

# FORMALDEHYDE (HCHO) SENSOR IN RAE SYSTEMS INSTRUMENTS

## SPECIFICATIONS, CALIBRATION, ORDERING, AND INSTRUMENT CONFIGURATION OPTIONS

### INTRODUCTION

The formaldehyde (HCHO) sensor for RAE Systems MultiRAE family and ToxiRAE Pro gas monitors can be used for a wide variety of applications, such as automobile and chemical manufacturing, construction, indoor air quality, medical, and many others.

### SPECIFICATIONS

#### Sensor and Size Type

4R+ intelligent sensor (stores calibration information, alarm limits and other relevant data)

<b>Range:</b>	0 to 10ppm
<b>Resolution:</b>	0.05 ppm
<b>Response Time:</b>	T50 < 80 seconds
<b>Storage Life:</b>	6 months in sealed container
<b>Warranty:</b>	1 year from date of shipment

#### Supported Monitors

<b>Single-gas:</b>	ToxiRAE Pro (Model PGM-1860)
<b>Multi-gas:</b>	MultiRAE Pro (PGM-6248)
	MultiRAE (PGM-6228)
	MultiRAE Lite Pumped (PGM-6208)
	MultiRAE Lite Diffusion (PGM-6208D)

### CALIBRATION INFORMATION

#### Calibration Gas

Carbon Monoxide gas (CO, 50 ppm) or  
Formaldehyde gas (HCHO, 9 ppm)

#### Calibration Sequence

If the HCHO sensor is installed in the same multi-gas instrument as sensors for compounds to which the HCHO sensor has cross-sensitivities, the HCHO sensor should be calibrated first, prior to the other sensors.

### ORDERING

The HCHO sensor can be ordered with the new ToxiRAE Pro and MultiRAE family of monitors listed in the "Supported Monitors" section, using the Product Assemble-to-Order (ATO) Configurator provided in the Portables Pricing Guide, or as an individual (replacement) sensor.

#### HCHO [Replacement] Sensor Ordering Information

Part Number: C03-0982-000

### CROSS-SENSITIVITY ISSUES AFFECTING INSTRUMENT CONFIGURATIONS INVOLVING THE HCHO SENSOR

Due to the HCHO sensor's high cross-sensitivities and long recovery times after its exposure to select compounds (especially when the sensor is installed in multi-gas monitors like the new MultiRAE), some sensor combinations cannot be supported in one multi-gas instrument. Other sensor combinations may be feasible, but users should take note of the additional operation and maintenance requirements and/or limitations prior to use for specific applications.

Cross-Interfering Compound	NH <sub>3</sub> (Ammonia)	CO <sub>2</sub> (Carbon Dioxide)	CH <sub>4</sub> (Methane)
Cross-Interfering Compound Concentration	50 ppm	5,000 ppm	50% LEL
HCHO Sensor Cross-Sensitivity Level	None/Minimal	None/Minimal	None/Minimal

#### Configurations without Cross-Sensitivities

Based on the information provided in the previous table, the HCHO sensor has virtually no cross-sensitivity to the following gases, so no related issues should be expected when the HCHO sensor is installed in the same instrument as the following sensors:

- Ammonia (NH<sub>3</sub>)
- Carbon Dioxide (CO<sub>2</sub>)
- Methane (CH<sub>4</sub>; catalytic bead LEL or NDIR)

**Notes:**

- Data in the tables within this note are based on the HCHO (formaldehyde) sensor's cross-sensitivity to a single gas of certain concentration.
  - Mixtures of gases were not tested, and results with mixed gases are unpredictable.
  - Cross-sensitivities to all the compounds are only valid for a specified concentration and may be different for higher concentrations of the same compound.
- All specifications have been verified under the following environmental conditions: temperature: 68° F (20° C); relative humidity (non-condensing): 50%; ambient pressure: 1atm (1,013 mbar)

**CONFIGURATIONS REQUIRING SPECIAL ATTENTION**

The HCHO sensor can be ordered with the sensors listed below, but customers should be aware of the potential issues related to sensor cross-sensitivities and slower recovery times.

- HCN (Hydrogen Cyanide)** – The HCHO sensor not only has a moderate positive cross-sensitivity to HCN gas, but it can also take up to 20 minutes to recover from exposure to HCN gas.

- H<sub>2</sub>S (Hydrogen Sulfide)** – The HCHO sensor has a very high positive cross-sensitivity to H<sub>2</sub>S gas and typical recovery times of up to 10 minutes.
- PH<sub>3</sub> (Phosphine)** – The HCHO sensor has a very high positive cross-sensitivity to PH<sub>3</sub> gas.
- PID (Volatile Organic Compounds)** – HCHO sensor has high cross-sensitivity and long sensor recovery time when exposed to 100 ppm or higher concentrations of Isobutylene.
  - 10 ppm Isobutylene calibration gas can be used to calibrate the PID sensor instead of 100 ppm Isobutylene to reduce its effect on the HCHO sensor.
- As illustrated in the table below, the HCHO sensor also has positive cross-sensitivities to the following gases, so caution should be taken when using respective sensors in the same instrument as the HCHO sensor:
  - Carbon Monoxide (CO)
  - Hydrogen (H<sub>2</sub>)
  - Nitric Oxide (NO)
  - Sulfur Dioxide (SO<sub>2</sub>)

Cross-Interfering Compound	CO (Carbon Monoxide)	H <sub>2</sub> (Hydrogen)	HCN (Hydrogen Cyanide)	N <sub>2</sub> S (Hydrogen Sulfide)	C <sub>4</sub> H <sub>8</sub> (Isobutylene)	NO (Nitric Oxide)	PH <sub>3</sub> (Phosphine)	SO <sub>2</sub> (Sulfur Dioxide)
Cross-Interfering Compound Concentration	50 ppm	200 ppm	10 ppm	10 ppm	100 ppm	25 ppm	5 ppm	5 ppm
HCHO Sensor Cross-Sensitivity Level	Moderate positive	Minimal	Moderate positive	<b>High positive</b>	<b>High positive</b>	Slight positive	<b>High positive</b>	Moderate positive
HCHO Sensor Cross-Sensitivity Approximate Value	20%	1-2%	25%	<b>150%+</b>	<b>100%+</b>	10%	<b>100%+</b>	30%

**PROBLEMATIC CONFIGURATIONS**

Due to HCHO sensor's negative cross-sensitivities (a potential safety threat!) to respective gases specified below, the users should exercise caution when using the HCHO sensor in the same instrument as the following sensors:

- Chlorine (Cl<sub>2</sub>)
- Nitrogen Dioxide (NO<sub>2</sub>)

Cross-Interfering Compound	Cl <sub>2</sub> (Chlorine)	NO <sub>2</sub> (Nitrogen Dioxide)
Cross-Interfering Compound Concentration	1 ppm	5 ppm
HCHO Sensor Cross-Sensitivity Level	Moderate negative	Moderate negative

Cross-Interfering Compound	Cl <sub>2</sub> (Chlorine)	NO <sub>2</sub> (Nitrogen Dioxide)
HCHO Sensor Cross-Sensitivity Approximate Value	-20%	-20%

**Note:** From a safety standpoint, a negative cross-sensitivity may present a higher risk than a positive one, as it will diminish a sensor's response to the target gas and so prevent an alarm.

**OTHER CONFIGURATIONS**

Customers wishing to order MultiRAE instruments with any other sensor combination involving the HCHO sensor should contact RAE Systems.