INSTALLATION INSTRUCTIONS

TG SERIES
Analog CO/NO2 Sensor

PRODUCT IDENTIFICATION

	Output	*Gas*	*Lid*
TGH-			

Output Type
A = Analog

Gas Type
C = Carbon Monoxide (CO)
N = Nitrogen Dioxide (NO2)
CN = CO/NO2 Combination

Enclosure Lid
Blank = Clear/Tinted
-S = Solid/Opaque

WARNING

- 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 test and maintenance as prescribed in the TG Series User's Manual section 'Periodic Test and Maintenance'
- Do not install in hazardous or classified locations.
- De-energize power supply prior to installation.
- CO/NO2 sensors should not be used as a substitute for proper installation, use, or maintenance of CO/NO2 emitting equipment.
- This CO/NO2 sensor is designed to detect conditions that could result in acute effects of carbon monoxide or nitrogen dioxide exposure. It will not fully safeguard individuals with specific medical conditions. If in doubt, consult a medical practitioner.

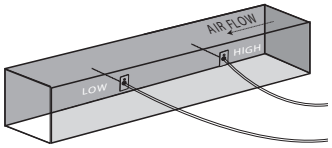
LIMITATION OF LIABILITY
Senva's liability, whether in contract, in tort, under any warranty, in negligence or otherwise shall not exceed the amount of the purchase price paid by the purchaser for the product. Under no circumstances shall Senva be liable for special or consequential damages.

FEATURES

Visual/Audible Indicators - Standard LCD, LED indicators (green, yellow, red), audible alarm.
Installation Flexibility - Dual outputs available that can be programmed for CO, NO2, and temperature signals. Programmable fan and alarm relays for occupant warnings.
Daisy Chain Wiring - TG Series supports parallel connection of multiple sensor voltage outputs.
Dual Gas Monitoring - Sensor can accomodate CO, NO2 or both CO and NO2 in one enclosure. Sensor can be expanded in field by adding additional CO or NO2 elements.
Easy Quick Start - TG Series has 4 Quick Start configurations that modify fan and alarm relay settings to common ranges utilized in the field.
Faster Commissioning - Test Mode in the Quick Start options lowers relay and alarm thresholds for faster field commissioning.
Stand Alone Controller - Wire one or more devices for direct control of an exhaust fan or VFD without costly controller.

INSTALLATION

1. Mount sensor on or near duct and secure using holes on enclosure.
2. Install and plumb pickup tubes as shown:

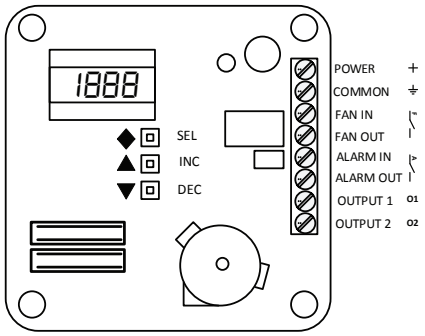


Connect tubes to hose barb fittings on sensor.

Recommended pickup tube length from duct to TG enclosure for a 90% change in 15 minutes is as follows:

Given Tube Length	Recommended Minimum Flow Velocity for 15 minute 90% change		
inches	*m/s*	*ft/min*	*mph*
6	1.3	261	3.0
12	1.4	270	3.1
18	1.4	279	3.2
24	1.6	317	3.6
30	1.7	335	3.8
36	1.7	340	3.9

3. Wire the sensor as required for your application:



Recommended cable type is 14-24 AWG shielded twisted pair. For runs over 200 feet use a minimum of 22 AWG.

DEFAULT SETTINGS

Analog Outputs
Output 1: 0-10V
Output 2: 0-10V

Output Channels
TGH-AC: CO = Output 1
TGH-AN: NO2 = Output 1
TGH-ACN: CO = Output 1
NO2 = Output 2

Output Scaling
CO: 0-200ppm
NO2: 0-10ppm

Fan Relay Setpoint
CO: 25ppm
NO2: 1ppm

Alarm Relay Setpoint
CO: 100ppm
NO2: 3ppm

To change default settings, refer to the User's Guide available online at www.senvainc.com/TGUG

SUPPORTING DOCUMENTS

TG Series User's Guide
www.senvainc.com/TGUG
- Periodic Test and Maintenance
- Device Configuration
- Diagnostic Codes

SENVA senvainc.com 1-866-660-8864 (F)1-503-296-2529 9290 SW Nimbus Ave. Beaverton Oregon 97008

OPERATION

The following section details daisy chain wiring support, fan/alarm relay functions, LCD function, LED function, and the sensor element lifetime clock.

Daisy Chain Wiring

Both voltage outputs are internally equipped to permit parallel connection of multiple sensor voltage outputs. Resulting voltage will be the greater of all connected sensors.

Fan/Alarm Relay

Both the fan and alarm relays are tied to the function of the LED indicators on each TG Series sensor. If a device has both the CO and NO2 elements populated on the board, then the relay functions will activate if either of the gases reach their fan or alarm threshold.

Status	LED	Fan Relay	Alarm Relay	Buzzer
Off	-	Closed	Closed	Silent
Below Fan Setpoint	Green	Open	Open	Silent
Above Fan Setpoint	Yellow	Closed	Open	Silent
Above Alarm Setpoint	Red	Closed	Closed	Silent
Above Alarm Setpoint for 30 minutes	Red	Closed	Closed	On

The duration of the fan/alarm relays and alarm buzzer operation are as follows. These values can also be modified from their default settings via the TG Series User's Guide(1).

Relay Activation Timing	
Fan/Alarm Relays	**Value**
Minimum ON time	60 seconds
Minimum OFF time	60 seconds
Maximum OFF time	0 (inactive)
Audible Alarm Activation Timing	
Buzzer	**Value**
Delay	30 minutes
Minimum ON time	0 seconds
Minimum OFF time	0 seconds

LCD Function

The LCD is factory defaulted to toggle between readouts for each gas type populated on the board. Toggling can be modified using the TG Series User's Guide(1).

LED Function

The LED indicators function in sync with the fan and alarm relay thresholds. LEDs will change state if either of the gases reach their fan or alarm setpoint.

Green	Normal readings below the fan setpoint
Yellow	Warning level above the fan setpoint and below the alarm setpoint
Red	Alarm level above the alarm setpoint

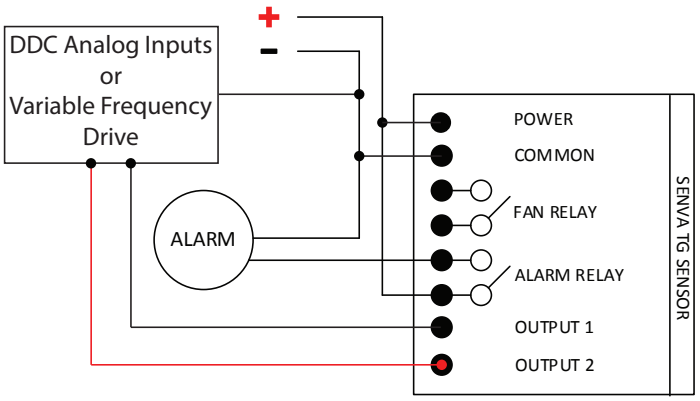
Sensor Element Lifetime Clock

With 30 days remaining on the element lifecycle, the green LED will blink once every 10 seconds. This timer can be viewed using the TG Series User's Guide(1). Contact factory for replacement elements.

(1) TG Series User's Guide available at www.senvainc.com/TGUG

ONE SENSOR PER CONTROL LOOP

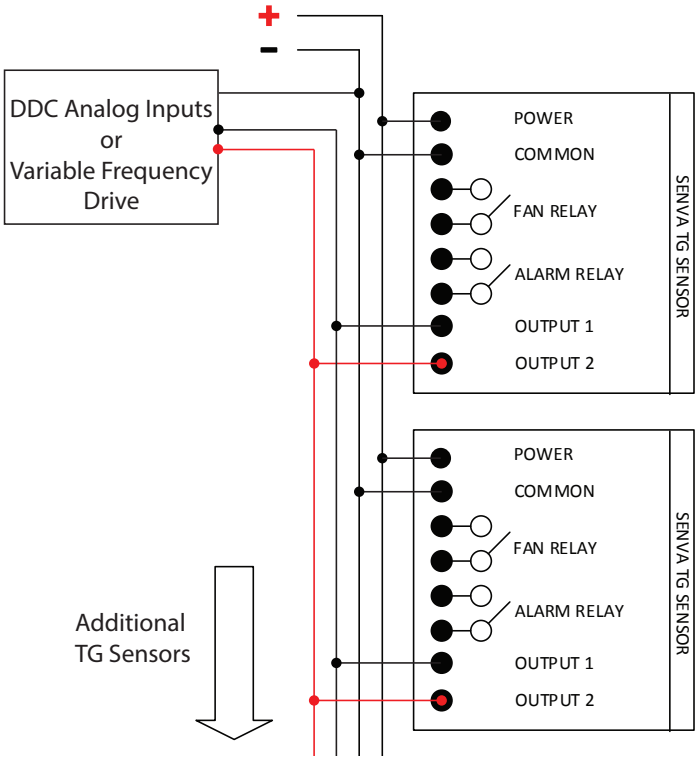
Diagram shows a standard connection between a single TG sensor, alarm and controller or variable frequency drive:



DAISY CHAIN OF OUTPUTS

Diagram shows connection between multiple TG sensors wired in a daisy chain to a controller or variable frequency drive using analog outputs. See below for requirements and recommendations for output and scaling settings.

There is no limit to the number of sensors that can be daisy chained, but wire resistance on long runs should be taken into account.



Analog Outputs

The analog outputs (0-5/10V) must be uniform on each TG sensor in the daisy chain. The 4-20mA is not compatible with daisy chain wiring.

Output Scaling

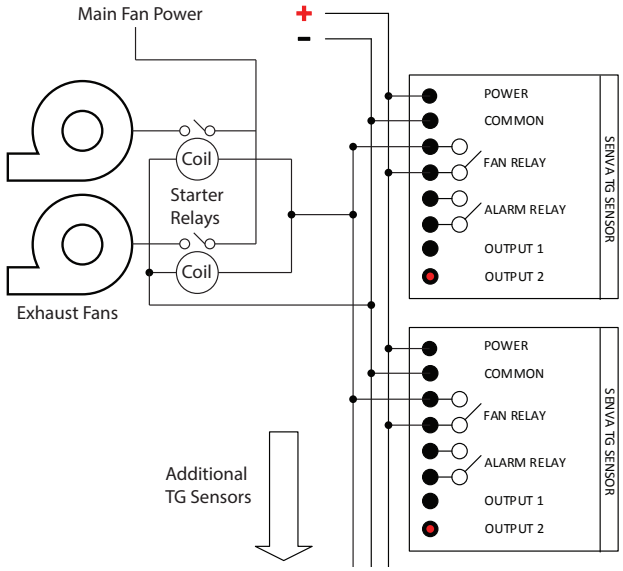
Senva recommends that each TG sensor's output scale are uniform between all devices in the daisy chain for all gas sensing elements that are populated on the board.

DAISY CHAIN OF FAN RELAYS

Diagram shows connection between one or multiple TG sensors wired to an exhaust fan using the fan setpoint relay(s). This function can be performed by a single TG sensor or a sequence of multiple TG sensors wired in parallel.

If wiring in a daisy chain, ensure that the fan relay setpoints are uniform for each sensor. The fan relays will activate if one or more of the sensors reach warning thresholds.

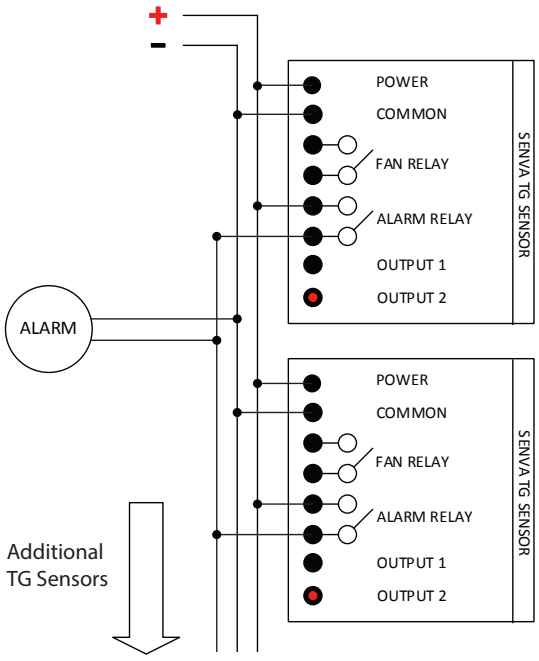
Device also features a maximum off time for the fan relay. See TG Series User's Guide to enable this feature.



DAISY CHAIN OF ALARM RELAYS

Diagram shows connection between one or multiple TG sensors wired to an alarm using the alarm relay(s).

If wiring in a daisy chain, ensure alarm relay setpoints are uniform for each sensor. Alarm relays will activate if one or more of the sensors reach alarm thresholds.

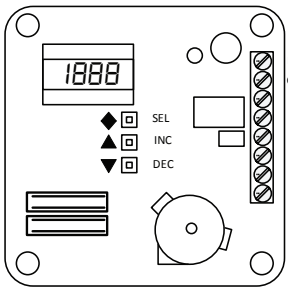


RELAY/OUTPUT TYPE MODIFICATIONS

This section will focus only on the following items:

- 'Quick Start' options for changing fan/alarm settings
- Altering output type for Outputs 1 and 2.

Device will timeout back to normal operation after 10 seconds of no activity, so it is recommended to fully read through this section before proceeding into the LCD menu. (*This is an abbreviated section of the TG Series User's Guide. Do not attempt to change any other parameters without utilizing the full TG Series User's Guide found online at www.senvainc.com/TGUG*)



LCD Menu Buttons
◆ 'Select' button
▲ 'Increase/Up' button
▼ 'Decrease/Down' button

Quick Start

Quick Start allows the user to quickly select from four preconfigured parameters for the fan and alarm settings for CO and NO2. This includes a 'test mode' for commissioning.

Press the select button ◆ until 9StArt, scrolls across the LCD.

Press the select button ◆ again and LCD will read A. This corresponds to the default fan/alarm settings. Choose from the table below which quick start parameter best fits your application and scroll to the setting using ▲ and ▼. Press the select button ◆ with your desired Quick Start displayed and proceed to 'Output Type options' section below.

LCD	CO Fan	CO Alarm	NO2 Fan	NO2 Alarm	Buzzer Delay
A	25ppm	100ppm	1ppm	3ppm	30 minutes
B	15ppm	50ppm	0.7ppm	2ppm	30 minutes
C	35ppm	100ppm	1ppm	5ppm	30 minutes
tSt	5ppm	10ppm	0.5ppm	1ppm	2 minutes
ESC	Exits back to main User Menu screen				

Output Type

After selecting the Quick Start parameter, device will display 10U which corresponds to the default 0-10V output type for Output 1 and Output 2. Choose from the table below which output type parameter best fits your application and scroll to the setting using ▲ and ▼. Press the select button ◆ with your desired output type displayed.

LCD	Output Type (Output 1 & Output 2)
10U	0-10V Output
1_5	1-5V Output
420	4-20mA Output
0_5	0-5V Output

After selecting the output type, LCD menu will bounce back to your selected Quick Start selection. Use the ▲ and ▼ to scroll to ESC option and press the select button ◆. Display will now show 9StArt. Again, use the ▲ and ▼ to scroll to ESC option and press the select button ◆, or allow the device to timeout (approximately 30 seconds), to return to normal operation.

SPECIFICATIONS

Power supply		15-30VDC/24VAC [1], 4w max, 120mA max.
Analog Outputs	2 programmable outputs	0-10V (default), 0-5V, 1-5V and 4-20mA (menu selectable)
	CO output scaling	0-200ppm (default), ranges up to 1000ppm (menu selectable)
	NO2 output scaling	0-10ppm (default), ranges up to 20ppm (menu selectable)
	Temperature output scaling	-20 to 85°C
Fan Relay	Fan relay characteristics	N.C. 10A@125VAC, 5A@30VDC
	CO fan relay setpoint	25ppm (default), 0-1000ppm (menu selectable)
	NO2 fan relay setpoint	1ppm (default), 0-20ppm (menu selectable)
Alarm Relay	Alarm relay characteristics	N.C. 1A@30VDC
	CO alarm relay setpoint	100ppm (default), 0-1000ppm (menu selectable)
	NO2 alarm relay setpoint	3ppm (default), 0-20ppm (menu selectable)
Display	3-1/2 digit LCD	Indicates CO ppm, NO2 ppm, Temp (menu selectable)
LED's	Green, Yellow, Red	Green = Normal, Yellow = Relay, Red = Alarm
Audible exposure alarm	85dB Piezo transducer	30 minutes above alarm setpoint per UL2034 (menu selectable)
CO Sensor Performance	Type	Electrochemical
	Accuracy	+/-5% of full scale[2] @ 20°C
	Reproducibility	+/-2% of reading
	Response time (T90)	<30 seconds[4]
	Certifications	UL2034 recognized
	Long term stability	<+/-5% per year
	Life expectancy	>5 years
NO2 Sensor Performance	Type	Electrochemical
	Accuracy	+/-5% of full scale[3] @ 20°C
	Reproducibility	+/-2% (same day)
	Response time (T90)	<25 seconds[4]
	Long term stability	<2% per month
	Life expectancy	>5 years
Operating Environment	Temperature, continuous	-20 to 40°C
	Temperature, intermittent	-30 to 55°C
	Humidity	15-95% continuous, 0-95% intermittent
Enclosure	Material	Polycarbonate
	Dimensions	3.7"h x 3.7"w x 2.24"d

(1) One side of transformer secondary is connected to signal common. Dedicated transformer is recommended.
(2) Carbon Monoxide full scale is 200ppm
(3) Nitrogen Dioxide full scale is 20ppm
(4) Reference 'Installation' section on page 1 to account for time required to change enlosure air sample by 90% within 15 minute window based on pickup tube length and airflow velocity.

TROUBLESHOOTING

Symptom	Solution
No output	Check wiring. Ensure power supply meets requirements.
Slow Response Timing	Verify tube length is within recommended length based on rate of airflow in duct. See 'Installation' section on page 1.
CO reading error	Verify control panel software is configured for correct output scaling.
	Sensor contaminated or at end of 5-year life. Replace sensor.
NO2 reading error	Verify control panel software is configured for correct output scaling.
	Sensor contaminated or at end of 5-year life. Replace sensor.
Relay Function	Verify setpoint. Verify test gas concentration. Cover sensor to prevent drafts and dilution during test.

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