

# MODEL GFC-7000E CO<sub>2</sub> ANALYZER Quick Start Guide

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## **Teledyne Analytical Instruments**

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## 1. OVERVIEW

The model GFC-7000E is a close derivative of an older Teledyne CO analyzer. The main differences are as follows.

- The optical bench is longer (14 m), making the instrument more sensitive at low CO<sub>2</sub> levels. The instrument has a user selectable full scale range of 0-100 PPB to 0-100 PPM of CO<sub>2</sub>.
- The instrument is rated for oxygen service. It does not come equipped with a sample flow rate sensor or internal pump or sample gas critical flow orifice. Hence, disregard any reference to those items in old users manuals. Also, the GFC-7000E uses a different sample pressure sensor.
- The rear panel is different. There is an extra pneumatic port for the exhaust of the purge gas to the GFC wheel. Also, there are relay alarm outputs available on the rear panel.

## 2. SPECIFICATIONS

### 2.1 Specifications

|                         |   |
|-------------------------|---|
| Ranges:                 | User selectable to any full scale range from 0-100 ppb to 0-100 ppm |
| Measurement Units:      | ppb, ppm, µg/m <sup>3</sup> , mg/m <sup>3</sup> (user selectable)   |
| Zero Noise:             | ≤ 2.5 ppb RMS <sup>(1)</sup>  |
| Span Noise:             | < 0.5% of reading RMS over 5 ppm <sup>(1)(3)</sup>                  |
| Lower Detectable Limit: | < 5 ppb <sup>(1)</sup>  |
| Zero Drift (24 hours):  | < 10 ppb <sup>(2)</sup>   |
| Zero Drift (7 days):    | < 20 ppb <sup>(2)</sup>   |
| Span Drift (24 hours):  | < 0.5% of reading <sup>(2)(4)</sup>                                 |
| Span Drift (7 days):    | < 1% of reading <sup>(2)(4)</sup>                                   |
| Linearity:              | Better than 1% of Range <sup>(5)</sup>                              |
| Precision:              | 0.5% reading <sup>(1)(5)</sup>                                      |
| Lag Time:               | <10 sec <sup>(1)</sup>  |
| Rise/Fall Time:         | <60 sec to 95% <sup>(1)</sup>                                       |
| Sample Flow Rate:       | 800 scc/min. ± 10%  |
| Temperature Range:      | 5 - 40°C operating  |
| Humidity Range:         | 0-95% RH, Non-Condensing  |
| Temp Coefficient:       | < 0.05 % of reading per °C (5 ppb/°C minimum)                       |
| Voltage Coefficient:    | < 0.05 % of reading per V   |
| Dimensions (HxWxD):     | 7" x 17" x 23.5" (178 mm x 432 mm x 597 mm)                         |

|                           |   |
|---------------------------|---|
| Weight:                   | 50 lb (22.7 kg)   |
| AC Power:                 | 100V 50/60 Hz (3.25A), 115 V 60 Hz (3.0A), 220 – 240 V 50/60 Hz (2.5A)                                |
| Environmental Conditions: | Installation Category (Over voltage Category) II Pollution Degree 2                                   |
| Analog Outputs:           | Three (3) Outputs   |
| Analog Output Ranges:     | 100 mV, 1 V, 5 V, 10 V, 2-20 or 4-20 mA isolated current loop.<br>All Ranges with 5% Under/Over Range |
| Analog Output Resolution: | 1 part in 4096 of selected full-scale voltage   |
| Status Outputs:           | 8 Status outputs from opto-isolators  |
| Control Inputs:           | 6 Control Inputs, 2 defined, 4 spare  |
| I/O:                      | One (1) RS-232; One (1) RS-485/RS-232/Ethernet Baud Rate : 300 - 115200                               |
| Certifications:           | CE: EN61010-1:90 + A1:92 + A2:95, EN61326 - Class A   |

- (1) As defined by the USEPA
- (2) At constant temperature and voltage
- (3) Or 0.2 ppm, whichever is greater
- (4) Or 0.1 ppm, whichever is greater
- (5) Above 10 ppm range, otherwise 0.2 ppm for lower ranges

### 3. Pneumatic Connections:

#### 3.1 Basic Pneumatic Connections

Figure 3-1 illustrates the most common configuration for gas supply and exhaust lines to the Model GFC-7000E analyzer. Figure 3-2 illustrates the pneumatic connections for optional configuration with zero/span valves. Please note that the flowmeter could also be hooked up upstream of the instrument. Since most flowmeters are calibrated at ambient pressure, the user should ensure that the flow going through the flow meter is at ambient pressure when it is placed upstream.

#### NOTE:

Sample and calibration gases should only come into contact with PTFE (Teflon), FEP, glass, stainless steel or brass.



#### CAUTION:

In order to prevent dust from getting into the gas flow channels of your analyzer, it was shipped with small plugs inserted into each of the pneumatic fittings on the back panel. Make sure that all of these dust plugs are removed before attaching exhaust and supply gas lines.

*GFC-7000E Rear Panel Pneumatic Connections*

| <b>Rear Panel Label</b> | <b>Function</b>   |
|-------------------------|---|
| Sample                  | Connect a gas line from the source of sample gas here.<br><br>Calibration gasses are also inlet here on units without zero/span valve option installed. |
| Exhaust                 | Connect an exhaust gas line of not more than 10 meters long here.   |
| Pressure Span           | On units with zero/span valve option installed, connect a gas line to the source of calibrated span gas here.   |
| Vent Span               | Not used.   |
| Zero                    | On units with zero/span valve option installed, attach a gas line to the source of zero air here.   |
| To Purge                | This inlet supplies purge air to the GFC wheel housing<br><br>Connect a source of dried air that has been scrubbed of CO <sub>2</sub> .                 |
| From Purge              | This exhausts purge air to the GFC wheel housing.<br><br>Connect an exhaust gas line of not more than 10 meters long here.                              |

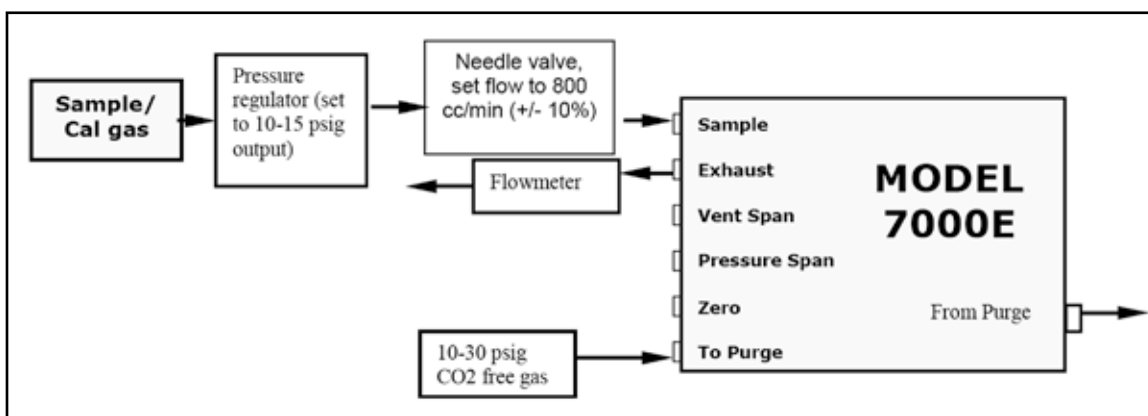


Figure 3-1: Pneumatic Connections–Basic Configuration

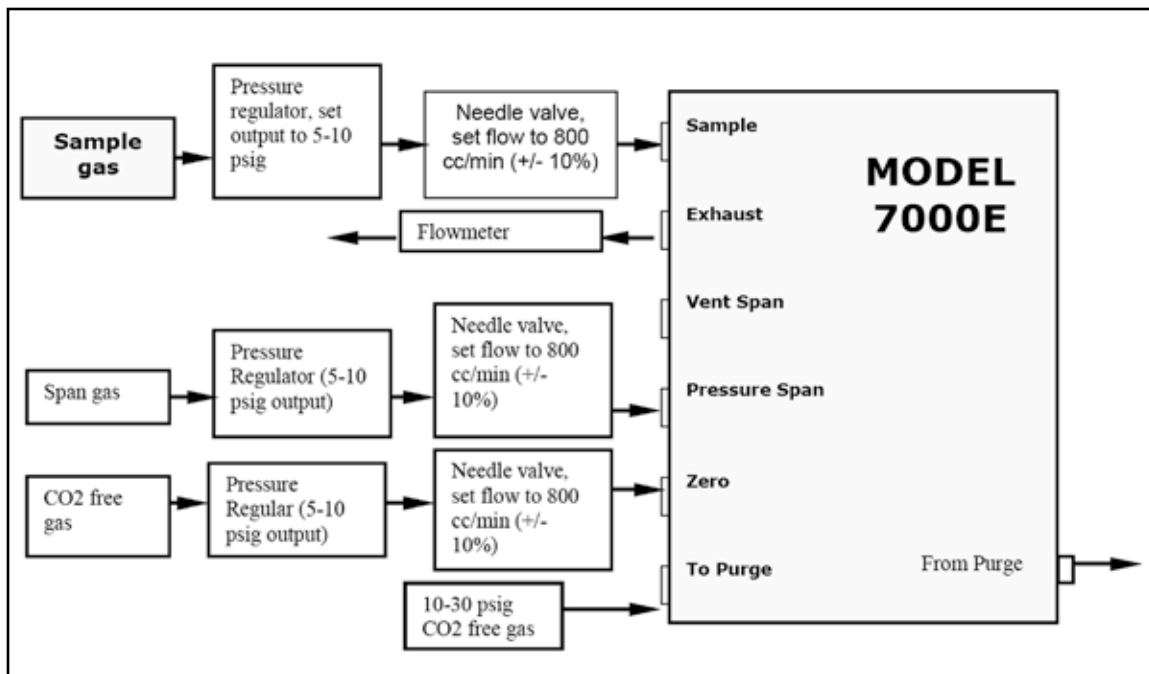


Figure 3-2: Pneumatic Connections  
Configuration with Zero/Span Valve Option

1. Attach a sample inlet line to the sample inlet port. The SAMPLE input line should not be more than 2 meters long.
2. Attach sources of zero air and span gas
3. Span Gas is a gas specifically mixed to match the chemical composition of the type of gas being measured at near full scale of the desired measurement range.

In the case of CO<sub>2</sub> measurements, it is recommended that you use a gas calibrated to have a CO<sub>2</sub> content equaling 80% of the range of compositions being measured.

EXAMPLE: If the application is to measure between 0 ppm and 50 ppm, an appropriate Span Gas would be 40 ppm. If the application is to measure between 0 ppm and 100 ppm, an appropriate Span Gas would be 80 ppm.

- Zero Air is similar in chemical composition to the earth's atmosphere but scrubbed of all components that might affect the analyzer's readings.

In the case of CO<sub>2</sub> measurements, this means CO<sub>2</sub> less than 0.1 ppm of CO<sub>2</sub> and Water Vapor. Zero Air can be purchased in pressurized canisters.

4. Attach an exhaust line to the exhaust outlet port.
  - The exhaust from the analyser and vent lines should be vented to atmospheric pressure using maximum of 10 meters of 1/4" PTFE tubing.

**CAUTION**

Venting should be outside the shelter or immediate area surrounding the instrument.



5. Attach a source of dried air scrubbed of CO<sub>2</sub> to the purge inlet port

**NOTE**

The source of purge gas should be at least 10 psig and capable of maintaining a flow of at least 1 liter/min. Purge source gas pressure should not exceed 30 psig

6. Once the appropriate pneumatic connections have been made, check all pneumatic fittings for leaks.

## 4.0 Relay alarm outputs (Standard configuration)

There are 4 relay alarm outputs (AL1-AL4) on the rear panel.

- AL1 is for system okay,
- AL2 is for concentration limit 1 exceeded and
- AL3 is for concentration limit 2 exceeded.
- AL4 is not used

The relay alarm output AL1 is enabled all the time, whereas the AL2 and AL3 can be enabled/disabled by going into the diagnostics menu (with 929 password), then factory options, then turning concentration Alarm Relays ON or OFF.

When the concentration alarm relays are enabled, concentration alarms status is no longer available through the "Status output" pins. So, either the alarm relays or the status bits could be used to monitor the concentration alarms, but not both at the same time. The default factory setting is to enable the concentration alarm relays.

The AL1 relay is energized when the system is okay and de-energized when the system has a fault. The AL2 and AL3 relays energize when the corresponding concentration limits are exceeded.

## Relay alarm outputs (Air Products Configuration)

There are 4 relay alarm outputs (AL1-AL4) on the rear panel.

- AL1 is for "system okay",
- AL2 is for "high range status" and
- AL3 is for "zero calibration status"
- AL4 is not used

The AL1 relay is energized when the system is okay and de-energized when the system has a fault. The AL2 relay is energized when the high auto-range is in use and AL3 relays energize when the instrument is in zero calibration mode.

## **5.0 Control inputs (Air Products Configuration only)**

An additional control input is available on this instrument. Control input "C" is used to select the range for remote calibration. When input C is low, the instrument selects high range during contact closure calibration.