SAFETY MANUAL



Honeywell® FS24X Plus™

Advanced multi-spectrum 3IR Flame detector

Honeywell

Disclaimer

In no event shall Honeywell® be liable for any damages or injury of any nature or kind, no matter how caused, that arise from the use of the equipment referred to in this manual.

Strict compliance with the safety procedures set out and referred to in this manual, and extreme care in the use of the equipment, are essential to avoid or minimize the chance of personal injury or damage to the equipment.

The information, figures, illustrations, tables, specifications, and schematics contained in this manual are believed to be correct and accurate as at the date of publication or revision. However, no representation or warranty with respect to such correctness or accuracy is given or implied and Honeywell will not, under any circumstances, be liable to any person or corporation for any loss or damages incurred in connection with the use of this manual.

The information, figures, illustrations, tables, specifications, and schematics contained in this manual are subject to change without notice.

Unauthorized modifications to the flame detection system or its installation are not permitted, as these may give rise to unacceptable health and safety hazards.

In no event shall Honeywell® be liable for any equipment malfunction or damages whatsoever, including (without limitation) incidental, direct, indirect, special, and consequential damages, damages for loss of business profits, business interruption, loss of business information, or other pecuniary loss, resulting from any violation of the above prohibitions.

Warranty

Honeywell® warrants the FS24X Plus™ system against defective parts and workmanship, and will repair or (at its discretion) replace any components that are or may become defective under proper usage within 3 years from shipment from Honeywell®.

This warranty does not cover consumables, batteries, fuses, normal wear and tear, or damage caused by accident, abuse, improper installation, unauthorized use, modification or repair, ambient environment, contaminants or abnormal operating conditions.

This warranty does not apply to sensors or components that are covered under separate warranties, or to any 3rd-party cables and components.

Any claim under the Honeywell® Product Warranty must be made within the warranty period and as soon as reasonably practicable after a defect is discovered. Please contact your local Honeywell® Service representative to register your claim.

This is a summary. For full warranty terms please refer to the Honeywell General Statement of Limited Product Warranty, which is available on request.

The safety lifetime of the product is considered to be no less than 10 years.

* An approvedHoneywell® representative is a person qualified, trained, or employed to perform the procedures described in this manual.

Copyright Notice

FS24X Plus™ is a registered trademark of Honeywell®.

Other brand and product names mentioned in this manual may be trademarks or registered trademarks of their respective companies and are the sole property of their respective holders.

Honeywell® is the registered trademark of Honeywell® Safety and Productivity Solutions (SPS).

Find out more at www.sps.honeywell.com

Product Overview

IEC 61508 is a generic functional safety standard. Functional safety is defined in this standard as "part of the overall safety relating to the Equipment Under Control (EUC) and the EUC control system which depends on the correct functioning of the electrical, electronic, and programmable electronic safety related systems, other technology safety-related systems, and external risk reduction facilities."

A functional safety system helps to reduce the risk that a hazardous event or hazardous situation occurs to a tolerable level.

Note: This may still happen, but the residual risk that this happens is reduced by a certain level (safety integ-rity level) by applying runtime control measures and fault avoidance measures during the whole lifecycle.

There are considered two fault categories:

- Latched
- Self-recovery

A Safety Integrity Level-certified system (SIL) can detect the majority of safe and unsafe failures. FS24X Plus™ is SIL 2 capable certified to IEC 61508. The following tables outline a system's safety integrity level in relation to its average probability of failure to perform its safety function on demand and probability of dangerous failure per hour.

See section 'Safety Function' later in this manual for a detailed explanation of the safety functions that the FS24X Plus™ fulfils.

This manual addresses the specific requirements for a SIL2 system applicable to installation, operation, and maintenance for safe operation for the FS24X Plus™ flame detectors.

The Honeywell® Advanced Flame FS24X Plus™ Flame Detectors, detect flaming fires in the field of view by the electromagnetic emissions signature that such fires create. They do that in the presence of other non-fire emissions that are noise.

Average Probability of Failure to Perform Its Design Function on Demand (Low Demand System)	
Safety Integrity Level	**Low demand mode of operation (Average probability of failure to perform its design function on demand (PFD))**
4	$\geq 10^{-5}$ to $< 10^{-4}$
3	$\geq 10^{-4}$ to $< 10^{-3}$
2	$\geq 10^{-3}$ to $< 10^{-2}$
1	$\geq 10^{-2}$ to $< 10^{-1}$

Probability of a Dangerous Failure Per Hour (High Demand System)	
Safety Integrity Level	**High demand or continuous mode of operation (Probability of a dangerous failure per hour (PFH))**
4	$\geq 10^{-9}$ to $< 10^{-8}$
3	$\geq 10^{-8}$ to $< 10^{-7}$
2	$\geq 10^{-7}$ to $< 10^{-6}$
1	$\geq 10^{-6}$ to $< 10^{-5}$

Quality Statement

The quality standard of Honeywell® is based entirely upon ISO 9001 + ISO/ IEC 80079-34.

Safety Function

The intended use of the FS24X Plus™ is to alert users to the presence of a potentially dangerous fires in a defined zone.

To achieve this aim, FS24X Plus™ provides a safety function with two outputs compatibility with different safety integrity levels.

A mA output is provided which is compatible for use within a SIL 2 system. Any output below 2.5 mA must be treated as loss of safety function. A range below 4 mA can be configured to provide warning indications. Values above 4.5 mA indicate an alarm output.

A set of relay output are also provided which are compatible for use within a SIL 1 system. Independent Fault, Suspected Alarm and Confirmed Alarm relay contacts are provided.

A de-energized fault relay must be treated as a fault condition and is a defined safe state for this safety function. The alarm relay contacts can be configured as either normally energized or normally de-energized dependent on the application needs.

Compliance to IEC 61508:2010 has been assessed by an independent third party and reference to their certification and test report can be found in the following sections.

Bluetooth, RS-485, and HART® communications are specifically not a part of the FS24X Plus™ safety function. These interfaces are non-interfering functions typically used for device setup, commissioning, diagnostics and troubleshooting. They do not interrupt the safety critical functions of the device.

The FS24X Plus™ contains self test diagnostics that operate continuously. Should a diagnostic detect a problem the product will transition to the safe state. In order to ease maintenance and loss of protection, many diagnostics will reset when the transient condition passes. for some rare events, it cannot be ascertained that a failure has actually resolved itself and hence the product will remain in a latched safe state requiring service personnel to perform further checks before putting the product back into service.

Safety Parameters

The following safety parameters are in alignment with the TÜV report HP98419C. They are valid for Modification State 1 and firmware version 5.05 of the FS24X Plus™.

Configuration	PFd	PFh	SFF	Diagnostic Coverage	β	β_D	D_D	D_U	Safe
Relay Output (SIL 1)	2.59×10^{-3}	5.82×10^{-7}	93.7%	91.4%	5%	5%	4952.34	581.89	1260.13
mA Output (SIL 2)	9.65×10^{-4}	2.11×10^{-7}	96.5%	94.9%	5%	5%	5254.78	210.25	899.67

The PFD figures quoted above assume a nominal one-year proof test interval and 8-hours repair time (MTTR).

The FS24X Plus™ internally has an HFT of 0 and is defined as a Type B device as per IEC 61508.

The diagnostic test interval and hence the response time for the FS24X Plus™ is within 30 seconds in normal operation for all diagnostics except for dirty window detection. Window obscuration detection can take up to 5 minutes to be detected.

Proof Test Interval

The purpose of a proof test is to return the unit to 'as new' condition in terms of its safety parameters.

Proof Test Interval	MTTR = 8 hours		MTTR = 72 hours	
	Relay	mA Output	Relay	mA Output
0.25	6.81×10^{-4}	2.74×10^{-4}	1.04×10^{-3}	6.24×10^{-4}
0.5	1.32×10^{-3}	5.04×10^{-4}	1.67×10^{-3}	8.54×10^{-4}
1	2.59×10^{-3}	9.65×10^{-4}	2.95×10^{-3}	1.31×10^{-3}

A proof test must be carried out at least once a year but, if required, users may shorten the proof test interval to meet the needs of their application.

Honeywell® allows such variations provided that the proper calculation method for calculating the PFH and PFD values as defined in IEC 61508 are used.

Note: The proof test interval should not preclude more frequent maintenance of FS24X Plus™ in accordance with the Operating Instructions if site conditions or other factors require it.

Special Notes

1. FS24X Plus™ must not be stored or otherwise exposed to temperatures or conditions outside of the allowable maximums listed in the 'Environmental Conditions' section of this manual.
2. This safety manual does not address installation, configuration, service, maintenance or decommissioning tasks.

   The FS24X Plus™ User Manual must be read and referred to in order to accomplish these tasks.

   Read and understand the FS24X Plus™ User Manual in full as this document also contains important safety information regarding the installation and continued use of the product.
3. It is important to understand and mitigate security risks associated with the day-to-day use of the system in connected IT infrastructures. Refer to the FS24X Plus™User Manual for information on additional security controls that should be implemented by users.
4. FS24X Plus™ proof tests shall be carried out strictly in accordance with this manual while referring to the FS24X Plus™ User Manual as required, and also by including any additional instructions or requirements that may be issued from time-to-time.
5. Although proof tests longer than one year can be used, it is essential that an entire power cycle is performed at least once a year to ensure that all power-on checks fully diagnose the system.
6. It is incumbent on all 3rd-Party OEMs and Partners to enforce these rules on all FS24X Plus™ equipment and assemblies manufactured and supplied by Honeywell®.
7. Modification of settings in the FS24X Plus™ shall strictly follow the procedure detailed in the Appendix 3: ***FlameManager*** of the FS24X Plus™ User Manual. Following modification of any settings in the FS24X Plus™, the entire list of settings must be reviewed to ensure that the product configuration is correct. A proof test should then be undertaken to ensure the functionality of the product is understood and is as expected.
8. Access to the product is possible remotely using the HART® connection and Honeywell®'s proprietary FP2 protocols. Security is provided on these connections. See the Security Guide of the User Manual.
9. It is possible to upgrade the firmware in the FS24X Plus™ over a USB connection using the ***FlameManager*** application. Before performing an upgrade, the user must check that the new firmware has already been certified to the relevant functional safety standard. Refer to the User Manual Appendix 3 for the firmware upgrade procedure. Following a firmware upgrade, a proof test as defined in the 'Proof Test' section of this manual should be undertaken to ensure the functionality of the product is understood and is as expected. Following the upgrade, the version string must be interrogated to ensure it is as expected. A proof test should then be undertaken to ensure the functionality of the product is understood and is as expected.
10. Power supplied to the FS24X Plus™ or to the 4-20 mA loop of the product shall be of an isolating type (galvanic isolation from mains, providing basic insulation) but does not need to be a Class II (SELV) power supply. At no time should voltages exceeding 60VDC be provided to the product. A minimum current of 10 mA at 12 V must be supplied to the relay.

    Note: Product damage may occur if more than 32 Volts are applied.

11. FS24X Plus™ contains relays that may be used to perform executive actions when an alarm is triggered. Ensure that such systems are identified and inhibited / disconnected before carrying out any proof testing, bump testing, or sensor calibrations.

12. If relay outputs are used for safety purposes, the following directions must be adhered to:

    a) The relay contacts must be protected with a fuse rated at a maximum of 3 A.

    b) Only resistive loads should be connected to the relay contacts.

    c) The fault relay output must be energised under normal conditions.

13. 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.

Environmental Conditions

The environmental conditions that the FS24X Plus™ is designed to operate within are listed below:

Voltage: 18 to 32V DC

Operating Temperature: -55°C to +75°C

Storage Temperature: -55°C to +85°C

Humidity: 0-100% RH Condensing

Altitude: 0-1500m

EMC: EN 50270, IEC/EN 61000-6-4; Radio Equipment Directive 2014/53/EU

IP-Protection: IP 66/67 (Type 4X in accordance with NEMA 250)

Proof Test

To give the user confidence and ensure that proof testing is always carried out on an optimal system, it is recommended that users carry out routine maintenance procedures before carrying out more specific proof tests.

Example inspection, testing and calibration procedures are given below, but users should always refer to the relevant manufacturer's technical documentation for details appropriate to their installations.

The purpose of a proof test is to return the unit to an 'as new' condition in terms of its safety parameters.

A proof test must be carried out at least once a year but, if required, users may shorten the proof test interval to meet the needs of their application.

Honeywell® allows such variations provided that the proper calculation method for calculating the PFH and PFD values as defined in IEC 61508 are used.

Note: The proof test interval should not preclude more frequent maintenance of FS24X Plus™ in accordance with the Operating Instructions if site conditions or other factors require it. Follow the procedures indicated in the Configuration and Operation section of the FS24X Plus™ User Manualin order to execute the Proof Test conditions described above.

Visual Inspection

1. Visually inspect the FS24X Plus™ paying particular attention to signs of insecurity, loose connections, damage, corrosion, ingress of moisture, or contamination. Clean and repair as required before proceeding with any functional testing or calibrations.
2. Switch on the electrical power. Observe the LEDs for correct operation while the POST is being carried out.
3. Record all adverse findings and their remedies to aid future proof testing analysis and fault finding.

Electrical Testing

1. Electrically test all external cables, paying particular attention to insulation resistance, shielding and Earthing (Grounding) resistance, and cable continuity and resistance.
2. Record all figures to aid future proof testing analysis and fault finding.

Check Sensor Response

Follow the procedures described in the FS24X Plus™User Manual in the Configuration and Operation section where a simulation of a fire event should be undertaken using a test lamp.

Output Testing

Follow the procedures described in the FS24X Plus™ User Manual in the following sections to accomplish output testing of relays:

- Configuration and Operation
- Appendix 6: Overview of the FS24X Plus™ Modbus® Interface
- Appendix 7: Fault Conditions

All relays should be forced both de-energized and energized. The mA Loop should be tested at the extents, at 4 mA and at mid-range points.

Contact Us

Americas

Honeywell® Analytics

405 Barclay Boulevard

Lincolnshire, Illinois 60069

Tel: +1 847 955 8200

Toll free: +1 800 538 0363

Fax: +1 847 955 8210

detectgas@honeywell.com

Europe, Middle East, and Africa

Honeywell® International Sarl

Z.A. La Piece 16

1180 Rolle

Switzerland

Main Phone: +41 21 695 30 00

reception.rolle@honeywell.com

Asia Pacific

Honeywell® Industrial Safety

7F SangAm IT Tower

434, Worldcup Buk-ro, Mapo-gu

Seoul 03922

South Korea

Tel: +82 (0) 2 6909 0300

Fax: +82 (0) 2025 0329

analytics.ap@honeywell.com

Technical Services

ha.global.service@honeywell.com

Manuals, software, and other information about this product are available at

sps.honeywell.com

www.honeywell.com

1701M5003

Revision A

Publication Date: March 31, 2022

© 2022 Honeywell®