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detcon

TOXIC

Gas Detection

Electrochemical Sensor Technology



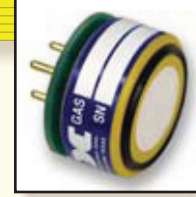
Catalog #TOX-1204

www.detcon.com

ISO 9001:2000 • Certified



Factory Testing
and Quality Assurance



Detcon Plug-In
Electrochemical Sensor

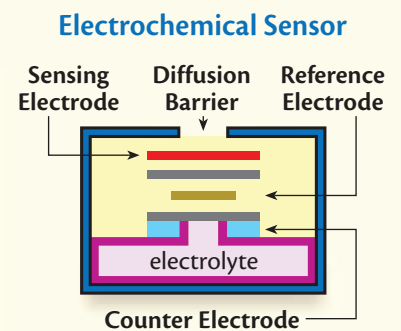
Description

Detcon toxic gas electrochemical gas sensor assemblies are designed to monitor ambient air for the presence of a wide variety of toxic gas compounds. The Detcon list of measurable toxic gases and the availability of full-scale ranges are among the most extensive in the gas detection industry. The detection technology is the 3-electrode electrochemical cell type. Each cell consists of three electrodes embedded in an electrolyte and is housed beneath a gas diffusion membrane. Sensitivity

and specificity to each target gas is achieved by varying the composition of the electrodes and/or the electrolyte solution. Typical service life is two years or greater in most industrial environments. The sensor assemblies are offered in three explosion-proof instrument packages (Series DM-400IS, DM-500IS, and DM-600IS) with varying features as described in this catalog. In addition, an Intrinsically Safe DM-200 version is covered separately in the Detcon DM-200 UniTox™ catalog.

Principle of Operation

Air and target gas diffuse through the diffusion barrier to reach the sensing electrode. The controlling circuit maintains an external operating voltage between the sensing and counter electrodes sufficient to drive the electrochemical reaction. The electrochemical reaction with the target gas generates a current flow between the sensing and counter electrodes. This current is proportional to the target gas concentration and is reversible. The electronic circuit also provides a specific bias potential between the reference and the sensor electrodes in such a manner that no current flows between them. The quick response of the sensor results in continuous monitoring of ambient air conditions.



Why Choose the Detcon Electrochemical Sensor?

The electrochemical cell is the most widely applied sensor design for detection of toxic gases. While there are certain specific applications where other sensor designs can be used to good effect (e.g. the metal oxide semiconductor and the photo-ionization detector), the electrochemical cell remains the most widely accepted for use in monitoring a broad range of gases. Detcon has a long history in the adaptation and application of electrochemical sensors, and the resultant product line makes optimal use of the many advantages of the technology.

Detcon electrochemical sensors utilize a wide variety of electrolyte chemistries and physical properties to achieve maximum target gas response with minimal potential for cross-interference from other gases. The list of detectable gases is very long for these sensors, and their structural similarity allows

for great flexibility in their integration. For this reason, all Detcon DM-Series detectors utilize universal transmitters, allowing for complete interchangeability of sensors and transmitters. Another advantage of the Detcon electrochemical sensors is their very low power consumption. This allows for use of intrinsically safe sensor housings, eliminating the need for sinters or other arrestor devices that can slow sensor response time and complicate maintenance.

Detcon electrochemical sensors provide high accuracy, rapid response and excellent long-term repeatability. Like all other Detcon sensors, they are packaged for ease of on-site maintenance featuring plug-in field replaceable sensor cells and control transmitters. Calibration frequencies can vary according to the specific type of cell being used, but the typical interval for these sensors ranges from 90 to 180 days.

Highlights

- ▶ Very rapid response to target gas
- ▶ Very repeatable response over time
- ▶ Minimal calibration and maintenance requirements
- ▶ Capable of measuring a long list of different toxic gases
- ▶ Intrinsically Safe sensor housing with universal control electronics

Where can you benefit from the use of the Detcon Electrochemical Sensor?

- ▶ Virtually any light or heavy industrial toxic gas monitoring application
- ▶ Remote areas where long-term signal stability is required
- ▶ Areas where low range concentrations of certain toxic gases must be reliably detected



Model DM-400IS

Standard
4-20 mA Output
Loop Powered

Detcon Model DM-400IS toxic gas detectors are a traditional explosion-proof sensor assembly with “blind” cover. Operator interface is via test points and span potentiometers accessed through the transmitter faceplate. Detcon Model DM-400 series sensors became commercially available in 1988. The most recent improvement was the conversion to a universal transmitter design wherein any of the 40 or more toxic gas detector sub-assemblies are compatible with a single transmitter. Plug-in modular packaging of the sensor transmitter circuit facilitates easy field level repair and upgrade of existing installations.

- ▶ 2 wire loop powered operation
- ▶ Linear 4-20 mA output
- ▶ One-man remote calibration
- ▶ Plug-in replaceable sensor
- ▶ Field upgradable to MicroSafe™ Intelligent Sensor assembly



Model DM-500IS

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

Detcon Model DM-500IS toxic 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 is universal and programmable for service over 40 toxic gas detector sub-assemblies. The sensor transmitter module is plug-in field replaceable which allows for easy field level repair and upgrade of any existing installation. DM-500IS transmitters can also be used to upgrade existing DM-400IS installations.

- ▶ 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



Model DM-600IS

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

Detcon Model DM-600IS toxic gas detectors are the most versatile of the 3 explosion proof toxic 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 compatible with over 40 toxic gas detector sub-assemblies and 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

Technology Features

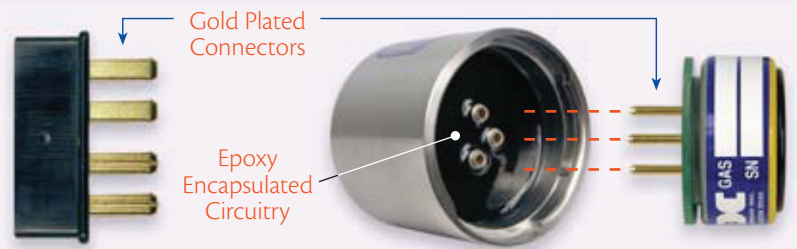
Field Replaceable Plug-in Components

The **transmitter electronics** module for each DM series sensor is a plug-in replaceable design which allows for rapid replacement or upgrade in the field. The toxic gas electrochemical sensors are modular and are also designed for quick and easy exchange without the need to de-classify the environment.



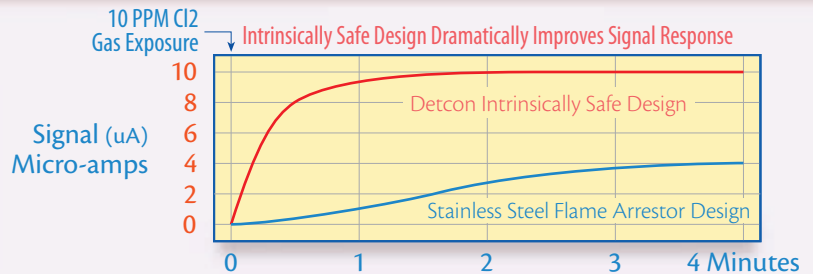
Corrosion Resistant Design

Many **toxic gases** are extremely corrosive and effect the longevity of electronic components. DM series sensors use high surface area gold-plated connections and all PCBs are epoxy encapsulated or covered with industrial grade conformal coating. A proprietary "condensation prevention packet" is also provided.



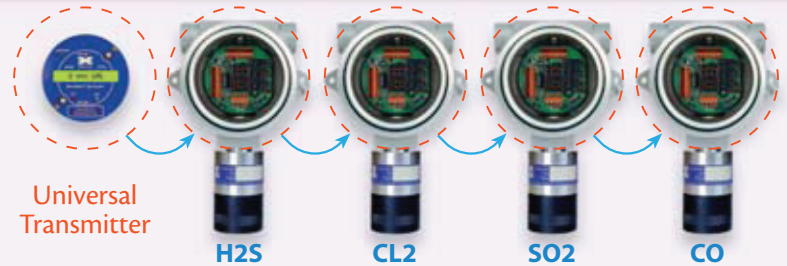
Intrinsically Safe Sensor Head

The **sensor head** is designed with an intrinsically safe barrier circuit that eliminates the need for a stainless steel flame arrestor, allowing direct gas exposure to the sensor. The resulting response time, repeatability, and long-term stability are dramatically improved for all gases, especially those that are corrosive by nature.



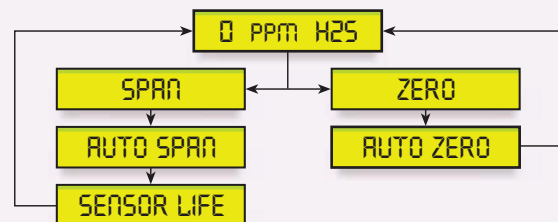
Universal Transmitter

The **DM series transmitter modules** are universal in their design, providing for great flexibility in system maintenance. Simply exchange the transmitter and dial in the gas formula and range that match up with the corresponding sensor head.



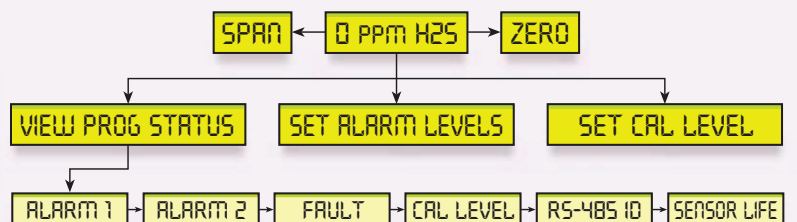
Simple Calibration (DM-500IS & DM-600IS)

Span and zero calibration are sequenced automatically by the microprocessor, and require only 2 touches from the calibration magnet and 3 minutes time. The as found reading and remaining sensor life are displayed during every span calibration.



Intuitive User Interface (DM-600IS 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.



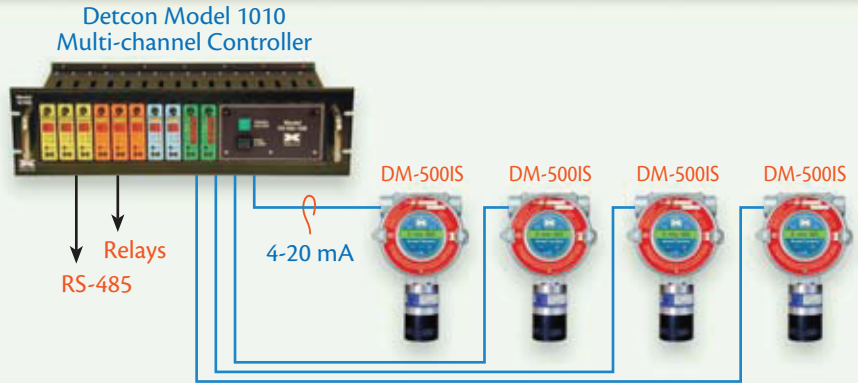
Integration Options

The **DM Series** of toxic 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

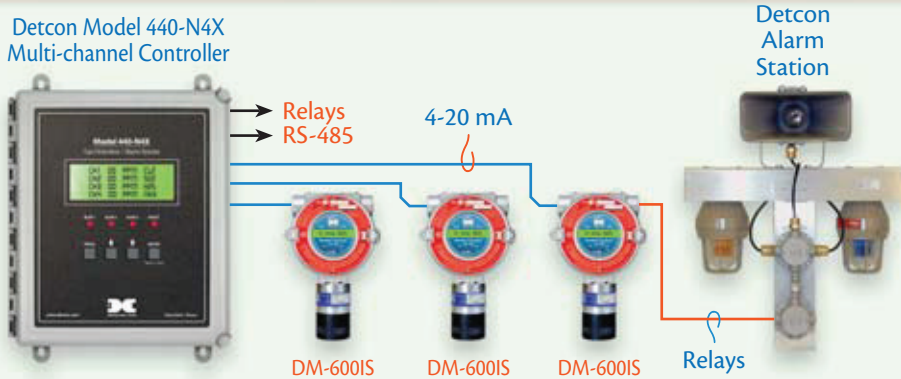
Direct feed of individual sensor

4-20 mA outputs to dedicated Detcon multi-channel controller. The controller repeats outputs, and provides relay and RS-485 output options.



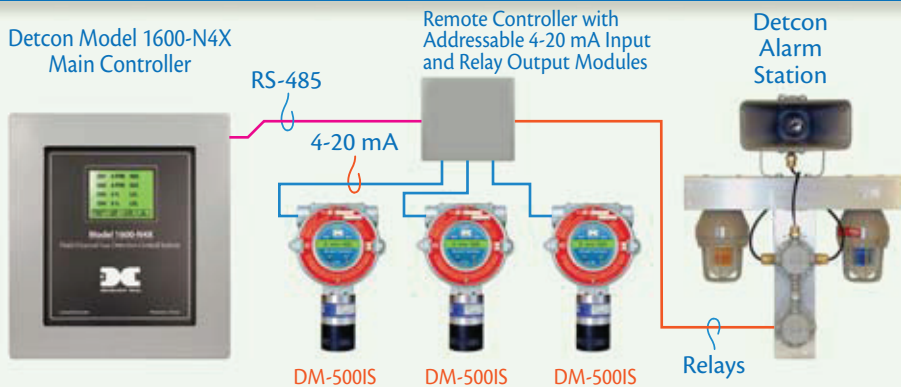
4-20 mA & Local Relays

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 DM-600IS) to activate field-mounted alarm stations or other response. Controller provides additional relay and RS-485 output options.



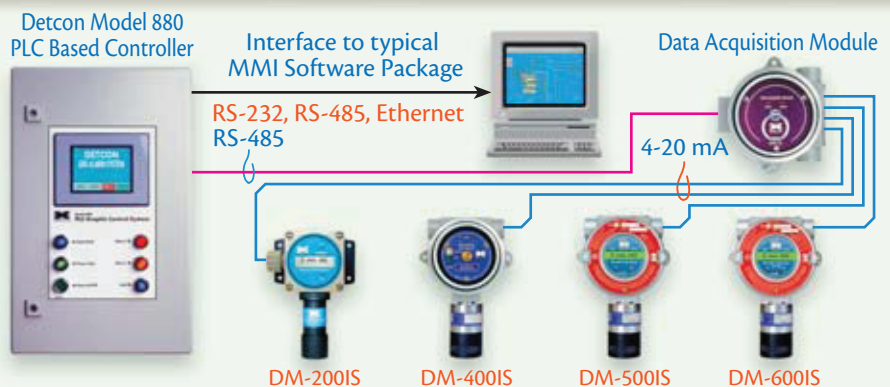
4-20 mA/RS-485 & Local Relays

Individual sensors (Model DM-500IS) 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, Cimplicity or other software package.



Order Guide

Complete the model number by choosing the model series (4, 5, or 6) and place that number in the “#” position of the Model Number listed in the table below. For example, a series 600 H2S sensor would be model number DM-600IS-H2S

Series	Description
(4) DM-400IS	Toxic gas sensor assembly with 4-20 mA output
(5) DM-500IS	MicroSafe™ toxic gas non-intrusive sensor assembly with 4-20 mA output
(6) DM-600IS	MicroSafe™ Toxic gas non-intrusive sensor assembly with 4-20 mA, RS-485, Relays

Model Number	Gas Name ¹	Range ppm ²	Response Time Sec. ³	Operating Temperature	Humidity Range %	Sensor Warranty ⁴
DM-#00IS-C2H3O	Acetaldehyde	0-100	T90 <140	-20°C to +50°C	15-90	2 Years
DM-#00IS-C2H2	Acetylene	0-100	T90 <140	-20°C to +50°C	15-90	2 Years
DM-#00IS-C3H3N	Acrylonitrile	0-100	T90 <140	-20°C to +50°C	15-90	2 Years
DM-#00IS-NH3	Ammonia	0-100	T90 <60	-20°C to +40°C	10-95	2 Years
DM-#00IS-AsH3	Arsine	0-1	T90 <60	-20°C to +40°C	20-95	1 1/2 Years
DM-#00IS-Br2	Bromine	0-5	T90 <60	-20°C to +50°C	15-90	2 Years
DM-#00IS-C4H6	Butadiene	0-100	T90 <140	-20°C to +50°C	15-90	2 Years
DM-#00IS-CS2	Carbon Disulfide	0-100	T90 <140	-20°C to +50°C	15-90	2 Years
DM-#00IS-CO	Carbon Monoxide	0-100	T90 ≤30	-40°C to +50°C	15-90	3 Years
DM-#00IS-COS	Carbonyl Sulfide	0-100	T90 <140	-20°C to +50°C	15-90	2 Years
DM-#00IS-Cl2	Chlorine	0-10	T90 <60	-20°C to +50°C	15-90	2 Years
DM-#01IS-ClO2	Chlorine Dioxide	0-1	T90 <60	-20°C to +50°C	15-90	2 Years
DM-#00IS-B2H6	Diborane	0-5	T90 <60	-20°C to +40°C	20-95	1 1/2 Years
DM-#00IS-C2H6S	Dimethyl Sulfide	0-100	T90 <140	-20°C to +50°C	15-90	2 Years
DM-#00IS-C3H5OCl	Epichlorohydrin	0-100	T90 <140	-20°C to +50°C	15-90	2 Years
DM-#00IS-C2H5OH	Ethanol	0-100	T90 <140	-20°C to +50°C	15-90	2 Years
DM-#00IS-C2H5SH	Ethyl Mercaptan	0-100	T90 <45	-40°C to +50°C	15-90	2 Years
DM-#00IS-C2H4	Ethylene	0-100	T90 <140	-20°C to +50°C	15-90	2 Years
DM-#00IS-C2H4O	Ethylene Oxide	0-100	T90 <140	-20°C to +50°C	15-90	2 Years
DM-#00IS-F2	Fluorine	0-1	T90 <80	-10°C to +40°C	10-95	1 1/2 Years
DM-#00IS-CH2O	Formaldehyde	0-100	T90 <140	-20°C to +50°C	15-90	2 Years
DM-#00IS-GeH4	Germane	0-2	T90 <60	-20°C to +40°C	20-95	1 1/2 Years
DM-#00IS-N2H4	Hydrazine	0-1	T90 <120	-10°C to +40°C	10-95	1 Year
DM-#00IS-H2	Hydrogen	0-100	T90 ≤30	-20°C to +50°C	15-90	2 Years
DM-#01IS-H2	Hydrogen	LEL	T90 <60	-40°C to +40°C	5-95	2 Years
DM-#02IS-H2	Hydrogen	0-1%	T90 <60	-40°C to +40°C	5-90	2 Years
DM-#00IS-HBr	Hydrogen Bromide	0-30	T90 <70	-20°C to +40°C	10-95	1 1/2 Years
DM-#00IS-HCl	Hydrogen Chloride	0-30	T90 <70	-20°C to +40°C	10-95	1 1/2 Years
DM-#00IS-HCN	Hydrogen Cyanide	0-30	T90 <40	-40°C to +40°C	5-95	2 Years
DM-#00IS-HF	Hydrogen Fluoride	0-10	T90 <90	-20°C to +35°C	10-80	1 Year
DM-#00IS-H2S	Hydrogen Sulfide	0-100	T90 ≤30	-40°C to +50°C	15-90	2 Years
DM-#00IS-CH3OH	Methanol	0-100	T90 <140	-20°C to +50°C	15-90	2 Years
DM-#00IS-CH3SH	Methyl Mercaptan	0-100	T90 <45	-40°C to +50°C	15-90	2 Years
DM-#00IS-NO	Nitric Oxide	0-100	T90 ≤10	-20°C to +50°C	15-90	3 Years
DM-#00IS-NO2	Nitrogen Dioxide	0-10	T90 <40	-20°C to +50°C	15-90	2 Years
DM-#00IS-O3	Ozone	0-1	T90 <120	-10°C to +40°C	10-95	2 Years
DM-#00IS-COCl2	Phosgene	0-1	T90 <120	-20°C to +40°C	10-95	1 1/2 Years
DM-#00IS-PH3	Phosphine	0-5	T90 <30	-20°C to +40°C	20-95	1 1/2 Years
DM-#00IS-SiH4	Silane	0-50	T90 <60	-20°C to +40°C	20-95	1 1/2 Years
DM-#00IS-SO2	Sulfur Dioxide	0-20	T90 ≤20	-20°C to +50°C	15-90	2 Years
DM-#00IS-C4H8S	Tetrahydrothiophene	0-100	T90 <30	-10°C to +40°C	10-95	2 Years
DM-#00IS-C4H4S	Thiophane	0-100	T90 <140	-20°C to +50°C	15-90	2 Years
DM-#00IS-C4H6O2	Vinyl Acetate	0-100	T90 <140	-20°C to +50°C	15-90	2 Years
DM-#00IS-C2H3Cl	Vinyl Chloride	0-100	T90 <140	-20°C to +50°C	15-90	2 Years

Notes

- 1 - Contact the factory for other gases not on this list
 - 2 - Standard Range - contact factory for other ranges
 - 3 - T90 = 90%
 - 4 - Replaceable plug-in sensor
 - 5 - LEL range hydrogen is not CSA certified
- Cross sensitivity data available on request.

Specifications

Sensor Type

Electrochemical

Repeatability

±2% FS

Linearity

±10% of Reading

Outputs

Linear 4-20 mA DC

RS-485 Modbus™ (DM-600IS only)

3 Relays (DM-600IS only)

Alarm 1, Alarm 2, & Fault; Contacts rated
5 amps @ 250VAC, 5 amps @ 30VDC

Input Voltage

11.5-28 VDC (DM-400IS & DM-500IS)

22.5-28 VDC (DM-600IS)

Power Consumption (max @ 24VDC)

0.5 watts (DM-400IS), 1.6 watts (DM-500IS)

<3 watts (DM-600IS)

Electrical Classification

Explosion proof, Class I, Div. 1, Groups B, C, D

Safety Approvals

CSA and UL

Warranty

Sensor: see table on left, Transmitter: 2 year

Sensor Weight/Shipping Weight

4 lbs/5lbs

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.

▶ ELECTROCHEMICAL SENSOR

Detcon Inc., as manufacturer, warrants each new electrochemical toxic gas plug-in sensor cell to be free from defects in material and workmanship under normal intended use for a specified period under the conditions described as follows: The warranty period begins on the date of shipment to the original purchaser and ends after the specified period listed in the table on the left.

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