

## **SAFETY MANUAL**

### **SIL 2 Certified Model OLCT 700 IR Combustible Hydrocarbon Gas Sensor**

#### **Version 4.0**

#### **1 SAFETY CERTIFIED MODEL OLCT 700 IR COMBUSTIBLE GAS DETECTOR**

This manual addresses the specific requirements and recommendations applicable to the proper installation, operation, and maintenance of the Safety-Certified (SIL-Certified) OLCT 700 IR Combustible Gas Detector. For complete information regarding performance, installation, operation, maintenance and specifications of the Model OLCT 700 IR, refer to instruction manual Document #NP700IRIMEN.

#### **2 SAFETY MESSAGES**

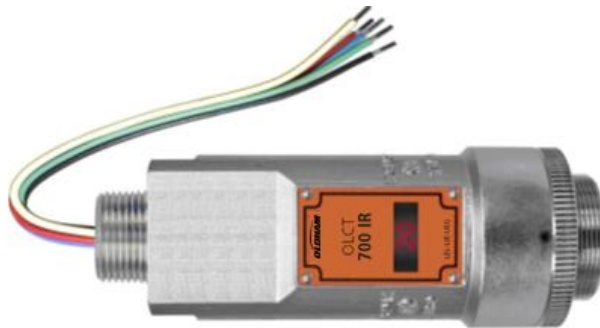
Procedures and instructions in this section may require special precautions to ensure the safety of personnel performing the operations. Information that raises potential safety issues is indicated by the word “Warning”. Always read and understand these safety messages.

#### ***Warning:***

The OLCT 700 IR Gas Detector is intended for use in hazardous environments that may include dangerous levels of combustible hydrocarbon gas vapors. This product must be properly installed, operated and maintained. Improper installation or use could result in death or serious injury.

Do not remove the XP Junction box cover and/or do not remove the sensor bottom housing (required to change out the plug-in NDIR sensor) in explosive environments when device power is on and circuits are live.

Detector must be properly installed, and XP junction box cover and sensor bottom housing must be fully engaged to meet hazardous area explosion-proof/non-incendive requirements.



### **3 DESIGN**

The Model OLCT 700 IR is a NDIR non-dispersive infrared type combustible hydrocarbon gas detector that is classified as a Type B smart device according to IEC61508. The OLCT 700 IR sensor provides a 4-20 mA output that is proportional to combustible gas vapor concentrations in the ranges of 0-100% LEL. The OLCT 700 IR contains extensive self-diagnostics and is programmed to send the current output to a specified failure state (0 mA) upon internal detection of a failure. A Modbus RS485 serial output is available in addition to the analog signal output. The Safety Certification for the OLCT 700 IR Gas Detector only covers the use of the standard analog 4-20 mA output.

**Safety-Certification of the OLCT 700 IR includes the 4-20 mA output. The RS-485 Modbus signal output is not part of the SIL Certification.**

**Note:** Proper analog signal loop resistance must be installed as documented in the instruction manual to enable proper 4-20 mA signal function. The end user must perform zero and span calibrations after any significant configuration changes or repair events. These include: restore defaults, change of range, replacing plug-in NDIR sensor, and replacing ITM module.

### **4 VALID INPUT RANGE**

OLCT 700 IR fault annunciation is provided on the 4-20mA signal output loop by signaling to 0mA current output level for at least 5 seconds. The receiving device must be programmed to indicate an out-of-range condition when current levels reach overcurrent (>21.5 mA) or undercurrent (< 1.3 mA).

**Note:** The OLCT 700 IR analog signal output is not safety-rated during detector warm-up, configuration mode, calibration mode, and during signal output loop testing. Alternative means should be used at the jobsite to ensure facility safety during these activities.

### **5 DIAGNOSTIC RESPONSE TIME**

The OLCT 700 IR will perform all critical diagnostic functions within 2 hours. This is the worst case diagnostic detection time.

### **6 CERTIFICATION**

The OLCT 700 IR Safety-Certified version is certified by Exida® to IEC 61508 for single input use in low and high demand, SIL 2 Safety Instrumented Systems. The OLCT 700 IR sensor is SIL2 certified as an individual component, but it can be used as part of a larger Safety Instrumented Systems as long as it is applied per the guidelines of this Safety Manual.

The OLCT 700 IR is SIL2 certified per IEC 61508:2010 with an HFT=0.

The revision levels of this SIL 2 certified OLCT 700 IR sensor is noted as Main PCB Rev 1, Amplifier PCB Rev 1, and Firmware V8.01N.

## **7 SAFETY – CERTIFIED PRODUCT IDENTIFICATION**

The model number printed on the label will include the character “S” in the model number string, indicating Exida® approval for SIL 2 standard. Example: Model OLCT 700 IR-S.

## **8 CONSTRAINTS**

The safety function of the Oldham Model OLCT 700 IR Combustible Gas Sensor is limited by the following constraints:

- Shall not be used in continuous mode applications
- The maximum load on the 4-20mA output of the OLCT 700 IR is 1K $\Omega$  with 24VDC input power and 500 $\Omega$  with 12VDC input power. The minimum load on the 4-20mA output is 10 $\Omega$ .
- Shall be span calibrated every 180- days using a calibrated gas standard. After calibration, the sensor shall be proof tested by applying the calibration gas and checking for the proper response of the 4-20mA output.
- Any PLC, DCS, or other control system used to monitor the OLCT 700 IR shall indicate a fault when the output from the sensor drops below 1.8mA for more than 4 seconds.
- After the OLCT 700 IR has been off power for more than 24 hours, it shall be allowed a 1 hour start-up period before performing its safety function
- Any PLC, DCS, or other control system used to monitor the OLCT 700 IR shall indicate that the sensor is in calibration mode when the output is greater the 1.8mA but less than 2.2mA. When in calibration mode, the OLCT 700 IR cannot perform its safety function.
- Any PLC, DCS, or other control system used to monitor the OLCT 700 IR shall indicate an over-range condition when the output from the sensor is above 21.5mA. When the OLCT 700 IR is over-range, the actual gas concentration may be higher than what is being reported by the 4-20mA output.
- The sensor shall not be installed in applications where it will be exposed to steam releases or excessive quantities of dust or oily vapors.
- Shall be operated with an input power of 11VDC – 30VDC
- Shall be installed oriented vertically and mounted more than 1ft. above the ground
- Shall not be operated, stored, or transported outside the temperature range of -40°C to 75°C
- The OLCT 700 IR enclosure and connected cabling shall be properly grounded and shielded
- The Modbus interface shall not be connected when the OLCT 700 IR is used in SIL2 applications
- The magnetic switches on the OLCT 700 IR shall not be used while the OLCT 700 IR is performing its safety function
- The user shall validate the initial configuration and any subsequent configuration changes of the OLCT 700 IR before using it for its safety function. This validation shall be accomplished by performing a proof test after all configuration changes are complete.
- No online software tools are needed or are to be used when the OLCT 700 IR is performing its safety function.

## 9 INSTALLATION

**NOTE:** For complete information regarding performance, installation, operation, maintenance and specifications of Model OLCT 700 IR, refer to instruction manual Document #NP700IRIMEN.

No specific or additional detector installation requirements exist above and beyond the standard installation practices documented in the Model OLCT 700 IR Instruction Manual.

Environmental operating specifications are applicable as published in the general specifications section in the Model OLCT 700 IR instruction manual.

The OLCT 700 IR operating power distribution system should be designed and installed so the terminal voltage does not drop below 11 VDC when measured at any specific location. The maximum current limit must be less than 0.5 amperes. The over-voltage protection on the power distribution system must be set for 30 VDC.

## 10 START-UP AND COMMISSIONING

The Safety Certified OLCT 700 IR gas detector can be commissioned by any qualified person with knowledge of gas detection instruments and the configuration device being used. Refer to the Start-Up and Commissioning sections provided in the OLCT 700 IR instruction manual.

## 11 OPERATION, MAINTENANCE, INSPECTION AND PROOF TESTING

All normal installation, start-up, and full field calibration recommendations as documented in the OLCT 700 IR instruction manual are applicable to the Safety Certified OLCT 700 IR gas detector.

Safety – Certified OLCT 700 IR gas detectors require additional Proof Testing to be performed in all cases.

Personnel performing Proof Test procedures shall be competent to perform the task. All proof test results must be recorded and analyzed. Any corrective actions taken must be documented in the event that an error is found in the safety functionality. The proof tests must be performed at a frequency as shown in Table 1.

Table 1: Frequency for Performing Proof Tests

<b>OLCT 700 IR Proof Test Name</b>	<b>Commissioning</b>	<b>Frequency per year</b>
Visual Field Inspection Proof Test	Yes	2
Gas Response Proof Test	Yes	2
Output Response Proof Test	Yes	1

**Warning:** Failure to perform the specified testing and inspection may lower or void the SIL rating for the product or system.

## **12 VISUAL FIELD INSPECTION PROOF TEST**

Tools Required: Programming magnet

Visual inspection of all Safety-Certified OLCT 700 IR Gas Detectors shall be conducted semi-annually to confirm that no external blockage of gas/vapor path into the sensing chamber exists, ex. debris, trash, snow, mud, external equipment, etc. Corrective action shall include removal of such impediments should they exist. All gas detectors must be inspected to ensure that they are capable of providing expected performance and protection. The Model OLCT 700 IR provides a scrolling LED display that indicates fault messages when operational parameters are abnormal. A momentary magnetic swipe across either programming magnet will visually indicate any scrolling Fault Messages should any be present.

Completion of Visual Field Inspection Proof test will be recorded and documented in the SIS logbook.

## **13 GAS RESPONSE PROOF TEST**

Tools Required:

50% LEL Span Calibration Gas Cylinder (containing 2.50 % volume methane /balance Air or N2)

Calibration Kit provided by Oldham

This proof test, commonly referred to as a “gas bump test”, requires application of high accuracy compressed calibration gas to the detector while in NORMAL operational mode and inspecting the 4-20 mA signal output level to ensure that the signal output is accurately indicative of the applied test gas concentration.

**Warning:** Any external alarm equipment, systems or signaling devices that could be automatically initiated by performing this test must be disabled or bypassed before performing this test!

When test gas is flowing into the detector, inspection of proper analog signal level output can be made by reading the analog signal output displayed on the control device. The criteria used for inspection pass is a stabilized response signal within +/- 5% LEL of the 50% LEL applied gas level . If response test is not within acceptable limits, then a Full Calibration procedure must be performed and the Gas Response Proof Test re-performed.

### **13.1 FULL CALIBRATION**

Tools Required:

Zero Gas Cylinder – Zero Air or N2 (may use local ambient air if it’s confirmed to be methane free)

Span Calibration Gas Cylinder - 50% LEL Span Calibration Gas Cylinder (containing 2.50 % volume methane /balance Air or N2)

Calibration Kit provided by Oldham

Programming magnet

Full Calibration shall be conducted when required. The procedure for performing the Full Calibration is in the Calibration section of the OLCT 700 IR instruction manual. In all cases the model OLCT 700 IR gas detector should be allowed to warm up for 5 minutes before conducting a Full Calibration.

**Warning:** The 4-20mA output from the OLCT 700 IR will drop to 2mA during the Full Calibration

Successful completion of the Gas Response Proof Test must be recorded and documented in the SIS logbook. If the Full Calibration is performed, it should also be documented in the SIS logbook.

## **14 OUTPUT RESPONSE PROOF TEST**

Tools Required:

Span Calibration Gas Cylinder - 50% LEL Span Calibration Gas Cylinder (containing 2.50 % volume methane /balance Air or N2)

Calibration Kit provided by Oldham

The Output Proof Test is performed as follows:

1. Inhibit alarm response at the control device.
2. Apply test gas (50% LEL methane/Air or N2 ) to the detector. Verify correct 4-20mA output signal at the control device.
3. Re-activate alarm response at the control device.

## **15 FAULT/FAILURE ACTION PLAN**

In the event that a Full Calibration does not result in acceptable Gas Response Proof test, then the standard Maintenance, Troubleshooting, and Device Repair and Return Procedures are listed in the OLCT 700 IR instruction manual must be followed. Any failure to successfully complete the Gas Response Proof Test must be recorded and documented in the SIS logbook.

## **16 PRODUCT REPAIR**

The OLCT 700 IR is partially field repairable. Follow the OLCT 700 IR instruction manual for proper guidance in executing the allowable field repair/replacement actions. No firmware changes are permitted or authorized. All failures detected by the transmitter diagnostics or by the Proof Test must be reported.

## **17 OPERATING, ENVIRONMENTAL, AND PERFORMANCE SPECIFICATIONS**

The Safety-Certified OLCT 700 IR product versions fully comply with, and must be operated in accordance with the functional, environmental, and performance specifications provided in the OLCT 700 IR instruction manual. A 24 hour mean time to repair should be assumed for safety availability calculations. All OLCT 700 IR diagnostics have a maximum 2 hour test interval.

## **18 SPARE PARTS**

Refer to “Spare Parts” in the OLCT 700 IR instruction manual. Safety Certification is based on having a sufficient number of spares to achieve a 24 hour mean time to repair.

## **19 CERTIFICATION AND FAILURE RATE DATA**

All Safety-Certified OLCT 700 IR models are certified compliant to:

IEC61508:2010

SIL 2 Certified

PFDavg @ 1 year is 5.0% of the SIL2 range.

Safe Failure Fraction (SFF): 93.2%

Safety Accuracy: +/-20% FS Range

Safety Response Time for % LEL Methane: < 60 seconds to T90

Product Life: 10 years, based on manufacturer data.

## **20 CERTIFICATIONS**

ATEX, CE Marking (Refer to the Model OLCT 700 IR Instruction Manual for details).

FMEDA Report available on request. Please contact Oldham at [info@oldhamgas.com](mailto:info@oldhamgas.com) or dial +33(0)3 21 60 80 80.

For complete information regarding performance, installation, operation, maintenance and specifications of Model OLCT 700 IR, refer to the instruction manual Document #NP700IRIMEN.

## **21 REVISION LOG**

Revision	Date	Changes made	Approval
1.0	October 1, 2014	Initial Release	MS