

Precision Digital Presents

Loop-Powered Devices, The Fundamentals

Webinar Organizers



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Objectives & Takeaways



Learn the critical criteria required for using a loop-powered device.



Be able to decide if loop power is your best choice.



Learn the conditions or application criteria that would prohibit use of a loop-powered device.

Agenda

1

Definition and characteristics of loop-powered devices

2

Critical specifications for loop power

3

When is loop power my best choice?

4

What would prevent me from using a loop-powered device?

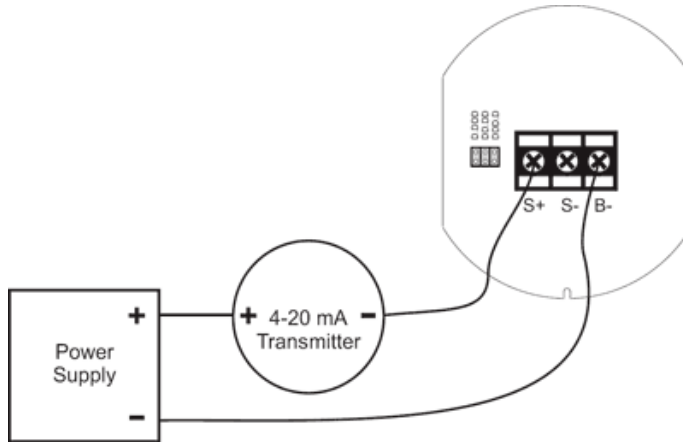
Getting to know you

- Where are you located?
- What is your industry?
- What is your level of expertise?

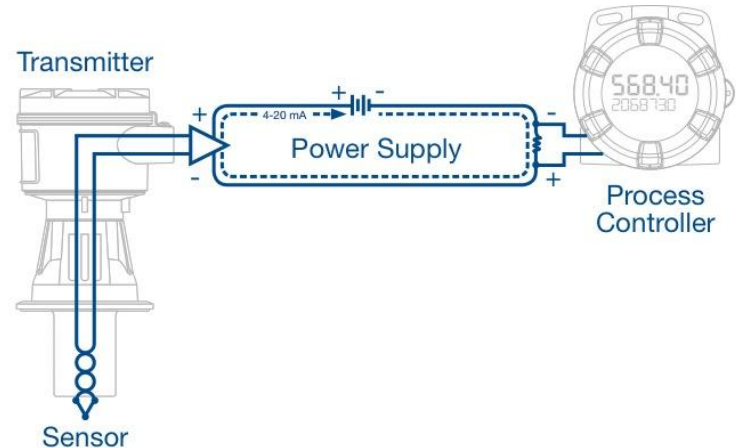


What is a loop-powered device?

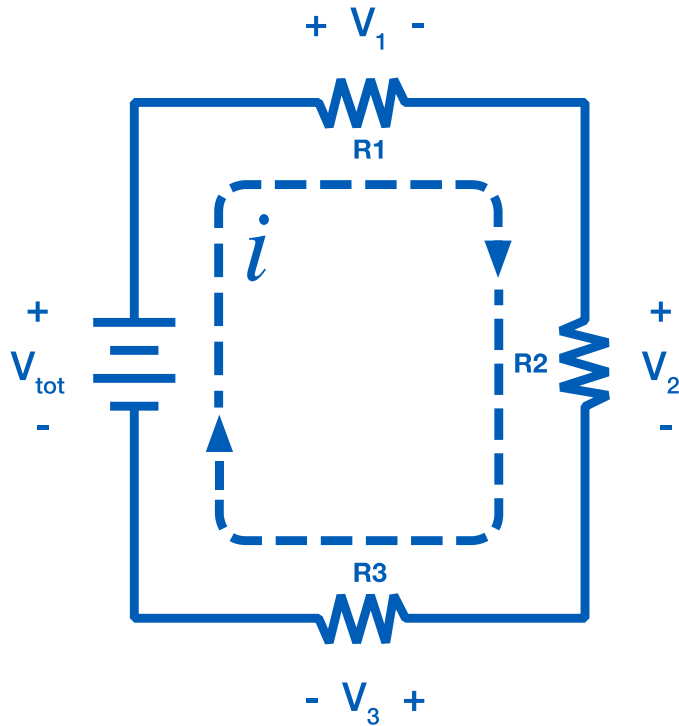
- A loop powered device gets its power from the system to which it is connected – there is no external power supply.
- ‘Loop power’ is the same as ‘2 wire’.



*Example Wiring of PD6870
Loop-Powered Explosion-Proof Display*



What is a loop-powered device?



- A loop powered device does not affect the current in the current loop
- The device adds a load/voltage drop into the loop

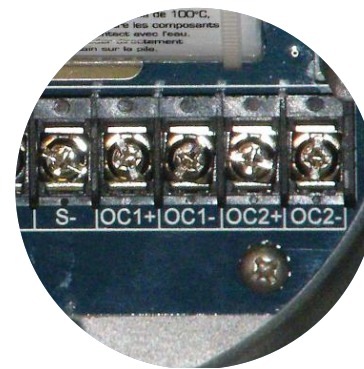
Characteristics of a loop-powered meter



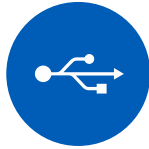
- Almost always have LCD displays (if any display)



- Few output options available
 - Open collector transistor
 - Passive analog output



Characteristics of a loop-powered meter



- Extremely limited serial communication options
 - Slow speed communication
 - Additional power options required



- Hazardous area approvals common
 - Intrinsically safe
 - Non-incendive

Critical specifications for loop power



- Voltage drop (is a specification)

- Examples:

- 3.0 V_{max}
- 3 V @ 20 mA
- 150 Ω input impedance (or equivalent resistance)

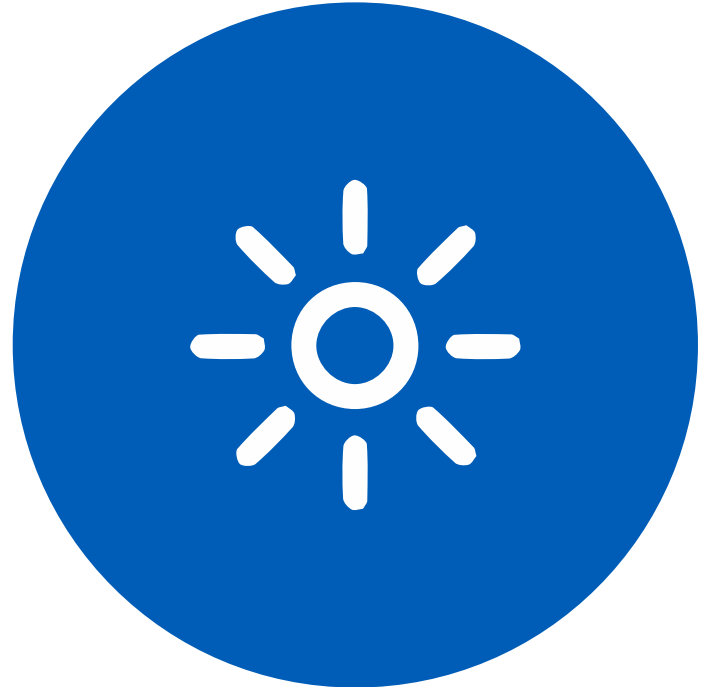
Remember:

$$V = IR$$
$$V_{\text{DROP}} = (.020 \text{ A}) * (150 \text{ } \Omega) = 3 \text{ V}$$

- More complicated devices may have a look up table (supply voltage vs. equivalent resistance, etc.)

Critical specifications for loop power

- Device voltage drops add up to determine total voltage drop
- Power supply must support cumulative voltage drop
- Example 4 Device Loop:
 - 24 V_{DC} Supply (V_{tot})
 - 2-Wire Rader Xmitter (V_1)
 - 12 V_{DC} @ 20 mA
 - Loop Powered Display (V_2)
 - 3 V_{DC} @ 20 mA
 - PLC Input (V_3)
 - PLC Externally Powered
 - Loop Drop Insignificant ($\approx 0.2 V_{DC}$)
 - V Supply > Voltage Drop
 - $24 V > 12 V + 3 V + 0.2 V$



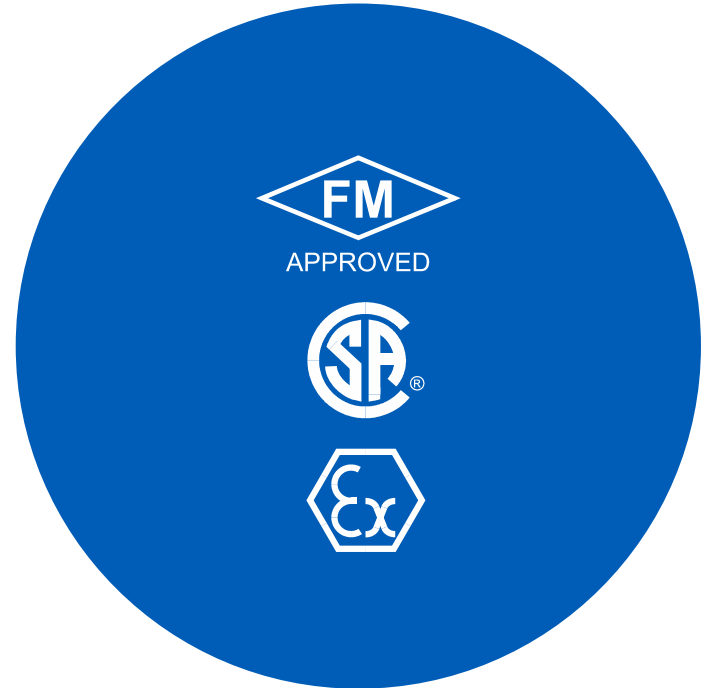
Critical specifications for loop power



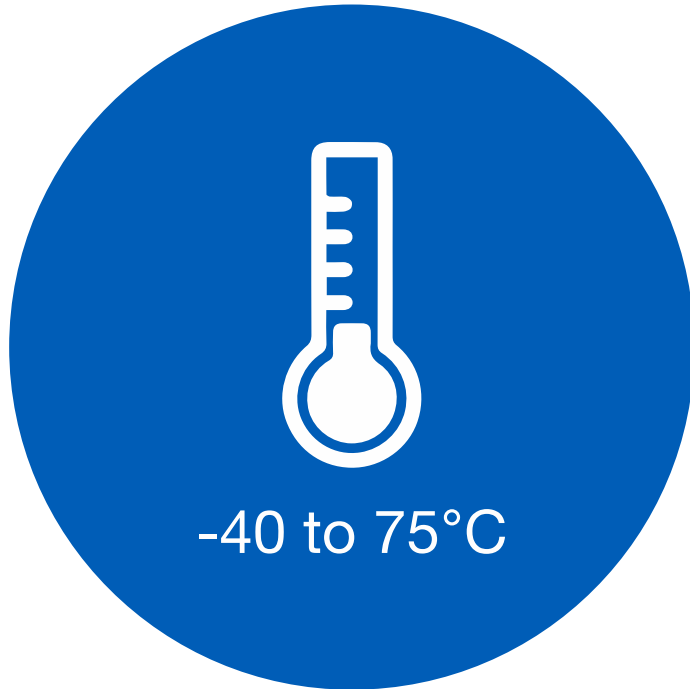
- Output spec
(refer back to characteristics)
 - Low power output signal
 - Usually need supplemental devices

Critical specifications for loop power

- Agency approvals common (as needed for your application)
 - Intrinsically safe (I.S.)
 - Non-incendive (N.I.)



Critical specifications for loop power



- Operating Temperature Range
 - Low temperature affects the LCD
 - depends on the type of LCD
 - Below -20°C is typically where LCD stops working
 - -40° LCDs are available
 - High temperature typically as high as $+180^{\circ}\text{C}$. Device temp range limited by other factors.

Getting to know you

- What is your primary application?



Questions



- Please enter your questions in the 'Chat' window – on the tab at the bottom of your control panel on the left side of your screen.

When is loop power my best choice?

Pros

- Simple and easy display for 4-20 mA transmitter
- Low cost solution for display
- Agency approvals (I.S. or N.I.)

Cons

- Very limited output options
- Very low power
 - Does not support relays
 - Does not support LEDs
 - Passive analog outputs only
 - Limited display variety
 - Limited serial communications
- Voltage drop/power supply considerations

When is loop power my best choice?

Let's review a real world application

Application

- Tank farm in need of remote level displays for oil tanks
- No power readily available
- The installation is outdoors and in a hazardous area

Solution

- A loop-powered indicator with an explosion-proof enclosure and agency approvals worked best



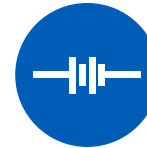
What criteria will prevent me from using loop power?



LED or Advanced LCD displays are not supported by loop power

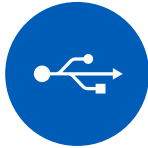


High power outputs such as relays or powered 4-20 mA outputs are not supported by loop power



External power supply required (in the transmitter or other)

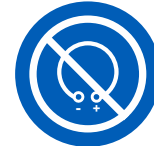
What criteria will prevent me from using loop power?



Requirement for
serial
communications



Extremely low
temperatures
($< -20^{\circ}\text{C}$) are usually
prohibitive



If you don't have 4-20
mA loop current
(ie: pulse, RTD,
thermocouple)

Summary

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What would prevent me from using a loop-powered device?

Getting to know you

- How often do you specify digital displays?



Q & A



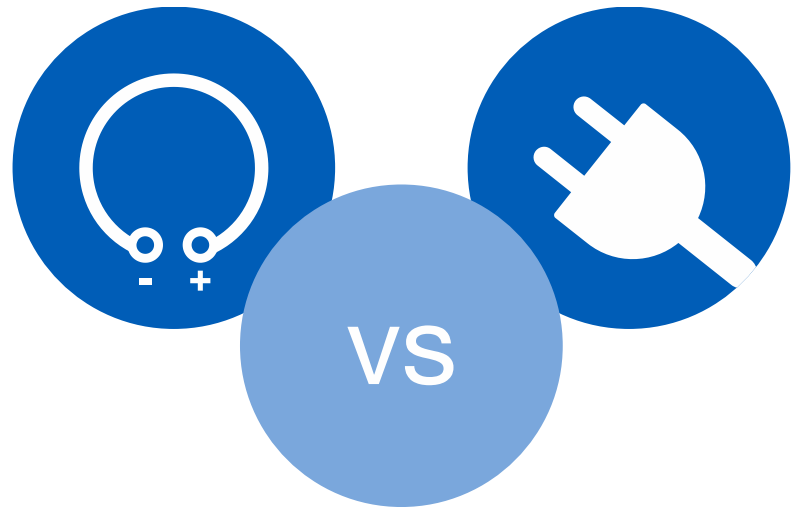
- Please enter your questions in the 'Chat' window – on the tab at the bottom of your control panel on the left side of your screen.
- Apologies if we do not get to your question today. We'll contact you offline with a response as soon as possible.

Next webinar – December 9

Loop vs Line Power; Understanding 2, 3 and 4 wire signals

An introductory class for those who have to deal with process signals but are not electrical engineers. After attending this webinar:

1. Understand the fundamentals and differences between the 2 wire, 3 wire and 4 wire connections
2. Determine the best choice for your application
3. Make the best decision for your instruments and meters



Precision Digital

Helping you become more proficient with process signals connections and communications.



Your source for:

- Loop Powered Meters
- Digital Panel Meters
- Explosion-Proof Instruments
- Large Display Meters
- And more



For more information



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thank you