

# PD6870 EXPLOSION-PROOF LOOP-POWERED PROCESS METER



- 4-20 mA input
- 1 V drop (4 V with Backlight)
- 3½ Digits LCD, 1" High
- Loop-Powered Backlight Option
- HART® Protocol Transparent
- Explosion-Proof, IP68, NEMA 4X Enclosure
- Flanges for Wall or Pipe Mounting
- Easy Calibration and Installation
- Operates from -40 to 75°C

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 <b>CAUTION:</b> Read complete instructions prior to installation and operation of the meter.	 <b>WARNING:</b> Risk of electric shock or personal injury.
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## WARNINGS

- This product is not recommended for life support applications or applications where malfunctioning could result in personal injury or property loss. Anyone using this product for such applications does so at his/her own risk. Precision Digital Corporation shall not be held liable for damages resulting from such improper use.
- Failure to follow installation guidelines could result in death or serious injury. Make sure only qualified personnel perform the installation.
- Never remove the meter cover in explosive environments when the circuit is live.
- Cover must be fully engaged to meet flameproof/explosion-proof requirements.

## Limited Warranty

Precision Digital Corporation warrants this product against defects in material or workmanship for the specified period under "Specifications" from the date of shipment from the factory. Precision Digital's liability under this limited warranty shall not exceed the purchase value, repair, or replacement of the defective unit.

## Registered Trademarks

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## INTRODUCTION

The ProtEX-FarVu PD6870 is a rugged, loop-powered meter with 1" display digits in an explosion-proof enclosure for demanding applications in hazardous areas or in the harshest environmental conditions. The meter derives all of its power from the 4-20 mA loop with a small 1 volt drop for easy installation in almost any system.

It is programmed using four easy to access front-mounted control dials with no complex or difficult to read programming menus necessary for setup. The numeric display will read from -1999 to 1999 over a 2000 count user adjustable scaling span. The backlight option lets you see the display under any lighting condition and is powered from the 4-20 mA loop with no additional power supply required.

The enclosure is provided with two threaded conduit holes and integrated pipe or wall mounting slotted flanges.

## ORDERING INFORMATION

Model	Description
PD6870-0L0	Explosion-Proof Loop-Powered Process Meter
PD6870-0K0	Explosion-Proof Loop-Powered Process Meter with Backlight

## Accessories

Model	Description
PDA0001	3/4" M-NPT to F-M20 Reducer
PDA0002	3/4" M-NPT to 1/2" F-NPT Reducer

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## SPECIFICATIONS

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

### General

<b>DISPLAY</b>	3 ½ digit LCD 1" (25.4 mm); -1999 to 1999
<b>DISPLAY UPDATE RATE</b>	2.5 Updates/Second
<b>OVERRANGE</b>	Display reads <i>!</i> on the left most digit
<b>PROGRAMMING METHOD</b>	Four front mounted rotary control dials accessed when the cover is removed.
<b>RECALIBRATION</b>	Recalibration is recommended at least every 12 months.
<b>NORMAL MODE REJECTION</b>	60 dB rejection ratio
<b>ENVIRONMENTAL</b>	Operating temperature range: -40 to 75°C Storage temperature range: -40 to 75°C Relative humidity: 0 to 90% non-condensing
<b>CONNECTIONS</b>	Screw terminals accept 12 to 22 AWG wire
<b>ENCLOSURE</b>	Explosion-proof die cast aluminum with glass window, 0.30% max copper content, corrosion resistant epoxy coating, color: blue. NEMA 4X, IP68. Two ¾" NPT threaded conduit openings. One ¾" NPT nickel plated brass conduit plug with 10 mm hex key fitting installed.
<b>MOUNTING</b>	May be mounted directly to conduit. Two slotted flanges for wall mounting or NPS 1½" to 2½" or DN 40 to 65 mm pipe mounting. See Mounting Dimensions on page 17.
<b>OVERALL DIMENSIONS</b>	5.65" x 5.25" x 4.86" (144 mm x 133 mm x 124 mm) (W x H x D)
<b>WEIGHT</b>	5.00 lbs (80 oz, 2.27 kg)
<b>WARRANTY</b>	3 years parts and labor


**Input**

<b>ACCURACY</b>	$\pm 0.1\%$ of full span $\pm 1$ count	
<b>TEMPERATURE DRIFT</b>	150 PPM/ $^{\circ}$ C from $-40$ to $75^{\circ}$ C ambient	
<b>DECIMAL POINT</b>	User selectable decimal point	
<b>CALIBRATION RANGE</b>	4 mA input: $-1000$ to $+1000$ ; 20 mA between 20 and 2000 counts greater than 4 mA display. Two point linear display span.	
<b>MAXIMUM VOLTAGE DROP</b>	<b>Without Backlight</b>	<b>With Loop-Powered Backlight</b>
	1 VDC @ 20 mA	4 VDC @ 20 mA
<b>EQUIVALENT RESISTANCE</b>	50 $\Omega$ @ 20 mA	200 $\Omega$ @ 20 mA
<b>INPUT OVERLOAD</b>	Over current protection to 2 A max.	
<b>HART TRANSPARENCY</b>	Analog input will not interfere with existing HART communications on the wired 4-20 mA signal	

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**Product Ratings and Approvals**

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<b>FM</b>	Class I, Division 1, Groups B, C, D Class II, Division 1, Groups E, F, G Class III, Division 1; T6 Class I, Zone 1, AEx d IIC T6 Gb Zone 21, AEx tb IIIC T85°C Ta = -40°C to +75°C Enclosure: Type 4X & IP66 Certificate number: 3040391
<b>ATEX</b>	 II 2 G D Ex d IIC T6 Gb Ex tb IIIC T85°C Db IP68 Ta = -40°C to +75°C ATEX Certificate: Sira 10ATEX1116X
<b>CSA</b>	Class I, Division 1, Groups B, C, D Class II, Division 1, Groups E, F, G Class III, Division 1; T6 Class I, Zone 1, Ex d IIC T6 Ta = -40°C to +75°C Enclosure: Type 4X & IP66 Certificate number: 11 2325749
<b>IECEX</b>	IECEX SIR 10.0056X Ex d IIC T6 Gb Ex tb IIIC T85°C Db IP68 Ta = -40°C to +75°C

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**Special Conditions for Safe Use:**

Use suitably certified and dimensioned cable entry device and/or plug. The equipment shall be installed such that the supply cable is protected from mechanical damage. The cable shall not be subjected to tension or torque. If the cable is to be terminated within an explosive atmosphere, then appropriate protection of the free end of the cable shall be provided.

**Year of Construction**

This information is contained within the serial number with the first four digits representing the year and month in the YYMM format.

**For European Community:** The PD6870 must be installed in accordance with the ATEX directive 94/9/EC, and the product certificate Sira 10ATEX1116X.

**Electromagnetic Compatibility**

<b>EMISSIONS</b>	EN 61326:2013 Safety requirements for measurement, control, and laboratory use – Industrial Group 1 Class A ISM emissions requirements
Radiated Emissions	Class A
<b>IMMUNITY</b>	EN 61326:2013 Safety requirements for measurement, control, and laboratory use
ESD	±4 kV contact, ±8 kV air
RFI – Amplitude Modulated	80-1000 MHz @ 10 V/m, 1.4-2.0 GHz @ 3 V/m, 2.0-2.7 GHz @ 1 V/m, 80% AM (1 kHz)
EFT	±2 kV DC mains, ±1 kV other
Telco Surge	±1 kV
CRFI	3 V, 0.15-80 MHz, 1 kHz 80% AM

**SAFETY INFORMATION****WARNINGS**

- Read complete instructions prior to installation and operation of the meter.
- Installation and service should be performed only by trained service personnel. Service requiring replacement of internal components must be performed at the factory.
- Disconnect from supply before opening enclosure. Keep cover tight while circuits are alive. Conduit seals must be installed within 18" (450mm) of the enclosure.
- Verify that the operating atmosphere of the meter is consistent with the appropriate hazardous locations certifications.
- If the meter is installed in a high voltage environment and a fault or installation error occurs, high voltage may be present on any lead



## INSTALLATION

**For Installation in USA:** The PD6870 must be installed in accordance with the National Electrical Code (NEC) NFPA 70.

**For Installation in Canada:** Install in accordance with applicable local and national regulations (e.g. NEC). The PD6870 must be installed in accordance with the Canadian Electrical Code CSA 22.1. All input circuits must be derived from a CSA approved Class 2 source.

**For European Community:** The PD6870 must be installed in accordance with the ATEX directive 94/9/EC and the product certificate Sira 10ATEX116X.

All controls and wiring connectors are accessed by opening the enclosure. To access electrical connectors, remove the 2 captive screws and remove the display module from the enclosure.



Disconnect from supply before opening enclosure. Keep cover tight while circuits are alive. Conduit seals must be installed within 18" (450mm) of the enclosure.

## Unpacking

Remove the meter from box. Inspect the packaging and contents for damage. Report damages, if any, to the carrier.

If any part is missing or the meter malfunctions, please contact your supplier or the factory for assistance.

## Pre-Installed Conduit Plug

The PD6870 is supplied with one pre-installed optional conduit plug for installations that do not require the use of both conduit entries. The conduit plug includes an internal hexagonal socket recess for removal. The pre-installed plug and installation is included in all hazardous area approvals of the PD6870.



**WARNING**

Installations of the supplied conduit plug require the application of non-setting (solvent free) thread sealant. If the pre-installed conduit plug is removed or replaced all relevant hazardous area guidelines must be followed for its installation or replacement conduit.

## Mounting

The PD6870 has two slotted mounting flanges that may be used for pipe mounting or wall mounting. Alternatively, the unit may be supported by the conduit using the conduit holes provided.

Refer to *Mounting Dimensions*, page 17 for details.



**WARNING**

Do not attempt to loosen or remove flange bolts while the meter is in service.

## Cover Jam Screw

The cover jam screw should be properly installed once the meter has been wired and tested in a safe environment. The cover jam screw is intended to prevent the removal of the meter cover in a flameproof environment without the use of tools. Using a M2 hex wrench, turn the screw clockwise until the screw contacts the meter. Turn the screw an additional 1/4 to 1/2 turn to secure the cover. Caution: Excess torque may damage the threads and/or wrench.

## Connections



### WARNINGS

- Static electricity can damage sensitive components.
- Observe safe handling precautions for static-sensitive components.
- Use proper grounding procedures/codes.
- If the meter is installed in a high voltage environment and a fault or installation error occurs, high voltage may be present on any lead or terminal.

To access the connectors, remove the enclosure cover and unscrew the two captive screws that fasten the display module. Remove the display module. Signal connections are made to a three-terminal connector on the rear of the display module. Grounding connections are made to the two ground screws provided on the base – one internal and one external.

- S+** 4-20 mA signal input positive terminal connection
- S-** 4-20 mA signal return/negative terminal connection
- B-** 4-20 mA signal return/negative terminal when using the installed loop powered backlight option.

Refer to Figure 1 for terminal positions.



### WARNING

Observe all safety regulations. Electrical wiring should be performed in accordance with all agency requirements and applicable national, state, and local codes to prevent damage to the meter and ensure personnel safety.



Figure 1. PD6870 Connectors

## Connections & Wiring Diagrams

Signal connections are made to a three-terminal connector mounted on the rear of the display module. The enclosure also provides one internal and one external earth grounding screw. The 4-20 mA input with no backlight has a maximum voltage drop of 1 V and is wired as shown in Figure 2. The loop-powered backlight configuration requires a total maximum voltage drop of 4 V. The backlight option is recommended for dim lighting conditions and is enabled when wired as shown in Figure 3.

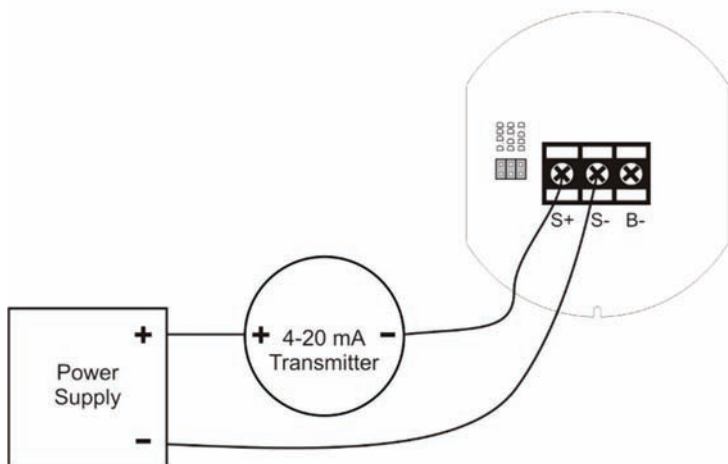


Figure 2. PD6870 Input Connections without Backlight

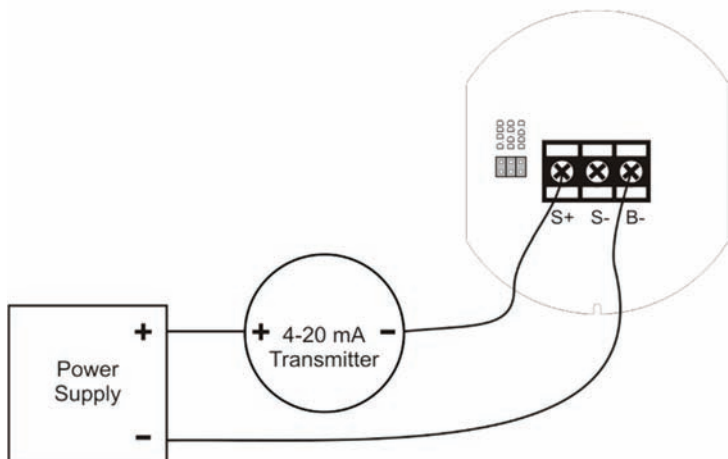


Figure 3. PD6870 Input Connections with Loop-Powered Backlight

## SETUP

### Overview

Setup is done using four rotary control dials located on the front of the display module that are accessed when the meter cover is removed. Setup is performed using a 4-20 mA signal source and scaling the 4 and 20 mA readings using the control dials.

### Scaling Controls and Display



Control	Description
LO	4 mA display adjust.
LO FINE	4 mA precision display adjust.
HI	20 mA display adjust.
HI FINE	20 mA precision display adjust.

## Setting Up the Meter

### Calibrating the Meter

The meter is provided factory calibrated to display -50.0 at 4 mA and 150.0 at 20 mA. HI and LO coarse and fine controls are labeled on the front of the display. Use the HI and LO controls for large range changes during calibration and the HI FINE and LO FINE controls for precision changes.

Apply a 4 mA signal and adjust the LO controls to display the desired reading. Apply a signal between 16 and 20 mA and adjust the HI controls to display the desired reading. Complete the calibration procedure by making minor adjustments to the LO and HI controls as necessary.

### Minimum & Maximum Input Span

A minimum input span of 20 counts is required between a 4 mA and 20 mA input. A maximum input span of 2000 counts may be setup between a 4 mA and 20 mA input. The meter will not properly calibrate or display if these minimum and maximum span ranges are not maintained during scaling.

### Setting the Decimal Point

Decimal point may be set using a three position jumper on the rear of the display module. To access the connectors, unscrew the two captive screws that fasten the display module. Remove the display module and place the jumper on the desired pins as indicated on the board for decimal point locations of D.DDD, DD.DD, DDD.D, or remove it if no decimal point is desired.

## Factory Defaults & User Settings

The following table shows the factory setting for most of the programmable parameters on the meter. Next to the factory setting, the user may record the new setting for the particular application.

Model: \_\_\_\_\_ S/N: \_\_\_\_\_ Date: \_\_\_\_\_

<b>Parameter</b>	<b>Default Setting</b>	<b>User Setting</b>
<i>Decimal point</i>	<i>1 place</i>	
<i>Calibration Settings</i>		
<i>Input 1</i>	<i>4.00 mA</i>	
<i>Display 1</i>	<i>-50.0</i>	
<i>Input 2</i>	<i>20.00 mA</i>	
<i>Display 2</i>	<i>150.0</i>	

## TROUBLESHOOTING

The rugged design and the user-friendly interface of the meter should make it unusual for the installer or operator to refer to this section of the manual. If the meter is not working as expected, refer to the recommendations below.

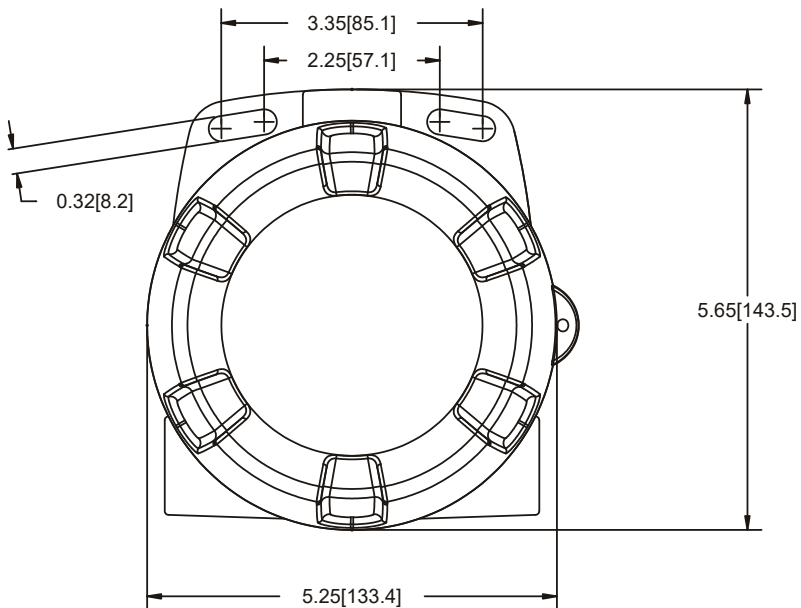
### Troubleshooting Tips

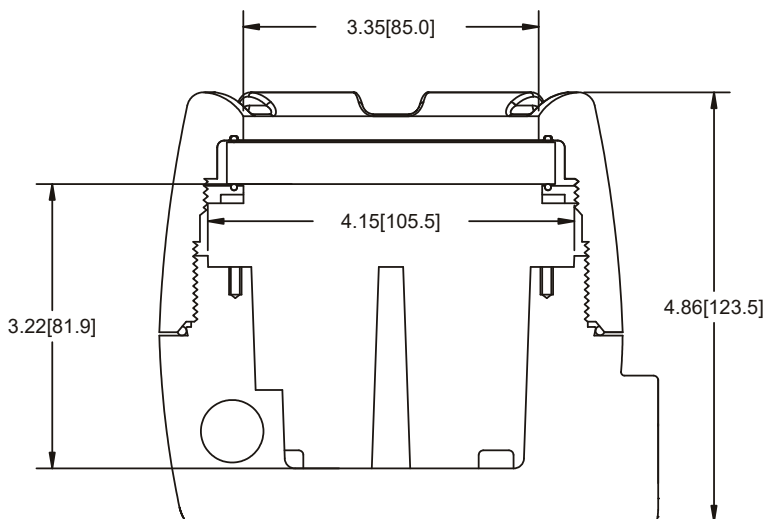
Symptom	Check/Action
No display	Check input signal connections.
Rate display unsteady during calibration	Adjust LO FINE or HI FINE controls to fine-tune the display.
Meter displays $f$ on the left most digit location	Check signal level is not over range. Dial down the HI control and re-calibrate at 20 mA.
Display is faded	Check input signal is not under 1 mA.
If the display locks up or the meter does not respond at all	Perform hard reset by shorting S+ and S- terminals.
Backlight does not appear	Verify backlight is installed. Check signal connections are as shown in Figure 3 on page 12.
Other symptoms not described above	Call Technical Support for assistance.



**MOUNTING DIMENSIONS**

All units: inches [mm]

**Figure 4. Enclosure Dimensions – Front View**



**Figure 5. Enclosure Dimensions – Side Cross Section View**

**Note:** The supplied conduit plug may extend up to 0.6 in [15 mm] from the conduit opening when installed.

# EU DECLARATION OF CONFORMITY

Issued in accordance with ISO/IEC 17050-1:2004 and ATEX Directive 2014/34/EU.

We,

**Precision Digital Corporation**  
233 South Street  
Hopkinton, MA 01748 USA

as the manufacturer, declare under our sole responsibility that the product(s),

**Model PD6870 Series Loop Powered Meter**

to which this declaration relates, is in conformity with the European Union Directives shown below:

<b>2014/35/EU</b>	<b>Low Voltage Directive</b>
<b>2014/34/EU</b>	<b>ATEX Directive</b>
<b>2014/30/EU</b>	<b>EMC Directive</b>
<b>2011/65/EU</b>	<b>RoHS Directive</b>

This conformity is based on compliance with the application of harmonized or applicable technical standards and, when applicable or required, a European Union notified body certification.

## Standards:

EN 60079-0:2009	EN 60079-1:2007
EN 60079-31:2009	EN 61010-1:2001
EN 61326:2006	

The standards EN 60079-0:2009, EN 60079-1:2007, EN 60079-31:2009, EN 61010-1:2001, and EN 61326:2006 are no longer harmonized. The requirements of these standards have been checked against the harmonized standard EN 60079-0:2012+A11:2013, EN 60079-1:2014, EN 60079-31:2014, EN 61010-1:2010, and EN 61326:2013 and there were no major technical changes affecting the latest technical knowledge for the products listed above.

**EC Type Examination Certificate:** Sira 10ATEX1116X

## Product Markings:



II 2 G D  
Ex d IIC T6 Gb  
Ex tb IIIC T85°C Db IP68  
Tamb = -40°C to +75°C

**ATEX Notified Body for EC Type Examination Certificate:** Sira Certification Service, NB 0518  
Unit 6, Hawarden Industrial Park  
Hawarden, Deeside, CH5 3US, UK

**ATEX Quality Assurance Notification No.:** SIRA 10 ATEX M462

**ATEX Notified Body for Quality Assurance:** Sira Certification Service, NB 0518  
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Hawarden, Deeside, CH5 3US, UK

Signed for and on behalf of Precision Digital Corporation:

Name: Jeffrey Peters  
Company: Precision Digital Corporation  
Title: President  
Date: 02/12/2018



Document No: DoC PD6870 {021218}

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