

PD6870 Explosion-Proof Loop-Powered Process Meter

Instruction Manual



- Fully-Approved Explosion-Proof Loop-Powered Process Meter
- 4-20 mA Input
- 1 Volt Drop (4 Volt Drop with Backlight)
- 1.0" (25.4 mm) 3½ Digits LCD Display; -1000 to 1999
- Display Mountable at 0°, 90°, 180°, & 270°
- HART® Protocol Transparent
- Loop-Powered Backlight Option
- Operating Temperature Range: -40 to 75°C (-40 to 167°F)
- Zero & Span Potentiometer Adjustments for Easy Field Scaling
- Conformal Coated PCBs for Dust and Humidity Protection
- FM Approved as Explosion-Proof / Dust-Ignition Proof / Flame-Proof
- CSA Certified as Explosion-Proof / Dust-Ignition Proof / Flame-Proof
- ATEX and IECEx Certified as Flame-Proof
- Wide Viewing Angle
- Flanges for Wall or Pipe Mounting
- Explosion-Proof, IP68, NEMA 4X Die-Cast Aluminum Enclosure
- Two 3/4" NPT Threaded Conduit Openings (One Plug Installed)
- 2" U-Bolt Kits Available
- Stainless Steel Tag Available
- 3-Year Warranty

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Disclaimer

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CAUTION

- Read complete instructions prior to installation and operation of the meter.

WARNINGS

- Risk of electric shock or personal injury.
- 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 alive.
- Cover must be fully engaged to meet flameproof/explosion-proof requirements.

WARNING

Cancer and Reproductive Harm - www.P65Warnings.ca.gov

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. See Warranty Information and Terms & Conditions on www.prediq.com for complete details.

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Introduction

The ProtEX-FarVu PD6870 is a rugged, explosion-proof, loop-powered meter with 1" display digits ideal 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.

The meter is programmed using four easy to access front-mounted potentiometers with no complex or difficult to read programming menus necessary for setup.

The numeric display will read from -1000 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
PDAPLUG75	3/4" Metal Conduit/Stopping Plug
PDA0001	3/4" M-NPT to F-M20 Reducer
PDA0002	3/4" M-NPT to 1/2" F-NPT Reducer
PDA1024-01	24 VDC Power Supply for DIN Rail
PDA6846	Steel 2" U-Bolt Kit. All Material: Zinc Plated Steel; (1) U-Bolt for 2" Pipe with (2 each) Washers, Lock Washers, and Nuts.
PDA6846-SS	Stainless Steel 2" U-Bolt Kit. All Material: Stainless Steel; (1) U-Bolt for 2" Pipe with (2 each) Washers, Lock Washers, and Nuts.
PDA-SSTAG	Custom Stainless Steel Tag (see website for convenient ordering form)

Accessories

PDA1024-01 24 VDC Power Supply



The [PDA1024-01](#) is a DIN rail mounted 1.5 A, 24 VDC power supply that can be used to power the 4-20 mA transmitter.

PDA6846 2" U-Bolt Kits



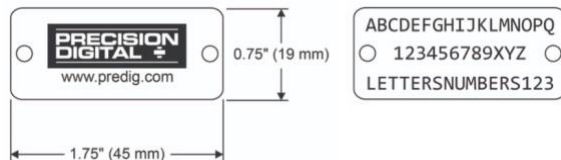
The [PDA6846](#) U-Bolt Kits provides a convenient way to mount the PD6870 to 1.5" or 2" pipes. They are available in steel and stainless steel.

PDA-SSTAG Stainless Steel Tag



The [PDA-SSTAG](#) is a laser etched stainless steel tag that can be customized with three lines of text. Each tag comes with a stainless steel wire and lead seal for easy mounting wherever you need.

Dimensions



Useful Tools

PD9501 Multi-Function Calibrator



This [PD9501](#) Multi-Function Calibrator has a variety of signal measurement and output functions, including voltage, current, thermocouple, and RTD.

PD9502 Low-Cost Signal Generator



The [PD9502](#) is a low-cost, compact, simple to use 4-20 mA or 0-10 VDC signal generator. It can easily be set for 0-20 mA, 4-20 mA, 0-10 V or 2-10 V ranges. Signal adjustment is made with a one-turn knob. A 15-27 VDC wall plug is provided with the instrument. Optional USB power bank is available.

Helpful Videos

The following videos might be of interest.

ProtEX Explosion-Proof Meter Introduction

Learn about all the meters in the ProteX Series.



https://www.predig.com/videos/rJsvL_8PEyc

ProtEX Approvals Overview

The ProtEX Series carries extensive international approvals for hazardous areas.



<https://www.predig.com/videos/CTsNXQeRqTA>

ProtEX Enclosure Unique Features

Learn about the unique features of the ProtEX Series enclosures.



<https://www.predig.com/videos/SwWKJ3L8ibo>

Introduction to ProtEX SafeTouch Programming

Through-glass buttons make programming easy without removing the enclosure's cover.



https://www.predig.com/videos/SafeTouch_Buttons

ProtEX-F&I Loop-Powered Level Meter

The PD6801 level meter displays level in feet and inches, providing simple and easy-to-understand level indication.



<https://www.predig.com/videos/AkWDnB-XI9k>

Vantageview Series Introduction

This series designed for use in safe areas delivers the same functionality of the ProtEX Series in a rugged plastic enclosure.



https://www.predig.com/videos/OC_trhGqTWU

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Specifications

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


General

Display	3 ½ digit LCD 1" (25.4 mm); -1000 to 1999
Display Orientation	Display may be mounted at 90° increments up to 270° from default orientation.
Display Update Rate	2.5 Updates/Second
Backlight	White; Loop-powered. Backlight can be enabled or disabled via alternative wiring of terminal block. Loop-powered backlight brightness will increase as the input signal current increases.
Display Overrange	Display reads 1 on the left most digit
Programming Method	Four (coarse and fine for zero and span) potentiometers accessed when the cover is removed.
Recalibration	Recalibration is recommended at least every 12 months.
Normal Mode Rejection	60 dB rejection ratio
Environmental	Operating temperature range: -40 to 75°C Storage temperature range: -40 to 75°C Relative humidity: 0 to 90% non-condensing Printed circuit boards are conformally coated.
Connections	Screw terminals accept 12 to 22 AWG wire
Enclosure	NEMA 4X, IP68 Explosion-proof die cast aluminum, 0.30% max copper content, corrosion resistant epoxy coating, Color: Blue Window: Glass Two ¾" NPT threaded conduit openings. One ¾" NPT nickel plated brass conduit plug with 12 mm hex key fitting installed.
Mounting	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 <i>Dimensions</i> on page 9.
Overall Dimensions	5.65" x 5.25" x 4.86" (W x H x D) (144 mm x 133 mm x 124 mm)
Weight	5.00 lbs (80 oz, 2.27 kg)
Warranty	3 years parts and labor. See Warranty Information and Terms & Conditions on www.predig.com for complete details.

Input

Input	4-20 mA						
Accuracy	±0.1% of full span ±1 count						
Maximum Voltage Drop & Equivalent Resistance	<table border="1"> <thead> <tr> <th>Without Backlight</th> <th>With Loop-Powered Backlight</th> </tr> </thead> <tbody> <tr> <td>1 VDC @ 20 mA</td> <td>4 VDC @ 20 mA</td> </tr> <tr> <td>50 Ω @ 20 mA</td> <td>200 Ω @ 20 mA</td> </tr> </tbody> </table>	Without Backlight	With Loop-Powered Backlight	1 VDC @ 20 mA	4 VDC @ 20 mA	50 Ω @ 20 mA	200 Ω @ 20 mA
Without Backlight	With Loop-Powered Backlight						
1 VDC @ 20 mA	4 VDC @ 20 mA						
50 Ω @ 20 mA	200 Ω @ 20 mA						
Temperature Drift	150 PPM/°C from -40 to 75°C ambient						
Decimal Point	User selectable decimal point						
Calibration Range	4 mA input: -1000 to +1000; 20 mA between 20 and 2000 counts greater than 4 mA display. Two point linear display span.						
Input Overload	Over current protection to 2 A max.						
HART Transparency	<p>The meter does not interfere with existing HART communications; it displays the 4-20 mA primary variable and it allows the HART communications to pass through without interruption.</p> <p>The meter is not affected if a HART communicator is connected to the loop. The meter does not display secondary HART variables.</p>						

Product Ratings and Approvals

FM	Explosion-proof for use in: Class I, Division 1, Groups B, C and D Dust-ignition proof for use in: Class II/III, Division 1, Groups E, F and G; T6 Flame-proof for use in: Class I, Zone 1, AEx d Group IIC; T6 Protection by Enclosure: Zone 21, AEx tb IIIC; T85°C Ta = -40 to 75°C. Enclosure: Type 4X, IP66. Certificate number: 3040391
CSA	Explosion-proof for use in: Class I, Division 1, Groups B, C and D Dust-ignition proof for use in: Class II/III, Division 1, Groups E, F and G; T6 Flame-proof for use in: Zone 1, Ex d IIC T6 Ta = -40 to 75°C. Enclosure: Type 4X & IP66/IP68. Certificate number: 2325749
ATEX	 II 2 G D. Flame-proof for use in: Zone 1, Ex d IIC T6 Gb Protection by Enclosure for use in: Dust Atmospheres (Zone 21) Ex tb IIIC T85°C Db IP68. Ta = -40°C to +75°C Certificate number: Sira 10ATEX1116X
IECEX	Flame-proof for use in: Zone 1, Ex d IIC T6 Gb Protection by Enclosure for use in: Dust Atmospheres (Zone 21) Ex tb IIIC T85°C Db IP68. Ta = -40°C to +75°C Certificate number: IECEX SIR 10.0056X

Electromagnetic Compatibility

Emissions	EN 61326-1 Safety requirements for measurement, control, and laboratory use – Industrial Group 1 Class A ISM emissions requirements
Radiated Emissions	Class A
Immunity	EN 61326-1 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

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 2014/34/EU, and the product certificate Sira 10ATEX1116X.

EU Declaration of Conformity

EU Declaration of Conformity is available in the Documentation CD provided with the product under the **EU DoC** menu.

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: 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 2014/34/EU and the product certificate Sira 10ATEX1116X.

⚠ WARNING

- 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.

All controls and wiring connections are located on the display module that is accessed by removing the enclosure cover. The controls can be accessed without removing the display module. The wiring connections can be accessed by removing the display module which is secured to the enclosure by two captive screws.

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 conduit plug for installations that do not require the use of both conduit entries. The conduit/stopping plug includes an internal hexagonal socket recess for removal. The conduit plug and its factory installation are included in all hazardous area approvals of this product.

⚠ WARNING

- In hazardous areas, conduit and conduit/stopping plugs require the application of non-setting (solvent free) thread sealant. It is critical that all relevant hazardous area guidelines be followed for the installation or replacement of conduit or plugs.

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 *Figure 1* and *Figure 2*.

⚠ WARNING

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

Dimensions

All units: inches (mm)

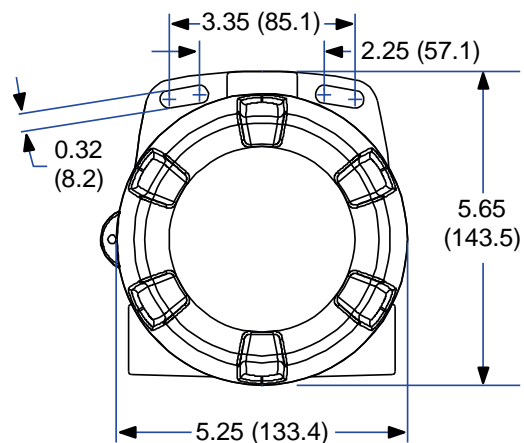


Figure 1. Enclosure Dimensions – Front View

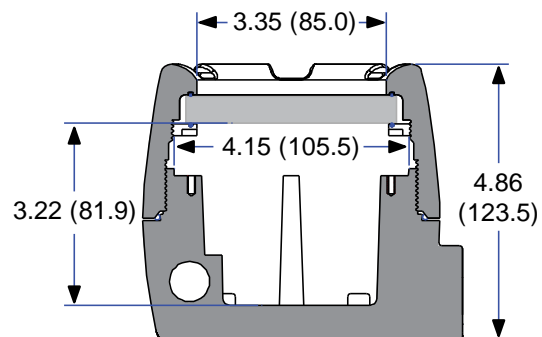


Figure 2. Enclosure Dimensions – Side Cross Section View

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



Download free 3-D CAD files of these instruments to simplify your drawings!

predig.com/documentation-cad

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

To access the wiring connections, remove the enclosure cover and unscrew the two captive screws that fasten 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 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 3* for terminal positions.

⚠ WARNINGS

- 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.
- 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.

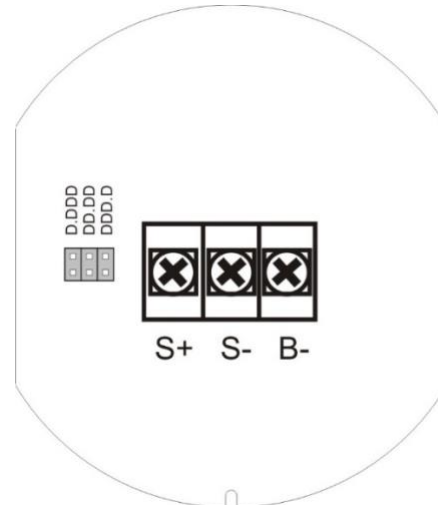


Figure 3. Connector Board

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 4*. 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 5*.

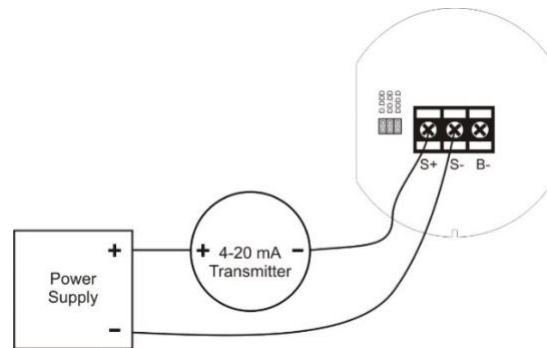


Figure 4. Connections without Backlight

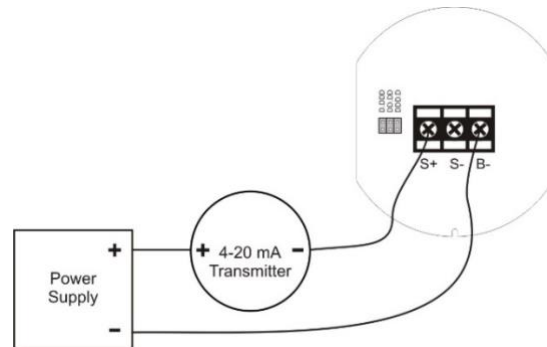


Figure 5. Connections with Loop-Powered Backlight

Setup

Overview

Setting the 4-20 mA input for the desired display is done using a calibrated 4-20 mA signal source and the four potentiometers located on the front of the display module. The cover must be removed to access these potentiometers. There is also a jumper array for setting the decimal point.

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

Setting the Decimal Point

A decimal point may be set using a three-position jumper array located on the rear of the display module. To access the jumper array, 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.

Minimum & Maximum Input Span

A minimum input span of 20 counts is required between the 4 mA and 20 mA inputs. A maximum input span of 2000 counts may be setup between the 4 mA and 20 mA input.

The meter will not calibrate properly if these minimum and maximum span ranges are not maintained during scaling.

Calibrating the Meter

The meter is provided factory calibrated to display -50.0 at 4 mA and 150.0 at 20 mA.

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

Factory Default & 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: _____

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

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.
Display unsteady during calibration	Adjust LO FINE or HI FINE controls to fine-tune the display.
Meter displays 1 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.
Backlight does not appear	Verify backlight is installed. Check signal connections are as shown in <i>Figure 5</i> on page 10.
Other symptoms not described above	Call Technical Support for assistance.

Contact Precision Digital

Technical Support

Call: (800) 610-5239 or (508) 655-7300

Fax: (508) 655-8990

Email: support@predig.com

Sales Support

Call: (800) 343-1001 or (508) 655-7300

Fax: (508) 655-8990

Email: sales@predig.com

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