



Connecting Ultrasonic Sensors to an Entek Bubbler

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In this article I am going to explain how to connect and calibrate the ultrasonic sensors we provide with our Bubbler system.

First, I am going to explain how to interface these sensors. The devices we provide are 4-20mA sensors and we use an analog interface for two reasons:

- A 4-20mA signal can travel longer distances
- It is not so affected by fading compared to RS232 or by noise that can be induced in the wires.

Now I am going to include some information that explained before in a previous article:

"4 – 20 mA Basics"

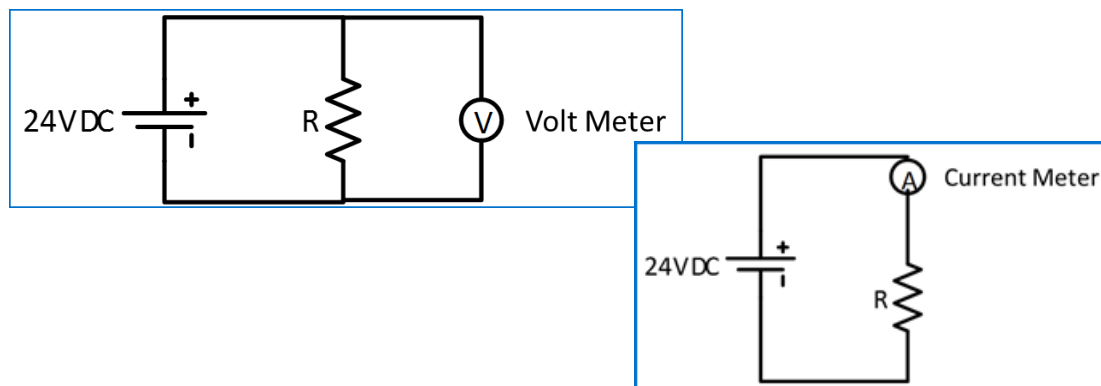
The 4-20 mA current loop consists of a power supply, a transmitter, and passive loop devices. The sensor draws current from its power source based on the measurement. For example, one sensor that is configured to measure 200 PSI as the maximum value draws 20 mA. If it measures 100 PSI, it draws 12 mA. At 0 PSI it draws 4 mA. The relationship between the current and the value measured is almost directly proportional, allowing us to calculate different values in the scale using $mx+b$ formula.

TESTING 4-20 MA SENSOR LOOP

There are different ways to test a 4-20 sensor:

- Connect the sensor to the source. Generally it uses a 24 VDC source.
- Connect a 220 - 249 ohm resistor to the analog exit of the sensor.
- Power on the sensor and try to change the magnitude (pressure, level, temperature, flow, etc.), and verify the value in the ammeter.

FIGURE 1. *Measuring the Current Loop Output*



When you use a volt meter, you have to calculate the current that is crossing the resistor using Ohm's Law:

$$V = I.R$$
$$I = \frac{V}{R}$$

Where:

- V: Voltage
- I: Current
- R: Resistance

There are some sensors that do not need a resistor; they have an internal one. Some A/D converters also have an internal resistor.

WIRING SENIX ULTRASONIC SENSORS

Here is the wiring setup for the Senix ultrasonic sensors :

FIGURE 2. Wiring Senix Ultrasonic Sensors

As you can see, you have to use the blue and brown to power the device, and the 4 – 20 mA signal comes from the green cable.

Now, you can connect a resistor: one end to the green wire and one to the blue wire (-DC Voltage/ Common). Check that the sensor is sending 4 mA for the minimum of the scale, and 20 mA for the maximum.

In order to make the sensor work with the PLC in the Entek Bubbler case, you have to use the same resistor and connect as in the following drawing:

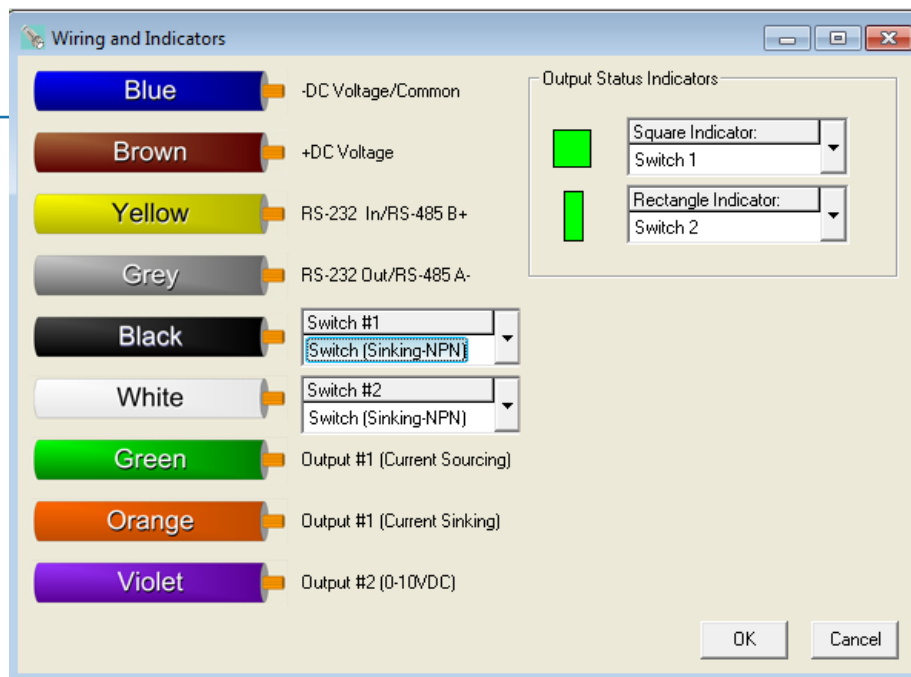


FIGURE 3. Connecting the Ultrasonic Sensor to the PLC

When the sensor is connected to the PLC, you will see variations in the voltage reading in the raw field (in the web browser).

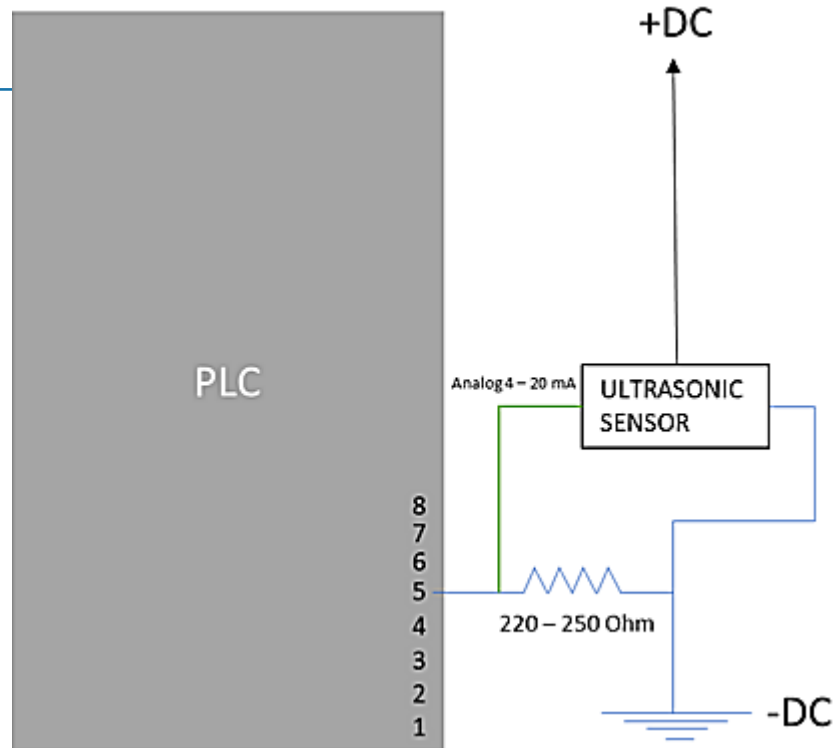


FIGURE 4. Entek Bubbler Configuration Channel Status

Entek DG2200					
Status Config System					
STATUS This screen allows you to monitor all channels of the DG2200 depth gauge. It shows the raw voltage measurements as well as the "scaled" engineering units. Value is calculated with the following formula: $\text{VALUE} = (\text{VOLTAGE} + \text{OFFSET}) * \text{SCALE}$					
Channel	Raw (V)	Value (EU)	Scale Factor	Offset	Filter (K)
1 - 1	5.15	21.78	5.250	-1.000	0.0
2 -	0.00	0.00	1.000	0.000	0.0
3 -	0.00	0.00	1.000	0.000	0.0
4 -	0.00	0.00	1.000	0.000	0.0
5 -	0.00	0.00	1.000	0.000	0.0
6 -	0.00	0.00	1.000	0.000	0.0
7 -	0.00	0.00	1.000	0.000	0.0
8 -	0.00	0.00	1.000	0.000	0.0