FM PERFORMANCE APPENDIX

FS24X PLUS™ FIRE AND FLAME DETECTOR

FS24XP-ANGXX

FS24XP-SNGXX

FS24XP-AMGXX

FS24XP-SMGXX

The Honeywell®FS24X Plus™ is a hazardous area Flame detector that uses 3IR sensors to respond quickly to a flaming fire.

It is factory calibrated, and the robust sealed design with no moving parts allows for mounting in harsh environments. These flame detectors are available in either a 316 Stainless Steel or Low Copper Aluminum.

NOTE: This is the FS24X Plus™ FM Performance Approval Appendix to FS & SS Series Flame Detectors and Associated Test Lamps Quick Reference Guide for Hazardous Location Installation #1701M5000HL. This appendix, the Quick Reference Guide and the User Manual must be used together.

⚠ WARNING

RISK OF IMPROPER FLAME DETECTION

• Install only in areas in accordance with the environmental and hazardous area ratings.

• Carefully review mounting area and position in accordance with the Quick Start Guide to ensure optimal flame detection regarding the angle of device and unobstructed view.

• Avoid potential sources of direct or indirect radiation in the flame detector field of view.

• Do not touch the sensors on the front of the electronics module.

• Avoid direct sunlight into the flame detector window – use provided sunshade, aim flame detectors down at 40 degrees or more when possible, and use multiple detectors to cover hazardous areas from different directions.

• Avoid close proximity to rapid modulation/chopping of sunlight (creating moving dark shadows) as optical sensor performance can be reduced, e.g. close trees in the wind, rotating blades.

• Use shielded cable for all wirings and ground the shield at one end as detailed in the Wiring section.

• Keep all devices and wire runs away from mercury vapor lights, variable speed drives, radio repeaters and other sources of electromagnetic interference.

• Follow local cabling and glanding rules.

• Seal all unused conduit entries and install proper drains/traps by local codes.

• Do not try to service parts inside the electronics module, there are no field serviceable parts, just module replacement.

Hazardous Classifications

Class I, Zone 1, AEx db IIC T5 Gb; Class I, Div. 1, Groups A, B, C, & D; Class II/III, Div. 1, Groups E, F, & G; Ex db IIC T5 Gb; Ex tb IIIC T135°C Db; FM14ATEX0058X; IECEx FMG14.0027X; T5 Ta = –50°C to +85°C; Type 4X, IP66/67; ⟨Ex⟩ II 2 D; II 2 G

Performance Specifications

Operating Temperature (ATEX/IECEx): –55°C to +75°C

Storage Temperature (ATEX/IECEx): –55°C to +85°C

Operating Temperature (North America): –50°C to +75°C

Storage Temperature (North America): –50°C to +85°C

Tested Fuels: n-heptane, methane, butane, propane, ethanol, methanol, hydrogen, diesel, kerosene, JP-4, and IPA

Sensitivity for Test: Low, Medium, High, and Very High Sensitivities (indoors/outdoors)

Software System & Safety: 5.01 identified on the label on electronics

Humidity: 0 to 99% relative humidity, can withstand 100% condensing humidity for short periods of time.

Field of View (FoV): The detector has a cone of view for all standard mounts of 90° (left 45°, right 45°, up 40°, down 50°) horizontal and vertical with the highest sensitivity on the central axis. (to EN54-10 70% of on-axis range).

• With Tank Mount: The detector has a FoV of left 50°, right 50°, up 50°, and down 50°.

• With FoV Restrictor: The detector has a FoV of left 35°, right 35°, up 30°, and down 35°.

• With Sunshade: The detector has a FoV of left 45°, right 45°, up 40°, and down 45°.

Operating Voltage: 24 VDC nominal (18-32 VDC) - Regulated.

Power Consumption: 1.8 watts (nominal); 2.4 watts (Alarm); 12 Watts (max) = 0.50A @ 24V with heater ON 100% duty cycle.

Note: Heater turns ON at –13°F [–25°C] in Normal Operation). Heaters are used during extreme cold to bring the internal electronics up to a minimum temperature. During this time, which can last up to 30 minutes, the internal microcontrollers are not running, halo will be off, and the current loop will report less than 1.5 mA.

Inrush Current is 0.75A for a maximum duration of less than 5ms

Weight: Aluminum 3 lbs. 11 oz. (1.7 kg); Stainless Steel 7 lbs. 7 oz. (3.4 kg)

Housing material: Low Copper (less than 0.25%) marine grade Painted casted Aluminum of ASTM A356.0 grade.

Polished cast Stainless Steel of ASTM CF8M grade.

Outputs: Fault, Alarm and Auxiliary SPDT relays Max. 32 Vdc/ac, max. 2 A, min 10mA at 12 V resistive load.

4-20 mA Source, sink or isolated current output.

FP2 over RS-485 and USB (USB is accessible through Detector Module electronic device only).

Modbus over RS-485.

HART®: The FS24X Plus™ Flame detector has HART® 7 communication; registered with FieldComm Group, EDD/DTM.

Mean Time Before Failure: >10-year MTBF with a commonly used database (e.g. MIL-217, MIL-217D, or Siemens SN29500). Two calculations - All components and only safety critical components.

Mounting Bracket: There are 3 mounts available: SM4 (standard), SM4-M (marine), and Tank Mount.

Enclosure: Diameter: 125 mm (4.92 in) x 115 mm (4.52 in) deep; Two M25 X 1.5P or two ¾'' NPT conduit entries.

Window size diameter: 79 mm (3.11 in)

Local notification indicator: LEDs HALO Light ring. Shows instrument status.

HALO is visible at 50 ft. in daylight conditions. Suitable for indoor and night applications.

HALO flash patterns during operation:

Illustration	State	Default Pattern	Optional (settable) Pattern
	Off or de-energized	Off	Same
	Normal Operation, No fire	Mostly off, flashing Green every 5 seconds	Off
	Inhibited	Solid Yellow	Same
	Fault	Flashing Yellow every second	Same
	Alarm	Solid Red	Flashing Red
	Warning	Flashing Yellow and Green Alternate	Same

Available Accessories/Spares

• SM4 Mounting Bracket

• FVR-01 FoV Restrictor

• SH-001 Sunshade

• SM4-M Marine Mounting Bracket

• NFPA 72 Connector Kit p/n FS24XP-NFPA-KIT

• Tank Mount

What's in the box?

• 1 Flame detector

• 1 Quick Start Guide

• 1 Standard Mount (SM4) or Marine Mount (SM4-M)

• 1 Threaded Stopping plug

• 1 Sunshade (SH-001)

Installation

NOTE: Must only be installed by appropriately trained and accredited personnel. Read all instructions and warnings before installing.

Location - Indoor or outdoor. Select a site with a low chance of mechanical damage and low vibration. Ensure that the detector has a line of sight to the threat location. Avoid false alarm sources. Orient the detector such that the Field of View covers the desired area. It is recommended to angle all detectors down at least 40 degrees from horizontal. Use the SH-001 Sunshade as needed to avoid direct sunlight hitting the detector window.

Wiring

FS24X Plus™ must be connected with suitable cabling/conduit for the environment in terms of temperature, current and protection against damage.

NOTE: Use appropriate ESD protection when handling electronics. Do not touch sensors or lenses. Fingerprints will inhibit performance.

Cable/Wiring – Shielded cable with twisted pairs and shield coverage of more than 80% with minimum pigtail lengths outside of the shield. Specifications as follows:

14 – 24 AWG rated 85ºC minimum:

• One 14 – 24 AWG Cu stranded wire (16 AWG recommended); or

• Two 16 - 24 AWG Cu stranded wires per terminal. Terminal block should be torqued to 5 lb in. (0.56 Nm) on each wire(s).


EMC - To ensure proper EMC protection, coil, and tape the cable shields at the control panel or power supply. Tie the other end of the shields together and terminate inside the detector enclosure, ensuring earth ground to the cabinet.

Terminal Blocks - The Flame detector Electro-Optical Detector Module has pluggable terminal blocks for interfaces (Power Supply, RS-485, Relay, etc.) with retention for easy plug-in replacement of the product in the field.

NFPA 72 Terminal Blocks - When connecting to a fire panel, compliance with NFPA 72 is obtained by using the terminal blocks in NFPA 72 Connection Kit p/n FS24XP-NFPA-KIT. Instructions are provided with the kit and online (see QR code on the back of this appendix).

Wiring Configurations

There are multiple ways to configure the current loop on the detector. Consult the User Manual for specifics on each of the methods shown below.
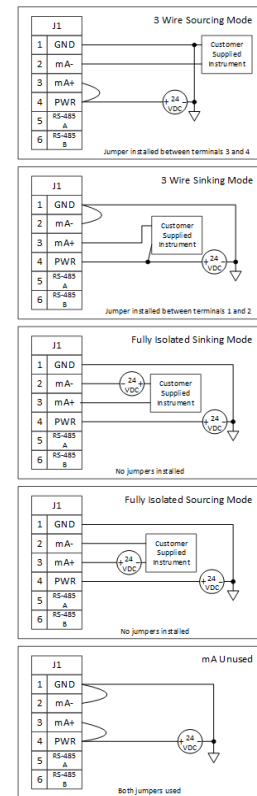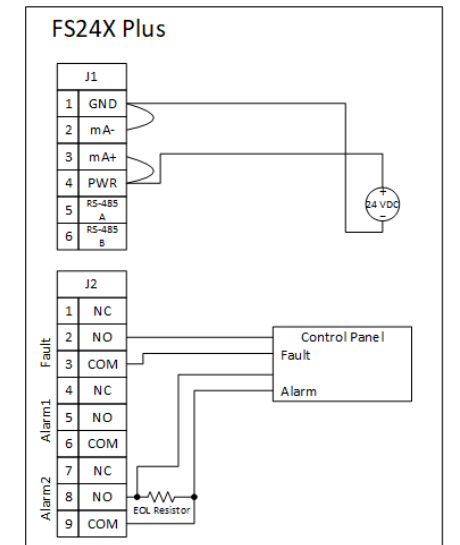

Communication Wiring

For Modbus and HART® details – See User Manual.

Independent Alarm and Fault Relay Interface Circuits

• Fault relay configured normally energized and wired using ordinarily open contact. i.e., continuity of the fault circuit will break if relay de-energized.

• Any loss of continuity in the power circuit will result in fault relay being de-energized and fault condition being signaled to the controller.

• Alarm relay typically configured de-energized and wired using the normally open circuit. i.e., the alarm circuit is shorted in the event of an alarm.

• The EOL resistor (selected following control panel specification) enables the signal circuit to be monitored by the control panel for continuity.

• Any loss of continuity in the alarm circuit, including the disconnect of either the signal conductor, or the EOL resistor, or both will be detected by the controller and signal as a fault.

• The termination of the alarm circuit conductor and the EOL resistor (or the next unit in a daisy chain of units) must be inserted into separate openings on the duplicate terminal block of the NFPA 72 Connection Kit to comply with NFPA 72 requirements.

Combined Alarm and Fault Relay Interface Circuits

• Fault relay configured normally energized and wired using ordinarily open contact. i.e., continuity of signal circuit will be broken if relay de-energized.

• Any loss of continuity in the power circuit will result in fault relay being de-energized and fault condition being signaled to the controller.

• Alarm relay usually configured de-energized and wired using the normally open circuit. i.e., the signal circuit is shorted in the event of an alarm.

• The EOL resistor (selected following control panel specification) enables the signal circuit to be monitored by the control panel for continuity.

• Any loss of continuity in the signal circuit, including the disconnect of either the signal conductor, or the EOL resistor, or both will be detected by the controller and signal as a fault.

• The termination of the alarm circuit conductor and the EOL resistor (or the next unit in a daisy chain of units) must be inserted into separate openings on the duplicate terminal block of the NFPA 72 Connection Kit to comply with NFPA 72 requirements.
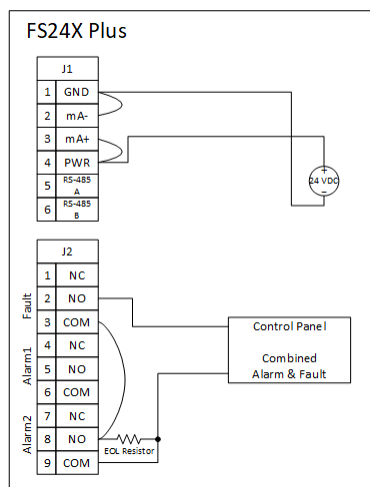
Configure the Detector (Safe Area)

1. Connect to the detector by using either a USB cable or through a twisted pair of wires via RS-485 converter to the PC or Laptop.

2. Run the Honeywell *FlameManager* Application.

3. In the Communication Parameters window, check the Connect port is USB if you are using a USB cable, or select a port from the Port Name list if connected with a twisted pair of wires RS-485 to the PC or laptop.

4. Click Connect.

5. From the Main window, select the Configure tab.

6. From the Configure window, you can perform any of the following operations:

Operation	Description
Flame Sensitivity	Select from four sensor's sensitivity values from low to very high. Be sure to comply with the site required Agency approvals.
Alarm Verification Time	The time the detector should wait before sending an alarm sign after detecting a possible flame source. This waiting time is to prevent false alarms.
Read	Read the detector flame sensitivity and alarm verification time current values.
Write	Apply new values selected for the flame sensitivity and the alarm verification time.
Latch Alarms	Holds the info when the detector is alarmed. To unlatch it, turn the detector off. Be sure to comply with NFPA 72 if required.
Relay Options	1 = Fault; 2 = Alarm; 3 = Auxiliary
4-20mA Output options	Set current levels for the faults, warning, Inhibit, alarm, and verified alarm notifications.

Commissioning the Detector

After set-up and installation, test the flame detector with the test lamp. Confirm coverage area is correct.

States & Outputs

The FS24X Plus™ Flame detector communicates status using a variety of output methods, including the LED, 4-20 mA current loop, Relays, RS-485 Modbus, and HART® EDD over 4-20mA current loop.

Test Lamps

The Honeywell® TL-1055 and TL-2055 test lamps are compatible with the FS24X Plus™ flame detectors. Note that the test lamps will alarm the detector, so we recommend inhibiting the safety system before testing.

⚠ **WARNING**

RISK OF EXPLOSION

USE TEST LAMP MODEL TL-1055 IN NON-HAZARDOUS LOCATIONS ONLY.

FOR HAZARDOUS LOCATIONS, USE MODEL TL-2055

Some of the most important functions of the remote test lamp ensure:

• The detector's optical path is not blocked.

• The detector is appropriately aimed at the fire threat area.

• The detector's alarming circuitry and outputs (i.e., relays, 4-to-20 mA, etc.) function properly.

Tests are made using the Honeywell® TL-2055 Test Lamp with a range of 10-25 ft when fully charged.

Wait a minimum of thirty (30) seconds between tests (i.e., test lamp or test fires) to allow the Detector's sensors to normalize to the spectral background conditions fully.

⚠ **WARNING:** The following conditions may have a detrimental effect on detector performance or increase the change of nuisance alarms and therefore should be avoided:

1. Locations where the detector is aimed directly at the sun.

2. Situations where the detector is continuously subjected to modulated sunlight.

Maintenance

After the FS24X Plus™ Flame detector is installed and commissioned, the detector's window must be kept clean. To ensure the detector is operating properly at all times, it may be necessary to establish a periodic cleaning schedule. Inspect at least quarterly in dirty environments. Semi-annual or quarterly testing should be performed, using the appropriate Honeywell® Test Lamp, to ensure the integrity of the detector. A complete "end-to-end" test of the entire fire detection system should be performed periodically depending on the application.

Flame Response Performance

The following tables provides FS24X Plus™ response times and distance to various fuels.

Fuel	Flame Response Sensitivity				Target Sensitivity	Alarm Response Time	
	Fire Size		Fire Distance				
	Indoor	Outdoor	Indoor	Outdoor		Typical	Maximum
n-Heptane	6 in X 6 in (0.15m X 0.15m)	12 in X 12 in (0.3m X 0.3m)	90 ft (27m)	200 ft (60m)	Very High		
			67 ft (20m)	150 ft (45m)	High		
			45 ft (13m)	100 ft (30m)	Medium		
			22 ft (6m)	50 ft (15m)	Low		
IPA	6 in X 6 in (0.15m X 0.15m)	12 in X 12 in (0.3m X 0.3m)	90 ft (27m)	135 ft (41m)	Very High		
Methane	3/8 in (9.5mm) Dia. Orifice, 15 in (0.38m) Plume	3/8 in (9.5mm) Dia. Orifice, 32 in (0.81m)Plume	45 ft (13m)	90 ft (27m)	Very High	5 Seconds	10 Seconds
Butane	N/A*1	3/8 in (9.5mm) Dia. Orifice, 32 in (0.81m) Plume	N/A*1	98 ft (29m)	Very High		
Ethanol	N/A*1	12 in X 12 in (0.3m X 0.3m)	N/A*1	135 ft (41m)	Very High		
Methanol	N/A*1	12 in X 12 in (0.3m X 0.3m)	N/A*1	105 ft (32m)	Very High		
Hydrogen	N/A*1	3/8 in (9.5mm) Dia. Orifice, 32 in (0.81m) Plume	N/A*1	61 ft (18m)	Very High		
Diesel	N/A*1	12 in X 12 in (0.3m X 0.3m)	N/A*1	150 ft (45m)	Very High		
Kerosene	N/A*1	12 in X 12 in (0.3m X 0.3m)	N/A*1	75 ft (22m)	Very High		
JP-4	N/A*1	6 in X 6 in (0.15m X 0.15m)	N/A*1	100 ft (30m)	Very High		

Note: *1 Indoor testing not FM witnessed.

| False Alarm Source | FS24X Plus™ 3IR | | | | | Product Sensitivity | Typical Alarm Response Time |
| | False Alarm Source Immunity Distance | False Alarm Stimuli Performance | | | | | |
		False Alarm Source Distance	Fire Size and Fuel	Fire Distance	Equivalent Fire Distance for 12 in X 12 in (0.3m X 0.3m)		
Direct Sunlight (Modulated)	>= 10 ft (3.1m)	>= 9 ft (2.8m)	12 in X 12 in (0.3m X 0.3m) n-Heptane	36 ft (10m)	36 ft (10m)	Very High	5 Seconds (Typical) 10 Seconds (Maximum)
Direct Sunlight (Un-Modulated)	N/A	N/A		65 ft (19m)	65 ft (19m)		
Reflected Sunlight (Modulated)	>= 10 ft (3.1m)	>= 25 ft (7.7m)	12 in X 12 in (0.3m X 0.3m) n-Heptane	18 ft (5m)	18 ft (5m)		
Reflected Sunlight (Un-Modulated)	>= 10 ft (3.1m)	>= 10 ft (3.1m)		70 ft (21m)	70 ft (21m)		
Electric Arc welding (7014) (Modulated)	>= 5 ft (1.6m)	>= 15 ft (4.6m)	12 in X 12 in (0.3m X 0.3m) n-Heptane	30 ft (9m)	30 ft (9m)		
Electric Arc welding (7014) (Un-Modulated)							
Electric Heater, 1500W (Modulated)	>= 5 ft (1.6m)	>= 15 ft (4.6m)	3 in X 3 in (76mm X 76mm) n- Heptane	20 ft (6m)	80 ft (24m)		
Electric Heater, 1500W (Un-Modulated)	>= 8 ft (2.5m)	>= 10 ft (3.1m)					
Flourescent lamps, Two 34W (Modulated)	>= 5 ft (1.6m)	>= 10 ft (3.1m)	3 in X 3 in (76mm X 76mm) n- Heptane	20 ft (6m)	80 ft (24m)		
Flourescent lamps, Two 34W (Un-Modulated)							
Halogen lamp, Quartz (un-shielded), 500W (Modulated)	>= 5 ft (1.6m)	>= 12 ft (3.7m)	3 in X 3 in (76mm X 76mm) n- Heptane	20 ft (6m)	80 ft (24m)		
Halogen lamp, Quartz (un-shielded, 500W (Un-Modulated)		>= 8 ft (2.5m)					
Halogen lamp, Quartz (shielded), 500W (Modulated)	>= 5 ft (1.6m)	>= 12 ft (3.7m)	3 in X 3 in (76mm X 76mm) n- Heptane	20 ft (6m)	80 ft (24m)		
Halogen lamp, Quartz (shielded), 500W (Un-Modulated)		>= 8 ft (2.5m)					
Incandescent Lamp, 300W (Modulated)	>= 5 ft (1.6m)	>= 10 ft (3.1m)	3 in X 3 in (76mm X 76mm) n- Heptane	20 ft (6m)	80 ft (24m)		
Incandescent Lamp, 300W (Un-Modulated)		>= 5 ft (1.6m)					
Sodium Vapor Lamp, 70W (Modulated)	>= 5 ft (1.6m)	>= 7 ft (2.2m)	3 in X 3 in (76mm X 76mm) n- Heptane	20 ft (6m)	80 ft (24m)		
Sodium Vapor Lamp, 70W (Un-Modulated)		>= 5 ft (1.6m)					

Flame response sensitivity to Canadian Std ULC/ORD-386

Detector: FS24X Plus™ — Very high sensitivity setting			
Fuel	Size	Distance (')	Average response time (secs)
N Heptane	0.6m x 0.6m (pan)	300'	5.1

Canadian FOV: ±50º vertical and horizontal

Canadian reliability: Less than one failure/million hours

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