

# YPP6870 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
- CSA Certified as Explosion-Proof / Dust-Ignition Proof / Flame-Proof
- ATEX and IECEx Certified as Flame-Proof
- Wide Viewing Angle
- Built-In Flange for Wall or Pipe Mounting
- Explosion-Proof, IP68, NEMA 4X Die-Cast Aluminum Enclosure
- Two 3/4" NPT Threaded Conduit Openings
- 3-Year Warranty

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**Disclaimer**

The information contained in this document is subject to change without notice. Yokogawa makes no representations or warranties with respect to the contents hereof; and specifically disclaims any implied warranties of merchantability or fitness for a particular purpose.

**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. Yokogawa 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.

**WARNING**

Cancer and Reproductive Harm - [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

**Limited Warranty**

Yokogawa Corporation warrants this product against defects in material or workmanship for the specified period under “Specifications” from the date of shipment from the factory. Yokogawa’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.yokogawa.com/us](http://www.yokogawa.com/us) for complete details.

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**Introduction**

The YPP6870 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 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
YPP6870-0K0	Explosion-Proof Loop-Powered Process Meter with Backlight

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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); -1000 to 1999
<b>Display Orientation</b>	Display may be mounted at 90° increments up to 270° from default orientation.
<b>Display Update Rate</b>	2.5 Updates/Second
<b>Backlight</b>	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.
<b>Display Overrange</b>	Display reads <i>f</i> on the left most digit
<b>Programming Method</b>	Four (coarse and fine for zero and span) potentiometers 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 Printed circuit boards are conformally coated.
<b>Connections</b>	Screw terminals accept 12 to 22 AWG wire
<b>Enclosure</b>	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.
<b>Mounting</b>	May be mounted directly to conduit. Built-in flange for wall mounting or NPS 1½" to 2½" or DN 40 to 65 mm pipe mounting. See <i>Dimensions</i> on page 7.
<b>Overall Dimensions</b>	5.65" x 5.25" x 4.86" (W x H x D) (144 mm x 133 mm x 124 mm)
<b>Weight</b>	5.00 lbs (80 oz, 2.27 kg)
<b>Warranty</b>	3 years parts and labor. See Warranty Information and Terms & Conditions on <a href="http://www.yokogawa.com/us">www.yokogawa.com/us</a> for complete details.

### Input

<b>Input</b>	4-20 mA						
<b>Accuracy</b>	±0.1% of full span ±1 count						
<b>Maximum Voltage Drop &amp; Equivalent Resistance</b>	<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						
<b>Temperature Drift</b>	150 PPM/°C from -40 to 75°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>Input Overload</b>	Over current protection to 2 A max.						
<b>HART Transparency</b>	<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>						

## General Compliance Information

### Electromagnetic Compatibility

<b>EMC Emissions</b>	<ul style="list-style-type: none"> <li>CFR 47 FCC Part 15 Subpart B Class A emissions requirements (USA)</li> <li>ICES-003 Information Technology emissions requirements (Canada)</li> <li>AS/NZS CISPR 11 Group 1 Class A ISM emissions requirements (Australia/New Zealand)</li> <li>EN 55011 Group 1 Class A ISM emissions requirements (EU)</li> <li>EN 61000-6-4 Emissions requirements for Heavy Industrial Environments - Generic</li> </ul>
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<b>EMC Emissions and Immunity</b>	EN 61326-1 EMC requirements for Electrical equipment for measurement, control, and laboratory use – industrial use
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### Product Ratings and Approvals

<b>CSA</b>	<p>Explosion-proof for use in: Class I, Division 1, Groups B, C and D</p> <p>Dust-ignition-proof for use in: Class II/III, Division 1, Groups E, F and G; T6</p> <p>Flame-proof for use in: Zone 1, Ex d IIC T6</p> <p>Ta = -40 to 75°C</p> <p>Enclosure: Type 4X &amp; IP66/IP68</p> <p>Certificate number: 2605742</p>
<b>ATEX</b>	<p>Explosion-proof for use in: II 2 G D</p> <p>Ex db IIC T6 Gb</p> <p>Ex tb IIIC T85°C Db IP68</p> <p>Ta = -40 to 75°C</p> <p>Certificate number: Sira 13ATEX1121X</p>
<b>IECEX</b>	<p>Explosion-proof for use in: Ex db IIC T6 Gb</p> <p>Ex tb IIIC T85°C Db IP68</p> <p>Ta = -40 to 75°C</p> <p>Certificate number: IECEX SIR 13.0042X</p>

### ATEX/IECEX Specific Conditions of Use

- The equipment label and epoxy coating may generate an ignition-capable level of electrostatic charges under certain extreme conditions. The user should ensure that the equipment is not installed in a location where it may be subjected to external conditions (such as high-pressure steam) which might cause a buildup of electrostatic charges on non-conducting surfaces. Additionally, cleaning of the equipment should be done only with a damp cloth.
- Flameproof joints are not intended to be repaired.
- All entry closure devices shall be suitably certified as "Ex d", "Ex t" and "IP66/68" as applicable. Suitable thread sealing compound (non-setting, non-insulating, non-corrosive, not solvent based, suitable for the ambient rating) must be used at the NPT conduit entries to achieve the IPx8 rating while maintaining the Ex protection concept.

### 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 YPP6870 must be installed in accordance with the ATEX directive 2014/34/EU, the product certificate Sira 13ATEX1121X, and the product manual.

## EU Declaration of Conformity

For shipments to the EU and UK, a Declaration of Conformity was printed and included with the product. For reference, a Declaration of Conformity is also available on our website.

## Safety Information

### CAUTION

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

### WARNINGS

- Risk of electric shock or personal injury.
  - Hazardous voltages exist within enclosure.
  - Installation and service should be performed only by trained service personnel.
  - Service requiring replacement of internal components must be performed at the factory.
  - 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.
- 

## Installation

**For Installation in USA:** The YPP6870 must be installed in accordance with the National Electrical Code (NEC) NFPA 70.

**For Installation in Canada:** The YPP6870 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 YPP6870 must be installed in accordance with the ATEX directive 2014/34/EU, the product certificate Sira 13ATEX1121X, and the product manual.

### WARNING

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

Wiring connectors are accessed by opening the enclosure. To access electrical connectors, remove the 2 captive screws, then disconnect the ribbon cable from the display module and set the display module aside.

## 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.

## 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 hazardous 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, screw head, or wrench.
-

### Mounting

The YPP6870 has a built-in flange 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]

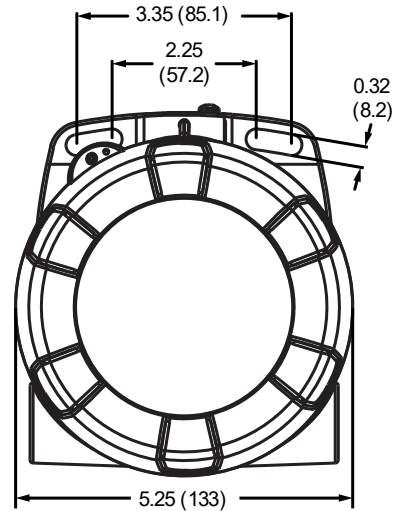


Figure 1. Enclosure Dimensions - Front View

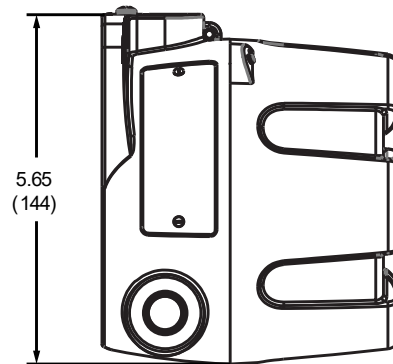


Figure 2. Enclosure Dimensions - Side View

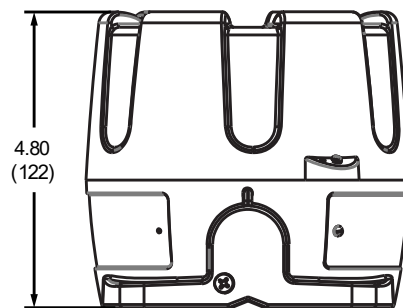


Figure 3. Enclosure Dimensions - Top View

## 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.

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

Refer to *Figure 4* 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.

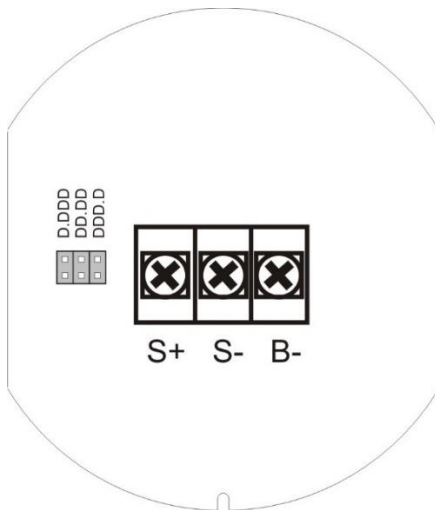


Figure 4. Connector Board

## 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 5*. 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 6*.

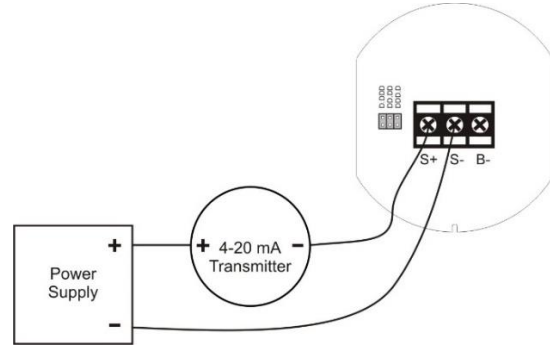


Figure 5. Connections without Backlight

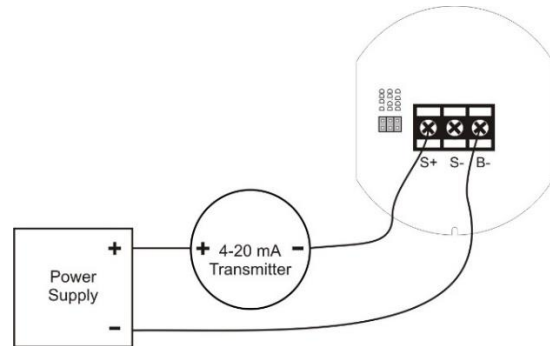


Figure 6. Connections with Loop-Powered Backlight



## 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 recalibrate 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 6</i> on page 8.
Other symptoms not described above	Call Technical Support for assistance.

## Contact Yokogawa

Sales and Technical Support

[www.yokogawa.com/us/contact](http://www.yokogawa.com/us/contact)

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