

SAFETY MANUAL

Model CTX10 Transmitter



SAFETY CERTIFIED MODEL CTX10 TRANSMITTER

This manual addresses the specific requirements and recommendations applicable to the proper installation, operation, and maintenance of all Safety-Certified (SIL-Certified) Model CTX10 Transmitter (CTX10) product versions. For complete information regarding system overview, performance, installation, operation, maintenance and specifications of the CTX10, refer to the instruction manual (95-8789).

QUALITY POLICY STATEMENT

All quality assurance control measures necessary for safety management as specified in IEC 61508 Part 1 have been implemented. The quality management system of Det-Tronics is based on the requirements of EN ISO 9001 and ANSI/ASQC Q9001 through the application of the Carrier Corporation Achieving Competitive Excellence (ACE) program. In addition, the Quality Management System complies with the European ATEX Directive requirements per EN 13980, the International Electrotechnical Commission requirements per OD005/V2, and the supervised testing requirements per ISO 17025.

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 CTX10 is intended for use in hazardous environments that may include explosive levels of flammable gases and vapors. This product must be properly installed, operated and maintained. Improper installation or use could result in an explosion or fire resulting in death or serious injury.

- *Do not remove the cover in explosive environments when device power is on and circuits are live.*
- *Device must be properly installed, and cover must be fully engaged to meet hazardous area explosion-proof/non-incendive requirements.*

DESIGN

The CTX10 is a stand alone device that performs all the functions of a gas controller and is classified as Type B smart device according to IEC61508. It provides an isolated 4-wire 4-20 mA output that is representative of the received input 4-20 mA level. The CTX10 contains extensive self-diagnostics and will set the detector current output to a specified failure state.

Safety-Certification of the CTX10 includes:

- the 4-20 mA output

Safety Certification of the CTX10 includes the following non-interfering inputs:

- Magnetic switches

DIAGNOSTIC RESPONSE TIME

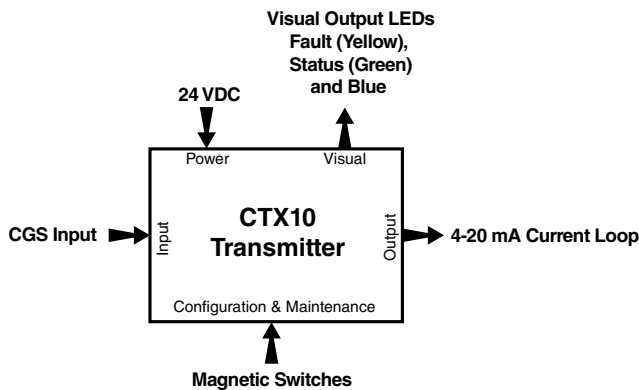
The CTX10 will perform all critical diagnostic functions within 58 minutes, worst case diagnostic detection time.

CERTIFICATION

The CTX10 is certified by *exida*® to IEC61508 for single input use in low demand, SIL 2 Safety Instrumented Systems (SIS).

Visual Status Indication

The CTX10 LEDs can be used to monitor internal status or to modify the factory settings. Refer to the CTX10 instruction manual (95-8789) for guidance on using the CTX10 LEDs.



SAFETY-CERTIFIED PRODUCT IDENTIFICATION

Safety Certification of all CTX10 models meeting SIL 2 safety standards is clearly identified on the product label.

INSTALLATION

NOTE

For complete information regarding performance, installation, operation, maintenance, and specifications of CTX10, refer to the instruction manual (95-8789).

No special or additional detector installation requirements exist above and beyond the standard installation practices documented in the CTX10 instruction manual.

The operating temperature range for the CTX10 is -40°C to $+75^{\circ}\text{C}$ for the analog output. Other environmental operating specifications are applicable as published in the specifications section in the CTX10 instruction manual (95-8789).

The CTX10 operating power distribution system should be designed and installed so the terminal voltage does not drop below 18 Vdc when measured at any specific location. The maximum current limit per device must be less than 2 amperes. The external system providing power to the CTX10 must have over-voltage protection that ensures supply voltage does not exceed 30 Vdc.

COMMON MISUSE SCENARIOS

Refer to the Installation and Troubleshooting sections of the instruction manual for detailed information on avoidance and resolution of common misuse scenarios. Applications to avoid include the following:

- Locations where impact or other excessive mechanical stress is likely.
- Locations where the CTX10 transmitter LEDs are not easily viewable or accessible.
- Mounting the CTX10 without properly sealing ALL conduit entries.

START-UP AND COMMISSIONING

NOTE

All safety functions of the CTX10 are active within 150 seconds of power-up without any user action required.

Commissioning Personnel

The Safety Certified CTX10 Transmitter can be commissioned by any qualified person with knowledge of the detection instruments and configuration devices being used. Refer to the Start-Up and Calibration sections provided in the CTX10 instruction manual.

Configuration

NOTE

Prior to device configuration, all alarm outputs must be bypassed. The device is not safety certified during configuration change activities.

NOTE

All configuration changes to the CTX10 must be verified by the user via a Proof test, power cycle and re-check of settings, or other appropriate method.

OPERATION, MAINTENANCE, INSPECTION AND PROOF TESTING

All normal installation, start-up, and field calibration recommendations as documented in the CTX10 instruction manual (95-8789) are applicable to the Safety Certified CTX10 Transmitter.

Safety-Certified CTX10 Transmitters 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.



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: None

Visual inspection of Safety-Certified CTX10 Transmitter and connected devices shall be conducted as needed to confirm that no external blockage of path into the sensing chamber/area exists, eg. debris, trash, snow, mud, external equipment, etc. Corrective action shall include removal of such impediments should they exist. All devices monitored by the CTX10 must be inspected to ensure that they are capable of providing expected performance and protection.

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

RESPONSE PROOF TEST

Tools Required: Compressed Calibration Gas Kit provided by Det-Tronics, or other device stimulation method

The Response Proof Test must be performed while the CTX10 and attached device are in NORMAL operation and requires application of sufficient stimulation to put the device into alarm state. The user must then inspect the signal output level to ensure that the signal output is accurately indicative of the applied condition.



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!

Response Proof Test Sequence

1. Inhibit alarm and fault response at the control device.
2. Apply stimulation to the attached device that is sufficient to indicate the high alarm mA level.

Table 1—Frequency for Performing Proof Tests

CTX10 Proof Test Name	Commissioning	Frequency
Visual Field Inspection Proof Test	Yes	As needed, depending on level and type of contaminants present
Response Proof Test	Yes	1 year

3. Verify correct change of state at the 4-20 mA output. Criteria for the 4-20 mA inspection pass of a gas detector is a response signal within $\pm 3\%$ of applied gas concentration (generally, a 50% full scale test concentration is applied).
4. Remove the test gas or other stimulation method and ensure that the unit returns to normal operation.
5. Induce a fault to the CTX10; suggested fault induction methods are listed below:
 - Lower input supply voltage below 10 Vdc
 - Remove the connected CGS gas sensor
6. Verify correct change of state to the 4-20 mA output at the control device.
7. Remove the fault induction source and ensure that the unit returns to normal operation.
8. Re-activate alarm and fault response at the control device.

If the response test result is not within acceptable limits or fails for any reason, a Full Calibration procedure must be performed and the Proof Test re-performed. The Full Calibration procedure for the CGS gas detector is listed below.

Full Calibration

Tools Required: Compressed Calibration Gas Kit provided by Det-Tronics
Magnet

Full Calibration shall be conducted when required as documented in the Calibration section of the CTX10 instruction manual. It is permissible to conduct the Full Calibration using the onboard magnetic calibration switch. In all cases, the CTX10 and attached gas sensor should be allowed to warm up for a minimum of one hour before conducting calibration.

Completion of the Response Proof Test must be recorded and documented in the SIS logbook.



WARNING

Any external alarm equipment, systems or signaling devices that were disabled must be re-activated at the conclusion of proof testing activities.

FAULT/FAILURE ACTION PLAN

In the event of an unsuccessful Response Proof test after a Calibration has been performed, the standard Troubleshooting and Device Repair and Return procedures as listed in the CTX10 instruction manual must be followed. Any failure to successfully complete the Response Proof Test must be recorded and documented in the SIS logbook.

PRODUCT REPAIR

The CTX10 is not field repairable, and any internal device repairs must be conducted at the factory. No firmware changes are permitted or authorized. All failures detected by the device diagnostics or by the Proof Tests that cannot be resolved through the troubleshooting and maintenance procedures described in the instruction manual must be reported to the manufacturer.

OPERATING, ENVIRONMENTAL, AND PERFORMANCE SPECIFICATIONS

The Safety-Certified CTX10 Transmitter product versions fully comply with, and must be operated in accordance with the functional, environmental, and performance specifications provided in the CTX10 instruction manual. A 24 hour mean time to repair should be assumed for safety availability calculations.

SPARE PARTS

Refer to “Replacement Parts” in the CTX10 instruction manual. Safety Certification is based on a sufficient number of spares to achieve a 24 hour mean time to repair.

CERTIFICATION AND FAILURE RATE DATA

IEC61508: 2010

Type B Device

Systematic Capability: SIL 2 certified

HFT: 0

Low Demand Mode

PFDavg should be calculated for any safety instrumented function using the CTX10. (Refer to FMEDA report for necessary information, including DU rate.)

Safety Accuracy: <4% error (see SPECIFICATIONS section of instruction manual for performance details).

Safety Response Time: The CTX10 contributes less than 2 seconds to the worst case safety response time.

Product Life: 10 years, based on manufacturer data.

All failure rate data for SIL verification is in the FMEDA report, which is available upon request.

NOTE

The CGS sensor must be replaced every 3 years. Refer to the CTX10 Instruction Manual (95-8789) Section 3.2 for CGS sensor life, and Section 9.3 for sensor replacement instructions.

ADDITIONAL CERTIFICATIONS

FM, CSA, ATEX, IECEx, CE.

For complete information regarding performance, installation, operation, maintenance and specifications of the CTX10, refer to the instruction manual (95-8789).

TERMS AND DEFINITIONS

FMEDA	Failure Mode Effects and Diagnostics Analysis
HFT	Hardware Fault Tolerance
LFL	Lower Flammable Limit
PFD	Probability of Failure on Demand (Probability of Dangerous Failure)
PFDavg	Average Probability of Failure on Demand
SIF	Safety Instrumented Function
SIL	Safety Integrity Level
SIS	Safety Instrumented System
CTX10	Model CTX10 Transmitter

IEC 61508 Failure Rates in FIT*

Failure Category	λ_{sd}	λ_{su}^{**}	λ_{dd}	λ_{du}
CTX10 Transmitter (CGS only)***	157	347	2650	1208

* FIT = 1 Failure / 10⁹ Hours

** It is important to realize that the No Effect failures are no longer included in the Safe Undetected failure category according to IEC 61508, ed2, 2010.

*** The CGS model must be used in an environment where the target gas is usually not present in order for these failure rates to be valid.



FlexSonic® Acoustic
Leak Detector



X3301 Multispectrum
IR Flame Detector



PointWatch Eclipse® IR
Combustible Gas Detector



FlexVu® Universal Display
with GT3000 Toxic Gas Detector



Eagle Quantum Premier®
Safety System



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