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detcon

H₂S

Gas Detection

Solid State MOS Sensor Technology

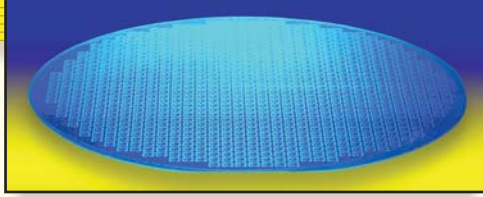
for *Harsh* and *Extreme* Locations



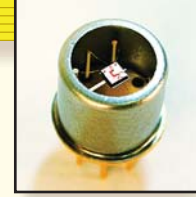
Catalog #H2S-0804

www.detcon.com

ISO 9001:2000 • Certified



Silicon Wafer
Microchip Fabrication



Proprietary
Microchip Sensor

Description

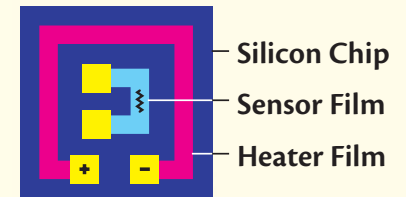
Detcon Solid State H2S gas sensor assemblies are designed to monitor ambient air for gas concentrations of hydrogen sulfide in a wide variety of ranges; from the standard field adjustable models with 0-20/50/100 PPM selectivity, to high-range models up to 1,000 PPM. The sensor technology is a proprietary solid state metal oxide semiconductor. The sensor consists of two thin films: a temperature sensitive heater film, and a hydrogen sulfide sensitive sensor film. Both films are deposited on a silicon microchip by vacuum deposition. The heater film elevates the operating

temperature of the sensor film to a level where an optimized sensitivity and response to hydrogen sulfide is achieved. The sensor film consists of a proprietary metal oxide that shows a dynamic signal change to hydrogen sulfide gas. Range of sensitivity is from part per billion to % by volume. This rugged sensor is capable of maintaining its operating characteristics for periods of up to 10 years in most industrial environments. The technology is offered in three explosion-proof instrument packages with varying features as described in this brochure.

Principle of Operation

Method of detection is by diffusion/adsorption. Air and gas diffuse through a sintered stainless steel filter and contact the heated surface of the metal oxide sensor film. As hydrogen sulfide gas molecules react with oxygen ions on the film, there is a decrease in electrical resistance proportional to the gas concentration. The heater film elevates the temperature of the sensor film creating convection and promoting a quick response to changing gas concentrations. This heater film is electronically controlled to maintain a constant temperature at the sensor film, thus enhancing stability and repeatability and eliminating the need for temperature compensation of the output. The sensor response is reversible and results in continuous monitoring of ambient air conditions.

Semiconductor Sensor (MOS)



Why Choose the Detcon Solid State H2S Sensor?

There are two primary technologies for ambient measurement of H2S: Solid State MOS and Electrochemical cell. Both have advantages for operating under specific conditions. Detcon manufacturers sensors utilizing **both** technologies, and has a long history of field experience in their application.

The Solid State MOS sensor is a particularly rugged device, and its use is most common in severe environments. It is rapid to respond to and recover from exposure to any level of H2S, and is unaffected by windy or stagnant release conditions. The sensor is not damaged nor is its lifetime significantly affected by ambient temperature extremes, humidity extremes, or constant exposure to H2S in the field. In fact, it is common to achieve 10 or more years of service life from a sensor. The MOS

is often preferred because of its long warranty and very low replacement cost. Typical calibration intervals for the MOS sensor range from 30-90 days, while electrochemical sensors generally require calibration every 90-180 days.

Choosing the best sensor for any application should involve close consideration of a variety of factors, from the end-users' accuracy and maintenance requirements to the prevailing environmental conditions. Detcon sales engineers are trained and ready to thoroughly review field applications and provide accurate and timely assistance in sensor selection. In the meantime, the following information summarizes the advantages of the Solid State sensor:

Highlights

- ▶ Extremely rugged/most resistant to damage from climatic extremes
- ▶ Very long service life
- ▶ Longest warranty of any H2S gas detection sensor in the world
- ▶ Inexpensive to replace and maintain
- ▶ Not affected by prolonged or high level exposure to H2S

Where can you benefit from the Detcon Solid State Sensor?

Extreme Climatic Conditions

- ▶ Open desert and other high temperature areas
- ▶ Sub-zero temperature areas
- ▶ Tropical and sub-tropical humidity

Harsh Environments

- ▶ Offshore operations
- ▶ Oil & gas drilling operations
- ▶ Areas with a constant presence of H2S

Model TP-424C

Standard
4-20 mA Output

Detcon Model TP-424C is a traditional explosion-proof assembly with "blind" cover. Operator interface is via test points and span potentiometers accessed through the transmitter faceplate. Detcon's Model TP-424 series sensor became commercially available in 1985 and has undergone periodic design upgrades throughout the years. The most recent improvement was the addition of extensive detector fault diagnostics. Detector fault circuits trigger light emitting diodes in the event of an open heater film or open sensor film and sync the 4-20 mA output to zero milliamps. Plug-in modular packaging of the sensor transmitter circuit facilitates easy upgrade of existing installations.

- ▶ Linear 4-20 mA output
- ▶ Integral sensor fault diagnostics
- ▶ Direct response constant temperature control
- ▶ One man remote calibration
- ▶ Field upgradable to MicroSafe™ Intelligent Sensor assembly



Model TP-524C

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

Detcon Model TP-524C is an intelligent sensor assembly featuring Detcon's MicroSafe™ intuitive software. Operator interface is non-intrusive using a hand-held magnet and program switches accessed through a glass lens cover. Calibration instructions appear in simple interactive and sequential 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 maintenance and repair. TP-524 transmitters can also be used to upgrade existing TP-424 installations.

- ▶ Linear 4-20 mA output
- ▶ Integral sensor fault diagnostics
- ▶ Direct response constant temperature control
- ▶ One-man remote calibration
- ▶ Self adjusting 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

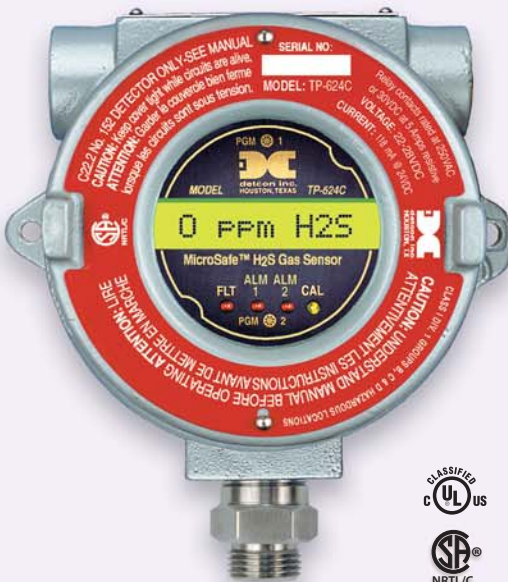


Model TP-624C

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

Detcon Model TP-624C is the most versatile of the solid state hydrogen sulfide sensor designs. The intelligent sensor assembly features Detcon's 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. Model TP-624 series sensors provide complete flexibility and redundancy in system integration options. Standard outputs include a linear 4-20 mA signal, three alarm relays, and an RS-485 serial communication port. The transmitter is a plug-in module which supports easy field level maintenance and repair.

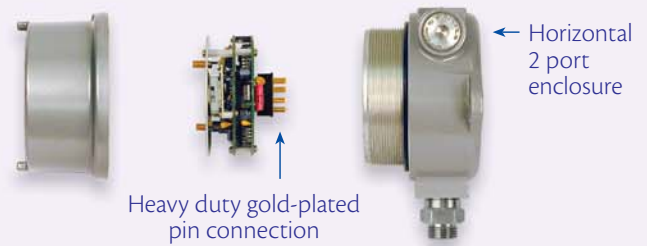
- ▶ Linear 4-20 mA output, 3 relays, and RS-485 Serial Communications
- ▶ Integral sensor fault diagnostics
- ▶ Direct response constant temperature control
- ▶ One-man remote calibration
- ▶ Self adjusting span with sensor life indication
- ▶ LED indicators for Fault and Calibration status
- ▶ Non-intrusive, magnetic programming interface (via hand-held magnet)
- ▶ Simple menu-driven programming and calibration
- ▶ 16 character backlit alphanumeric display



Technology Features

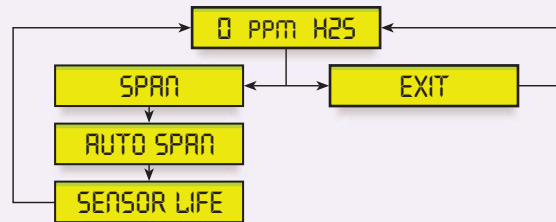
Field Replaceable Plug-in Electronics

The transmitter electronics for each of the TP series sensors are equipped with a multi-pin mating plug for rapid replacement or upgrade in the field. High surface area gold-plated pins provide maximum corrosion resistance and the enclosure design protects against water ingress.



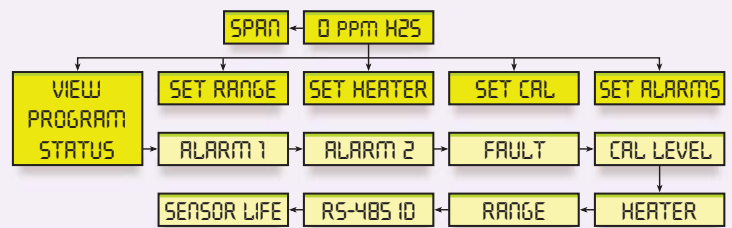
Simple Calibration (TP-524C & TP-624C)

Span calibration is automatic and requires only 2 touches from a calibration magnet and 3 minutes. There is no requirement for zero adjustment. As found reading and remaining sensor life are displayed during every calibration.



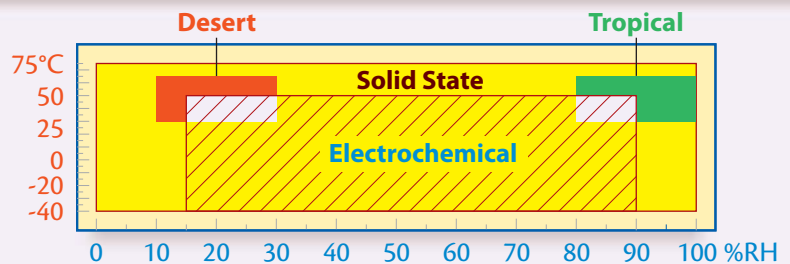
Intuitive User Interface (TP-624C Shown)

In addition to span calibration, the user interface allows for adjustment of range, sensor heater voltage, calibration gas value, and alarm level set-points. The "View Program Status" function displays all current set-point parameters for quick review.



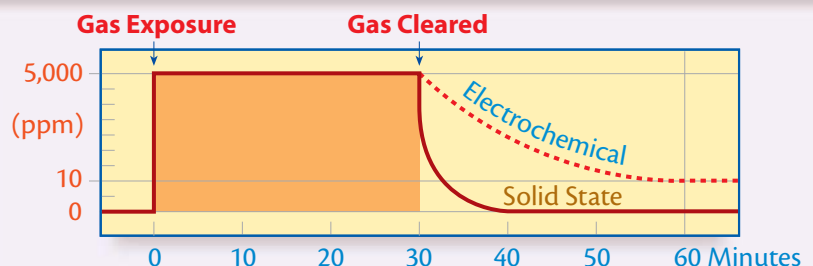
Temperature & Humidity Extremes

Detcon's Solid State MOS sensor performs over a wider range of temperature and humidity than any other sensor design. It is an ideal choice for tropical, desert, and other climate extremes.



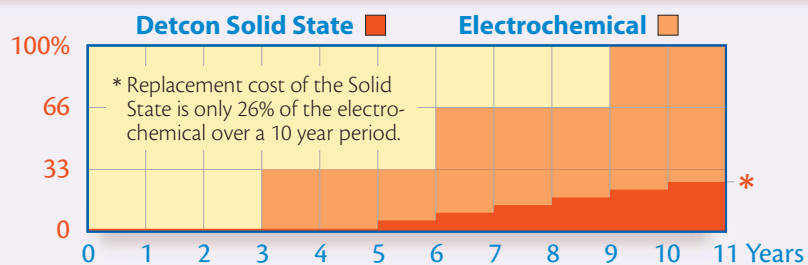
Recovery From High H2S Exposure

The solid state MOS sensor technology can withstand high exposures to H2S. It recovers rapidly and suffers no change in measurement performance. Electrochemical H2S sensors may be permanently damaged from over exposure or continuous exposure to H2S gas.



Long Warranty/Low Cost of Ownership

The Detcon solid state MOS is covered by the longest H2S sensor warranty in the industry. Detcon's 10-year pro rata warranty provides the end-user with guaranteed protection from excessive sensor replacement costs. Chart at right assumes 3 year service life of electrochemical sensor.

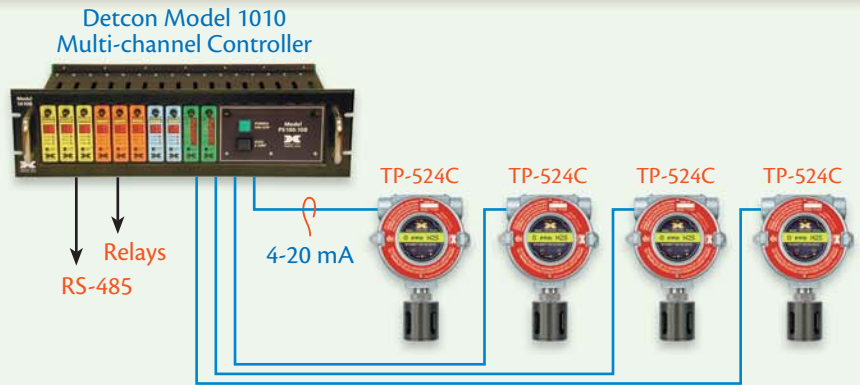


Integration Options

The **TP Series** of H2S 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.

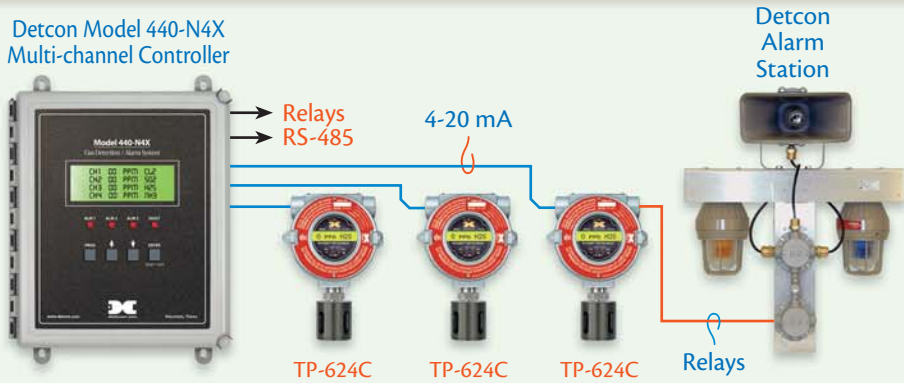
4-20 mA

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.



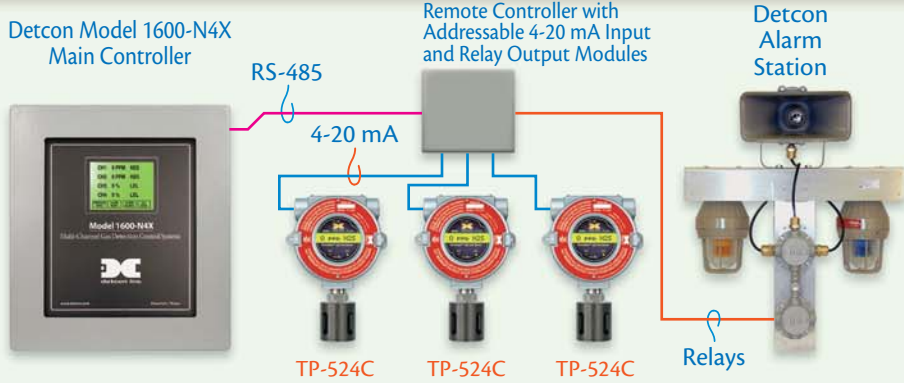
4-20 mA & Local Relays

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 TP-624C) to activate field-mounted alarm stations or other responses. Controller provides additional output relays.



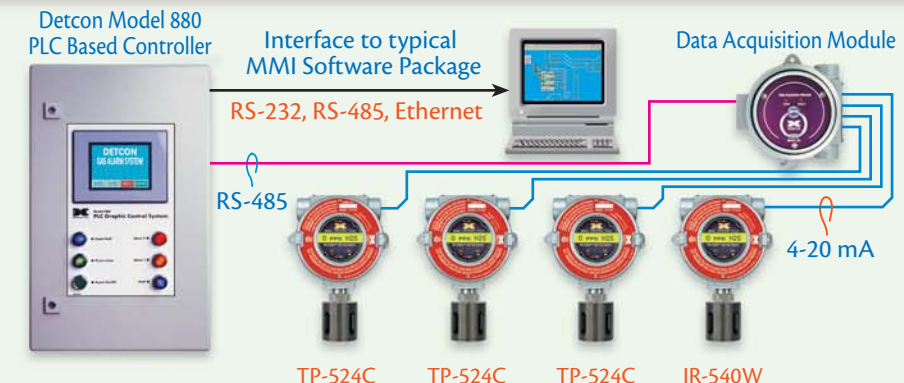
4-20 mA/RS-485 & Local Relays

Individual sensors (Model TP-624C) 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

TP-424C H2S Solid state MOS sensor assembly with 4-20 mA output

TP-524C MicroSafe™ H2S solid state MOS non-intrusive sensor assembly with 4-20 mA output

TP-624C MicroSafe™ H2S solid state MOS non-intrusive sensor assembly with 4-20 mA, RS-485, & Relays

Specifications

Sensor Type

Solid State Metal Oxide Semiconductor

Measurement Range

0-20 ppm, 0-50 ppm, 0-100 ppm

Accuracy/Repeatability

±10% of reading or ±2 ppm (greater of)

Response/Clearing Time

T50 <45 seconds

T80 <90 seconds

Operating Temperature Range

-40°F to +167°F; -40°C to +75°C

Operating Humidity Range

15-100% RH (non condensing)

Outputs

Linear 4-20 mA DC

RS-485 Modbus™ (TP-624C only)

3 Relays (TP-624C only)

Alarm 1, Alarm 2, & Fault

Contacts rated 5 amps @ 250VAC,

5 amps @ 30VDC

Input Voltage

11.5-28 VDC (TP-424C & TP-524C)

22.5-28 VDC (TP-624C)

Power Consumption

<2 watts @ 24 VDC (TP-424C)

<2 watts @ 24 VDC (TP-524C)

<3 watts @ 24 VDC (TP-624C)

Electrical Classification

Explosion proof

Class I, Division 1, Groups B, C, D

Safety Approvals

CSA and UL Approved

Warranty

Sensor: 10 year conditional

Transmitter: 2 year

Sensor Weight/Shipping Weight

4 lbs/5lbs

Shipping Dimensions

12.5W" x 9.5D" x 8H"

Interference

GAS

PPM

Methane 25,000 = 0

Ethane 5,000 = 0

Hexane 5,000 = 0

Propane 5,000 = 0

Butane 5,000 = 0

Carbon Monoxide 800 = 0

Carbon Dioxide 5,000 = 0

Carbon Disulfide 14 = 0

Methanol 500 = 2

Isopropanol 200 = 1

Ammonia 500 = 1

Diesel Fuel 500 = 0

Dimethyl Sulfide 4.4 = 0

Ethylene 200 = 0

Freon 12 1,000 = 0

Hydrogen 1,000 = 8

Ethyl Mercaptan 10 = 1

Methyl Mercaptan 5 = 2

Sulfur Dioxide 300 = 0

Toluene 32 = 0

Ethanol 200 = 1

888-367-4286

281-367-4100



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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.

▶ SOLID STATE H2S SENSOR

10 Year Conditional Warranty

Detcon Inc., as manufacturer, warrants each new solid state H2S MOS sensor element to be free from defects in material and workmanship under intended normal use for a period of 10 years under the following conditions: The warranty period begins on the date of shipment to the original purchaser and ends ten years thereafter. The original serial number must be legible on each sensor element base.

▶ WARRANTY SCHEDULE

Year	Handling Chg.
first 5 years	\$10.00
6th year	\$44.00
7th year	\$76.00
8th year	\$110.00
9th year	\$144.00
10th year	\$176.00
non-warranty	\$200.00