

***Model FX-CO<sub>2</sub>***  
***Operator's Manual***



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## NOTATION CONVENTIONS

Notices are used in this operator's manual to alert you to hazardous conditions to person or instrument and to notify you of additional information. This operator's manual uses the following notices.



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### WARNING

Notifies you of potential danger that can result in personal injury or death.

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### CAUTION

Notifies you of potential damage to equipment.

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### NOTE

Notifies you of additional or critical information.

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**Thermo** GasTech maintains an instrument service facility at the factory as well as authorized service facilities around the world. Should your instrument require service, you may contact us at:

Toll free: 1.877.GASTECH (USA)

In Canada: 403.291.4700

You may also visit our website to locate an authorized service locations.  
[www.thermogastech.com](http://www.thermogastech.com) or [www.thermogastech.ca](http://www.thermogastech.ca) (In Canada)

**For warranty or non-warranty repairs**, call us to complete a Return Material Authorization (RMA) form, obtain billing and shipping information and tell us the nature of the problem.

**For non-warranty repairs**, you will need to provide a purchase order number. If you need to set a limit to the repairs costs, state a “Not to Exceed” figure. If you need a quotation before you can authorized the repair costs, so state, but understand this will incur additional costs and may delay processing of the repair.

Enclose the copy of the RMA (Return Material Authorization) that was previously faxed to you. Pack the instrument and all its accessories (preferably in its original packing) and any special instructions.

Repairs are warranted for 90 days from the date of shipment. Sensors have individual warranties.

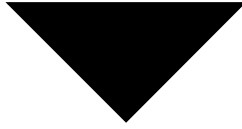


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## NOTE

**Thermo** GasTech assumes no liability for work performed by unauthorized service facilities.

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# WARRANTY STATEMENT

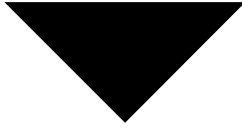
**Thermo GasTech** (the “Company”) warrants that the FX-CO<sub>2</sub> will operate substantially in conformance with the Company’s published specifications, when subjected to normal, proper, and intended usage by properly trained personnel, for a period of one (1) year after shipment to Customer (the “Warranty Period”). The Company agrees during the Warranty Period, provided it is promptly notified in writing upon the discovery of any defect and further provided that all costs of returning the defective Products to the Company are prepaid by Customer, to repair or replace, at the Company’s option, defective products so as to cause the same to operate in substantial conformance with said specifications. Replacement parts may be new or refurbished, at the election of the Company. All replaced parts shall become the property of the Company.

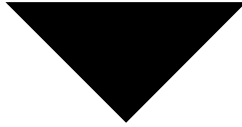
Lamps, pump diaphragms/valves, batteries, fuses, bulbs, and other expendable items are expressly excluded from the warranty. Sensors have individual warranties that may be different from the period specified above.

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# INTRODUCTION

## Overview

The Model FX-CO<sub>2</sub> is a non-dispersive infrared analyzer for measuring environmental CO<sub>2</sub> concentrations in work spaces. Its measurement range is 0 - 5.00% CO<sub>2</sub> for the diffusion - sampling version, or 0-10.0% for the flow-through version. (an optional 0-1.00% range is available).

Packaged in a compact, weathertight Nema 4X enclosure, the Model FX-CO<sub>2</sub> can be installed in indoor or outdoor locations. The FX-CO<sub>2</sub> comes in two configurations, a diffusion-sampling version and a flow-through version.

A simple two-step calibration procedure and replaceable splash shield (diffusion version) make the Model FX-CO<sub>2</sub> simple to maintain.

## Displays and Indicators

The Model FX-CO<sub>2</sub> has a 3-digit liquid crystal display (LCD) on the front panel shows the measured CO<sub>2</sub> concentration in volume percent. Ten thousand parts per million (ppm) equals 1.0% by volume.

## Output

The FX-CO<sub>2</sub> provides a linear analog output of 4-20 mA corresponding to 0-5.00% CO<sub>2</sub>, 0-10.0% CO<sub>2</sub> (or 0-1.00% CO<sub>2</sub>).

## Specifications

Table 1-1 lists the FX-CO<sub>2</sub> performance, physical, electrical and environmental specifications.

**Table 1-1 Model FX-CO<sub>2</sub> Specifications**

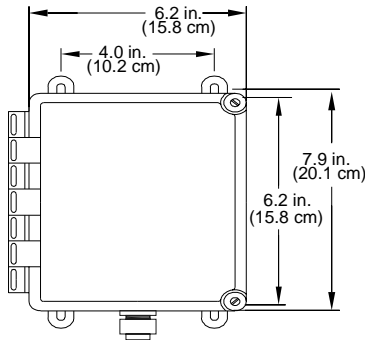
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Operating principle	Non-dispersive infrared (NDIR)
Gas sampling method	Diffusion or flow-through
Measurement range	0 - 5.00 % CO <sub>2</sub> (Diffusion), 0-10.0% CO <sub>2</sub> (Flow-through) (0-1.00 % optional)
Analog Output	4-20 mA (250 ohms maximum impedance)
Typical drift (per year)	±0.5 % (@ 2.5 %)
Accuracy	±5% of reading or ± 0.05 %, (0.2% for 10% range) whichever is greater
Repeatability	± 0.05 % (± 0.2% for 10% range)
Recommended Calibration Interval	One Year
Response time	Less than 3 minutes to 90% of full response
Operating temperature range	0 to 45 ° C (32 to 113 ° F)
Operating humidity range	0 - 90% RH (non condensing)
Storage temperature	-30 to + 60 ° C (-22 to 140 ° F)
Power requirements	12-24 VDC
Power consumption	Less than 2W @ 12 VDC
Calibration adjustments	Span and zero
Warm-up time	3 minutes
Digital Display	3 digit, .35" LCD
Operating life expectancy	5 years typical
Warranty	Twelve months

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## Installation

### Mounting



**Figure 1-1 Outline and Mounting Dimensions, FX-CO<sub>2</sub>**



### CAUTION

The FX-CO<sub>2</sub> is suitable for installation only in a non-hazardous environment (where general purpose equipment is used). The FX-CO<sub>2</sub> is not suitable for installation in Class I, Division 1 or Division 2 areas.

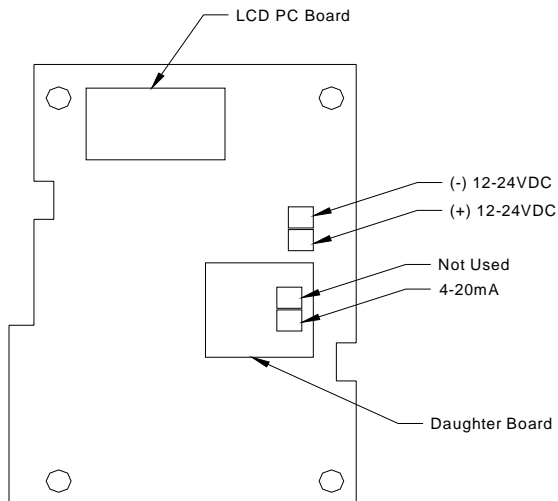
The Model FX-CO<sub>2</sub> is designed for flush mounting with four fasteners. Mount using the four mounting feet located at the rear corners of the housing.

Select a mounting area that is representative of the area to be monitored. Choose an area where the unit is visible and accessible, but not likely to be bumped, disturbed or washed down. Mount the monitor at breathing zone height, approximately 5 ft. from ground level. Make sure that sufficient space is available around the unit so that the door to the enclosure can be opened and wiring access is available. For the flow-through version, allow access to sample and exhaust connections, located at the bottom of the enclosure.

### Plumbing (Flow-through Version Only)

The supplied sample must be clean and dry. The sample and exhaust connections are for 1/4" OD tubing. The filter supplied should be mounted in the sample line as close as possible to the inlet fitting, to ensure a clean dry sample. Flow should be controlled at approximately 0.5 lpm (1.0 scfh), and the exhaust should be vented to atmospheric pressure to avoid pressurizing the infrared sensor. It is recommended that some sort of flow monitoring device (e.g. flowmeter) be installed in the sample line to allow visual verification of flow.

## Wiring



**Figure 1-2 Wiring Diagram**

This section describes the external connections to the Model FX-CO<sub>2</sub>. Wiring enters the chassis through a hub at the bottom left of the housing. A label identifies the terminals of the terminal blocks. Use #14-#20 AWG conductors, shielded or in metal conduit to avoid EMI/RFI. Ground the shield at the controller end only, not at the transmitter.

The FX-CO<sub>2</sub> requires 12 or 24 VDC to operate, and provides a linear 4-20 mA output. The power terminals are at the right of the main circuit board, and are labeled V+ and V-. The current output is from the bottom terminal on a small add-on board that is mounted above the main circuit board. Wiring for use with **Thermo** GasTech Model 2321 and SafeTNet 210/410/2000 controllers is shown in the table below:

**Table 1-2 Wiring to Model 2321 controller**

FX-CO <sub>2</sub> terminal	Model 2321 Terminal	Model 210/410/2000 Terminal
V+	3 (+)	5 or 9 (+)
V-	1 (-)	6 or 10 (-)
Current	2 (FB)	7 or 11 (FB)

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## Bump Test/Test mode switch

A “bump” test can be performed to verify proper response of the unit without causing a controller that is monitoring the unit’s analog output to go into alarm. The test mode switch is a small pushbutton switch mounted at the bottom left of the main board (labeled JP5). When the switch pushbutton is depressed, the unit goes into the test mode. In this mode the display indicates the true CO<sub>2</sub> concentration, but the analog output is locked at approximately 2 mA. The test mode is indicated by a flashing of the reading on the LCD. The unit automatically exits the test mode ten minutes after the mode is initiated.

To perform a bump test:

1. Open the door of the housing and push the test mode switch pushbutton. The reading on the LCD will begin to flash, and the current output will drop to approximately 2 mA.
2. Apply a known concentration of CO<sub>2</sub> (preferably at least 20% of full scale) to the detector (see procedure in Calibration section).
3. Allow 1-2 minutes for the reading to stabilize.
4. If the reading does not match the test gas concentration  $\pm 10\%$ , perform a calibration as outlined in the Calibration section.
5. Remove the test gas. The unit will return to normal operating mode after approximately ten minutes.



### WARNING

**The analog output is locked at approximately 2 mA while the FX-CO<sub>2</sub> is in test mode. The output will not indicate changes in ambient CO<sub>2</sub> concentration.**

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## Calibration

This section describes the calibration procedure.

A calibration requires the use of calibration gas of known concentration. A calibration kit is available from the factory.

To verify the Model FX-CO<sub>2</sub>'s calibration, proceed as follows:

1. Open the door of the enclosure.
2. Move the shorting block on jumper JP2 (located at the bottom left of the circuit board), and install it so that it covers both pins of jumper JP2. For the diffusion version, remove the red cap from the calibration fitting mounted inside the main enclosure to the right of the circuit board. Attach the flexible tube from the regulator to the calibration fitting. For the flow-through version, disconnect the sample line or stop sample flow. Attach the regulator to a cylinder of known CO<sub>2</sub> concentration, preferably 50% of full scale. Turn on the regulator, and allow approximately one minute for the reading to stabilize.
3. If the reading differs by more than  $\pm 10\%$  from the known concentration of the calibration gas, use the 'UP' and 'DOWN' buttons located to the left of jumper JP2 to adjust the reading to match the calibration gas concentration.
4. Remove the jumper from JP2. After a few seconds the display will show a series of dashes. This signals that the unit is in a time-out mode before returning to operation. This mode will last approximately 60 seconds.



### NOTE

Do not remove calibration gas prior to removing jumper JP2.

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5. Turn off the calibration gas flow, and remove the regulator from the gas cylinder.
6. Attach the regulator to a cylinder of test gas known to contain less than 50 ppm CO<sub>2</sub> (for instance 100% nitrogen).
7. Turn on the regulator and allow the zero gas to flow until the normal display appears and the reading is stable (about one minute).
8. Install the jumper on JP3. Press and release the test mode switch pushbutton (JP5). After a few seconds the display will show a series of dashes.
9. Remove the shorting block from jumper JP3 and install it so that it only covers one of the pins on jumper JP2.

10. Turn off the test gas and remove the regulator from the cylinder. For the diffusion version, remove the tubing from the calibration fitting and install the red cap removed in step 2. For the flow-through version, reconnect the sample line or restart sample flow. The unit will return to normal operating mode about one minute after the jumper is removed from JP3 in step 9.
11. Close and secure the door of the enclosure.



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### **WARNING**

**The analog out put is locked at approximately 2 mA while the FX-CO<sub>2</sub> is in calibration mode (JP2 or JP3 closed) mode. The output will not indicate changes in ambient CO<sub>2</sub> concentration. The jumper must be removed to return the unit to normal operating mode.**

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## **Sensor Filter Replacement (Diffusion version)**

The sensor is protected by a porous water-resistant filter, located at the bottom of the enclosure and secured by a compression fitting. In the event that the filter becomes dirty or contaminated, it should be replaced. To replace the filter:

1. Disconnect power to the unit
2. Loosen the bushing nut on the compression fitting to release the sensor and filter from the compression fitting.
3. Gently pull the filter out of the compression fitting. Do not pull too hard or you may damage or dislodge the sensor.
4. Push a new filter into the compression fitting.
5. Hand tighten the bushing nut to seal the gland around the filter. Do not use a wrench or tool.
6. Turn power back on and re-calibrate if necessary.

## **Sample Line Filter Replacement (Flow-through Version)**

Inspect the sample line frequently and verify that proper flow is maintained. If the filter becomes contaminated with dirt or moisture, replace immediately.



Appendix  
A

# Parts List

Table A-1 lists part numbers for the FX-CO<sub>2</sub> Monitor replacement parts and accessories.

**Table A-1 Parts List**

<b>Part No.</b>	<b>Description</b>
33-0006	Filter, sensor (diffusion)
33-0151	Sample line filter (Flow-through)
67-0037-01	Model FX-CO <sub>2</sub> Monitor, 0-1%, diffusion
67-0037-02	Model FX-CO <sub>2</sub> Monitor, 0-5%, diffusion
67-0037-03	Model FX-CO <sub>2</sub> Monitor, 0-10%, flow-through
67-0037-04	Model FX-CO <sub>2</sub> Monitor, 0-1%, flow-through
71-0134	FX-CO <sub>2</sub> Monitor Operator's Manual
81-0070	Cylinder, 2.5% CO <sub>2</sub>
81-0071	Cylinder, 5000 ppm (CO <sub>2</sub> )
81-0078	Cylinder, 100% nitrogen (N <sub>2</sub> )
81-0212	Calibration kit, CO <sub>2</sub> (2.5%)/N <sub>2</sub> (100%)
81-0212-01	Calibration kit, CO <sub>2</sub> (5000 PPM)/N <sub>2</sub> (100%)
81-1003	Regulator, Calibration Kit

