APPLICATION NOTE

Programming 4-20 mA for Flow Proportional Sampling

Using PVS4100-Series, CVS4200-Series, or BVS4300-Series Samplers

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Programming 4-20 mA for Flow Proportional Sampling

1. Introduction

When using the 4-20 mA interface, a PVS4100-series, CVS4200-series, or BVS4300-series sampler must base the calculations on the maximum possible flow rate and sample frequency (for example, one sample every 10,000 gallons). The 4-20 mA input corresponds to the flowmeter output, where 20 mA is equivalent to the maximum flow and 4 mA is equivalent to the minimum flow. The sampler controller generates 100 pulses per minute internally at the maximum flow. This number decreases with the amount of flow proportional to the 4-20 mA scale. Use the equation below to determine the number of pulses required for the sampler to collect a sample; units are gallons:

$$\# \ of \ \frac{pulses}{sample} = 100 \ \frac{pulses}{min} \bullet \frac{1}{maxQ \ \frac{gallons}{min}} \bullet y \ \frac{gallons}{sample}$$

maxQ = maximum flow rate measured by a flowmeter, which is equivalent to the 20 mA output of the sensor.

y = volume of water passing through the system between required samples. This value is the required sample frequency at maximum flow, which is often based on a permit requirement.

For example, if the EPA requires your facility to collect a sample every 10,000 gallons, and the maximum flow rate through your system is 500 gallons per minute, you need to have the sampler collect a sample every 2,000 pulses.

$$\# \ of \ \frac{pulses}{sample} = 100 \ \frac{pulses}{min} \bullet \frac{1}{500 \ \frac{gallons}{min}} \bullet 10,000 \ \frac{gallons}{sample} = 2,000 \ pulses \ per \ sample$$

2. Programming the Keypad Controller

1. Press **SET**, then **#4** on the keypad (**START DELAY**).
2. Press the right arrow until **DISABLED** is displayed, then press **ENTER**.
3. Press **SET**, then **#5** on the keypad (**SAMPLE INITIATION**).
4. Press the right arrow until **4-20 mA** is displayed, then press **ENTER** (**4-20mA** will be flashing). **4-20mA INPUT** will be displayed with **0000000** (seven zeros displayed with the first 0 flashing).
5. Using the keypad, enter the number of pulses required to trigger the sampler.
6. Press the **RESTART** button two times to run the program.

Tip: To prevent overflows of your sample container

If the flowrate in your system can vary significantly, we recommend setting the controller to cease sampling after a set number of samples. First, you need to determine the number of samples that can fit in your container. Divide the total volume of the sample container by the volume of each collected sample to determine total samples needed to fill the container to the top.

$$\frac{Total\ volume\ (mL)}{volume\ per\ sample\ (mL)} = total\ samples\ collected\ to\ fill\ container$$

For example, if you have a 2.5 gallon or 9-liter sample container and are collecting 100 mL every sample:

$$\frac{9000\ mL}{100\ mL} = 90\ totals\ samples\ collected\ to\ fill\ 9\ L\ sample\ container$$

We recommend setting the number to 1 less than the total number to prevent any spillage. For this example, enter 0000089.

Optional programming to terminate program after *X* samples

1. Using the keypad again, press **SET**, then **#6**, **PROGRAM TYPE**, **COMPOSITE**, press **ENTER**.

2. **Terminate After 0000000 Samples** should show at this point (for first time setup). Depending on your sample container size, you need to enter a number that is less than what it would take to overflow the container.

3. Press the **RESTART** button two times to activate the program once again.

When collecting your samples from the sample container, if the sampler has shut down because it reached the maximum number of samples to collect, **pressing the RESTART button two times is required**.

3.   Wiring the 4-20 mA Flowmeter to the Sampler

3.1   CVS42000-Series or BVS4300-Series Sampler

For a CVS4200-series or BVS4300-series sampler, the flowmeter 4-20 mA output wires connect to terminals 8 and 9 on the sampler's terminal board-1. See TABLE 3-1.

TABLE 3-1. Wiring	
1	LINE
2	NEUTRAL
3	GROUND
4	
5	FAULT
6	DC V (+)
7	FULL
8	4-20 mA (+)
9	4-20 mA (−)
10	COUNT IN
11	COMMON GND
12	EXT START
13	COMMON GND
14	EXT STOP
15	STATUS (+)
16	STATUS (−)
17	BATTERY (+)
18	BATTERY (−)
CVS/BVS TB-1 STD	

3.2 **PVS4100-Series Sampler**

For the PVS4000-series sampler, the flowmeter 4-20 mV output wires connect to the sampler external signal cable (FIGURE 3-1). Connect the flowmeter +4-20 mA wire to the signal cable orange/white wire and connect the flowmeter –4-20 mA wire to the signal cable green/white wire.

FIGURE 3-1. PVS4100 external signal cable

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