MOORE INDUSTRIES

Now PC-Configurable Too!

Description

Moore Industries' TRZ Smart HART® Temperature Transmitter is the ideal solution when temperature measurements must be made in remote or difficult-to-access locations.

Using the industry-standard HART (Highway Addressable Remote Transducer) protocol, you can rerange and perform measurement parameter changes to the TRZ over the same 4-20mA wire pair from anywhere on the loop. You can view and change parameters with a PC running Moore Industries' PC-based configuration software even if a HART Communicator is not available.

The versatile, microprocessor-based TRZ 2-Wire (loop-powered) transmitter accepts input from:

- **2, 3, and 4-Wire RTD Types**
  (Pt, Cu, and Ni; 25 to 1000Ω)

- **12 Thermocouple Types**
  (J, K, E, T, R, S, N, B, C, D, L, and U)

- **Direct Millivolt Sources**
  (–10 to 70mV)

- **Resistance and Potentiometer Devices**
  (0 to 2200Ω)

The TRZ converts the input to an accurate, linear, 4-20mA output signal that is superimposed with HART data. This analog and digital output is ideal for direct interface with both HART and non-HART readout instruments, recorders, DCS's, PLC's, and other computer-based SCADA systems.

Figure 1. *The TRZ Smart HART Temperature Transmitter features programmable inputs with a fully isolated output.*
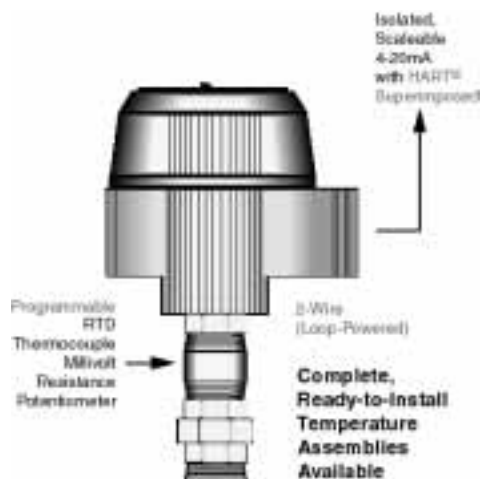
The TRZ is offered in ready-to-install temperature assemblies and in a head-mount "hockey-puck" housing.

WE'VE GOT HART ABILITY

Features

- **Universal, programmable input.** The TRZ accepts a wide range of RTD, T/C, millivolt, resistance, and potentiometer inputs. Store multiple Configuration Files on your PC, then program additional transmitters with just a few PC keystrokes.

- **Remote configuration over 4-20mA wires or via PC.** You can use a standard HART Hand-Held Communicator, a HART-based host, or a PC to configure or check the status of the TRZ from anywhere on the loop.

- **Point-to-point and multidrop configurations.** The TRZ can be used just like a traditional analog 4-20mA transmitter on a loop or, to save wiring costs, up to 15 can be networked onto one digital HART communication link.

- **Coexists with installed analog instruments.** The HART digital signal transmits "transparently" along the TRZ's analog loop without disturbing the 4-20mA signal or other devices connected on the loop (like indicators, recorders, and controllers).

Certifications

CE   CSA   Ex   FM APPROVED

Check the listing and the housing information on page 7 for full certification details.

All product names are registered trademarks of their respective companies.
HART is a registered trademark of the HART Communications Foundation.

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

In the majority of applications, the TRZ is installed on a point-to-point 4-20mA process loop like a regular analog transmitter (Figure 3). A HART Communicator or HART-based system is used to configure and view the TRZ's operating parameters and diagnostic data from any point on the loop.

Multidrop Networks Save Wiring Costs

Up to 15 TRZ's connect in parallel on to a HART digital communication link (Figure 4). This means you can use a single loop, instead of 15 separate loops, to connect multiple TRZ's. In a multidrop network, the TRZ'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 TRZ's individual address (1-15) to initiate communication with the TRZ for configuration or viewing of the transmitter's data. A HART Communicator can be used in this configuration to access information from, or transmit configuration information to, the TRZ from anywhere on the HART loop.

Basic Master/Slave Structure

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

The TRZ 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 TRZ two times per second to access the current process variable status, send setup data to the TRZ, or remotely view its identification, configuration, and diagnostic information.

Additional TRZ Advantages

Complete Signal Isolation—Delivering 500Vac input-to-output signal isolation, the TRZ stops ground loops, motor noise, and other electrical interferences from distorting process signals.

Figure 2. *The TRZ's complete signal isolation stops ground loops from affecting signal accuracy.*
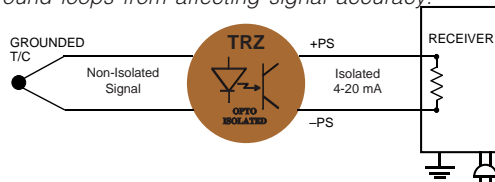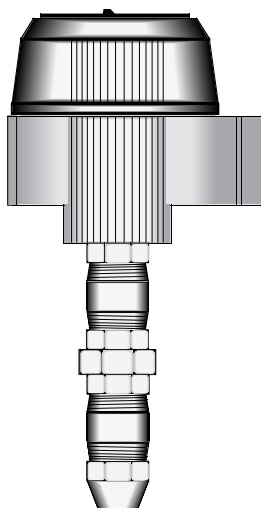
Figure 3. *Point-to-Point TRZ Loop.*

TRZ Smart HART Temperature Transmitter
(HART Slave Device)

NOTE:
The HART Communicator or PC with Smart Hart Interface Cable may be connected at any termination point on the signal loop. The HART Communicator and the TRZ Signal loop must have between 250 and 1100Ω load for proper communications

4-20mA Analog with Digital HART superimposed

DCS
PLC
SCADA
Data Recorder
Indicator

HART
Primary Master
or Non-HART
Communicating Device

Power
Supply

PC with HART Modem
(Secondary Master)
running Moore Industries'
TRZ Configuration Software

HART Communicator
(Secondary Master)

Figure 4. *Multidrop TRZ Network.*

Up to 15 TRZ Smart HART Temperature Transmitters

HART-Based
DCS
(Primary
Master)

HART Digital Signal

TRZ
(HART
Slave)

TRZ
(HART
Slave)

TRZ
(HART
Slave)

HART
Communicator
(HART
Secondary
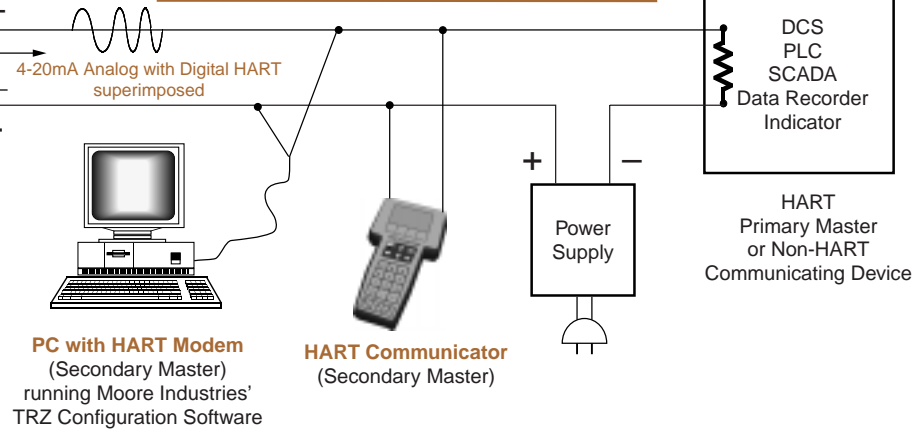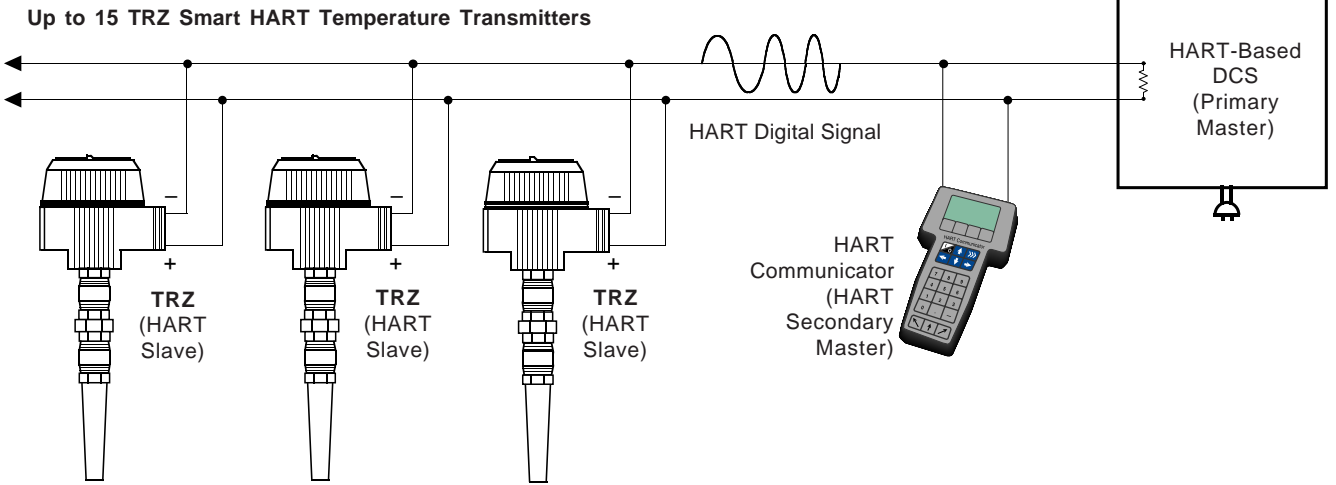Master)

Sensor and Self-Diagnostics—The TRZ monitors its input (sensor) and its own operation constantly. If it senses an unwanted condition, it sends a message that a HART Communicator or a HART-based control system can view. It also drives its output upscale or downscale (user-selectable).

Figure 5. *TRZ Dimensions*

87 mm
(3.44 in)

Safety Lock
(LH2 only)

Conduit Connection
½-in NPT (N models)
or M20 (M & C models)

9 mm
(0.35 in)

50.8 mm
(2 in)

Process Connection
½-in NPT (N & M models)
or G½ (BSP) (C models)

LH2
83 mm
(3.26 in)

LH1
78 mm
(3.07 in)

21.85 mm
(0.86 in)

DIA. 72 mm
(DIA. 2.85 in)

Linearization and RJC—To help assure a highly accurate input-to-output relationship, the TRZ's linearization capability "smooths" the sensor input signal to compensate for non-linear primary measurements. Its advanced Reference (Cold) Junction Compensation techniques produce stable readings even in fluctuating ambient temperature conditions.
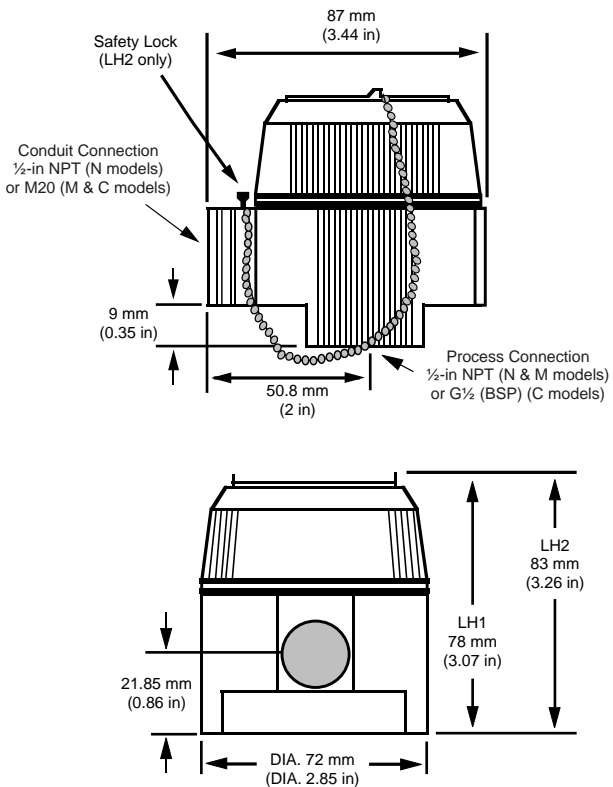
On-Board Test Jacks—The TRZ features test jacks that can be used to access and read its 4-20mA output with a current meter.

Non-Volatile Memory—If power to the unit is lost, the microprocessor-based TRZ resumes normal operation with the parameters you've configured upon reapplication of power.

Silicone-Encapsulated Circuitry—Helps assure reliable and stable performance even in humid or high-vibration environments.
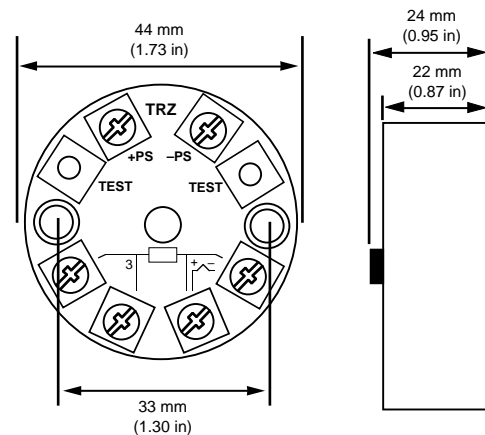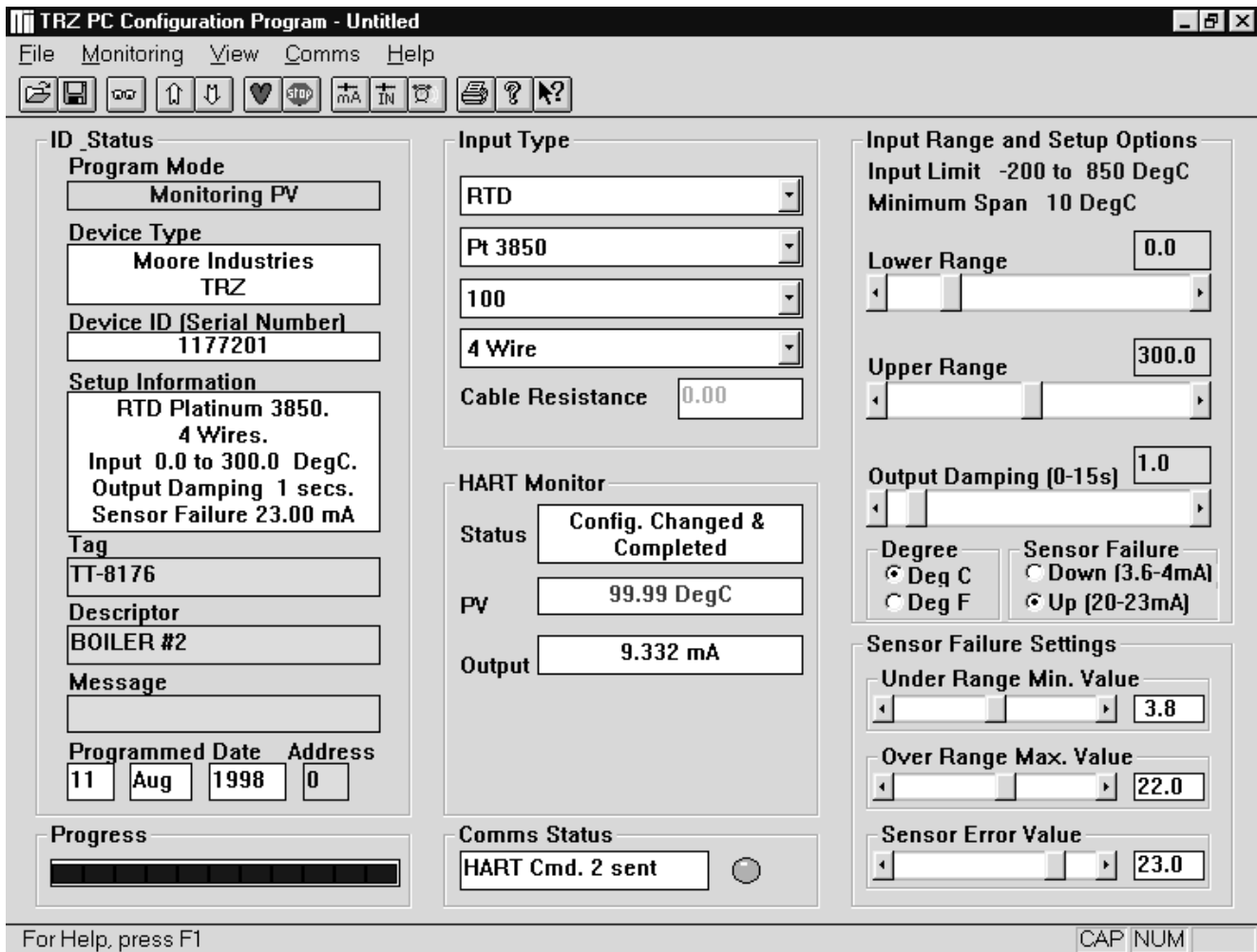
44 mm
(1.73 in)

24 mm
(0.95 in)

22 mm
(0.87 in)

TRZ

+PS   −PS

TEST   TEST

33 mm
(1.30 in)

TRZ

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Figure 6. *All operating parameters can be selected and viewed from a single software screen.*

Intelligent PC Configuration Software

Now, in addition to configuring your TRZ with a HART® Communicator, you can configure it with your PC! Our new Intelligent PC Configuration Software will allow you (with the aid of our HART-to-RS232 Smart Interface Cable) to set up your TRZ in a minute or less, all from one screen!

Set-Up Safeguards
Alert messages make it nearly impossible to make incompatible configuration selections.

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

On-Line Help System
If you have a question during configuration, a push of a button provides your answer. Just point to the area on the Configuration Screen where you have a question or are encountering difficulty, and an explanation appears on the bottom of the screen.

Real-Time Process Readout
The software continuously displays the process measurement and the communication status between the TRZ transmitter and PC.

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

Precise Digital Output Trimming

This fine adjustment minimizes the impact of measurement errors introduced by inaccurate readout devices, allowing you to take full advantage of the exceptional precision of the TRZ.

On-Screen Setup Confirmation with Auto Recognition

When you connect the TRZ to the PC, our software tells you exactly when, and with what parameters, the transmitter was configured. If you make changes, your new choices are instantly displayed.

Sensor-Specific Input Trimming

To ensure that the TRZ's calibrated input precisely matches the sensor's actual measurement, you can capture and store zero and full-scale values from the sensor.

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.

Complete Programming Kit

One ordering number (P/N 235-829-01) gets you everything you need to use TRZ software, including a HART-to-RS232 Smart Interface Cable with HART modem.

Simple Remote Testing, Viewing, and Configuration

The TRZ can be programmed in minutes and interrogated at any time, from anywhere on the 4-20mA loop. You can use a standard HART Communicator (such as Model 275), a HART-based control system, or your PC to:

- **Program Input Type and Range**
  Span, Zero, and Input Type values are all fully programmable (see Table 1 on page 8 for available input types and ranges).

- **Adjust Sensor Trim Offset**
  You can set an offset to compensate for measurement errors that are caused when a temperature sensor is not calibrated or not performing up to its rated specifications.

- **Set Damping Time**
  To eliminate imprecise readings caused by noise and other insignificant process fluctuations, you can set a damping time from 0-15 seconds, in intervals of 1 second.

- **View Real-Time Process Values**
  You can 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.

- **Set Over/Under Range Mode**
  You can select upscale (selectable from 20.00 to 23.00mA) or downscale (selectable from 3.60 to 4.00mA) drive if the input exceeds the programmed upper or lower input range values.

- **Choose Sensor Failure Mode**
  If the sensor input is lost, you have the choice of the output going upscale (selectable from 20.00 to 23.00mA) or downscale (selectable from 3.60 to 4.00mA).

- **Select Device Identification and Information**
  Tag number (8 characters), configuration date, unit location code (16 characters), a message (32 characters), and polling address (0-15) are selectable.

- **View and Reset Minimum/Maximum Values**
  You can view the highest and lowest process values achieved since the last reset, then reset the TRZ to accept new high/low values.

- **Fix Output Current (Loop Test)**
  To assist in calibrating your system, the TRZ's current output can be fixed to a known value so you can check it against the value being read by your receiving device.

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Specifications

HART Specifications	**Address Range:** 0-15 (Addresses 1-15 are for digital communications only) **Transmission Speed:** 1200 baud **Character Format:** 1 Start Bit - 8 Data Bits - 1 Odd Parity Bit - 1 Stop Bit	**Performance (continued)**	**Power Supply Effect:** 0.005% of span per 1V **Load Effect:** Negligible within power and load limits **Load Capability:** Load (KΩ) = (Vdc - 12) / 23mA **Burnout Protection:** User-programmable; Upscale from 20.00 to 23.00mA; Downscale from 3.60 to 4.00mA **Output Current Limiting:** User-programmable; Input Overrange from 20.00 to 23.00mA; Input Underrange from 3.60 to 4.00mA **T/C Input Impedance:** 40μΩ, nominal **RTD Excitation:** 200μA, ±10% **RTD Lead Wire Resistance Maximum:** 10Ω per wire for temperatures less than 600°C; 30Ω per wire for temperatures greater than 600°C; 0.1°C per 10Ω per wire maximum compensation error **Damping:** User-set; 0-15 seconds **Resolution:** Input, 16-bit; Output, 12-bit	**Ambient Conditions**	**Operating and Storage Range:** –40°C to +85°C (–40°F to +185°F) **Relative Humidity:** 0-98%, condensing **Ambient Temperature Effect:** 0.01% of span per °C change, max; 0.003% of span per °C change, typical **Effect on Reference (Cold) Junction Compensation:** ±0.005°C per °C change from room temperature (25°C) **RFI/EMI Immunity:** 30V/m @ 20-1000MHz, when tested according to SAMA standard 33.1 in metal enclosure (10V/m @ 27-1000MHz, when tested according to IEC 1000-4-3-1995 in metal enclosure) **Common Mode Rejection:** 110dB, min, @ 50/60Hz **Normal Mode Rejection:** 55dB, typical, @ 1V peak-to-peak, 50/60Hz
Performance	**Input Accuracy:** Refer to Table 1 **Output Accuracy:** ±0.1% of span (Total accuracy combines input accuracy, output accuracy, and temperature effect; for T/C inputs only, include Reference Junction Compensation in Total Accuracy.) **Reference Junction Compensation Accuracy:** ±0.8°C **Stability:** T/C and RTD inputs 0.05°C for one year **Isolation:** 500Vac input-to-output **Output Response:** 1.0 second for output to go from 10-90% in response to a full step change on input (2.0 second response time for resistance measurements over 2000Ω and RTD measurements over 1000Ω) **Ripple:** Less than 0.06V peak-to-peak, max, 60-120Hz **Maximum Input Protection:** ±35Vdc			**Weight**	**In LH1 Housing:** 329 g (11.6 oz) **In LH2 Housing:** 549 g (19.4 oz) **In HPP Housing:** 51 g (1.8 oz)
		Intrinsic Safety	**Supply Range:** 12-28Vdc **Internal Inductance:** ≤15μH **Internal Capacitance:** ≤1nF **Barrier Data:** 28Vdc, max; 100mA max		

TRZ Device Description (DD)

Moore Industries TRZ Device Description (DD) is the device-specific software that is loaded into a standard HART Communicator (such as the Model 275 HART Communicator). It allows full access to the TRZ's programming functions. The TRZ DD is HART Communication Foundation approved and available on the Foundation's June 1997 (and later) Device Driver Library release.

To determine if your HART Communicator has the TRZ DD, press "1" to select "Offline" and press "1" again to select "New Configuration". A list of companies will appear, including Moore Industries if your communicator is loaded with the TRZ Device Description.

Also Programs with the Generic HART DD

Most of the TRZ's important programming features can be accessed without the TRZ DD by using the "Generic" HART DD available on HART Communicators. Or you can order the TRZ factory-configured with all of the TRZ parameters that are not accessible through the generic DD. Moore Industries can update your HART Communicator with the TRZ Device Description and all the latest DD's required for your other HART transmitters.

Alternatively, the TRZ Device Description is available from any service center that is approved to upgrade universal HART Communicators. Consult our Interface Solution Center nearest you for HART service center locations.

Ordering Information

Unit	Input	Output	Power	Housing
TRZ Smart HART Temperature Transmitter	**PRG** Programmable with standard HART Communicator, HART-based control system, or Moore Industries' PC-based Configuration Software (included)	**4-20MA** output with HART digital data superimposed	**12-28DC** (loop-powered from output side)	**HPP** Hockey-puck housing for mounting in standard connection heads **LH1NS*** Connection head) with two entry ports: ½-inch NPT cable and process—black PBT polyester cover **LH1NA*** Connection head with two entry ports: ½-inch NPT cable and process—black aluminum cover **LH1MS*** Connection head with two entry ports: M20 cable and ½-inch NPT process—black PBT polyester cover **LH1CS*** Connection head with two entry ports: M20 cable and G½ (BSP) process—black PBT polyester cover **LH2NS*‡** Explosion-proof connection head with two entry ports: ½-inch NPT cable and process—black metal cover **LH2MS*‡** Explosion-proof connection head with two entry ports: M20 cable and ½-inch NPT process—black metal cover **CH6** Plastic polypropilene connection head

* For alternate cover color, replace the fifth designator in the LH1 model number with appropriate letter from below (i.e. LH1N**G**): **C** = Clear (LH1 only), **B** = Blue, **R** = Red, **Y** = Yellow, **G** = Green.

NOTE: Add "**P**" suffix to any LH or CH housing for 2-inch pipe mounting hardware (e.g., LH1NS**P**).

** For Group A (only) all conduit must be sealed within 18 inches.

‡ LH2 Explosion-proof certification carries 60°C (140°F) max ambient temperature restriction.

Other connection heads, cabinets, and enclosures are also available. Ask your Interface Solutions Expert for details.

When ordering specify: Unit / Input / Output / Power [Housing]
Model Number Example: TRZ / PRG / 4-20MA / 12-28DC [LH1NSP]

Additional Parts

Each TRZ order comes with one copy of our Configuration Software on a 3½-inch floppy disk (Windows™ '95, '98, and NT compatible). A HART Communicator is not included with the TRZ.

<u>*Note:*</u>
To configure the TRZ with our Intelligent PC Configuration Software, you must use a HART-to-RS232 Smart Interface Cable with HART modem.

Additional accessories are available as follows:

Part Number *235-829-01*	**PC-Programming Kit** Includes one copy of the TRZ Intelligent PC Configuration Software and one HART-to-RS232 Cable with HART Modem.
Part Number *235-75120-03*	**TRZ Intelligent PC Configuration Software** (One copy comes free with each order)
Part Number *803-048-26*	**HART-to-RS232 Smart Interface Cable with HART Modem**

Certifications

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

CSA Intrinsically Safe – Class I, Divison 1, Groups A, B, C, and D – HPP housing only

Non-incendive – Class I, Division 2, Groups A, B, C, and D – HPP housing only

General Location – HPP housing

KEMA (CENELEC) Intrinsically Safe – EEX ia IIC T4/T5 HPP housing only

FM Intrinsically Safe – Class I, Division 1, Groups A, B, C, D, E, F, and G – HPP housing

Non-incendive – Class I, Division 2, Groups A, B, C, and D – HPP housing only

Explosion-proof – Class I, Division 1, Groups A, B, C, and D – LH2 housing only (60°C(140°F) maximum ambient temperature)--*see note*

NOTE: Factory Mutual (FM) certifications apply to the TRZ and the LH2NS and LH2MS connection head combination *only.* Sensor, thermowell or fixed immersion sensor components are *not* included in the certifications.

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Table 1. *Input Types, Ranges, Minimum Span and Maximum Range Specifications, and Accuracy of TRZ.*

Input	Type	α	Ω	Measuring Range	Minimum Span	Input Accuracy
RTD	Platinum	0.003850	25-500	−200 to 850°C −328 to 1562°F	10°C 18°F	±0.2°C ±0.36°F
			1000	−200 to 320°C −328 to 608°F		
		0.003902	25-500	−100 to 650°C −148 to 1202°F		
			1000	−100 to 320°C −148 to 608°F		
		0.003916	25-500	−200 to 500°C −328 to 932°F		
			1000	−200 to 320°C −328 to 608°F		
	Nickel	0.00618	25-500	−50 to 250°C −58 to 482°F	10°C 18°F	±0.2°C ±0.36°F
			1000			
	Copper	0.00427	25-1000	−50 to 200°C −58 to 392°F	10°C 18°F	±0.2°C ±0.36°F
Ω	Direct Resistance or Potentiometer	n/a	n/a	0 to 390Ω	5Ω	±0.08Ω
				0 to 2200Ω	25Ω	±0.4Ω

Input	Type	Maximum Range	Conformance Range	Minimum Span	Input Accuracy
T/C	J	−210 to 1200°C −346 to 2192°F	−200 to 1000°C −328 to 1832°F	50°C 90°F	±1.0°C ±1.8°F
	K	−250 to 1372°C −454 to 2502°F	−230 to 1370°C −382 to 2498°F		
	E	−270 to 1000°C −454 to 1832°F	−250°C to 900°C −418 to 1652°F		
	T	−250 to 400°C −454 to 752°F	−220 to 400°C −364 to 752°F	40°C 72°F	
	R	−50 to 1768°C −58 to 3216°F	0 to 1750°C 32 to 3182°F	100°C 180°F	±2.0°C ±3.6°F
	S				
	N	−270 to 1300°C −454 to 2372°F	−130 to 1300°C −202 to 2372°F	50°C 90°F	±1.0°C ±1.8°F
	B	100 to 1820°C 392 to 3308°F	500 to 1820°C 932 to 3308°F	50°C 90°F	±2.0°C ±3.6°F
	C (W5)	0 to 2300°C 32 to 4172°F	0 to 2300°C 32 to 4172°F	100°C 180°F	
	D (W3)				
	L	−200 to 900°C −328 to 1652°F	−200 to 900°C −328 to 1652°F	50°C 90°F	±1.0°C ±1.8°F
	U	−200 to 600°C −328 to 1112°F	−200 to 600°C −328 to 1112°F		
mV	DC	−10 to +70mV	n/a	2mV	±0.04mV
		−0.1 to +1.1V		20mV	±0.4mV