SAFETY MANUAL

FlameGard® 5 UV/IR Flame Detector Series

Safety Manual

Part No. **MAN5UVIRSAFETY**
Revision **0**

This manual describes the safety related information for the installation, operation, configuration, and maintenance for following flame detectors:

- FlameGard 5 UV/IR Flame Detector with HART Communications
- FlameGard 5 UV/IR Flame Detector
- FlameGard 5 UV/IR-E Flame Detector

For complete information regarding performance, installation, operation, maintenance and specifications of the above products, please refer to the associated product manual.

MSA's mission is to benefit society by providing solutions through industry-leading safety products, services and systems that save lives and protect capital resources from the dangers of hazardous flames, gases and vapors.

The safety products you have purchased should be handled carefully and installed, calibrated, and maintained in accordance with the associated product instruction manual. Remember, these products are for your safety.

WARNING: TOXIC, COMBUSTIBLE, AND FLAMMABLE GASES AND VAPORS ARE VERY DANGEROUS. USE EXTREME CAUTION WHEN THESE HAZARDS ARE PRESENT.

INTRODUCTION

General Description

The MSA FlameGard 5 UV/IR Flame Detector is an ultraviolet and/or infrared flame detector that detect unwanted fires and respond with a 4-20 mA analog output or optional relay output. All detectors are regarded as Type B field devices per IEC 61508.

The safety function of the flame detectors do not include:

- RS-485 Modbus communication
- HART communication

Modbus and HART communication are typically used for field device setup, diagnostics, and troubleshooting. Carefully observe requirements for interfacing in hazardous locations. Modbus and HART communication are non-interfering functions and do not interrupt the safety critical function of the detectors.

INSTALLATION

NOTE: Power should remain disconnected until all other wiring connections are made.

For complete installation information for the FlameGard 5 UV/IR Flame Detector, refer to the specific instruction manual.

Location Considerations

There is no one optimal manner to install a flame detector for all applications. Instead, several variables should be considered when selecting locations to install detectors, including the following:

- Detector field of view (FOV)
- Optical sensitivity range
- Environmental conditions

In addition, the flame detectors should be mounted in locations, which will inhibit people or objects from obscuring the detector's FOV. The unit should be mounted free from shock and vibration and convenient for visual inspection and cleaning. Furthermore, the detector(s) should be tilted downward so that dust or moisture does not accumulate on the window. Finally, though the detectors are Radio Frequency Interference (RFI) resistant, they should not be located near radio transmitters, high magnetic or electrical fields, or in areas with similar interference.

NOTE: Frequent inspection, cleaning, and sensitivity checking is suggested for detectors mounted in dirty environments.

No special or additional detector mounting, wiring, power, or tool requirements exist beyond the standard installation practices documented in the product instruction manual.

WARNING: Under NO circumstances should equipment be connected or disconnected when under power. This is contrary to hazardous area regulations and may also lead to serious damage to the equipment. Equipment damaged in this manner is not covered under warranty.

OPERATION AND MAINTENANCE

For complete operation and maintenance information for the FlameGard 5 UV/IR Flame Detector, refer to the product instruction manual.

Before connecting a unit, check to make sure power is turned off. Before power-up, check all wiring connections.

Once correctly installed, the unit requires very little maintenance other than regular sensitivity and alarm checks and cleaning of the window. MSA recommends that a schedule be established and followed.

The flame detector performs internal diagnostics on critical faults every second and a Continuous Optical Path Monitor (COPM) check every 1 minute. The detector will respond with 0 mA and fault relay trip for an internal fault and 2 mA and fault relay trip for a COPM fault.

NOTE: The removal of particulate matter and any film buildup on the lenses and light rods is necessary to ensure proper sensitivity of the system. It is recommended that the window and light rods be cleaned at least every 30 days, or more often if the detector is located in a particularly dirty environment.

CAUTION: In case of a power cycle event confirm that sensitivity settings have not changed. Use the Modbus communication to verify sensitivity – Low, Medium, or High. The FlameGard 5 UV/IR test lamp can also be used to check the operation of the detector. Observe requirements for interfacing in hazardous locations.

Refer to the Troubleshooting Section in the appropriate product instruction manual in the event of sensitivity check fault or operational fault. Spare parts should be on-hand as described in the Spare Parts Section of the product instruction manual.

SPECIFICATIONS

Table 1 and Table 2 list specifications for the FlameGard 5 UV/IR Flame Detector. For a complete list of specifications, refer to the product instruction manual .

FlameGard 5 UV/IR Flame Detector	
Instruction Manual P/N	MAN5UVIR
Temp. Range	
Operating:	-40°F to 185°F (-40°C to 85°C)
Storage:	-40°F to 185°F (-40°C to 85°C)
Humidity Range:	0 to 100% RH, non-condensing
Input Power:	
Absolute min:	20 VDC
Nominal:	24 VDC
Absolute max:	36 VDC

Table 1A – FlameGard 5 UV/IR Environmental/Electrical Specifications

FlameGard UV/IR–E Flame Detector	
Instruction Manual P/N	MAN5UVIRE
Temp. Range	
Operating:	-40°F to 194°F (-40°C to 90°C)
Storage:	-40°F to 194°F (-40°C to 90°C)
Humidity Range:	0 to 100% RH, non-condensing
Input Power:	
Absolute min:	20 VDC
Nominal:	24 VDC
Absolute max:	36 VDC

Table 1B – FlameGard UV/IR-E Environmental/Electrical Specifications

Mode	FlameGard 5 UV/IR Flame Detector	FlameGard 5 UV/IR-E Flame Detector
Fault	0 mA	0 mA
COPM Fault	2 mA	2 mA
Ready	4 mA	4 mA
IR only Signal (FlameGard UV/IR)	8 mA	8 mA
UV only Signal (FlameGard UV/IR)	12 mA	12 mA
WARN Signal	16 mA	16 mA
ALARM Signal	20 mA	20 mA

Table 2 – Analog Output Specifications (Max Load: 600 ohms)

CERTIFICATIONS AND FAILURE RATE DATA

The FlameGard 5 UV/IR Flame Detector has gone through rigorous reliability and functional safety assessments, which have resulted in these field devices being certified to IEC 61508 Parts 1, 2, and 3, by FM Approvals. The reliability assessment is a failure rate prediction that assumes an average temperature of 40ºC and an environmental factor equivalent to Ground Fixed. It is assumed that the field devices will be installed in a Safety Instrumented System (SIS) operating in a Low Demand environment per IEC 61508. Tables 3A and 3B list the SIL parameters for each field device.

Field Device	**FlameGard UV/IR Flame Detector**	
Output Type	**Relay Output**	**4-20 mA Output**
FM Certificate	3041816	
MTBF (Years)	20	
λ_{DD} (Fails per hour)	2.63E-6	2.61E-6
λ_{DU} (Fails per hour)	3.15E-7	2.65E-8
Safe Failure Fraction (SFF)	95%	99.6%
Safety Integrity Level (SIL)*	2	3
Diagnostic Test Interval	1 second (Critical Faults) 1 minute (COPM)	
Typical Response Time	< 3 seconds	
Average Probability of Failure on Demand PFD_{avg}1oo1**	3.51E-04	3.91E-05

Table 3A – SIL Parameters for FlameGard UV/IR Flame Detector

* Hardware Fault Tolerance (HFT) = 0
** PFD_{avg}1oo1 assumes a 4 hour repair time and 90 day proof test interval.

Field Device	FlameGard 5 UV/IR-E Flame Detector	
Output Type	**Relay Output**	**4-20 mA Output**
FM Certificate	3041816	
MTBF (Years)	21	
λ_{DD} (Fails per hour)	2.5E6	2.5E-6
λ_{DU} (Fails per hour)	1.2E-7	1.3E-7
Safe Failure Fraction (SFF)	98.2%	98%
Safety Integrity Level (SIL)*	2	2
Diagnostic Test Interval	1 second (Critical Faults) 1 minute (COPM)	
Typical Response Time	< 3 seconds	
Average Probability of Failure on Demand PFD_{avg}1oo1**	1.4E-4	1.5E-4

Table 3B – SIL Parameters for FlameGard 5 UV/IR-E Flame Detector

* Hardware Fault Tolerance (HFT) = 0
** PFD_{avg}1oo1 assumes a 4 hour repair time and 90 day proof test interval.

Agency Approvals

The FlameGard 5 UV/IR and UV/IR-E Flame Detectors have the following approvals:

FlameGard 5 UV/IR Detector
CSA
FM Approvals*
ATEX
HART Registered
IEC 61508 per FM Approvals

Table 4A – Agency Approvals for FlameGard 5 UV/IR Detector

* The FlameGard 5 UV/IR -H2 is not FM approved.

FlameGard 5 UV/IR-E Detector
ATEX
IEC 61508 per FM Approvals

Table 4B – Agency Approvals for FlameGard 5 UV/IR-E Detector