

# ExSense T SERIES HART SMART TEMPERATURE TRANSMITTERS

**EXsense**  
series

Model PD312 HART®



Model PD306 HART®



Model PD310 HART®



Model PD301



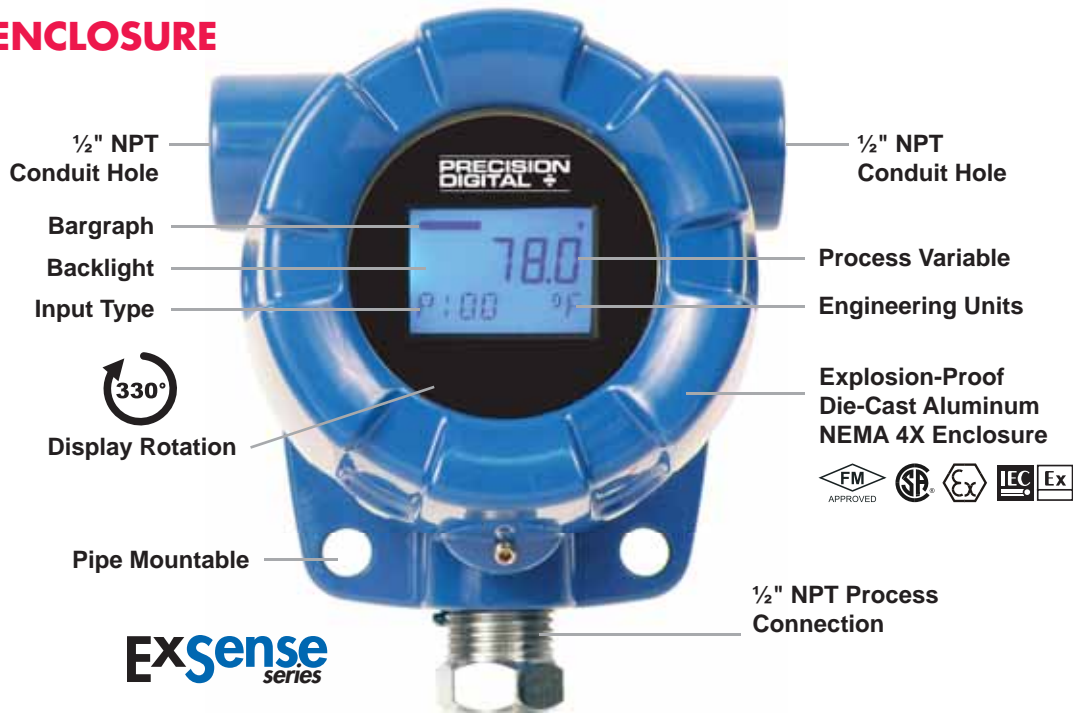
Model PD302 HART®



## FEATURES

- Smart Temperature Transmitters with HART® Protocol
- Universal Input: RTD, TC, Ohm & mV Inputs
- Easy to Program with PC or HART Communicator
- Order Configured at the Factory Ready to Install
- Enhanced Display Model with 330° Rotatable Backlit LCD
- Display PV, Input Type, Eng Units & Bargraph
- Enhanced Display Model PD312 with Pt100 RTD
- Low-Cost Model PD301, PC Programmable
- 2-Wire Scalable 4-20 mA Output
- Galvanic Isolation Prevents Ground Loops
- Wide Voltage Range: 10.5 to 45 VDC
- Operating Temperature: -40 to 75°C
- Automatic Cold Junction Compensation for TC Inputs
- Protection Heads & Thermowells Available
- FM, CSA, ATEX, IECEx Explosion-Proof Enclosures

**DISPLAY & ENCLOSURE  
FEATURES**



**EXsense**  
series

**INTRODUCTION**

The ExSense T Series is a line of smart temperature transmitters that include some models with HART® communication capability. These models can be configured using a HART modem and a PC running the free HART software provided, or they can be modified in the field using a handheld HART communicator. The other models can be configured using a USB modem and a PC running the free software provided. Enhanced displays models can be ordered with Pt100 RTD, J, K, T thermocouples; see Ordering Information for model numbers.

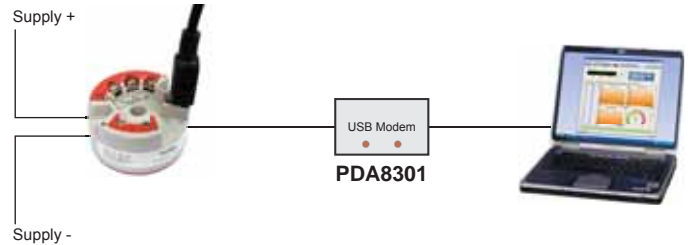
**PD301-PD306 Head Mount Models**

The head mount models are offered as: hockey-puck only (PD301 & PD302) which can be mounted inside a DIN Form B connection head, pre-mounted in a connection head (PD303 & PD304), and pre-mounted in a connection head with temperature probe (PD305 & PD306). The PD302, PD304, and PD306 include HART communication capability. Standard enclosed models have an aluminum connection head with a 1/2" NPT conduit hole and 1/2" NPT process opening for a probe, thermowell, or adaptor fitting, and are available with safe area (NEMA 4X, IP66 rated), or Certified explosion-proof housings. Non-standard models with other conduit hole and process opening sizes, as well as an optional stainless steel housing are available, see [www.predig.com/ExSenseBuilder](http://www.predig.com/ExSenseBuilder).

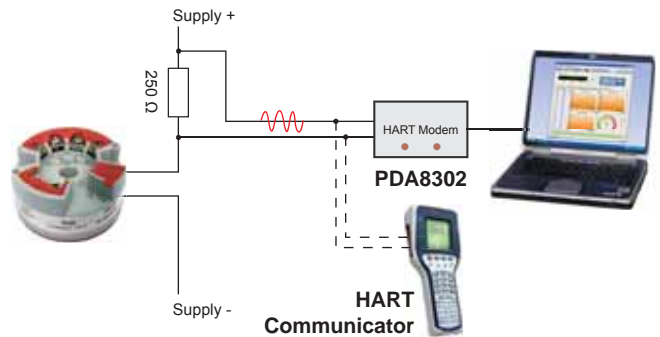
**PD310 & PD312 Enhanced Display Models**

The enhanced display models, with standard loop-powered backlight, let the user see the display under any lighting condition, and present valuable information such as the process variable, input type, engineering units, and bargraph. The display can be programmed to show the PV, mA output, or %. These models are housed in a sleek & rugged explosion-proof, NEMA 4X enclosure with two 1/2" NPT conduit holes, and one 1/2" NPT process sensor connection port for probe, thermowell, or adaptor fitting. Non-standard models with other conduit hole and process opening sizes are available, see [www.predig.com/ExSenseBuilder](http://www.predig.com/ExSenseBuilder). For remote mounting applications the PD310 may be ordered without the process sensor connection port. Both models are available with safe area (NEMA 4X, IP66 rated), or Certified explosion-proof enclosures.

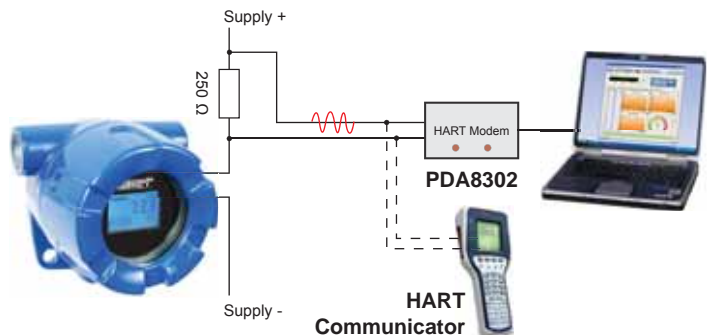
**PROGRAMMING**



**PD301-PD306 PC Programming**



**PD302 HART Programming**



**PD310 & PD312 HART Programming**

**PC Programming Software**



The Current Setup window is used to trim the analog output to match the device reading the current. Click on Read and type the values in the boxes. Click on Update to upload the new values to the transmitter. Test your loop by selecting a Fix Loop value and clicking Send.

The Parameter Setup window is used to set up the input type, range for the 4-20 mA, temp units, and other settings related to the sensor and analog output. You can also select to display PV, mA, or %.



The HART Information window allows you to program or read the transmitter information and to modify the HART address.

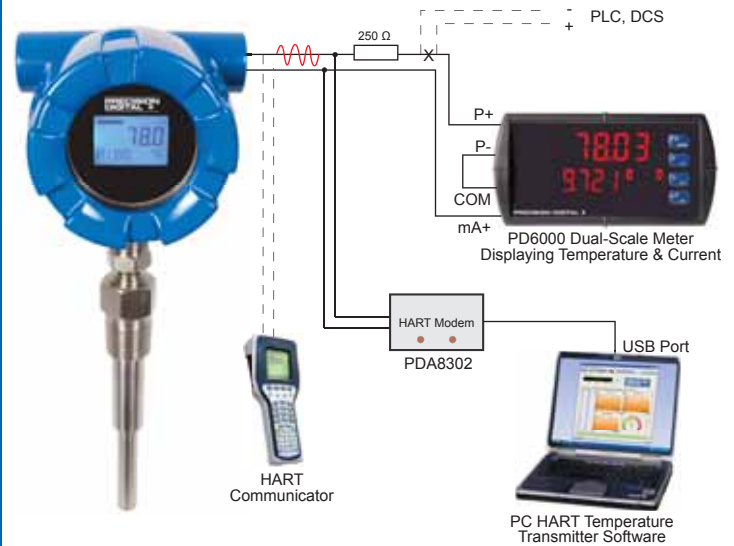
The Graph Monitor window is used to monitor the PV, mA, and %. You can also monitor just one of the variables. A log data file can be saved for later viewing; it contains the time, data value, and units. The screen update rate is selectable between 2 sec and 30 min.



**APPLICATIONS**

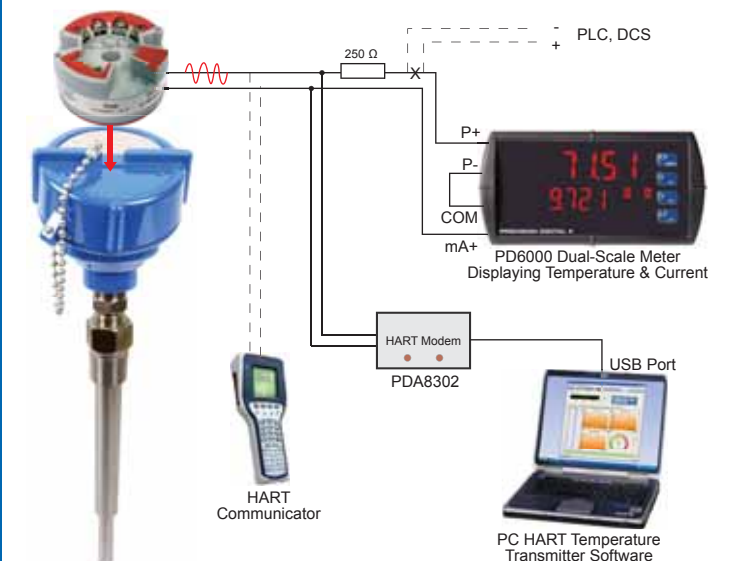
**PD312 HART Transmitter & Remote Display**

In this application the Smart HART Explosion-Proof Temperature Transmitter is being powered by the PD6000 dual-scale meter; the meter displays the temperature on the top and the mA current on the bottom display. A PLC, DCS, or other devices could be connected in the loop as shown. The 250 ohm resistor is the minimum loop resistance needed for HART communication with a HART modem or a HART communicator.



**PD306 HART Head Transmitter & Remote Display**

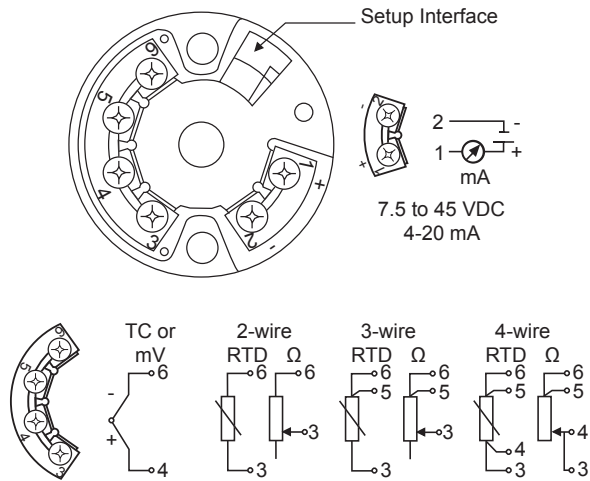
In this application the Smart Transmitter is mounted in the exp-proof protection head and is being powered by the PD6000 dual-scale meter. The HART communicator and HART modem are used during configuration or troubleshooting.



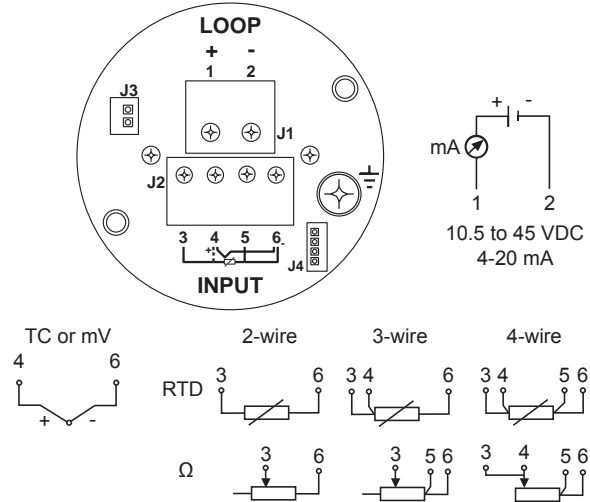


**CONNECTIONS**

**PD301-PD306**

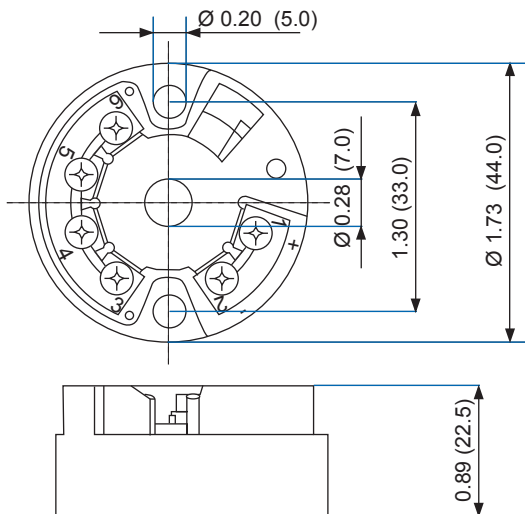


**PD310 & PD312**

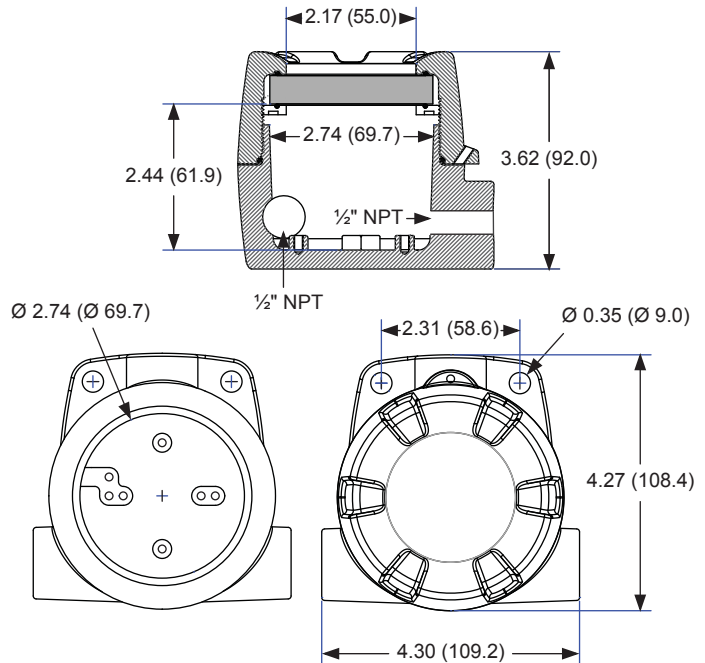


**DIMENSIONS**

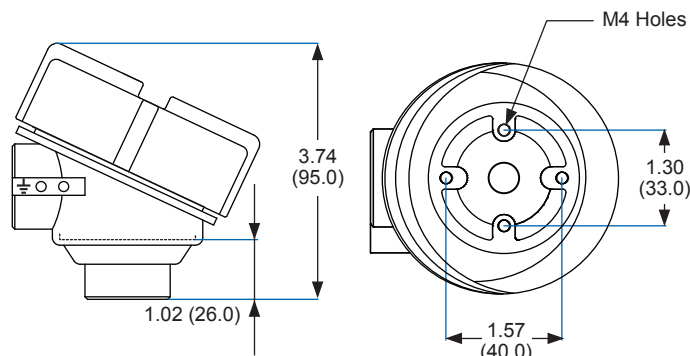
**PD301 & PD302**



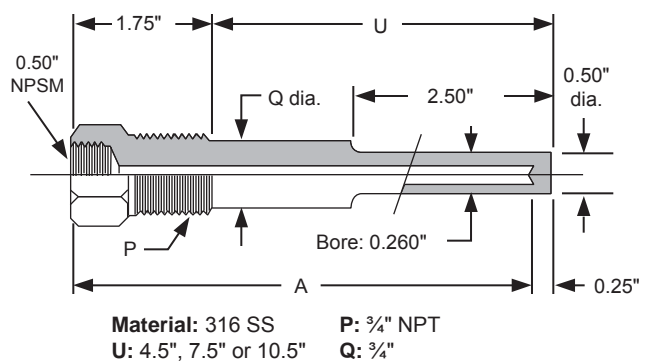
**PD310 & PD312**



**PD303 & PD304**



**Thermowell Type T1**



**ACCURACY & RANGES**

Input	Type	Input Range	Accuracy (% of Span)	Min Output Span (4-20 mA)
RTD	Pt100	-200 to 850°C (-328 to 1562°F)	±0.2°C or 0.08%	10°C (18°F)
	Pt500	-200 to 250°C (-328 to 482°F)	±0.5°C or 0.20%	10°C (18°F)
	Pt1000	-200 to 250°C (-328 to 482°F)	±0.3°C or 0.12%	10°C (18°F)
	Cu50	-50 to 150°C (-58 to 302°F)	±0.2°C or 0.08%	10°C (18°F)
	Cu100	-50 to 150°C (-58 to 302°F)	±0.3°C or 0.12%	10°C (18°F)
	Ni100	-60 to 180°C (-76 to 356°F)	±0.2°C or 0.08%	10°C (18°F)
	Ni500	-60 to 180°C (-76 to 356°F)	±0.5°C or 0.20%	10°C (18°F)
	Ni1000	-60 to 150°C (-76 to 302°F)	±0.3°C or 0.12%	10°C (18°F)
Potentiometer	Resistance	0 to 400 Ω	±0.1 Ω or 0.08%	10 Ω
		0 to 2,000 Ω	±1.5 Ω or 0.12%	100 Ω
TC	B	0 to 1820°C ( 32 to 3308°F)	±2.0°C or 0.08%	500°C (900°F)
	E	-270 to 1000°C (-454 to 1832°F)	±0.5°C or 0.08%	50°C (90°F)
	J	-210 to 1200°C (-346 to 2192°F)	±0.5°C or 0.08%	50°C (90°F)
	K	-270 to 1372°C (-454 to 2501°F)	±0.5°C or 0.08%	50°C (90°F)
	N	-270 to 1300°C (-454 to 2372°F)	±1.0°C or 0.08%	50°C (90°F)
	R	-50 to 1768°C ( -58 to 3214.4°F)	±2.0°C or 0.08%	500°C (900°F)
	S	-50 to 1768°C ( -58 to 3214.4°F)	±2.0°C or 0.08%	500°C (900°F)
	T	-270 to 400°C (-454 to 752°F)	±0.5°C or 0.08%	50°C (90°F)
	C	0 to 2320 °C (32 to 4208 °F)	±0.5°C or 0.08%	50°C (90°F)
	D	0 to 2320 °C (32 to 4208 °F)	±0.5°C or 0.08%	50°C (90°F)
Voltage	mV	-10 to 75 mV	±20µV or 0.08%	5 mV
		-100 to 100 mV	±20µV or 0.08%	5 mV
		-100 to 500 mV	±30µV or 0.08%	6 mV
		-100 to 2000 mV	±50µV or 0.08%	20 mV

**ACCESSORIES**

**TC & RTD Protection Heads**

- Exp-Proof Certified & General Purpose
- Aluminum & Stainless Steel
- NEMA 4X, IP66 Rated
- Stainless Steel Ball Chain



**RTD Probes & Thermowells**

RTD probes are offered in 6", 9", and 12" lengths and 1/4" diameter; other sizes are available upon request. Spring-loaded probes and thermowells are special order; please consult the factory for details.

**CONNECTION HEADS**

**Material:** Die-cast aluminum or 316 stainless steel  
**Certification:** FM/CSA/ATEX Explosion-proof Certified, NEMA 4X, IP66 or general purpose without certification  
**Connections:** Two 1/2" NPT for conduit and process connection; other sizes available upon request  
**Mounting Holes:** Accept M4 screws, see dimensions drawing  
**Surface Finishing:** Aluminum: Blue epoxy coated, Stainless steel: Electropolished  
**O-Ring:** Buna-N  
**Weight:** Aluminum: 0.450 kg (1.0 lbs), Stainless steel: 0.90 kg (2.0 lbs)  
**Features:** SS ball chain included, terminal block (Ceramic/Bakelite optional)  
**Overall Dimensions:** Dia. 3.5" x 4.0" (90 mm x 101.6 mm)

**ORDERING INFORMATION**

ExSense T Series • HART Smart Temperature Transmitters	
Base Model	Description
PD301	Head Mount Temperature Transmitter
PD302	HART Head Mount Temperature Transmitter
PD303	Temperature Transmitter with Connection Head
PD304	HART Temperature Transmitter with Connection Head
PD305	Temperature Transmitter with Connection Head & Temp Probe
PD306	HART Temperature Transmitter with Connection Head & Probe
PD310	HART Temperature Transmitter with Display
PD312	HART Temperature Transmitter with Display & Temperature Probe
PDA8301	USB Adapter for Head Mount Transmitter
PDA8302	HART to USB Modem
PDA1080WN	Safe Area Connection Head, Aluminum
PDA1080WM	Explosion-Proof Connection Head, Aluminum
PDA1080SM	Explosion-Proof Connection Head, Stainless Steel

Note: HART models must be configured using the HTTemp PC software and PDA8302 HART modem. The Input Type and Units cannot be changed with HART Communicators (e.g. HC275, HC375).

Go to [www.predig.com/ExSenseBuilder](http://www.predig.com/ExSenseBuilder) to build a complete model number and get pricing.

- Example 1:** PD301-C0 Head mount temperature transmitter with factory defaults  
**Example 2:** PD310-G2-C1 HART temperature transmitter with display, safe area, custom configuration  
**Example 3:** PD312-A2-C1-P11-S06-T106  
 PD312 = HART temperature transmitter with display & temperature probe  
 A2 = Explosion-proof aluminum with 1/2" NPT conduit & process connection  
 C1 = Custom configuration  
 P11 = 100 Pt RTD with 6" leads  
 S06 = Spring-loaded 6" probe  
 T106 = Type 1 thermowell to match 6" spring-loaded probe  
**Example of Other Options:**  
 • C0 = Factory default configuration      • G2 = General purpose enclosure for safe area  
 • C2 = Custom configuration with Certificate of Calibration      • R06 = 6" Rigid probe

## SPECIFICATIONS

Except where noted all specifications apply to operation at 25°C.

### General

**Input:** Universal RTD, TC, Resistance, or Voltage

**Output:** Two-wire 4-20 mA scalable

**Accuracy:** ±0.08% of span typical, see table for details

**Temperature Drift:** RTD: ±0.004°C/°C; TC: ±0.03°C/°C

**Underrange:** 3.8 mA

**Overrange:** 20.8 mA

**Sensor Break:** Selectable ≤3.6 mA Low Alarm or ≥22 mA High Alarm

**Response Time:** 1 second

**Long Term Stability:** Better than 0.05% per year

**Start Up Time:** Less than 5 seconds

**Noise Filter:** Programmable 0 to 85 µA

**Damping Time:** Programmable 0 to 30 sec

**Output Resolution:** 0.3 µA

**Non-Volatile Memory:** All programmed settings are stored in non-volatile memory for a minimum of ten years.

**Relative Humidity:** 0 to 90%, condensation allowed

**Isolation:** 2 kV input-to-output

**Shock & Vibration Resistance:** 4g/2 to 150 Hz as per IEC 60 068-26

**EMC:** Immunity & emission interference according to GB/T17626.2-1998), compliance with IEC 61000-4-3:1995

**Warranty:** 1 year parts & labor

### PD301 & 302 Head Mount Smart Transmitter

**Programming Method:**

PD301: PDA8301 USB modem and PC software

PD302: PDA8301 USB or PDA8302 HART modem and PC software or field handheld HART communicator\*

**Power Supply:** 7.5 to 45 VDC, reverse polarity protected

**Load Impedance:** 790 Ω @ 24 VDC max or ((V supply - 7.5 V)/0.0208 A) Ω

**Operating Temperature:** -40 to 85°C

**Storage Temperature:** -40 to 100°C

**Connections:** Screw terminals accept 12 to 22 AWG

**Enclosure:** Polycarbonate housing with epoxy potting, NEMA 1, IP00 (NEMA 4X, IP66 with PDA1080WM)

**Weight:** 1.18 oz (33.5 g)

**Overall Dimensions:** Dia. 1.73" x 0.89" (44 mm x 22.5 mm)

**Installation Angle:** No limit

**Installation Area:** Connection head according to DIN 43 729 Form B

### PD303 & PD304 Head-Mounted Smart Transmitter

**Programming Method:**

PD303: PDA8301 USB modem and PC software

PD304: PDA8301 USB or PDA8302 HART modem and PC software or field handheld HART communicator\*

**Power Supply:** 7.5 to 45 VDC, reverse polarity protected

**Load Impedance:** 790 Ω @ 24 VDC max or ((V supply - 7.5 V)/0.0208 A) Ω

**Operating Temperature:** -40 to 85°C

**Storage Temperature:** -40 to 100°C

**Connections:** Screw terminals accept 12 to 22 AWG

**Enclosure:** Aluminum or 316 SS mounting head NEMA 4X, IP66 with optional explosion-proof Certification

**Weight:** 1.0 lb (453.6 g)

**Overall Dimensions:** Dia. 3.5" x 4.0" (90 mm x 101.6 mm)

**Installation Angle:** No limit

**Installation Area:** Connection head according to DIN 43 729 Form B

\* The Input Type and Units cannot be changed with HART Communicators (e.g. HC275, HC375).

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### PD305 & PD306 Head-Mounted Smart Transmitter with Thermowell and/or Probe

**Programming Method:**

PD305: PDA8301 USB modem and PC software

PD306: PDA8301 USB or PDA8302 HART modem and PC software or field handheld HART communicator

**Power Supply:** 7.5 to 45 VDC, reverse polarity protected

**Load Impedance:** 790 Ω @ 24 VDC max or ((V supply - 7.5 V)/0.0208 A) Ω

**Operating Temperature:** -40 to 85°C

**Storage Temperature:** -40 to 100°C

**Connections:** Screw terminals accept 12 to 22 AWG

**Enclosure:** Aluminum or 316 SS mounting head NEMA 4X, IP66 with optional explosion-proof Certification

**Weight:** 1.0 lb (453.6 g) plus probe/thermowell weight

**Overall Dimensions:** Dia. 3.5" x 4.0" (90 mm x 101.6 mm) plus probe/thermowell length

**Installation Angle:** No limit

**Installation Area:** Connection head according to DIN 43 729 Form B

### PD310 & 312 Exp-Proof Smart Transmitter

**Display:** PV: 0.3" (8 mm) 5-digit LCD, Input & Units: 0.2" (5 mm)

**Bargraph:** 52 segments with 2% resolution

**Backlight:** Loop-powered, always on

**Programming Method:** PDA8302 HART modem and PC software or field handheld HART communicator

**Power Supply:** 10.5 to 45 VDC, reverse polarity protected

**Load Impedance:** 650 Ω @ 24 VDC max or ((V supply - 10.5 V)/0.0208 A) Ω

**Operating Temperature:** -40 to 75°C

**Storage Temperature:** -40 to 100°C

**Connections:** Screw terminals accept 12 to 22 AWG

**Enclosure:** Explosion-proof or general purpose die-cast aluminum, 0.3% max copper content, NEMA 4X, IP66; two ½" NPT conduit holes, one ½" NPT process connection; other sizes available upon request.

**Enclosure Approvals:** *FM:* Explosion-proof for Class I, Division 1, Groups B, C and D; dust-ignition-proof for Class II/III, Division 1, Groups E, F and G, hazardous (classified) locations, indoors and outdoors (Type 4X/IP66)

*CSA:* Explosion-proof for Class I, Division 1, Groups B, C and D; dust-ignition-proof for Class II/III, Division 1, Groups E, F and G, hazardous (classified) locations, indoors and outdoors (Type 4X/IP66)

*ATEX:* II 2 G D, Ex d IIC, Ex tD A21, IP68, Ta = -40°C to +85°C

*IECEX:* Ex d IIC, Ex A21 tD, IP68, Ta = -40°C to +85°C

**Weight:** 2.42 lb (1.10 Kg)

**Overall Dimensions:** 4.30" x 4.27" x 3.62" (109.2 x 108.4 x 92.0)

(W x H x D), probe and thermowell are not included

**EXsense**  
series

Your Local Distributor is:

LDS300\_B 03/10

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