

SONOFLOW® Flow Meters

Configuring SONOFLOW® Flow Sensors for 4-20 mA Output to a DCS or PLC



TECHNICAL NOTE



SONOFLOW® ultrasonic flow sensors are equipped with a 4-20 mA output which is commonly used to monitor flow with external distributed controls systems or process logic controllers. The rate at which the control system receives data will differ from the rate of the sensor output so it is important to configure the SONOFLOW® sensor to achieve the most accurate readings of live data in your control system.

Theory Behind the Settings

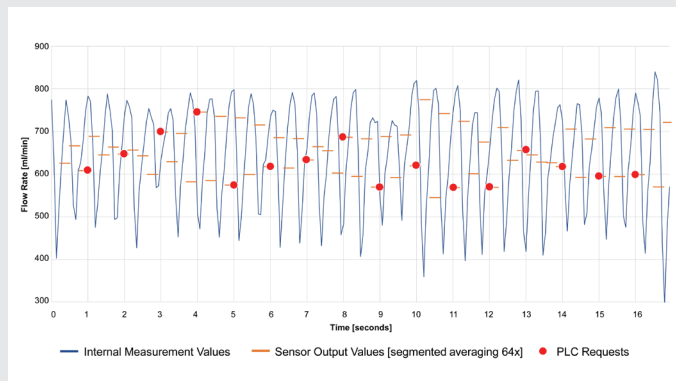
- ▶ The SONOFLOW® sensor outputs data every 10 ms through the 4-20 mA output, averaged over specified time.
- ▶ Most PLCs are not capable of reading data every 10 ms and will only record the signal every 200 ms to 2 seconds, depending on the system. Because the SONOFLOW® 4-20 mA output supplies data in a predefined cycle, we must synchronize the averaging of the sensor to report a segment of data that coincides with the PLC reading.

Example

Initial Situation:

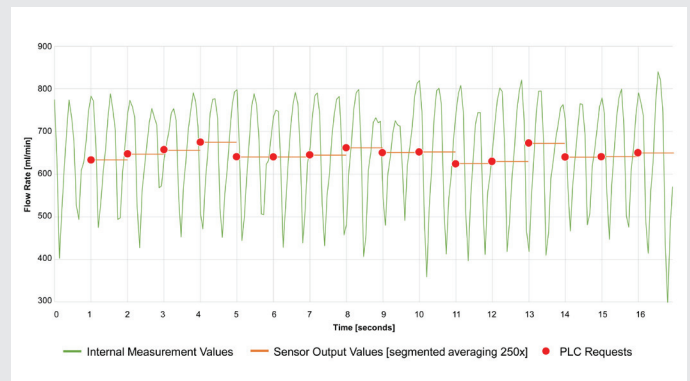
Both diagrams show exactly the same high resolution real time flow profile (blue and green diagram curves) of a peristaltic pump and the PLC reads data every 1 s (red dots).

Diagram 1: Real Time Flow Measurement | Averaging 64



- ✔ Segmented Averaging “64x => T = ca. 0.26 s” is activated: After having collected 64 samples, the sensor uses them to calculate and output an average until the next 64 samples are collected (orange lines). So the output value changes approximately every 0.26 s.

Diagram 1: Real Time Flow Measurement | Averaging 250



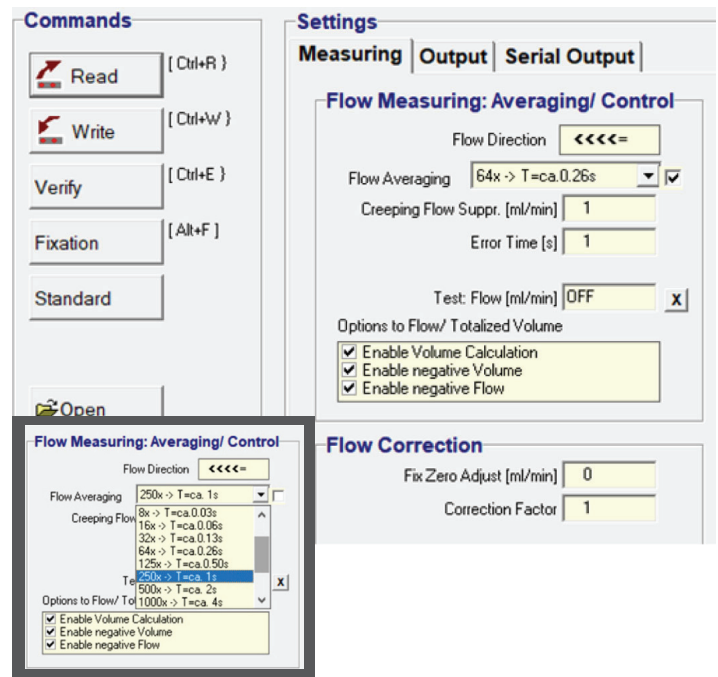
- ✔ Segmented Averaging “250x => T = ca. 1 s” is activated: After having collected 250 samples, the sensor uses them to calculate and output an average until the next 250 samples are collected (orange lines). So the output value changes approximately every 1 s.

If the flow sensor is set to average every 0.26 seconds (Diagram 1), it will create ~4 output values every 1 s (PLC reading rate). So your PLC will lose 3/4th of the available flow information. The flow reading looks erratic. This effect is increased with the use of a peristaltic pump.

For the PLC not to miss any data, the sensor needs to be adjusted. Diagram 2 indicates a harmonisation of the sensor value output and sampling rate of the PLC. This is done by setting the averaging to 250 x (new average value every ~1 second). The 4-20 mA output of the sensor will then be equal to the mean flow over the previous 1 second period. The reading is smoother and no data will be lost.

Optimizing the SONOFLOW® Settings for Reading the 4-20 mA Output in a PLC

- Make sure the SONOFLOW® Monitor software is properly installed and the sensor is properly identified by the software.
- Determine the rate at which your system will read the 4-20 mA signal, usually between 200 ms and 2 seconds.
- Locate the Flow Measuring: Averaging/ Control section of the software.
- As the SONOFLOW® sensor and PLC cannot synchronize the data rate appropriately, the sensor averaging needs to be adjusted to report a reading averaged over the entire PLC reading rate and not just a portion of this time period.
- The sensor uses a rolling average by default. Turn off the rolling average by unchecking the box next to "Flow Averaging."
- Select an averaging rate from the „Flow Averaging“ drop down menu which is equal to or greater than the rate at which your PLC will read the data. For example, if your PLC reads every 1 second, select 250x. This ensures that the sensor will collect data for 1 second before reporting an average. This average will be output through the 4-20 mA output for each 20 ms report until the next average is reached.
- Remember to click "Write" to save the changes to your sensor.

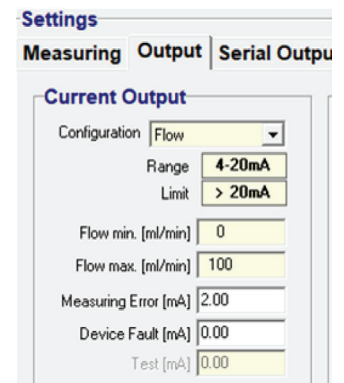


Recommended Sensor Settings for Different PLC Reading Rates

PLC READING	2 sec	1 sec	0.6 sec	0.2 sec	„n“ sec
SENSOR SETTING	500 x (T= ca. 2 s)	250 x (T= ca. 1 s)	250 x (T= ca. 1 s)	64 x (T= ca. 0.26 s)	__ x (T= ca. X s)
T should be equal to or above PLC reading rate					... with T ≥ n

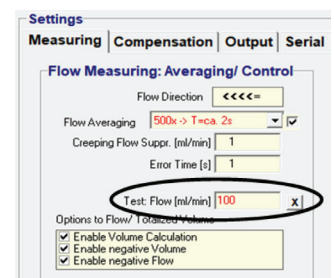
Setup of 4-20 mA Output

- Go to Settings Tab > Output > Current Output box.
- Make sure the Configuration is set to "Flow."
- Enter your "Flow Min" and "Flow Max." This will correspond to the scaling of the 4-20 mA output.
- Remember to click "Write" to store the settings in the sensor.
 - It is recommended to set Flow Min at 0 unless you have a bidirectional application.
 - For bidirectional flow you will need to enter a negative number in "Flow Min."
 - It is recommended to set "Flow Max" 20 % above your actual max flow expected average due to peristaltic waveform if you are using a peristaltic pump.



Optional: Confirm 4-20 mA Calibration Using Test Flow Setting

- Go to Measuring Tab and locate "Flow Measuring: Averaging/ Control" box.
- In "Test Flow [ml/min]" enter the max flow for the 4-20 mA output "Current Output" For example, 100 ml. Click "Enter." Click "Write."
- Disconnect sensor and properly connect the 4-20 mA output to the PLC.
- Your PLC should read 100 ml/min or your max flow from above.
- If the PLC reading does not match the test flow, this indicates that the current output needs calibration: Contact your SONOTEC rep or calibration technician.
- Reconnect sensor to the software and click on "Test Flow" box: It should read "Off." Click "Write."



SONOTEC® preserves the right to change technical specifications without further notice. (Rev. 1 / 2020-06-22)

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