PRTXD Series RTD Temperature Transmitters

M-4455/0407

NOTE:
Spring-loaded RTD probes MUST be used with a thermowell. Probe length is measured from top of full threads to tip of probe. Length = thermowell “A” or “element length” dimension. See the Omega thermowell specifications. Probe length is NOT the same as thermowell insertion depth.

PRTXD Series RTD Transmitters

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**Range**

-58.0°F to 392.0°F or -50.0°C to 200.0°C

User selectable °F or °C

**Resolution**

0.1 degree over entire range

**Accuracy**

±0.1% of span plus maximum sensor error of ±0.3°C at 0°C, ±1.1°C at 150°C

**Sensor**

100Ω RTD element, 0.00385 α coefficient

IEC-751 Class B: ±0.3°C at 0°C, ±1.1°C at 150°C

10 second time constant

**Display**

4 readings per second nominal display update rate

4% digit LCD, 1/2" digit height, alphanumeric lower display for units

**Out of Range Indication**

ALARM1 on display above 392°F or 200°C

ALARM2 on display below -58°F or -50°C

Below approx. -103°F (-75°C) or above approx. 482°F (250°C), the display will indicate 1...-...-...

and the loop current will go downslope or upscale depending on programmed burnout configuration.

**Controls & Functions**

**TEST**

When held sets loop current and display to test level, independent of temperature input, to allow testing of system operation

▲: Up: increase output or calibration values during setup

▼: Down: decrease output or calibration values during setup

**Loop Supply Voltage**

Any DC supply/loop resistance that maintains 8 VDC to 32 VDC at gauge terminals. Erratic operation may occur if loop voltage falls below specifications.

Indication on display for low loop power

Reverse polarity protected

**Loop Output Characteristics**

4-20 mA output configurable to span any part of temperature range

0.0013 mA loop current resolution for spans greater than 164°F (90°C)

Output resolution is reduced for spans less than 164°F (90°C)

Updated approximately 4 times per second

Configurable for upscale or downslope burnout

**Calibration**

User settable passcode to enter calibration mode

Zero and span temperature calibration

**Weight**

Transmitter: Approx. 12 ounces

Shipping weight: Approx. 1 pound

**Material and Color**

NEMA 4X ABS/polycarbonate housing, light gray

Gasketed rear cover

**Connection and Probe Material**

1/2" NPT male hex nipple, 316 stainless steel

316 stainless steel probe sheath

**Environmental**

Storage: -40 to 203°F (-40 to 95°C) at housing

Operating: -4 to 185°F (-20 to 85°C) at housing

**Description**

The PRTXD series is microprocessor controlled industrial temperature indicator with a digital temperature display and 4-20 mA retransmission in a rugged NEMA 4X housing. The PRTXD has a 2-wire connection and all operating power is supplied by the 4-20 mA current loop.

The RTD temperature reading is linearized for both the digital display and the 4-20 mA output. The temperature display may be set up to read °F or °C and the 4-20 mA output may be set to correspond to a desired temperature range.

**Installation and Precautions**

A thermowell is required with flowing material, pressurized applications, and all applications using spring-loaded versions of the PRTXD.

Install or remove using wrench on probe hex fitting only. Do not attempt to tighten by turning housing or any other part of the transmitter. Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation.

**Electrical Connections**

The 2-wire connection allows the PRTXD to be used as a temperature display powered by a low-voltage DC source, or as a loop-powered 4-20 mA transmitter. Connect the loop (+) supply to the RED lead and the loop (−) supply to the BLACK lead.

Reversing the connections will not harm the transmitter but it will not operate with incorrect polarity.

Select a loop power supply voltage and total loop resistance so that when the loop current is 20 mA, the transmitter will have at least 8 VDC at its terminals. For correct operation and to avoid erratic or erroneous readings, the terminal voltage must not fall below 8 VDC. Too large a loop resistance will cause the output to "limit" or saturate before reaching its full 20 mA output.

The minimum loop supply voltage may be calculated from the formula:

\[ V_{\text{min}} = 8V + (20\text{mA} \times \text{Total loop resistance}) \]

If the terminal voltage falls below about 7.8 VDC erratic operation may occur. This is an indication that the loop supply/resistance may not allow adequate power for reliable operation. This should never occur in normal use. If it does, examine the loop supply and resistance.

**Operation**

The PRTXD is designed for continuous operation. Warm-up time is negligible. When power is first applied, the PRTXD will set the loop current to maximum and check the voltage available. If there is sufficient voltage available to power the unit, all active segments will be displayed briefly. Then the display and the loop current will correspond to the temperature of the RTD probe.

At power-up, if the voltage available is not sufficient, only the low power segment will be displayed. This is an indication that the loop impedance is too high or the loop power supply voltage is too low. After successful power-up, if the loop voltage falls below the minimum required for reliable operation, the PRTXD will continue to indicate the temperature of the RTD with the low power segment blinking at a slow rate.

If the RTD temperature goes above 392°F or 200°C, ALARM1 will be displayed. If the RTD temperature goes below -58°F or -50°C, ALARM2 will be displayed.

If the RTD temperature continues beyond these limits, the display will eventually indicate 1...-...-...

and the loop current will be minimum if downslope burnout is configured or maximum if upslope burnout is configured.

**Functional Characteristics**

The display and the 4-20 mA output are updated approximately 4 times per second. The RTD probe has a time constant of approximately 10 seconds, which is typical of an RTD probe in a stainless sheath.

The RTD temperature measurement is read by an A/D (analog to digital) converter, linearized by the microprocessor and displayed on the LCD.

The digitized and linearized RTD signal is also converted to an analog signal to produce the 4-20 mA output. The 4-20 mA output can be set to any range within the linearized range of the PRTXD. The 4-20 mA D/A (digital to analog) conversion will produce a loop current resolution of approximately 0.0013 mA for spans as small as 164°F or 90°C.

For smaller spans, the A/D resolution is smaller than the D/A resolution and loop current resolution will decrease. As the output span setting is further reduced, uneven "stair stepping" may become noticeable in the output signal. For this reason extremely small 4-20 mA span settings may be undesirable and should be avoided.

**Passcode Entry**

The PRTXD has a user configurable passcode (factory default 3510) that must be entered to access the configuration and calibration modes.

See the appropriate sections for details on accessing and using these modes.

**Configuration**

Hold ▲ and press TEST to CFG

Calibration: Hold ▼ and press TEST to CAL

When the buttons are released, the upper display will indicate _ _ _ _ with the left-most position blinking, and the lower display will indicate P R A 5 5.

Pressing and releasing TEST exits passcode entry if no entry has been made.

Enter the user modifiable passcode.

Use the ▲ up and ▼ down buttons to set the left-most digit to 3.

Press and release the TEST pushbutton to move to the next position. The 3 will remain, and the second position will be blinking.

Use the ▲ up and ▼ down buttons to select 5.

Press and release the TEST button to move to the next position. 3 5 will remain, and the third position will be blinking.

Use the ▲ up and ▼ down buttons to select 1.

Press and release the TEST button to move to the next position. 3 5 1 will remain, and the fourth position will be blinking.

Use the ▲ up and ▼ down buttons to select 0.

Press and release the TEST button to continue with calibration procedures.

Note: If an incorrect passcode was entered, the display will eventually indicate —— —— —— —— with the left-most position blinking, and the lower section will indicate P R A 5 5.

To exit and return to the normal operating mode, press and release the TEST button.

Enter factory passcode 1220 as follows.
Use the ▲ up and ▼ down buttons to set the leftmost digit to 1.
Press and release the TEST button to index to the next position. The 1 will remain, and the second position will be blinking.
Use the ▲ up and ▼ down buttons to select 2.
Press and release the TEST button to index to the next position. 1 2 will remain, and the third position will be blinking.
Use the ▲ up and ▼ down buttons to select 2.
Press and release the TEST button to index to the next position. 1 2 2 will remain, and the fourth position will be blinking.
Use the ▲ up and ▼ down buttons to select 0.
Press and release the TEST button to proceed to the passcode configuration.

Note: If an incorrect passcode was entered, the gauge will exit to the normal operating mode.
The upper display section will indicate the user modifiable passcode. The lower section will display UDPCD.
To change the user modifiable passcode, press and release either the ▲ up or ▼ down button.
The first character of the passcode will begin to blink.
Use the ▲ up and ▼ down buttons to set the blinking character to the desired value, then press and release the TEST button to move to the next character.
Repeat for each character position.
When the user modifiable passcode is displayed with no characters blinking, press and release the TEST button to save the new passcode and restart the gauge.

Note: To make a correction to the new passcode before saving and restarting, press either the ▲ up or ▼ down button to return to the UDPCD code entry sequence.

Configuration Mode
Press and hold the ▲ up button and then press the TEST button until the upper display indicates CFG.
Enter the passcode as outlined in the the Passcode Entry section.
After the correct passcode is entered, press and release the TEST button to configure °F/°C, upscale/downscale burnout, 4 mA temperature, and 20 mA temperature.

Configuring Deg C or Deg F
The upper display section will be blank, and the lower section will display either DEG C or DEG F.
To change from °C to °F, press and release the ▲ up button. The lower section of the display will change to DEG F.
To change from °F to °C, press and release the ▼ down button. The lower section of the display will change to DEG C.
Note: whether or not a change is made, the Test value will be reset to 0.0°C or to 32.0°F.
Press and release the TEST button to move on to the next parameter.

Configuring Upscale or Downscale Burnout
The upper display section will be blank, and the lower section will display either DH BO or UP BO.
To change from upscale burnout to upscale burnout, press and release the ▲ up button. The lower section of the display will change to UP BO.
To change from upscale burnout to upscale burnout, press and release the ▼ down button. The lower section of the display will change to DH BO.
Press and release the TEST button to move on to the next parameter.

Configuring Range Lower Limit
The upper display section will indicate the temperature corresponding to a loop current of 4 mA. The lower section will display R GLO.
To change the temperature corresponding to a loop current of 4 mA, use the ▲ up and the ▼ down buttons to set the desired value.
Press and release the TEST button to move on to the next parameter.

Configuring Range Upper Limit
The upper display section will indicate the temperature corresponding to a loop current of 20 mA. The lower section will display R GHI.
To change the temperature corresponding to a loop current of 20 mA, use the ▲ up and the ▼ down buttons to set the desired value.

Exiting the Configuration Mode
Press and release the TEST button to save the configuration parameters and restart the gauge.
The configuration parameters will not be saved if the procedure is interrupted before completion.

TEST Button
When the front-panel TEST button is held depressed, the display and loop current are switched, independent of the temperature, to a test level determined by the setting of the Test adjustment.
To set the test output level, press and hold the front-panel TEST button and press the ▲ up or ▼ down button to adjust the test output to the desired temperature setting. This setting is stored in non-volatile memory.

Calibration
The PRTXD is factory calibrated and there is generally no need to alter calibration settings. Calibration should only be attempted if the user has access to a temperature reference of known accuracy.
The quality of the calibration is only as good as the accuracy of the calibration equipment and ideally should be at least four times the unit’s accuracy.

Entering Calibration Mode
While pressing and holding the ▼ down button, press the TEST button to enter the calibration mode.
The upper section of the display will indicate CAL.
Enter the passcode as outlined in the the Passcode Entry section.
After the correct passcode is entered, press and release the TEST button to continue with calibration procedures.

Loop Calibration
Upon successful passcode entry, the upper segments of the display will indicate the RTD probe temperature.
The lower segments of the display will alternate between CAL and either DEG C or DEG F. The loop current will correspond to the RTD probe temperature.

Note: To store the calibration parameters and exit calibration mode at any time, press and hold the TEST button until the display indicates - - - -.
The loop current calibration procedure coordinates the loop current to the display indication, and is performed independently of applied temperature. It requires a direct physical measurement of the loop current.

4 mA Loop Current
Press the TEST button and release it when the display indicates LCAL.
If the TEST button is held for longer than 2 seconds, the display will indicate - - - - and the gauge will exit the calibration mode when all buttons are released.
The upper display segments will indicate the preconfigured temperature corresponding to a 4 mA loop current. The lower display segments will alternate between CAL and 4 MA.
Use the ▲ up and ▼ down buttons to adjust the actual loop current to 4 mA.
Note: Only the loop current will change. The upper display segments will continue to indicate the preconfigured temperature.

20 mA Loop Current
Press the TEST button and release it when the display indicates HCAL.
If the TEST button is held for longer than 2 seconds, the display will indicate - - - - and the gauge will exit the calibration mode when all buttons are released.
The upper display segments will indicate the preconfigured temperature corresponding to a 20 mA loop current.
The lower display segments will alternate between CAL and 20 MA.
Use the ▲ up and ▼ down buttons to adjust the actual loop current to 20 mA.
Note: Only the loop current will change. The upper display segments will continue to indicate the preconfigured temperature.

Temperature Indication & Output Calibration
The temperature calibration procedure simultaneously adjusts both the display indication and the loop current to correspond to the actual applied temperature.
If the calibration is to be performed using an RTD simulator, open the rear cover of the enclosure, disconnect the RTD probe at the connector on the circuit board, and connect the simulator in its place.

Ice-Point Calibration
Press the TEST button and release it when the display indicates CAL.
If the TEST button is held for longer than 2 seconds, the display will indicate - - - - and the gauge will exit the calibration mode when all buttons are released.
Apply 0.0°C or 32.0°F to the RTD using a temperature bath with a known accurate reference thermometer. The lower display segments will alternate between CAL and DEG C or DEG F.
Use the ▲ up and ▼ down buttons to adjust the upper display segments to indicate 0.0°C or 32.0°F or a reading equal to the reference thermometer.

Span Calibration
Apply full-scale temperature to the RTD. The lower display segments will alternate between CAL and DEG C or DEG F.
Use the ▲ up and ▼ down buttons to adjust the upper display segments to indicate the applied temperature value.
To store the calibration parameters and exit calibration mode, press and hold the TEST button until the display indicates - - - -.
For immediate technical or application assistance:

USA and Canada: Sales Service: 1-800-826-6342 / 1-800-TC-OMEGA®
Customer Service: 1-800-622-2378 / 1-800-622-BEST®
Engineering Service: 1-800-872-9436 / 1-800-USA-WHEN®
Telex: 996404 EASYLINK: 62968934 CABLE: OMEGA

Canada: 976 Bergar
Laval (Quebec) H7L 5A1, Canada
Tel: (514) 856-6928 FAX: (514) 856-8886
e-mail: info@omega.ca

Mexico: En Español: (01) 203-359-7803 e-mail:spanol@omega.com
Fax: (01) 203-359-7807 info@omega.com.mx

USA: One Omega Drive, Box 4047
Stamford CT 06907-0047
Tel: (203) 359-1660 FAX: (203) 359-7700
e-mail: info@omega.com

For warranty requests, please have the following information available before contacting OMEGA:
1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty,
3. Repair instructions and/or specific problems relative to the product.

For return requests, consult OMEGA for current repair charges.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of 13 months from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal one (1) year product warranty to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product. If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a “Basic Component” under 10 CFR 21 (NRC), used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

For warranty returns, please have the following information available before contacting OMEGA:
1. Purchase Order number under which the product was purchased,
2. Model and serial number of the product under warranty,
3. Repair instructions and/or specific problems relative to the product.

For non-warranty repairs, consult OMEGA for current repair charges.

Have the following information available before contacting OMEGA:
1. Purchase Order number to cover the cost of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

The information contained in this document is believed to be correct, but OMEGA Engineering, Inc. accepts no liability for any errors it contains, and reserves the right to alter specifications without notice. WARNING: These products are not designed for use in, and should not be used for, human applications.

It is the policy of OMEGA to comply with all worldwide safety and EMCEMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

For more information, please contact OMEGA Engineering, Inc.