

SAFETY MANUAL

SIL 2 Certified Model OLCT 700 TP H2S Gas Sensor

SAFETY CERTIFIED MODEL OLCT 700 TP H2S GAS DETECTOR

This manual addresses the specific requirements and recommendations applicable to the proper installation, operation, and maintenance of all Safety-Certified (SIL-Certified) OLCT 700 TP product versions. For complete information regarding performance, installation, operation, maintenance and specifications of the Model OLCT 700 TP, refer to instruction manual Document #NP700TPIMEN.

SAFETY MESSAGES

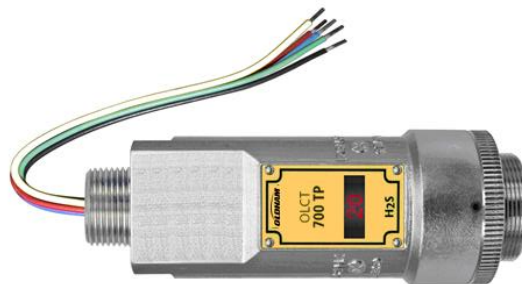
Procedures and instructions in this section may require special precautions to ensure the safety of personnel performing the operations. Information that raises potential safety issues is indicated by the word “Warning”. Always read and understand these safety messages.

Warning:

The OLCT 700 TP Gas Detector is intended for use in hazardous environments that may include dangerously levels of toxic H2S 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 MOS H2S 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.



DESIGN

The OLCT 700 TP is a mixed metal oxide semiconductor type H₂S gas detector that is classified as Type B smart device according to IEC61508. The OLCT 700 TP sensor provides a 4-20 mA output that is proportional to H₂S vapor concentrations in the ranges of 0-20 ppm, 0-50 ppm, and 0-100 ppm. The OLCT 700 TP 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 TP Gas Detector only covers the use of the standard analog 4-20 mA output.

Safety-Certification of the OLCT 700 TP 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 span calibration after any significant configuration changes or repair events. These include: restore defaults, change of range, replacing plug-in MOS H₂S sensor, and replacing ITM module.

VALID INPUT RANGE

OLCT 700 TP fault annunciation is provided on the 4-20mA signal output loop by signaling to 0mA current output level. The receiving device must be programmed to indicate a fault condition when current levels reach overcurrent (>20 mA) or undercurrent (0 mA).

Note: The OLCT 700 TP 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.

DIAGNOSTIC RESPONSE TIME

The OLCT 700 TP will perform all critical diagnostic functions within 1 hour. This is the worst case diagnostic detection time.

CERTIFICATION

The OLCT 700 TP Safety-Certified version is certified by Exida® to IEC 61508 for single input use in low demand, SIL 2 Safety Instrumented Systems. The OLCT 700 TP 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 TP is SIL2 certified per IEC 61508:2010 with an HFT=0.

The revision levels of this SIL 2 certified OLCT 700 TP sensor is noted as Main PCB Rev 1, Amplifier PCB Rev 5, and Firmware V5.14N.

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 TP-S.

CONSTRAINTS

The safety function of the Oldham Model OLCT 700 TP Hydrogen Sulfide 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 TP is 1K Ω with 24VDC input power and 500 Ω with 12VDC input power
- Shall be span calibrated every 90 days using a calibrated gas standard and humidifier tubing. After calibration, the sensor shall be proof tested by applying the calibration gas and checking for the proper response of the 4-20mA output.
- After the OLCT 700 TP has been off power for more than 24 hours, it shall be allowed a 24 hour start-up period before performing its safety function
- Any PLC, DCS, or other control system used to monitor the OLCT 700 TP shall indicate a fault when the output from the sensor drops below 1.3mA.
- Any PLC, DCS, or other control system used to monitor the OLCT 700 TP shall indicate that the sensor is in calibration mode when the output is greater the 1.3mA but less than 3mA. When in calibration mode, the OLCT 70 TP cannot perform its safety function.
- Any PLC, DCS, or other control system used to monitor the OLCT 700 TP shall indicate an over-range condition when the output from the sensor is above 22mA. When the OLCT 700 TP 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 known poisons. The poisons include (but are not limited to):
 - o Silicone vapors such as those found in greases and lubricants
 - o Halide compounds containing chlorine, chlorine dioxide, fluorine, HF, HCl, and bromine
 - o Caustic and acid liquids and concentrated vapors
 - o Heavy metals such as tetraethyl lead
- At least 10% O₂ in the background gas is required for the OLCT 700 TP to operate correctly. The reading is affected by changing O₂ levels.
- Shall be operated with an input power of 11VDC – 30VDC
- Shall be installed oriented vertically and mounted more than 1ft. above the ground
- If the OLCT 700 TP is powered down for long periods of time, the sensor cell shall be protected with a desiccant pouch and sealing cap
- Shall not be operated, stored, or transported outside the temperature range of -40°C to 75°C
- The OLCT 700 TP enclosure and connected cabling shall be properly grounded and shielded
- The Modbus interface shall not be connected when the OLCT 700 TP is used in SIL2 applications
- The magnetic switches on the OLCT 700 TP shall not be used while the OLCT 700 TP is performing its safety function

- The user shall validate the initial configuration and any subsequent configuration changes of the OLCT 700 TP before using it for its safety function. This validation shall be accomplished by performing a proof test after all configurations are complete.

INSTALLATION

NOTE: For complete information regarding performance, installation, operation, maintenance and specifications of Model OLCT 700 TP, refer to instruction manual Document # NP700TPIMEN.

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

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

The OLCT 700 TP 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 must be set for 30 VDC.

START-UP AND COMMISSIONING

The Safety Certified OLCT 700 TP 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 TP instruction manual.

OPERATION, MAINTENANCE, INSPECTION AND PROOF TESTING

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

Safety – Certified OLCT 700 TP 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

OLCT 700 TP Proof Test Name	Commissioning	Frequency per year
Visual Field Inspection Proof Test	Yes	4 (Quarterly)
Gas Response Proof Test	Yes	4 (Quarterly)
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.

VISUAL FIELD INSPECTION PROOF TEST

Tools Required: Programming magnet

Visual inspection of all Safety-Certified OLCT 700 TP Gas Detectors shall be conducted quarterly 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 TP 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.

GAS RESPONSE PROOF TEST

Tools Required: Span Calibration Gas Cylinder (50 ppm H₂S/balance Air or mid-scale of range used)

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 +/- 10% of applied gas level or +/- 2 ppm (the greater of). Use a test gas value that is 50% of selected range. If response test is not within acceptable limits, then a Full Calibration procedure must be performed and the Gas Response Proof Test re-performed.

Full Calibration

Tools Required: Span Calibration Gas Cylinder - H₂S/background Air (50% of selected range)

Calibration Kit provided by Oldham

Programming magnet

Full Calibration shall be conducted when required as documented in the Calibration section of the OLCT 700 TP instruction manual. In all cases the model OLCT 700 TP gas detector should be allowed to warm up for 24 hours minimum before conducting span calibration.

Successful completion of the Gas Response Proof Test must be recorded and documented in the SIS logbook.

OUTPUT RESPONSE PROOF TEST

Using 4-20 mA Output Signal

1. Inhibit alarm response at the control device.
2. Apply test gas (50% of FS Range of H₂S ppm/balance Air) to the detector. Verify correct output at the control device.
3. Re-activate alarm response at the control device.

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 TP instruction manual must be followed. Any failure to successfully complete the Gas Response Proof Test must be recorded and documented in the SIS logbook.

PRODUCT REPAIR

The OLCT 700 TP is partially field repairable. Follow the OLCT 700 TP 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.

OPERATING, ENVIRONMENTAL, AND PERFORMANCE SPECIFICATIONS

The Safety-Certified OLCT 700 TP product versions fully comply with, and must be operated in accordance with the functional, environmental, and performance specifications provided in the OLCT 700 TP instruction manual. A 24 hour mean time to repair should be assumed for safety availability calculations. All OLCT 700 TP diagnostics have a maximum 1 hour test interval.

SPARE PARTS

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

CERTIFICATION AND FAILURE RATE DATA

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

IEC61508:2010

SIL 2 Certified

PFDavg @ 1 year consumes 9% of the allowable SIL 2 budget.

Safe Failure Fraction (SFF): 90.4%

Safety Accuracy: +/-20% FS Range

Safety Response Time for H₂S: < 120 seconds to T80

Product Life: 10 years, based on manufacturer data.

CERTIFICATIONS

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

FMEDA Report available on request. Please contact Oldham at 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 TP, refer to the instruction manual Document # NP700TPIMEN.

REVISION LOG

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