

Safety Manual

FL500, FL500-H2 UV/IR Flame Detectors



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WARNING!

These instructions must be provided to users before use of the product and retained for ready reference by the user. Read this manual carefully before using or maintaining the device. The device will perform as designed only if it is used and maintained in accordance with the manufacturer's instructions. Otherwise, it could fail to perform as designed, and persons who rely on this device could sustain serious injury or death.

The warranties made by MSA with respect to the product are voided if the product is not installed and used in accordance with the instructions in this manual. Please protect yourself and your employees by following the instructions.

Please read and observe the WARNINGS and CAUTIONS inside. For additional information relative to use or repair, call 1-800-MSA-2222 during regular working hours.

For countries of Russian Federation, Republic of Kazakhstan and Republic of Belarus, the gas detector will be delivered with a passport document that includes valid approval information. On the CD with manual instruction attached to the gas detector the user will find the documents "Type Description" and "Test Method" - appendixes to Pattern Approval Certificate of Measuring instrument, valid in the countries of use.

The Declaration of Conformity can be found under the following link: <https://MSAsafety.com/DoC>.

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Contents

1 Introduction 4

2 Description 4

3 Installation 5

4 Operation 6

5 Maintenance 7

6 Specifications 7

 6.1 System Specifications 7

 6.2 Environmental Specifications 7

7 Approvals 8

1 Introduction

WARNING!

Toxic, combustible, and flammable gases and vapors are very dangerous. Be very careful when these hazards are in the atmosphere.

Failure to follow this warning can result in serious personal injury or death.

This manual gives the safety-related information for installation, operation, configuration, and maintenance of the FL500 and FL500-H2 UV/IR Flame Detectors.

For complete information about installation, operation, configuration, maintenance, specifications, and performance, refer to the FL500 UV/IR Flame Detector Operating Manual (PN 10193213).

2 Description

The FL500 and FL500-H2 ultraviolet/infrared (UV/IR) flame detector, referred to hereafter as the "FL500" or "device," senses UV and IR radiation to identify a fire and send 4 - 20 mA analog output or optional relay output. IEC 61508 identifies all detectors as Type B field devices.

The FL500 is compatible with the General Monitors TA402A trip amplifier, which is satisfactory for Safety Integrity Level (SIL) 3.

The safety function of the device does not include RS-485 Modbus or HART communication, which are typically used for field device setup, diagnostics, and troubleshooting. Modbus and HART communication are non-interfering functions that do not interrupt the safety-critical function of the detectors.

3 Installation

**WARNING!**

- Do NOT connect or disconnect equipment when power is supplied to the device. Doing so can result in serious damage to the equipment. The warranty does not apply to equipment that is damaged in this way.
- Do not install or operate a device that is damaged.
- Install the device in a location away from conditions (such as high-pressure steam) where electrostatic charge can collect on nonconducting surfaces. This equipment uses an external nonmetallic coating. If extreme levels of electrostatic charge collect, ignition can occur.
- Make sure that there is no physical blockage from permanent objects such as structures and equipment or temporary objects such as personnel and vehicles in the sensor's field of view. If there is physical blockage in the sensor's field of view, the device cannot accurately monitor the area for flame.
- Keep the device safe from vibration and mechanical shock, which can cause damage.
- Do NOT install the device in an area where temperatures will be more than 185°F (85°C).

Failure to follow these warnings can result in serious personal injury or death.

To select the best location to install the device, refer to the FL500 Operating Manual (PN 10193213) for information about field of view and environmental conditions.

Make sure that the device:

- Is in a location where personnel and objects cannot cause a blockage of the field of view
- Is in a location that is convenient for visual inspection and cleaning
- Is in a location where ice, dirt, or debris cannot collect on the optical window
- Points downward to prevent dust and moisture from collecting on the optical window

Although the device is resistant to radio frequency interference (RFI), do not install the device near radio transmitters, high magnetic or electrical fields, or areas with similar interference.

4 Operation

WARNING!

- Do NOT connect or disconnect equipment when power is supplied to the device. Doing so can result in serious damage to the equipment. The warranty does not apply to equipment that is damaged in this way.
- Do not install or operate a device that is damaged.
- Make sure that there is no physical blockage from permanent objects such as structures and equipment or temporary objects such as personnel and vehicles in the sensor's field of view. If there is physical blockage in the sensor's field of view, the device cannot accurately monitor the area for flame.

Failure to follow these warnings can result in serious personal injury or death.

For complete operating instructions, refer to the FL500 Operating Manual (PN 10193213).

1. Before you connect the device to the power supply, make sure that the power supply is OFF.
2. Before you supply power to the device, do the following:
 - a. Replace the red dust cap with an applicable cable gland.
 - b. Disconnect external devices such as automatic extinguishing fire suppression systems to prevent activation.
 - c. Make sure that the settings for the DIP switch are in the correct configuration.
 - d. Make sure that the device is mounted and wired correctly.
 - e. Make sure that there is no blockage of the field of view for each device.
 - f. Make sure that the optical window and reflectors are clean.
 - g. Make sure that the power supply is connected correctly.
3. After the self-test start-up sequence is complete, do a sensitivity check.
4. Use the TL105 test lamp to make sure that FL500 operation is correct.

The device does internal diagnostics on critical faults every second. If an internal fault occurs, the device sends 0 mA output and the fault relay de-energizes.

Continuous Optical Path Monitoring (COPM) does a check of the device's optical path and related electronic circuitry every 2 minutes. If a COPM fault occurs, the device sends 2.0 mA output and the fault relay de-energizes.

If a sensitivity check fault or an operational fault occurs, refer to the Troubleshooting section in the FL500 Operating Manual (PN 10193213).

If a power-cycle event occurs, use Modbus communication to make sure that the sensitivity settings have not changed.

5 Maintenance

WARNING!

- Use ONLY Industrial Strength Windex® with Ammonia D (General Monitors PN 10272-1) to clean the optical window. The optical window material is sapphire, not glass. Using any other commercial glass cleaner will cause damage to the optical window. The warranty does not supply coverage for optical windows that are damaged in this way.
- Use ONLY a damp cloth to clean the device. Otherwise, electrical shock or ignition from ESD can occur.

Failure to follow these warnings can result in serious personal injury or death.

For complete maintenance instructions, refer to the FL500 Operating Manual (PN 10193213).

Remove debris and film buildup on the optical window and reflectors every 30 days at a minimum.

NOTICE

Examine and clean the optical window, and do sensitivity checks more frequently for devices that are installed in dirty areas.

Do sensitivity checks regularly.

6 Specifications

6.1 System Specifications

Operating temperature range	-67° to 185° F (-55° C to 85° C)
Storage temperature range	-40° to 185° F (-40° C to 85° C)
Humidity range	0% to 95% RH conditioning
Nominal supply voltage	24 Vdc
Supply voltage range	20 to 36 Vdc (measured at device)

6.2 Environmental Specifications

Fault signal	0 to 0.2 mA
COPM fault signal	2.0 +/- 0.2 mA
Ready signal	4.0 +/- 0.2 mA
IR only signal	8.0 +/- 0.2 mA
UV only signal	12.0 +/- 0.2 mA
Alarm low signal	16.0 +/- 0.2 mA
Alarm high signal	20.0 +/- 0.2 mA

7 Approvals

Rigorous reliability and functional safety assessments by FM Approvals show the FL500 to be certified to IEC 61508, Parts 1, 2, and 3. The reliability assessment is a failure-rate prediction that assumes an average temperature of 104°F (40°C) and an environmental factor equivalent to Ground Fixed. It is assumed that the device will be installed in a Safety Instrumented System (SIS) that operates in a low-demand environment, per IEC 61508. The following are the SIL parameters for the FL500.

Output Type	Relay Output	4-20 mA Output
FM Certificate	PR449249	PR449249
λ DD (Fails per hour)	6.15E-7	4.34E-7
λ DU (Fails per hour)	2.24E-08	3.72E-11
Safe Failure Fraction (SFF)	98%	99%
Safety Integrity Level (SIL)*	2	3
Diagnostic Test Interval	Critical faults = 1 second COPM faults = 2 seconds	
Typical response time	<3 seconds	
Average probability of failure on demand $PFD_{avg1001}^{**}$	2.71E-5	1.78E-6

* Hardware Fault Tolerance (HFT) = 0

** $PFD_{avg1001}$ assumes a 4-hour repair time and 90-day proof test interval.

CSA (CSA 18.70180732X), FM, ATEX (Sira 18ATEX1073X), IECEx (SIR 18.0026X), HART Registered, SIL 3 suitable.