quality you need and the options you require with the ease of just one ordering number!

For the best accuracy, have your transmitter and sensor calibrated together in our sensor-matching calibration bath.

**See our Ready-to-Install Temperature Transmitter Assemblies data sheets for details.**

**Sensor-to-Transmitter Matching**

Our sensor matching process starts by immersing the temperature sensor into stabilized temperature baths in our calibration lab. The transmitter captures two points from the sensor and stores them in non-volatile memory. It then uses them to compensate for deviations between a sensor's stated linearization curve and its actual measurements.

Sensor matching provides you with incredible accuracy at an affordable price. Accuracy varies with the sensor, so contact the factory for information on your sensor type.

## Specifications (HLPRG: mA and V Input Model)

**HART Specifications**

**Address Range:** 0-15 (1-15 are for multidrop loops)
**Transmission Speed:** 1200 bps
**Character Format:** 1 Start Bit - 8 Data Bits - 1 Odd Parity Bit - 1 Stop Bit

**Performance**

**Input Range:** Voltage: 0-10V; Current: 0-50mA
**Input Accuracy:** ±1mV (±0.01% of maximum span); ±2 microamps (±0.01% of 20mA span)
**Output Range:** 4-20mA
**Analog Output Accuracy:** ±0.01% of maximum span
**Overall Accuracy:** The overall accuracy of the unit is the combined input and output accuracy. It includes the combined effects of linearity, hysteresis, repeatability and adjustment resolution. It does not include ambient temperature effect.
**Stability:** Refer to Table 5
**Isolation:** THZ²: HPP, 1500Vrms between input and output continuous; DIN, 500Vrms between input and output continuous; TDZ²: 500Vrms input-to-output continuous, and will withstand a 500Vac dielectric strength test for one minute with no breakdown
**Response (Rise) Time:** 100msec maximum for the output to change from 10% to 90% for an input step change of 0% to 100%
**Step Response Time:** 500msec maximum, 256msec typical from the time an input is applied until the output reaches 90% of its final value
**Ripple:** 10mVp-p measured across a 250 ohm load resistor at frequencies up to 120Hz
**Over-voltage Protection:** Current: 100mA, maximum; Voltage: ±18Vdc maximum

**Performance (Continued)**

**Digital Input Filter:** User-programmable; 50/60 Hz
**Power Supply Effect:** ±0.002% of span per 1V change
**Load Effect:** Negligible within specified power limits
**Load Capability:** (500 ohms@24V)

$$\frac{\text{Supply Voltage - 12V}}{0.024\text{A}} = \text{Ohms}$$

**Burnout Protection:** User-programmable, Upscale 20 to 23.6mA; Downscale 3.6 to 4.0mA
**Output Current Limiting:** User-programmable, 3.6 to 4.0mA and 20 to 23.6mA for input under/over range; 25mA, maximum (hardware limit
**Input Impedance:** Voltage: 1Mohm, nominal; Current 20ohms, nominal
**Damping:** User set; 0-30 seconds
**Resolution:** Input, 20-bit; Output, 16-bit
**Power Supply Requirement:** 12-30Vdc for I.S. version; 12-42Vdc for standard version

**Display (TDZ² only)**

**Type:** TDZ²; Top Row, 10mm (0.4 in) high black digits on a reflective background; Bottom Row, 6mm (0.225 in) high digits on a reflective background; Two-digit HART address indicator
**Format:** Two rows of five alphanumeric characters
**Decimal Points:** Can be user-set to enable automatic adjustment of decimal point to 2 decimal-places; Allowed decimal places: Auto, 1, 2 or 3
**Range:** -99999 to 99999
**Minimum Display Span:** 1.00

**Ambient Temperature**

**Operating Range:** -40°C to +85°C (-40°F to +185°F);
**Storage Range:** -40°C to +85°C (-40°F to +185°F)
**Relative Humidity:** 0-95%, non-condensing
**Ambient Temperature Effect:** Refer to Table 6
**Startup Time:** <0.5sec, maximum
**Noise Rejection:** Common mode, 100dB@50/60Hz; Normal Mode: Voltage, 70dB @1Vp-p@50/60Hz; Current, 70dB@50mA p-p@50-60Hz
**RFI/EMI Immunity:** THZ²: HPP and DIN 10V/m@80-1000MHz, 1kHz AM, when tested according to IEC 61326 with 0.5% of span or less error;
With -RF DIN Option: 20V/m@80-1000MHz, 1kHz AM, when tested according to IEC 61326 with 0.5% of span or less error;
TDZ²: 20V/m when tested according to IEC61326 with 0.5% of span or less error

**Weight**

**THZ² DIN:** 221g (7.9 oz)
**THZ² HPP:** 91g (3.2 oz)
**THZ² HPP in LH1:** 423g (15.1 oz)
**THZ² HPP in LH2:** 644g (22.9 oz)
**TDZ² HP:** 182g (6.4 oz)
**TDZ² HP in BH:** 1.4kg (50.2 oz)
**TDZ² HP in D-Box:** 672g (23.4 oz)
**TDZ² HP in SB:** 3.2kg (113 oz)

***Table 5.*** *Long-Term Stability Table (HLPRG: mA and V Input Model)*

| Stability (% of max. span) | Standard Stability Version | | | | | |
|---|---|---|---|---|---|---|
| | Input to Output | | | Input to HART | | |
| | 1 yr | 3 yrs | 5 yrs | 1 yr | 3 yrs | 5 yrs |
| Voltage | 0.014 | 0.18 | 0.23 | 0.066 | 0.114 | 0.147 |
| Current | 0.093 | 0.16 | 0.21 | 0.047 | 0.081 | 0.105 |

***Table 6.*** *Ambient Temperature Effects Table (HLPRG: mA and V Input Model)*

| Input Type | Digital Accuracy per 1°C (1.8°F) change in Ambient | Analog Accuracy per 1°C (1.8°F) change in Ambient |
|---|---|---|
| Voltage | 1mV | 0.004% of span (16mA) |
| Current | 2 microamps | |

# THZ² & TDZ²

Smart HART® Temperature Transmitters
and Signal Isolators

## Versatile Housing, Enclosure and Mounting Choices

| Model | Features | Dimensions |
|---|---|---|
|  **THZ²** in **HPP** Encapsulated Housing | • Small size and protected, encapsulated electronics make this model ideal for integrating into industrial machinery, machine tools, facility monitoring systems and similar production and process equipment.<br>• For retrofit applications, standard diameter and mounting hole dimensions allow easy integration into installed thermowell and remote-mounted connection heads. | Page 12 |
|  **THZ²** in **LH** Connection Head Field-Mount Enclosure | • Compact, lightweight connection head mounts right on the thermowell/sensor assembly, or in a convenient remote location from the sensor.<br>• Encapsulated electronics resist the harmful effects of moisture and humidity that enter though the conduit connections.<br>• Explosion-proof and very affordable general location (NEMA 4X, IP66) versions available. | Page 12 |
|  **THZ²** in **DIN** Rail Mount Housing | • Only 25mm (1-inch) wide, this compact model is perfect for mounting in a control room, high-density instrument cabinet or field-mounted enclosure.<br>• Universal mounting bracket easily snaps on and off of G-type and top hat DIN-rails, and standard relay tracks.<br>• Metal, temperature-compensating terminal blocks provide exceptionally stable measurements even in fluctuating ambient temperature conditions. | Page 13 |
|  **TDZ²** in **HP** Hockey-Puck Housing with Display | • Mounts on a surface, G-type or top hat rails and on relay track when on site display is needed in a control room, cabinet or enclosure.<br>• Replacement transmitter installs in a Moore Industries BH or D-BOX enclosure and in other common field-mount instrument enclosures. | Page 13 |
|  **TDZ²** in **BH** Aluminum Field-Mount Field-Mount Enclosure<br><br>**TDZ²** in **SB** 316 Stainless Steel Field-Mount Enclosure<br><br>**TDZ²** in **D-BOX** Aluminum Base with Polycarbonate Cover Field-Mount Enclosure | • Economical choice when reliable field protection and on site indication are required.<br>• Modular transmitter electronics can be easily removed without disturbing the enclosure or sensor assembly.<br>• Explosion-proof (BH and SB enclosures) or economical general location NEMA 4X, IP66 (D-BOX) protection. | BH Page 14<br><br>D-BOX Page 14 |

# Ordering Information

| Unit | Input | Output | Power | Options | Housing |
|---|---|---|---|---|---|
| **THZ2** Smart HART Temperature Transmitter Without Display<br><br>**TDZ2** Smart HART Temperature Transmitter with Display | **HLPRG** Programs to accept:<br><br>Current: Any range between 0-50mA including:<br>0-20mA<br>4-20mA<br>10-50mA<br><br>Voltage: Any range between 0-10V including:<br>0-5Vdc<br>1-5Vdc<br>0-10Vdc<br><br>**TPRG** Programs to accept:<br><br>RTD<br>2-, 3-, 4-Wire Platinum, Copper, Nickel<br><br>Thermocouple (J, K, E, T, R, S, B, N, C)<br><br>0-4000 ohms<br><br>-50-1000mV<br><br>(see Table 1 for additional information) | **4-20MA** Scaleable to narrower ranges | **12-42DC**<br>**12-30DC** | **-FMEDA** Unit comes with Failure Modes, Effects and Diagnostic Analysis (FMEDA) data for evaluating the instrument for suitability of use in a safety-related application<br>**-RF** Enhanced RFI/EMI protection (DIN housing only; see Specs for details) | **THZ2: DIN-Rail Mount, HPP and LH Connection Head**<br>**DIN** DIN-style aluminum housing mounts on 32mm G-type (EN50035) and 35mm Top Hat (EN50022)<br>**HPP** Encapsulated hockey-puck housing for mounting in connection heads<br>**LH1NS** Aluminum IP66 connection head (NEMA 4X, IP66) with two 1/2-inch entry ports and a PBT polyester cover<br>**LH1MS** Aluminum IP66 connection head (NEMA 4X, IP66) with two entry ports: M20 cable and 1/2-inch NPT and a PBT polyester cover<br>**LH1CS** Aluminum IP66 connection head (NEMA 4X, IP66) with two entry ports: M20 cable and G1/2 (BSP) and a PBT polyester cover<br>**LH2NS** Aluminum Explosion-proof/Flameproof connection head with two entry ports: 1/2-inch NPT conduit and a metal cover<br>**LH2MS** Aluminum Explosion-proof/Flameproof LH2 connection head with two entry ports: M20 cable and 1/2-inch NPT conduit and a metal cover<br>**CH6** Polypropylene connector head<br><br>**A** suffix with LH2 indicates ANZEx/TestSafe (Ex d) Flame-Proof approvals; 2" pipe-mount kit included (i.e., LH2MSA)<br>**E** suffix with LH2 denotes ATEX Flame-Proof enclosures; 2" pipe-mount kit included (i.e., LH2MS**E**)<br>**P** suffix indicates enclosure is equipped with 2" pipe-mount hardware kit (i.e., LH1NS**P**)<br>See LH housing datasheet for more information<br><br>**TDZ2: HP Hockey-Puck, BH and D-BOX Enclosures**<br>**HP** Hockey-puck housing and spring clips<br>**DN** Snap-in mounting for HP case on TS-32 DIN-rail<br>**FL** Mounting flanges on HP for relay track or screw mounting<br>**FLD** Mounting flanges on HP for 3½" relay track mounting<br>**BH2NG** Aluminum Explosion-Proof enclosure with two 1/2-inch NPT entry ports and a glass cover<br>**BH2TG** Aluminum Explosion-Proof enclosure with two 3/4-inch NPT entry ports and a glass cover<br>**BH2MG** Aluminum Explosion-Proof enclosure with two M20 x 1.5 NPT entry ports and a glass cover<br>**BH3NG** Aluminum Explosion-Proof enclosure with three 1/2-inch NPT entry ports<br>**BH3TG** Aluminum Explosion-Proof enclosure with two 3/4-inch side-entry NPT ports, one 1/2" bottom port, and a glass cover<br>**BH3MG** Aluminum Explosion-Proof enclosure with two, M20 x 1.5 side-entry ports, one 1/2" bottom-entry port, and a glass cover<br>**SB2NG** 316 Stainless Steel 2-Hub, Explosion-Proof enclosure with two, ½-inch NPT entry ports and a glass cover<br>**SB2MG** 316 Stainless Steel 2-Hub, Explosion-Proof enclosure with two, M20 x 1.5 entry ports and a glass cover<br>**D2LC** 2-Hub, Aluminum base, clear cover, IP66/NEMA 4X enclosure<br><br>**A** suffix with BH or SB indicates ANZEx/TestSafe (Ex d) Flame-Proof approvals 2" pipe-mount kit included (i.e., BH2MG**A** or SB2MG**A**)<br>**E** suffix with BH or SB denotes ATEX Flame-Proof enclosures; 2" pipe-mount kit is included (i.e., BH2MG**E**, SB2NG**E**)<br>**P** suffix indicates enclosure is equipped with 2" pipe-mount hardware kit (i.e., BH2NG**P**)<br>See BH, SB and D-BOX datasheets for more information. |

**To order, specify:**
Unit / Input / Output / Power / Option [Housing]
**Model Number Example:**
THZ2 / TPRG / 4-20MA / 12-42DC [LH2NSP]
THZ2 / HLPRG / 4-20mA / 12-42DC [DIN]
TDZ2 / TPRG / 4-20MA / 12-42DC [BH2NGP]

## Accessories

Each THZ² or TDZ² orders comes with one copy of our Intelligent PC Configuration Software (Windows® compatible) Use the following information to order additional parts:

| |
|---|
| **P/N 750-75E05-01**–Interface Solution PC Configuration Software on CD (One copy comes free with each order) |
| **P/N 803-040-26**–Non-Isolated PC Configuration Cable |
| **P/N 803-039-26**–Isolated PC Configuration Cable |
| **P/N 235-829-02**–PC-Programming Kit includes one copy of our Intelligent PC Configuration Software and one HART-to-RS232 Cable with HART modem |
| **P/N 803-048-26**–HART-to-RS232 Smart Interface Cable with HART Modem |
| **P/N 804-021-26**–HART-to-USB Smart Interface Cable with HART Modem |
| **P/N 804-030-26**–Fuse Protected, Non-Isolated USB Communication Cable |

***Figure 7.*** *Dimensions for the THZ² in the HPP hockey-puck housing.*

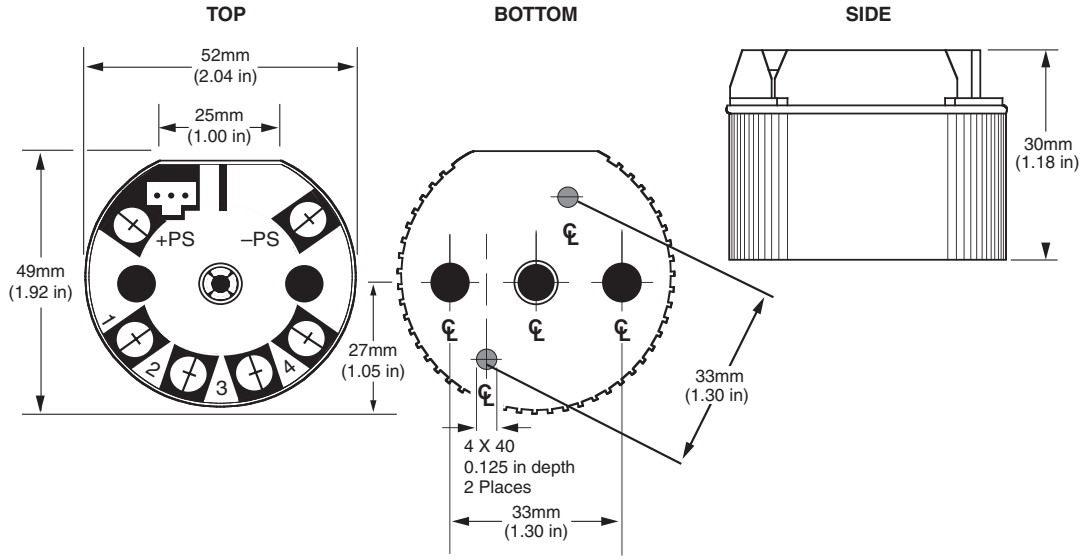



***Figure 8.*** *Dimensions for the THZ² in the LH connection head.*

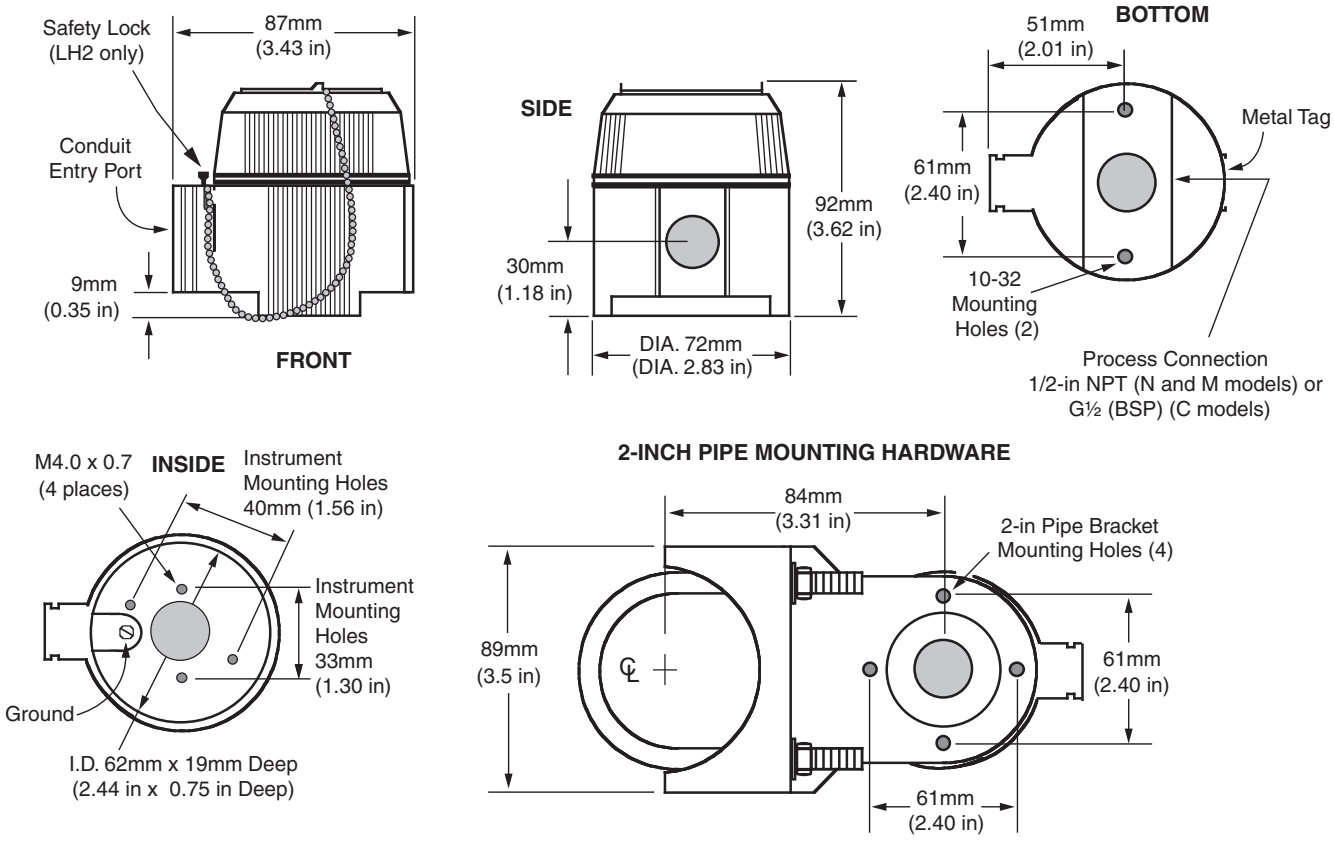


***Figure 9.*** *Dimensions of the THZ² in the DIN rail-mount housing (unit with TPRG input shown).*

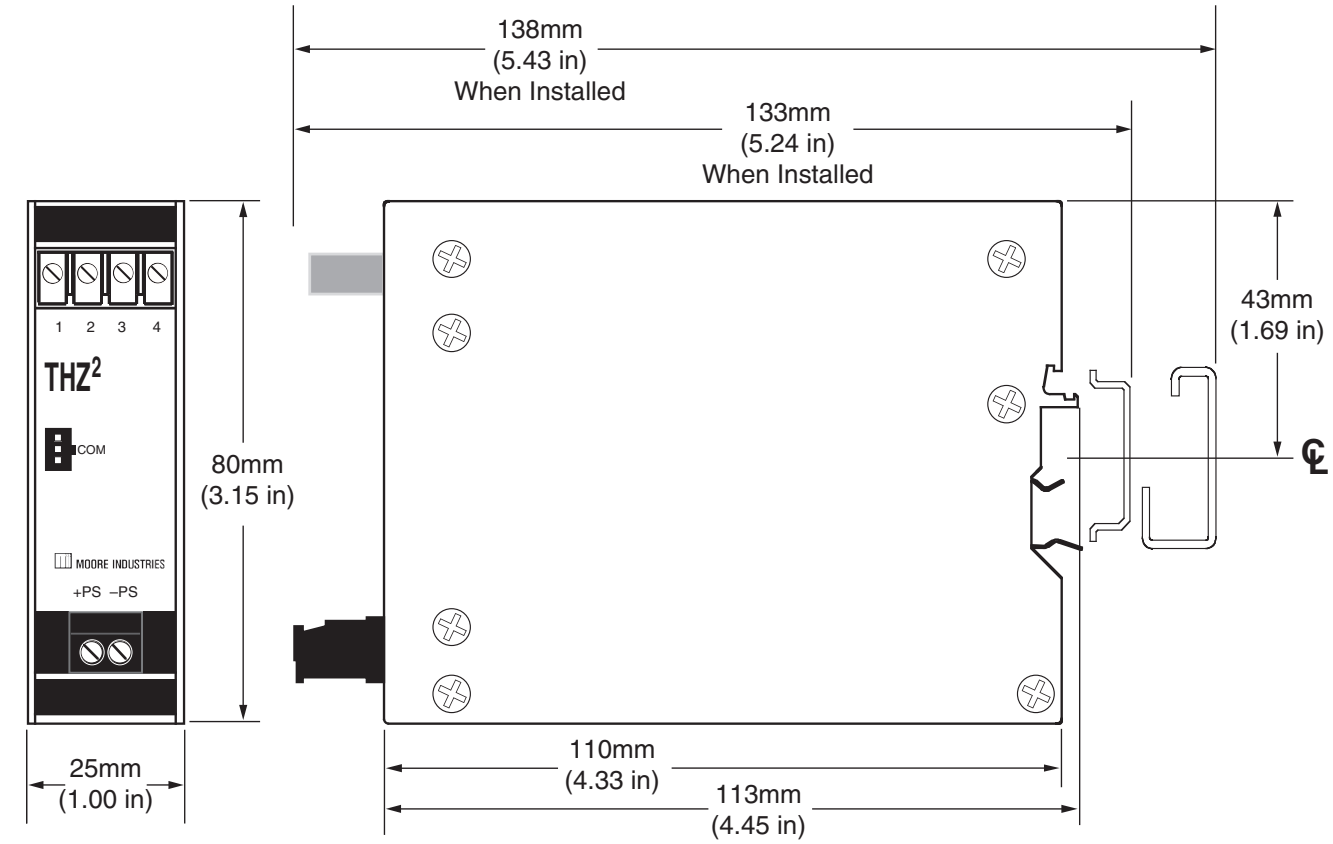
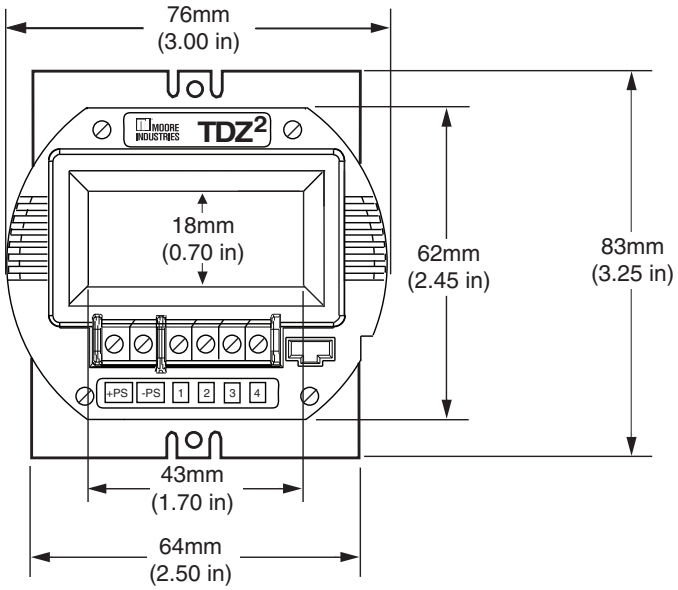
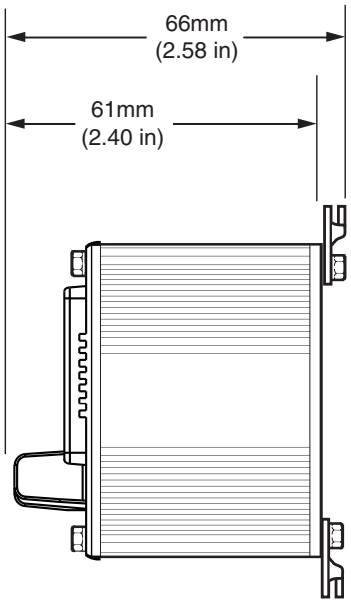



***Figure 10.*** *Dimensions for TDZ² in HP hockey-puck housing.*




**FRONT VIEW**




**SIDE VIEW**

***Figure 11.*** *Dimensions for the TDZ² in BH field-mount enclosure.*

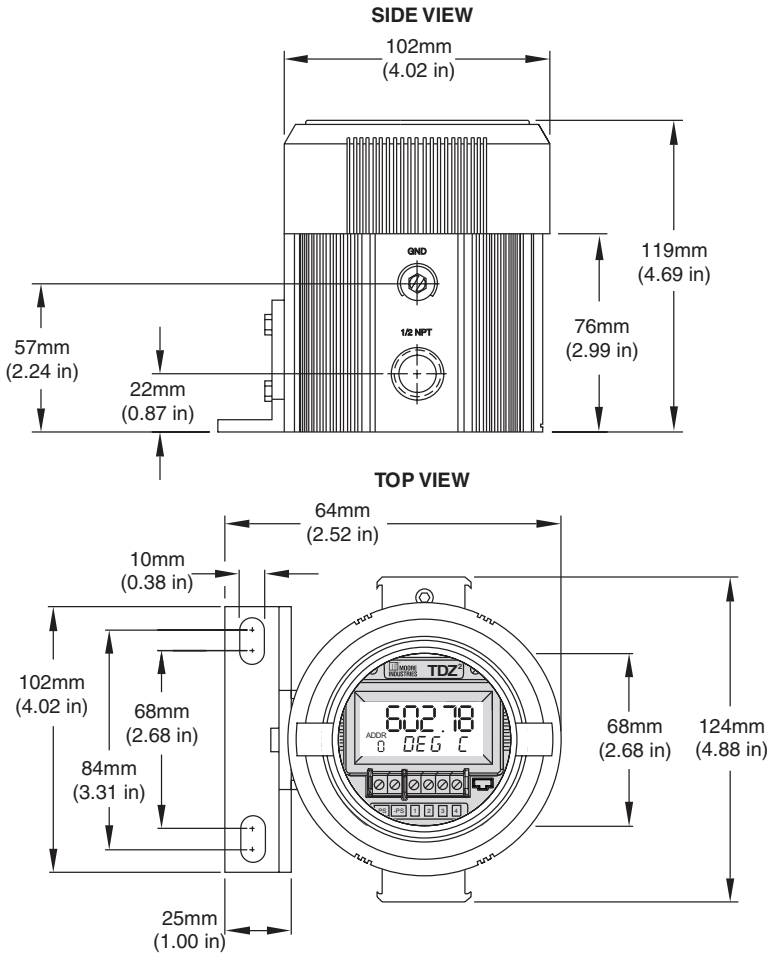



***Figure 12.*** *Dimensions for TDZ² in D-BOX field-mount enclosure.*

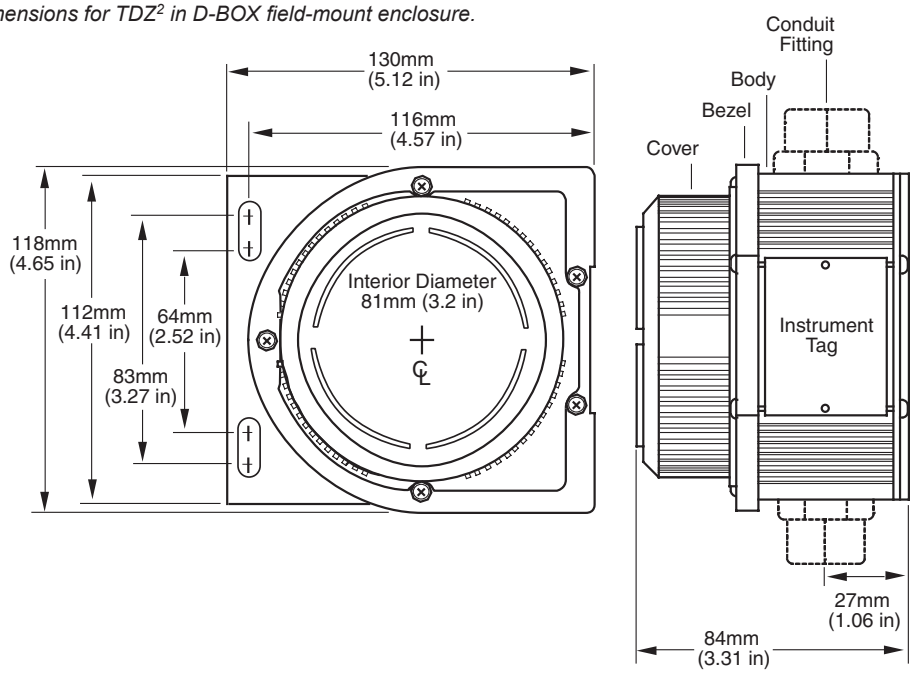


***Figure 13.*** *Terminal designations for all units (While terminal placement may differ from unit to unit, all models use identical numeric designations.)*

THZ² and TDZ² (HLPRG) Terminal Designations

| **THZ² HPP Housing** | | | | | |
|---|---|---|---|---|---|
| **Power** | **Top Terminals (Left to Right)** | | | | |
| | +PS | -PS | | | |
| **Input** | **Bottom Terminals (Left to Right)** | | | | |
| | N/A | +I | +V | COM | |
| **THZ² DIN Housing** | | | | | |
| **Input** | **Top Terminals (Left to Right)** | | | | |
| | N/A | +I | +V | COM | |
| **Power** | **Bottom Terminals (Left to Right)** | | | | |
| | +PS | -PS | | | |
| **TDZ² HP Housing** | | | | | |
| **Power/ Input** | **Bottom Terminals (Left to Right)** | | | | |
| | +PS | -PS | N/A | +I | +V | COM |

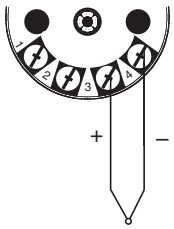
THZ² and TDZ² (TPRG) Terminal Designations

| **THZ² HPP Housing** | | | | |
|---|---|---|---|---|
| **Power** | **Top Terminals (Left to Right)** | | | |
| | +PS | -PS | | |
| **Input** | **Bottom Terminals (Left to Right)** | | | |
| | 1 | 2 | 3 | 4 |
| **THZ² DIN Housing** | | | | |
| **Input** | **Top Terminals (Left to Right)** | | | |
| | 1 | 2 | 3 | 4 |
| **Power** | **Bottom Terminals (Left to Right)** | | | |
| | +PS | -PS | | |
| **TDZ² HP Housing** | | | | |
| **Power/ Input** | **Bottom Terminals (Left to Right)** | | | | | |
| | +PS | -PS | 1 | 2 | 3 | 4 |

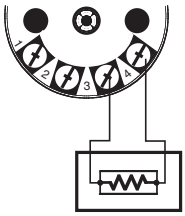
**KEY:**
COM = Common
+I = Current Input
+PS = Positive Power Input
-PS = Negative Power Input
+V = Voltage Input

**NOTE:**
1. Terminal blocks can accommodate 14-22 AWG (2.0-0.3mm²) solid wiring.
2. HP Housing terminals utilize M2.6 screws. Tighten terminals to 2.8 in lb (0.31Nm), maximum.

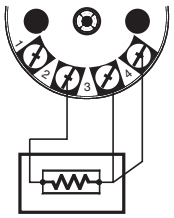
***Figure 14.*** *Sensor input connections for units with TPRG input type.*



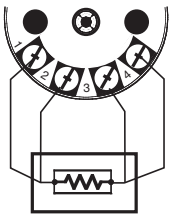
Thermocouple and Millivolt Input



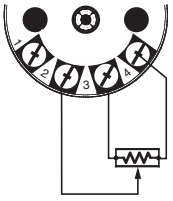
2-Wire RTD or Decade Resistance Box



3-Wire RTD or Decade Resistance Box



4-Wire RTD or Decade Resistance Box



Potentiometer Input

# THZ² & TDZ²

Smart HART® Temperature Transmitters
and Signal Isolators

***Certifications***

**THZ2-HPP**

**Factory Mutual (US/Canada):**
**Intrinsically-Safe & Non-Incendive**
Class I, Divisions 1 & 2, Groups A, B, C, & D
Class I, Zone 0, AEx ia IIC

**ATEX Directive 94/9/EC (FM Approvals):**
**Intrinsically-Safe & Type "n"**
II 1G Ex ia IIC, II 3G Ex nA IIC

**IECEx (FM Approvals):**
**Intrinsically-Safe & Type "n"**
Ex ia IIC, Ex nA IIC

**Temperature Codes:**
T5 @ 85°C Maximum Operating Ambient
T6 @ 60°C Maximum Operating Ambient

**CE Conformant:**
EMC Directive 2004/108/EC – EN 61326

**THZ2-HPP in LH2 Housing**

**Factory Mutual:**
**Explosion-Proof & Dust-Ignition Proof**
Class I, Division 1, Groups A*, B, C & D
Class II & III, Division 1, Groups E, F & G
**Environmental Protection:** Type 4X & IP66
T6 @ 60°C Maximum Operating Ambient
*For Group A applications, seal all conduits within 18"

**CSA Group (Canadian Standards Association):**
**Explosion-Proof**
Class I, Division 1, Groups A*, B, C, & D
Class II, Groups E, F, & G
Class III, IP66
Ambient Temp. Range: -20 C to +60C; T6
* For Group A applications, seal all conduits within 18"

**ATEX Directive 94/9/EC (ISSeP):**
**Explosion/Flame-Proof**
II 2 G Ex d IIC T6 (Tamb 60°C)
II 2 D Ex tD A21 IP66 T85°C

**ANZEx (TestSafe):**
**Explosion/Flame-Proof**
Ex d IIC T6 (Tamb 60°C) IP66

**TDZ2-HP**

**Factory Mutual (US/Canada):**
**Intrinsically-Safe & Non-Incendive**
Class I, Divisions 1 & 2, Groups A, B, C, & D
Class I, Zone 0, AEx ia IIC

**ATEX Directive 94/9/EC (FM Approvals):**
**Intrinsically-Safe & Type "n"**
II 1G Ex ia IIC, II 3G Ex nA IIC

**IECEx (FM Approvals):**
**Intrinsically-Safe & Type "n"**
Ex ia IIC, Ex nA IIC

**Temperature Code:**
T4 @ 85°C Maximum Operating Ambient

**CE Conformant:**
EMC Directive 2004/108/EC – EN 61326

**TDZ2-HP in BH/SB2 Housing**

**Factory Mutual:**
**Explosion-Proof & Dust-Ignition Proof**
Class I, Division 1, Groups A*, B, C & D
Class II & III, Division 1, Groups E, F & G
Environmental Protection: Type 4X & IP66
T6 @ 60°C Maximum Operating Ambient
*For Group A applications, seal all conduits within 18"

**CSA Group (Canadian Standards Association):**
**Explosion-Proof**
Class I, Division 1, Groups A*, B, C, & D
Class II, III, Groups E, F, & G
Type 4X, IP66
Ambient Temp. Range: -20 C to +60C; T6
* For U.S. Group A applications, seal all conduits within 18"

**ATEX Directive 94/9/EC: (ISSeP)**
**Explosion/Flame-Proof**
II G Ex d IIC T6 Gb
II D Ex tb IIIC Db T85°C IP66

**ANZEx (TestSafe):**
**Explosion/Flame-Proof**
Ex d IIC T6 (Tamb 60°C)

MOORE INDUSTRIES