4-20 mA – Wireless Smart Sensor Connectivity Kit

SENSING INCREDIBLE THINGS

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4-20 mA Process Signals

What is 4-20 mA

- A very common means to connect 'field devices' (Sensors) to control and monitoring equipment
- Devices are often referred to as **field transmitters** and include:
  - Temperature, Pressure, Strain, Ultrasonic, Level, Flow, pH and many others
- Common in **Intrinsically Safe** applications where sensor measurement is isolated from the detection system.
- The current flowing in the circuit, referred to as the *Loop Current* will vary between 4 and 20 mA, determined by the measured value
- If the current is less than 4 mA or greater than 20 mA indicates and **error condition**
- The mA signal is typically **scaled** to represent engineering units, for example, for an ultrasonic Depth measurement:
  - 4 mA == 10 feet depth
  - 20 mA == 100 feet depth

Advantages of 4-20 mA

➢ Less sensitive to electrical noise

➢ Integrated broken wire detection (0 mA)

➢ Long range transmission
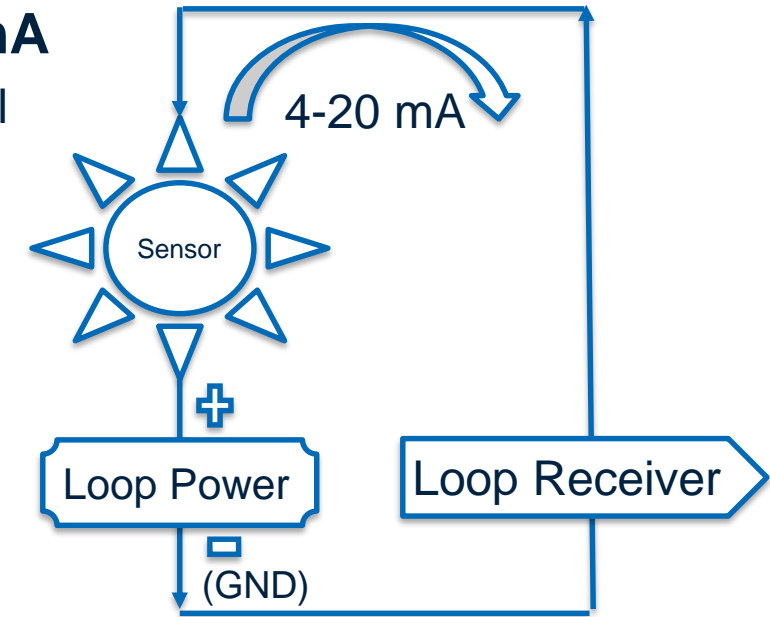
- **Loop Power**: Provides 'excitation' voltage to the sensor, typically 12 – 24 Vdc
- **Sensor**: Controls the current that flows thru the circuit based on the measured value
- **Loop Receiver**: Converts the 4-20 mA signal and displays or transmits the measured value
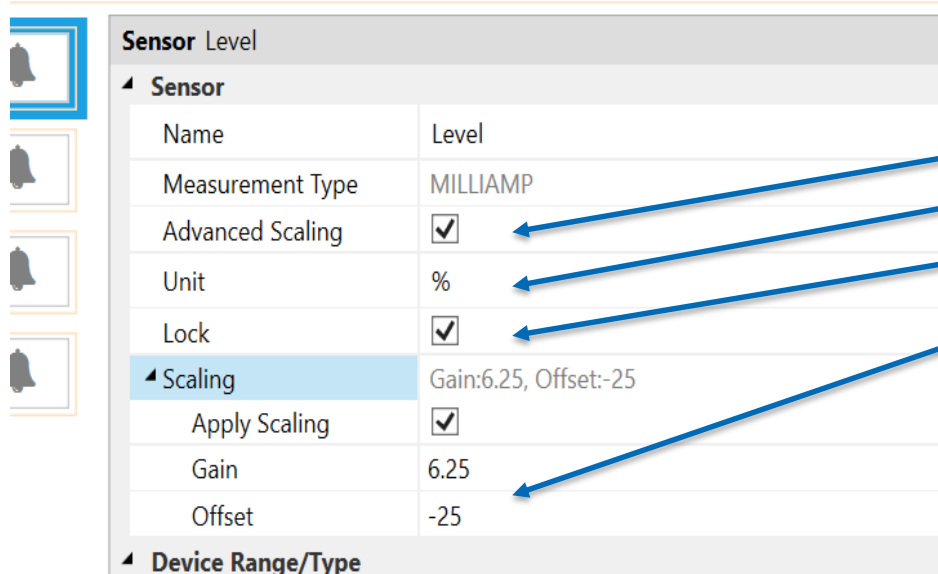
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4-20 Process Signal

External Device

M12.8-S-M-FM

PSU-93

XW-ED

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ZW-REC Receiver

SmartEdge Gateway

Pin	Connection
1	N.C.
2	4-20 mA Process Signal 1 (Positive)
3	4-20 mA Process Signal 0 (Positive)
4	N.C.
5	Shield
6	N.C.
7	Ground
8	3.3 Vdc (Not Used)

- **PSU-93** Provides Excitation current
- **M12.5-S-M-FM** provides 8 pin Screw Terminal connector
- **XW-ED** converts 4-20 mA to Smart Sensor digital interface and transmits wirelessly to **ZW-REC** receiver

- XW-ED supports up to 2 external 4-20 Process Signals
- ZW-REC supports up to 128 XW-EDA transmitters

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4-20 mA Process Signals - Scaling

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- External 4-20 mA signal conveys information in terms of mA, which represent some other 'unit of measure'
  - Level Sensor Example: 4 mA == 10 ft of water, 20 mA == 100 ft of water *or* 4 mA == 0% full, 20 mA = 100% full
- Smart Sensor allows linear **scaling** of measurement for **unit** conversion using simple $y = Mx + B$ formula, where M is the 'gain' and B is an offset.
  - Determine Gain: (Actual_Hi – Actual_Lo)/(Reading_Hi – Reading_Lo) == (100 – 0) / (20 - 4) == 6.25
  - Determine Offset: use calculated Gain, with 0 as Actual == 0 - 6.25 * 4 == -25
  - Change the 'units' string to %

Sensor Level

◢ Sensor	
Name	Level
Measurement Type	MILLIAMP
Advanced Scaling	☑
Unit	%
Lock	☑
◢ Scaling	Gain:6.25, Offset:-25
Apply Scaling	☑
Gain	6.25
Offset	-25
◢ **Device Range/Type**	

Advanced Scaling option opens the scaling options
Change *unit* to any string (maximum 4 characters)
Ensure *lock* option is set (retains across power reset)

Enter calculated **Gain** and **Offset** values

Level	Input1	Input2	Input3
50.0 %	0.0 mA	0.0 mA	N0:0 | IN1:0 DI

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