

Application Note

TG Field Calibration



153-0047-0C

12/5/2023

Applies To: Senva TG Series with UL

Description: Recommendations for field calibration of TG sensors.

OVERVIEW

The TG series products provide you with the ability to field calibrate the sensors to help correct for this drift. Senva recommends annual field calibration on all TG sensors in order to keep the sensors operating properly within their intended application. For combustible and refrigerant sensors, a 6 month calibration period is recommended.

EQUIPMENT

Contact Senva (866-660-8864) to buy calibration gas kits and shrouds which will contain all necessary equipment for each sensor.

If using gas not provided by Senva, please ensure your calibration gas is not expired and that it meets the below requirements for concentration (PPM or %) and you are using a **0.5 LPM regulator**. It is also recommended to calibrate using Senva's gas shrouds to ensure proper gas allocation.

Carbon Monoxide

- 100 PPM Certified
- 0.5 LPM Regulator
- Tygon or Silicone Tubing
- TG-CO Gas Shroud (CALSHROUD-CO)

Nitrogen Dioxide

- 10 PPM Certified
- 0.5 LPM Stainless Steel Regulator
- Tygon Tubing
- TG Gas Shroud (CALSHROUD-TGUL)

Methane, Propane, Hydrogen

- 50% LEL Certified
- 0.5 LPM Regulator
- Tygon or Silicone Tubing
- TG Gas Shroud (CALSHROUD-TGUL)

Oxygen

- 19.0% Certified
- 0.5 LPM Stainless Steel Regulator
- Tygon Tubing
- TG Gas Shroud (CALSHROUD-TGUL)

Refrigerant Gases

- 1000 PPM Certified
- 0.5 LPM Regulator
- Tygon or Silicone Tubing
- TG Gas Shroud (CALSHROUD-TGUL)

H2S, NH3

- 25 PPM Certified
- 0.5 LPM Stainless Steel Regulator
- Tygon Tubing
- TG Gas Shroud (CALSHROUD-TGUL)

FIRMWARE CHECK PROCEDURE

- 1) Access the *Setup Menu* by holding the **◆** and **▲** buttons down simultaneously for one second.
- 2) Select Version (*VER*) from the menu using the **◆** button.
- 3) If Version is 2.2.6 OR 2.2.7 go to "*Calibration Adjustment procedure*"
- 4) For all other firmware versions, if a minor adjustment to the present sensor calibration is desired see "*Adjustment Percentage Procedure*"
- 5) For all other firmware versions, if a full field calibration is desired see "*Field Calibration Procedure*"
- 6) After calibration is done go to "*Calibration Check procedure*"

CALIBRATION ADJUSTMENT PROCEDURE

Menu System Procedure

- 1) Access the *Setup Menu* by holding the **◆** and **▲** buttons down simultaneously for one second.
- 2) Scroll with **▼** and select the sensor from the menu you would like to calibrate (*S1* or *S2*) and use the **◆** button to enter the sensor setup menu. *S1* is the sensor on the bottom left; *S2* is the sensor on the bottom right.
- 3) Scroll down to *SFA* using the **▼** button and press **◆**
- 4) Adjust the present value using the percentage calculated in the *Adjustment Percentage procedure*
- 5) Use the **▲** or **▼** buttons to adjust the sensitivity and then press **◆**

Calibration Procedure

Apply gas to sensor:

- 1) Using "Menu System Procedure", ensure *SFA* field is set to 100. If not, set the field to 100 now.
- 2) Apply the gas shroud over the sensor and turn the gas on to a flow rate of 0.5 LPM. Senva provided regulators will either be on or off, these do not require adjustment to 0.5 LPM.
 - Ensure the gas cup stays over the top of the sensor until the PPM value doesn't increase for 10 seconds. This timeframe is typically between 60 and 90 seconds.
 - Ensure gas cannister is at the same elevation as the device.

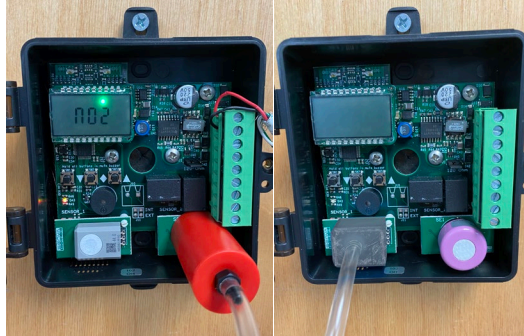


Figure 1: Gas shrouds secured over respective sensing elements. Left is TGUL Shroud for all other gases; Right is CO shroud for CO elements.

- 3) DO NOT calibrate with TG lid closed. This may cause a calibration error due to inconsistent flow rate and concentration across the sensing element.
- 4) While applying gas note the PPM value that the device showed (*Device PPM*) and the value of the PPM of gas being applied (*Gas PPM*).
- 5) Divide the *Device PPM* by the *Gas PPM* to get a *Ratio*.

$$\text{AppliedGasPPM}/\text{MeasuredGasPPM} = \text{Ratio}$$

- 6) Multiply the *Ratio* by 100.

$$\text{Ratio} * 100 = \text{Corrected SFA}$$

Example: Device showed 8 PPM, while the gas being applied is 10 PPM gas:

$$10 \text{ PPM} / 8 \text{ PPM} = 1.25$$

$$1.25 * 100 = 125$$

You will then adjust the SFA field to be 125

- 7) Apply the *Corrected SFA* value to the SFA field of the device. See "Menu System Procedure" for instructions on accessing the menu, or see "BACnet/Modbus Procedure" for instructions on setting this value over RS485
- 8) Check calibration using "Calibration Check Procedure".

BACNET/MODBUS PROCEDURE

- 1) If adjusting the S1 sensor's sensitivity:
 - a. Read the present SFA field from AV156 (BACnet) or R156 (Modbus)
 - b. Adjust the value using the percentage calculated in the *Adjustment Percentage Discovery* procedure
 - c. Write the adjust value to the SFA field at AV156 (BACnet) or R156 (Modbus)
- 2) If adjusting the S2 sensor's sensitivity:
 - a. Read the present SFA field from AV166 (BACnet) or R166 (Modbus)
 - b. Adjust the value using the percentage calculated in the *Adjustment Percentage Discovery* procedure
 - c. Write the adjust value to the SFA field at AV166 (BACnet) or R166 (Modbus)

AUTOMATIC CALIBRATION ADJUSTMENT PROCEDURE

STOP! Preform a Firmware check before proceeding, see “Firmware Check Procedure”. Do not perform this field calibration on versions 2.2.6 or 2.2.7.

Navigate to calibration Menu:

- 1) Access the *Setup Menu* by holding the \blacklozenge and \blacktriangle buttons down simultaneously for one second.
- 2) Scroll with \blacktriangledown and select the sensor from the menu you would like to calibrate (S1 or S2) and use the \blacklozenge button to enter the sensor setup menu. S1 is the sensor on the bottom left; S2 is the sensor on the bottom right.
- 3) Scroll with \blacktriangledown button and select CAL with the \blacklozenge button. You can cancel the calibration at any time before it is complete by holding all 3 buttons down simultaneously for 1 second ($\blacktriangledown+\blacklozenge+\blacktriangle$).
- 4) The display will first show AIR and then show a timer. The AIR test will take 10 seconds. During this time do not touch the unit or apply gas.

Apply gas to sensor:

- 1) GAS will show up on the screen, and a timer will start counting down from 180 seconds (3 minutes).
 - Apply the gas shroud over the sensor and turn the gas on to a flow rate of 0.5 LPM. Senva provided regulators will either be on or off, these do not require adjustment to 0.5 LPM.
 - Ensure the gas cup stays over the top of the sensor throughout the 3 minutes.
 - Ensure gas cannister is at the same elevation as the device.

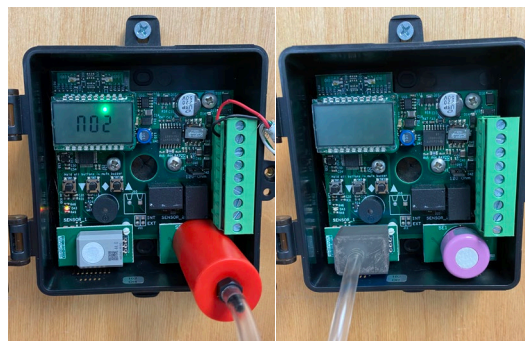


Figure 1: Gas shrouds secured over respective sensing elements. Left is TGUL Shroud for all other gases; Right is CO shroud for CO elements.

- DO NOT calibrate with TG lid closed. This may cause a calibration error due to inconsistent flow rate and concentration across the sensing element.
- DO NOT perform this procedure with calibration gas that is not certified to the concentrations listed above. If necessary, calibration with a different concentration of

gas can be accomplished using the adjustment factor. Please consult factory for instruction.

- 2) Once completed the display will go back to its normal sequence, displaying each sensor and its concentration.
 - d. Adjust the value using the percentage calculated in the *Adjustment Percentage Discovery* procedure
 - e. Write the adjust value to the SFA field at AV166 (BACnet) or R166 (Modbus)
- 3) Check calibration using “Calibration Check Procedure” .

CALIBRATION CHECK PROCEDURE

To verify sensor response or to verify calibration, choose from the following procedures.

- 1) For the fastest and most efficient gas usage, apply gas directly to sensor as shown in Figure 2. After 60 seconds, the device should read about 90% of the expected concentration. For 100%, continue applying gas for a total of 90 seconds.

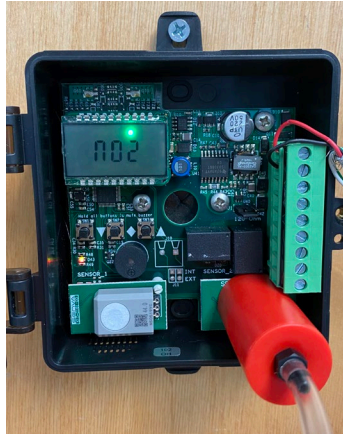


Figure 2: Recommended calibration check setup

- 2) To test response with the enclosure closed, partially tape one hole of enclosure and apply gas through the other hole. This will ensure the concentrated gas build within the enclosure and ambient air can escape without building pressure.



Figure 3: Applying test gas with enclosure closed.

- a. This process may take up to 3 minutes to completely displace the air in the enclosure.
- b. Please also note that some gases, such as NO₂, are extremely volatile and may experience some degradation as it leaves the canister, so you may not see the full reading expected.