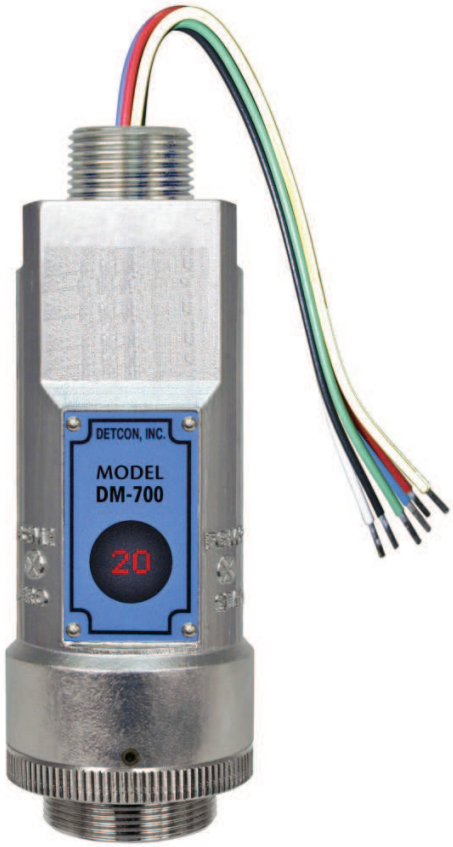
INSTRUCTION MANUAL
Detcon Model DM-700



DM-700 Toxic Gas Sensors
DM-700 O_2 Deficiency Sensors

This manual covers all ranges of electrochemical and O_2 deficiency sensors offered in the Detcon Product Line

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1. Introduction

1.1 Description

Detcon Model DM-700 toxic gas and O_2 deficiency sensors are non-intrusive "Smart" sensors designed to detect and monitor a wide range of toxic gasses in air. Ranges of detection for toxic gasses are from 0-1ppm up to 0-10,000ppm. Ranges for O_2 deficiency are 0-100ppm up to 0-25% by volume. The sensor features an LED display of current reading, fault and calibration status. The Sensor is equipped with standard analog 4-20mA and Modbus™ RS-485 outputs. A primary feature of the sensor is its method of automatic calibration, which guides the user through each step via fully scripted instructions displayed on the LED display.

The microprocessor-supervised electronics are packaged in an encapsulated module and housed in an explosion proof casting, called the ITM (Intelligent Transmitter Module). The ITM includes a four character alpha/numeric LED used to display sensor readings, and the sensor's menu driven features when the hand-held programming magnet is used.

Electrochemical Sensor Technology

The Toxic gas sensors are based on electrochemical cells. Each cell consists of three electrodes embedded in an electrolyte solution all housed beneath a diffusion membrane. Sensitivity to specific target gasses is achieved by varying composition of any combination of the sensor components. Good specificity is achieved in each sensor type. The cells are diffusion limited via small capillary barriers resulting in a long service life of up to three or more years. The electrochemical cell is packaged as a field replaceable intelligent plug-in sensor.

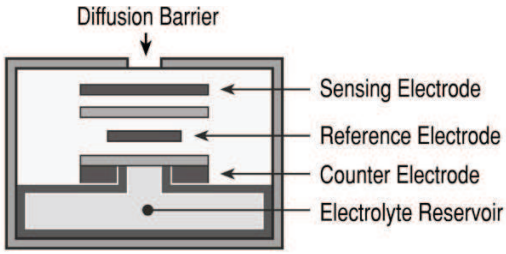

Figure 1 Construction of Electrochemical Toxic Sensor

The O_2 deficiency sensor technology is a two electrode galvanic metal air battery type cell, which is housed as a field replaceable intelligent plug–in sensor. The cell is diffusion limited and functions as a direct current generator proportional to the amount of oxygen adsorption. The sensors are temperature compensated and show good accuracy and stability over the operating temperature range of –20° to 50°C (-4° to +122° Fahrenheit). The sensor is warranted for two years and has an expected service life of up to 2.5 years in ambient air at 20.9% oxygen.

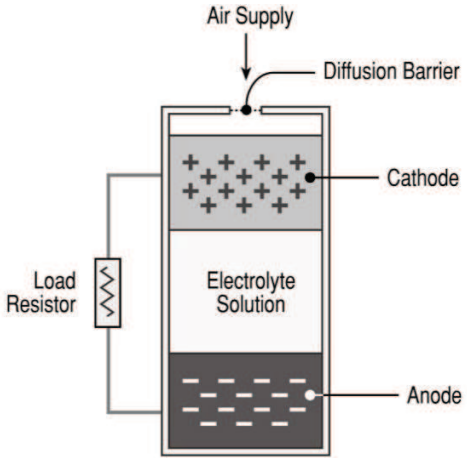

Figure 2 Construction of Galvanic Cell

1.2 Sensor Electronics Design

Intelligent Transmitter Module

The DM-700 Intelligent Transmitter Module (ITM) is a fully encapsulated microprocessor-based package that is universal in design and will accept any Detcon intelligent plug-in electrochemical gas sensor. The ITM design uses an internal intrinsically safe barrier circuit that lifts the requirement for use of flame arrestors to achieve Class 1, Division 1 (Zone1) area classification. This facilitates fast response times and improved calibration repeatability on highly corrosive gas types. The ITM circuit functions include extensive I/O circuit protection, on-board power supplies, internal intrinsically safe barrier circuit, microprocessor, LED display, magnetic programming switches, a linear 4-20mA DC output, and a Modbus™ RS-485 output. Magnetic program switches located on either side of the LED Display are activated via a hand-held magnetic programming tool, thus allowing non-intrusive operator interface with the ITM. Calibration can be accomplished without declassifying the area. Electrical classifications are Class I, Division 1, Groups A B C D, Class I, Zone 1, Group IIC, and II 2G Ex d ib IIC Gb (sensor only).

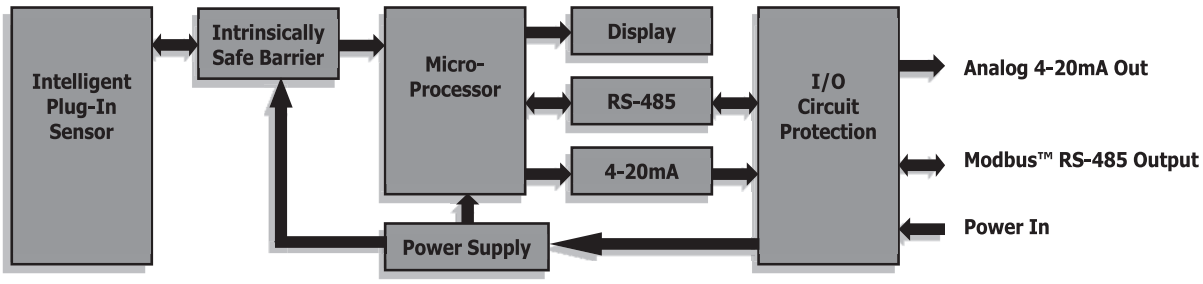

Figure 3 ITM Circuit Functional Block Diagram

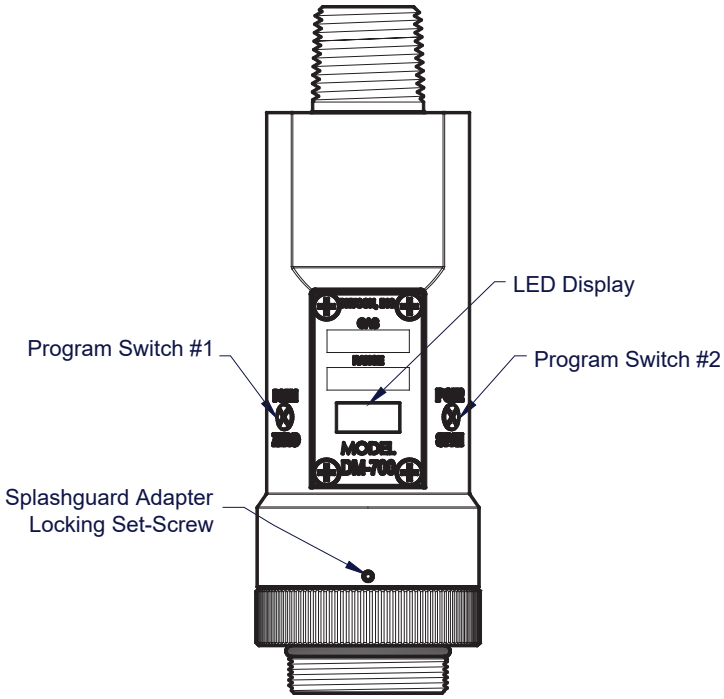

Figure 4 Sensor Assembly Front View

1.3 Modular Mechanical Design

The Model DM-700 Sensor Assembly is completely modular and is made up of four parts (See Figure 5 for Assembly Break-away):

1) DM-700 Intelligent Transmitter Module (ITM)
2) Intelligent Plug-in Sensor (varies by gas type and range)
3) Model DM-700 Splash Guard Adapter
4) Splash Guard.

NOTE: All metal components are constructed from electro polished 316 Stainless Steel in order to maximize corrosion resistance in harsh environments.

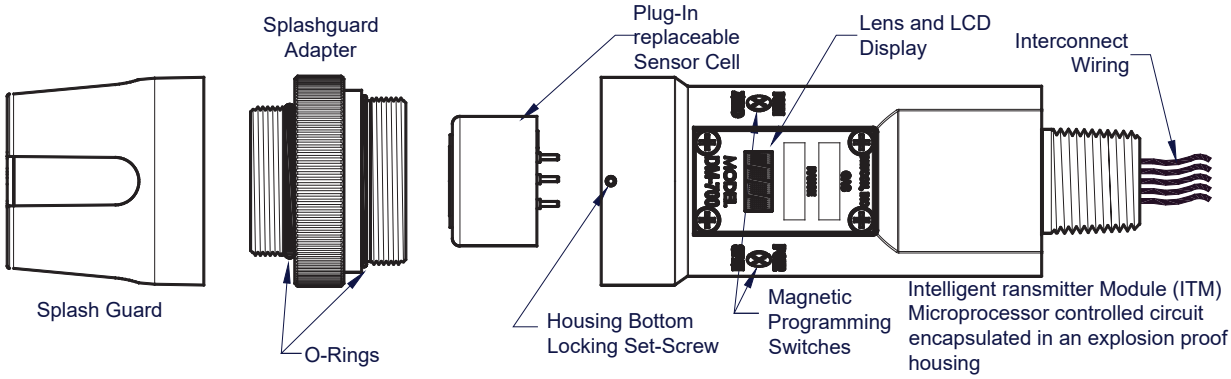

Figure 5 Sensor Assembly Breakaway

1.4 Intelligent Plug-in Electrochemical Gas Sensor

The Detcon family of electrochemical gas sensors are field proven, intelligent plug-in sensors with over-sized gold-plated connections that eliminate corrosion problems. The intelligent design provides automatic recognition of gas type, units, full-scale range, and calibrations data when a new sensor is plugged in. The sensor can be accessed and replaced in the field very easily by releasing the locking setscrew and unthreading the Splashguard Adapter. Detcon's family of toxic sensors have a long shelf life and are supported by an industry-leading warranty.

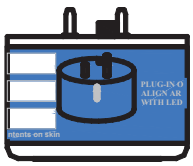

Figure 6 Intelligent Plug-in Sensor

2. Installation

2.1 ATEX Operational Guidelines for Safe Use

1. Install sensor only in areas with classifications matching with those described on the ATEX approval label. Follow all warnings listed on the label.

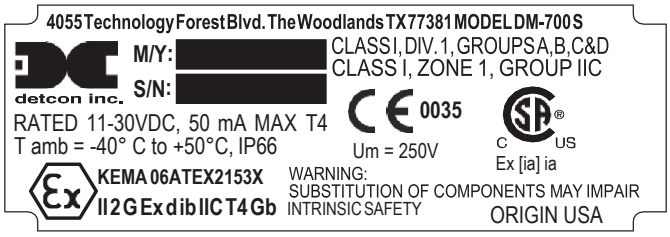

Figure 7 ATEX Approval Label

2. Ensure that the sensor is properly threaded into a suitable flameproof rated junction box with a downward pointing female ¾" NPT threaded connection. The sensor should be threaded up at least 5 full turns until tight, with the LED display facing forward (+/-15°). Minimize use of Teflon Tape, or any type of non-conductive pipe thread coating on the NPT threaded connection.

3. A good ground connection should be verified between the sensor's metal enclosure and the junction box. If a good ground connection is not made, the sensor can be grounded to the junction box using the sensor's external ground lug. Also verify a good ground connection between the junction box and earth ground.

4. Ensure that the Housing Bottom and plug-in sensor are installed during operation. The Housing Bottom should be threaded tightly to the Intelligent Transmitter Module. The locking setscrew (M3.5 x 0.6 6g6h Stainless Steel Allen set screw cup point with yield strength of greater than 40,000 PSI, typical 80,000 PSI) should then be tightened down to keep the Housing Bottom from being inadvertently removed or from becoming loose under vibration. The locking setscrew ensures that Housing Bottom is only removable by authorized personnel with the use of special tools. A M1.5 Allen Wrench is required. If screw requires replacement, only an identical screw may be used.

5. Proper precautions should be taken during installation and maintenance to avoid the build-up of static charge on the plastic components of the sensor. These include the splashguard and splashguard adapter.

6. The screws holding down the retaining plate label are special fasteners of type Stainless Steel, Phillips Pan-head Machine screw, M3 x 0.5 6g6h having yield strength of greater than 40,000 PSI, typical 80,000 PSI. If screw requires replacement, only an identical screw may be used.

7. Do not substitute components that are not authorized by the scope of the safety approval. This may impair the intrinsic safety rating.

8. Do not operate the sensor outside of the stated operating temperature limits.

9. Do not operate the sensor outside the stated operating limits for voltage supply.

10. The sensor power supply common (black wire) must be referenced to the metal enclosure body (ground) during installation.

11. These sensors meet EN60079-0:2012, EN60079-1:2007, and EN60079-11:2012.

12. These sensors have a maximum safe location voltage of Um=250V.

13. These sensors pass dielectric strength of 500VRMS between circuit and enclosure for a minimum of 1 minute at a maximum test current of 5mA.

2.2 Sensor Placement

Selection of sensor location is critical to the overall safe performance of the product. Six factors play an important role in selection of sensor locations:

(1) Density of the gas to be detected
(2) Most probable leak sources within the industrial process
(3) Ventilation or prevailing wind conditions
(4) Personnel exposure
(5) Maintenance access
(6) Additional placement considerations

Density

Placement of sensors relative to the density of the target gas is such that sensors for the detection of heavier than air gasses should be located within 4 feet of grade as these heavy gasses will tend to settle in low lying areas. For gasses lighter than air, sensor placement should be 4-8 feet above grade in open areas or in pitched areas of enclosed spaces.

Leak Sources

The most probable leak sources within an industrial process include flanges, valves, and tubing connections of the sealed type where seals may either fail or wear. Other leak sources are best determined by facility engineers with experience in similar processes.

Ventilation

Normal ventilation or prevailing wind conditions can dictate efficient location of gas sensors in a manner where the migration of gas clouds is quickly detected.

Personnel Exposure

The undetected migration of gas clouds should not be allowed to approach concentrated personnel areas such as control rooms, maintenance or warehouse buildings. A more general and applicable thought toward selecting sensor location is combining leak source and perimeter protection in the best possible configuration.

Maintenance Access

Consideration should be given to providing easy access for maintenance personnel. Consideration should also be given to the consequences of close proximity to contaminants that may foul the sensor prematurely.

NOTE: All installations of the gas sensor should point straight down (refer to Figure 12). Improper sensor orientation may result in false readings and permanent sensor damage.

Additional Placement Considerations

The sensor should not be positioned where it may be sprayed or coated with surface contaminating substances. Painting sensor assemblies is prohibited.

Although the sensor is designed to be RFI resistant, it should not be mounted in close proximity to high-powered radio transmitters or similar RFI generating equipment.

Mount in an area void of high wind, accumulating dust, rain or splashing from hose spray, direct steam releases, and continuous vibration. If the sensor cannot be mounted away from these conditions then make sure the Detcon Harsh Environment Splashguard accessory is used.

Do not mount in locations where temperatures will exceed the operating temperature limits of the sensor. Where direct sunlight leads to exceeding the high temperature-operating limit, use a sunshade to help reduce temperature.

2.3 Sensor Contaminants and Interference

Electrochemical toxic gas may be adversely affected by exposure to other airborne gasses. Depending on the cross-sensitivity relationship, there may be a positive or negative impact on the reading.

The most commonly present gasses that potentially cause interference problems are listed in Table 6 Cross Interference Table (refer to Section 9).

The presence of cross-interference gasses in an area does not preclude the use of this sensor technology, although it is possible that the sensor could experience a false high or false low reading should exposure occur.

Cross-Interference Data Table

Table 6 Cross Interference Table (refer to Section 9) lists the gasses typically found in industrial environments that may cause a cross-interference response on members of the Detcon family of toxic gas sensors. Review Table 6 in Section 9 for the correct gas and then scan across the list for possible interference gasses. Determine the magnitude of cross-interference that may occur.

2.4 Mounting Installation

The DM-700 sensor assembly is designed to be threaded into a ¾” Female NPT fitting of a standard cast metal, Explosion-Proof Enclosure or Junction Box. Thread the sensor up until tight (5 turns is typically expected) and until the display is pointed in the direction that sensor will normally be viewed and accessed.

The DM-700 should be vertically oriented so that the sensor points straight down. The explosion-proof enclosure or junction box would then typically be mounted on a wall or pole. Detcon provides a standard selection of junction boxes available as sensor accessories (See Figures 8, 9, 10, and 11 below). Any appropriately rated enclosure with a downward facing ¾” NPT female connection will suffice.

When mounting on a wall, it is recommended to use a 0.25”-0.5” spacer underneath the mounting ears of the Detcon standard J-Box to offset the sensor assembly from the wall and create open access around the sensor assembly. Spacing requirements for other junction boxes may vary.

When mounting on a pole, secure the Junction Box to a suitable mounting plate and attach the mounting plate to the pole using U-Bolts. (Pole-Mounting brackets for Detcon J-box accessories are available separately.)

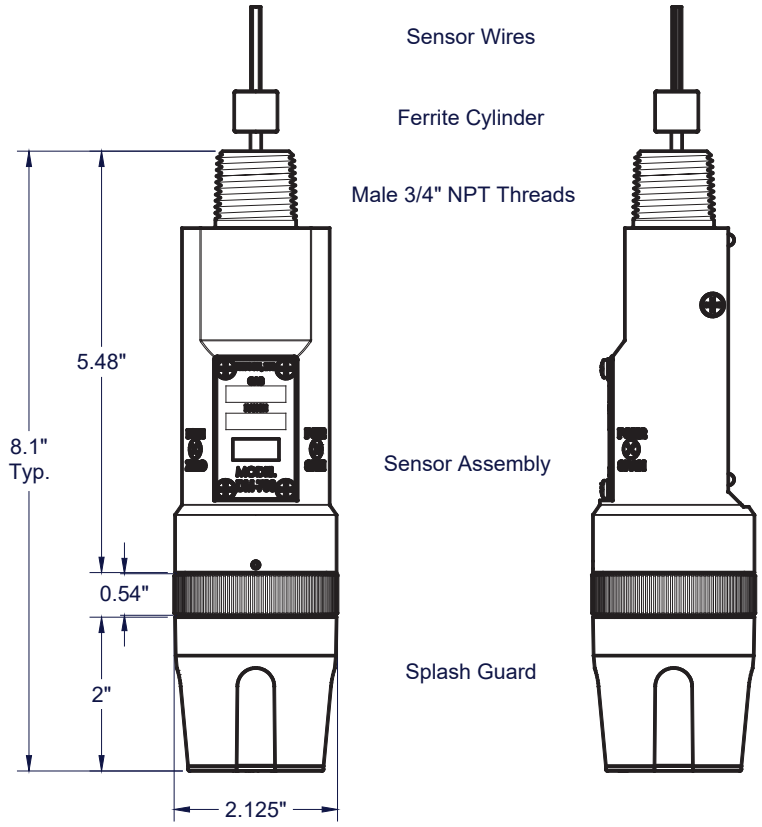

Figure 8 Outline and Mounting Dimensions (Sensor Assembly only)

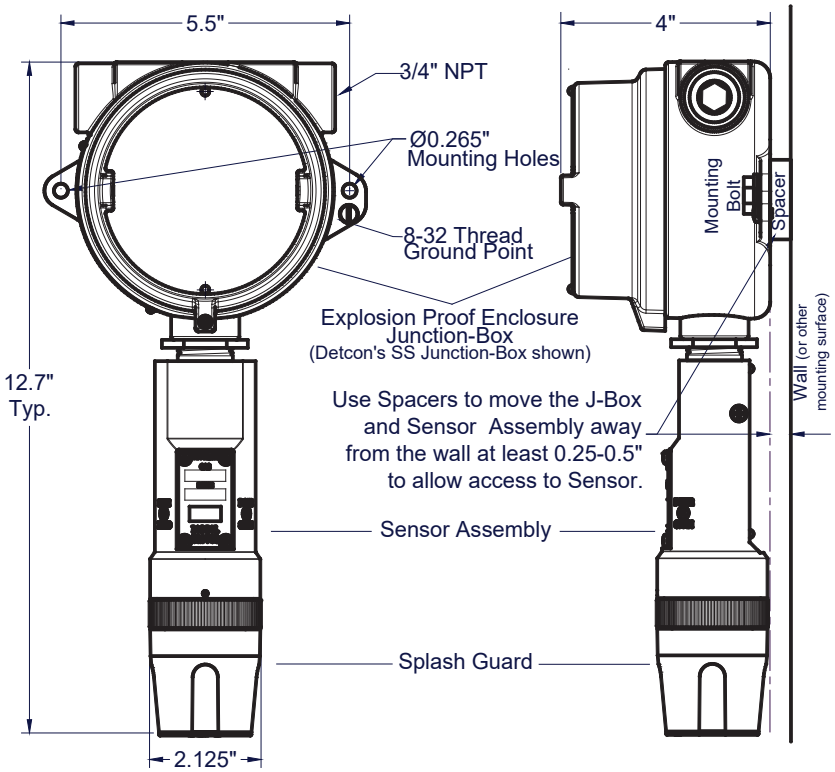

Figure 9 Outline and Mounting Dimensions (Stainless Steel Junction Box)

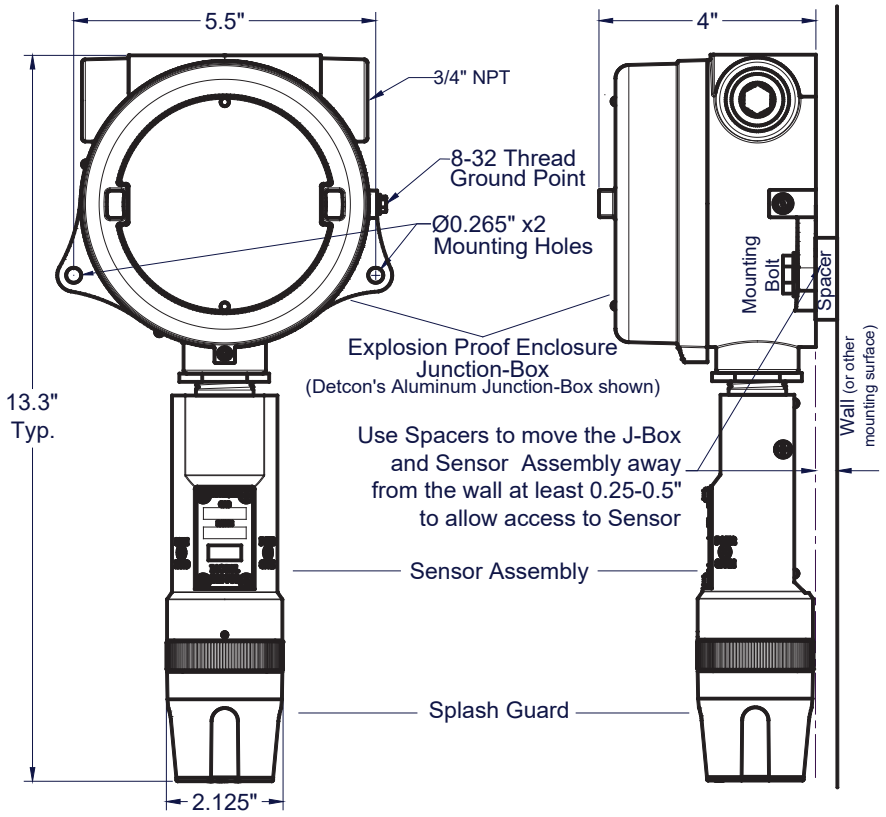

Figure 10 Outline and Mounting Dimensions (Aluminum Junction Box)

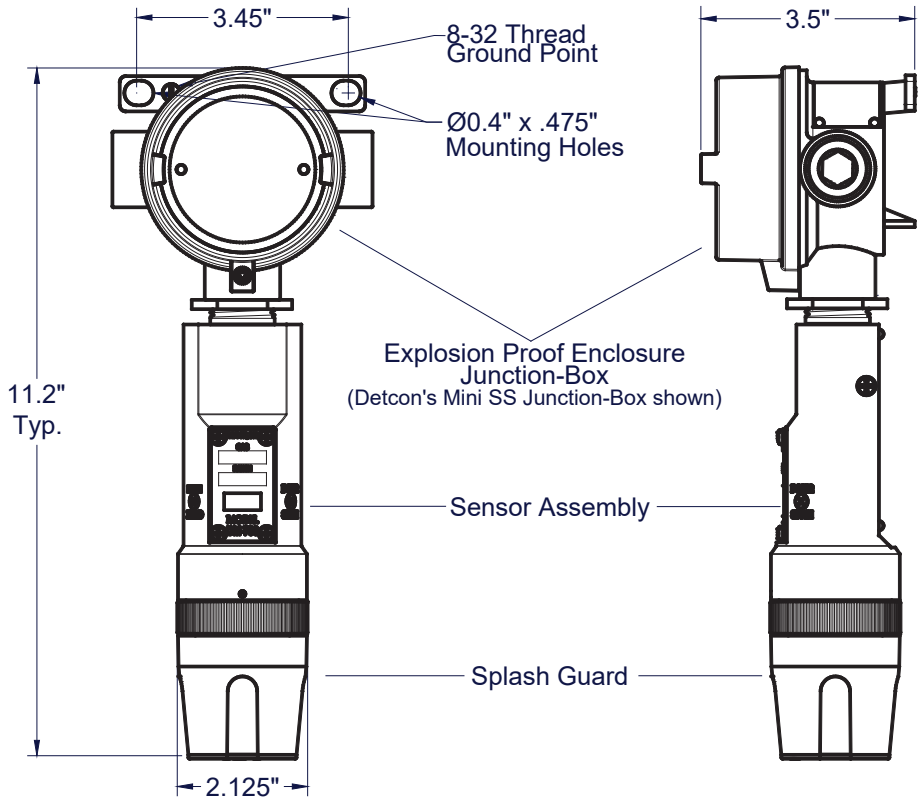

Figure 11 Outline and Mounting Dimensions (Mini Stainless Steel Junction Box)