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**detcon**

**CO<sub>2</sub>**

# Gas Detection

## Infrared Sensor Technology



**DC**  
detcon inc.

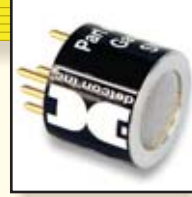
Catalog #IR-CO2-0404

[www.detcon.com](http://www.detcon.com)

ISO 9001:2000 • Certified



Factory Testing in Accordance with  
ISO 9001:2000 Certified Quality Program



Detcon Plug-In  
Infrared Sensor

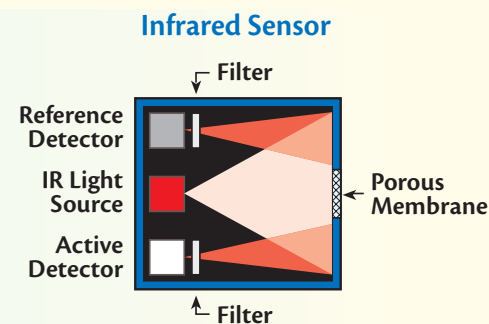
# Description

**Detcon CO<sub>2</sub> infrared sensors** are designed to detect and monitor Carbon Dioxide gas across a very wide range of sensitivity. Sensor designs are available for detection ranges as low as 0-3000 ppm and as high as 100% by volume. The sensors utilize a non-dispersive, sub-miniature detector assembly that contains an IR light source, an active pyroelectric detector and a reference pyroelectric detector. The IR light source and both detectors are packaged as a plug-in field replaceable optical

sensor module. Two models are available, Detcon Model IR-540 and Detcon Model IR-640. Both models feature Detcon's unique and intuitive MicroSafe™ software. Operator interface is non-intrusive via a small handheld magnet. Embedded intuitive software guides the operator through configuration programming and simple calibration procedures. Both sensor assemblies are certified by CSA and UL for installation in Class I, Division 1, Group B C D areas.

## Principle of Operation

**IR sensors** operate on the principle of infrared light absorption as a means to detect the presence of carbon dioxide gases. The Detcon IR sensor uses a miniature plug-in optical detector in stainless steel housing. The target gas diffuses through a sintered stainless steel flame arrestor and into an optical cavity. A lamp provides a cyclical IR radiation source that contacts two pyroelectric detectors. These "active" and "reference" detectors each give an output that measures the intensity of the radiation contacting their surface. The active detector is covered with a filter specific to the IR spectrum where carbon dioxide gas molecules absorb and the reference detector has a filter specific to the non-absorbing part of the IR spectrum. Carbon dioxide gas absorbs a fraction of the IR radiation and the active detector signal decreases. The reference detector signal remains unchanged in the presence of the target gas. The ratio of the active and reference detector signals is used to compute the gas concentration. By using the ratio, drift caused by changes in the lamp intensity or optical reflectivity is eliminated.



## Why Choose the Detcon Infrared Sensor?

**There is virtually only one method** to economically monitor carbon dioxide gas and that is via infrared optical detectors. Detcon manufactures an extremely durable and field serviceable sensor assembly utilizing this technology and boasts a long history of use to solve some of industry's most demanding gas monitoring applications. Both Detcon CO<sub>2</sub> gas detection sensors are independently certified for use in hazardous areas.

### Fail-safe Operation and Reduced Maintenance

Detcon IR sensors provide continuous self-diagnostic checking of the optics. This provides a high degree of fail-safe operation and thus allows for less frequent calibration. In many applications, annual maintenance and calibration is all that is required

to maintain a high level of sensor performance and reliability.

### Heated Optics and Low Power Design

Most IR cell designs incorporate secondary heaters to elevate optical component surface temperatures and eliminate losses due to condensation. The Detcon optical detector is a miniature assembly and the IR lamp's internal heat is sufficient to prevent condensation problems. With no secondary heater, the Detcon IR sensor has very low power consumption, and allows smaller and lower cost power supplies to be specified.

### No Oxygen Required

Detcon carbon dioxide IR sensors do not require background O<sub>2</sub> and they are not damaged as a result of over-range exposure.

## Highlights

- ▶ Fail-safe Operation and Less Frequent Calibration
- ▶ Rugged Packaging with Field Replaceable Plug-in Optical Detector
- ▶ Long Service Life and 5 year Warranty
- ▶ Simple Operator Interface with Intuitive Software

## Where can you benefit from the use of the Detcon Infrared Sensor?

- ▶ Indoor/Outdoor Air Quality
- ▶ Enhanced Oil Recovery
- ▶ Beverage and Bottling Processes
- ▶ Agricultural Green House Monitoring and Control
- ▶ Fruit and Produce Storage/Transportation
- ▶ Fire Suppression Agent Release System Alarm and Control

# Model IR-540W

**MicroSafe™ Intelligent Sensor**  
**4-20 mA**  
**Non-intrusive Interface**

**Detcon Model IR-540W** carbon dioxide gas detectors are non-intrusive intelligent sensors featuring Detcon MicroSafe™ intuitive software. Operator interface is via a hand-held magnet and program switches accessed through a glass lens cover. Calibration instructions appear in simple script on a 16-character display. The transmitter design incorporates extensive fault diagnostics with each condition conveniently identified on the transmitter display. The sensor transmitter module is plug-in field replaceable which allows for easy field level repair and upgrade of any existing installation.

- ▶ Linear 4-20 mA output
- ▶ One-man remote calibration
- ▶ Plug-in replaceable sensor
- ▶ Self adjusting zero and span with sensor life indication
- ▶ LED indicators for Fault and Calibration status
- ▶ Non-intrusive, magnetic programming interface (via hand-held magnet)
- ▶ Simple menu-driven programming and calibration
- ▶ 16 character backlit alphanumeric display



**IR-540W (0.3 to 5% ranges)**  
**IR-542W (10% to 100% ranges)**



# Model IR-640W

**MicroSafe™ Intelligent Sensor**  
**4-20 mA, RS-485, Relays**  
**Non-intrusive Interface**

**Detcon Model IR-640W** carbon dioxide gas detectors are the most versatile of the 2 explosion proof CO<sub>2</sub> sensor product groups. Model series 600 sensors provide complete flexibility in system integration options. Standard outputs include a linear 4-20 milliamp signal, three alarm relays and an RS-485 serial communication port. The intelligent sensor assembly features Detcon MicroSafe™ intuitive software. Operator interface is non-intrusive. All maintenance and programming functions are menu driven and accessed through a glass lens cover using a hand-held magnet. The universal transmitter is packaged as a plug-in module which supports easy field level maintenance and repair.

- ▶ Linear 4-20 mA output, alarm relays (3), and RS-485 Serial Communications
- ▶ One-man remote calibration
- ▶ Plug-in replaceable sensor
- ▶ Self adjusting zero and span with sensor life indication
- ▶ LED indicators for Fault and Calibration status
- ▶ Non-intrusive, magnetic programming interface (via hand-held magnet)
- ▶ Simple menu-driven programming and calibration
- ▶ 16 character backlit alphanumeric display



**IR-640W (0.3 to 5% ranges)**  
**IR-642W (10% to 100% ranges)**



# Technology Features

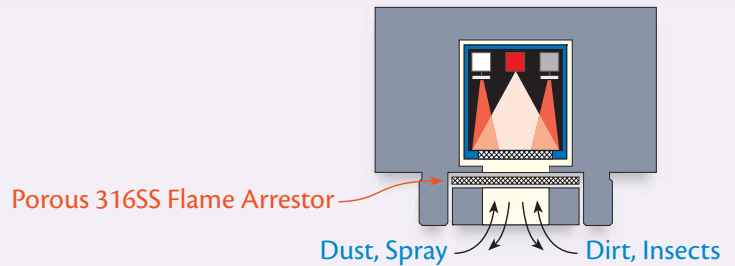
## Field Replaceable Plug-in Components

The transmitter electronics for each of the IR series sensors are equipped with a gold-plated mating plug for rapid replacement or upgrade in the field. The IR sensor body is constructed with stainless steel components and is plug-in replaceable within minutes.



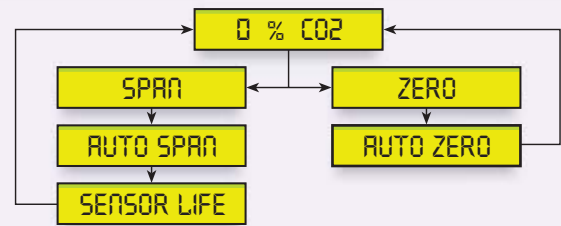
## Protected Optics Design

The enclosed optical chamber operates at 7-10°C hotter than ambient temperature so condensation is eliminated entirely. The optical chamber is protected from the environment by a porous metal flame arrestor. This prevents optical failures due to dust, dirt, spray and insects.



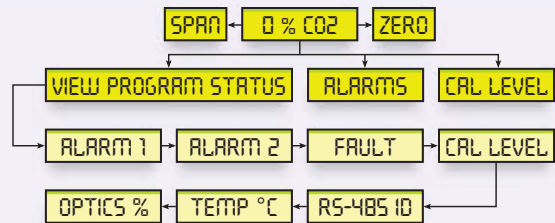
## Simple Calibration (IR-540W & IR-640W)

Span and zero calibration are automatic and require only 2 touches from a calibration magnet and 3 minutes. As found reading and remaining sensor life are displayed during every calibration.



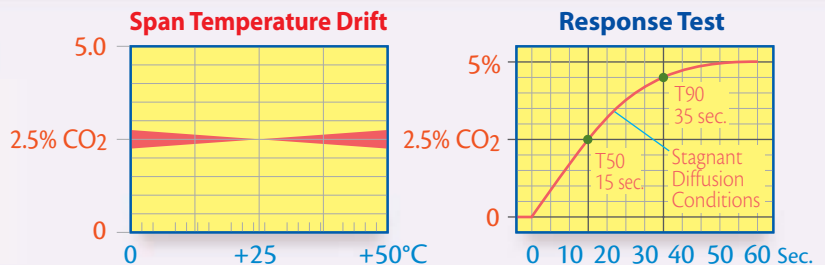
## Intuitive User Interface (IR-640W Shown)

The user interface allows for adjustment of calibration gas value and alarm level set-points. The "View Program Status" function displays all current set-point parameters for quick review.



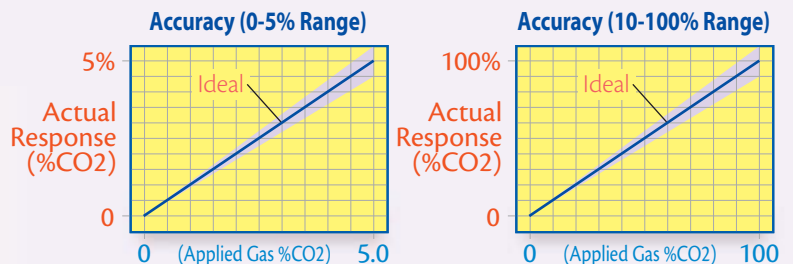
## 100% Performance Approved

The Detcon Series of IR CO<sub>2</sub> gas sensors are tested to meet strict industrial performance specifications. These tests include accuracy, response time, long-term stability, temperature/humidity drift. The temperature compensation delivers exceptional temperature stability.



## Wide Range Selection

The Detcon Series of IR CO<sub>2</sub> gas sensors cover the full spectrum of industrial and commercial CO<sub>2</sub> measurement. There are two sensors employed to achieve this. A low range sensor covers the 0-5% range (IR-540W & IR-640W), and a high range sensor covers the 10-100% range (IR-542W & IR-642W)

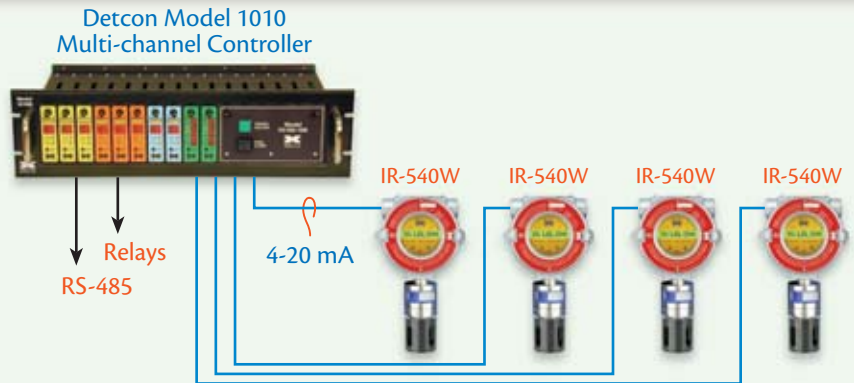


# Integration Options

The **IR Series** of carbon dioxide gas detectors provide the end-user with a wide variety of output options including 4-20 mA, RS-485 Modbus RTU, and relay contacts. As stand-alone devices, they are compatible with virtually any industry standard data acquisition system. Additionally, Detcon provides a complete range of pre-engineered gas detection systems. Shown below are a series of typical system integration approaches.

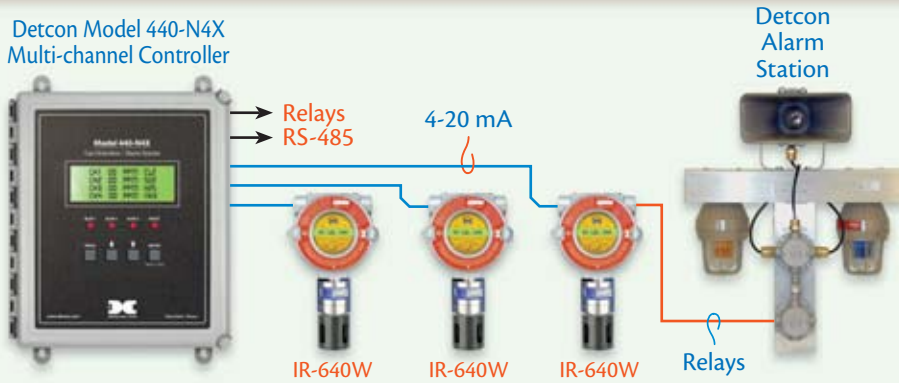
## ▶ 4-20 mA

**Direct feed of individual sensor** 4-20 mA outputs to dedicated Detcon multi-channel controller. The controller repeats outputs, and provides relay and RS-485 output options.



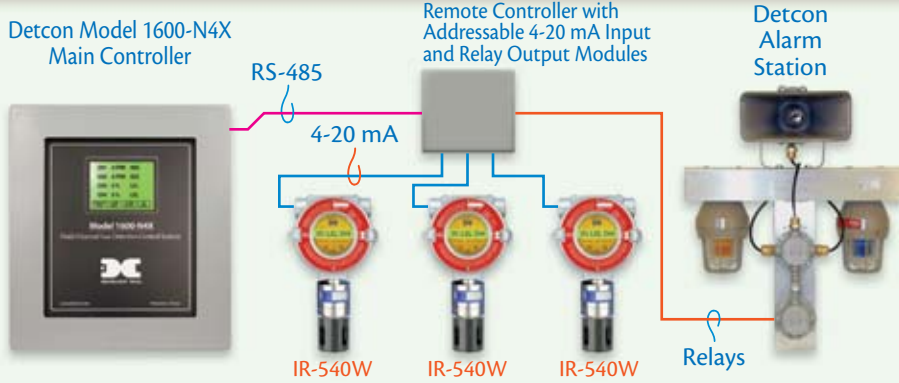
## ▶ 4-20 mA & Local Relays

**Direct feed of 4-20 mA outputs** to dedicated Detcon multi-channel controller is combined with direct wiring of built-in relay outputs (from Model IR-640W) to activate field-mounted alarm stations or other responses. Controller provides additional output relays.



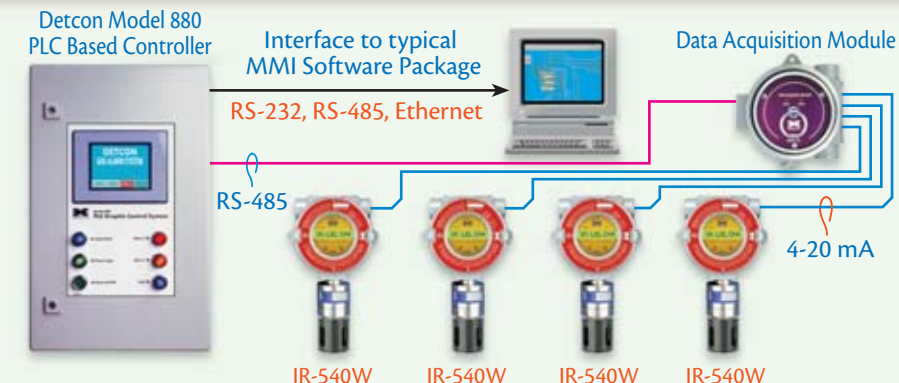
## ▶ 4-20 mA/RS-485 & Local Relays

**Individual sensors** (Model IR-540W) provide 4-20 mA inputs to a remote-mount addressable 4-20 mA Input Module. The addressable 4-20 mA Input Module communicates via RS-485 to Model 1600 Controller. The remote-mounted addressable Relay Output Module provides signal for local alarm station. Detcon Model 1600 controller provides all data handling, display and historical logging.



## ▶ 4-20 mA & RS-485 Combination

**Individual sensor 4-20 mA** outputs are routed to Detcon DA-1 Data Acquisition Modules for conversion to RS-485. DA-1s are looped and fed to Model 880 PLC providing all data handling, display, and historical logging. The Model 880 then can be interfaced to a PC-based MMI using Citect, Wonderware or other software packages.



# Order Guide

## Model # Description

- IR-540W** MicroSafe™ carbon dioxide non-intrusive sensor assembly with 4-20 mA output (Low Range)
- IR-542W** MicroSafe™ carbon dioxide non-intrusive sensor assembly with 4-20 mA output (High Range)
- IR-640W** MicroSafe™ carbon dioxide non-intrusive sensor assembly with 4-20 mA, RS-485, & Relays (Low Range)
- IR-642W** MicroSafe™ carbon dioxide non-intrusive sensor assembly with 4-20 mA, RS-485, & Relays (High Range)

\*Specify range at time of order (see range options at lower right)

## Specifications

### Sensor Type

Non Dispersive Infrared (NDIR) Optical

### Measurement Range

0-0.3/1/3/5% (low range sensor)  
0-10/20/50/100% (high range sensor)

### Accuracy

±10% of Reading or  
±2.5% of Range (greater of)

### Repeatability

±3% of reading

### Response Time

T50 <15 seconds  
T90 <35 seconds

### Zero Drift

< 0.05% per year

### Operating Temperature Range

-40°F to +167°F; -40°C to +75°C

### Operating Humidity Range

0-99% RH (non-condensing)

### Outputs

Linear 4-20 mA DC  
RS-485 Modbus™ (IR-640 & IR-642 only)  
3 Relays (IR-640 & IR-642 only)  
Alarm 1, Alarm 2, & Fault  
Contacts rated 5 amps @ 250VAC,  
5 amps @ 30VDC

### Input Voltage

11.5-28 VDC (IR-540 & IR-542)  
22.5-28 VDC (IR-640 & IR-642)

### Power Consumption (Maximum)

<2.5 watts @ 24 VDC (IR-540 & IR-542)  
<3 watts @ 24 VDC (IR-640 & IR-642)

### Electrical Classification

Explosion proof  
Class I, Division 1, Groups B, C, D  
CSA and UL Approved

### Warranty

Sensor: 5 year pro-rated  
Transmitter: 2 year

### Sensor Weight/Shipping Weight

5 lbs/6 lbs

### Shipping Dimensions

12.5W" x 9.5D" x 8H"

## Warranty

### ▶ ELECTRONICS

#### 5 Year Fixed Fee Service Policy

Detcon Inc. warrants each new control transmitter circuit to be free from defects in material and workmanship under intended normal use for a period of two years from the date of shipment to the original purchaser. Detcon, further provides for a five year fixed-fee service policy covering the control transmitter circuit. The fixed fee service policy shall affect any necessary factory repair for the period following the two-year warranty period and shall end five years after expiration of the warranty. All warranties are FOB the Detcon factory located in The Woodlands, Texas, USA.

### ▶ IR PLUG-IN OPTICAL SENSOR

#### 5 Year Conditional Warranty

Detcon Inc., as manufacturer, warrants each new IR plug-in optical sensor to be free from defects in material and workmanship under intended normal use for a period of 5 years under the following conditions: The warranty period begins on the date of shipment to the original purchaser and ends 5 years thereafter.

#### Warranty Schedule

First 2 years: no charge  
3rd year: 25% of replacement charge  
4th year: 50% of replacement charge  
5th year: 75% of replacement charge  
Non-warranty: 100% of replacement charge

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## Additional Information

### ▶ INTERFERENCE GASES & CALIBRATION

#### The Detcon IR Series CO2 gas

sensors are selective to CO2. There are no known interference gases. All sensors are factory calibrated prior to shipment.

### ▶ STANDARD DETECTABLE RANGES

#### IR-540W AND IR-640W

0-0.3% CO2  
0-0.5% CO2  
0-1% CO2  
0-3% CO2  
0-5% CO2

#### IR-542W AND IR-642W

0-10% CO2  
0-25% CO2  
0-50% CO2  
0-100% CO2

### ▶ DIMENSIONS/MOUNTING DETAIL

