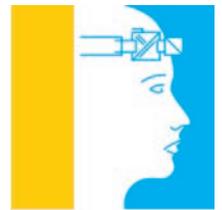


THZ<sup>3</sup>/TDZ<sup>3</sup> Programmable Smart HART Temperature Transmitter



**PACTware**<sup>™</sup>

PACTware Consortium e. V.

**MEMBER**



# THZ<sup>3</sup>/TDZ<sup>3</sup>

Programmable Smart HART  
Temperature Transmitter

User's Manual

238-741-00B  
April 2015



## Demand MOORE Reliability

### Customer Support

Moore Industries is recognized as the industry leader in delivering top quality to its customers in products and services. We perform a sequence of stringent quality assurance checks on every unit we ship. If any Moore Industries product fails to perform up to rated specifications, call us for help. Our highly skilled staff of trained technicians and engineers pride themselves on their ability to provide timely, accurate, and practical answers to your process instrumentation questions. Our headquarters and other facilities phone numbers are listed below.

There are several pieces of information that can be gathered before you call the factory that will help our staff get the answers you need in the shortest time possible. For fastest service, gather the complete model and serial number(s) of the problem unit(s) and the job number of the original sale.

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[www.miinet.com](http://www.miinet.com)

## Safety Messages

Please read this manual in its entirety. It should answer most of your questions. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining this product. Should you still have questions please visit our web site at [www.miinet.com](http://www.miinet.com) or contact any of our sales/support offices nearest you.

Your safety and the safety of others is very important. We have provided many important safety messages in this manual. Please read these messages carefully. These safety messages alert you to potential hazards that could hurt you or others or render damage to units.

All Moore Industries instrumentation should only be used for the purpose and in the manner described in this manual. If you use this product in a manner other than that for which it was intended, unpredictable behavior could ensue with possible hazardous consequences.

Each safety message is associated with a safety alert symbol. These symbols are found in the throughout the manual. The definition of these symbols is described below:

Pay particular attention wherever you see the following symbols:



**Note** – Information that is helpful for a procedure, condition or operation of the unit.



**Caution** – Hazardous procedure or condition that could damage or destroy the unit.



**Warning** – Hazardous procedure or condition that could injure the operator.

### Qualified Personnel

The Moore Industries' product/systems described in this manual may be operated only by personnel qualified for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these Moore Industries' products/systems.

### Proper use of Moore Industries products

Moore Industries' products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Moore Industries'. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

We have reviewed the contents of this publication to ensure consistency with the hardware and/or software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions. Specifications and information are subject to change without notice.

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## THZ3/TDZ3 Quick Start Guide

The THZ3/TDZ3 is ready to install and is either set up with your specified configuration or the default configuration below. If you need to change any parameters this can be done using a HART handheld configurator or FDT/DTM application (see Sections 4 & 5).

After programming your transmitter, install the unit into your application using the connection diagrams and terminal designation table located in this manual.

### Default Configuration - Single Sensor Mode

**Sensor 1:** 4 Wire RTD, Pt3850, 100 Ohms, 0-100° C

**Broken Wire:** Enabled

**Broken Wire Holdoff:** Disabled, 0 seconds

**Sensor 2:** Disabled

**Filter:** 60Hz

**Running Average Filter:** DISABLED, Setting: 1

**PV Damping:** DISABLED, 0 seconds

**(TDZ<sup>3</sup>) Display Source:** Primary Variable (PV)

**(TDZ<sup>3</sup>) Decimal Places:** Auto

**Analog Output:** 4-20mA

**Analog Output Under Range Min Value:** 3.8mA

**Analog Output Over Range Max Value:** 21.6mA

**Sensor Fail Mode:** High, 23.6mA

PV is= Sensor 1

SV is= RJC Temperature

TV is= Sensor 1

QV is= Sensor 1

**Input Quality Alarms:** Allow measurement out of conformance range = On,  
Allow Limited = Off, Allow Dropping = Off

**Advanced Features:** Disabled

## Section 1 - Introduction

The Moore Industries' THZ<sup>3</sup>/TDZ<sup>3</sup> is the next generation of the THZ<sup>2</sup>/TDZ<sup>2</sup>. The THZ<sup>3</sup>/TDZ<sup>3</sup> provides all the same capabilities as the THZ<sup>2</sup>/TDZ<sup>2</sup> with additional support for 2 sensors, new measurement modes (backup, average, high select/low select and differential) and advanced device intelligence.

This is the user's manual for Moore Industries' THZ<sup>3</sup>/TDZ<sup>3</sup> Programmable Smart HART Temperature Transmitters. It contains all of the information needed to configure, install, operate and maintain the instruments.

### Overview

The THZ<sup>3</sup>/TDZ<sup>3</sup> has the ability to accept one or two sensor inputs. The variables of the THZ<sup>3</sup>/TDZ<sup>3</sup> can be configured as either sensor 1, sensor 2, average, differential, backup, low or high select. In backup mode, the THZ<sup>3</sup>/TDZ<sup>3</sup> automatically switches to the secondary sensor input if the primary sensor fails; either sensor can be selected as the primary sensor. This substantially increases the overall reliability of the measurements. Upon switching to the secondary sensor, an alert is available via the HART "Additional Status" diagnostic bit and is also sent to the TDZ<sup>3</sup> display. If a sensor fault occurs when not in backup mode, the THZ<sup>3</sup>/TDZ<sup>3</sup> can be configured to drive the analog output upscale, downscale, to a preset value or will hold last output.

The THZ<sup>3</sup>/TDZ<sup>3</sup> has enhanced device intelligence which includes sensor drift, corrosion detection, range alarms and device diagnostics. These can check and alert the user when thermocouples fail unexpectedly, resistance thermometers exceed set parameters or the device has failures. A more detailed explanation of these features is provided later in this section. For more information on the THZ<sup>3</sup>/TDZ<sup>3</sup> diagnostics please see Section 6.

HART 7 compliance provides device configuration via DD, HART diagnostic data and exception based reporting. In addition a DTM is provided to enable programming and monitoring with any FDT compliant host or program such as PACTware.

The TDZ<sup>3</sup> has an additional feature, an easy-to-read customizable display.

### Model Numbers and Options

The following section provides details of the Moore Industries model number and the available options for the THZ<sup>3</sup> and TDZ<sup>3</sup>.

Moore Industries model numbers for the THZ<sup>3</sup>/TDZ<sup>3</sup> are structured as follows:

THZ<sup>3</sup> / PRG / 4-20MA / 12-30DC / [HPP]

Unit / Input / Output / Power / - Options [Housing]

Refer to **Section 9 Ordering Information** for a quick reference table of ordering information. Further details are provided for each model below.

### INPUT

#### PRG

The THZ<sup>3</sup>/TDZ<sup>3</sup> supports one or two RTD, T/C, mV, Potentiometer and Ohms as configurable inputs.

The input field of the model number string can also specify the specific sensor in a temperature transmitter assembly (see RTI series data sheets for more information). If a second sensor is required in the assembly then this needs to be ordered separately.



**Note:** While the THZ<sup>3</sup>/TDZ<sup>3</sup> will accept a dual input sensor configuration the following limitations apply only when using two input sensors:

**TDZ<sup>3</sup> [HP]** – 2-wire and/or 3-wire sensors. 4-wire sensors (RTDs) cannot be used.

**THZ<sup>3</sup> [DIN]** – (see figure 3.2) 2-wire and/or 3-wire sensors. 4-wire sensors (RTDs) cannot be used.

**THZ<sup>3</sup> [HPP]** – (see figure 3.4) Sensor 1 can be configured as 2-wire or 3-wire sensor. Sensor 2 is then restricted to a 2-wire sensor.

### OUTPUT

#### 4-20MA

The isolated analog output provides a 4-20mA signal (scalable to narrower ranges) with a HART signal superimposed.

### POWER

The THZ<sup>3</sup> and TDZ<sup>3</sup> are 2-wire, loop powered instruments. They are powered either by an external power supply, or by a DCS (or PLC) input channel that provides power to the loop.

#### 12-42DC

12-42Vdc is the standard power range.

#### 12-30DC

To specify units for installation in intrinsically safe areas, specify the 12-30Vdc power option. This option is not applicable to DIN housing.

## OPTIONS

### **-RF**

Applies to DIN housing only. This option provides enhanced RFI/ EMI filtering with protection of 20 V/m @ 80-1000 MHz, 1kHz AM.

## HOUSING

### **[HP]**

The TDZ<sup>3</sup> with display is available in an HP housing. The THZ<sup>3</sup> is not available in this housing.

The HP unit can also be ordered in an explosion proof or protective enclosure eg. BH, SB, D-Box etc. or with a clip for DIN rail or track mounting.

### **[HPP]**

The THZ<sup>3</sup> is available in an HPP housing. The TDZ<sup>3</sup> is not available in this housing.

Encapsulated hockey-puck housing for mounting in connection heads. The HPP unit can also be ordered in an explosion proof or protective enclosure eg. LH1, LH2.

### **[DIN]**

The THZ<sup>3</sup> is available in a DIN housing. The TDZ<sup>3</sup> is not available in this housing.  
DIN-style aluminum housing mounts on 35mm Top Hat DIN rail (EN50022)

Please refer to Section 9 Ordering Information for all housing options.

## Measurement Modes and Device Variables

The THZ<sup>3</sup>/TDZ<sup>3</sup> can support one or two sensor inputs. With one input it provides an output which is proportional to the input with options for trimming, custom linearization and scaling. With two sensor inputs there are many other measurement modes:

**Single Measurement** - Sensor 1 or Sensor 2 can be selected

**Backup Measurement** - Sensor 1 fail to Sensor 2 or Sensor 2 fail to Sensor 1. If the primary sensor fails the secondary sensor will continue to drive the analog output without any interruption and a HART status flag is set.

**Average Measurement** - This will output the average value of Sensor 1 and Sensor 2.

**Differential Measurement** - Select from  
 -Differential: S1-S2  
 -Differential: S2-S1  
 -Absolute Differential: |S1-S2|

**Low Select and High Select Measurements** - This will output the larger or smaller measurement of Sensor 1 or Sensor 2.

For both single sensor and two sensor inputs there are many other variables, known as Device Variables, that are calculated from the inputs. Most HART commands use variables known as Dynamic Variables. The Device Variables need to be assigned or 'mapped' to the Dynamic Variables.

The tables below define the Device Variables and Dynamic Variables.

**Table 1.1.** Device Variables

Device Variable	Device Variable Description
RJCT	Reference Junction Compensation Temperature used for Thermocouple compensation
SEN1	Sensor 1 reading ohms, mv, potentiometer, temperature with optional trimming, scaling or custom curve applied
SEN2	Sensor 2 reading ohms, mv, potentiometer, temperature with optional trimming, scaling or custom curve applied
BU1-2	Use Sensor 1 until it fails then back up to Sensor 2
BU2-1	Use Sensor 2 until it fails then back up to Sensor 1
AVG	Calculate the average of Sensor 1 and Sensor 2
DIFF12	Sensor 1 minus Sensor 2
DIFF21	Sensor 2 minus Sensor 1
ABDIF	Absolute difference of Sensor 1 and Sensor 2
LOSEL	Selects the lower (smaller) of Sensor 1 and Sensor 2
HISEL	Selects the higher (larger) of Sensor 1 and Sensor 2

**Table 1.2.** Dynamic Variables

Dynamic Variable	Dynamic Variable Description
PCT	Percent Of Output Range (PV scaled to 0-100%)
AO	Analog Output/ Loop Current
PV	Primary or Process Variable
SV	Secondary Variable
TV	Tertiary Variable
QV	Quaternary Variable

To select the measurement which appears on the Analog Output, the relevant Device Variable must be assigned to the PV (Primary or Process Variable) By default, Sensor 1 (SEN1) is assigned to the PV.



**Note:** To use a calculated Device Variable, both sensors' engineering units (EGU) must be compatible (i.e. the same or both temperature units). If a calculated Device Variable has different engineering units (EGU) from the Sensors' EGU, scaling will need to be used to change the units.

### HART Broadcast Messaging (Burst Mode)

The THZ3/TDZ3 supports enhanced broadcast messaging more commonly referred to as burst mode. When set to burst mode, the THZ3/TDZ3 will proactively send out messages instead of waiting for the host to request them. This enables event driven communication (high, low, deviation of signal or change in status) and/or timed communication (every x seconds) to the host. Up to 3 different burst messages may be configured in the THZ3/TDZ3. Please see section 4 for more information on burst mode configuration



**Note:** When using burst mode in the THZ3/TDZ3, the host must also be configured to communicate in burst mode.

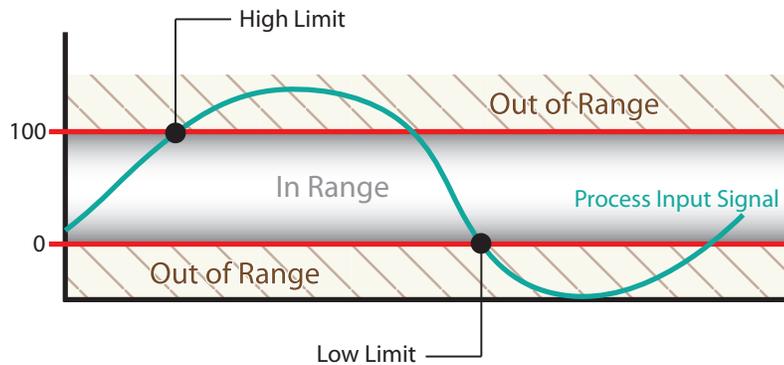
### Sensor Diagnostics

As part of the enhanced device intelligence, the THZ<sup>3</sup>/TDZ<sup>3</sup> performs Total Sensor Diagnostics. This can save you downtime by letting you know when a problem occurs, what type and its location. Some of these diagnostics such as drift alert and corrosion detection can also be used for predictive diagnostics to warn of future problems. This allows for planned sensor replacement and minimal process interruption.

### Range Alarms

The THZ<sup>3</sup>/TDZ<sup>3</sup> implements 4 independently configurable Range Alarms. Typical applications are outside of range detection, in range detection and sensor drift.

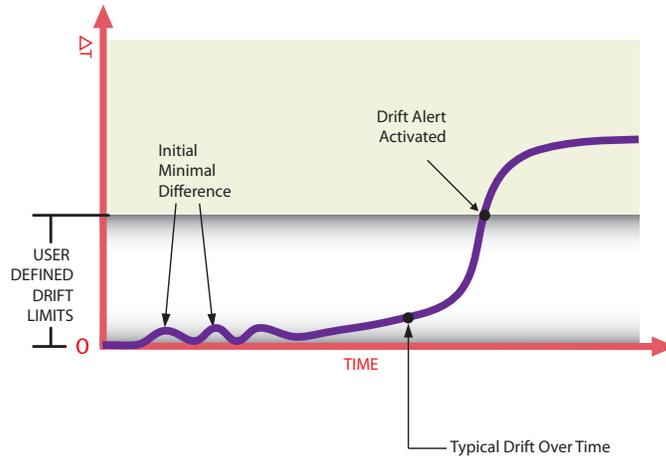
Range Alarms (RA) can be used to detect if a Device Variable is inside or outside of an arbitrary user specified range. Any Device Variable can be used as the source, including the RJC Temperature, Loop Current, and Percent of Range (POR). The alarm can be set to a warning (set a HART status bit) or an alarm (sets a different status bit, plus AO fail response). It can also be configured as latching or non latching.



**Note:** If a Range Alarm Response is set to Alarm, the AO will always perform a fail response even if the source Device Variable is not assigned to the PV. Setting the Range Alarm Response to Warning will not affect the AO.

### Sensor Drift Detection

Drifting in sensors occurs from a number of different causes including environmental contamination, vibration, and extreme temperature fluctuations. This can lead to false sensor readings. The THZ<sup>3</sup>/TDZ<sup>3</sup> can be configured to detect these false readings by using a Range Alarm to monitor the absolute differential between two sensors (i.e. RTD & T/C or two RTDs or T/Cs) at the same point. This method can provide a range alarm warning or alarm to indicate that there is an issue with one of the sensors. See Chart below for clarification.



In this example a Range Alarm is set with the Absolute Differential as the source. An out of range warning or alarm is configured with the low and high limits set to 0C° to 5C° respectively, creating an alarm when Sensor 1 and Sensor 2 readings drift apart by more than 5C°.

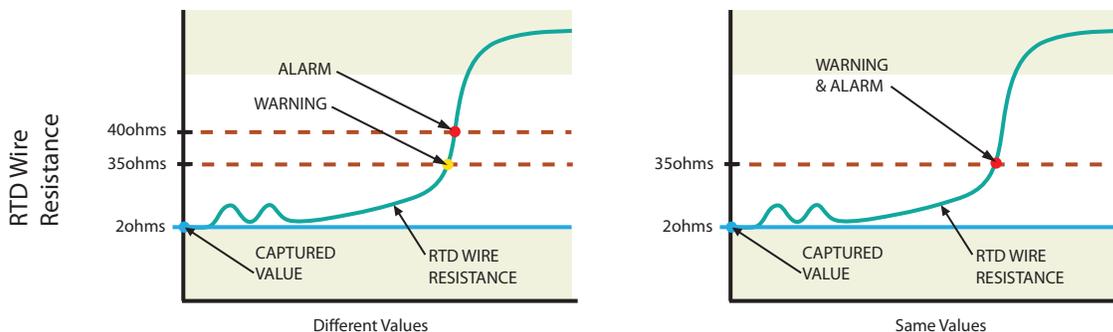


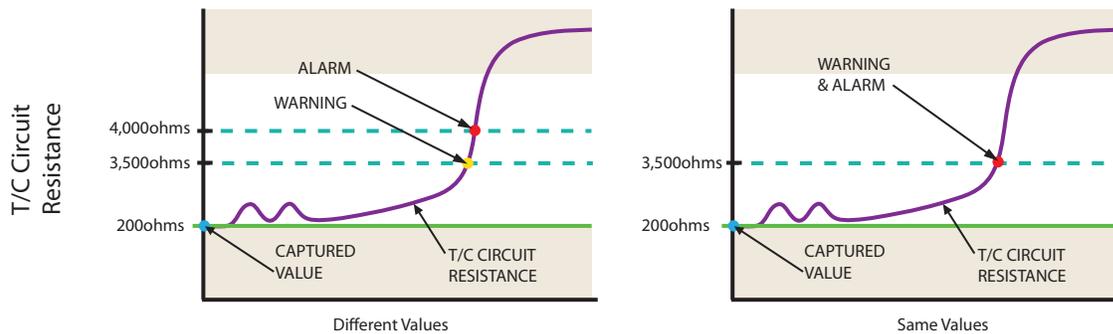
**Note:** When setting the drift limit please allow for sensor tolerances and differences in sensor response times to avoid false drift alerts.

### Corrosion Detection

Corrosion of the sensor connections is primarily caused by oxidation or electrolysis which can lead to inaccurate readings with RTD measurements. The THZ<sup>3</sup>/TDZ<sup>3</sup> is able to detect corrosion on 3W or 4W RTDs by measuring the change in compensating lead wire resistance between terminals 3 and 4 providing an alert when preset value limits are exceeded.

Additionally the THZ<sup>3</sup>/TDZ<sup>3</sup> monitors the status of T/C circuits. High resistance values in T/C circuits could indicate a potential impending T/C burnout.





To setup Corrosion Detection, the user captures the nominal sensor resistance value and sets the Warning and Alarm limits. These can be set at different levels or the same level for both. See chart below for clarification.

Selecting Warning will set a fault message on the TDZ3 display and send a HART message to any HART Handheld or HART monitoring HOST. In addition an alert will be sent to any FDT host that is communicating with the transmitter. Selecting Alarm will also drive the Analog output to Fail Mode if the sensor is assigned to the PV. If the unit is in backup mode, and the primary sensor has a corrosion alarm, the PV will switch to the backup sensor.

### Broken Wire Detection

During operation, the THZ<sup>3</sup> and TDZ<sup>3</sup> send random microamp pulses through input wiring to check for broken wiring or a burned out sensor. By default the broken wire detection is always enabled, and this feature is essential to ensure that dangerous failure of the sensor or signal input is detected by the THZ<sup>3</sup> and TDZ<sup>3</sup> and consequently alarmed.

If the THZ<sup>3</sup>/TDZ<sup>3</sup> detects a broken wire or burned out sensor during operation, the transmitter sets the output upscale or downscale to warn of trouble. The transmitter is able to identify sensor wire(s) causing the problem and indicate the fault as a message to the HART Handheld/FDT HOST, TDZ<sup>3</sup> display and by setting a HART status bit. Specific error messages eliminate the work of removing the sensor or checking all lead wires to diagnose a problem. This feature is especially valuable during startup.

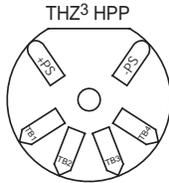
Additionally the THZ<sup>3</sup> and TDZ<sup>3</sup> have another feature referred to as BW (Broken Wire) Holdoff Time. This allows users to add an additional time delay before the broken wire diagnostic alert is reported. When enabled, a Broken Wire delay of 0-60 seconds can be set. This feature prevents the transmitter from going into a fault state when intermittent high levels, or spikes, of extraneous plant noise is conducted onto the sensor leads.

## Section 2 - Calibration and Bench Check

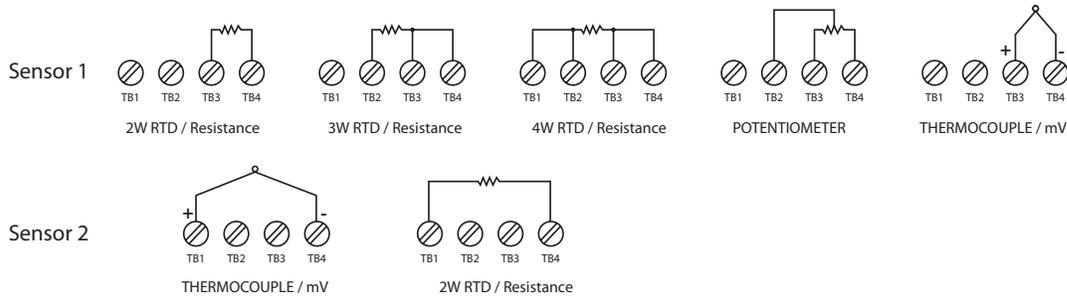
Please refer to Figure 2.1 for proper terminal connections while calibrating or performing a bench on your THZ<sup>3</sup>/TDZ<sup>3</sup>.

**Figure 2.1. Terminal Designations**

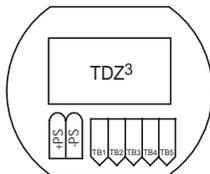
### THZ3 HPP (4 Terminals) Input Connections



Note: THZ<sup>3</sup> [HPP] (see figure 3.4) – When using two input sensors, Sensor 1 can be configured as 2-wire or 3-wire sensor. Sensor 2 is then restricted to a 2-wire sensor.



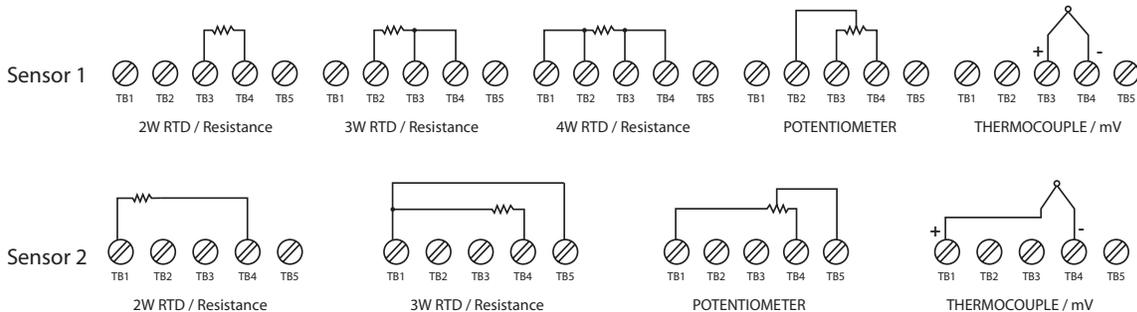
### TDZ3 HP and THZ3 DIN (5 Terminals) Input Connections



Note: TDZ<sup>3</sup> – When using two input sensors you are limited to 2-wire and/or 3-wire sensors. 4-wire sensors (RTDs) cannot be used.



Note: THZ<sup>3</sup> [DIN] (see figure 3.2) - When using two input sensors you are limited to 2-wire and/or 3-wire sensors. 4-wire sensors (RTDs) cannot be used.



## Calibration

Every THZ<sup>3</sup>/TDZ<sup>3</sup> is calibrated to our specifications prior to delivery to our customers. We recommend that you check the calibration every year and re-calibrate only when necessary. Please refer to the Long Term Stability Table in Section 8 of this manual. Calibration by the end user can be performed in the field by capturing or trimming the input and/or trimming the analog output.

Sensor trimming increases the measurement accuracy of your instrument by matching the reading of its actual input to its scaling. The THZ<sup>3</sup>/TDZ<sup>3</sup> offers the use of a trimming feature that can be accessed using a HART Communicator, a HART Host, or an FDT Host (such as PACTware).

Likewise, output trimming increases the measurement accuracy of the THZ<sup>3</sup>/TDZ<sup>3</sup> by calibrating its analog output to the device that is receiving the output (such as a DCS). This ensures that the output of the THZ<sup>3</sup>/TDZ<sup>3</sup> is being correctly interpreted.

## Calibration using a HART handheld communicator

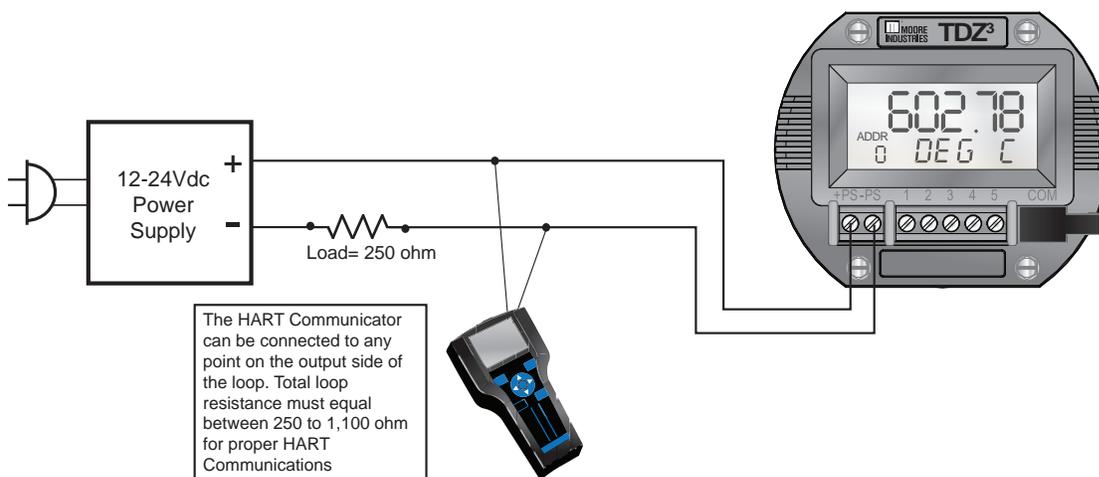
To perform the Input Trimming of the THZ<sup>3</sup>/TDZ<sup>3</sup> set up the equipment in Table 2.1 as shown in Figures 2.1 thru 2.4.

**Table 2.1. Necessary Equipment**

Device	Specifications
Millivolt or Resistance Source	Accurate to $\pm 0.05\%$ of span for the intended application.
Power Supply	24Vdc, $\pm 10\%$
Load Resistor	250 ohms with $\pm 0.01\%$ precision
Multimeter	Calibrated to an accuracy of $\pm 0.025\%$ , or better; such as Fluke Model 725, or similar
HART Communicator	Any HART HandHeld Communicator or Host (with THZ <sup>3</sup> /TDZ <sup>3</sup> Device Description loaded)

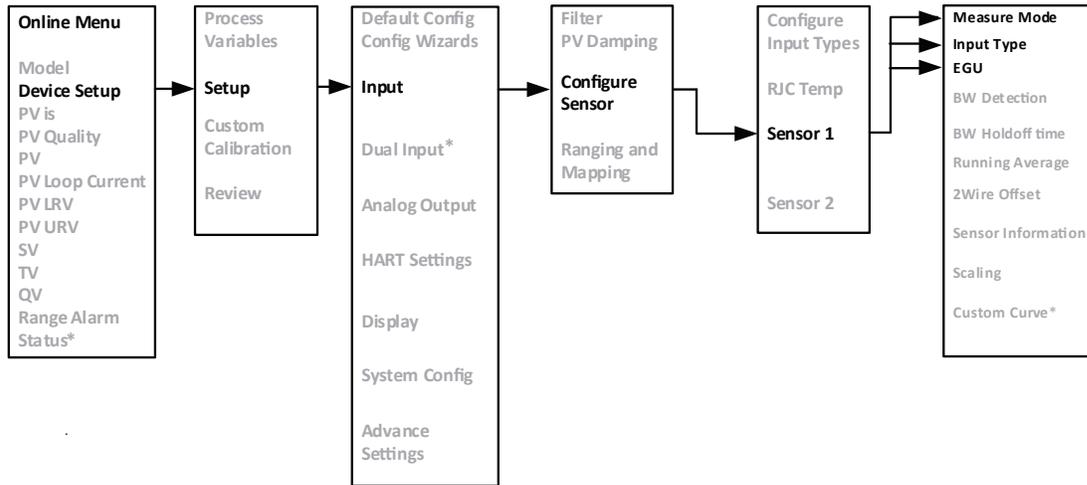
See Figure 2.2 for the power supply and loop connections. The TDZ<sup>3</sup> is shown, but the power supply and loop connections for the THZ<sup>3</sup> [HPP] and THZ<sup>3</sup> [DIN] will be similar.

**Figure 2.2. Power Supply and Loop connections**



Use your HART Communicator to verify how your instrument is configured. Refer to Figure 2.3 below for clarity.

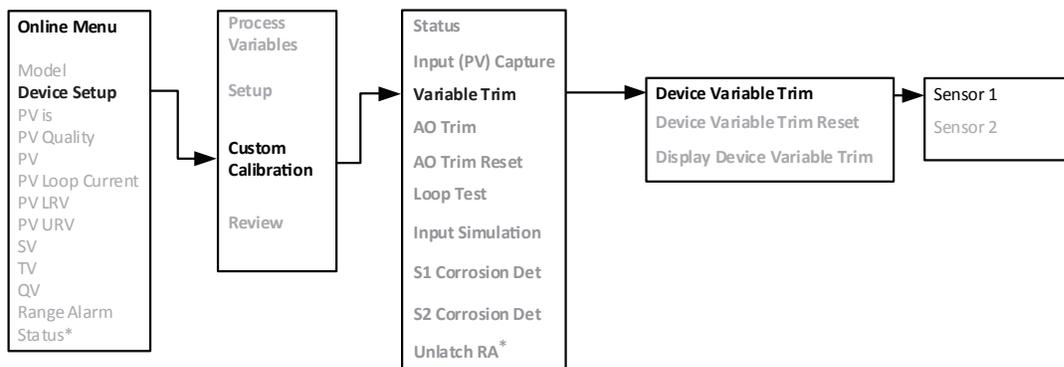
**Figure 2.3.** Verify Instrument Configuration with HART Communicator



This will help you to be sure to apply the correct input with which to trim your THZ<sup>3</sup>/TDZ<sup>3</sup>. By example: If the Sensor 1 Measure Mode is “RTD 4 wire” and the Sensor 1 Input Type is “Pt 3850 1000 ohm” and Sensor 1 EGU is “deg F” then you should be using an accurate resistance source (such as a decade box) to emulate the 4-wire, Pt 3850, 1000Ω RTD and use the Fahrenheit temperature tables to source the correct resistances for your specific temperature range. Be sure to also check the HART Communicator’s Online Menu to see your instrument’s PV LRV (Primary Variable Lower Range Value) and PV URV (Primary Variable Upper Range Value) settings so that you know the span of temperature to be used.

Now you are ready to do the actual input trimming of your THZ<sup>3</sup>/TDZ<sup>3</sup>. Using your HART Communicator, follow Figure 2.4 below and steps on next page for clarity.

**Figure 2.4.** Input Trimming with HART Communicator

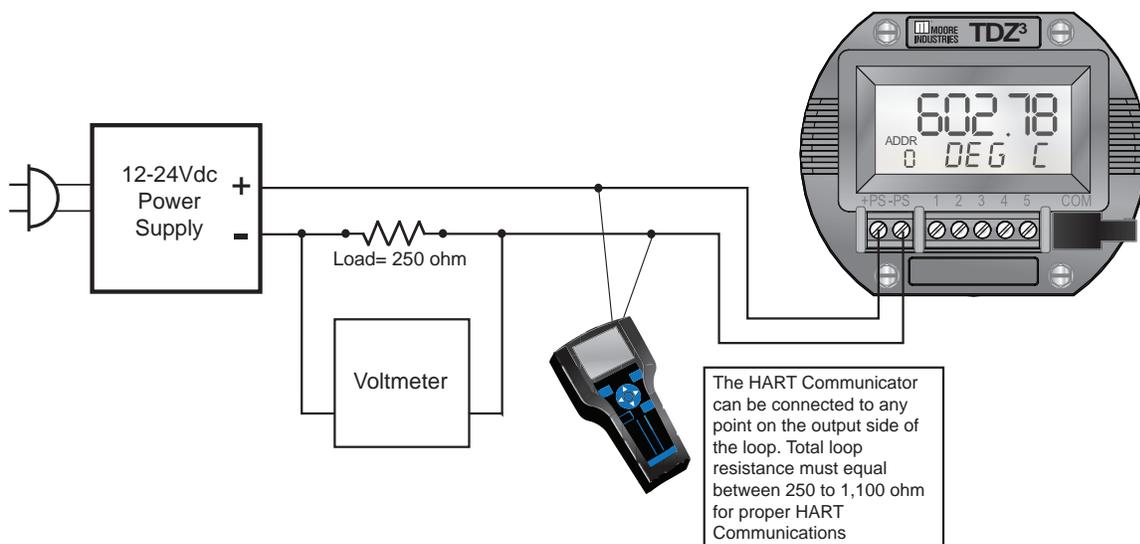


1. From the Online menu select "Device setup".
2. Select "Custom Calibration".
3. Select "Variable Trim".
4. Select "Device variable trim".
5. Follow and heed the information and instructions on the screen of your HART Communicator.
6. Select "Sensor 1".
7. Select "Trim Low".
8. You will now be setting your input resistance to match your PV LRV. By example – If your LRV is 32° F the input you will apply to the instrument will be 1000.00Ω.
9. When your reading stabilizes press the OK button to capture the value and follow the prompts.
10. Follow the screen prompts to trim the PV URV.
11. Save the trim values and return your instrument to loop control and verify that your input is reading correctly.
12. You can then perform the Variable Trim for Sensor 2 if you are using a dual sensor configuration.

Trimming for a thermocouple input will be similar, except you will be providing an accurate millivolt signal to simulate temperature.

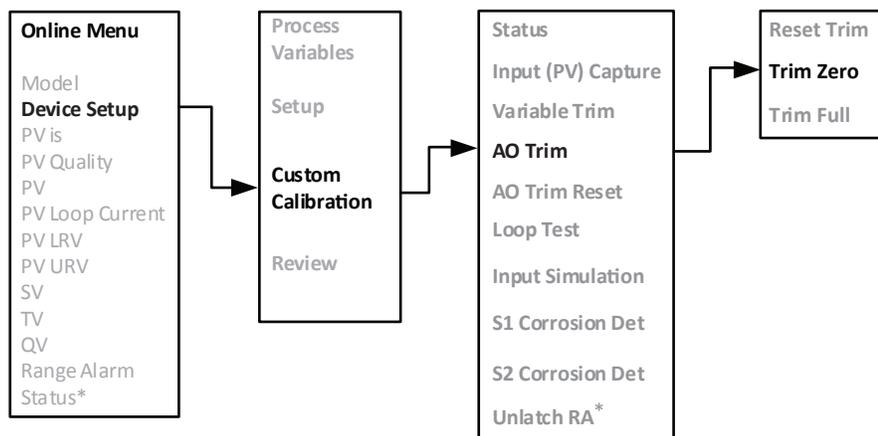
To perform the Output Trimming of the THZ<sup>3</sup>/TDZ<sup>3</sup> set up the equipment specified in Table 2.1. then use your HART Communicator, follow steps below and refer to Figure 2.5 for clarity.

**Figure 2.5.** Output Trimming



**Note:** You do not need to connect any sensor to the input terminals to perform the output trim.

Figure 2.6. Output Trimming with HART Communicator



1. From the Online menu select "Device setup".
2. Select "Custom Calibration".
3. Select "AO Trim" (this allows you to trim the Analog Output)
4. Start with the "Trim Zero" function.
5. Follow and heed the information and instructions on the screen of your HART Communicator.
6. Use your voltmeter to measure the voltage drop across the 250Ω resistor. A 4mA output will read as 1V across the resistor.
7. Follow the instructions on the screen of your HART Communicator and then proceed to "Trim Full".
8. Use your voltmeter to measure the voltage drop across the 250Ω resistor. A 20mA output will read as 5V across the resistor.

## Calibration using FDT/DTM Software

This section provides information on calibrating the TDZ<sup>3</sup>/ THZ<sup>3</sup> using a PC with PACTware (an FDT frame application). For users who already have an FDT Frame Application, all the following information is still relevant. For more information on FDT/DTM please refer to [www.fdtgroup.org](http://www.fdtgroup.org).

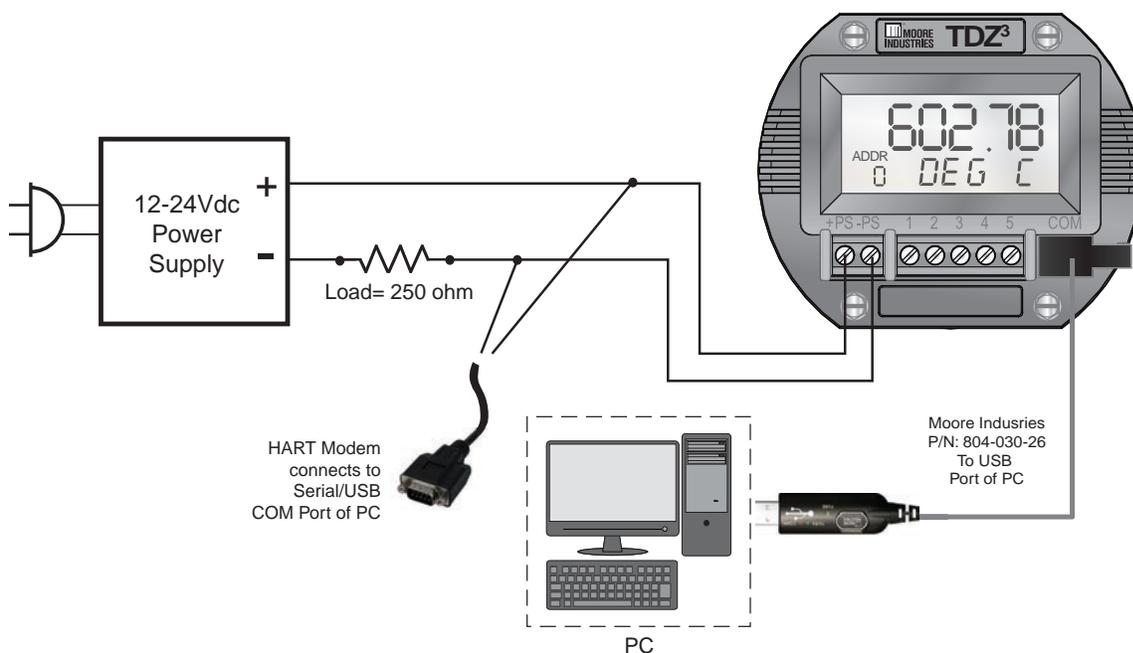
To perform the Input Trimming of the THZ<sup>3</sup>/TDZ<sup>3</sup> set up equipment in Table 2.2 as shown in Figure 2.7.

**Table 2.2.** Necessary Equipment

Device	Specifications
<b>Millivolt or Resistance Source</b>	Accurate to $\pm 0.05\%$ of span for the intended application.
<b>Power Supply</b>	24Vdc, $\pm 10\%$
<b>Load Resistor</b>	250 ohms with $\pm 0.01\%$ precision
<b>Multimeter</b>	Calibrated to an accuracy of $\pm 0.025\%$ , or better; such as Fluke Model 725, or similar
<b>PC with PACTware or FDT frame application</b>	PACTware version 4.1 SP3 or newer
<b>Communications Cable</b>	Moore Industries P/N 803-040-26 or 804-030-26

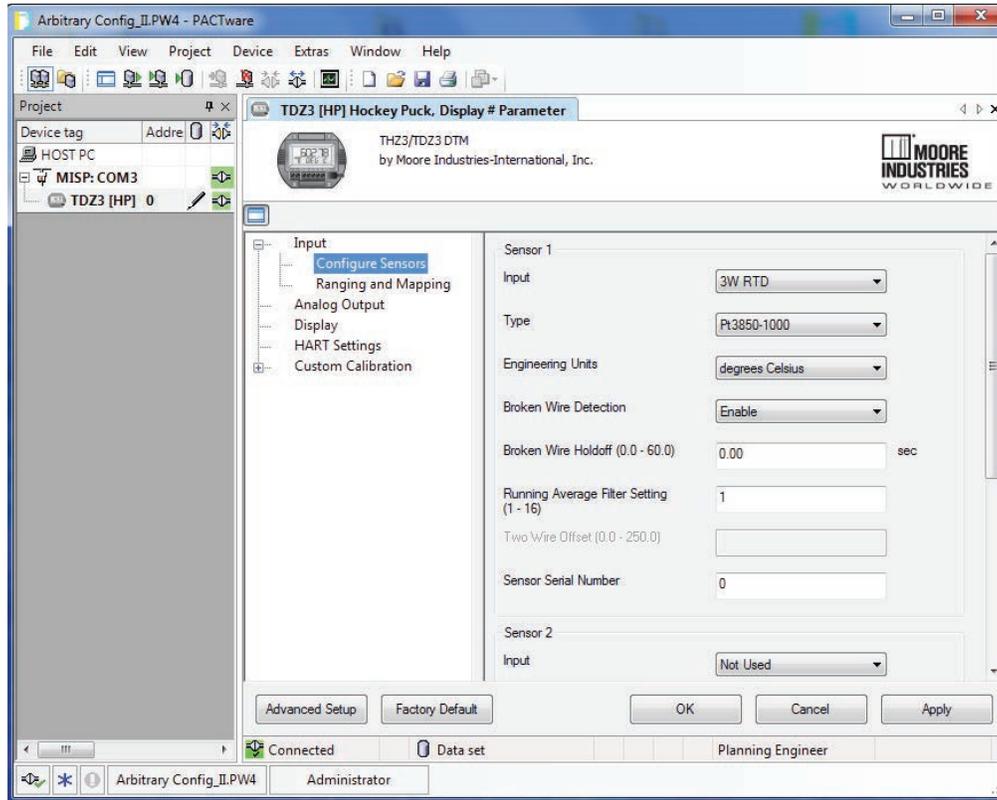
For instructions on installation and setup of the THZ<sup>3</sup>/TDZ<sup>3</sup> DTM with PACTware or another FDT frame, please refer to section 5. See Figure 2.7 for the power supply and loop connections. The TDZ<sup>3</sup> is shown, but the power supply and loop connections for the THZ<sup>3</sup> [HPP] and THZ<sup>3</sup> [DIN] will be similar.

**Figure 2.7.** Calibration Setup for PACTware



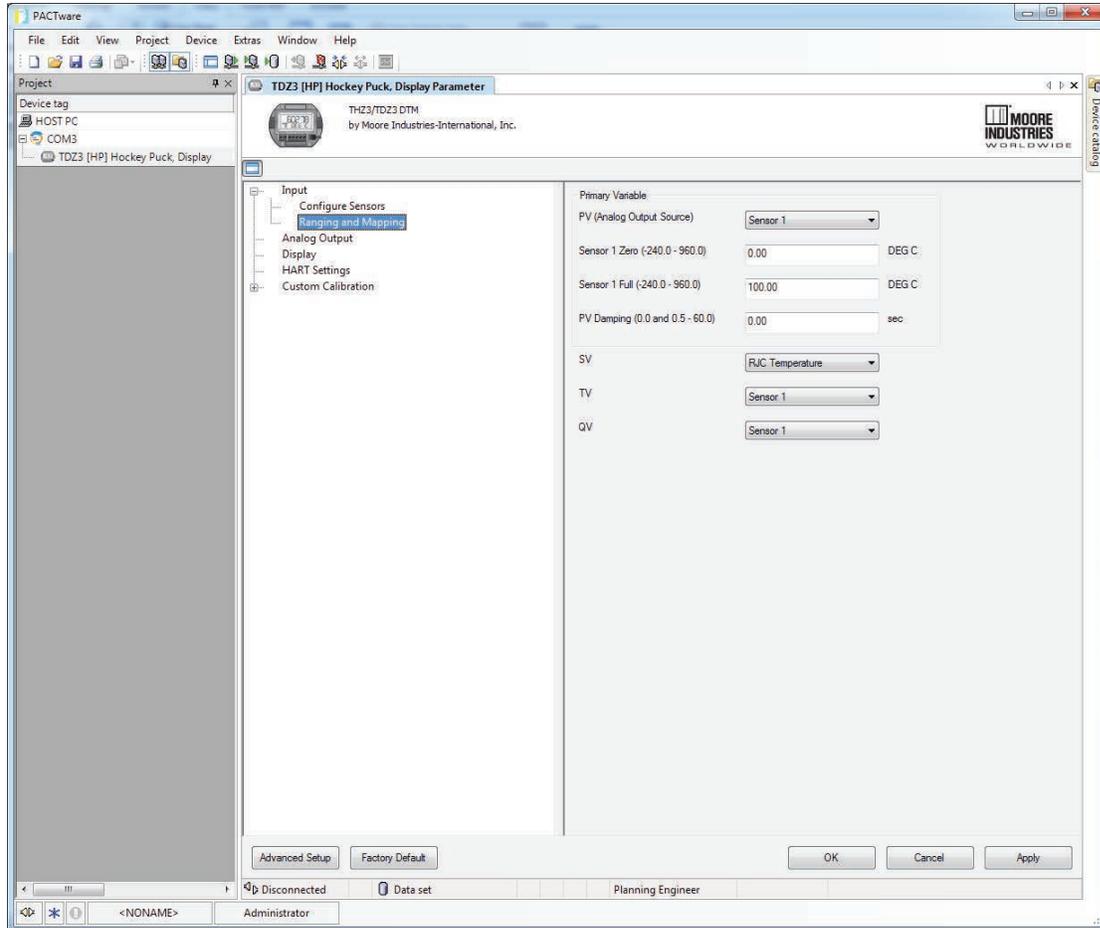
Use PACTware to verify how your instrument is configured. Refer to Figure 2.8 below.

Figure 2.8. Verify your sensor type



Check the Configure Sensors settings in PACTware. This will help you to be sure to apply the correct input with which to trim your THZ<sup>3</sup>/TDZ<sup>3</sup>. By example: If the Sensor 1 Input is “3W RTD” and the Type is “Pt3850-1000” and Engineering Units is “degrees Celsius” then you should be using an accurate resistance source (such as a decade box) to emulate the 3-wire, Pt 3850, 1000Ω RTD and use the Celsius temperature tables to source the correct resistances for your specific temperature range.

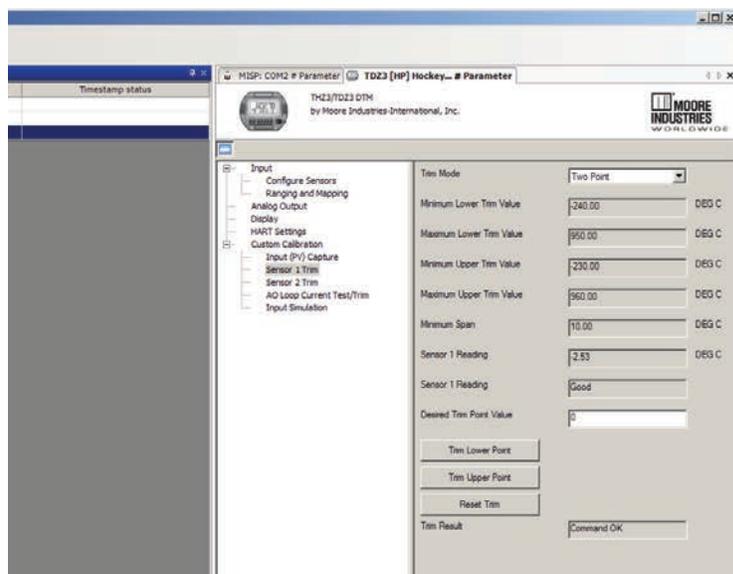
Figure 2.9. Verify your sensor range



Check the Ranging and Mapping settings in PACTware. In Figure 2.9 you can see that Sensor 1 is mapped to the Primary Variable and the range is defined as 0-100 Degrees C.

Now you are ready to do the actual input trimming of your THZ<sup>3</sup>/TDZ<sup>3</sup>. Proceed to Sensor 1 Trim in PACTware as seen in Figure 2.10.

Figure 2.10. Sensor 1 Trim



The Trim Mode can be set for One Point or Two Point. If interested in obtaining the best accuracy at one temperature point, choose the One Point mode. The most common Trim Mode is Two Point. This mode yields greater measurement accuracy over a temperature range by trimming points on each side of a specific range or by trimming at your Zero and Full scale values (as configured in the Ranging and Mapping screen). The below example outlines a Two Point trim at the Zero and Full scale points..



**Note:** The current Sensor 1 Reading is -2.53° C.

Perform the following steps -

1. Set Trim Mode to “Two Point”
2. Set your input resistance to match your Sensor 1 Zero point. By example – If your Sensor 1 Zero point is 0° C the input you apply to the instrument will be 1000.00Ω.
3. Enter the Sensor 1 Zero value into the field entitled Desired Trim Point Value. For my example I will be entering 0 (as my range is defined as 0-100°).
4. When your reading stabilizes press the Trim Lower Point button and your Sensor 1 Reading should now read the correct Trim Point Value (0 in this example).
5. Enter the Sensor 1 Full value into the field entitled Desired Trim Point Value. For my example I will be entering 100 (as my range is defined as 0-100°).
6. Set your input resistance to match your Sensor 1 Full point. By example – If your Sensor 1 Full point is 100° C the input you apply to the instrument will be 1385.00Ω.
7. When your reading stabilizes press the Trim Upper Point button and your Sensor 1 Reading should now read the correct Trim Point Value (100 in this example).

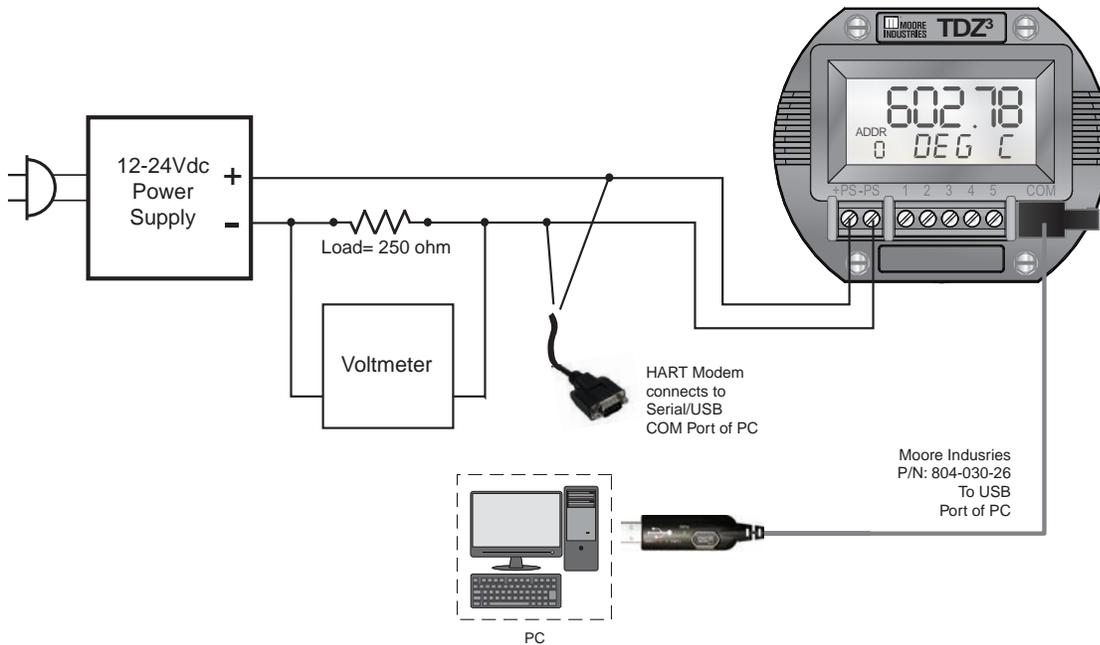
You can then perform Sensor 2 Trim if you are using two input sensors.

Your trim values will be automatically saved to your instrument.

The output of the THZ<sup>3</sup>/TDZ<sup>3</sup> is accurately calibrated prior to delivery to our customers. However, you may wish to trim the instrument's analog output to match what you are reading on your monitoring or control system. By example: if the THZ<sup>3</sup> is putting out 12.0mA and your DCS is reading 11.85mA you can trim the output of the THZ<sup>3</sup> so that the two readings will match. Note: trimming of the analog output will not affect the HART digital data.

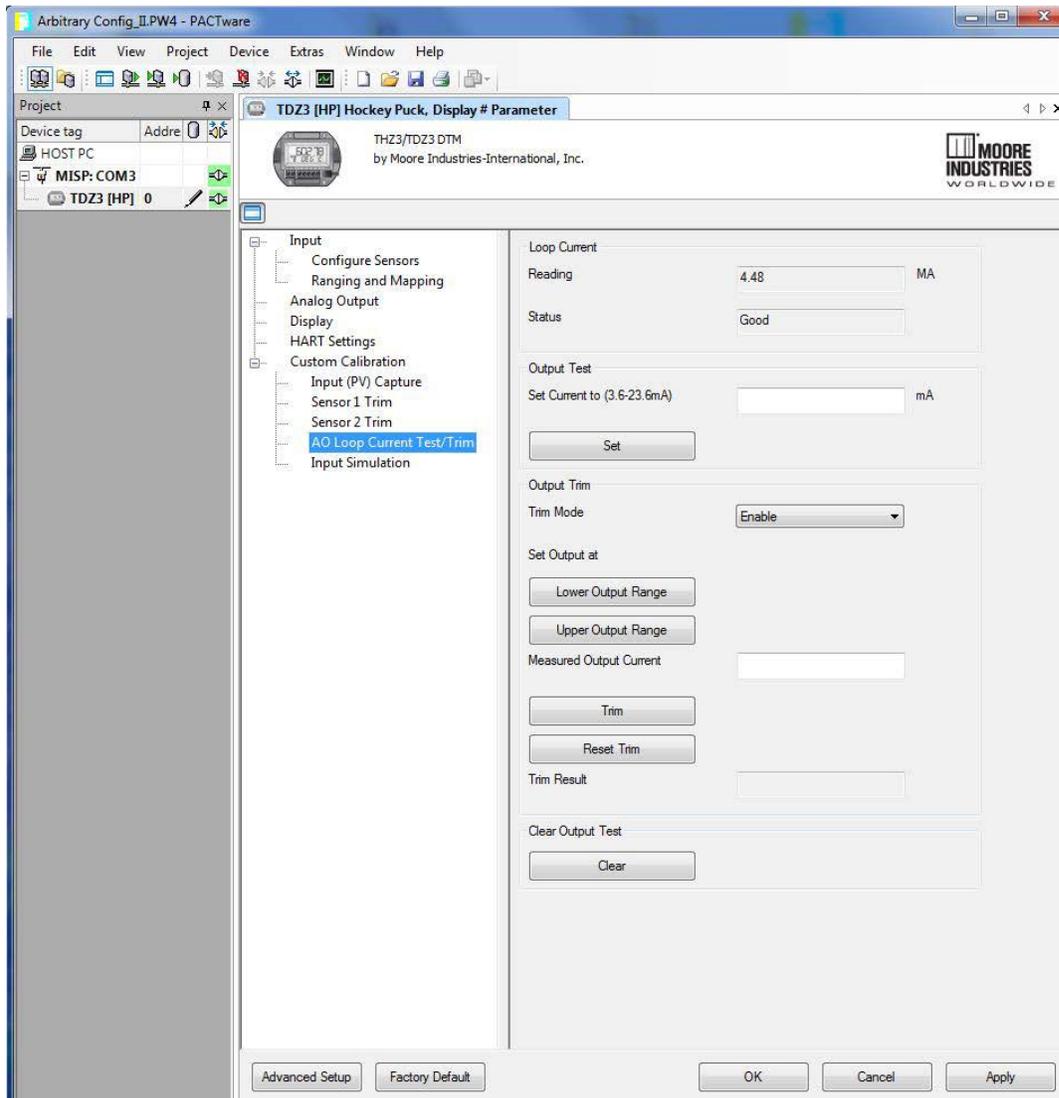
To perform output trimming set up your THZ<sup>3</sup>/TDZ<sup>3</sup> as shown in Figure 2.11.

Figure 2.11. Output Trimming



Select the Custom Calibration/AO Loop Current Test/Trim option in the configuration menu as shown in Figure 2.12.

Figure 2.12. Custom Calibration/AO Loop Current Test/Trim



The points that will be used for trimming will be the “AO Zero” and the “AO Full” that were configured earlier. For my example these two points will be 4mA (AO Zero) and 20mA (AO Full).

In the “Output Trim” section of the Parameter screen Set Output to “Lower Output Range”. This will set the instrument’s output to 4mA. Use your voltmeter to read the voltage drop across the 250Ω resistor and calculate the actual current going through the resistor.

Example: A voltage reading of 1.08v equates to 4.32mA ( $1.08V \div 250\Omega = 4.32mA$ ). Enter this value in the Measured Output Current box and then push the “Trim” button.

Now, select the "Upper Output Range". This will set the instrument's output to 20mA. Use your voltmeter to read the voltage drop across the 250Ω resistor and calculate the actual current going through the resistor.

Example: A voltage reading of 4.91v equates to 19.64mA ( $4.91V \div 250\Omega = 19.64mA$ ). Enter this value in the Measured Output Current box and then push the "Trim" button.

Now that the 2-point output trimming has been done you can test the results by entering an output value in the "Set Current to" box. Enter 4 (for 4mA) in the box, select the "Set" button and the instrument's output will go to 4mA and you can check for a 1V reading across the resistor. You can then enter 20 and check for a 5V reading across the resistor.

There is no need to press the "Apply" button as all trim changes take immediate effect.



**Note:** When complete BE SURE to press the "Clear" button to return control of the output back to your THZ<sup>3</sup>/TDZ<sup>3</sup>.

## Bench Check

We highly recommend that you perform a bench check of your THZ<sup>3</sup>/TDZ<sup>3</sup> prior to installing it in the field. Doing this will ensure it is operating within your expectations or requirements.

### Bench Check using a HART Handheld Communicator

To perform the bench check of your THZ<sup>3</sup>/TDZ<sup>3</sup> set up the equipment in Table 2.3 as shown in Figures 2.13.

**Table 2.3.** Bench Check Necessary Equipment

Device	Specifications
Millivolt or Resistance Source	Accurate to $\pm 0.05\%$ of span for the intended application.
Power Supply	24Vdc, $\pm 10\%$
Load Resistor	250 ohm with $\pm 0.01\%$ precision
Multimeter	Calibrated to an accuracy of $\pm 0.025\%$ , or better; such as Fluke Model 725, or similar
HART Communicator	Any HART HandHeld Communicator or Host (with THZ3/TDZ3 Device Description loaded)

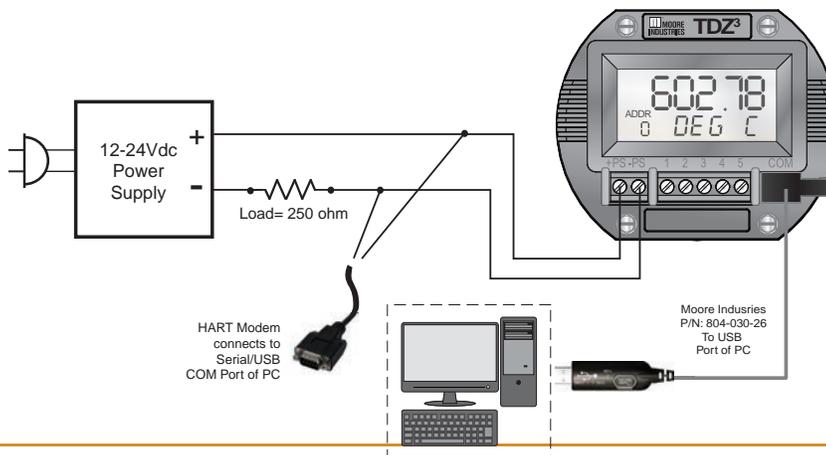
Connect your THZ<sup>3</sup>/TDZ<sup>3</sup> as shown if figure 2.13. See Section 4 of this manual to configure your THZ<sup>3</sup>/TDZ<sup>3</sup> as appropriate for your application. If possible, use the exact temperature sensor (RTD or thermocouple) that you will be using in your final application. Apply power to the THZ<sup>3</sup>/TDZ<sup>3</sup> and see that it is reading the correct ambient temperature and providing the correct output for the given input.

Example: If your TDZ<sup>3</sup> is configured to measure a temperature range of 50-100° F and is now on your test bench and is reading an ambient temperature of 72° then you should expect an output of 11.04mA.

If it is not feasible for you to use the actual temperature sensor for your bench test, or if your desired temperature range is nowhere near your ambient temperature, then use a temperature simulator (such as a Fluke 725 or similar) to provide your input.

Once your bench setup is complete you can now use your FDT/DTM software to check the transmitter's dynamic variables and analog output. If using PACTware you can use the "Measured value" menu command to view the transmitter's real time values (see Section 5.24 of this manual).

**Figure 2.13.** Bench Check Setup



### Bench Check using a FDT/DTM Software

This section provides information on checking the TDZ<sup>3</sup>/ THZ<sup>3</sup> using a PC with PACTware (an FDT frame application). For users who already have an FDT Frame Application, all the following information is still relevant. For more information on FDT/DTM please refer to [www.fdtgroup.org](http://www.fdtgroup.org).

To perform the bench check of your THZ<sup>3</sup>/TDZ<sup>3</sup> set up the equipment in Table 2.4 as shown in Figures 2.14.

**Table 2.4.** Bench Check Necessary Equipment

Device	Specifications
<b>Millivolt or Resistance Source</b>	Accurate to $\pm 0.05\%$ of span for the intended application.
<b>Power Supply</b>	24Vdc, $\pm 10\%$
<b>Load Resistor</b>	250 ohm with $\pm 0.01\%$ precision
<b>Multimeter</b>	Calibrated to an accuracy of $\pm 0.025\%$ , or better; such as Fluke Model 725, or similar
<b>PC with PACTware or FDT frame application</b>	PACTware version 4.1 SP3 or newer
<b>Communications Cable</b>	Moore Industries P/N 803-040-26 or 804-030-26

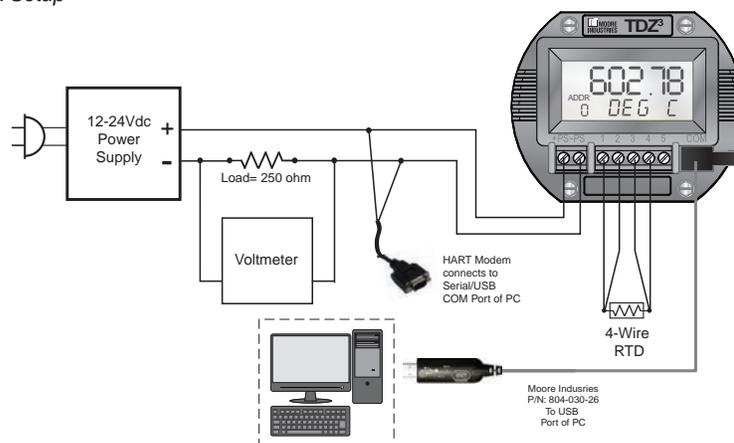
For instructions on installation and setup of the THZ<sup>3</sup>/TDZ<sup>3</sup> DTM with PACTware or another FDT frame, please refer to section 5. See Section 4 of this manual to configure your THZ<sup>3</sup>/TDZ<sup>3</sup> as appropriate for your application. If possible, use the exact temperature sensor (RTD or thermocouple) that you will be using in your final application. Apply power to the THZ<sup>3</sup>/TDZ<sup>3</sup> and see that it is reading the correct ambient temperature and providing the correct output for the given input.

Example: If your TDZ<sup>3</sup> is configured to measure a temperature range of 50-100° F and is now on your test bench and is reading an ambient temperature of 72° then you should expect an output of 11.04mA.

If it is not feasible for you to use the actual temperature sensor for your bench test, or if your desired temperature range is nowhere near your ambient temperature, then use a temperature simulator (such as a Fluke 725 or similar) to provide your input.

Once your bench setup is complete you can now use your FDT/DTM software to check the transmitter's dynamic variables and analog output. If using PACTware you can use the "Measured value" menu command to view the transmitter's real time values (see Section 5.24 of this manual).

**Figure 2.14.** Bench Check Setup



### Section 3 - Installation and Wiring

Instructions in this section and others may require special precautions to ensure the safety of the personnel performing the operations. Notes, Cautions and Warnings that may cause potential safety issues are indicated throughout this manual by symbols, please refer to Page 3 of this manual to view and familiarize yourself with these safety message symbols.

Figures 3.2 through 3.7 show the various housings and their dimensions.

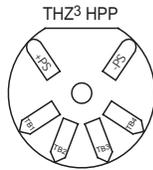


**Note:** Make sure to calibrate and bench check the instruments prior to installation. Also, install all instruments in their intended application before making any electrical connections. For DIN rail mounted instruments, allow enough room for pivoting instruments vertically on the rail for removal in applications involving multiple banks of units.

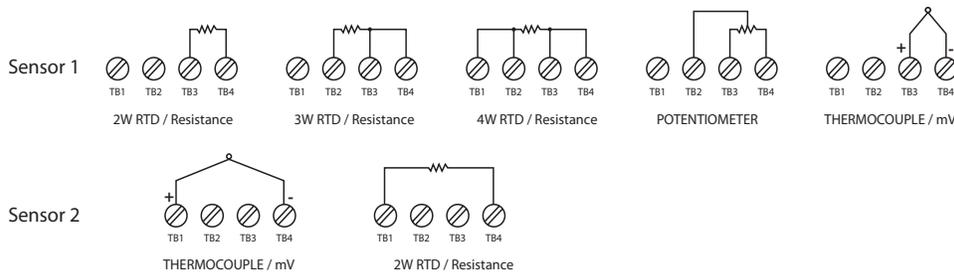
### Terminal Designations

Figure 3.1. Terminal Designations

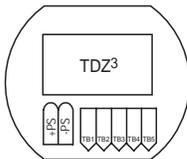
#### THZ3 HPP (4 Terminals) Input Connections



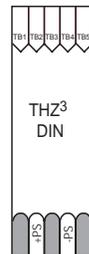
Note: THZ<sup>3</sup> [HPP] (see figure 3.4) – When using two input sensors, Sensor 1 can be configured as 2-wire or 3-wire sensor. Sensor 2 is then restricted to a 2-wire sensor.



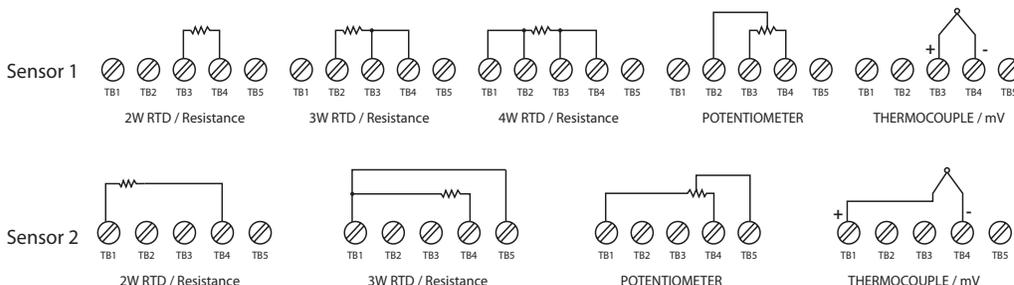
#### TDZ3 HP and THZ3 DIN (5 Terminals) Input Connections



Note: TDZ<sup>3</sup> – When using two input sensors you are limited to 2-wire and/or 3-wire sensors. 4-wire sensors (RTDs) cannot be used.



Note: THZ<sup>3</sup> [DIN] (see figure 3.2) - When using two input sensors you are limited to 2-wire and/or 3-wire sensors. 4-wire sensors (RTDs) cannot be used.



## Dimensions

Figure 3.2. Dimensions of Aluminum DIN Housing

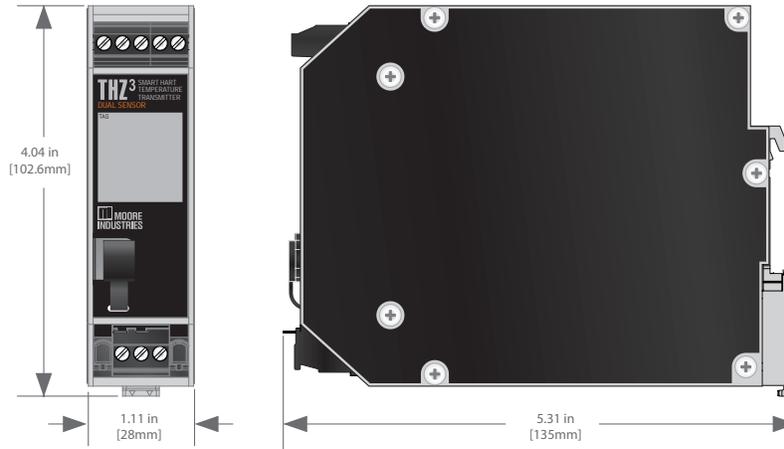


Figure 3.3. Dimensions of Aluminum HP Display Housing

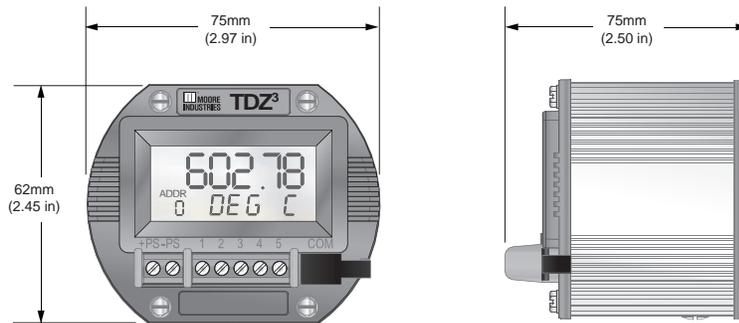
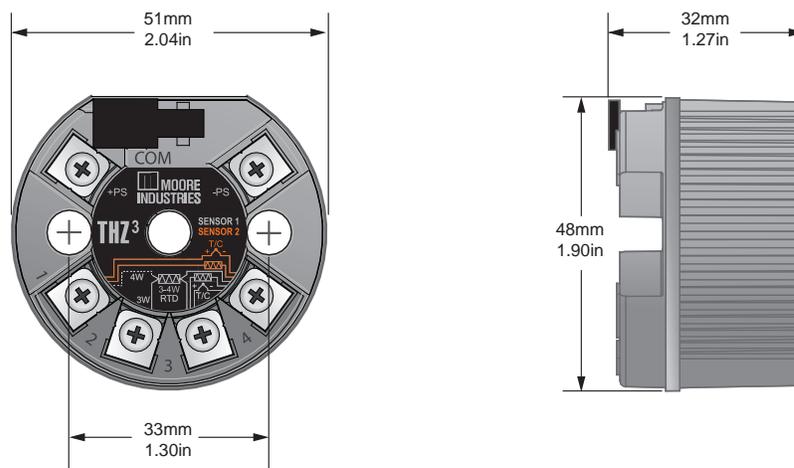


Figure 3.4. Dimensions of THZ<sup>3</sup> HPP Housing



# THZ<sup>3</sup>/TDZ<sup>3</sup>

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Figure 3.5. Dimensions of BH Housing

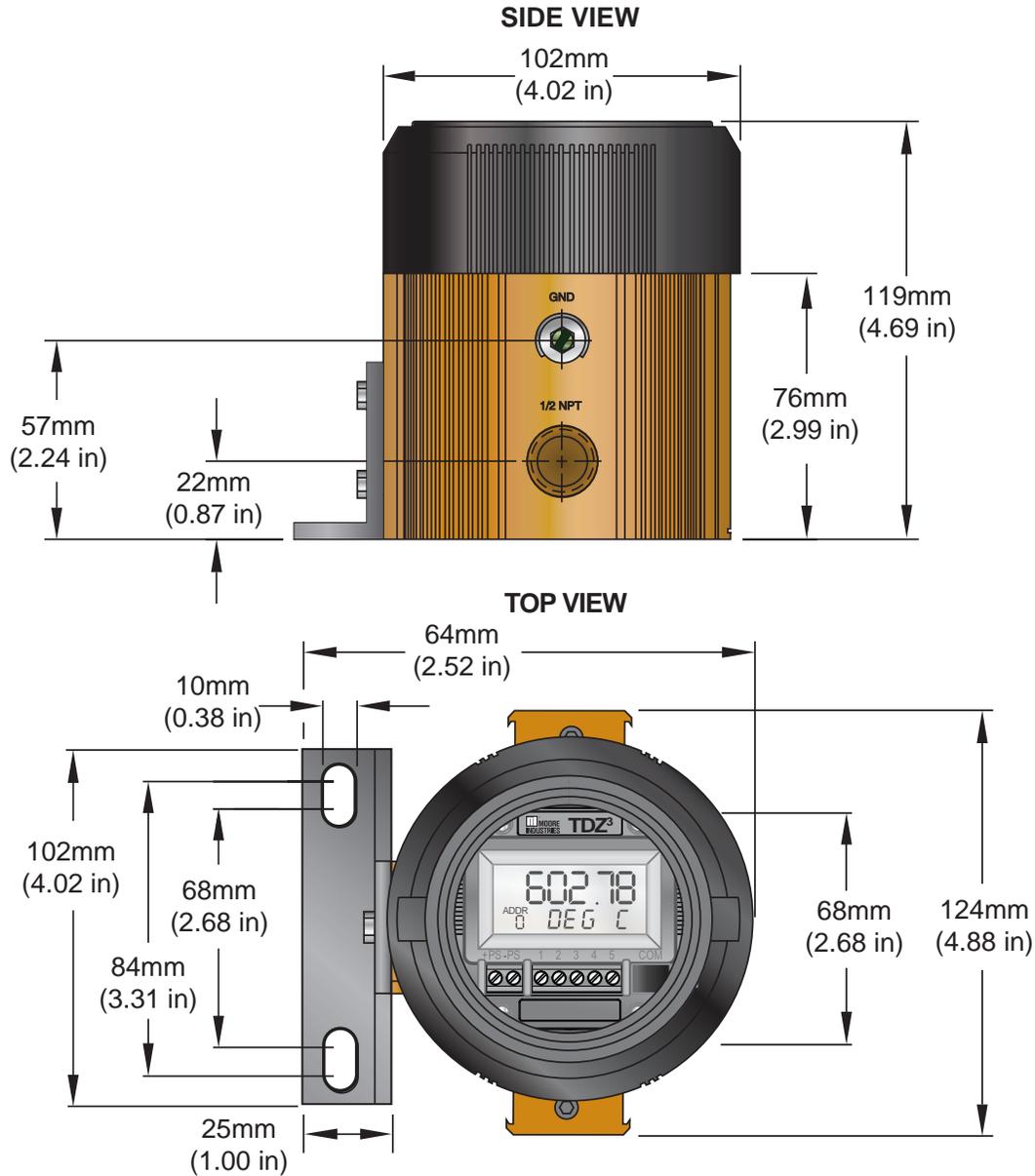
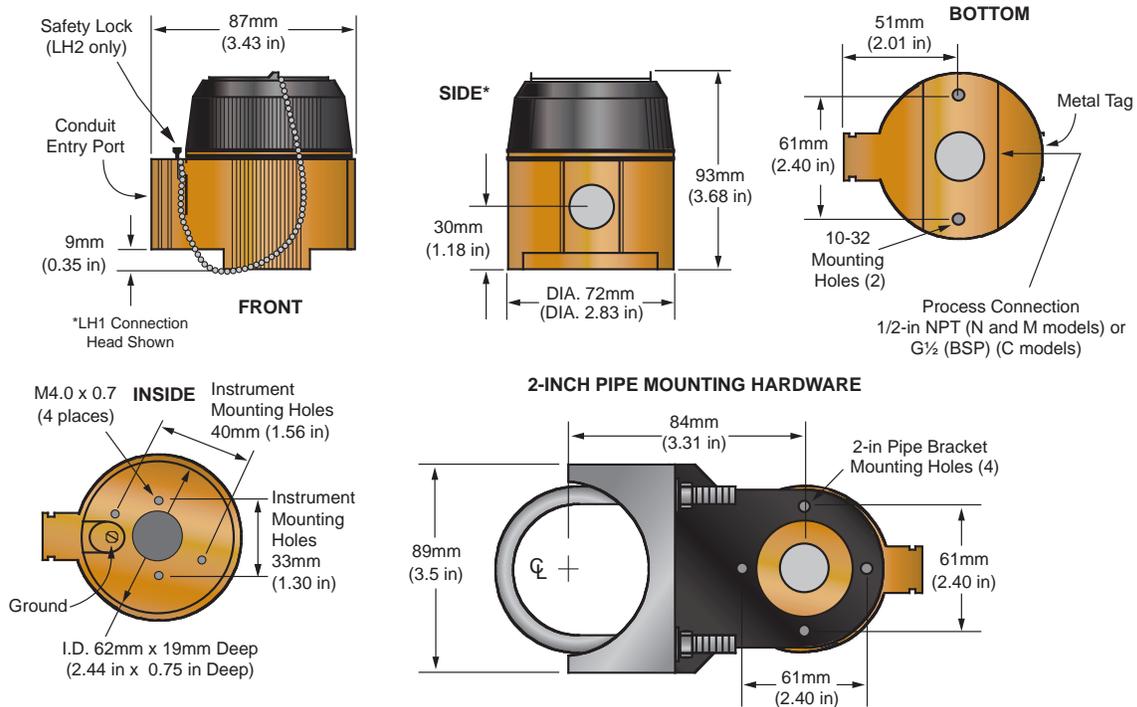


Figure 3.6. Dimensions of LH Housing



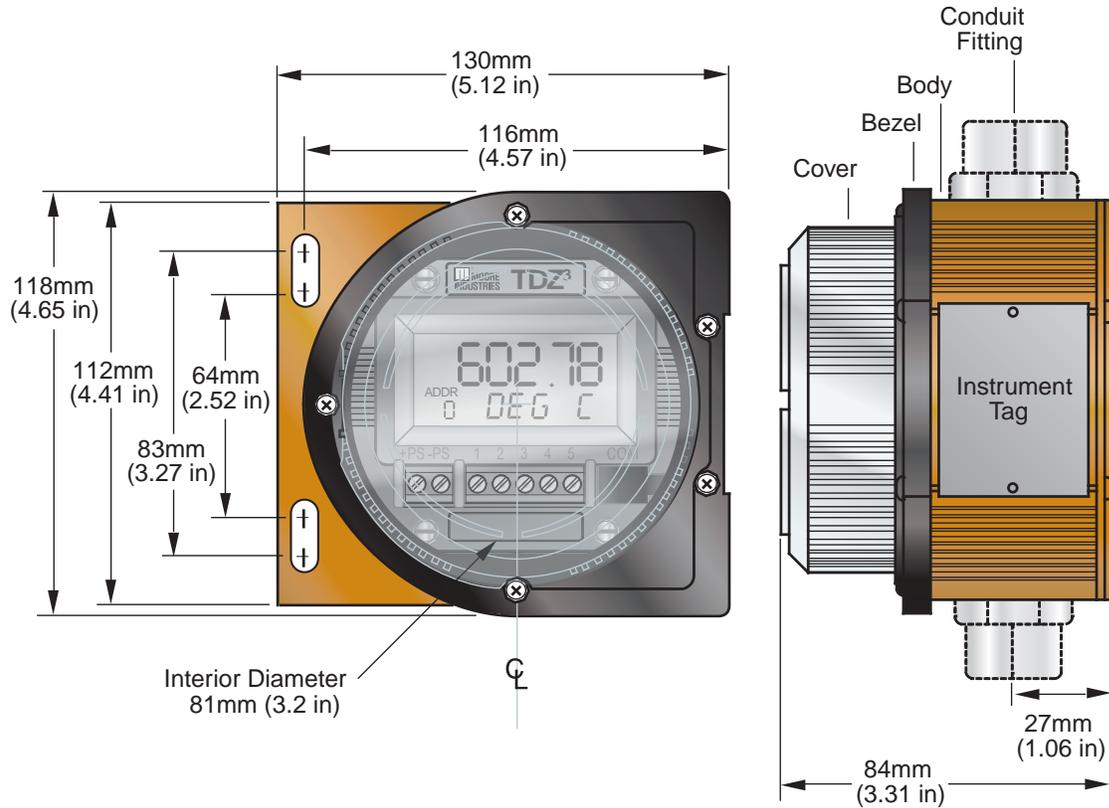
# THZ<sup>3</sup>/TDZ<sup>3</sup>

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Figure 3.7. Dimensions of D-Box Housing



### Electrical Connections

When installing any Moore Industries product, always follow all local regulations and standards for grounding, shielding, and safety.



**WARNING:** Terminals on this unit may be connected to hazardous voltages. Before making ANY connections to this unit, always remove power from the loop or instrument power terminals.

### Installation Category

All terminals are rated CAT I.

### Equipment Ratings

The THZ<sup>3</sup> and TDZ<sup>3</sup> do not generate hazardous voltages, they provide a low voltage (0-1V) input and a 4-20mA output. Products connected to the THZ<sup>3</sup> and TDZ<sup>3</sup> should be designed to receive this type of input.



**WARNING:** If this unit is used in a manner not specified by Moore Industries, the protection provided by the equipment may be impaired.

### Input/Output Wiring

The Input/Output connections can be made with 14 to 24 AWG (2.5mm<sup>2</sup> to 0.2mm<sup>2</sup>) wire.

The end of each conductor should be stripped no more than 0.25in (7mm).

Tighten the screws on the terminal block to 4.4 - 5.3 lbf·in (0.5 - 0.6 N·m).

### Recommended Ground Wiring Practices

Moore Industries recommends the following ground wiring practices:

- Any Moore Industries product in a metal case or housing should be grounded.
- The protective earth conductor must be connected to a system safety earth ground before making other connections.
- All input signals to, and output signals from, Moore Industries' products should be wired using a shielded, twisted pair wiring technique. Shields should be connected to an earth or safety ground.
- For the best shielding, the shield should be run all the way from the signal source to the receiving device. (see Note below)
- The maximum length of un-shielded input and output signal wiring should be 2 inches.



**Note:** Some of Moore Industries' instruments can be classified as receivers (IPT2, IPX2, etc.) and some can be classified as transmitters (TRX, TRY, etc.) while some are both a receiver and a transmitter (SPA2, HIM, etc). Hence, your shield ground connections should be appropriate for the type of signal line being shielded. The shield should be grounded at the receiver and not at the signal source.

### CE Certification-related Guidelines

The grounding and wiring practices described above must be followed in order for the unit(s) to meet the requirements set forth in EMC standard EN61326.

## Installation in Hazardous Locations

This section contains important information regarding installation of THZ<sup>3</sup> and TDZ<sup>3</sup> in Hazardous Area Locations.



**Note:** The THZ3-DIN is suitable for Class I, Division 2, Groups A-D or Non-Hazardous locations only.



**WARNING:**

Substitution of components is not allowed, as it may impair the intrinsic safety.



**AVERTISSEMENT:**

La substitution de composants peut compromettre la sécurité intrinsèque.



**WARNING:**

To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.



**AVERTISSEMENT:**

Risque d'explosion. Avant de déconnecter l'équipement, couper le courant ou s'assurer que débrancher tant que l'emplacement est désigné non dangereux.



**WARNING:**

Explosion Hazard. Do not disconnect equipment when a flammable or combustible atmosphere is present.



**AVERTISSEMENT:**

Risque d'explosion. Ne pas débrancher tant que le circuit est sous tension, à moins qu'il ne s'agisse d'un emplacement non dangereux.



**WARNING:**

Explosion Hazard. Substitution of components may impair suitability for Class I, Division 2.



**AVERTISSEMENT:**

Risque d'explosion. La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, Division 2

Maximum operating parameters of the "COM" port for use in Non-Hazardous areas shall not exceed 3.0V, 300mA and 240mW.

## Special Conditions of Use

The following instructions must be adhered to when the THZ<sup>3</sup> and TDZ<sup>3</sup> is used in hazardous locations and potentially explosive atmospheres.

### cFMus Installations

#### Intrinsically Safe Applications

#### Class I, Division 1, Groups A-D

#### Class1, Zone 0, AEx ia IIC, Ex ia IIC

The THZ<sup>3</sup> and TDZ<sup>3</sup> shall be installed in an enclosure which maintains an ingress protection rating of at least IP20 and also meets the requirements of ANSI/ISA 61010-1 or C22.2 No 1010-1. The COM port shall not be used in Hazardous areas.



**Note:** Using the box provided on nameplate, the User shall permanently mark type of protection chosen for the specific installation. Once the type of protection has been marked it shall not be changed.

### Nonincendive, Type n Applications

#### Class I, Division 2, Groups A-D

#### Class1, Zone 2, AEx nA IIC, Ex nA IIC

When installed as Division 2 equipment, the THZ<sup>3</sup> and TDZ<sup>3</sup> shall be mounted within a tool-secured enclosure which meets the requirements of ANSI/ISA 61010-1 or C22.2 No. 1010-1 and be capable of accepting the applicable wiring method per the NEC or as specified in the C22.1 Canadian Electrical Code, Part I.

When installed as Zone 2 equipment, the THZ<sup>3</sup> and TDZ<sup>3</sup> shall be mounted within a tool-secured enclosure which meets the requirements of ANSI/ISA 60079-0 or CAN/CSA-E60079-0 and ANSI/ISA 60079-15 or CAN/CSA 60079-15 and be capable of accepting the applicable wiring methods per the NEC or as specified in the C22.1 Canadian Electrical Code, Part I. The enclosure shall, at a minimum, meet the requirements of IP54.

On installation of Zone 2 equipment, the THZ<sup>3</sup> and TDZ<sup>3</sup> shall be provided with supply transient protection external to the apparatus such that the voltage at the supply terminals of the THZ<sup>3</sup> and TDZ<sup>3</sup> does not exceed 58.8V peak or 58.8Vdc.

The COM port shall not be used in Hazardous areas.



**Note:** Using the box provided on nameplate, the User shall permanently mark type of protection chosen for the specific installation. Once the type of protection has been marked it shall not be changed.

## European Union Installations (ATEX 94/9/EC Directive)

### Intrinsically Safe Applications - Zone 0 II 1 G Ex ia IIC

The THZ<sup>3</sup> and TDZ<sup>3</sup> shall be installed in an enclosure which maintains an ingress protection rating of at least IP20.

The communications port shall be programmed through Moore Industries Fuse-Protected USB Communications Cable, Part No. 804-030-26A, as described on Control Drawings 100-100-80 (TDZ<sup>3</sup>) or 100-100-81 (THZ<sup>3</sup>).

The Cable cannot be used in Hazardous Areas or in ambient temperatures in excess of 75° C.



**Note:** Using the box provided on nameplate, the User shall permanently mark type of protection chosen for the specific installation. Once the type of protection has been marked it shall not be changed.

### Type n Applications – Zone 2 II 3 G Ex nA IIC

When installed as Category 3 equipment, the THZ<sup>3</sup> and TDZ<sup>3</sup> shall be mounted within a tool-secured enclosure which meets the requirements of EN 60079-0 and EN 60079-15 and is capable of accepting the applicable wiring methods specified in EN 60079-14. The enclosure shall, at a minimum, meet the requirements of IP54.

On installation, the THZ<sup>3</sup> and TDZ<sup>3</sup> shall be provided with supply transient protection external to the apparatus such that the voltage at the supply terminals of the THZ<sup>3</sup> and TDZ<sup>3</sup> does not exceed 119V peak or 119Vdc.

The COM port shall not be used in Hazardous areas.



**Note:** Using the box provided on nameplate, the User shall permanently mark type of protection chosen for the specific installation. Once the type of protection has been marked it shall not be changed.

## IECEX Installations

### Intrinsically Safe Applications - Zone 0 Ex ia IIC

The THZ<sup>3</sup> and TDZ<sup>3</sup> shall be installed in an enclosure which maintains an ingress protection rating of at least IP20.

The communications port shall be programmed through Moore Industries Fuse-Protected USB Communications Cable, Part No. 804-030-26A, as described on Control Drawing 100-100-80 (TDZ<sup>3</sup>) or 100-100-81 (THZ<sup>3</sup>).

The Cable cannot be used in Hazardous Areas or in ambient temperatures in excess of 75° C.



**Note:** Using the box provided on nameplate, the User shall permanently mark type of protection chosen for the specific installation. Once the type of protection has been marked it shall not be changed.

### Type n Applications – Zone 2 Ex nA IIC

When installed as EPL Gc equipment, the THZ<sup>3</sup> and TDZ<sup>3</sup> shall be mounted within a tool-secured enclosure which meets the requirements of IEC60079-0 and IEC60079-15 and be capable of accepting the applicable wiring methods for the country of origin. The enclosure shall, at a minimum, meet the requirements of IP54.

On installation, the THZ<sup>3</sup> and TDZ<sup>3</sup> shall be provided with supply transient protection external to the apparatus such that the voltage at the supply terminals of the THZ<sup>3</sup> and TDZ<sup>3</sup> does not exceed 119V peak or 119Vdc.

The COM port shall not be used in Hazardous areas.



**Note:** Using the box provided on nameplate, the User shall permanently mark type of protection chosen for the specific installation. Once the type of protection has been marked it shall not be changed.

## Section 4 - Configuration

The THZ<sup>3</sup>/ TDZ<sup>3</sup> can be configured using a HART communicator, HART host or a PC running an FDT/DTM program. All functions can be configured using either method with the exception of custom curves which cannot be generated or imported using the HART communicator. However, once custom curves have been saved in the unit they can be selected using the HART Communicator.

The following Configuration Overview is applicable to both programming methods. The remainder of this Section details programming with a HART communicator. For details of configuring using FDT/DTM please refer to Section 5.

### Configuration Overview

The following will be an overview of configuration for the THZ<sup>3</sup>/ TDZ<sup>3</sup>.

Usage of the THZ<sup>3</sup> and TDZ<sup>3</sup> can be grouped into three general classifications:

- Single Sensor
- Dual with “identical” sensors
- Dual with diverse sensors.

When both sensors are being used, and they both produce the same units the measurements can be combined to provide additional calculated values such as average, differential, low select etc. The inputs can be either identical (e.g. the same exact RTD) or be different sensors, producing the same measurement. For a full list of available measurements please see Tables 8.2 through 8.4 in Section 8.



**Note:** To use a calculated Device Variable, both sensors' engineering units (EGU) must be compatible (i.e. the same, or both temperature units). If a calculated Device Variable has different engineering units (EGU) from the sensors' EGU, scaling will need to be used to change the units.

### Single Sensor

The THZ<sup>3</sup> or TDZ<sup>3</sup> can be configured to use a single sensor. Follow these steps:

- 1) Configure the sensor.
  - a. Use the “Configure Input Types” method to select SEN1, and to have SEN2 disabled.
  - b. Navigate to the Sensor 1 Configuration menu, and make any additional settings as needed.
- 2) Assign/Map the Device Variables to the HART Variables (PV, SV etc.) The only Device Variables available are SEN1 and RJC T. In most cases, SEN1 should be assigned to PV (Default setting).
- 3) Configure the PV Range (PV URV and LRV).
- 4) Configure the AO's Range, limits, and fail response.



**Note:** A single sensor 4W RTD is the factory default configuration. (see Quick start guide for details)

### Dual with Identical Sensors

The THZ<sup>3</sup> or TDZ<sup>3</sup> can be configured for use with two identical sensors. Follow these steps:

- 1) Configure the sensor
  - a. Use the "Configure Input Types" method to select SEN1, and to use the same sensor for SEN2
  - b. Navigate to the Sensor 1 Configuration menu, and make any additional settings as needed
  - c. Repeat for Sensor 2
- 2) Assign/Map the Device Variables to the HART Variables (PV, SV etc.) Any variable can be assigned to the PV. However in most cases, BU1-2 or AVG will be used as the PV.
- 3) Configure the PV Range (PV URV and LRV)
- 4) Configure the AO's Range, limits, and fail response

### Dual with Mixed Sensors

The THZ<sup>3</sup> or TDZ<sup>3</sup> can be configured for use with two different sensors (for example, T/C and a RTD).

Follow these steps:

- 1) Configure the sensor
  - a. Use the "Configure Input Types" method to select SEN1, and select "Configure Independently" for SEN2. Select the proper input mode/type for SEN2
  - b. Navigate to the Sensor 1 Configuration menu, and make any additional settings as needed
  - c. Repeat for Sensor 2
- 2) Assign/Map the Device Variables to the HART Variables (PV, SV etc.) Any variable can be assigned to the PV. However in most cases, BU1-2 or AVG will be used as the PV.
- 3) Configure the PV Range (PV URV and LRV)
- 4) Configure the AO's Range, limits, and fail response



**Note:** While the THZ<sup>3</sup>/TDZ<sup>3</sup> will accept a dual input sensor configuration the following limitations apply only when using two input sensors:

**TDZ<sup>3</sup> [HP]** – 2-wire and/or 3-wire sensors. 4-wire sensors (RTDs) cannot be used.

**THZ<sup>3</sup> [DIN]** (see figure 3.2) - 2-wire and/or 3-wire sensors. 4-wire sensors (RTDs) cannot be used.

**THZ<sup>3</sup> [HPP]** (see figure 3.4) – Sensor 1 can be configured as 2-wire or 3-wire sensor. Sensor 2 is then restricted to a 2-wire sensor.

## The following additional features may also be useful:

### Sensor Trimming

Sensor Trimming increases the measurement accuracy of your instrument by trimming the reading of its actual input, to either a calibrated source or the device to which it is connected. This verifies that the input to the transmitter is being interpreted correctly. You may trim any point between 0% and 100% along the scale. Note that one-point trimming applies an offset to the sensor reading, while two-point trimming applies both an offset and a gain.

Trimming can be applied to one or both sensors (SEN1 & SEN2).

### Running Average Filter

This function filters the sensor input signal with a user-selected range between 1 and 16. A higher Running Average Filter setting provides smoother output transitions; however, increases response time. Conversely, a lower setting provides a faster response time, but may seem more unstable.

### Filter

This setting is used to configure the input filter. The filter is designed to reduce the effects of mains induced noise. The input filter frequency value should be set to the frequency of the local AC supply—either 50Hz or 60Hz.

### Scaling

Scaling can be applied to any Device Variable including Sensor 1 and Sensor 2. It provides for a linear transformation from the Device Variable's units to any other engineering unit (EGU). Two points are specified (Input minimum, Scale minimum) and (Input maximum, Scale maximum).

When scaling is enabled, no unit checking is done. It is possible to convert the value from one unit to another by configuring for unity scaling eg, (0, 0 and 100, 100). However this should be unnecessary.

### Custom Curve (Advance Settings)

The unit provides the capability to program 4 independent custom curves (CC1-4) which can be applied to any available Device Variable to define a non-linear scaling. Each Custom Curve can contain up to 128 pairs (X, Y) where X is the input and Y the output.

Custom Curves cannot be entered using the HART Communicator, they must be entered via the FDT/DTM. However, once a custom curve has been saved in the unit it can be assigned and enabled or disabled using the HART Communicator.

### PV Settings

There are a few settings which apply specifically to the PV:

- PV Upper Range Value (URV) and Lower Range Value (LRV): Used to scale the PV to the Percent of Range and Loop Current values. These settings are independent from any other scaling settings.
- PV Damping: PV Damping allows you to introduce a delay into the response of your unit in order to stop short-lived spikes from initiating faults and generating fault messages. The damping time setting is the time PV takes to make a 63% change in response to a step change.

### Analog Output

The system will scale the PV from its LRV/URV (Lower Range Value / Upper Range Value) range to the AO's Zero/Full range. As the PV exceeds this range, the AO will continue linearly until it reaches the AO URV (AO Under Range Value) or AO ORV (AO Over Range Value), where it "flatlines." At this point, the output is considered saturated, and will be limited to that value.

If the PV's data quality goes BAD, or a system error is detected which should result in the programmed fail response, the AO will respond as configured by either:

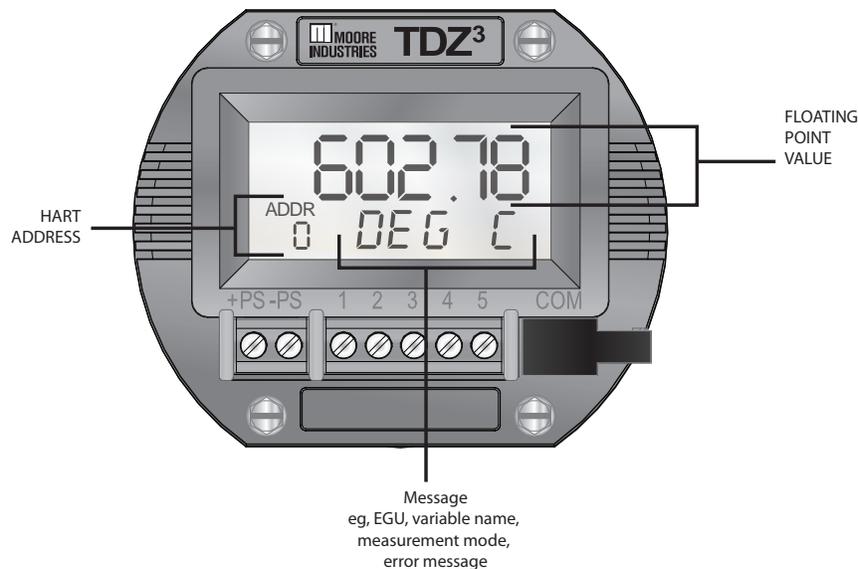
- Fail High to 23.6 mA
- Fail Low to 3.6 mA
- Hold Last Value
- Fail to a Preset Value, configurable between 3.6 and 23.6mA

### Analog Output Trimming

AO Trimming increases the accuracy of your instrument by calibrating its analog output to the device that is receiving the output. This ensures that the instruments are matched to each other.

### Display (TDZ<sup>3</sup> only)

All dynamic and additional device variables in the transmitter can be selected for display. If none are selected, then the unit will behave as though the PV is marked for display. A "screen" of data includes the two main rows of characters on the display. Normally, a floating point value is shown on the top with a text message on the bottom row. Some items require more than one screen to be displayed. Each screen is shown for 2 seconds. If the value being displayed changes, it will be updated while that screen is being shown.



## HART Broadcast Messaging (Burst Mode)

When set to burst mode, the THZ<sup>3</sup>/TDZ<sup>3</sup> will proactively send out messages instead of waiting for the host to request them. This enables event driven communication (high, low, deviation of signal or change in status) and/or timed communication (every x seconds) to the host.



**Note:** When using burst mode in the THZ<sup>3</sup>/TDZ<sup>3</sup>, the host must also be configured to communicate in burst mode.

Up to 3 different burst messages may be configured independently in the THZ<sup>3</sup>/TDZ<sup>3</sup>. For each burst message the following parameters need to be configured:

HART Command – determines which parameters are sent in the message

Update Periods – specifies the minimum and maximum time between messages

Trigger – determines what triggers a message to be sent to the host

Slot 1-8 – For HART commands 9 and 3 only, select the device variables for the message

The following HART commands can be selected for the burst message:

<u>Command</u>	<u>Variables in burst message</u>	<u>Trigger Source</u>
1	Primary Variable (PV)	PV
2	Loop current and Percent of Range (POR)	POR
3	Dynamic Variables and Loop Current	PV
9	Device Variables with status	Device Variable in Slot 1
33	Device Variables	Device Variable in Slot 1
48	Additional Device Status	Status bits

Update Periods: The Update and Maximum Update periods determine the minimum and maximum time interval between each message. The update periods can be set to the following values:

0.5, 1, 2, 4, 8, 16, 32, 60-3600 seconds

The actual frequency of messages sent will be determined by the update periods and trigger mode.

If the trigger mode is set to Continuous, then the message will be sent every x seconds where x is the Update period.

If the trigger mode is set to any other value (i.e. it is looking for a trigger) then the message will be sent every x seconds (update period) if the trigger condition is met. If the trigger condition is not met then a message will be sent every y seconds where y is the Maximum Update period. This ensures that the device and host communicate regularly (once per hour if y is set to the maximum value of 3600 seconds).

Trigger: This determines what triggers a message to be sent to the host. The trigger source value depends on the HART command and is defined above.

There are three parameters which need to be set for the trigger - mode, level and units

<u>Mode</u>	<u>Level</u>	<u>Units</u>	<u>Description</u>
Continuous	1.0***	Not used	Messages will be sent every x seconds where x is the Update period
Window	positive value	set*	Messages will be sent if the reading increases or decreases by the window value
Rising	any**	set*	Messages will be sent if the reading is above the trigger value (High alarm)
Falling	any**	set*	Messages will be sent if the reading is below the trigger value (Low alarm)
On Change	1.0***	Not used	Used for command 48 to detect any status change

*\*Units must match the trigger source units. If the units do not match then trigger mode becomes inactive.*

*\*\* The trigger level can be any value in the trigger source range.*

*\*\*\* For continuous and level modes the trigger level and units are not applicable. The level is set to 1.0 by default.*

In all cases, burst messages are sent every x seconds (Update Period) if the trigger condition is met. If the trigger condition is not met, the update time will drop to the Maximum Update Period.

Slots 1-8: For commands 9 and 33, the Device Variables which will be sent in the message need to be selected. By default all slots are set to 'Not Used'. Only Slots 1-4 can be assigned for Command 33.

If a trigger condition is set, Slot 1 must have a Device Variable assigned and this will be used as the trigger source.

### Burst message examples:

#### Read PV every second

Burst message settings: HART command 1:Read PV

Update period: 1 second

Maximum update period: 1 second

Trigger Mode: Continuous

Trigger Level: 1.0

Trigger Units: (250) Not Used

#### Read Dynamic Variables and Loop Current every second when PV exceeds 50degC or every 5 minutes (when PV does not exceed 50degC)

HART command 3: Read Dynamic Variables and Loop Current

Update period: 1 second;

Maximum update period: 300 seconds

Trigger Mode: Rising

Trigger Level: 50.00

Trigger Units: degrees Celsius

**Read Additional Device status every 0.5 second if there are any status changes or every hour if there are no status changes**

HART command 48: Read Additional Device Status

Update period: 0.5 seconds;

Maximum update period: 3600 seconds

Trigger Mode: Change

Trigger Level: 1.0

Trigger Units: (250) Not Used

## Sensor Diagnostics

Sensor Drift Alert using Range Alarms and Sensor Corrosion Detection can also be used for predictive diagnostics to warn of future problems.

Broken Wire Holdoff Time allows you to add an additional time delay before a sensor broken wire is reported which provides some noise immunity and prevents false alarms caused by other factors that may be misinterpreted as Broken Wire.

Please refer to Section 1 for more detailed information on Sensor Diagnostics.

## Input Quality Alarms

The THZ<sup>3</sup>/TDZ<sup>3</sup> also allows the user to determine how certain types of input quality issues are handled and how they can affect the Device Variables, Dynamic Variables and AO. There are 3 different quality alarms: Measurement out of Conformance Range, Allow Limited and Allow Dropping. See Section 6 for more information.

## Programming Device Description Menu on THZ<sup>3</sup>/TDZ<sup>3</sup> with HART Communicator handheld devices

To program your TDZ<sup>3</sup> or THZ<sup>3</sup>, your HART communicator must be equipped with the Device Description for your instrument. Please follow the steps below to configure instrument. Refer to Figure 4.1 for an outline of menu options.



### Online Menu

The *Online* menu displays the current process value of your application, the lower and upper range values and the actual output current. Use the *Device Setup* menu to configure the TDZ<sup>3</sup> or THZ<sup>3</sup> as detailed in the rest of this section.

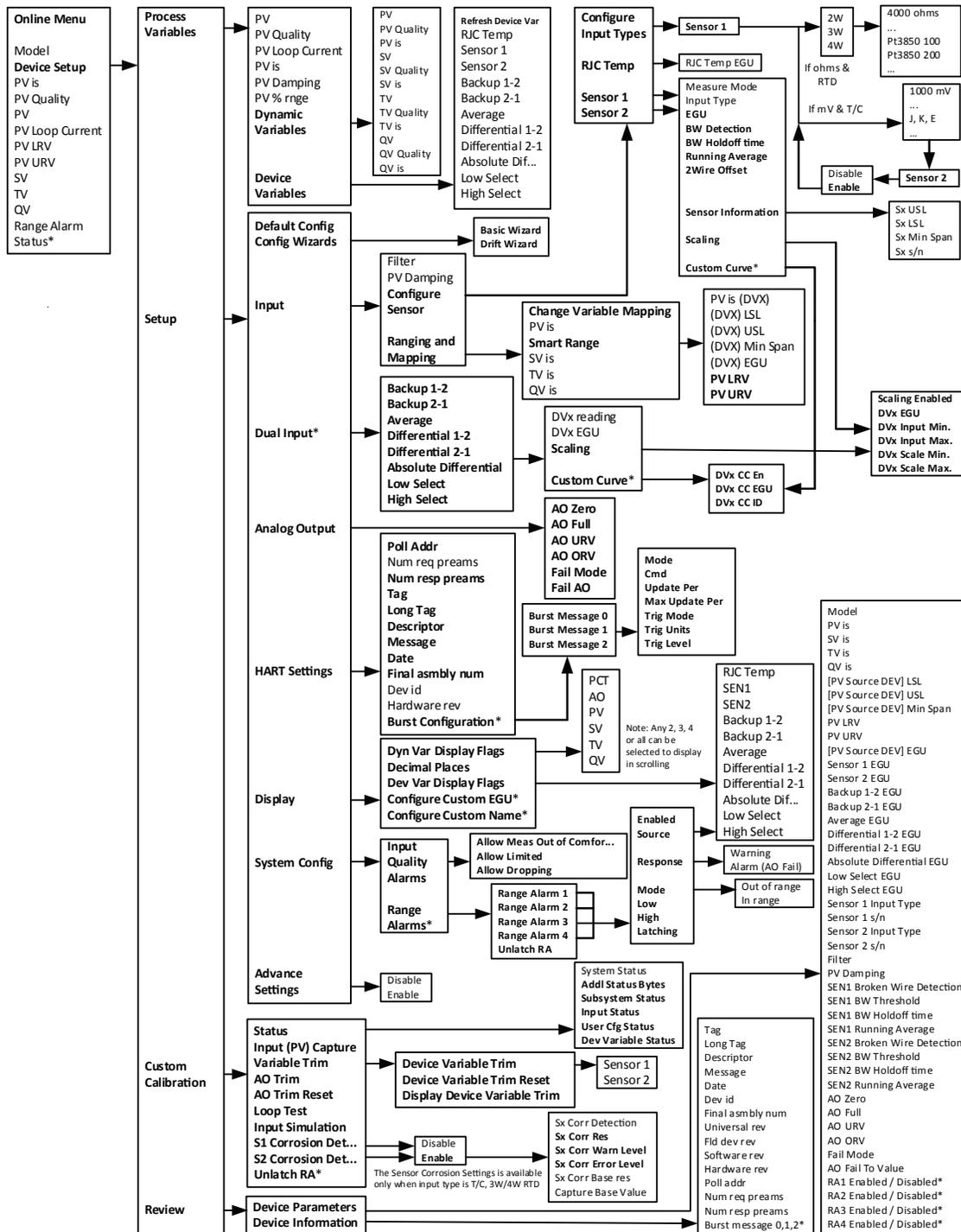


**Note:** In the following configuration information, all default values are shown in [ ].



**Note:** When making changes or updates within menus you will notice the menu item is highlighted and an asterisk ( \* ) appears in front of the menu item changed/updated. This indicates that a change/update was made yet not updated on the unit itself. To insure that changes/updates are implemented, you must hit the SEND button to refresh and update the THZ<sup>3</sup>/ TDZ<sup>3</sup> unit. Hitting the HOME button or the BACK arrow will cancel the desired change/update.

Figure 4.1. TDZ<sup>3</sup> or THZ<sup>3</sup> Configuration Online menu overview



\* These menu options are only available when "Advanced Settings" is enabled

## DD Device Setup Reference Guide

The following provides a comprehensive list of configuration menus and options which can be used as a quick reference guide to identify the different configuration capabilities and locate them in the menu system. For more information on the specific features please refer to the Configuration Overview and the specific menu descriptions.



**Note:** \* Is used to identify advanced features which are only accessible by enabling Advanced Settings in the SETUP menu.

### Process Variables

This menu is for information only. It displays PV parameters and values and allows selection of all Dynamic and Device Variables to display their present values and quality.

### Setup

**Default Config-** Reset to factory default (see Quick Start Guide for default configuration settings)

**Config Wizards-** Configuration Wizards to simplify programming:

**Basic Wizard** – Configures a single sensor or dual identical sensors

**Drift Wizard** – Set up a Drift Alert between two sensors (see Section 1 Sensor Diagnostics)

### Input

**Filter** – 50Hz or 60Hz input filter to reduce mains induced noise

**PV Damping** – introduces a delay in the response to stop input noise from generating output errors

**Configure Sensor:**

**Input Type** (eg. Thermocouple TypeK, 4W RTD Pt3850 100ohm etc.)

**RJC Temp EGU**

**Sensor 1 /2 EGU** (engineering units)

**Sensor 1 /2 Broken Wire detection & hold off**

**Sensor 1/2 Running Average filter**

**Sensor 1/2 2 wire offset** (2W RTD/resistance only)

**Sensor 1/2 Information** (Limits, span, serial number)

**Sensor 1/2 Scaling**

**\*Sensor 1/2 Custom Curve**

**Ranging & Mapping**

**Variable Mapping-** assigns the Device Variables (eg. SEN1, BU1-2) to the HART Variables (PV, SV etc.)

**Smart Range** –sets the PV lower range and upper range values to AO 0-100%

## **\*Dual Input**

Configure Scaling and Custom Curve for all the calculated Device Variables

## **Analog Output**

**AO Zero & Full Values**

**AO Under Range & Over Range Values**

**AO Fail Mode** (*High, Low, Hold Last, Fail to Value*)

## **HART Settings**

Allows configuration of HART parameters:

**Polling Address**

**Number of HART request preamble characters** (*read only*)

**Number of HART response preamble characters**

**Tag, Long Tag, Descriptor, Message, Date, Final assembly number**

**Device id, Hardware revision** (*read only*)

**\*Burst Configuration** - can be configured to send out up to 3 burst messages

## **Display (TDZ3 only)**

**Select Dynamic & Device Variables to be displayed**

**Number of Decimal Places**

**\*Configure Custom EGU & Custom Name**

## **System Configuration**

**Input Quality Alarms setup**

**Allow Measurement Out of Conformance Range**

**Allow Limited**

**Allow Dropping**

**\*Range Alarms – configure up to 4 range alarms**

## **Advanced Settings**

**Disable/Enable**

## **Custom Calibration**

### **Status**

**Provides access to all HART status messages:**

*Additional Status Bytes*  
*Subsystem Status*  
*Input Status*  
*User Configuration Status*  
*Analog Output Status*  
*Device Variable Status*

## **Input Capture**

Used to match the device input and output zero and full scale to a known value.

## **Variable Trim**

Sensor 1/2 Trimming and Reset

## **AO Trim**

Analog Output Trimming and Reset

## **Loop Test**

Set Analog Output to a fixed mA value

## **Input Simulation**

Clear or Set a simulated Input.

## **S1/S2 Corrosion Detection**

Set up corrosion detection on Sensor 1 and/or 2

## **\*Unlatch Range Alarm**

Unlatch any of the 4 Range Alarms.

## **Review**

This menu is for information only. It provides configuration information for:

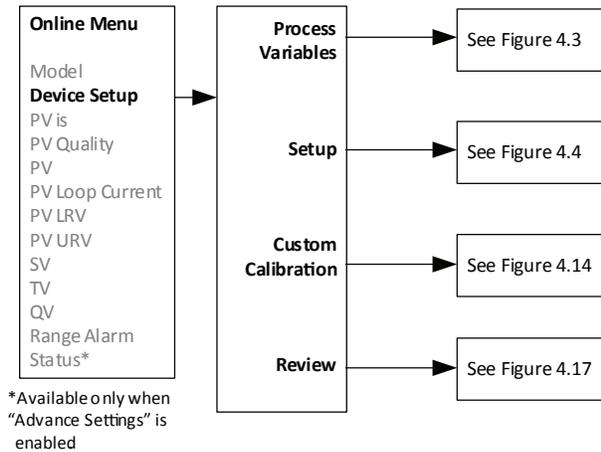
**Device Parameters**

**Device Information**

## Device Setup Menu

The *Device Setup* menu allows you to access the following menus: **Process Variable, Setup, Custom Calibration and Review** refer to Figure 4.2.

Figure 4.2. TDZ<sup>3</sup> or THZ<sup>3</sup> Device Setup menu



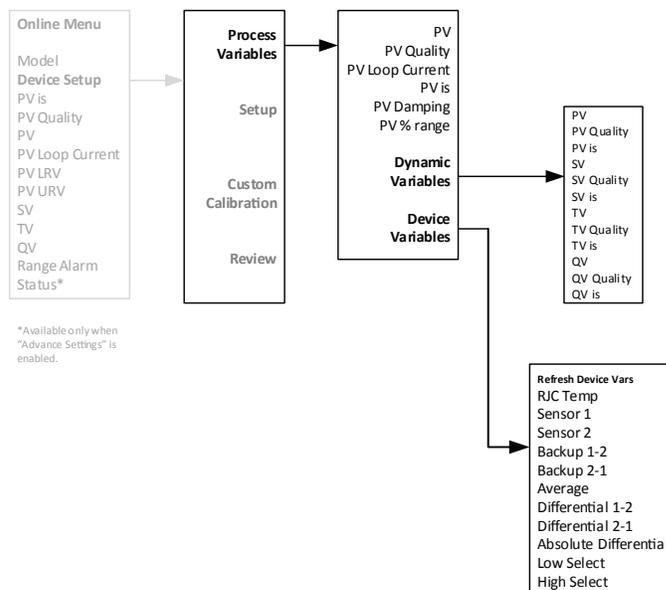
## Process Variable Menu:

The Process Variable menu displays the present values of parameters listed on the Communicator display which include the selected EGU, PV, PV Quality, PV Loop current, PV is, PV Damping, PV % Range, Dynamic Variables and Device Variables.

**Dynamic Variables**– The Dynamic Variables menu displays the present Dynamic Variables parameter values.

**Device Variables**– The Device Variables menu displays the present Device Variables parameter values. If any Device Variable quality is not good, this will show its data quality flag instead of its value.

Figure 4.3. TDZ<sup>3</sup> or THZ<sup>3</sup> Process Variable menu



### Setup Menu:

The Setup menu allows you to access the following menus: **Default Config, Config Wizards, Input, Dual Input, Analog Output, HART Settings, Display, System Config, and Advance Settings.**

**Default Config**– The Default Config menu allows user to reset to factory default settings.



**Note:** Selecting yes will restore default factory settings to unit and is not reversible.

### Config Wizards:

This menu contains Configuration Wizards to simplify programming of commonly used features:

**Basic Wizard:** Basic Wizard can be used to configure either a Single Sensor or Dual Sensors. Follow the on-screen prompts to set all your parameters.



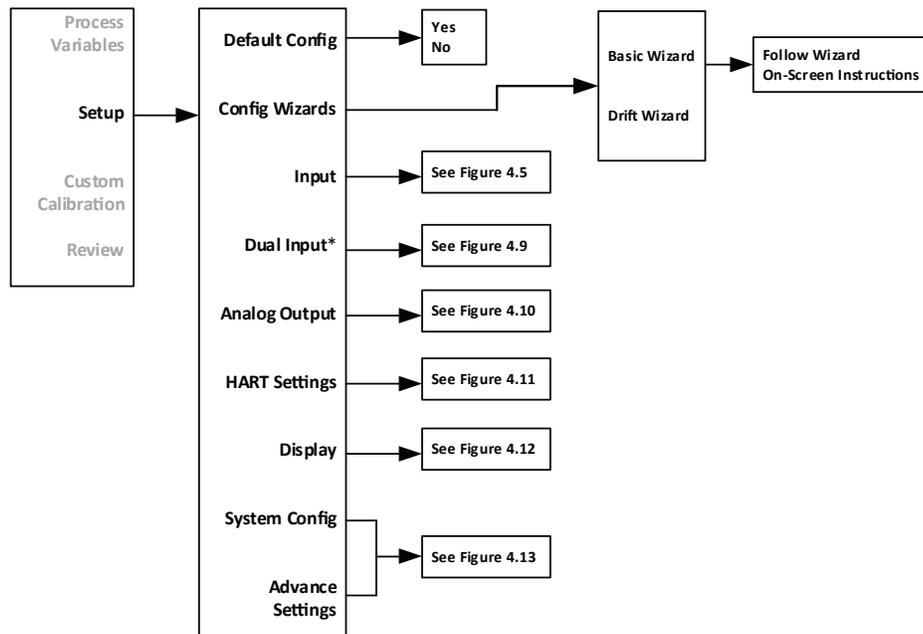
**Note:** Selecting the Dual Sensor option will limit your ability to customize parameters of Sensor 2. By default, the wizard sets Sensor 2 parameters to be exactly the same as Sensor 1.

**Drift Wizard:** Use this wizard to setup a Drift Alert that is tracked by monitoring the absolute differential temperature between two sensors at the same point (the same process temperature). After selecting a specific Range Alarm (1 to 4) to configure, you can select “**Warning**” or “**Alarm (AO Fail)**”. Selecting **Warning** sends a message to the HART Handheld/FDT host, TDZ<sup>3</sup> display and sets a HART status bit. Selecting **Alarm** will also drive the Analog output to Fail Mode. The absolute differential Device Variable used for the Drift Alert can also be assigned/mapped to any of the HART Dynamic Variables PV, SV, TV or QV. For more information on the Drift Alert and Range Alarm features please refer to section 1.



**Note:** After making all desired changes enter **SEND** to update the unit.

Figure 4.4. TDZ<sup>3</sup> or THZ<sup>3</sup> Setup menu



### Input Menu:

The Setup menu allows you to access the following menus: **Filter, PV Damping, Configure Sensor, and Ranging & Mapping.**

**Filter [60Hz]**– This setting is used to configure the input filter. The filter is designed to reduce the effects of mains induced noise. The input filter frequency value should be set to the frequency of the local AC supply—either 50Hz or 60Hz.

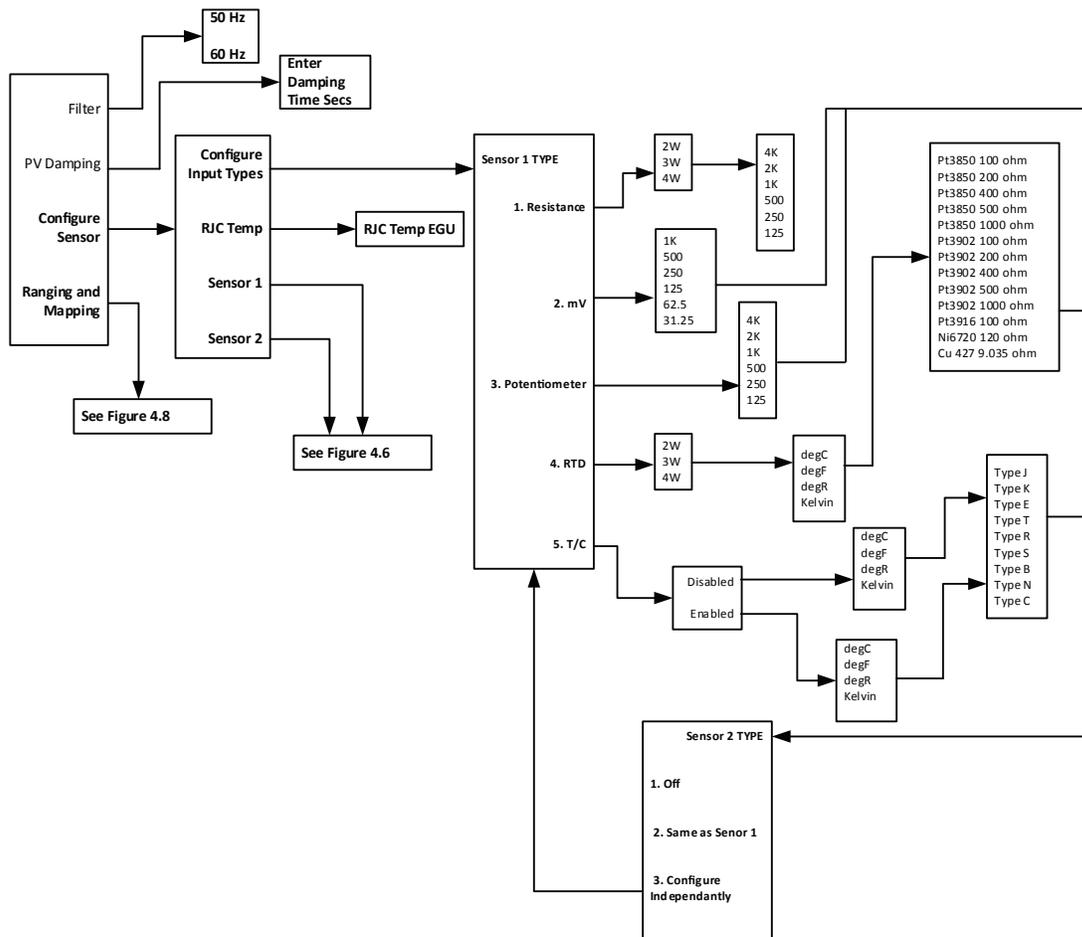
**PV Damping [DISABLED, 0 seconds]**– PV Damping allows you to introduce a delay (0-60 seconds) into the response of your unit in order to stop short-lived spikes from initiating faults and generating fault messages. The damping time setting is the time PV takes to make a 63% change in response to a step change.

**Configure Sensor**– The *Configure Sensor* menu allows you to access to the following list for configuration: *Configure Input Types, RJC Temp, Sensor 1, and Sensor 2* refer to Figure 4.5.



**Note:** After making all desired changes enter **SEND** to update the unit.

Figure 4.5. TDZ<sup>3</sup> or THZ<sup>3</sup> Input menu



### Configure Input Types:

Selecting this will enable to configure Sensor 1 and Sensor 2 as follows:



**Note:** While the THZ<sup>3</sup>/TDZ<sup>3</sup> will accept a dual input sensor configuration the following limitations apply only when using two input sensors:

**TDZ<sup>3</sup> [HP]** 2-wire and/or 3-wire sensors. 4-wire sensors (RTDs) cannot be used.

**THZ<sup>3</sup> [DIN]** (see figure 3.2) 2-wire and/or 3-wire sensors. 4-wire sensors (RTDs) cannot be used.

**THZ<sup>3</sup> [HPP]** (see figure 3.4) Sensor 1 can be configured as 2-wire or 3-wire sensor. Sensor 2 is then restricted to a 2-wire sensor.

### Sensor 1 Type [4W RTD]

Selecting this will prompt the Sensor 1 Type menu screen. Here you can select from **Resistance, mV, Potentiometer, RTD, or T/C**. Highlight the desired sensor type and hit enter.

#### -Resistance:

1. Choose from 2 Wire, 3 Wire, or 4 Wire Connection
2. Select a Resistance value from 4k, 2k, 1k, 500, 250, or 125
3. Sensor 2 Type menu will appear (see below)

#### -mV:

1. Choose from 1k, 500, 250, 125, 62.5, or 31.25 mV
2. Sensor 2 Type menu will appear (see below)

#### -Potentiometer:

1. Choose from 4k, 2k, 1k, 500, 250, or 125ohms
2. Sensor 2 Type menu will appear (see below)

#### -RTD:

1. Choose from 2 Wire, 3 Wire, or 4 Wire Connection Configuration
2. Select temperature unit from degC, degF, degR, or Kelvin
3. Select desired RTD and hit enter
4. Sensor 2 Type menu will appear (see below)

#### -T/C:

1. Choose between Enabled or Disabled for RJC Temperature compensation. This should be enabled for the majority of cases. Disable RJC ONLY if you are using a rare and old remote reference junction wiring strategy
2. Select temperature unit from the following degC, degF, degR, or Kelvin
3. A variety of Thermocouples to choose from select desired T/C and hit enter
4. Sensor 2 Type menu will appear (see below)

### Sensor 2 Type [Off]:

1. Choose from the following menu options *Off, Same as Sensor 1, or Configure Independently*.

-Selecting *Off* will turn Sensor 2 off

-Selecting *Same as Sensor 1*, the configuration parameters from *Sensor 1* will be copied to configure *Sensor 2*

-Selecting *Configure Independently*, this will allow you configure parameters of *Sensor 2* separately. (Same menu options as Sensor 1 above)

## RJC Temp:

Selecting this will prompt menu displaying *RJC Temp EGU* select this. On next menu screen the current *RJC Temp EGU* is displayed and you will be able to select new desired *RJC Temp EGU*. You may choose for the following *degC, degF, degR, or Kelvin*. Once selecting desired *RJC Temp EGU* next screen will return you to previous *RJC Temp EGU* menu at this point you go choose from the following *HELP, SEND, or HOME*. After entering *SEND* you can choose to *SAVE*, this will prompt menu allowing to choose desired *Location, Name, and Config Type*. Refer to Figure 4.5 for clarification.



**Note:** You must hit the *SEND* button to refresh and update the *THZ<sup>3</sup>/TDZ<sup>3</sup>* unit, otherwise hitting *HOME* or *BACK* arrow will not make or update the desired *RJC Temp EGU* change/update.

## Sensor 1:

Selecting this will prompt menu displaying:  
Refer to Figure 4.6 for clarification.

**-S1 Measure Mode:** selecting this will display current measuring mode. Enter *EXIT* to return to previous screen in Menu.

**-S1 Input type:** selecting this will display current input type. Enter *EXIT* to return to previous screen in Menu.

**-S1 EGU Units:** selecting this will display current *S1 EGU* and allow you to change from the following *degC, degF, degR, Kelvin, mV, ohms, or %*. Enter *ESC* if no change is required. If you choose to change the current *S1 EGU* select desired unit and hit the *ENTER* button to return to previous screen in Menu.

**-S1 Broken Wire Detection [Enabled]:** selecting this will display whether *Sensor 1 Broken Wire Detection* is *Disabled or Enabled*. If you make a change select desired parameter and hit the *ENTER* button to return to previous screen in Menu. See Section 1 for more information on Broken wire detection.

**-S1 BW Holdoff time [0 seconds]:** This allows users to add an additional time delay before broken wire is detected. When enabled, a Broken Wire delay of 0-60 seconds can be set which provides some noise immunity and prevents false alarms caused by other factors that may be misinterpreted as Broken Wire. Selecting this will display current *Sensor 1 Broken Wire Holdoff time* and allow you to make changes as required. If you make a change, select desired parameter and hit the *ENTER* button to return to previous screen in Menu.

**-S1 Running Average[1]:** This function is for filtering the input signal. The *TDZ<sup>3</sup>* and *THZ<sup>3</sup>* a running average filter with a user-selected range between 1 and 16. Selecting this will display the current *Sensor 1 Running Average* and allow you to make changes as required. If you make a change select desired parameter and hit the *ENTER* button to return to previous screen in Menu.



**Note:** A higher *Running Average Filter* setting provides smoother output transitions; however, increases response time. Conversely, a lower setting provides a faster response time, but may seem more unstable.

**-S1 2Wire Offset:** This setting is to offset the wire resistance of the 2Wire sensor cable, and will help the accuracy of the measurement. Selecting this will display current *Sensor 1 2Wire Offset* and allow you to make changes as required. If you make a change select desired parameter and hit the *ENTER* button to return to previous screen in Menu.

**-S1 Sensor Information:** selecting this will display the *Sensor 1, Sensor Information menu*.

The following will be displayed with your set parameters:

- Sensor 1 USL:* Upper Sensor Limit
- Sensor 1 LSL:* Lower Sensor Limit
- Sensor 1 Min Span:* Minimum Span
- Sensor 1 s/n:* Sensor 1 Serial Number

Hit the *HOME* button to return to home menu.

**-S1 Scaling:** Selecting this will prompt menu shown in Figure 4.6. The Following options are displayed ***Sensor 1 Scl En, Sensor 1 EGU, Sensor 1 Input Min, Sensor 1 Max., Sensor 1 Scale Min., and Sensor 1 Scale Max.*** Here you can *Enable or Disable* Sensor 1 Scaling, select an *EGU* for Sensor 1, enter Sensor 1 Input Min/Max and Sensor 1 Scale Min/Max.

**-S1 Custom Curve:** Selecting this will prompt menu shown in Figure 4.7. This allows enabling/disabling custom curve, setting engineering units and selecting 1 of 4 predefined Custom Curves to apply to Sensor 1.



**Note:** The **Custom Curve** menu is only visible if **Advance Settings** is Enabled. Custom Curves have to be generated and saved in the unit using the DTM before they can be assigned to the Sensor.



**Note:** After making all desired changes enter *SEND* to update the unit.

### Sensor 2:

Selecting this will prompt the same menu options as previous Sensor 1 configuration. The same parameters features and setting options will be made available to change/update as Sensor 1 but these changes/update will be made to Sensor 2 when done within this menu. Refer to Figure 4.5 for clarification.

Hit the *HOME* button to return to home menu.



**Note:** After making all desired changes enter *SEND* to update the unit.

After entering *SEND* you can choose to *SAVE*, this will prompt menu allowing to choose desired Location (*Internal Flash* or *System Card*), Name, and Config Type.



**Note:** When selecting a Location where to save file to, both locations are on the *HART handheld communicator*, "*Internal Flash*" stores file directly into the *HART handheld communicator internal flash*. While selecting "*System Card*" allows you to save to the installed system card (*SD memory card*).



**Note:** After making all desired changes enter *SEND* to update the unit.

Figure 4.6. TDZ<sup>3</sup> or THZ<sup>3</sup> Sensor 1 and Sensor 2 menus in Input menu

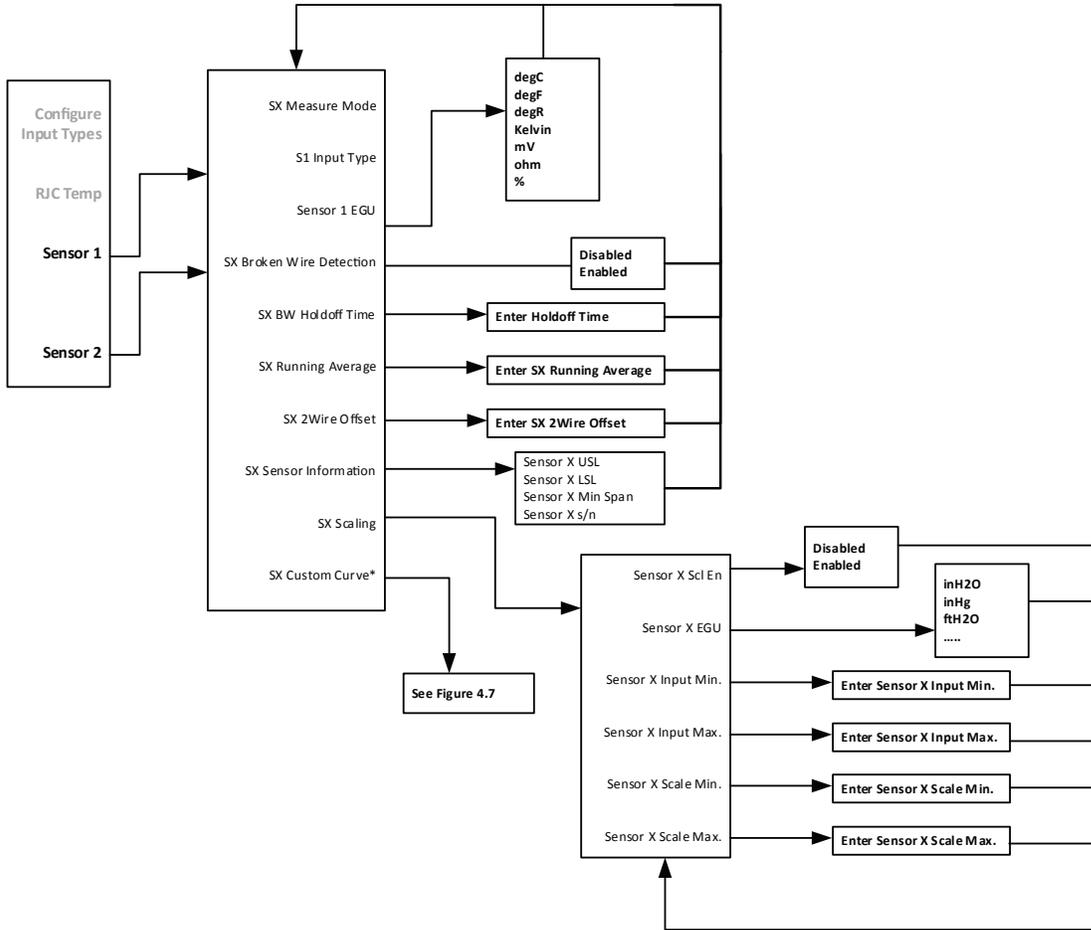
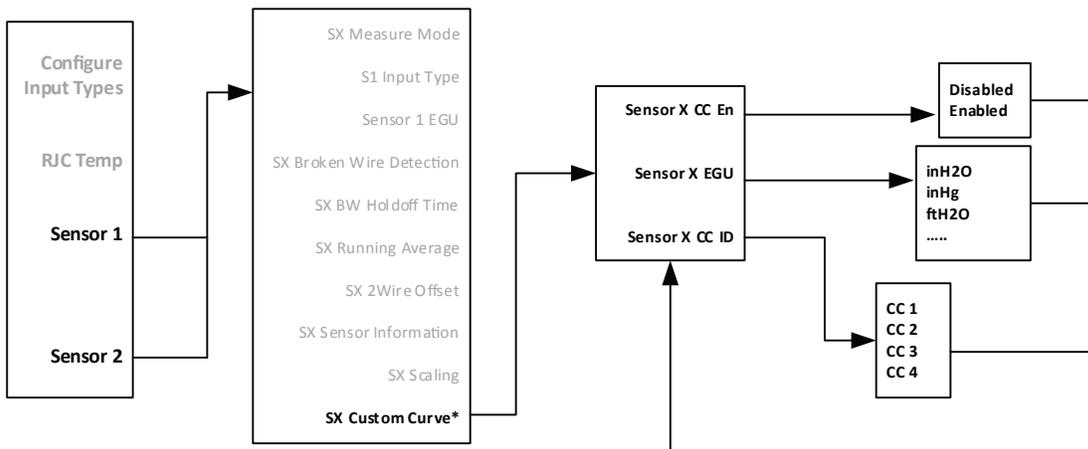


Figure 4.7. TDZ<sup>3</sup> or THZ<sup>3</sup> Custom Curve for Sensor 1 and Sensor 2 in Input menu



### Ranging and Mapping:

The Ranging and Mapping menu will allow you to view current Device Variable assignment/mapping to PV, SV, TV, and QV. It will also allow you to designate or change each one as needed. To do so enter the **Change Variable Mapping** menu option. This menu will prompt you to select from **RJC Temperature, Sensor 1, Sensor 2, Backup 1-2, Backup 2-1, Average, Differential 1-2, Differential 2-1, Absolute Differential, Low Select, or High Select** to each variable (PV, SV, TV, & QV).

**-Smart Range:** Selecting this will prompt the menu shown in Figure 4.8. The **Smart Range** menu, displays the following information: **PV is, Sensor 1 LSL, Sensor 1 USL, Sensor 1 Min span, Sensor 1 EGU, PV LRV, and PV URV**. This displays which Sensor is mapped to PV (PV is); that Sensor variable's LSL (lower scale limit), USL (upper scale limit), Min Span (minimum span), Sensor variable's EGU, PV LRV (Primary variable lower range value), and the PV URV (Primary variable upper range value).

Enter the desired 0% device variable value for the PV LRV, and this is the value will set the Analog output at its 0% scale (normally is 4mA).

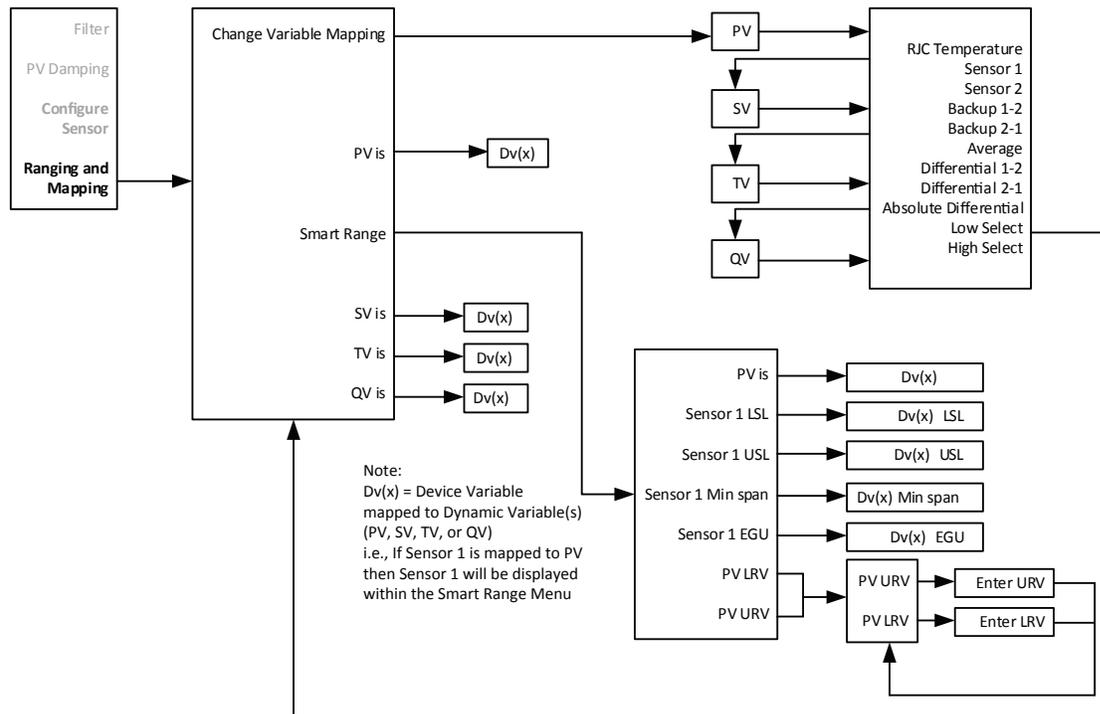
Enter the desired 100% device variable value for the PV URV, and this is the value will set the Analog output at its 100% scale (normally is 20mA).

Any value which falls within the range of the mapped device variable LSL and USL may be used for PV LRV and PV URV.



**Note:** After making all desired changes enter SEND to update the unit.

Figure 4.8. TDZ<sup>3</sup> or THZ<sup>3</sup> Ranging and Mapping within Input menu



### Dual Input:

The **Dual Input** menu will allow you to view and set Scaling and and Custom Curve for the following Device Variables: **Backup 1-2, Backup 2-1, Average, Differential 1-2, Differential 2-1, Absolute Differential, Low Select, and High Select**. Refer to Figure 4.9 for clarification, menu is shown for Backup 1-2 but is the same for any of the given Device variables.

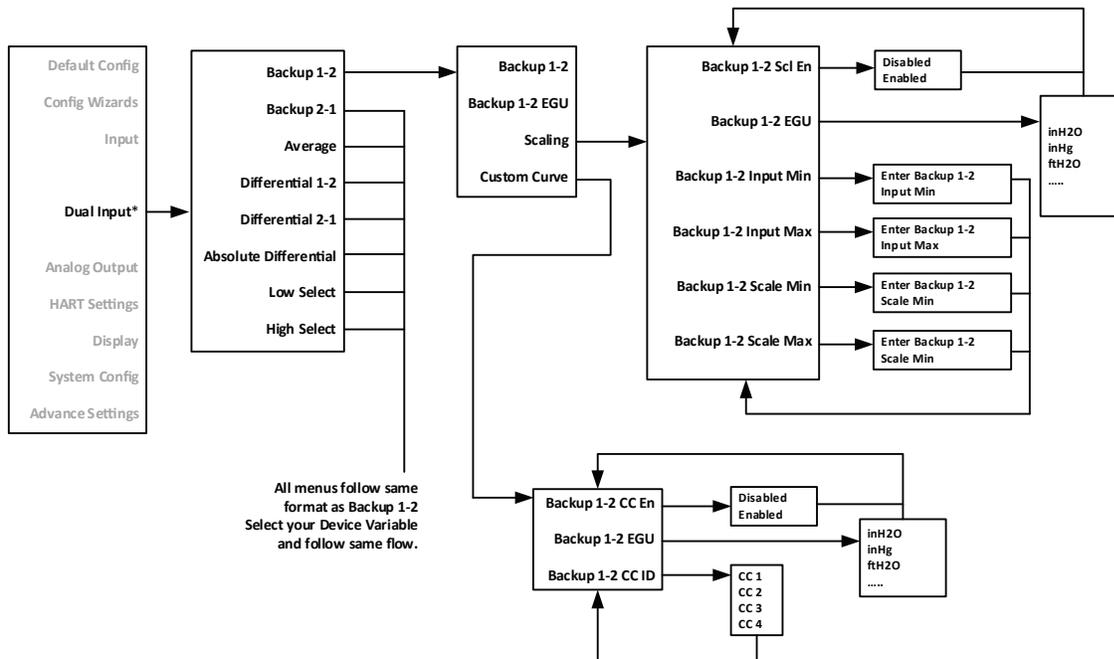


**Note:** The **Dual Input** menu is only visible if **Advance Settings** is Enabled.



**Note:** After making all desired changes enter **SEND** to update the unit.

Figure 4.9. TDZ<sup>3</sup> or THZ<sup>3</sup> Dual input



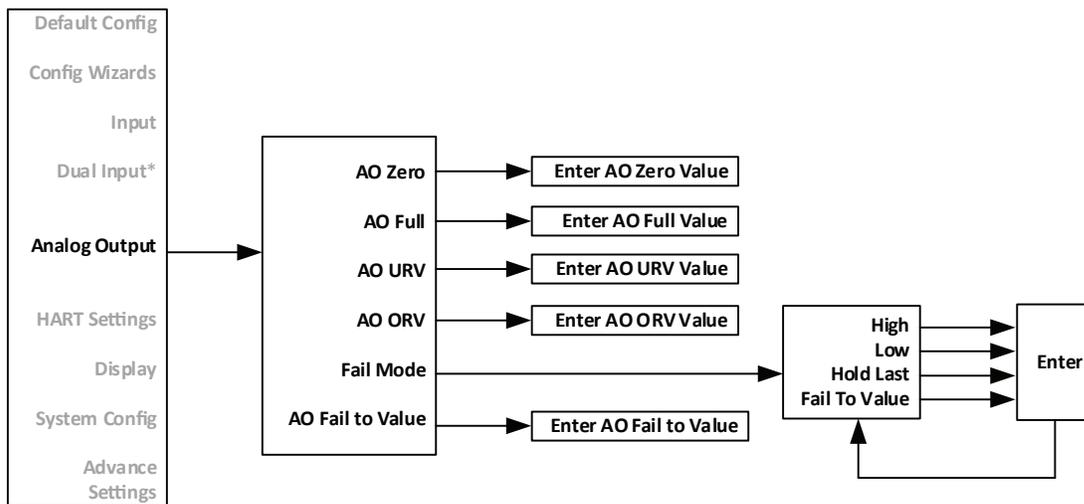
### Analog Output:

The **Analog Output** menu will allow you to view and set the following menu items: **AO Zero**, **AO Full**, **AO URV** (Under range value), **AO ORV** (Over range value), **Fail Mode**, and **AO Fail to Value**. See Figure 4.10 below for further clarification.



**Note:** After making all desired changes enter **SEND** to update the unit.

Figure 4.10. TDZ<sup>3</sup> or THZ<sup>3</sup> Analog Output



## HART Settings:

The **HART Settings** menu displays the following options **Poll Addr**, **Num req preams**, **Tag**, **Long Tag**, **Descriptor**, **Message**, **Date**, **Final asbly num**, **Dev id**, **Hardware rev** and **Burst Configuration**. See Figure 4.11 for further clarification.

**Poll Addr [0]**– This is the HART Polling Address, enter a number from 0-63.

**Num req preams [10]**– This displays the number of Preamble Characters (0xFF) that are sent before any HART requested message. This is set to 10.

**Num resp preams (5-20) [5]**– Enter the number of Preamble Characters (0xFF) that are sent before any HART response message. This command selects the minimum number of preambles to be sent by a device before the start of a response packet in the HART message. A longer preamble means slower communication. The number of preambles may need to be manually increased for some HART hosts, if there are missed messages or communication errors.

**Tag**– Place a unique label that corresponds to your instruments location or specific usage (8 characters maximum).

**Long Tag**– Place a unique label that corresponds to your instruments location or specific usage (32 characters maximum).

**Descriptor**– Place text that is used as a description of how the instrument is being used (16 characters, maximum).

**Message**– Place additional information that may be helpful in describing the instrument or its use (32 characters, maximum).

**Date**– Store a date that corresponds to specific system function, i.e. instrument configuration date, calibration due date, preventive maintenance schedule, etc.

**Final asbly num [0]**– You may enter a number that is used for identification purposes, and is associated with the field device (8 characters, maximum).

**Dev id**– This is a read-only value that uniquely identifies the field device when combined with the manufacturer identification and device type.

**Hardware rev**– This is a read-only value which corresponds to the revision of the electronics hardware of the field device.

**Burst Configuration**– Burst Mode enables the device to continuously send out HART messages to any listening device. This mode can be configured to send out up to 3 burst messages. See HART Burst Message description in the Feature Overview at the beginning of Section 4 for more information.

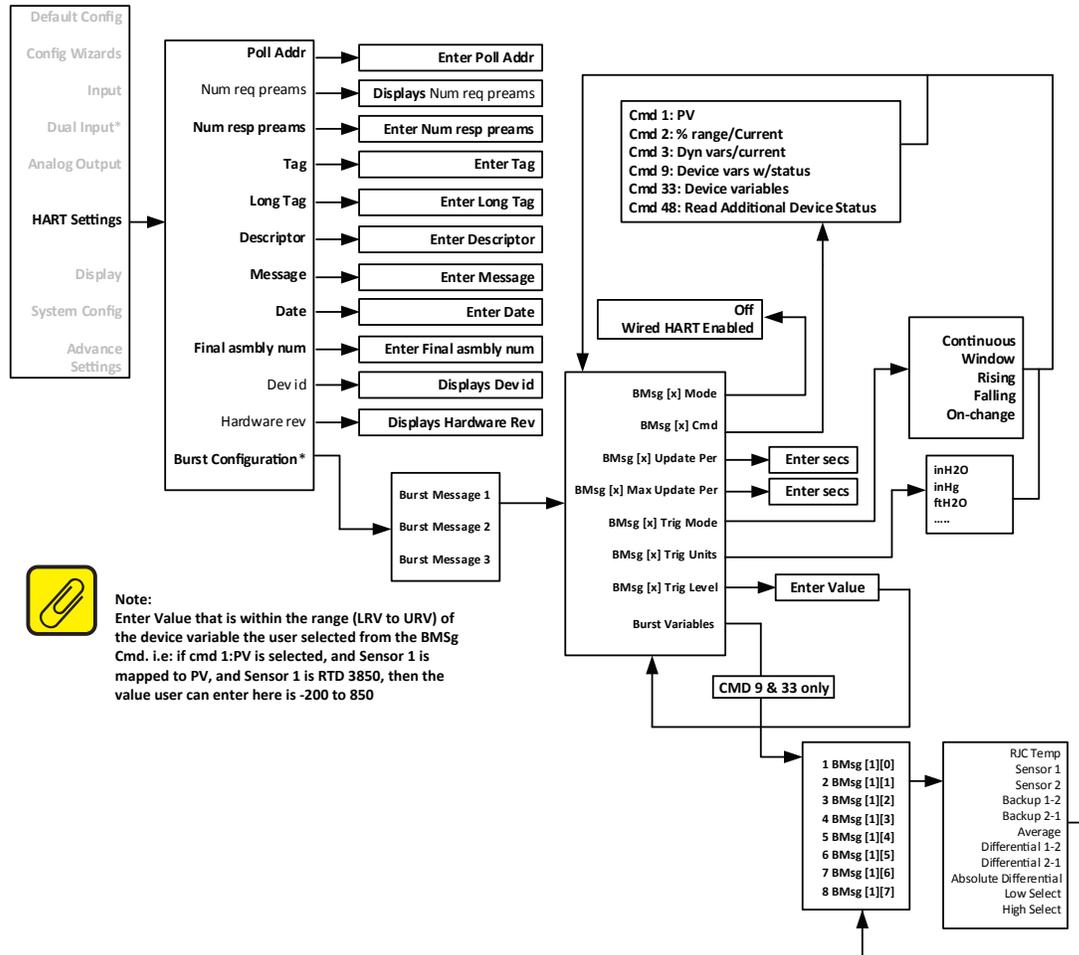


**Note:** The **Burst Configuration** menu is only visible if **Advance Settings** is Enabled.



**Note:** After making all desired changes enter **SEND** to update the unit.

Figure 4.11. TDZ<sup>3</sup> or THZ<sup>3</sup> HART Settings menu



## Display Menu (TDZ<sup>3</sup> only)

The Display menu allows you to select which variables are shown and also allows for custom names and engineering units (EGU). Refer to Figure 4.12 for further clarification.



**Note:** The **Configure Custom EGU\***, and **Configure Custom Name\*** menus are only visible if **Advance Settings** is Enabled.



**Note:** After making all desired changes enter **SEND** to update the unit.

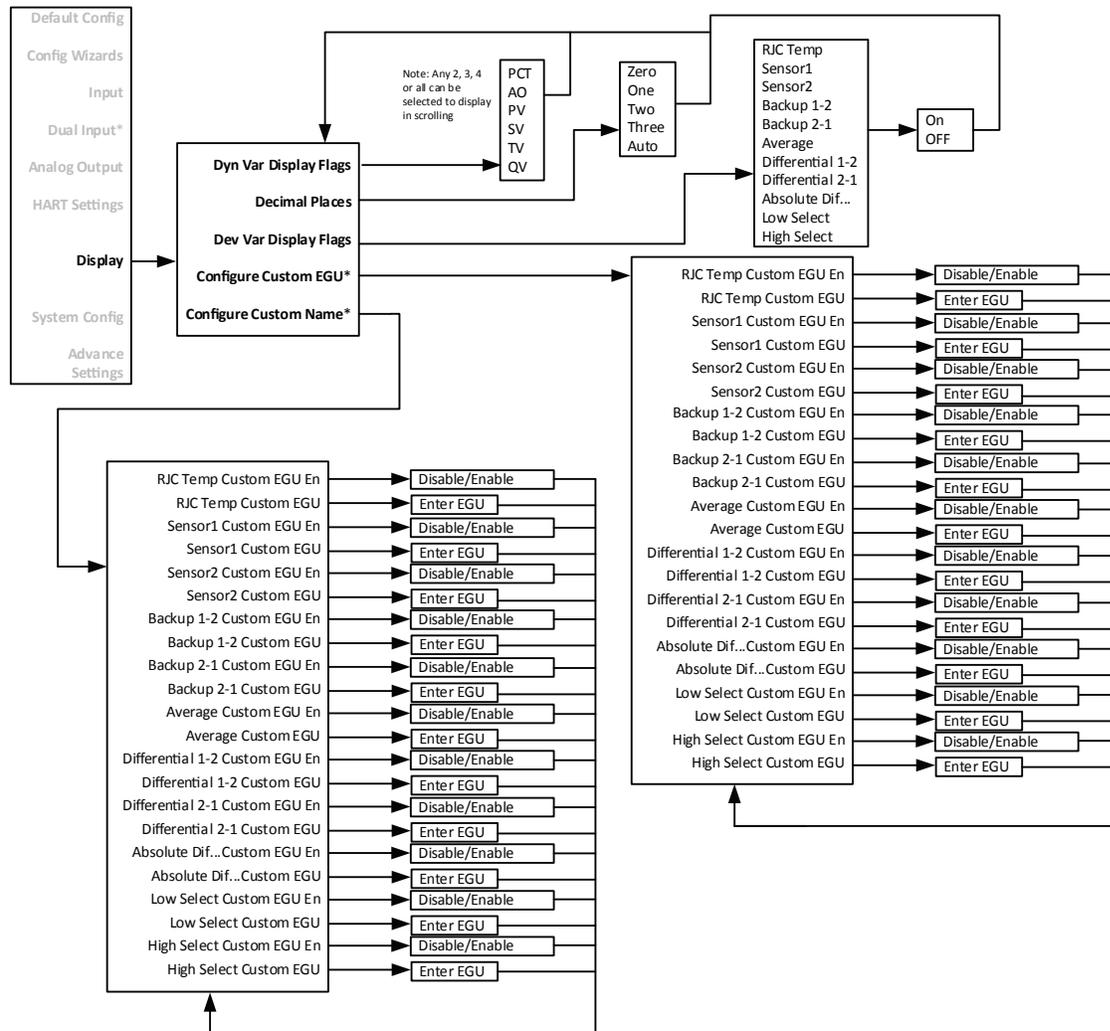


**Note:** Both the Custom EGU and Custom Name are limited to 5 alphanumeric characters.

Legal characters are:

A-Z (caps only)  
0-9  
% ` ( ) \* + , - / < = > ? @ [ \ ] ^ \_

Figure 4.12. TDZ<sup>3</sup> or THZ<sup>3</sup> Display menu



## Dynamic Variable Display Flags

These flags control which Dynamic Variables (PCT, AO, PV, SV, TV, QV) are displayed. By default PV is shown.

When PV, SV, TV, or QV are selected for display, each will result in three screens.

123.45 / Dynamic Var Name

123.45 / Source Device Var Name

123.45 / Units

For example: If the PV is 123.45 OHMS being sourced from the Average Device Variable, the following will be shown:

123.45 / PV

123.45 / AVG

123.45 / OHMS

When the Percent of Range or Loop Current are selected for display, each will be shown using two screens:

12.345 / AO

12.345 / MA

or

12.345 / PCT

12.345 / PCT

If there is a problem with the underlying Device Variable, only one screen will be shown:

BADDQ / Dynamic Var Name

In this last case, the nature of the error will be shown separately.

## Decimal Places [Auto]

This setting (0-3, AUTO) controls the maximum number of decimal places shown. For example, a setting of AUTO, will display 1.2345, or 12.345. Depending on the magnitude of the whole portion of the number, the decimal point may be forced to the right. If 3 Decimal places are selected, 1.234 will be shown. However the DP will be moved to allow 123.45 to be shown.

## Device Variable Display Flags

These flags control if individual Device Variables are shown. One or all Device Variables can be selected (SEN1, SEN2, RJC T, BU1-2, BU2-1, AVG, DIF12, DIF21, ABDIF, LOSEL, HISEL).

When selected, a Device Variable is shown using two screens.

123.45 / Name (default or custom name)

123.45 / UNITS

If there is a problem with the Device Variable, then the following will be shown:

BADDQ / Name (default or custom name)

## Configure Custom EGU\*

Each Device Variable can have a custom EGU string specified for it. The Custom EGU must be enabled in Advanced Settings for it to be displayed. This is a 5 character custom string.

Legal characters are:

A-Z (caps only)

0-9

% ' ( ) \* + , - / < = > ? @ [ \ ] ^ \_

## Configure Custom Name\*

Each Device Variable can have a custom name string specified for it. The custom name must be enabled in Advanced Settings for it to be displayed. This is a 5 character custom string.

Legal characters are the same as those for custom EGU (see above)

For displayed Device Variables, the custom name will replace the default name.

Dynamic Variables cannot have a custom name. However when the underlying Device Variable's name is shown, the custom name is shown instead.

## System Configuration Menu

The **System Config** menu displays the following options **Input Quality Alarms and Range Alarms**\*

**Input Quality Alarms** – Directs you to a sub-menu. When accessed, this will allow you turn On or Off the following menu options **Allow Measurement out of Conformance Range, Allow Limited, and Allow Dropping**. These settings allow the user to determine how certain types of input quality issues are handled and how they can affect the Device Variables, Dynamic Variables and AO. See Section 6 for more information.

**Range Alarms** – Directs you to a sub-menu. When accessed, you will able to configure Range Alarms 1-4. You can also select and reset an actively latched range alarm provided that the input has returned to a non-alarm level. See Section 1 more information on Range Alarms.

Each alarm has the following settings:

**Enabled:** [Disabled] Enables or Disables the Range Alarm

**Source:** [Primary Variable] The Variable to be used as a source for the Range Alarm

**Response:** [Warning] How to react if the specified condition occurs:

**Warning** - Sends a warning message to the HART Handheld/FDT host, TDZ<sup>3</sup> display and sets a HART status bit.

**Alarm** - Sends the AO into fail mode and sends an alarm message to the HART Handheld/FDT host, TDZ<sup>3</sup> display. It also sets a (different) HART status bit.

**Assertion:** [In Range] Indicates if the Range Alarm should detect if the source variable goes Out of range, or goes In range.

**Low:** [0.00] The defined lower limit of the Range Alarm

**High:** [100.00] The defined upper limit of the Range Alarm

**Latching:** [Enabled] Disables or Enables latching of the alarm. Non-latching alarms return to a non-alarm state whenever the process input returns to a non-alarm level. Once tripped, a latching alarm remains in an alarm state until the input returns to a non-alarm level and is reset. Latching alarms can be reset from the Range Alarm or Custom Calibration menu.



**Note:** The **Range Alarms** menu is only visible if **Advance Settings** is Enabled.

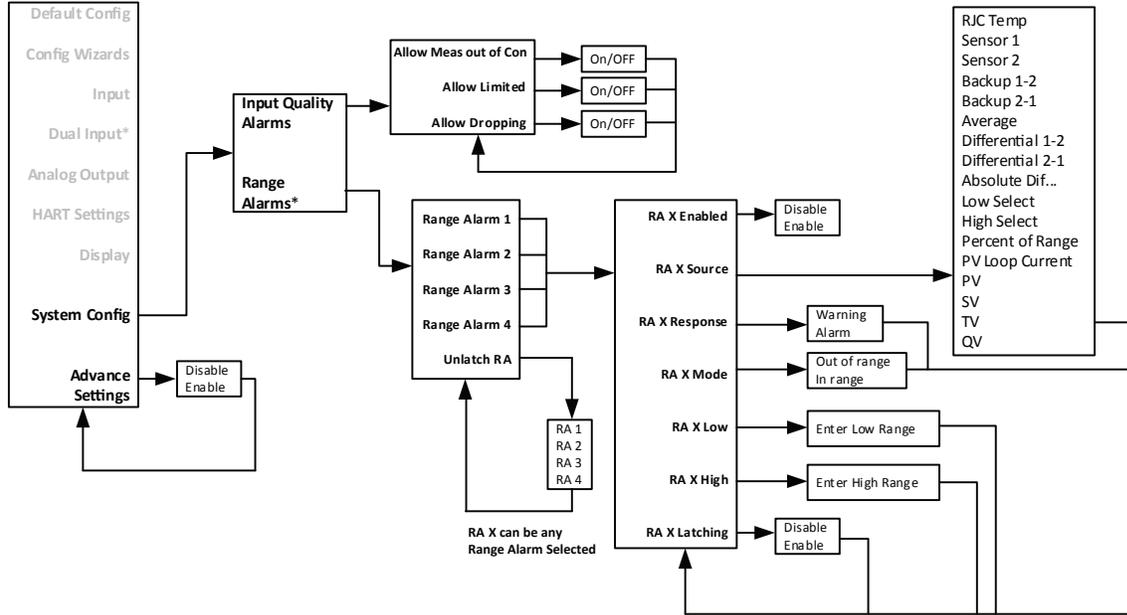


**Note:** If a Range Alarm Response is set to Alarm, the AO will always perform a fail response even if the Source Device Variable is not assigned to the PV.



**Note:** After making all desired changes enter **SEND** to update the unit.

Figure 4.13. TDZ<sup>3</sup> or THZ<sup>3</sup> System Configuration and Advance Settings Menus

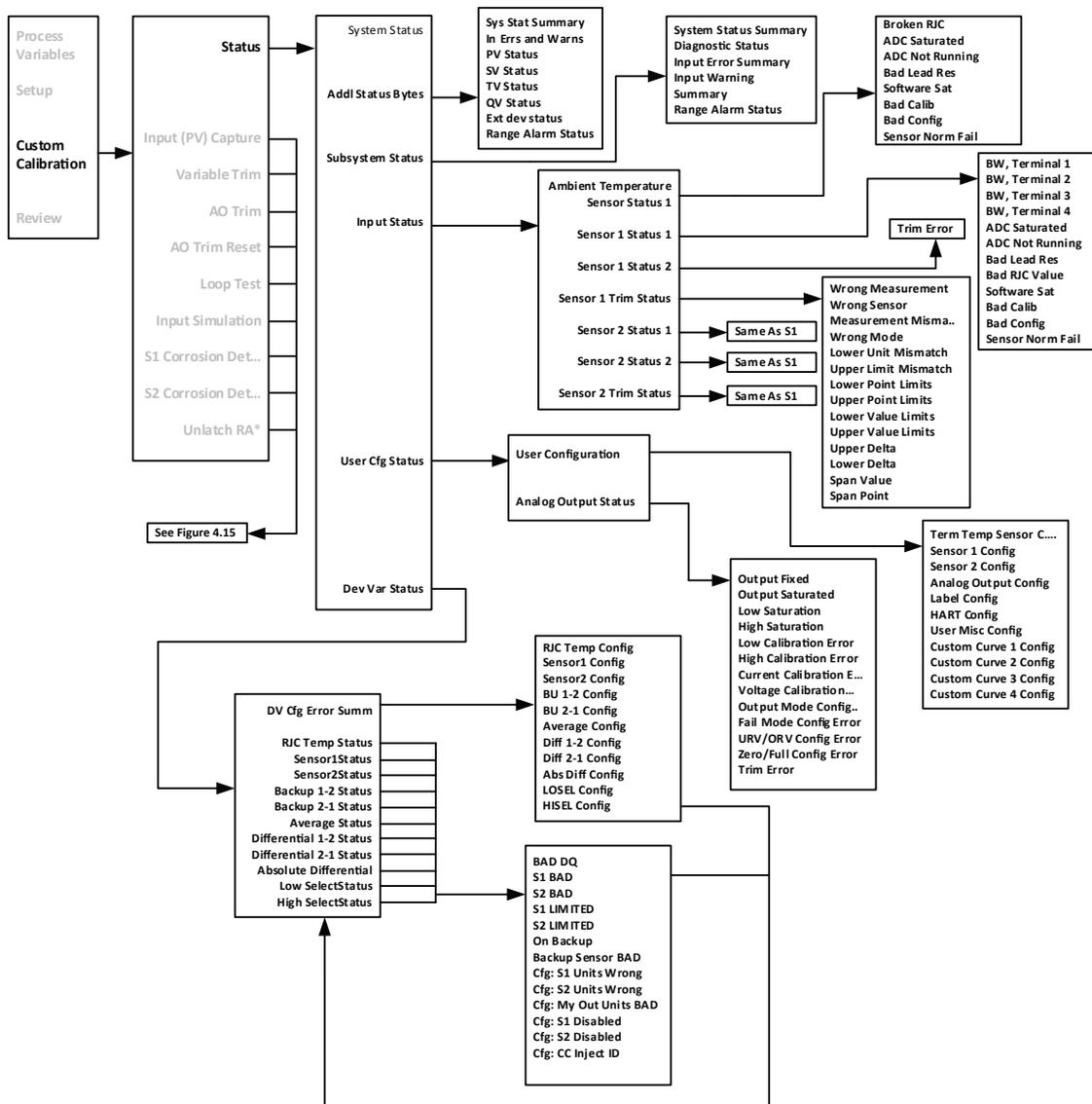


### Custom Calibration Menu

The **Custom Calibration** menu allows you to access the following menus: **Status**, **Input (PV) Capture**, **Variable Trim**, **AO Trim**, **AO Trim Reset**, **Loop Test**, **Input Simulation**, **S1 Corrosion Detection**, **S2 Corrosion Detection** and **Unlatch RA**. Refer to Figure 4.14 below.

**Status** – Directs you to a sub-menu. When accessed, you will come to the following menu options, System Status, Addl Status Bytes, Subsystem Status, Input Status, User Cfg Status, and Dev Variable Status. Refer to Figure 4.14.

Figure 4.14. TDZ<sup>3</sup> or THZ<sup>3</sup> Status menu within the Custom Calibration Menu



**Input Capture**– Input Capture is used to match the device input and output zero and full scale to a known value.

Adjust input sensor to 0% value to TDZ<sup>3</sup> or THZ<sup>3</sup> and follow the screen instructions. This will set the device's output to known 4mA value. Adjust input sensor to 100% value to TDZ<sup>3</sup> or THZ<sup>3</sup> and follow the screen instructions. This will set the device's output to a known 20mA value.

**Variable Trim**– This menu allows you to view the following options Device Variable Trim, Device Variable Trim Reset, and Display Device Variable Trim. Refer to Figure 4.15.

**AO Trim**– Directs you to a sub-menu. Here you can select Reset Trim, Trim Zero or Trim Full.

**AO Trim Reset**– Directs you to a sub-menu. Here you can select No or Yes.

**Loop Test**– A loop test may be performed in order to check output performance and accuracy and to trim other instruments in the loop. Your output will be a current value, in mA, equal to the value you input. You can check the other current devices on the loop and calibrate them to this signal.

**Input Simulation** – Allows you Clear or Set a simulated Input.

**S1 Corrosion Detection** – This captures the nominal resistance value of Sensor 1, then allows setting 2 threshold resistances (warning and alarm) to identify when corrosion occurs. This applies only to Thermocouples and 3W and 4W RTDs. See section 1 for more information on Corrosion Detection.

**S2 Corrosion Detection** – This captures the nominal resistance value of Sensor 2, then allows setting 2 threshold resistances (warning and alarm) to identify when corrosion occurs. This applies only to Thermocouples and 3W and 4W RTDs. See section 1 for more information on Corrosion Detection.

**Unlatch Range Alarm**– This allows you to select and reset an actively latched range alarm (1-4) provided that the input has returned to a non-alarm level.

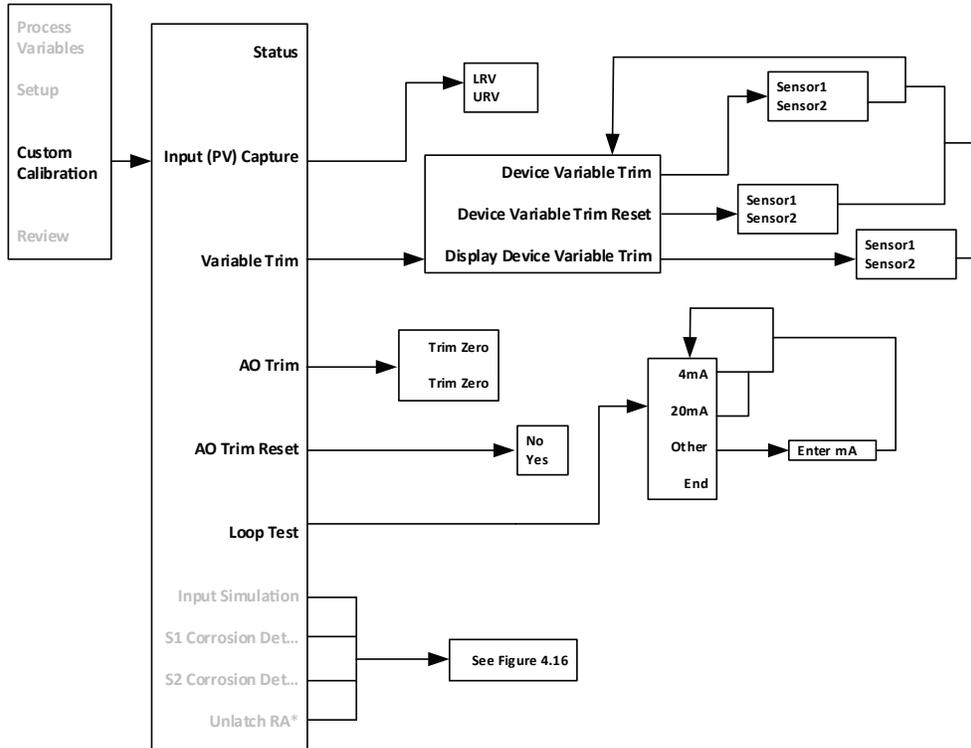


**Note:** The **Unlatch RA\*** menus are only visible if **Advance Settings** is Enabled.

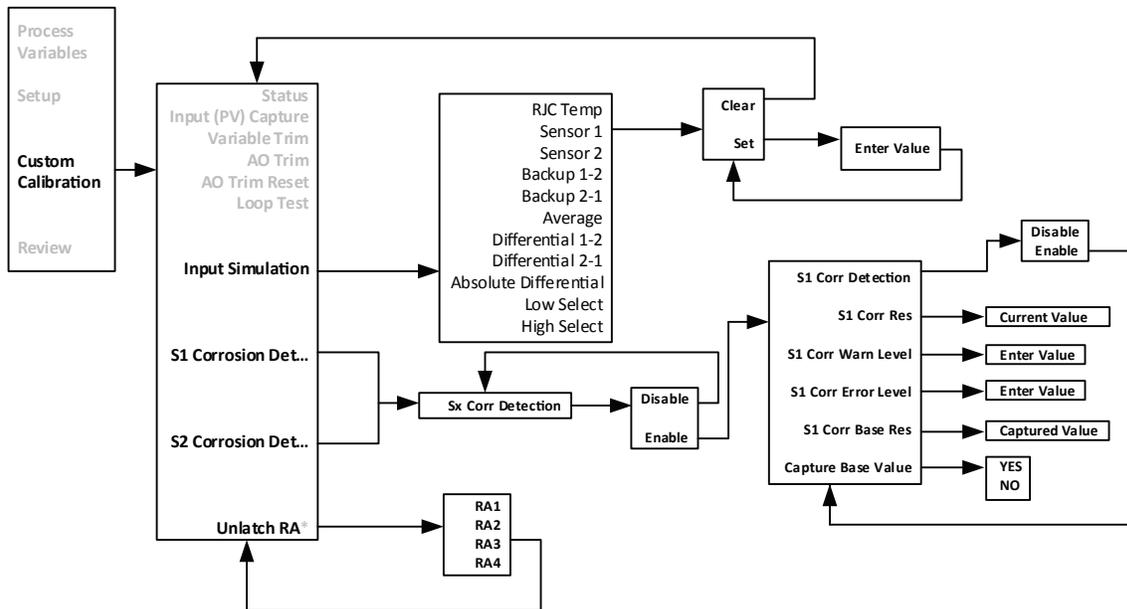


**Note:** After making all desired changes enter **SEND** to update the unit.

**Figure 4.15.** TDZ<sup>3</sup> or THZ<sup>3</sup> Input (PV), Variable Trim, AO Trim, AO Trim Reset, and Loop Test within the Custom Calibration Menu



**Figure 4.16.** TDZ<sup>3</sup> or THZ<sup>3</sup> Input Simulation, S1 Corrosion Detection, S2 Corrosion Detection and Unlatch Range Alarms within the Custom Calibration Menu



## Section 5 - Configuration using FDT/DTM Software

Before reading this section on the FDT/DTM configuration, please read the Configuration Overview at the beginning of Section 4 for general information on configuring the TDZ<sup>3</sup>/THZ<sup>3</sup>.

This section provides information on configuring the TDZ<sup>3</sup>/THZ<sup>3</sup> using a PC with PACTware (an FDT frame application). For users who already have an FDT Frame Application, all the following information is still relevant except for the PACTware installation. For more information on FDT/DTM please refer to [www.fdtgroup.org](http://www.fdtgroup.org).

### **FDT Frame Application**

Moore Industries has always provided manufacturer-specific programs to operate our field instruments to the full extent. TDZ<sup>3</sup>/THZ<sup>3</sup> will require the use of an FDT frame application, which allows configuration and adjustment of any and all field instruments, which have a DTM. For users who do not already have an FDT frame application, Moore Industries provides PACTware.

An FDT frame application, such as PACTware, is a PC program which interfaces with individual software modules for instrument operation. This interface is regarded as the FDT; the individual software modules for instrument adjustment are called DTMs (Device Type Manager). This configuration makes user-friendly adjustments possible because the interface for instrument adjustment is optimally adapted to each instrument.

Furthermore, you can communicate with an FDT frame application not only via HART but also via any standard field bus system. Moore Industries provides a proprietary serial communication DTM named MISP, which allows faster device configuration using our USB communication cable. The MISP DTM will be provided in addition to the TDZ<sup>3</sup>/THZ<sup>3</sup> Device DTM. In the FDT frame application, these individual instrument DTMs and communication DTMs are installed as required.

### **FDT/DTM Software Installation**

In order to get started you will need to either install the PACTware software and DTMs or just install the DTMs (if you already have an FDT frame application installed). All the files you need are included in the Moore Industries PACTware/DTM CD, or from our website [www.miiinet.com](http://www.miiinet.com).

The PACTware installer file will install PACTware and all required DTMs.

### PACTware\_vxxx\_FDT\_DTM\_Installation\_Moore\_Industries.exe

When you run the installer you will have the option to select which components you want to install:

#### PACTware 4.1 SP3

**ICS Generic HART FDT DTM** - This is for HART instruments which do not have a DTM

**HART Communication FDT DTM** - This is for using a HART modem to connect to TDZ<sup>3</sup>/THZ<sup>3</sup>

**MII MISP Communications DTM** - This is for using a Moore Industries serial or USB cable

**MII TDZ3 THZ3 DTM** - This is the Device DTM for the TDZ<sup>3</sup> and THZ<sup>3</sup>



You will also find individual DTM installers on the CD in Comms and Device folders. Use these if you already have PACTware or another FDT frame application and just need to install or update the Moore Industries DTMs.

**Comms Folder:** MISP\_vxxx\_CommsDTM\_Moore\_Industries.exe

**Device Folder:** TDZ3\_THZ3\_vxxx\_DeviceDTM\_Moore\_Industries.exe

The USB cable driver is also available in the Comms folder on the CD if you need to install the Moore Industries USB cable on your PC for the first time.

**Comms Folder:** MIUSB\_Cable\_vxxx\_PC\_Configuration\_Software\_Moore\_Industries.exe

### Moore Industries MISP DTM Installation

If you want to communicate with the TDZ<sup>3</sup>/THZ<sup>3</sup> using the USB communications cable, you will need to install the MISP DTM. The MISP DTM can be found on the Moore Industries PACTware/DTM CD, or from our website [www.miinet.com](http://www.miinet.com).

File is named: MISP\_DTM\_Configuration\_Software\_Moore\_Industries.exe

To install simply locate file, double click file and follow on screen instructions to install.



### Moore Industries "THZ<sup>3</sup>/TDZ<sup>3</sup>" DTM Installation

File is named: THZ3\_TDZ3\_PC\_Configuration\_Software\_Moore\_Industries

To install simply locate file, double click file and follow on screen instructions to install.



### Using DTM's with FDT Frame Application (PACTware)

Once you have installed all the necessary DTMs on your system, you are now ready to launch the FDT frame application (PACTware) and configure your device. There are two distinct communications methods you can choose to use. Refer to Figures 5.1-5.3 for hookup diagrams for these configurations.

**HART Communications DTM:** is a Communication DTM for use of HART devices via HART modem.

**MISP Communications DTM:** is a Moore Industries Serial Protocol which allows communication via Fuse-Protected USB Communications cable (P/N: 804-030-26).

Figure 5.1. THZ<sup>3</sup> HPP hook-up diagram for HART or MISP DTM configurations.

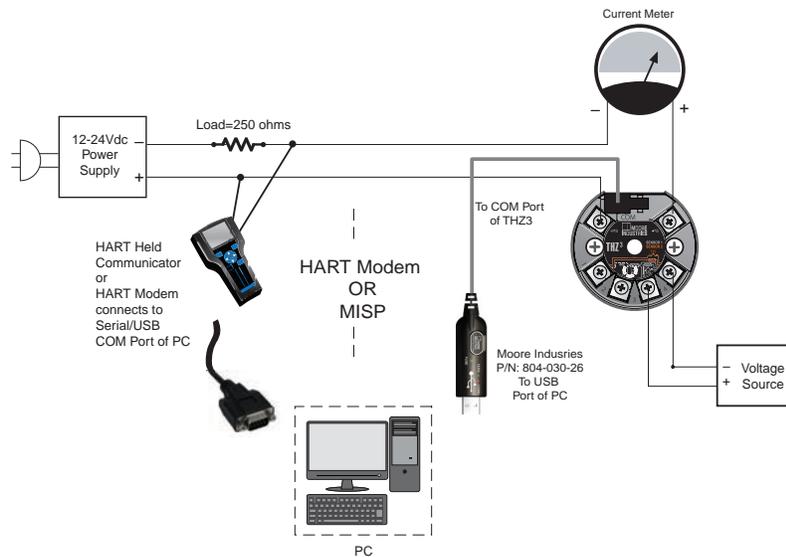
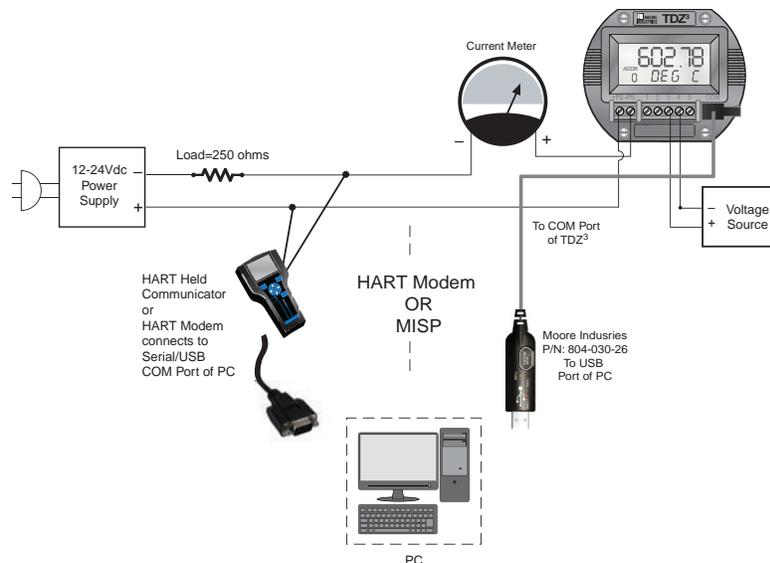


Figure 5.2. TDZ<sup>3</sup> HP hook-up diagram for HART or MISP DTM configurations.



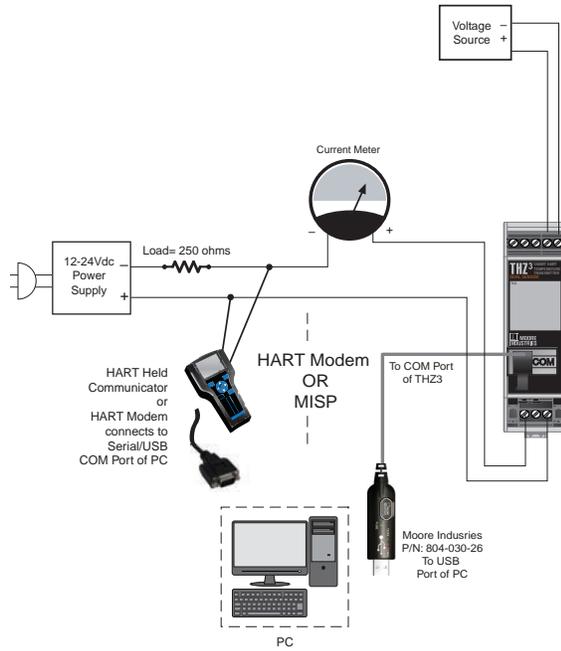
# THZ<sup>3</sup>/TDZ<sup>3</sup>

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Figure 5.3. THZ<sup>3</sup> DIN hook-up diagram for HART or MISP DTM configurations.

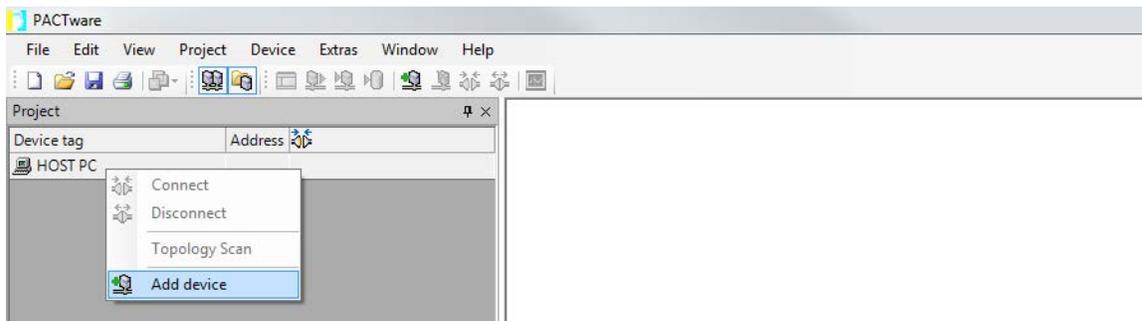


### Connecting to THZ<sup>3</sup>/TDZ<sup>3</sup> using MISP

To configure the MISP Communications DTM you will need to add necessary DTMs within the PACTware software to start your configuration. You will also need to have a Moore Industries Fuse Protected USB Communications Cable (sold separately P/N:804-030-26). Refer to Fuse Protected USB Communications Cable documentation for installation of USB Communications Utility and configuration. Follow steps below to connect and configuration your device.

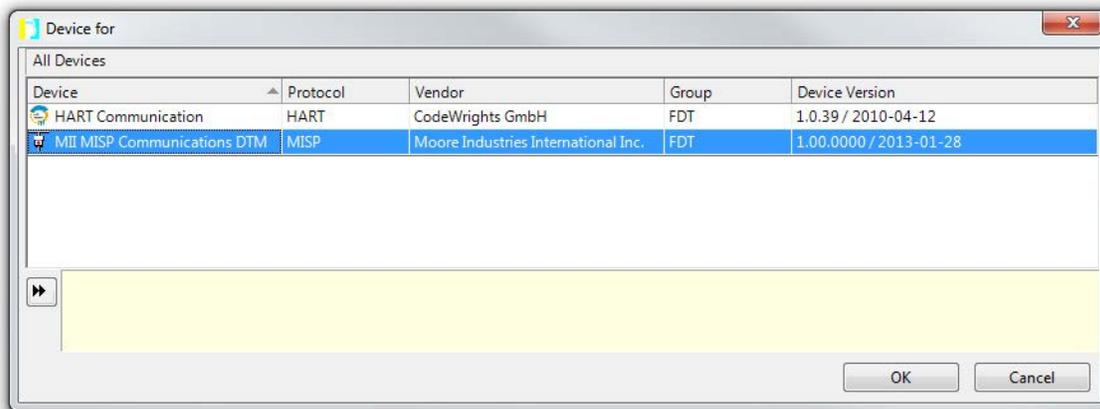
1. Connect TDZ<sup>3</sup>/THZ<sup>3</sup> unit per Figures 5.1- 5.3.
2. Launch PACTware software.
3. Right Click on the Device Tag named "HOST PC" and select "Add device"

Figure 5.14. MII MISP configuration adding a device.



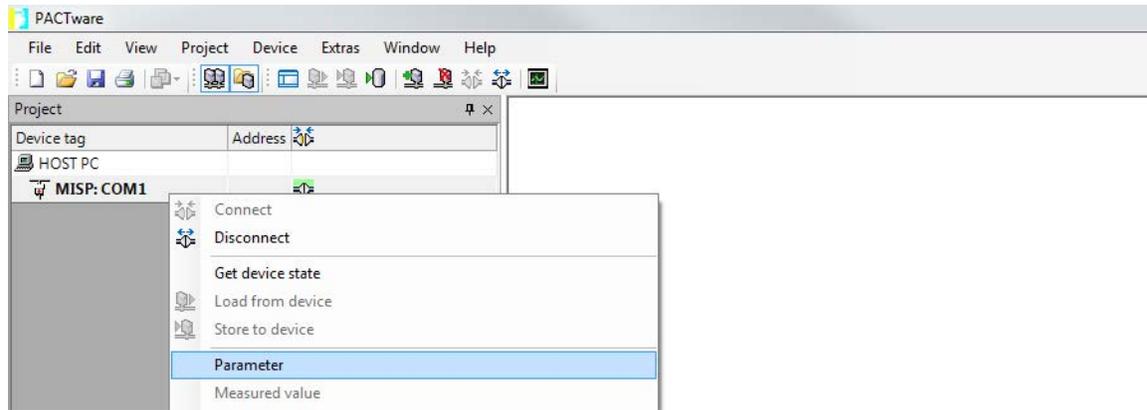
4. Select the MISP Communications DTM and enter OK.

Figure 5.5. Adding the MII MISP Communication DTM.



5. Right Click on COM1 and select “Parameter”.

**Figure 5.6.** Adding the MII MISP Communication DTM.

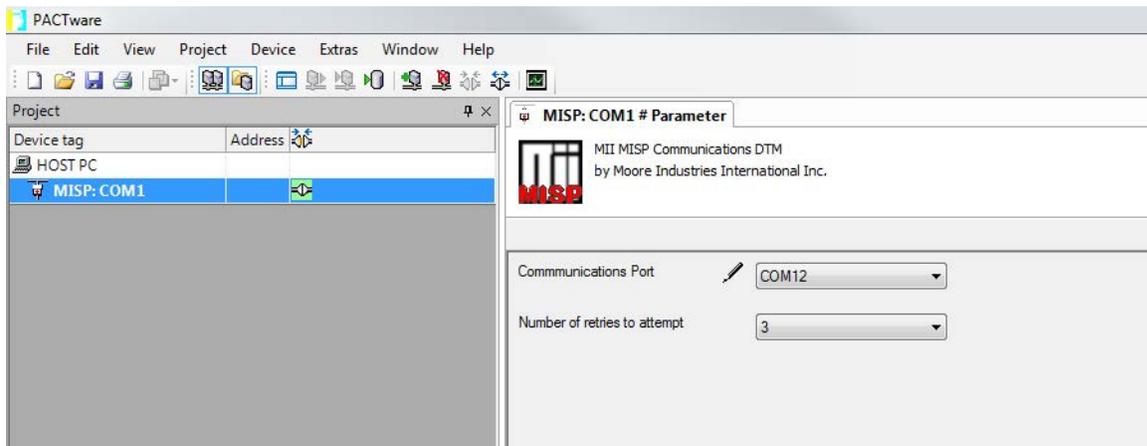


6. In the Communications Port drop-down menu select the actual COM port which your Fuse Protected USB Communications Cable is connected to click “Apply” then “OK”.



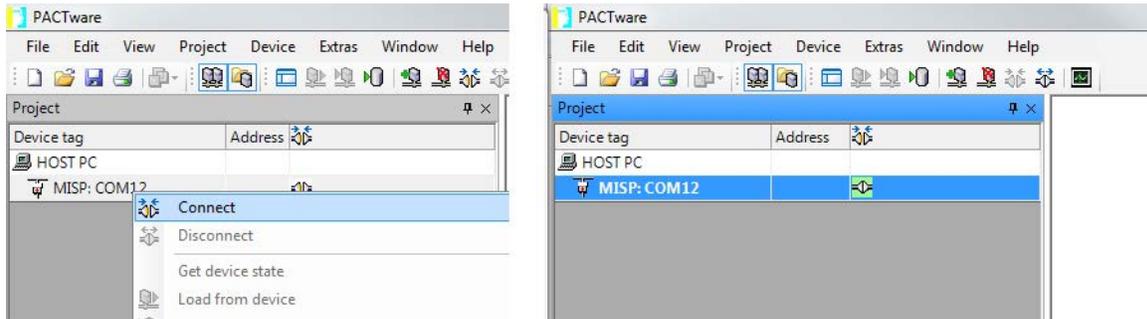
**Note:** You need to be certain to click apply when making these changes. Once the correct COM Port is selected and you have applied it to parameters the small Pencil icon will disappear. If Pencil icon is still visible, it indicates that the change has not been applied to device.

**Figure 5.7.** Selecting correct COM port for the MII MISP Communication DTM.



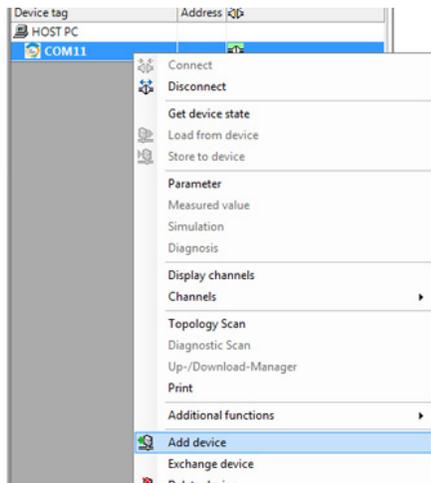
7. Return to Device Tag Menu the MISP COM port you selected should now appear i.e. “MISP:COM12” hover over it, right click and select “Connect”. You will now see the “online state” turn green to indicate you have a connection.

**Figure 5.8.** COM Port Confirmation

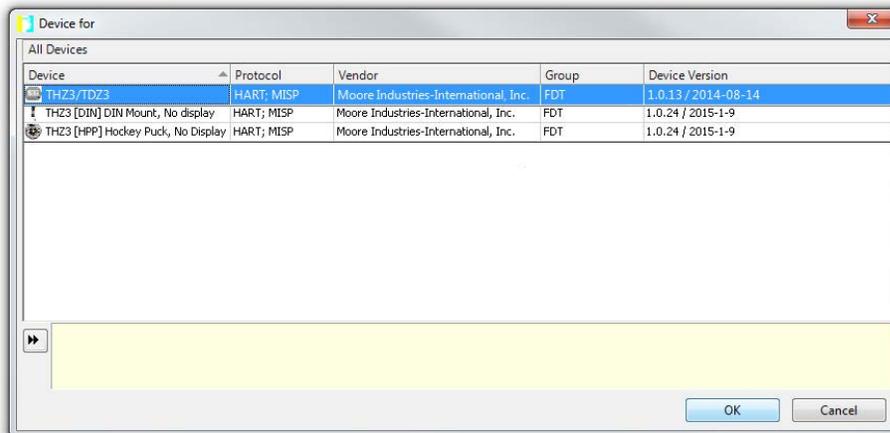


8. Next you will right click on “MISP:COM 12” and select “Add device”. Select desired TDZ<sup>3</sup>/THZ<sup>3</sup> DTM from list and click “Ok”. See Figures 5.9 and 5.10.

**Figure 5.9.** Adding Device to MISP:COM Port

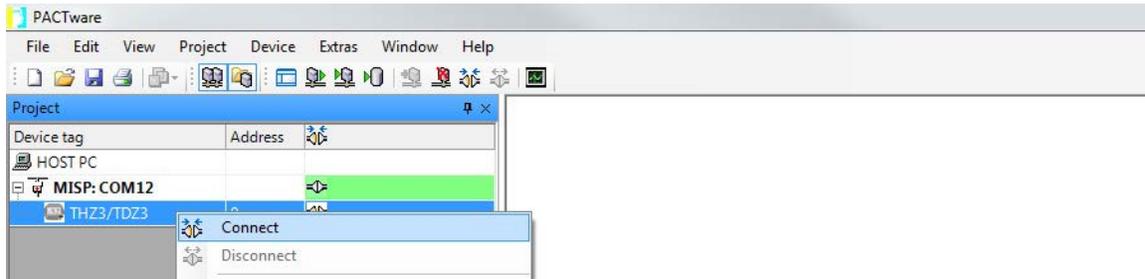


**Figure 5.10.** Selecting desired THZ<sup>3</sup>/TDZ<sup>3</sup> DTM



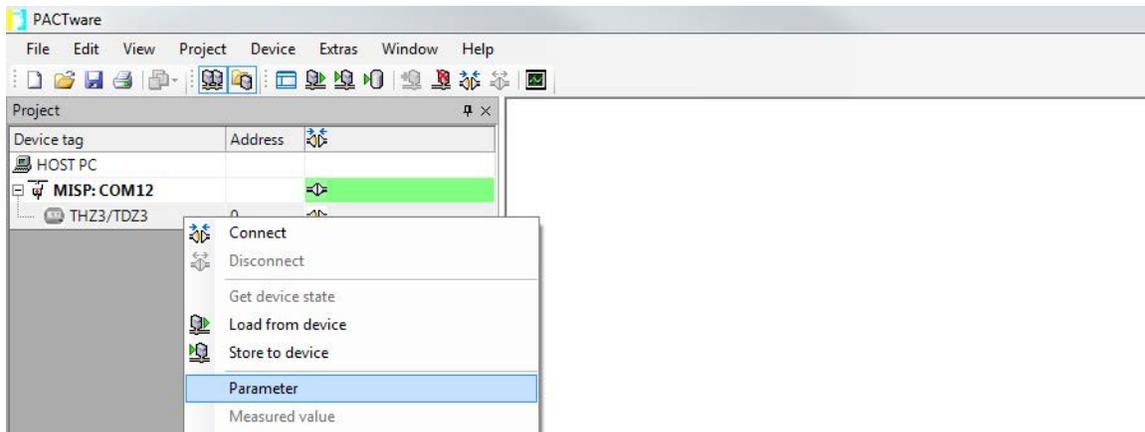
9. Now right click on selected DTM (i.e. TDZ<sup>3</sup> [HP]) in the Device Tag menu and select “Connect”. You will now see the “online state” turn green to indicate you have a connection.

**Figure 5.11.** Connecting to selected Device DTM for THZ<sup>3</sup> / TDZ<sup>3</sup>



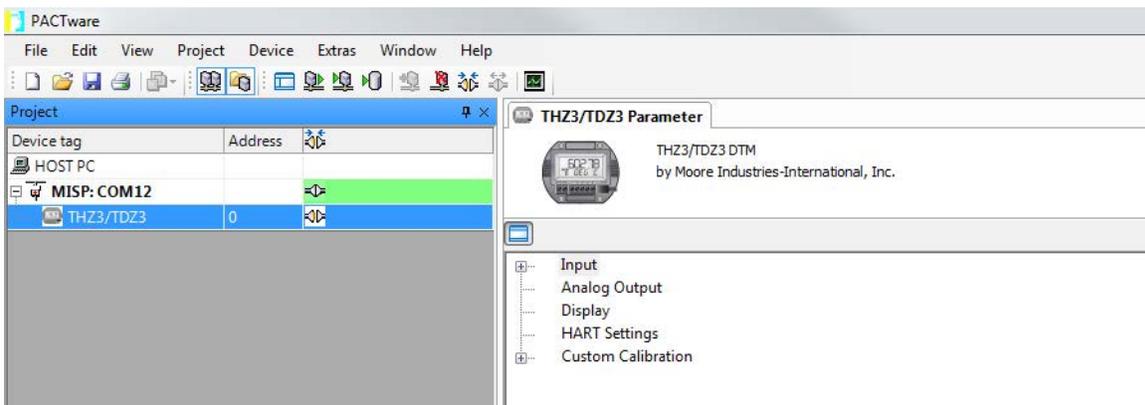
10. Right click on DTM (i.e. TDZ<sup>3</sup> [HP]) in the Device Tag menu and select “Parameters”. This will bring up screen for the TDZ<sup>3</sup> parameters. You are now ready to start your configuration of the device. You may also acquire the factory default settings directly from device by right clicking on DTM (i.e. TDZ<sup>3</sup> [HP]) in the Device Tag menu and selecting “Load from device”.

**Figure 5.12.** Enabling Parameters Configuration page for THZ<sup>3</sup>/TDZ<sup>3</sup> DTM



11. You will now see the “online state” turn green to indicate you have a connection. Now you can go ahead and configure parameters of the DTM (i.e. TDZ<sup>3</sup> [HP]) .

**Figure 5.13.** THZ<sup>3</sup> / TDZ<sup>3</sup> Parameters



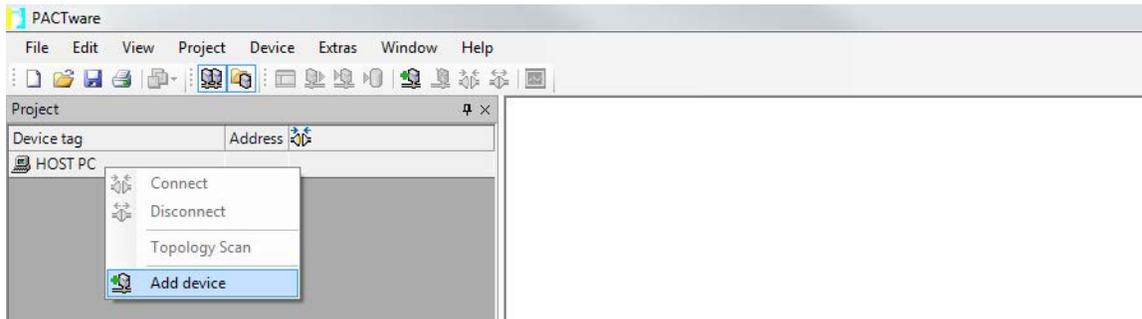
Please go to THZ<sup>3</sup>/TDZ<sup>3</sup> DTM Configuration section

### Connecting to THZ<sup>3</sup>/TDZ<sup>3</sup> using HART

To configure the HART Communications DTM you will need to add necessary DTMs within the FDT frame application (PACTware) software to start your configuration. Follow steps below to achieve this.

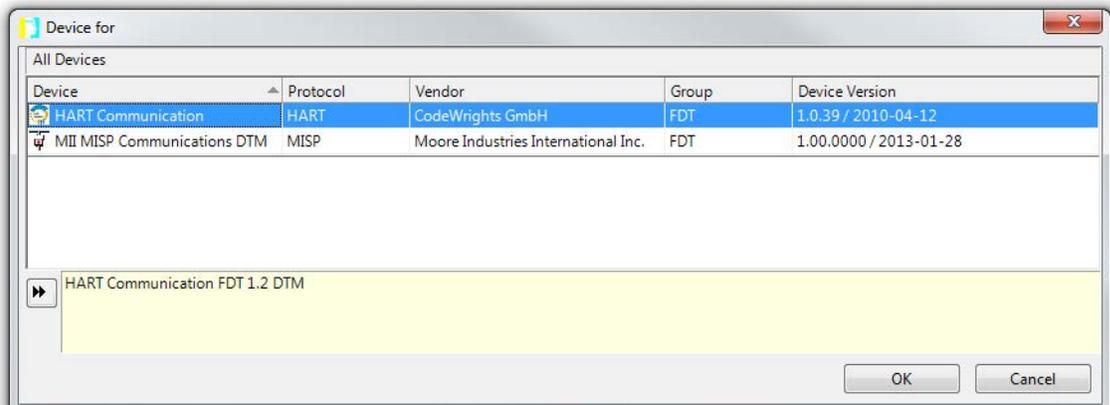
1. Connect TDZ<sup>3</sup>/THZ<sup>3</sup> unit per Figures 5.1- 5.3.
2. Launch FDT frame application (PACTware) software.

Figure 5.14. HART configuration adding a device.



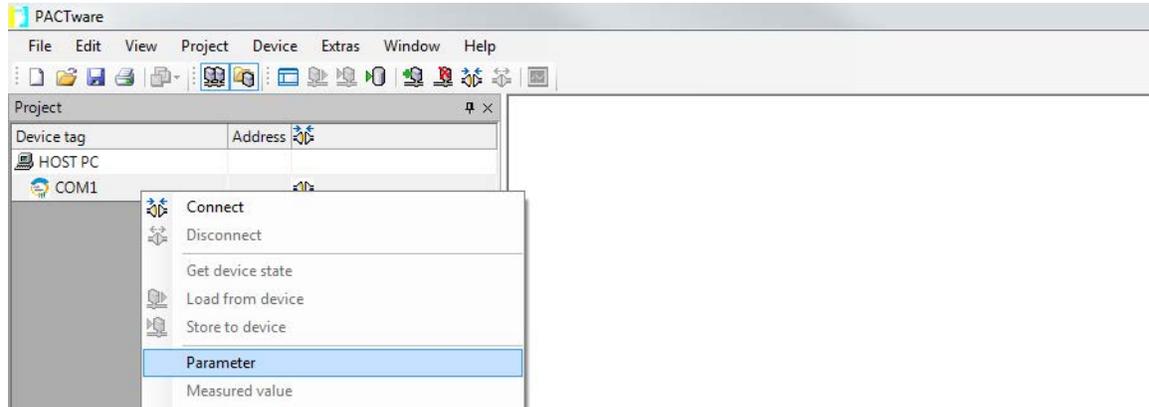
3. Right Click on the Device Tag named “HOST PC” and select “Add device”

Figure 5.15. Adding HART Communication DTM.



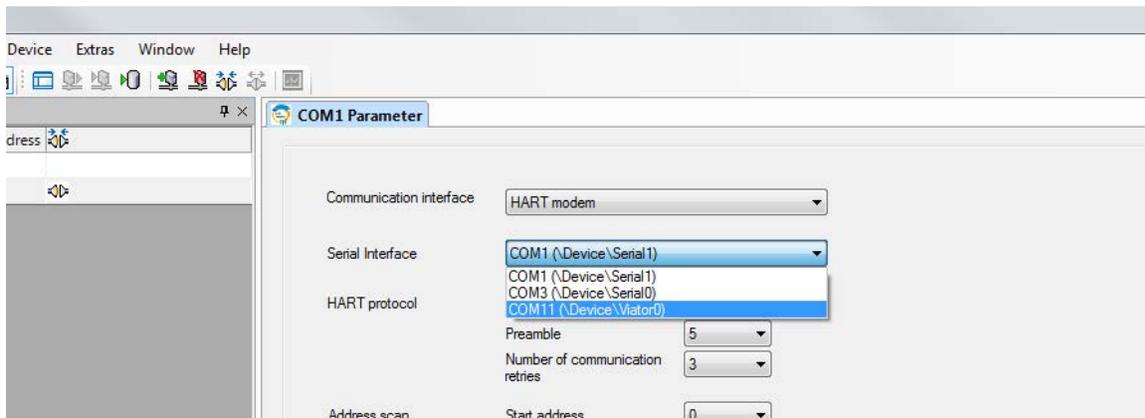
4. Select the HART Communications DTM and enter OK

Figure 5.16. COM Port Parameters



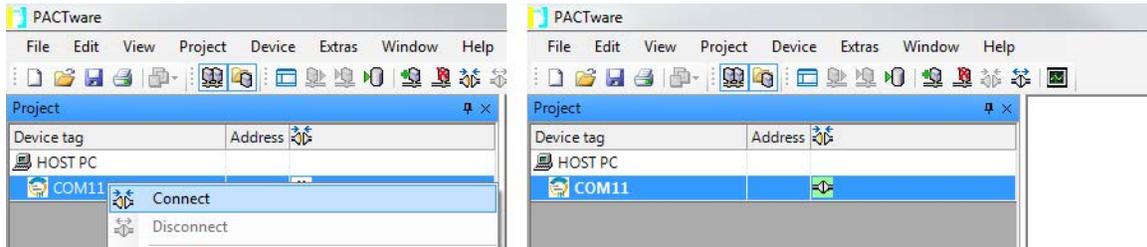
5. Right Click on COM1 and select “Parameter”.

Figure 5.17. COM Port Parameters



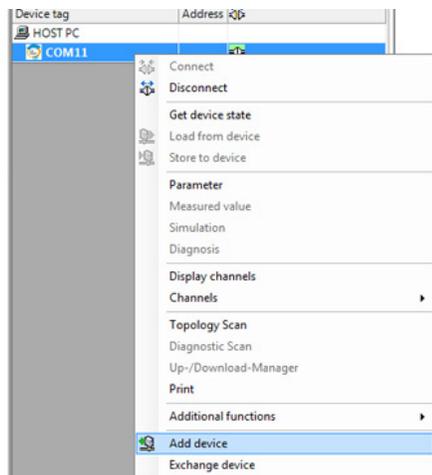
6. In the Serial Interface drop-down menu select the actual COM port which your HART Modem is connected to click “Ok” to apply.

Figure 5.18. COM Port Confirmation



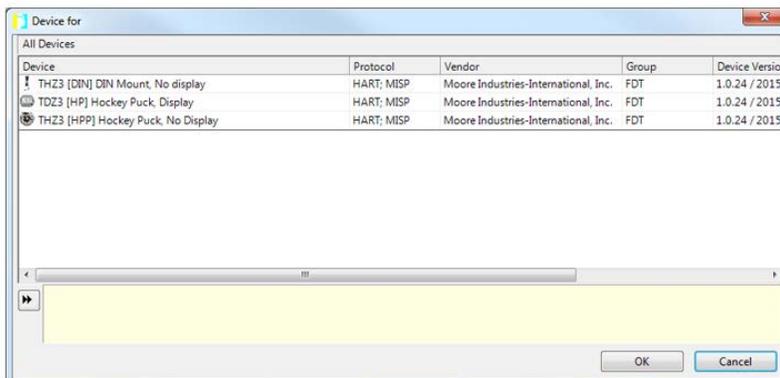
7. Return to Device Tag Menu the COM port you selected should now appear i.e. “COM11” hover over it, right click and select “Connect”. You will now see the “online state” turn green to indicate you have a connection.

Figure 5.19. Adding Device to COM Port



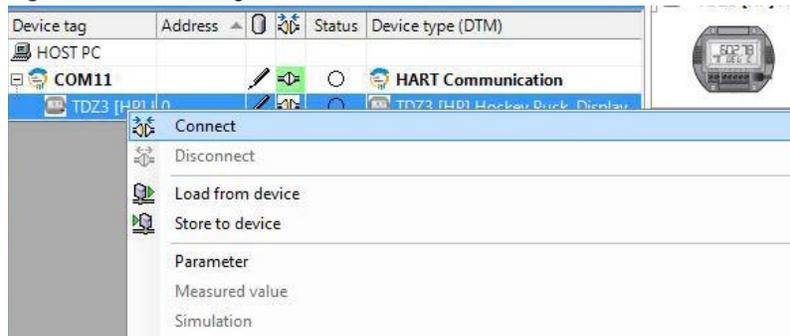
8. Next you will right click on “COM11” and select “Add device”. Select desired “TDZ<sup>3</sup>/THZ<sup>3</sup>” DTM and click “Ok”.

Figure 5.20. Selecting desired Device DTM for THZ<sup>3</sup>/TDZ<sup>3</sup>



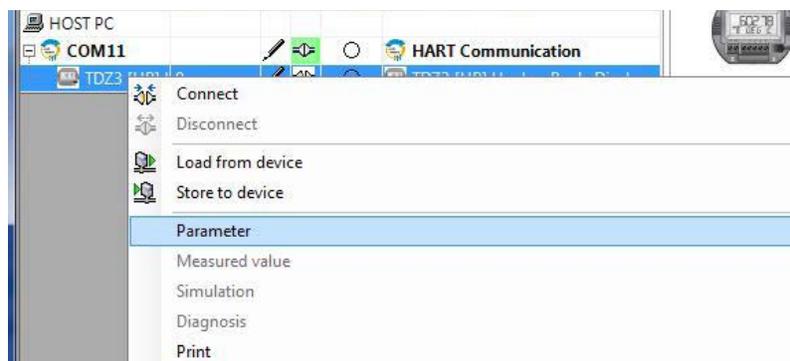
9. Now right click on selected DTM (i.e. TDZ<sup>3</sup> [HP]) the Device Tag menu and select “Connect”. You will now see the “online state” turn green to indicate you have a connection.

**Figure 5.21.** Connecting Device DTM for THZ<sup>3</sup> / TDZ<sup>3</sup>



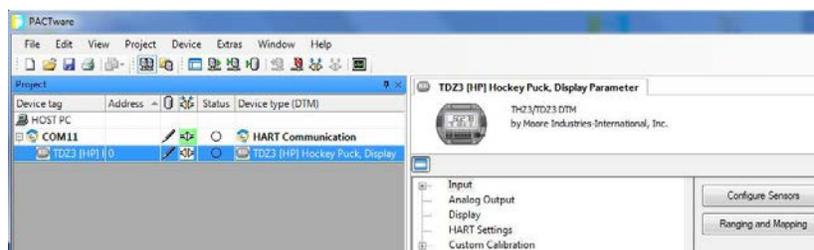
10. Right click on “right click on selected DTM (i.e. TDZ<sup>3</sup> [HP]) in the Device Tag menu and select “Parameters”. This will bring up screen for the DTM parameters. You are now ready to start your configuration of the device. You may also acquire the factory default settings directly form device by right clicking on selected DTM (i.e. TDZ<sup>3</sup> [HP]) in the Device Tag menu and selecting “Load from device”.

**Figure 5.22.** Enabling Parameters for selected THZ<sup>3</sup> / TDZ<sup>3</sup> DTM



11. You will now see the “online state” turn green to indicate you have a connection. Now you can go ahead and configure parameters of the on selected DTM (i.e. TDZ<sup>3</sup> [HP]).

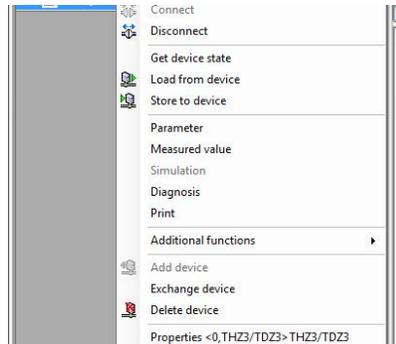
**Figure 5.23.** THZ<sup>3</sup> / TDZ<sup>3</sup> Parameters



### THZ<sup>3</sup>/TDZ<sup>3</sup> configuration using DTM

The following menu options and terminology are specific to PACTware but other FDT frame applications have similar menus. This PACTware menu is common for all device DTMs and only the 'Additional Functions' submenu has TDZ<sup>3</sup>/THZ<sup>3</sup> specifics. Where the menu is grayed out this feature is not available for the TDZ<sup>3</sup>/THZ<sup>3</sup>.

Figure 5.24. Menu Options for THZ<sup>3</sup> / TDZ<sup>3</sup> DTM



Right click on selected TDZ<sup>3</sup>/THZ<sup>3</sup> DTM icon to display the following menu:

**Connect** – Select this to connect to device you wish to configure.

**Disconnect** – Select to disconnect from current device connected.

**Load from device** – Select this to load configuration currently on device to PACTware.

**Store to Device** – Select this to send current configuration from PACTware to device.

**Parameter** – Select this to enter and configure the device (You can also configure the device by double clicking on the device icon with the left mouse button).

**Measured Value** – Select this to view the device values for the Dynamic Variables and Device Variables.

**Simulation** – N/A.

**Diagnosis** – Select this to view Main System Status, within this you can find Additional Status Bytes and Subsystem Status .

**Additional Functions** – Selecting this opens a submenu:

Compare Offline: N/A

Compare Online: N/A

Set Value: N/A

Set HART Polling Address: N/A

**Clear Configuration Changed Bit:** This clears the Configuration changed Bit by HART master. This feature only works when using HART Communications.

**Clear More Status Available Bit:** Clears the More Status available Bit when Main Systems Status indicates "More Status Available".

**Upload Custom Curves From Device:** This will upload any or all of custom curves available to PACTware.

**Download Custom Curves To Device:** This will download any or all of custom curves available to Device.

**Import Custom Curves:** This will import any Custom Curves settings external files using the .CVS Format to PACTware.

**Export Custom Curves:** This will allows you to export and save .CVS Format files of any Custom Curves settings generated in PACTware.

**Write device data to file:** N/A.

**Add Device** – N/A.

**Exchange Device** – Select this if you wish to swap devices.

**Delete Device** – Select this to delete the current device, PACTware will not allow you to delete device unless device is disconnected.

**Properties** – Select this to view the "About DTM" and "History" .

## THZ3/TDZ3 DTM Parameter Reference guide

The following provides a comprehensive list of DTM configuration menus and options which can be used as a quick reference guide to identify the different configuration capabilities and locate them in the menu system. For more information on the specific features please refer to the Configuration Overview and the specific menu descriptions.



**Note:** \* Is used to identify advanced features which are only accessible using Advanced Setup menus in the DTM.

### THZ<sup>3</sup>/TDZ<sup>3</sup> Parameter

#### Input

##### Configure Sensor

\*RJC Temp – change engineering units (EGU)

Sensor 1/2

- Input & Type (eg. Thermocouple TypeK, 4W RTD Pt3850 100ohm etc.)
- EGU (engineering units)
- Broken Wire detection & hold off
- Running Average filter
- 2-Wire offset (2W RTD/resistance only)
- \*Corrosion detection (enable, base, warning and failure settings)
- Serial Number
- Filter – 50Hz or 60Hz input filter to reduce mains induced noise

\*Sensor 1/2 Scaling

\*Sensor 1/2 Custom Curve enable & selection

##### Ranging & Mapping

Primary Variable

- PV (Analog Output Source) selection
- Smart Range –sets the PV Zero and Full values to AO 0-100%
- PV Damping – set delay in the response to stop input noise from generating output errors

SV, TV & QV Mapping- assigns the Device Variables (eg. SEN1, BU1-2)

##### \*Configure Dual Input

\*Scaling settings and Custom Curve selection for all the calculated Device Variables

##### \*System Configuration

\*High Availability (Input Quality Alarms) setup

Allow Measurement Out of Conformance Range

Allow Limited

Allow Dropping

\*Custom Curves – import/input 1-4 custom curves

\*Range Alarms – configure up to 4 range alarms

## Analog Output

*PV input range (display only)*  
*AO Zero & Full Values*  
*AO Under Range & Over Range Values*  
*AO Fail Mode (High, Low, Hold Last, Fail to Value)*

## Display (TDZ<sup>3</sup> only)

*Select Dynamic & Device Variables to be displayed*  
*Number of Decimal Places*  
*\*Configure Custom EGU & Custom Name*

## HART Settings

*Allows configuration of HART parameters:*  
*Polling Address*  
*Number of HART response preamble characters*  
*Tag, Long Tag, Descriptor, Message, Final assembly number*  
*Programmed Date, Device id, Hardware revision, HART Revision, Firmware revision (Read only)*  
*\*Burst Configuration - can be configured to send out up to 3 burst messages*

## Custom Calibration

*Input (PV) Capture - match the device input and output zero and full scale to a known value.*  
*Sensor 1/2 Trim*  
*Analog Output Loop Test & Trim*  
*Input Simulation - Clear or Set a simulated Input.*  
*\*Sensor 1/2 Corrosion Detection base value capture and monitor*

## THZ<sup>3</sup>/TDZ<sup>3</sup> DTM Parameter in Basic Setup Configuration

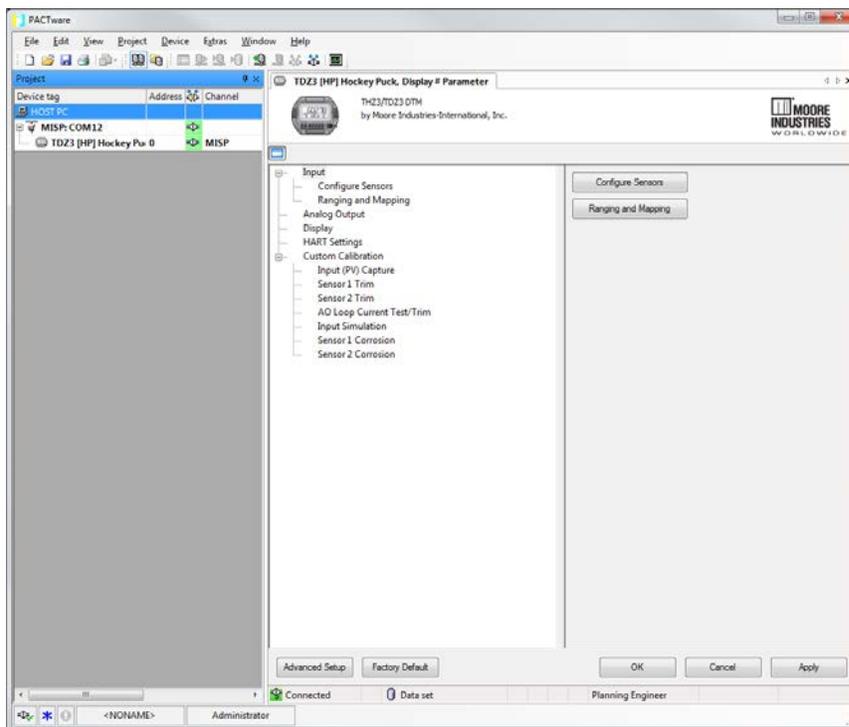
Once you have added and connected the DTM's within PACTware, you are now ready to make the configuration changes to device parameters that best fit your needs. There are 2 views of the configuration, Basic and Advanced. By default you will be shown the Basic Setup which will provide configuration for most applications.

If you need to configure the advanced features, then you will need to select the Advanced Setup menu by clicking on the Advanced Setup icon on the bottom left of the window. To view Advanced Setup features and functions see the TDZ<sup>3</sup>/THZ<sup>3</sup> DTM Parameter Advanced Setup Configuration later in this Section.



**Note:** The Advanced Setup menu contains all the Basic Setup plus the advanced features so the following Basic Setup description is applicable to Advanced Setup also.

Figure 5.25. THZ<sup>3</sup> / TDZ<sup>3</sup> Parameters Page Menu for Basic Setup



### Parameter Menu Configuration

The Parameter Menu page consists of five main Menu options **Input**, **Analog Output**, **Display**, **HART Settings**, and **Custom Calibration**.



**Note:** The Display option will only be active for the TDZ<sup>3</sup>. It will be grayed out for the THZ<sup>3</sup>

## INPUT

### Configure Sensor Types:

Select the Configure Sensors this will enable to configure Sensor 1 and Sensor 2 as follows:  
Refer to Figure 5.26.

#### Sensor 1 INPUT and Type Selection:

##### -Resistance:

1. From the **Input** Drop-down Menu select either **2 Wire Resistance, 3 Wire Resistance, or 4 Wire Resistance** Connection.
2. From the **Type** Drop-down Menu Select a Resistance value from **4k, 2k, 1k, 500, 250, or 125 ohms**.
3. Sensor 2 can also be configured in the same manner.

##### -mV:

1. From the **Input** Drop-down Menu select Millivolts.
2. From the **Type** Drop-down Menu choose from **1k, 500, 250, 125, 62.5, or 31.25 mV**
3. Sensor 2 can also be configured in the same manner.

##### -Potentiometer:

1. From the **Input** Drop-down Menu select **Potentiometer**.
2. From the **Type** Drop-down Menu select either **4k, 2k, 1k, 500, 250, or 125 ohms**
3. Sensor 2 can also be configured in the same manner.

##### -RTD:

1. From the **Input** Drop-down Menu select either **2 Wire, 3 Wire, or 4 Wire Connection Configuration**.
2. From the **Type** Drop-down Menu select desired RTD.
4. Sensor 2 can also be configured in the same manner.

##### -T/C:

1. From the **Input** Drop-down Menu select either **Thermocouple (with RJC), or Thermocouple (no RJC)**. Select TC (no RJC) ONLY if you are using a rare and old remote reference junction wiring strategy.
2. From the **Type** Drop-down Menu select desired T/C.
3. Sensor 2 can also be configured in the same manner.

#### Sensor 2 INPUT and Type Selection:

1. You can choose to have Sensor 2 in "Not Used" mode and the parameters will be greyed out. You also can configure Sensor 2 in the same manner as Sensor 1.



**Note:** While the THZ<sup>3</sup>/TDZ<sup>3</sup> will accept a dual input sensor configuration the following limitations apply only when using two input sensors:

**TDZ<sup>3</sup> [HP]** 2-wire and/or 3-wire sensors. 4-wire sensors (RTDs) cannot be used.

**THZ<sup>3</sup> [DIN]** (see figure 3.2) - 2-wire and/or 3-wire sensors. 4-wire sensors (RTDs) cannot be used.

**THZ<sup>3</sup> [HPP]** (see figure 3.4) – Sensor 1 can be configured as 2-wire or 3-wire sensor. Sensor 2 is then restricted to a 2-wire sensor.

**Sensor 1 and 2 Engineering Units:**

Figure 5.26. THZ<sup>3</sup> / TDZ<sup>3</sup> Parameters Input Configure Sensor Types

1. From the **Engineering Units** Drop-down Menu select the unit of measurement desired.

**Sensor 1 and 2 Broken Wire Detection:**

1. From the **Broken Wire Detection** Drop-down Menu select either **Enable** or **Disabled**.

**Sensor 1 and 2 Broken Wire Holdoff (0.0-60.0secs):** This allows users to add an additional time delay before broken wire is detected. When enabled, a Broken Wire delay of 0-60 seconds can be set which provides some noise immunity and prevents false alarms caused by other factors that may be misinterpreted as Broken Wire.

1. Enter the **Broken Wire Holdoff** value you desire.

**Sensor 1 and 2 Running Average Filter Setting (1-16) :** This function is for filtering the input signal. The TDZ<sup>3</sup> and THZ<sup>3</sup> has a running average filter with a user-selected range between 1 and 16.

1. Enter the **Running Average Filter Setting** value you desire.



**Note:** A higher Running Average Filter setting provides smoother output transitions; however, increases response time. Conversely, a lower setting provides a faster response time, but may seem more unstable.

**Sensor 1 and 2 Two Wire Offset (0.0-250.0)** : This setting is to offset the wire resistance of the 2-Wire sensor cable, and will help the accuracy of the measurement.

1. Enter the **Offset** value you desire.

**Sensor 1 and 2 Serial Number:**

1. Enter the **Serial Number** for the device here.

**Filter:** This setting is used to configure the input filter. The filter is designed to reduce the effects of mains induced noise. The input filter frequency value should be set to the frequency of the local AC supply—either 50Hz or 60Hz.

1. Choose either **50Hz or 60Hz** filter for your the devices here.

### Ranging and Mapping

The Ranging and Mapping menu will allow you to view current Device Variable assignment/mapping to PV, SV, TV, and QV. It will also allow you to designate or change each one as needed. To do so enter the **Change Variable Mapping** menu option. In this menu you will select from **RJC Temperature, Sensor 1, Sensor 2, Backup 1-2, Backup 2-1, Average, Differential 1-2, Differential 2-1, Absolute Differential, Low Select, or High Select** to each variable (PV, SV, TV, & QV). Refer to Figure 5.27.

In addition to mapping the Dynamic Variables, you can also set the PV lower range and upper range values to AO 0-100% and PV Damping. PV Damping allows you to introduce a delay into the response of your unit in order to stop short-lived spikes from initiating faults and generating fault messages. The damping time setting is the time PV takes to make a 63% change in response to a step change.

**Figure 5.27.** THZ<sup>3</sup> / TDZ<sup>3</sup> Parameters Input Ranging and Mapping

Primary Variable		
PV (Analog Output Source)	Sensor 1	
Sensor 1 Zero (-240.0 - 960.0)	0.00	DEG C
Sensor 1 Full (-240.0 - 960.0)	100.00	DEG C
PV Damping (0, 0.5 - 60.0)	0.00	sec
SV	Sensor Backup 1-2	
TV	Sensor Backup 2-1	
QV	Sensor 1	

## Analog Output

The **Analog Output** menu will allow you to view and set Fail Mode type and Fail Mode value you can see the following menu items: **AO Zero**, **AO Full**, **AO URV**, **AO ORV**, **AO Fail Mode**, and **AO Fail to Value**. See Figure 5.28 below for further clarification.

Use this portion of the menu to set the AO Zero, AO Full, AO URV (under range value), AO ORV (over range value), AO Fail MODE and AO Fail Mode values, to trim the output and to reset the trimmed output.

Figure 5.28. THZ<sup>3</sup>/TDZ<sup>3</sup> Parameters Analog Output

Primary Variable Input Range		
Sensor 1 Zero	<input type="text" value="0.00"/>	DEG C
Sensor 1 Full	<input type="text" value="100.00"/>	DEG C
AO Zero (3.6 - 23.6)	<input type="text" value="4.00"/>	mA
AO Full (3.6 - 23.6)	<input type="text" value="20.00"/>	mA
AO Under Range Value (3.6 - 4.0)	<input type="text" value="3.80"/>	mA
AO Over Range Value (20.0 - 23.6)	<input type="text" value="21.60"/>	mA
AO Fail Mode	<input type="text" value="Low (3.6mA)"/>	
AO Fail to Value	<input type="text"/>	

### Display Menu (TDZ<sup>3</sup> only)

The Display menu allows you to select which variables are shown and also allows for custom names and engineering units (EGU). Refer to Figure 5.29 for further clarification.

Figure 5.29. TDZ<sup>3</sup> Display Menu Parameters Analog Output

Dynamic Variables  
Select to Display

- PV
- SV
- TV
- QV
- AO Loop Current
- Percent of Output Range (PCT)

Display Decimal Places  
Auto

Additional Device Variables  
Select to Display

- RJC Temperature
- Sensor 1
- Sensor 2
- Sensor Backup 1-2
- Sensor Backup 2-1
- Average
- Differential 1-2
- Differential 2-1
- Absolute Differential
- Low Select
- High Select

Note: Each variable selected will remain on the LCD display for 2 seconds and then scroll to the next one

When PV, SV, TV, or QV are selected for display, each will result in three screens.

**123.45 / Dynamic Var Name**  
**123.45 / Source Device Var Name**  
**123.45 / Units**

When the Percent of Range or Loop Current are selected for display, each will be shown using two screens:

**12.345 / AO**  
**12.345 / MA**  
or  
**12.345 / PCT**  
**12.345 / PCT**

When selected, a Device Variable is shown using two screens.

**123.45 / Name (default or custom name)**  
**123.45 / UNITS**

If there is a problem with the underlying Device Variable, only one screen will be shown:

**BADDQ / Dynamic Var Name**

In this last case, the nature of the error will be shown separately.

## HART Settings

The **HART Settings** menu provides access to the following HART settings:  
See Figure 5.30 for further clarification.

**Poll Address (0-63) [0]** – This is the HART Polling Address, enter a number from 0-63.

**Number of Response Preambles (5-20) [5]**– Enter the number of Preamble Characters (0xFF) that are sent before any HART response message. This command selects the minimum number of preambles to be sent by a device before the start of a response packet in the HART message. A longer preamble means slower communication. The number of preambles may need to be manually increased for some HART hosts, if there are missed messages or communication errors.

**Tag**– Place a unique label that corresponds to your instruments location or specific usage (8 characters maximum).

**Long Tag**– Place a unique label that corresponds to your instruments location or specific usage (32 characters maximum).

**Descriptor**– Place text that is used as a description of how the instrument is being used (16 characters, maximum).

**Message**– Place additional information that may be helpful in describing the instrument or its use (32 characters, maximum).

**Final Assembly Number [0]** – You may enter a number that is used for identification purposes, and is associated with the field device (8 characters, maximum).

**Programmed Date**– This is a read-only value, displays the date this unit was programmed at factory.

**Device Id (S/N)**– This is a read-only value that uniquely identifies the field device when combined with the manufacturer identification and device type.

**Hardware Revision**– This is a read-only value corresponds to the revision of the electronics hardware of the field device.

**HART Revision**– This is a read-only corresponds to the HART revision installed on field device.

**Firmware Revision**– This is a read-only value corresponds to the revision of the Firmware of the field device.

**Figure 5.30.** THZ<sup>3</sup>/TDZ<sup>3</sup> HART Setting

Polling Address (0 - 63)	<input type="text" value="0"/>
Number of Response Preambles (5 - 20)	<input type="text" value="10"/>
Device Information	
Tag	<input type="text"/>
Long Tag	<input type="text"/>
Descriptor	<input type="text"/>
Message	<input type="text"/>
Final Assembly Number	<input type="text" value="0"/>
Programmed Date	<input type="text" value="11 November 2014"/>
Device ID (S/N)	<input type="text" value="2339763"/>
Hardware Revision	<input type="text" value="0"/>
HART Revision	<input type="text" value="7"/>
Firmware Revision	<input type="text" value="1.0.09"/>

## Custom Calibration

The **Custom Calibration** menu displays the following Sub menu options **Input (PV) Capture**, **Sensor 1 Trim**, **Sensor 2 Trim**, **AO Loop Current Test/Trim**, and **Input Simulation**. See Figure 5.31.

Figure 5.31. THZ<sup>3</sup> / TDZ<sup>3</sup> Custom Calibration Menu



## Input (PV) Capture

Input Capture is used to capture the actual device input zero and full scale. Use the “PV Capture Lower” or “PV Capture Upper” button to achieve this. Menu displays values for the following **PV Device Variable**, **PV Lower Limit**, **PV Upper Limit**, **PV Lower Range Value**, **PV Upper Range Value**, **PV**, and **PV Status**. See Figure 5.32

Figure 5.32. THZ<sup>3</sup> / TDZ<sup>3</sup> Custom Calibration Menu - Input (PV) Capture

PV Device Variable	<input type="text" value="Sensor 1"/>	
PV Lower Limit	<input type="text" value="-240.00"/>	DEG C
PV Upper Limit	<input type="text" value="960.00"/>	DEG C
PV Lower Range Value	<input type="text" value="54.51"/>	DEG C
PV Upper Range Value	<input type="text" value="54.54"/>	DEG C
PV	<input type="text" value="54.50"/>	DEG C
PV Status	<input type="text" value="Good"/>	
<input type="button" value="PV Capture Lower"/>		
<input type="button" value="PV Capture Upper"/>		
Capture Result	<input type="text"/>	

### Sensor 1 Trim

Here you can select your Trim Mode, select from either **Disabled**, **One Point**, or **Two Point**. Also displayed are the following Values : **Minimum Lower Trim Value**, **Maximum Lower Trim Value**, **Minimum Upper Trim Value**, **Maximum Upper Trim Value**, **Minimum Span**, **Sensor 1 Reading**, **Sensor 1 Reading (State)**, and **Desired Trim Point Value**. There are three buttons **Trim Lower Point**, **Trim Upper Point**, and **Factory Default**. Finally a display field for the displaying **Trim Result** value. Refer to Figure 5.33.

### Sensor 2 Trim

Is identical to the Sensor 1 Trim menu when Sensor 2 is enabled.

**Figure 5.33.** THZ<sup>3</sup> / TDZ<sup>3</sup> Custom Calibration Menu - Sensor 1 and Sensor 2 Trim

The screenshot shows a web-based calibration interface. At the top, 'Trim Mode' is set to 'Disabled' in a dropdown menu. Below are several input fields with their current values and units: 'Minimum Lower Trim Value' (-240.00 DEG C), 'Maximum Lower Trim Value' (950.00 DEG C), 'Minimum Upper Trim Value' (-230.00 DEG C), 'Maximum Upper Trim Value' (960.00 DEG C), 'Minimum Span' (10.00 DEG C), and 'Sensor 1 Reading' (-240.00 DEG C). The 'Sensor 1 Reading' field has a dropdown menu currently showing 'Poor Accuracy, Low Limited'. There is an empty input field for 'Desired Trim Point Value'. At the bottom, there are three buttons: 'Trim Lower Point', 'Trim Upper Point', and 'Factory Default'. Below the buttons is a 'Trim Result' field which is currently empty.

Trim Mode	Disabled	
Minimum Lower Trim Value	-240.00	DEG C
Maximum Lower Trim Value	950.00	DEG C
Minimum Upper Trim Value	-230.00	DEG C
Maximum Upper Trim Value	960.00	DEG C
Minimum Span	10.00	DEG C
Sensor 1 Reading	-240.00	DEG C
Sensor 1 Reading	Poor Accuracy, Low Limited	
Desired Trim Point Value		
Trim Lower Point		
Trim Upper Point		
Factory Default		
Trim Result		

### AO Loop Current Test/Trim

A loop test may be performed in order to check output performance and accuracy and to trim other instruments in the loop. Your output will be a current value, in mA, equal to the value you input. You can check the other current devices on the loop and calibrate them to this signal.

In this menu you will see a read only Loop Current "Reading" and Status" this is the present output current of device. The Output Test allows you to Set the Analog Output to a value between 3.6-23.6mA.

In the Output Trim section you can trim the Analog Output. Use the Trim Mode to set to either Disabled, One Point, or Two Point, click apply to set. Once set store configuration to device. There is the Lower Output Range and Upper Output Range buttons, use these to set your Trim value(in mA) using your voltmeter to measure the voltage drop across the 250Ω resistor. A 4mA output will read as 1V across the resistor. Use the Trim button after entering value in the Measured Output Current Field. You also have the option to reset trim to Factory default. Once all trim

In the Clear Output Test section use the Clear button to return the Analog Output to its actual value. The use the following steps to configure a One Point or Two Point Trim. Refer to Figure 5.34

#### One Point

1. Navigate to the "AO Loop Current Test/Trim" page.
2. Select the Trim Mode (one point).
3. Click on the Apply button.
4. Send the "Store to device command".
5. Click on the "Lower Output Range" button.



**Note:** This puts the AO in manual mode and the actual AO value is given.

6. Enter the given Analog Output value in mA in the "Measured Output Current" entry field.
7. Click on the "Trim" button.
8. Repeat steps 6-7 until the desired value is obtained.
9. Once the desired value is obtained, click on the "Clear" button.



**Note:** If you do not click the Clear button, the Analog Output will remain in manual mode and will NOT follow the input signal.

10. You are done with one point trimming.

### Two Point

1. Navigate to the “AO Loop Current Test/Trim” page.
2. Select the Trim Mode (two point).
3. Click on the Apply button.
4. Send the Store to device command.\*
5. Click on the appropriate button for the AO level being trimmed (Lower or Upper Output Range).



**Note:** This puts the AO in manual mode and the actual AO value is given.

6. Enter the given Analog Output value in mA in the “Measured Output Current” entry field.
7. Click on the “Trim” button.
8. Repeat steps 6-7 until the desired value is obtained.
9. Repeat steps 5-8 for the second point to be trimmed.
10. If you are done trimming, click on the “Clear” button.



**Note:** If you do not click the Clear button, the Analog Output will remain in manual mode and will NOT follow the input signal.

11. You are done with two point trimming.

**Figure 5.34.** THZ<sup>3</sup> / TDZ<sup>3</sup> Custom Calibration Menu - AO Loop Current Test/Trim

The screenshot shows a web-based calibration interface for the THZ<sup>3</sup> / TDZ<sup>3</sup> transmitter. It is divided into several sections:

- Loop Current:** A 'Reading' field shows '12.62' mA. A 'Status' dropdown menu is set to 'Manual or Fixed'.
- Output Test:** A 'Set Current to (3.6-23.6mA)' field is empty, with a 'Set' button below it.
- Output Trim:** A 'Trim Mode' dropdown menu is set to 'Disabled'. Below it are 'Set Output at' buttons for 'Lower Output Range' and 'Upper Output Range'. A 'Measured Output Current' field is empty, with 'Trim' and 'Factory Default' buttons below it. A 'Trim Result' field is also empty.
- Clear Output Test:** A 'Clear' button is located at the bottom of the interface.

### Input Simulation

This menu allows you to run simulated inputs for any of Device Variables that are enabled (active). Select desired Device Variable enter a value within the allowed range and click Set button. Use the Clear button to clear all set simulations. See figure 5.35.

**Figure 5.35.** THZ<sup>3</sup>/TDZ<sup>3</sup> Custom Calibration Menu - Input Simulation

Device Variables	Simulated Value
RJC Temperature	Off
Sensor 1	Off
Sensor 2	Off
Sensor Backup 1-2	Off
Sensor Backup 2-1	Off
Average	Off
Differential 1-2	Off
Differential 2-1	Off
Absolute Differential	Off
Low Select	Off
High Select	Off

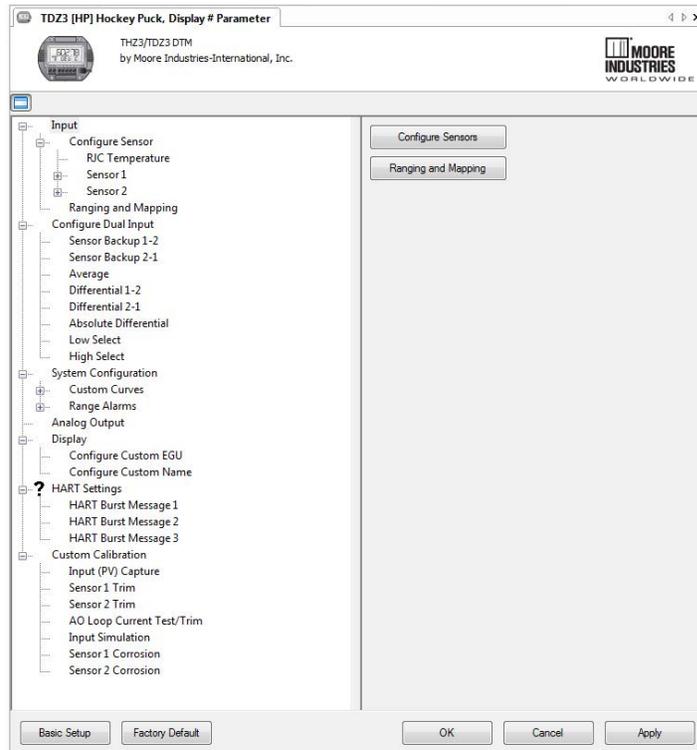


**Note:** Before exiting this screen, remember to hit the Clear button or the Device Variables will remain set to their simulated values.

### THZ<sup>3</sup>/TDZ<sup>3</sup> DTM Parameter Advanced Setup Configuration

The Advanced Setup menu contains all the Basic Setup plus the advanced features please refer to the Basic Setup description in addition to this section.

Figure 5.36. THZ<sup>3</sup> / TDZ<sup>3</sup> Parameters Page Menu for Advanced Setup



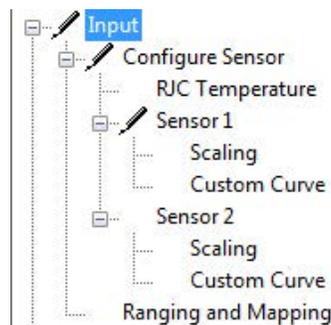
## INPUT

The Advanced Setup for the Input menu contains similar features as the Basic Setup with added features.

### Configure Sensor:

Selecting will allow you to configure RJC Temperature, Sensor 1 and Sensor 2 together or individually, and Ranging Mapping as follows: Refer to Figure 5.37.

Figure 5.37. THZ<sup>3</sup> / TDZ<sup>3</sup> Input Menu for Advanced Setup



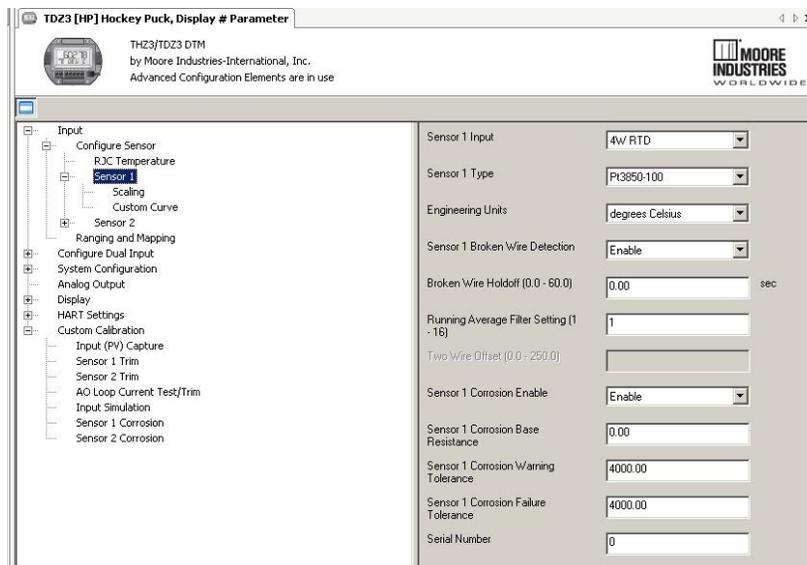
**RJC Temperature** – This allows you to choose the EGU for RJC Temperature.

**Sensor 1** – Selecting this allows you to configure Sensor 1 much like you do in the Basic Setup with the additional feature which allows to enable and configure Sensor Corrosion. You may also enable and configure Sensor Corrosion through the Custom Calibration Menu. Refer to Figure 5.38



**Note:** This is the only location in where you are able to enable the Sensor Corrosion feature, furthermore this feature and its settings are only available when Input type is T/C, 3-Wire RTD, or 4-Wire RTD.

Figure 5.38. THZ<sup>3</sup> / TDZ<sup>3</sup> Sensor 1/2 Menu for Advanced Setup



**Scaling** – This allows you to customize your display for your application. By example, if your process is sending a -200°C to 850°C signal to the THZ<sup>3</sup> or TDZ<sup>3</sup> and you wish to view the input as 0-100% then this can be accomplished with the Scaling feature.

**Custom Curve** – This allows you to enable/disable Custom Curve Operation and Select which Custom Curve (1-4) to assign to Sensor 1/2.



**Note:** Refer to the **System Configuration Menu** to configure Custom Curves 1-4 once enable and assigned.

**Sensor 2** – Configure this in the same manner as Sensor 1, same limitations apply.

### Ranging and Mapping:

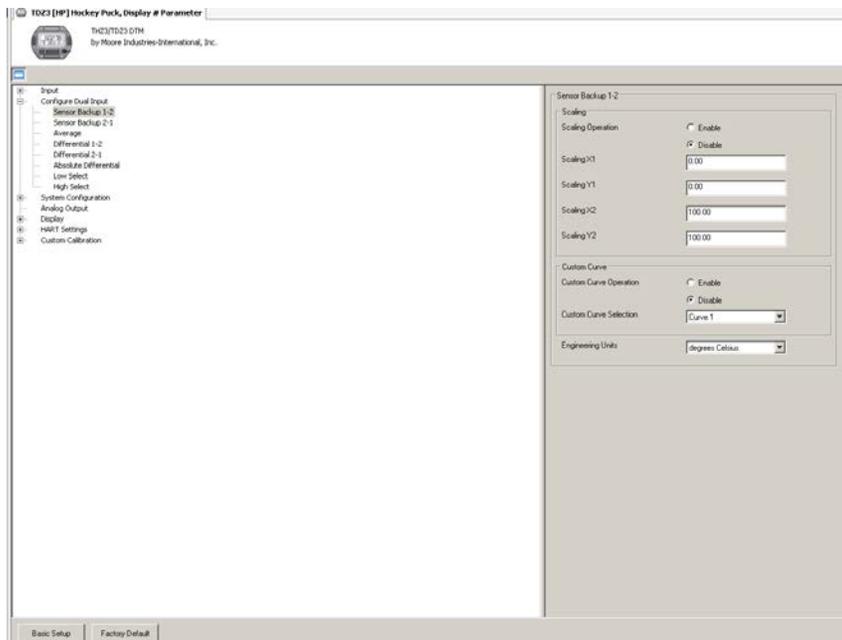
Refer to Basic Setup for detailed information.

### Configure Dual Input:

This menu will allow you configure the scaling, custom curve and EGU of each of the Device Variables individually. The following variables are available: See Figure 5.39 for clarification.

- Sensor (X) Backup 1-2**
- Sensor (X) Backup 2-1**
- Average**
- Differential 1-2**
- Differential 2-1**
- Absolute Differential**
- Low Select**
- High Select**

Figure 5.39. THZ<sup>3</sup> / TDZ<sup>3</sup> Configure Dual Input Menu for Advanced Setup



### System Configuration:

This menu will allow you enable and configure High Availability/Integrity Flags (Input Quality Alarms), Custom Curves and Range Alarms features. See Figure 5.40 for clarification.

Figure 5.40. THZ<sup>3</sup> / TDZ<sup>3</sup> System Configuration Menu for Advanced Setup



**High Availability (Input Quality Alarms)** – This will allow you turn On or Off the following menu options **Allow Measurement out of Conformance Range, Allow Limited, and Allow Dropping**. These settings allow the user to determine how certain types of input quality issues are handled and how they can affect the Device Variables, Dynamic Variables and AO. See Section 6 for more information, see Figure 5.40 for Menu layout.

**Custom Curves 1-4** – Selecting this allows you to set number of points for up to 4 custom curve and allows you to select both the Input and Output units for each custom curve 1-4. This feature also allows you the ability to write a table in Microsoft® Excel, save it in a .csv format, and import it into the Configuration Software. This makes it simple to save the custom table for downloading to multiple units or for backup purposes. See Figure 5.41.

Figure 5.41. THZ<sup>3</sup> / TDZ<sup>3</sup> Custom Curves 1-4 in the System Configuration Menu for Advanced Setup



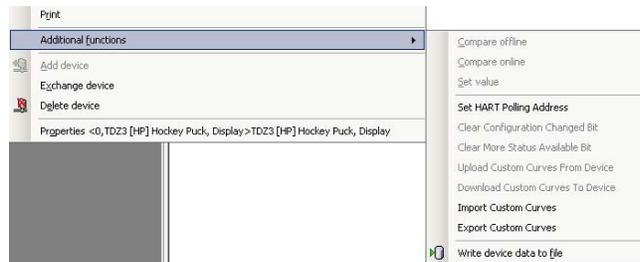
**Custom Curve Data 1-4** – This will display a table with the amount of points you configured previously in the Custom Curve section, values for your custom table can be entered here. See Figure 5.42

Figure 5.42. THZ<sup>3</sup> / TDZ<sup>3</sup> Custom Curves Data 1-4 in the System Configuration Menu for Advanced Setup



**Note:** Importing and exporting of .csv files for Custom Curves is done via the Additional Functions Menu in THZ<sup>3</sup>/TDZ<sup>3</sup> DTM. Refer to Additional Functions in the THZ<sup>3</sup>/TDZ<sup>3</sup> configuration using DTM Section.

Figure 5.43. THZ<sup>3</sup> / TDZ<sup>3</sup> Additional Functions Menu for Importing and Exporting Custom Curve settings



**Range Alarms** – This menu allows you to enable and configure each of the 4 Range Alarms. See Section 1 more information on this feature.

Each alarm has the following settings (see Figure 5.43) :

**Enable:** [Disabled] Enables or Disables the Range Alarm

**Latching:** [Disabled] Enables or Disables latching of the alarm. Non-latching alarms return to a non-alarm state whenever the process input returns to a non-alarm level. Once tripped, a latching alarm remains in an alarm state until the input returns to a non-alarm level and is reset.

**Source:** [Primary Variable] The Variable to be used as a source for the Range Alarm

**Response:** [Warning] How to react if the specified condition occurs: Warning - Sends a warning message to the HART Handheld/DTM, TDZ<sup>3</sup> display and sets a HART status bit. Alarm - Sends the AO into fail mode and sends an alarm message to the HART Handheld/DTM, TDZ<sup>3</sup> display. It also sets a (different) HART status bit.

**Assertion:** [Out of Range] Indicates if the Range Alarm should detect if the source variable goes Out of range, or goes In range.

**Low:** [0.00] The defined lower limit of the Range Alarm

**High:** [100.00] The defined upper limit of the Range Alarm

**UnLatch Range Alarm:** Reset an actively latched range alarm provided that the input has returned to a non-alarm level.



**Note:** If a Range Alarm Response is set to Alarm, the AO will always perform a fail response even if the Source Device Variable is not assigned to the PV.

Figure 5.43. THZ<sup>3</sup> / TDZ<sup>3</sup> Range Alarms 1-4 in the System Configuration Menu for Advanced Setup



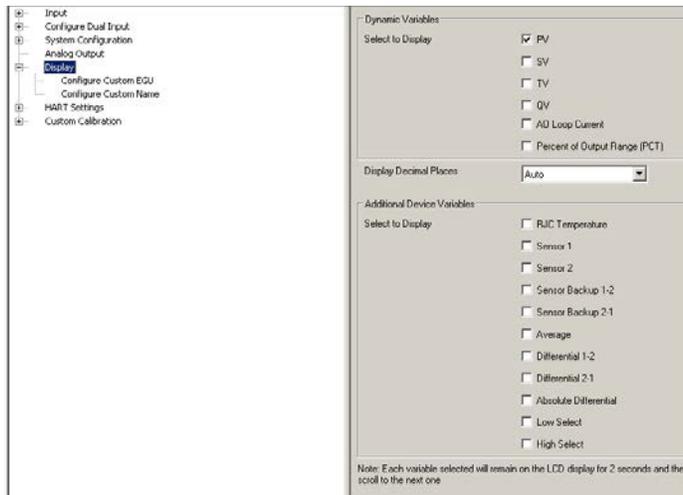
### Analog Output:

Refer to Basic Setup for detailed information.

### Display (TDZ<sup>3</sup> only):

The Display menu provides access to Basic Setup and additionally allows you to enable and assign both a Custom EGU and a Custom Name labels. See Figure 5.44 for clarification.

Figure 5.44. THZ<sup>3</sup> / TDZ<sup>3</sup> Display Menu for Advanced Setup



**Configure Custom EGU**—The Configure Custom (EGU) allows you to enable and assign a custom EGU of your choice. See Figure 5.45 for clarification.

Figure 5.45. THZ<sup>3</sup> / TDZ<sup>3</sup> Configure Custom EGU in Display Menu for Advanced Setup



**Configure Custom Name**– The Configure Custom Name allows you to enable and assign a custom label for your choice. Dynamic Variables cannot have a custom name. However when the underlying Device Variable's name is shown, the custom name is shown instead. See Figure 5.46 .



**Note:** Both the Custom EGU and Custom Name are limited to 5 alphanumeric characters.

Legal characters are:

A-Z (caps only)  
0-9  
% ` ( ) \* + , - / < = > ? @ [ \ ] ^ \_

Figure 5.46. THZ<sup>3</sup> / TDZ<sup>3</sup> Configure Custom Name in Display Menu for Advanced Setup

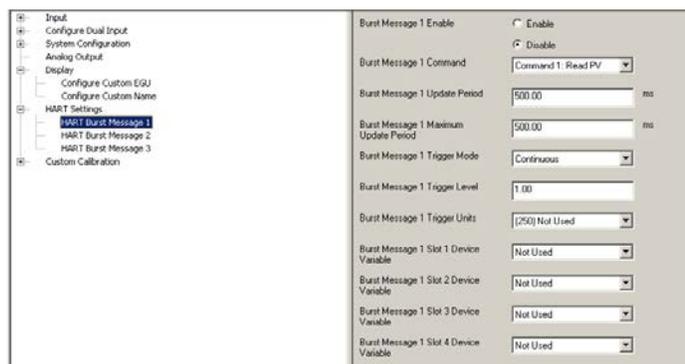


### HART Settings:

The HART Settings menu provides access to Basic Setup HART settings. See basic Setup for further clarification. Additionally this menu allows for configuration of 3 unique HART Burst Messages. Refer to HART Broadcast messaging at the beginning of Section 4 for clarification on settings and functions.

**HART Burst Message 1-3**– Here you can enable or disable and configure HART Burst messages 1-3. See Figure 5.47 for clarification.

Figure 5.47. THZ<sup>3</sup> / TDZ<sup>3</sup> HART Burst Messages 1-3 in HART Settings Menu for Advanced Setup



### Custom Calibration:

The Advanced Setup for the Custom Calibration menu contains similar features as the Basic Setup with added feature of Sensor 1/2 Corrosion.

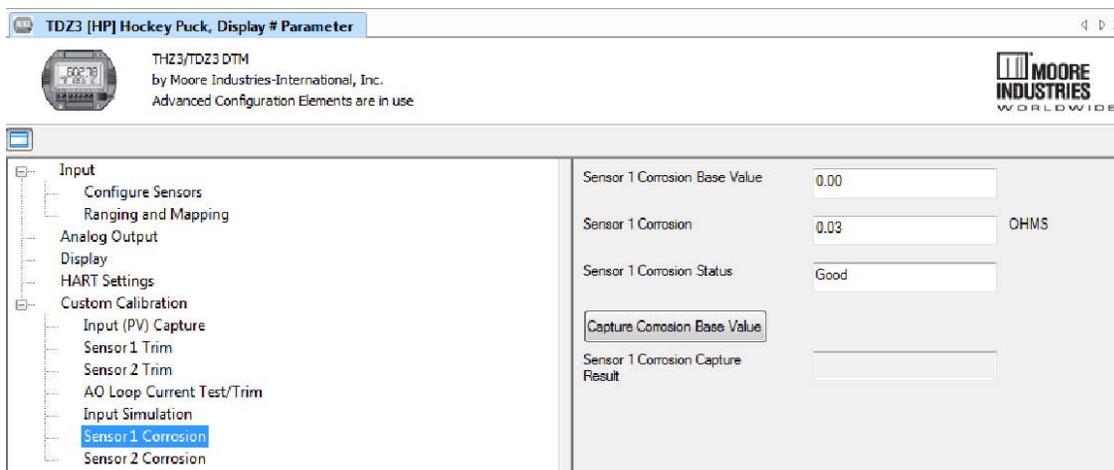
### Sensor 1 and Sensor 2 Corrosion

The Sensor 1/2 menu is only available when Sensor 1 or 2 Corrosion are enabled in the Input/Configure Sensor 1 or 2 Menu in the Advanced Setup.

This menu allows you to capture the nominal sensor resistance value, you can also check the current resistance value and corrosion the status.

For a more detailed explanation refer to Corrosion Detection in Section 1.

Figure 5.48. THZ<sup>3</sup>/TDZ<sup>3</sup> Custom Calibration Menu - Sensor 1 Corrosion and Sensor 2 Corrosion



## Section 6 - Operation and Maintenance

### Operation

Once calibrated, installed, and supplied with the correct power, the TDZ<sup>3</sup> and THZ<sup>3</sup> begins to operate immediately. Depending upon environmental conditions, it can be expected to operate unattended for extended periods of time.

### THZ<sup>3</sup>/TDZ<sup>3</sup> Diagnostics

The THZ<sup>3</sup>/TDZ<sup>3</sup> has a high level of diagnostic capability to continually monitor itself and its inputs. Whenever the unit diagnoses a failure which compromises the unit operation it will enter failure mode ie.

- Set analog output (AO) to fail mode
- Send error message to display (TDZ<sup>3</sup>)
- Send error message to the HART Handheld/DTM
- Set device malfunction status bit in HART and set the relevant HART bits in additional status

The unit will enter failure mode when one of the following occurs:

- A device diagnostic error (hardware, software, data, communications)
- The Device Variable which is mapped to the PV is marked as BAD
- There is a Range Alarm error
- There is a configuration error in any Device Variable which has been assigned/ mapped to HART variables, burst messages or TDZ<sup>3</sup> display

The following provides an overview of the different types of diagnostics. For a full list of status and diagnostic messages please refer to Status Messages and HART Registers.

**Internal diagnostics:** On power up the unit runs through a thorough diagnostic test (RAM, ROM, CPU etc.) and an initialization process (SYS INIT is displayed on the TDZ<sup>3</sup>). If any errors are found, the unit will enter failure mode. Once in operation, the unit continues diagnostic tests in the background.

**Configuration diagnostics:** On power up the stored configuration is validated. If it is invalid, the unit will enter failure mode. To clear the failure, reset to the factory default configuration, then configure as appropriate for the application. If the configuration is changed, the unit will check before running and enter failure mode if it is invalid.

**Input diagnostics:** The THZ<sup>3</sup>/TDZ<sup>3</sup> has extensive hardware diagnostics of sensor input(s) to detect broken wire, saturation, out of conformance range and linearization errors. In addition, the unit can be configured to detect sensor corrosion, sensor drift or in/out of range conditions (see Section 1, Sensor Diagnostics section for more information).

Every Device & Dynamic Variable in the THZ<sup>3</sup>/TDZ<sup>3</sup> has a quality stamp, per the HART standard. (See section 1, Tables 1.1 & 1.2 for a list of Device Variables)

This quality stamp can be one of the following values:

GOOD, BAD, POOR ACCURACY with associated flags HI/LO LIMITED, CONSTANT

The quality stamps on the sensor readings (SEN1 & SEN2) are used in conjunction with the input quality alarms to determine the quality of Device Variables and/or the AO response.

## Input Quality Alarms

The THZ3/TDZ3 also allows the user to determine how certain types of input quality issues are handled and how they can affect the Device Variables and their mapped Dynamic Variables/AO. There are 3 different quality alarms: Measurement out of Conformance Range, Allow Limited and Allow Dropping.

**Measurement out of Conformance Range [ON]:** When a temperature reading goes outside the linear conformance range of the sensor and/or when a value is applied to a custom curve outside the curve's range (resulting in extrapolation) the accuracy becomes degraded.

If Allow Measurement out of Conformance Range Alarm is set ON (Default), then the Device Variable will be stamped POOR ACCURACY

If the alarm is OFF, then the Device Variable is stamped as BAD.

**Allow Limited [OFF]:** When a sensor's value reaches its Upper or Lower Limit it will not be allowed to go beyond the limit. This typically happens in conjunction with input saturation, and / or RTD / Thermocouple normalization failure.

If Allow Limited is set OFF (Default), then the Device Variable is stamped as BAD.

If the alarm is ON, then it is stamped as POOR ACCURACY / LIMITED.

**Allow Dropping [OFF]:** If two sensor inputs are used, the Device Variables which are calculated from the sensors reflect the quality of the inputs. ie If SEN1 is BAD then the ABDIF would also be BAD even if SEN2 is GOOD. The exception to this is BU1-2 and BU2-1 which will be GOOD provided either SEN1 or SEN2 are GOOD quality.

The Allow Dropping allows certain calculated Device Variables (AVG, LOSEL and HISEL) to maintain the value of the GOOD sensor to provide higher availability of the reading.

If Allow Dropping is ON then the bad sensor data is dropped from the calculated variable and its quality shall be set to POOR ACCURACY.

If the alarm is OFF (Default) then the derived variable is quality stamped as BAD.

## Status Messages

Status messages are displayed on the TDZ3 or HART Handheld/FDT host whenever there are events which affect the sensor measurements, configuration or the unit itself.

When one or more failure conditions is detected all error messages will be displayed on the TDZ3 in a cyclic manner for a period of 2 seconds per message.

Similar information is also provided in the HART status registers.

**Table 6.1.** TDZ<sup>3</sup> or THZ<sup>3</sup> Display Errors- Sensor Data

TDZ3 Display	Condition
RJC T ERROR	Problem with the RJC Temperature Sensor
BADDQ (Var Name)	The referenced item (Device, Dynamic or Output Variable) had bad data quality. <i>Error related to the sensor or output should follow.</i>
ERROR SNSRn	Problem with Sensor n, specific error <i>Message should follow</i>
WIREn BROKE	There is a broken wire on the previously referenced sensor. If the specific broken wire cannot be detected, the message will state 'Wires Broke'
ADC SAT	The input is too high for the selected input range
BAD RJC	Reference Junction Compensation could not be applied
NORM FAIL	The physical measurement could not be converted to temperature
ON BCKUP	A Backup device variable (BU1-2, or BU2-1) is mapped as PV, and the primary sensor has failed
CAN'T BCKUP	A Backup device variable (BU1-2, or BU2-1) is mapped as PV, and the backup sensor has failed

**Table 6.2.** TDZ<sup>3</sup> or THZ<sup>3</sup> Display Errors- System

TDZ3 Display	Condition
ERROR FEND	Communications with the front end have failed
ERROR NVMEM	Failure to restore configuration from non-volatile storage
ITRNL INVLD	Stored Factory information is invalid
ERROR CONFIG	There is one or more configuration error
CORRn WARN/ERROR	Corrosion sensor n is indicating a warning / error condition
RA n WARN/ERROR	Range Alarm n is indicating a warning / error condition
OUT SATLO / SATHI	The Loop Current has reached the configured Under/ Over Range Value and is being limited there.
CAL C ERROR	Configuration error detection when calibration attempted
CAL D ERROR	An input error was detected during calibration

**Table 6.3.** TDZ<sup>3</sup> or THZ<sup>3</sup> Display Errors- Diagnostic Fails

TDZ3 Display	Condition
ERROR DIAG	One or more diagnostic has failed
ERROR COP	Unit was reset due to the watchdog
ERROR RAM	The RAM Test has detected a failure
ERROR ROM	The ROM Diagnostic has detected a failure
ERROR ALU	The CPU's ALU (Arithmetic Logic Unit) Diagnostic has detected a failure
ERROR I/O	The CPU's IO Diagnostic has detected a failure
ERROR REG	The CPU's Register Diagnostic has detected a failure
ERROR SQMON	The sequence monitor diagnostic has detected a failure
ERROR STACK	The Stack Monitor Diagnostic has detected a failure
ERROR ICUR	The Injection Current Diagnostic has detected a failure
ERROR SWARE	General Software Fault

## HART Status Registers

The THZ3/TDZ3 provides the following status registers per the HART standards.

- Field Device Status     A byte indicating the “current operating status of the field device”. Among the bits are “Device Malfunction” and “More Status Available” This status is returned in the response to every HART command.
- Additional Status        15 bytes containing system and diagnostic status information. This status is returned by Universal Command 48: Read Additional Device Status.
- Device Variable Status   A byte associated with each Device Variable which indicates Quality and Limited Status. This status is returned by Universal Command 9: Read Device Variable with Status.

## Field Device Status Byte

A byte indicating the “current operating status of the field device”. This status is returned in the response to every HART command.

**Table 6.4** TDZ<sup>3</sup> or THZ<sup>3</sup> Field Device Status Bits

Bit	Description
0	Primary variable out of limits - The PV is beyond its operating limit
1	Non primary variable out of limits -A Device Variable not mapped to the PV is beyond its operating limits
2	Loop Current Saturated – The Loop Current has reached its upper (or lower) endpoint limit and cannot increase (or decrease) and further
3	Loop Current Fixed – The Loop Current is being held at a fixed value and is not responding to process variations
4	More Status Available – More status information is available via Command 48, Read Additional Status Information
5	Cold Start – A power failure of Device Reset has occurred
6	Configuration Changed – An operation was performed that changed the device's configuration
7	Device Malfunction – The device detected a serious error or failure that compromises device operation

## Additional Status Byte (HART Command 48)

The TDZ3/THZ3 returns 15 bytes when the Additional Status is requested via HART command 48.

**Table 6.5** TDZ<sup>3</sup> or THZ<sup>3</sup> Additional Status Byte

0	0	Status	Diagnostic Status
	1	Status	Input Error Summary
	2	Status	Input Warning Summary
	3	Status	Analog Output Status
	4	Status	Front End Status
	5	Status	User Config Error Summary
	6	Status	Device Variable Config Error Summ.
	7	Error	Persistence Errors
1	0	—	UNUSED
	1	Status	Sensor 1 Corrosion Warning
	2	Status	Sensor 2 Corrosion Warning
	3	Status	Range Alarm Warning Summary
	4	—	UNUSED
	5	Status	Sensor 1 Corrosion Error
	6	Status	Sensor 2 Corrosion Error
	7	Error	Range Alarm Error Summary
2 PV	0	Error	Total Device Variable Failure. Given the quality of the contributing sensor data and the availability flag settings, a valid DV could not be produced
	1	Error	Sensor 1 has failed
	2	Error	Sensor 2 has failed
	3	Status	Sensor 1 quality is LIMITED
	4	Status	Sensor 2 quality is LIMITED
	5	Error	Primary sensor has failed, running on the backup sensor (BACKUP 1-2, and 2-1 only)
	6	Error	The Backup sensor has failed, it is not possible to fail over (BACKUP 1-2 and 2-1 only)
3 SV	0	Error	Total Device Variable Failure. Given the quality of the contributing sensor data and the availability flag settings, a valid DV could not be produced
	1	Error	Sensor 1 has failed
	2	Error	Sensor 2 has failed
	3	Status	Sensor 1 quality is LIMITED
	4	Status	Sensor 2 quality is LIMITED
	5	Error	Primary sensor has failed, running on the backup sensor (BACKUP 1-2, and 2-1 only)
	6	Error	The Backup sensor has failed, it is not possible to fail over (BACKUP 1-2 and 2-1 only)

Table 6.5. Continued

4 TV	0	Error	Total Device Variable Failure. Given the quality of the contributing sensor data and the availability flag settings, a valid DV could not be produced
	1	Error	Sensor 1 has failed
	2	Error	Sensor 2 has failed
	3	Status	Sensor 1 quality is LIMITED
	4	Status	Sensor 2 quality is LIMITED
	5	Error	Primary sensor has failed, running on the backup sensor (BACKUP 1-2, and 2-1 only)
	6	Error	The Backup sensor has failed, it is not possible to fail over (BACKUP 1-2 and 2-1 only)
5 QV	0	Error	Total Device Variable Failure. Given the quality of the contributing sensor data and the availability flag settings, a valid DV could not be produced
	1	Error	Sensor 1 has failed
	2	Error	Sensor 2 has failed
	3	Status	Sensor 1 quality is LIMITED
	4	Status	Sensor 2 quality is LIMITED
	5	Error	Primary sensor has failed, running on the backup sensor (BACKUP 1-2, and 2-1 only)
	6	Error	The Backup sensor has failed, it is not possible to fail over (BACKUP 1-2 and 2-1 only)
6-13	0-7	—	UNUSED
14	0	Status	Range Alarm 1 Warning
	1	Status	Range Alarm 2 Warning
	2	Status	Range Alarm 3 Warning
	3	Status	Range Alarm 4 Warning
	4	Error	Range Alarm 1 Error
	5	Error	Range Alarm 2 Error
	6	Error	Range Alarm 3 Error
	7	Error	Range Alarm 4 Error

### Device Variable Status (HART Command 9)

Each Device Variable has an associated status byte which provides information about the quality of the data (See THZ3/TDZ3 Diagnostics for more information)

**Table 6.6** Device Variable Status HART Command 9

Bit	Description
0-3	Unused
4-5	Limit Status 00 Not Limited 01 High Limited 10 Low Limited 11 Constant
6-7	Process 00 Bad 01 Manual/Fixed 10 Poor Accuracy 11 Good

### Maintenance

Moore Industries suggests a quick check for terminal tightness and general unit condition every year. Always adhere to any site requirements for programmed maintenance. The calibration of this instrument should be checked every year and re-calibrated only when necessary.

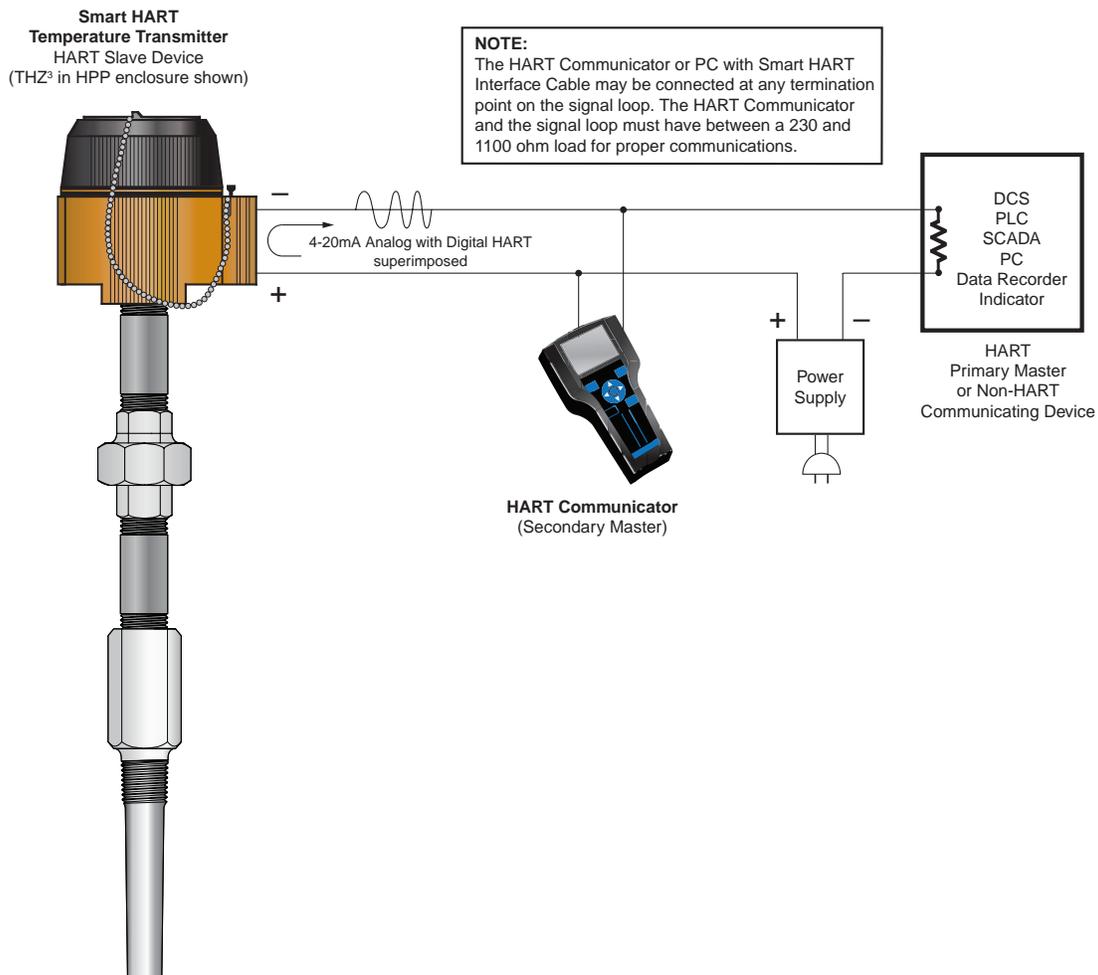
## Section 7 - Applications

This section provides some examples of typical applications for the TDZ<sup>3</sup> and THZ<sup>3</sup>.

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

In the majority of applications, the THZ<sup>3</sup> or TDZ<sup>3</sup> is installed on a point-to-point 4-20mA process loop like a regular analog transmitter (Figure 7.1). A HART Communicator, HART-based system or FDT Host is used to configure and view the transmitter's operating parameters and diagnostic data from any point on the loop.

**Figure 7.1.** 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 PACTware (a HART modem is not required for PC setup).

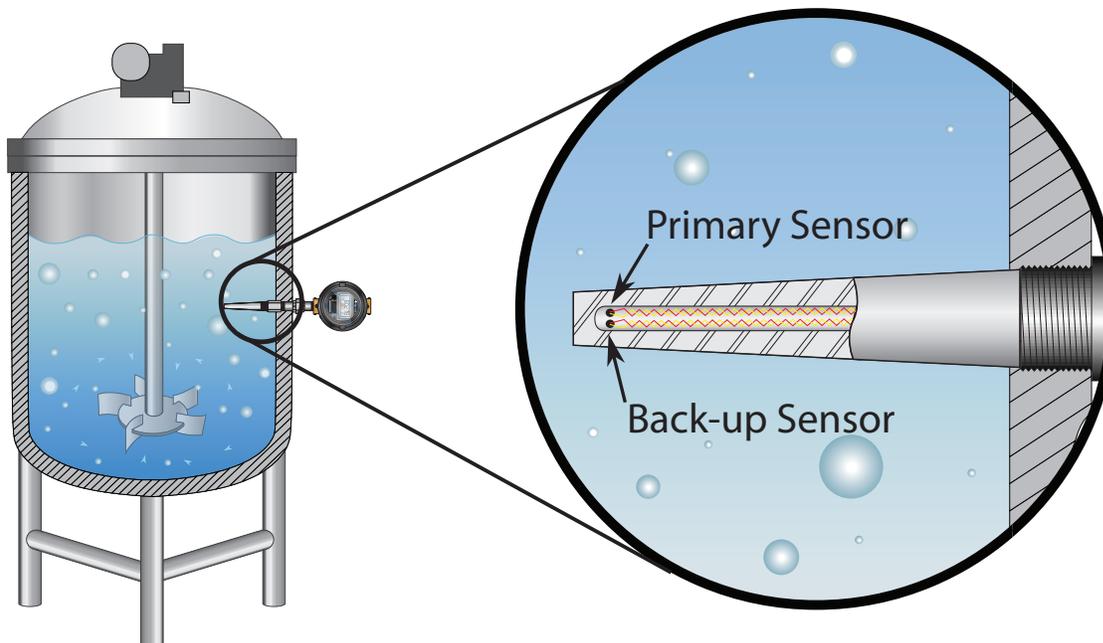


## Dual Sensor Input Gives You Expanded Measurement Capability and Protection

With Dual Input sensors, the THZ<sup>3</sup> and TDZ<sup>3</sup> simplify your operations with advanced features that give you far more control over your temperature measurements (see Figure 7.2). Each sensor is individually selectable and programmable.

- **Backup and Fail-Over Protection** allows either of the sensors or inputs to be designated as the primary measurement, with the secondary input acting as the backup sensor in case of primary sensor failure.
- **Average and Differential Measurement** allows you to average the two input measurements or select the differential (A-B or B-A) or absolute differential between the two inputs.
- **High-Select and Low-Select Feature** enables the transmitter to continuously monitor two separate inputs and designate either the highest or lowest input to represent the analog output.
- **Dynamic Variable Mapping** permits the user to assign either input or the calculated result of inputs to any of the four HART variables (PV, SV, TV or QV) that can be read by any HART-compatible host system.

**Figure 7.2.** When reading critical temperatures in a critical batch processing vessel, fail-over protection allows the secondary input of the Dual Input TDZ<sup>3</sup> to act as a back-up sensor when the primary sensor fails.

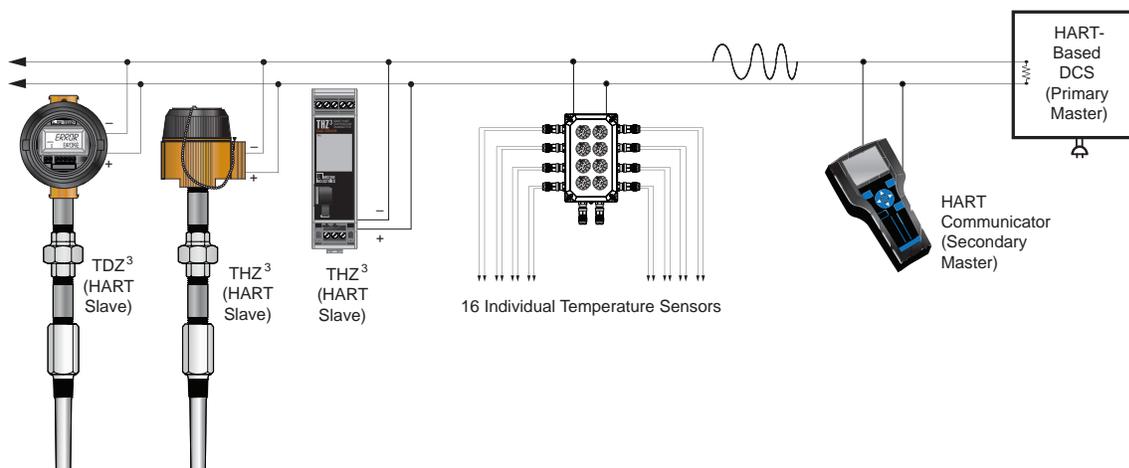


### Multidrop Networks Save Wiring Costs

Any combination of up to 15 THZ<sup>3</sup> and TDZ<sup>3</sup> smart transmitters connect in parallel onto a HART digital communication link (Figure 7.3). 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 (1-63) 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.

**Figure 7.3.** Save time and money by networking up to 15 of our Smart HART transmitters onto a single digital data link.



### 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 THZ<sup>3</sup> or TDZ<sup>3</sup> 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.

## Section 8 - Specifications

<p><b>HART Specifications</b></p>	<p><b>Address Range:</b> 0-63 (1-63 are for multidrop loops) <b>Transmission Speed:</b> 1200 bps <b>Character Format:</b> 1 Start Bit - 8 Data Bits - 1 Odd Parity Bit - 1 Stop Bit</p>	<p><b>Performance (Continued)</b></p> <p><b>T/C Input Impedance:</b> 40Mohms, nominal <b>RTD &amp; Ohms Excitation:</b> 250 microamps, ±10% <b>RTD Lead Wire Resistance Maximum:</b> RTD resistance + 2X lead wire resistance &lt; 4000 ohms; <b>Damping:</b> User set; 0-60 seconds <b>Resolution:</b> Input, 20-bit; Output, 16-bit <b>Power Supply Requirement:</b> 12-30Vdc for I.S. version; 12-42Vdc for standard version</p>
<p><b>Performance</b></p>	<p><b>Input Accuracy:</b> Refer to Table 1 <b>Output Range:</b> 4-20mA <b>Analog Output Accuracy:</b> 3µA (0.019% of 4-20mA Span) <b>Overall Accuracy:</b> 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 <b>Reference (Cold) Junction Compensation:</b> ±0.25°C (±0.45°F); DIN ±0.45°C (±0.81°F) <b>Stability:</b> Refer to Table 2 <b>Isolation:</b> THZ3 HPP, DIN and DIN -RF: 500Vrms input-to-output continuous; will withstand a 1350Vac dielectric strength test for one minute with no breakdown input to output to case; TDZ3 HP: 500Vrms input-to-output continuous; will withstand a 500Vac dielectric strength test for one minute with no breakdown input to output to case <b>Response (Rise) Time:</b> 100msec maximum for the output to change from 10% to 90% for an input step change of 0% to 100% <b>Step Response Time:</b> 460msec (single), 650msec (dual) typical from the time an input is applied until the output reaches 90% of its final value <b>Ripple:</b> 10mVp-p measured across a 250 ohm load resistor at frequencies up to 120Hz <b>Input Over-voltage Protection:</b> ±3Vdc peak to peak, maximum <b>Digital Input Filter:</b> User-programmable; 50/60Hz <b>Power Supply Effect:</b> ±0.002% of span per 1V change <b>Load Effect:</b> Negligible within specified power limits <b>Load Capability:</b> (500 ohms@24V) <math display="block">\frac{\text{Supply Voltage} - 12V}{0.024A} = \text{Ohms}</math> <b>Burnout Protection:</b> User-programmable, Upscale 23.6mA; Downscale 3.6mA; preset value or hold-last output <b>Output Current Limiting:</b> User-programmable, 3.6 to 4.0mA and 20 to 23.6mA for input under/over range; 24mA, maximum (hardware limit)</p>	<p><b>Display</b></p> <p><b>Type:</b> 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 <b>Format:</b> Two rows of five alphanumeric characters <b>Decimal Points:</b> Allowed decimal places: Auto, 1, 2 or 3 <b>Range:</b> -99999 to 99999 <b>Minimum Display Span:</b> 1.00</p> <p><b>Ambient Temperature</b></p> <p><b>Operating Range:</b> -40°C to +85°C (-40°F to +185°F) <b>Storage Range:</b> -40°C to +85°C (-40°F to +185°F) <b>Relative Humidity:</b> 0-95%, non-condensing <b>Ambient Temperature Effect:</b> See Table 3 <b>Effect on Reference (Cold) Junction Compensation:</b> ±0.005% per °C change of ambient temperature <b>Startup Time:</b> The system output reaches 90% of its value based on input in less than 5 seconds after power up <b>Noise Rejection:</b> Common mode, 100dB@50/60Hz; Normal Mode: Refer to Table 4 <b>RFI/EMI Immunity:</b> 20 V/m @ 80-1000 MHz, 1kHz AM for TDZ<sup>3</sup> HP and THZ<sup>3</sup> DIN -RF and 10 V/m @ 80-1000 MHz, 1kHz AM for THZ<sup>3</sup> DIN and THZ<sup>3</sup> HPP when tested according to IEC61000-4-3</p> <p><b>Weight</b></p> <p><b>THZ<sup>3</sup> DIN:</b> 221g (7.9 oz) <b>THZ<sup>3</sup> HPP:</b> 91g (3.2 oz) <b>THZ<sup>3</sup> HPP in LH1:</b> 423g (15.1 oz) <b>THZ<sup>3</sup> HPP in LH2:</b> 644g (22.9 oz) <b>TDZ<sup>3</sup> HP:</b> 182g (6.4 oz) <b>TDZ<sup>3</sup> HP in BH:</b> 1.4kg (50.2 oz) <b>TDZ<sup>3</sup> HP in D-Box:</b> 672g (23.4 oz) <b>TDZ<sup>3</sup> HP in SB:</b> 3.2kg (113 oz)</p>

# THZ<sup>3</sup>/TDZ<sup>3</sup>

## Programmable Smart HART Temperature Transmitter

User's Manual  
238-741-00B  
April 2015

### SECTION 8

**Table 1. THZ<sup>3</sup>/TDZ<sup>3</sup> Dual Input and Accuracy Table**

Input	Type	$\alpha$	Ohms	Conformance Range	Minimum Span	Input Accuracy	Maximum Range	Sensor-to-Transmitter Matching
RTD	Platinum	0.003850	100	-200 to 850°C -328 to 1562°F	10°C (18°F)	±0.1°C (±0.18°F)	-240 to 960°C -400 to 1760°F	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.
			200					
			300					
			400					
			500					
			1000					
	Platinum	0.003902	100	-100 to 650°C -148 to 1202°F	10°C (18°F)	±0.1°C (±0.18°F)	-150 to 720°C -238 to 1328°F	
			200					
			400					
			500					
Platinum	0.003916	100	-200 to 510°C -328 to 950°F	10°C (18°F)	±0.1°C (±0.18°F)	-240 to 580°C -400 to 1076°F		
		Nickel	0.00672			120	-80 to 320°C -112 to 608°F	-100 to 360°C -148 to 680°F
Copper	0.00427	9.035	-50 to 250°C -58 to 482°F	10°C (18°F)	±0.85°C (±1.53°F)	-65 to 280°C -85 to 536°F		
Ohms	Direct Resistance	n/a	0-4000 ohms	0-4000 ohms	10 ohms	±0.4 ohms	0-4095 ohms	
	Potentiometer	n/a	125, 250, 500, 1k, 2k, 4k ohms	0-100%	10%	±0.1%	0-100%	
TC	J	n/a	n/a	-180 to 760°C -292 to 1400°F	35°C 63°F	±0.25°C (±0.45°F)	-210 to 770°C -346 to 1418°F	
	K	n/a	n/a	-150 to 1370°C -238 to 2498°F	40°C 72°F	±0.3°C (±0.54°F)	-270 to 1390°C -454 to 2534°F	
	E	n/a	n/a	-170 to 1000°C -274 to 1832°F	35°C 63°F	±0.2°C (±0.36°F)	-270 to 1013°C -454 to 1855.4°F	
	T	n/a	n/a	-170 to 400°C -274 to 752°F	35°C 63°F	±0.25°C (±0.45°F)	-270 to 407°C -454 to 764.6°F	
	R	n/a	n/a	0 to 1760°C 32 to 3200°F	50°C 90°F	±0.55°C (±0.99°F)	-50 to 1786°C -58 to 3246.8°F	
	S	n/a	n/a	0 to 1760°C 32 to 3200°F	50°C 90°F	±0.55°C (±0.99°F)	-50 to 1786°C -58 to 3246.8°F	
	B	n/a	n/a	400 to 1820°C 752 to 3308°F	75°C 135°F	±0.75°C (±1.35°F)	200 to 1836°C 392 to 3336.8°F	
	N	n/a	n/a	-130 to 1300°C -202 to 2372°F	45°C 81°F	±0.4°C (±0.72°F)	-270 to 1316°C -454 to 2400.8°F	
	C	n/a	n/a	0 to 2300°C 32 to 4172°F	100°C 180°F	±0.8°C (±1.44°F)	0 to 2338°C 32 to 4240.4°F	
Millivolts	DC	n/a	n/a	-50 to 1000mV	4mV	30 microvolts	-50 to 1000mV	

**Table 8.2.** Long-Term Stability Table

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 8.3.** Ambient Temperature Effects Table

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	0.001% of span (16mA)
All T/C	0.0003°C + 0.0015% of reading	0.001% of span (16mA)
T/C B	0.003°C + 0.0015% of reading	0.001% of span (16mA)
Millivolt	0.0005mV + 0.0015% of reading	0.001% of span (16mA)
Ohm	0.002 ohms + 0.0015% of reading	0.001% of span (16mA)

**Table 8.4.** Normal Mode Rejection Ratio Table

Sensor Type	Max. p-p Voltage Injection for 70dB at 50/60 Hz
T/C E	120mV
T/C J, K, N, C	60mV
T/C T, R, S, B	30mV
100 ohm Pt RTD	120mV
200 ohm Pt RTD	200mV
300 ohm, 400 ohm, 500 ohm, 1000 ohm Pt RTD	400mV
1000 ohm Pt RTD	800mV
120 ohm Ni RTD	200mV
9.03 ohm Cu RTD	30mV
Resistance 4Kohm/mV 1000mV	800mV
Resistance 2Kohm/mV 500mV	400mV
Resistance 1Kohm/mV 250mV	200mV
Resistance 500ohm/mV 125mV	120mV
Resistance 250ohm/mV 62.5mV	50mV
Resistance 125ohm/mV 31.25mV	30mV

## Section 9- Ordering Information

Ordering information detailed below.

### Field Mount Unit

Unit	Input	Output	Power	Options	Housing
<b>THZ<sup>3</sup></b> Smart HART Temperature Transmitter	<b>PRG</b> Programmable with standard HART communicator or HART compatible host; program or monitor with any FDT compliant host or program, such as PACTware, utilizing our DTM.  <b>RTD</b> 2-, 3-, 4-Wire Platinum, Copper, Nickel  <b>Thermocouple</b> (J, K, E, T, R, S, B, N, C)  <b>0-4000 ohms</b>  <b>-50-1000mV</b>  (see Table 1 for additional information)	<b>4-20MA</b> Scalable to narrower ranges	<b>12-42DC*</b>  <b>12-30DC</b> Intrinsically Safe (I.S.) applications  * Non-incendive (Class 1 Div 2, Zone 2) by default	<b>None</b>	<b>HPP</b> Hockey-puck housing for mounting in standard connection heads  <b>LH1NS‡</b> Connection head with two entry ports: ½-inch NPT cable and process-black PBT polyester cover  <b>LH1MS‡</b> Connection head with two entry ports: M20 cable and ½-inch NPT process-black PBT polyester cover  <b>LH1CS‡</b> Connection head with two entry ports: M20 cable and G½ (BSP) process-black PBT polyester cover  <b>LH1NX</b> Connection head with ½-inch NPT entry and mounting plate for customer's air duct opening-black PBT polyester cover  <b>LH2NS(*)</b> or (‡) Explosion-proof connection head with two entry ports: ½-inch NPT cable and process-black metal cover  <b>LH2MS(*)</b> or (‡) Explosion-proof connection head with two entry ports: M20 cable and ½-inch NPT process-black metal cover  * Either <b>A</b> or <b>E</b> suffix (comes supplied with 2" pipe mount hardware) <b>A</b> suffix indicates ANZEx/TestSafe (Ex d) Flame-Proof approvals (i.e. LH2NSA) <b>E</b> suffix indicates ATEX (Ex d and tD) Flame-Proof approvals (i.e. LH2NSE) <b>‡</b> <b>P</b> suffix indicates enclosure comes equipped with base plate and U-bolts for mounting on a 2-inch pipe (i.e. LH1NSP)

**To order, specify:** Unit / Input / Output / Power / Option [Housing]

**Model Number Example:** THZ<sup>3</sup> / PRG / 4-20MA / 12-30DC / [LH2NS]

### DIN-Style Mount Unit

Unit	Input	Output	Power	Options	Housing
<b>THZ<sup>3</sup></b> Smart HART Temperature Transmitter in DIN-style housing	<b>PRG</b> Programmable with standard HART communicator or HART compatible host; program or monitor with any FDT compliant host or program, such as PACTware, utilizing our DTM.  <b>RTD</b> 2-, 3-, 4-Wire Platinum, Copper, Nickel  <b>Thermocouple</b> (J, K, E, T, R, S, B, N, C)  <b>0-4000 ohms</b>  <b>-50-1000mV</b>  (see Table 1 for additional information)	<b>4-20MA</b> Scalable to narrower ranges	<b>12-42DC</b>	<b>-RF</b> Enhanced RFI/EMI filtering provides protection of 20 V/m @ 80-1000 MHz, 1kHz AM.	<b>DIN</b> DIN-style aluminum housing mounts on 35mm Top Hat (EN50022) rails

**To order, specify:** Unit / Input / Output / Power / Option [Housing]

**Model Number Example:** THZ<sup>3</sup> / PRG / 4-20MA / 12-42DC / [DIN]

### Field Mount Unit with Display

Unit	Input	Output	Power	Options	Housing
<b>TDZ<sup>3</sup></b> Smart HART Temperature Transmitter with Display	<b>PRG</b> Programmable with standard HART communicator or HART compatible host; program or monitor with any FDT compliant host or program, such as PACTware, utilizing our DTM.	<b>4-20MA</b> Scalable to narrower ranges	<b>12-42DC*</b>  <b>12-30DC</b> Intrinsically Safe (I.S.) applications.  <small>* Non-incendive (Class 1 Div 2, Zone 2) by default</small>	<b>None</b>	<b>HP</b> Hockey puck housing and spring clips
	<b>RTD</b> 2-, 3-, 4-Wire Platinum, Copper, Nickel  <b>Thermocouple</b> (J, K, E, T, R, S, B, N, C)  <b>0-4000 ohms</b>  <b>-50-1000mV</b>  <small>(see Table 1 in Section 7 for additional information)</small>				<b>DN</b> Snap-in mounting for HP case on TS-32 DIN-rail  <b>FL</b> Mounting flanges on HP for relay track or screw mounting  <b>FLD</b> Mounting flanges on HP for 3½" relay track mounting  <b>BH2NG</b> (*) or (‡) Explosion-Proof enclosure with two 1/2-inch NPT entry ports and a glass cover  <b>BH2TG</b> (*) or (‡) Explosion-Proof enclosure with two 3/4-inch NPT entry ports and a glass cover  <b>BH2MG</b> (*) or (‡) Explosion-Proof enclosure with two M20 x 1.5 NPT entry ports and a glass cover  <b>BH3NG</b> (*) or (‡) Explosion-Proof enclosure with three 1/2-inch NPT entry ports  <b>BH3TG</b> (*) or (‡) Explosion-Proof enclosure with two 3/4-inch side-entry NPT ports, one 1/2" bottom port, and a glass cover  <b>BH3MG</b> (*) or (‡) Explosion-Proof enclosure with two, M20 x 1.5 side-entry ports, one 1/2" bottom-entry port, and a glass cover  <b>SB2NG</b> (*) or (‡) 2-Hub, Explosion-Proof enclosure with two, ½-inch NPT entry ports and a glass cover  <b>SB2MG</b> (*) or (‡) 2-Hub, Explosion-Proof enclosure with two, M20 x 1.5 entry ports and a glass cover  <b>D2LC</b> 2-Hub, low base, clear cover, IP66/ NEMA 4X enclosure

**Additional Parts**  
The communications cables must be purchased separately:

**P/N 804-030-26**—Non-Isolated Fuse Protected USB Communication Cable (required by IECEx and ATEX for products installed in Intrinsically Safe areas)

**P/N 803-040-26**—Non-Isolated Serial Configuration Cable for 2-Wire Instruments

**P/N 804-021-26**—HART-to-USB Smart Interface Cable with HART Modem.

**To order, specify:** Unit / Input / Output / Power / [Housing]  
**Model Number Example:** TDZ<sup>3</sup> / PRG / 4-20MA / 12-42DC / [BH2NGP]

\* Either **A** or **E** suffix (comes supplied with 2" pipe mount hardware)  
**A** suffix indicates ANZEx/TestSafe (Ex d) Flame-Proof approvals (i.e. BH2MGA)  
**E** suffix indicates ATEX (Ex d and tD) Flame-Proof approvals (i.e. BH2MGE)  
**‡ P** suffix indicates enclosure comes equipped with base plate and U-bolts for mounting on a 2-inch pipe (i.e. BH2NGP)

## Section 10 - Certification Information



# EC Declaration of Conformity

Moore Industries-International, Inc.  
16650 Schoenborn Street  
North Hills, CA 91343-6196 U.S.A.

Date Issued: 22 Apr. 2015  
No. 100-100-253 Rev. B  
Page 1 of 2

Equipment Description:

**Programmable HART Temperature Transmitter with Display**

**Model TDZ3 / \* / \* / \* / \* / \***

\* Indicates any input, output, power, options and housing as stated in the product data sheet.

Directive:

**2004/108/EC (EMC: Electromagnetic Compatibility)**

Specifications Conformed To:

**EN 61326-1:2006** Electrical equipment for measurement, control and laboratory use - EMC requirements

Equipment Description:

**Programmable HART Temperature Transmitter with Display**

**Model TDZ3 / \* / 4-20mA / 12-30DC / \* / HP**

\* Indicates any input and options as stated in the product data sheet.

Directive:

**94/9/EC (ATEX: Equipment and protective systems for potentially explosive atmospheres)**

Provisions of the Directive Fulfilled by the Equipment:

**Group II Category 1G Ex ia IIC Ga T4**

Notified Body for EC-Type Examination:

**FM Approvals Ltd.** [Notified Body Number 1725]

1 Windsor Dials, Windsor, Berkshire,  
SL41RS, United Kingdom

EC-Type Examination Certificate:

**FM13ATEX0098X**

Harmonized Standards Used:

**EN60079-0:2012** Explosive atmospheres Part 0: Equipment - General requirements

**EN60079-11:2012** Explosive atmospheres Part 11: Equipment protection by intrinsic safety "i"

**EN60079-26:2007** Explosive atmospheres - Part 26: Equipment with equipment protection level (EPL) Ga

Equipment Description:

**Programmable HART Temperature Transmitter with Display**

**Model TDZ3 / \* / 4-20mA / 12-42DC / \* / HP**

\* Indicates any input and option as stated in the product data sheet.

Directive:

**94/9/EC (ATEX: Equipment and protective systems for potentially explosive atmospheres)**

Provisions of the Directive Fulfilled by the Equipment:

**Group II Category 3G Ex nA IIC Gc T4**

Type Examination Certificate:

**FM13ATEX0096X**



## EC Declaration of Conformity

Moore Industries-International, Inc.  
16650 Schoenborn Street  
North Hills, CA 91343-6196 U.S.A.

Date Issued: 22 Apr. 2015  
No. 100-100-253 Rev. B  
Page 2 of 2

Harmonized Standards Used:

**EN60079-0:2012** Explosive atmospheres Part 0: Equipment - General requirements  
**EN60079-15:2010** Explosive atmospheres Part 15: Equipment protection by type of protection 'n'

Equipment Description:

**Programmable HART Temperature Transmitter with Display in the BH or SB Enclosure  
Model TDZ3 / \* / \* / \* / \* / BH\*\*E or SB2\*\*E**  
\* Indicates any input, output, power and options as stated in the product data sheet.  
\*\*Indicates any BH or SB2 Enclosure with the 'E' suffix.

Directive:

**94/9/EC (ATEX: Equipment and protective systems for potentially explosive atmospheres)**

Provisions of the Directive Fulfilled by the Equipment:

**Group II Category 2G Ex d IIC T6 Gb; Group II Category 2D Ex tb IIIC Db T85°C IP66**

Notified Body for EC-Type Examination:

**ISSeP** [Notified Body Number 0492]  
Zoning A. Schweitzer 7340  
Colfontaine, Belgium

EC-Type Examination Certificate:

**ISSeP 08 ATEX 033 X**

Harmonized Standards Used:

**EN 60079-0:2012** Explosive atmospheres Part 0: Equipment - General requirements  
**EN 60079-1:2007** Explosive atmospheres Part 1: Equipment protection by flameproof enclosures 'd'  
**EN 60079-31:2010** Explosive atmospheres Part 31: Equipment dust ignition protection by enclosure 't'

Notified Body for Quality Assurance:

**SIRA** [Notified Body Number 0518]  
Rake Lane, Eccleston,  
Chester, Cheshire,  
CH4 9JN, England

On Behalf of Moore Industries-International, Inc., I declare that, on the date the equipment accompanied by this declaration is placed on the market, the equipment conforms with all technical and regulatory requirements of the above listed directives.

Signature:

Deanna Esterwold, Quality Manager



## EC Declaration of Conformity

Moore Industries-International, Inc.  
16650 Schoenborn Street  
North Hills, CA 91343-6196 U.S.A.

Date Issued: 22 Apr. 2015  
No. 100-100-252 Rev. B  
Page 1 of 2

Equipment Description:

**Programmable HART Temperature Transmitter**  
**Model THZ3 / \* / \* / \* / \* / \***

\* Indicates any input, output, power, options and housing as stated in the product data sheet.

Directive:

**2004/108/EC (EMC: Electromagnetic Compatibility)**

Specifications Conformed To:

**EN 61326-1:2006** Electrical equipment for measurement, control and laboratory use - EMC requirements

Equipment Description:

**Programmable HART Temperature Transmitter**  
**Model THZ3 / \* / 4-20mA / 12-30DC / \* / HPP**

\* Indicates any input and options as stated in the product data sheet.

Directive:

**94/9/EC (ATEX: Equipment and protective systems for potentially explosive atmosphere)**

Provisions of the Directive Fulfilled by the Equipment:

**Group II Category 1G Ex ia IIC Ga T4/T5/T6**

Notified Body for EC-Type Examination:

**FM Approvals Ltd.** [Notified Body Number 1725]  
1 Windsor Dials, Windsor, Berkshire,  
SL41RS, United Kingdom

EC-Type Examination Certificate:

**FM13ATEX0098X**

Harmonized Standards Used:

**EN60079-0:2012** Explosive atmospheres Part 0: Equipment - General requirements  
**EN60079-11:2012** Explosive atmospheres Part 11: Equipment protection by intrinsic safety 'I'  
**EN60079-26:2007** Explosive atmospheres - Part 26: Equipment with equipment protection level (EPL) Ga

Equipment Description:

**Programmable HART Temperature Transmitter**  
**Model THZ3 / \* / 4-20mA / 12-42DC / \* / HPP**

\* Indicates any input and option as stated in the product data sheet.

Directive:

**94/9/EC (ATEX: Equipment and protective systems for potentially explosive atmosphere)**

Provisions of the Directive Fulfilled by the Equipment:

**Group II Category 3G Ex nA IIC Gc T4/T5/T6**

Type Examination Certificate:

**FM13ATEX0096X**



## EC Declaration of Conformity

Moore Industries-International, Inc.  
16650 Schoenborn Street  
North Hills, CA 91343-6196 U.S.A.

Date Issued: 22 Apr. 2015  
No. 100-100-252 Rev. B  
Page 2 of 2

Harmonized Standards Used:

**EN60079-0:2012** Explosive atmospheres Part 0: Equipment - General requirements  
**EN60079-15:2010** Explosive atmospheres Part 15: Equipment protection by type of protection 'n'

Equipment Description:

**Programmable HART Temperature Transmitter in the LH2 Enclosure**  
**Model THZ3 / \* / \* / \* / \* / LH2\*\*E**

\* Indicates any input, output, power and options as stated in the product data sheet.

\*\*Indicates any LH2 Enclosure with the 'E' suffix.

Directive:

**94/9/EC (ATEX: Equipment and protective systems for potentially explosive atmosphere)**

Provisions of the Directive Fulfilled by the Equipment:

**Group II Category 2G Ex d IIC T6 Gb; Group II Category 2D Ex tb IIIC Db T85°C IP66**

Notified Body for EC-Type Examination:

**ISSEP** [Notified Body Number 0492]  
Zoning A. Schweitzer 7340  
Colfontaine, Belgium

EC-Type Examination Certificate:

**ISSEP 08 ATEX 033 X**

Harmonized Standards Used:

**EN 60079-0:2012** Explosive atmospheres Part 0: Equipment - General requirements  
**EN 60079-1:2007** Explosive atmospheres Part 1: Equipment protection by flameproof enclosures 'd'  
**EN 60079-31:2010** Explosive atmospheres Part 31: Equipment dust ignition protection by enclosure 't'

Notified Body for Quality Assurance:

**SIRA** [Notified Body Number 0518]  
Rake Lane, Eccleston,  
Chester, Cheshire,  
CH4 9JN, England

On Behalf of Moore Industries-International, Inc., I declare that, on the date the equipment accompanied by this declaration is placed on the market, the equipment conforms with all technical and regulatory requirements of the above listed directives.

Signature:

Deanna Esterwold, Quality Manager

# THZ<sup>3</sup>/TDZ<sup>3</sup>

## Programmable Smart HART Temperature Transmitter

User's Manual  
238-741-00B  
April 2015

### SECTION 10

<b>DO NOT SCALE DRAWING</b>	DRAWN C. Whan 8/14	CATEGORY CONTROL DRAWING	DRAWING NUMBER 100-100-80	SHEET 1 of 2	REVISION A
TOLERANCES (UNLESS NOTED) DECIMALS ±0.01 / mm X ±.1 / .254 .XX ±.01 / .025 XXX ±.005 / .125 HOLES ±.003 / .000 ANGLES ±1/2°	CHECKED V. Garcia 8/14	TITLE <b>Installation Diagram: TDZ3 (STZ) [HP] Intrinsically Safe System</b>	REVISED BY ECO	DATE 09/14	APPROVAL CW WT
NOTICE RE PROPRIETARY INFORMATION: This drawing and the information contained herein are the proprietary property of Moore Industries International, Inc. (MI) and should not be reproduced or disclosed to any third party without the written consent of an authorized officer of MI.					

**Hazardous Area / Explosive Atmosphere**

**TDZ3 (STZ)**

**CAUTION:** The 'COM' Port must not be used in Hazardous Areas. See sheet 2 for connection diagram.

**Non-Hazardous Area**

**Entity Parameters**

Uo = 6.51 Vdc	Ca or Co ≥ Ci + Ccable
Io = 61.7 mA	La or Lo ≥ Li + Lcable
Po = 100 mW	Uf or Vmax ≥ Voc or Vt
Co = 21.9 µF	If or Imax ≥ Isc or It
Lo = 9.35 mH	Pi ≥ Po
Co = 499.9 µF	
Lo = 37.38 mH	
Co = 999.9 µF	
Lo = 74.77 mH	
Uf or Vmax = 30 Vdc	
If or Imax = 110 mA	
Pi or Pmax = 825 mW	
Ci = 5.17 nF	
Li = 0 mH	

**NOTE:** If Ca of the Associated Apparatus is greater than 3µF, then the total cable capacitance shall be limited to 3µF.

**Entity Parameters**

RTD, T/C, mV, Ω	Group IIC
Sensor Terminals (1, 2, 3, 4, 5)	Group IIB
Power/Loop (+PS & -PS)	Group IIA

**Barrier or other Associated Apparatus**

1 2

3

4

Unspecified Apparatus

**Area Classification**

Class I, Div. 1, Groups A-D	T Rating
Class I, Zone 0, Group IIC	
Group II, Category 1, Gas Group IIC, EPL = Ga	T4 @ 85°C
Class I, Div. 2, Groups A-D	
Class I, Zone 2, Group IIC	
Group II, Category 3, Gas Group IIC, EPL = Gc	
Operating Temperature Range: -40°C ≤ Tamb. ≤ +85°C	
Must use +90°C suitable cabling	

**-- NOTE --**

SEE SHEET 2 FOR INSTALLATION NOTES

**-- WARNING --**

Substitution of components may impair Intrinsic Safety. To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

**Certified Product**

This is a controlled 'Related' or 'Schedule' drawing. No modifications are permitted without the notification and final approval of the Certification Engineer (related dwgs.) or the Certifying Agency (schedule dwgs.)

	<b>DO NOT SCALE DRAWING</b>		CATEGORY	CONTROL DRAWING	DRAWING NUMBER	100-100-80	SHEET 2 of 2	REVISION	A	
	TOLERANCES (UNLESS NOTED)	DRAWN	CHECKED	ENGINEER	SCALE	TITLE	REVISED BY	DATE	BY	APPROVAL
DECIMALS = ±0.001mm FRACTIONS = 1/32" HOLES = ±0.003/0.000 ANGLES = ±4/12"	C. Whan	See Sht. 1	See Sht. 1	NONE	Installation Diagram: TDZ3 (STZ) [HP] Intrinsically Safe System	SEE SHEET 1				

**Installation Notes:**

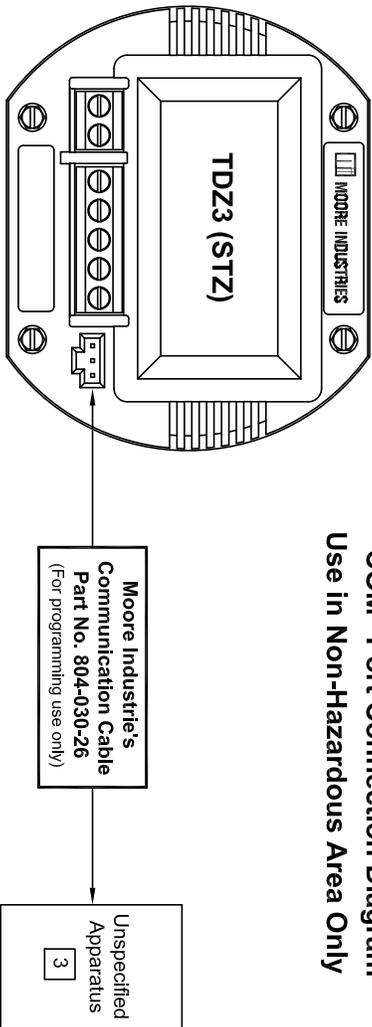
1. The Associated Apparatus must be FM Approved for installations in the U.S.; Canadian Approved for installations in Canada; ATEX Certified for installations in Europe and IECEx Certified for IECEx installations. Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
2. The control room equipment (unspecified apparatus) connected to the Associated Apparatus must not generate more than 250 Vrms or Vdc, or the marked Um on the associated apparatus, whichever is less.
3. Installations in the U.S. shall be in accordance with ANSI/ISA RP12.06.01 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the latest edition of the National Electrical Code (ANSI/NFPA 70). Resistance between Intrinsically Safe Ground and earth ground must be less than 1.0 Ohm.
5. Installation in Canada shall be in accordance with the latest edition of the C22.1 Canadian Electrical Code, Part I.
6. Installation in Europe shall be in accordance with the latest editions of the wiring practices for the country of origin and EN 60079-14.
7. Installation for IECEx certification shall be in accordance with the latest editions of the wiring practices for the country of origin.
8. The Entity Concept allows interconnection of associated apparatus and intrinsically safe apparatus when the following is true: Uo ≤ Ui, Io ≤ Ii, Po ≤ Pi, Co Ci + Ccable; Lo Li + Lcable.
9. No revision is allowed to this drawing without prior FM Approval.

**-- WARNING --**  
Substitution of components may impair Intrinsic Safety. To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

Where English is not a language of the Country in which the equipment is being used, please apply to Moore Industries International, Inc. (MII) for a suitable translation.

Installation may only be carried out by suitably trained personnel and in accordance with national wiring regulations or codes of practice.

**"COM" Port Connection Diagram  
Use in Non-Hazardous Area Only**



**Certified Product**  
This is a controlled 'Released' or 'Scheduled' drawing. No modifications are permitted without the notification and final approval of the Certification Engineer (release days) or the Certifying Agency (scheduled days).

# THZ<sup>3</sup>/TDZ<sup>3</sup>

## Programmable Smart HART Temperature Transmitter

User's Manual  
238-741-00B  
April 2015

### SECTION 10

<b>DO NOT SCALE DRAWING</b>	DRAWN C. Whan 8/14	CATEGORY CONTROL DRAWING	DRAWING NUMBER 100-100-81	SHEET 1 of 2	REVISION A																														
TOLERANCES (UNLESS NOTED) DECIMALS = ±0.005/mm X = ±0.1254 XX = ±0.1025 XXX = ±0.0030/0.125 HOLEES = ±0.0030/0.090 ANGLES = ±12°	CHECKED V. Garcia 8/14	TITLE Installation Diagram: THZ3 (STZ) [HPP] Intrinsically Safe System	REVISED BY ECO 17401	DATE 10/14	APPROVAL CW WT																														
<p><b>MOORE INDUSTRIES</b></p> <p><b>CAUTION:</b> The 'COM' Port must not be used in Hazardous Areas. See sheet 2 for connection diagram.</p>																																			
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<p><b>Entity Parameters</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>RTD, T/C, mV, Ω</td> <td>Ca or Co ≥ Ci + Ccable</td> </tr> <tr> <td>Uo = 6.51 Vdc</td> <td>La or Lo ≥ Li + Lcable</td> </tr> <tr> <td>Io = 61.7 mA</td> <td>Ui or Vmax ≥ Voc or Vi</td> </tr> <tr> <td>Po = 100 mW</td> <td>Pi ≥ Po</td> </tr> <tr> <td>Co = 21.9 μF</td> <td></td> </tr> <tr> <td>Lo = 9.35 mH</td> <td></td> </tr> <tr> <td>Co = 499.9 μF</td> <td></td> </tr> <tr> <td>Lo = 37.38 mH</td> <td></td> </tr> <tr> <td>Co = 999.9 μF</td> <td></td> </tr> <tr> <td>Lo = 74.77 mH</td> <td></td> </tr> <tr> <td>Ui or Vmax = 30 Vdc</td> <td></td> </tr> <tr> <td>Io or Imax = 110 mA</td> <td></td> </tr> <tr> <td>Pi or Pmax = 825 mW</td> <td></td> </tr> <tr> <td>Ci = 5.17 nF</td> <td></td> </tr> <tr> <td>Li = 0 mH</td> <td></td> </tr> </table>						RTD, T/C, mV, Ω	Ca or Co ≥ Ci + Ccable	Uo = 6.51 Vdc	La or Lo ≥ Li + Lcable	Io = 61.7 mA	Ui or Vmax ≥ Voc or Vi	Po = 100 mW	Pi ≥ Po	Co = 21.9 μF		Lo = 9.35 mH		Co = 499.9 μF		Lo = 37.38 mH		Co = 999.9 μF		Lo = 74.77 mH		Ui or Vmax = 30 Vdc		Io or Imax = 110 mA		Pi or Pmax = 825 mW		Ci = 5.17 nF		Li = 0 mH	
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	<b>DO NOT SCALE DRAWING</b>		CATEGORY CONTROL DRAWING	DRAWING NUMBER 100-100-81	SHEET 2 of 2	REVISION A
	TOLERANCES (UNLESS NOTED) DECIMALS = ±fraction X .XX ±.01 / .25 .XXX ±.003 / .125 HOLES ±.003 / .080 ANGLES ±.117°	DRAWN C. Whon	8/14	TITLE Installation Diagram: THZ3 (STZ) [HPP] Intrinsically Safe System	REVISED BY SEE SHEET 1	DATE BY APPROVAL

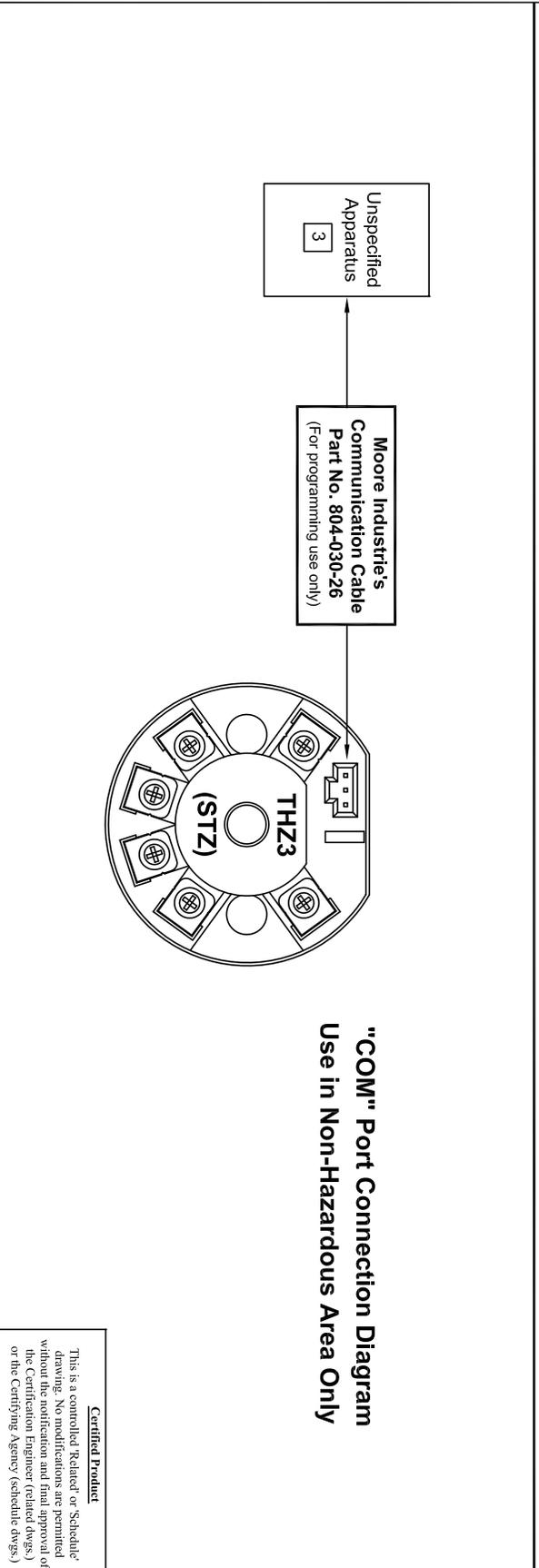
#### Installation Notes:

1. The Associated Apparatus must be FM Approved for installations in the U.S.; Canadian Approved for installations in Canada; ATEX Certified for installations in Europe and IECEx Certified for IECEx installations.
2. Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
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9. No revision is allowed to this drawing without prior FM Approval.

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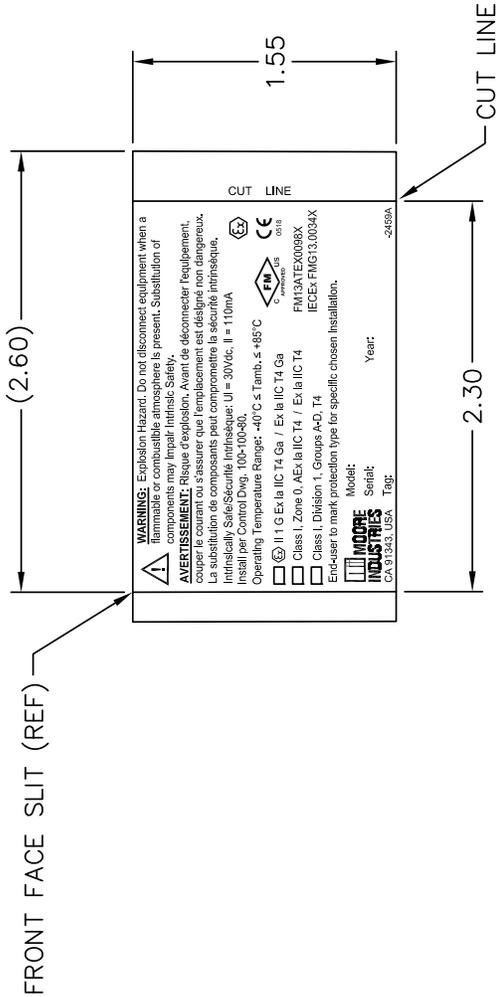
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**Certified Product**  
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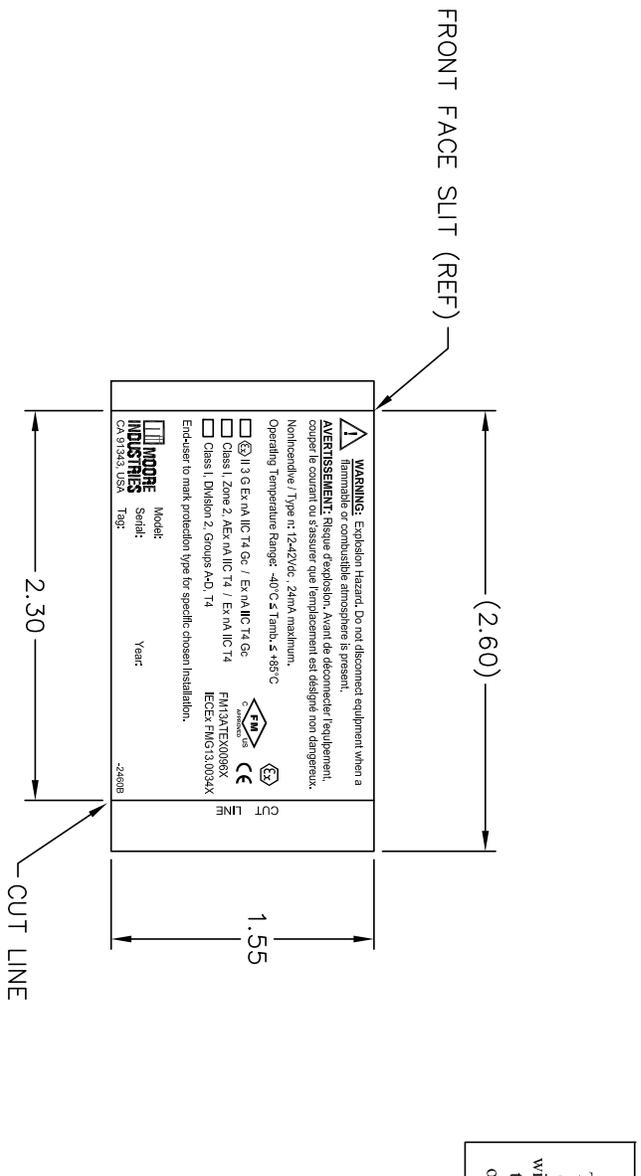
<b>DO NOT SCALE DRAWING</b>	DRAWN		CATEGORY		DRAWING NUMBER		REVISION	
	CHECKED	C. Whan	COMPUTERIZED LABEL		200-251-2459		A	
TOLERANCES (UNLESS NOTED)	11/13		TITLE		DATE		BY	
DECIMALS =math>mm</math>	11/13		ID LABEL, TDZ3 [HP] (STZ)		09/14		CW	
X =math>±.1 /2.54</math>	ENGINEER		-CFMus/IECEX/ATEX		REVISED BY		ECC 17400	
.XX =math>±.01 /0.25</math>	W. Tchan		Intrinsically Safe		NOTICE RE PROPRIETARY INFORMATION: This drawing and the information contained herein are the proprietary property of Moore Industries International, Inc. (MI) and should not be reproduced or disclosed to any third party without the written consent of an authorized officer of MI.		WT	
.XXX =math>±.005/0.125</math>	SCALE		1/1					
HOLES =math>±.003/0.080</math>								
ANGLES =math>±1/2°</math>								

**Certified Product**  
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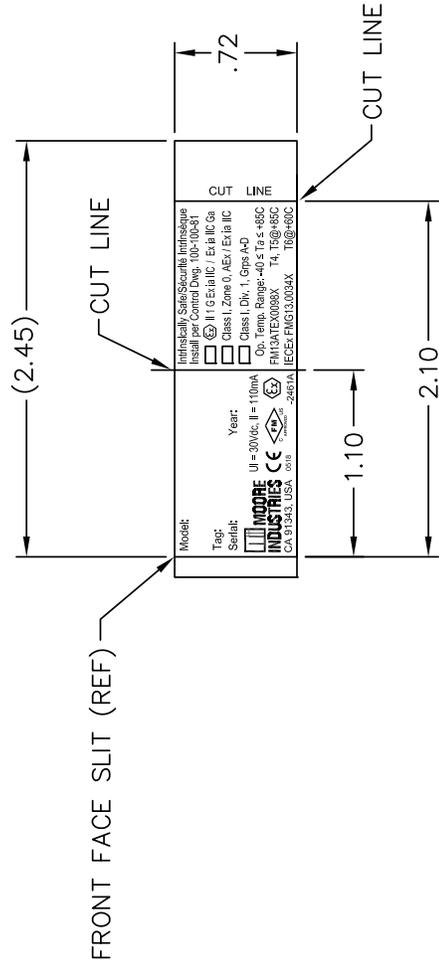
- NOTES: UNLESS OTHERWISE SPECIFIED**
1. MATERIAL: .002 SILVER, IDENTIPLATE (MII P/N 200-305-00) CUT TO SIZE AS SHOWN. REFER TO LABEL SPEC. DRAWING 200-305-00. ADHESIVE BACKING IS UL/CSA APPROVED HIGH PERFORMANCE ACRYLIC. PRINTING IS WITH BLACK, UL/CSA, THERMAL TRANSFER RIBBON (801-003-96).
  2. THE FIXED TEXT AND GRAPHIC FIELDS FOR THIS LABEL ARE STORED UNDER NO. 200-251-2459 IN THE LEGI 93 LABEL MACHINE COMPUTER HARD DISK.
  3. TO PRINT THIS LABEL: JOB SPECIFIC MODEL, SERIAL, AND TAG NUMBERS WILL BE DOWNLOADED FROM THE MENTOR DATA FILE AND PRINTED ALONG WITH THE FIXED TEXT AND GRAPHICS (SUPPLIED BY THE LEGI 93 DATA FILE) TO CREATE THE FINISHED LABEL.

 <b>MOORE INDUSTRIES</b>	<b>DO NOT SCALE DRAWING</b>		CATEGORY	DRAWING NUMBER	REVISION
	TOLERANCES (UNLESS NOTED) DECIMALS = ±.01 mm .X     ±.1 / 2.54 .XX    ±.01 / 0.25 .XXX   ±.003 / 0.125 HOLES   ±.003 / 0.080 ANGLES   ±.1 / 2°	DRAWN	C. Whan	11/13	200-251-2460
	CHECKED	V. Garcia	03/15		
	ENGINEER	W. Tchan	11/13		
	SCALE	1/1			
TITLE		COMPUTERIZED LABEL		DRAWING NUMBER	
ID LABEL, TDZ3 [HP] (STZ)		-cFMus/IECEX/ATEX		200-251-2460	
Default		Default		200-251-2460	
REVISED BY		ECO 17538		DATE BY APPROVAL	
				03/15 CW WT	
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- NOTES: UNLESS OTHERWISE SPECIFIED**
1. MATERIAL: .002 SILVER, IDENTIPLATE (MIL P/N 200-305-00) CUT TO SIZE AS SHOWN. REFER TO LABEL SPEC. DRAWING 200-305-00. ADHESIVE BACKING IS UL/CSA APPROVED HIGH PERFORMANCE ACRYLIC. PRINTING IS WITH BLACK, UL/CSA, THERMAL TRANSFER RIBBON (801-003-96).
  2. THE FIXED TEXT AND GRAPHIC FIELDS FOR THIS LABEL ARE STORED UNDER NO. 200-251-2460 IN THE LEG1 93 LABEL MACHINE COMPUTER HARD DISK.
  3. TO PRINT THIS LABEL: JOB SPECIFIC MODEL, SERIAL, AND TAG NUMBERS WILL BE DOWNLOADED FROM THE MENTOR DATA FILE AND PRINTED ALONG WITH THE FIXED TEXT AND GRAPHICS (SUPPLIED BY THE LEG1 93 DATA FILE) TO CREATE THE FINISHED LABEL.

	<b>DO NOT SCALE DRAWING</b>		CATEGORY	DRAWING NUMBER	REVISION
	TOLERANCES (UNLESS NOTED) DECIMALS = ±.003 / 0.080 .X = ±.01 / 0.25 .XX = ±.005 / 0.125 .XXX = ±.003 / 0.080 HOLES = ±.12° ANGLES = ±.12°	DRAWN: C. Whan CHECKED: V.G. ENGINEER: W. Tchan SCALE: 1/1	11/13 11/13 11/13	COMPUTERIZED LABEL MOD/SERIAL LABEL, THZ3 (STZ) INTRINSICALLY SAFE	200-251-2461 ECO 17401 DATE: 10/14 BY: CW
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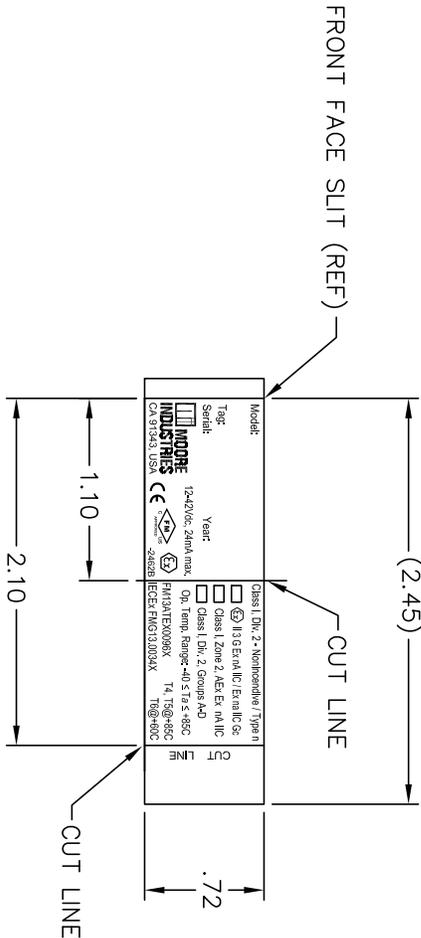
3. MATERIAL: .002 SILVER, ULTRAPLATE (MI P/N 200-304-00) ROLL STOCK. REFER TO LABEL SPEC. DRAWING 200-304-00. ADHESIVE BACKING IS UL/CSA APPROVED HIGH PERFORMANCE ACRYLIC. PRINTING IS WITH BLACK, UL/CSA, THERMAL TRANSFER RIBBON (801-003-96).
2. THE FIXED TEXT AND GRAPHIC FIELDS FOR THIS LABEL ARE STORED UNDER NO. 200-251-2461 IN THE LEGI LABEL MACHINE COMPUTER HARD DISK.

1. TO PRINT THIS LABEL: DOWNLOAD THE FIXED TEXT AND GRAPHICS (SUPPLIED BY THE LEGI DATA FILE) TO CREATE THE FINISHED LABEL.

**NOTES: UNLESS OTHERWISE SPECIFIED**

**Certified Product**  
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	<b>DO NOT SCALE DRAWING</b>		CATEGORY		DRAWING NUMBER	REVISION
	TOLERANCES (UNLESS NOTED) DECIMALS = ± inch/mm .X = ±.1 / 2.54 .XX = ±.01 / 0.25 .XXX = ±.005 / 0.125 HOLES = ±.003 / 0.080 ANGLES = ±1/2°	DRAWN C. Whan	CHECKED V.G.	ENGINEER W. Tchan		
	11/13	3/15	11/13		ECO 17538	DATE BY APPROVAL 3/15 JAD WT
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- MATERIAL: .002 SILVER, ULTRAPLATE (MIL P/N 200-304-00) ROLL STOCK. REFER TO LABEL SPEC. DRAWING 200-304-00. ADHESIVE BACKING IS UL/CSA APPROVED HIGH PERFORMANCE ACRYLIC. PRINTING IS WITH BLACK, UL/CSA, THERMAL TRANSFER RIBBON (801-003-96).
- THE FIXED TEXT AND GRAPHIC FIELDS FOR THIS LABEL ARE STORED UNDER NO. 200-251-2462 IN THE LEGI LABEL MACHINE COMPUTER HARD DISK.
- TO PRINT THIS LABEL: DOWNLOAD THE FIXED TEXT AND GRAPHICS (SUPPLIED BY THE LEGI DATA FILE) TO CREATE THE FINISHED LABEL.

**NOTES: UNLESS OTHERWISE SPECIFIED**

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This is a controlled 'Related' or 'Schedule' drawing. No modifications are permitted without the notification and final approval of the Certification Engineer (related dwgs.) or the Certifying Agency (schedule dwgs.)

## Warranty Disclaimer

Moore Industries ("The Company") makes no express, implied or statutory warranties (including any warranty of merchantability or of fitness for a particular purpose) with respect to any goods or services sold by the company. The company disclaims all warranties arising from any course of dealing or trade usage, and any buyer of goods or services from the company acknowledges that there are no warranties implied by custom or usage in the trade of the buyer and of the company, and that any prior dealings of the buyer with the company do not imply that the company warrants the goods or services in any way.

Any buyer of goods or services from the company agrees with the company that the sole and exclusive remedies for breach of any warranty concerning the goods or services shall be for the company, at its option, to repair or replace the goods or services or refund the purchase price. The company shall in no event be liable for any consequential or incidental damages even if the company fails in any attempt to remedy defects in the goods or services, but in such case the buyer shall be entitled to no more than a refund of all monies paid to the company by the buyer for purchase of the goods or services.

Any cause of action for breach of any warranty by the company shall be barred unless the company receives from the buyer a written notice of the alleged defect or breach within ten days from the earliest date on which the buyer could reasonably have discovered the alleged defect or breach, and no action for the breach of any warranty shall be commenced by the buyer any later than twelve months from the earliest date on which the buyer could reasonably have discovered the alleged defect or breach.

## Return Policy

For a period of thirty-six (36) months from the date of shipment, and under normal conditions of use and service, Moore Industries ("The Company") will at its option replace, repair or refund the purchase price for any of its manufactured products found, upon return to the Company (transportation charges prepaid and otherwise in accordance with the return procedures established by The Company), to be defective in material or workmanship. This policy extends to the original Buyer only and not to Buyer's customers or the users of Buyer's products, unless Buyer is an engineering contractor in which case the policy shall extend to Buyer's immediate customer only. This policy shall not apply if the product has been subject to alteration, misuse, accident, neglect or improper application, installation, or operation. THE COMPANY SHALL IN NO EVENT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

## To return equipment to Moore Industries for repair, follow these four steps:

1. Call Moore Industries and request a Returned Material Authorization (RMA) number.

### Warranty Repair –

If you are unsure if your unit is still under warranty, we can use the unit's serial number to verify the warranty status for you over the phone. Be sure to include the RMA number on all documentation.

### Non-Warranty Repair –

If your unit is out of warranty, be prepared to give us a Purchase Order number when you call. In most cases, we will be able to quote you the repair costs at that time. The repair price you are quoted will be a "Not To Exceed" price, which means that the actual repair costs may be less than the quote. Be sure to include the RMA number on all documentation.

2. Provide us with the following documentation:
  - a) A note listing the symptoms that indicate the unit needs repair
  - b) Complete shipping information for return of the equipment after repair
  - c) The name and phone number of the person to contact if questions arise at the factory
3. Use sufficient packing material and carefully pack the equipment in a sturdy shipping container.
4. Ship the equipment to the Moore Industries location nearest you.

The returned equipment will be inspected and tested at the factory. A Moore Industries representative will contact the person designated on your documentation if more information is needed. The repaired equipment, or its replacement, will be returned to you in accordance with the shipping instructions furnished in your documentation.



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