

# TG UL Field Calibration Instructions

## OVERVIEW

All sensors experience “calibration drift” over time. An instrument that experiences calibration drift can still measure the quantity of gas present, but it cannot convert this information into an accurate numerical reading. Calibration checks or full calibration with a traceable gas concentration will verify or update the instrument’s reference point.

The best way to verify accurate and reliable gas detection is to test the sensor with a known concentration of gas. This procedure will verify whether the sensors in the instrument respond accurately and whether the alarms function properly.

In addition to routine test and maintenance, the following calibration is required at these intervals:

TG UL Sensor Element Type	Calibration Interval
Refrigerant and combustibles	Every six months
All others	Annually

## **WARNING!**

- Instrument inaccuracy due to improper or irregular maintenance and calibration can lead to exposure to hazardous levels of toxic gases or to an oxygen-deficient atmosphere. This exposure can cause workers to suffer serious injuries or illness, and even death. Flammable gas explosions are often catastrophic, resulting in worker injuries and death, or destruction of property.
- Only qualified trade installers should install, program, maintain and test system incorporated therein. Installer is responsible for compliance of all applicable codes.
- Read, understand, and follow instructions thoroughly.
- The unit and associated systems require routine additional test and maintenance, in addition to calibration, as prescribed in the TG Series User’s Manual section ‘Periodic Test and Maintenance’
- Do not install in hazardous or classified locations.
- Sensors should not be used as a substitute for proper installation, use, or maintenance of hazardous gas emitting equipment.
- Sensors are designed to detect conditions that could result in acute effects due to gas exposure. They will not fully safeguard individuals with specific medical conditions. If in doubt, consult a medical practitioner.

## EQUIPMENT REQUIRED

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Contact Senva to purchase calibration gas kits and shrouds which contain all necessary equipment for each sensor (866-660-8864 or [www.senva.com](http://www.senva.com)).

Always ensure 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**. Calibrate using only Senva 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

- 20.9% 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)

## CALIBRATION METHODS

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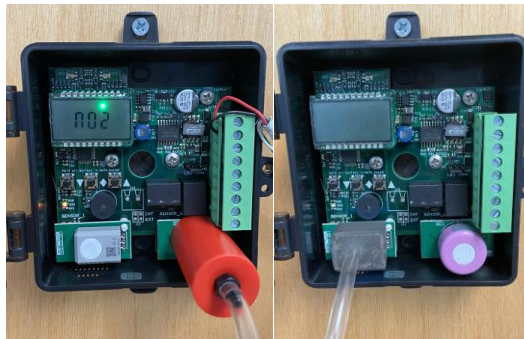
There are three calibration methods:

1. Scaled Factor Adjustment
2. BACnet or Modbus Calibration using Scaled Factor Adjustment
3. Automatic Calibration Adjustment (to a specified gas concentration).

## CALIBRATION USING SCALED FACTOR ADJUSTMENT (SFA)

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- 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 bottom right.
- 3) Scroll down to SFA using the **▼** button and press **◆**
- 4) Use the **▲** or **▼** buttons to adjust the sensitivity and then press **◆**
- 5) Ensure SFA field is set to 100. If not, set it to 100 now.
- 6) 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.*

**⚠** DO NOT calibrate with TG lid closed. This may cause a calibration error due to inconsistent flow rate and concentration across the sensing element.

7) 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*).

a. Divide the *Applied Gas PPM* by the *Measured Gas PPM* to get a *Ratio*.

$$\text{Applied Gas PPM} / \text{Measured Gas PPM} = \text{Ratio}$$

b. Multiply the *Ratio* by 100.

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


*Example: Device is reading 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*

8) Apply the *Corrected SFA* value to the SFA field of the device using the menu or see "BACnet/Modbus Procedure" for instructions on setting this value over RS485

9)  Verify calibration using the "Calibration Verification Procedure".

## BACNET/MODBUS CALIBRATION PROCEDURE

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- 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)
- 3)  Verify calibration using the "Calibration Verification Procedure".

## AUTOMATIC CALIBRATION ADJUSTMENT PROCEDURE (ACA)

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### WARNING!

Perform “Firmware Check Procedure” before proceeding.

**IF VERSION 2.2.6 or 2.2.7 CO and/or NO<sub>2</sub>, DO NOT USE AUTOMATIC CALIBRATION ADJUSTMENT!**

***Sensors with 2.2.6 or 2.2.7 firmware calibrated using Automatic Calibration procedure may exhibit low readings unsuitable for intended use.***

Calibrate 2.2.6 or 2.2.7 versions using only Scaled Factor Adjustment Procedure SFA (page 2). These versions will have identical field performance as all TG series, they just cannot be calibrated using ACA.

If you inadvertently use ACA on a CO sensor, you must re-calibrate using SFA.

If you inadvertently use ACA on an NO<sub>2</sub>, the sensor element must be re-placed. Senva will provide replacement element (pre-calibrated) for drop-in replacement at no charge.

## PERFORM FIRMWARE CHECK PROCEDURE

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- 1) Access the *Setup Menu* by holding the **◆** and **▲** buttons down simultaneously for one second.
- 2) Select Version (*UEP*) from the menu using the **◆** button.



### **IF VERSION 2.2.6 or 2.2.7, DO NOT USE AUTOMATIC CALIBRATION ADJUSTMENT!**

Calibrate 2.2.6 or 2.2.7 versions using only Scaled Factor Adjustment Procedure SFA (Go to page 2) for accurate readings.

### **Navigate to automatic calibration menu:**

- 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 with **▼** button and select *CAL* with the **◆** button. You can cancel the calibration at any time before it is complete by holding all 3 buttons down simultaneously for 1 second (**▼+◆+▲**).
- 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. *995* 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.

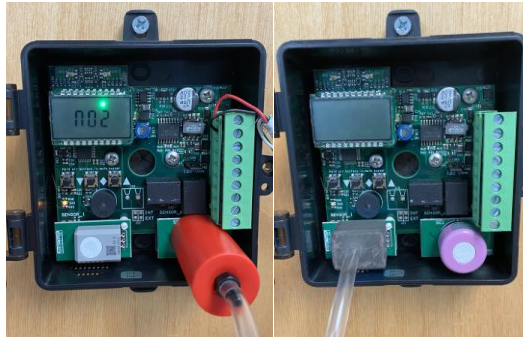





Figure 1: Gas shrouds secured over respective sensing elements. Left is TGUL Shroud for all other gases; Right is CO shroud for CO elements.

2.  DO NOT calibrate with TG lid closed. This may cause a calibration error due to inconsistent flow rate and concentration across the sensing element.
3.  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.
4. Once completed the display will go back to its normal sequence, displaying each sensor and its concentration.
5. Adjust the value using the percentage calculated in the *Adjustment Percentage Discovery* procedure
6. Write the adjust value to the SFA field at AV166 (BACnet) or R166 (Modbus)
7.  Verify calibration using “Calibration Verification Procedure”

## CALIBRATION VERIFICATION PROCEDURE - REQUIRED

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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 NO<sub>2</sub>, are extremely volatile and may experience some degradation as it leaves the cannister, so you may not see the full reading expected.