Manual
MS-00909-0100-9020, Rev AF
October 2025

Spectrex™ 20/20Q Flame Detector

SPECTREX™

EMERSON™

Legal notice

Safety information

⚠ WARNING

Physical access

Unauthorized personnel may potentially cause significant damage to and/or misconfiguration of end users' equipment. This could be intentional or unintentional and needs to be protected against.

Physical security is an important part of any security program and fundamental in protecting your system. Restrict physical access by unauthorized personnel to protect end users' assets. This is true for all systems used within the facility.

⚠ CAUTION

Improper wiring may damage the detector.

NOTICE

To comply with Electromagnetic Control (EMC) Directive 2014/30/EU and protect against interference caused by radio frequency interference (RFI) and electromagnetic interference (EMI), shield the cable to the detector and ground the detector.

NOTICE

Disconnect external devices, such as fire alarms and automatic extinguishing systems, before performing maintenance.

Do not expose the detector to radiation of any kind unless required for testing purposes.

Do not open the electronic compartment. Keep this part closed at all times. It can only be opened at the factory. Opening the electronic component side invalidates the warranty.

Only access the wiring compartment to wire or remove the detector or access RS-485 terminals for maintenance.

Abbreviations and acronyms

Abbreviation or acronym	Definition
ATEX	Atmospheric explosives
AWG	American wire gauge
BIT	Built-in test
EMC	Electromagnetic compatibility
EOL	End of line
FOV	Field of view
IAD	Immune at any distance
IECEx	International Electrotechnical Commission Explosion
IPA	Isopropyl alcohol
IR	Infrared
JP5	Type of jet fuel
Latching	Refers to relays remaining in the **ON** state even after the **ON** condition has been removed.
LED	Light emitting diode
LPG	Liquified petroleum gas
mA	Milliamps (0.001 amps)
Modbus®	Master-slave messaging structure
N/A	Not applicable
NFPA	National Fire Protection Association
NPT	National pipe thread
RS-485	Communication protocol allowing bi-directional communication
PN	Part number
SIL	Safety integrity level
UNC	Unified coarse thread
Vac	Volts alternating current
Vdc	Volts direct current

Contents

1 Introduction

1.1 Product overview

The SharpEye™ 20/20Q QuadSense Flame Detector is part of the leading, next-generation SharpEye 20/20 series.

The flame detector uses triple infrared (IR3) technology and showcases a fast and reliable hydrocarbon fire detection range spanning up to 150 ft. (45 m), paired with unmatched reliability and immunity to false alarms.

NOTICE

If the product is used outside of specified limits, this voids the product certification, and Emerson is not responsible for any incurred warranty expense.

Do not open this product, except for the terminal compartment as listed in this document, under any circumstances.

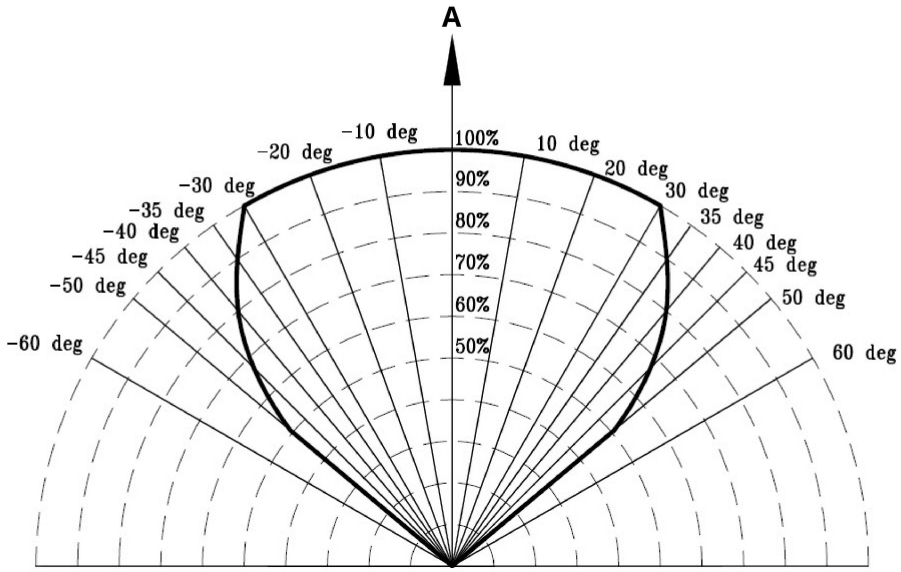
The detector is not field-repairable. Do not attempt to modify or repair the internal circuits or change their settings, as this will impair the system's performance and void the product warranty.

Opening the attachment screws to dismantle the front part of the detector from remaining parts is restricted and voids the product warranty.

2 Installation

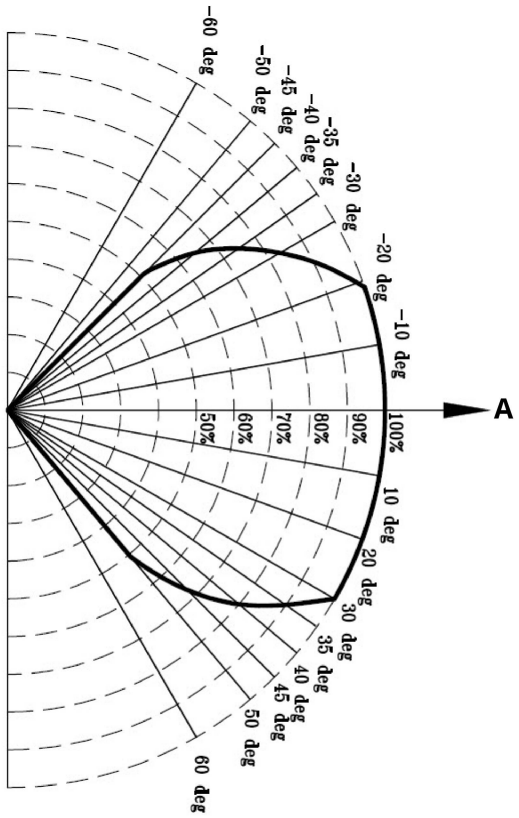
2.1 Field of view

Figure 2-1: Horizontal Field of View



A. Relative range

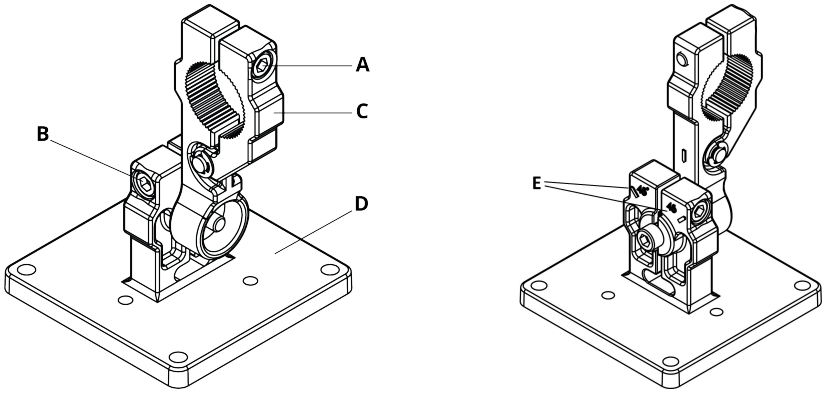
Figure 2-2: Vertical Field of View



A. Relative range

2.2 Tilt mount

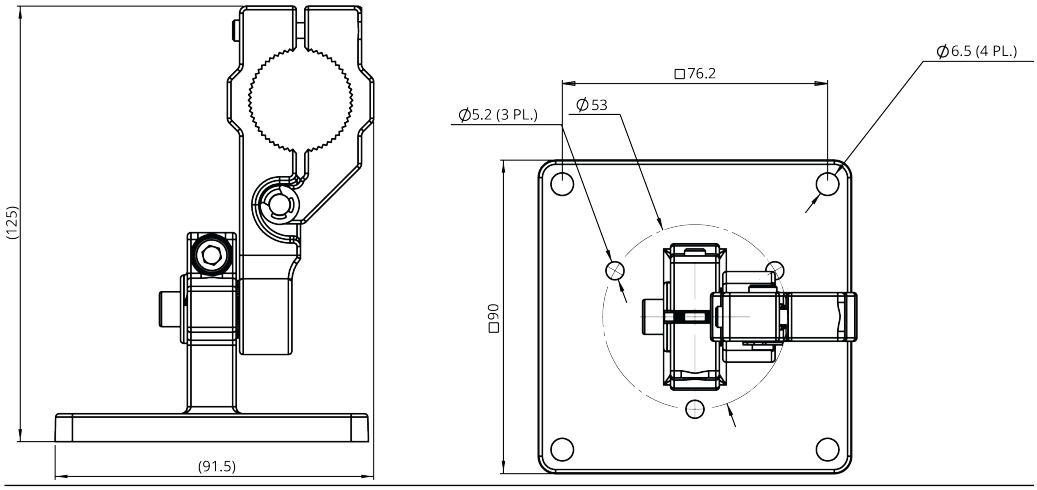
Figure 2-3: Tilt Mount



A. Clamp locking screw
B. Horizontal/vertical locking screw
C. Rotating clamp
D. Tilt holding plate
E. 45° mark

Figure 2-4: Tilt Mount Photo

Figure 2-5: Tilt Mount Dimensions



Note
Dimensions are in millimeters.

2.3 Changing default detector settings

The following settings can be modified using the Modbus® Manager.

- Built-in test (BIT)
- Detection options
- Lock option
- 4–20 mA settings
- Sensitivity
- Alarm delay
- Alarm latch

3 Operation

3.1 Power up the detector

Procedure

1. Connect the detector to power.
2. Wait up to 60 seconds for the detector to complete the initial start-up procedure.

Turning on the detector initiates the following sequence of events:

- The amber light-emitting diode (LED) flashes at 4 Hz.
- The built-in test (BIT) is executed.
- BIT completes.
- Detector enters **Normal** mode, indicated by:
  - Flashing green LED at 1 Hz
  - Fault relay contacts closing
  - mA output is `4 mA`

3.2 Test detector

Use the Spectrex FS-1100 Flame Simulator to test the detector.

Procedure

1. Verify that you are using the flame simulator that fits the detector you are testing.
2. Verify that you are at the correct distance from the detector according to its type and sensitivity.

   See Table 3-1.

   Table 3-1: Flame Simulator Testing Ranges

Sensitivity settings	Standard distance
9.8 ft. (3 m)	N/A
32.8 ft. (10 m)	6.6 ft. (2 m)
65.6 ft. (20 m)	13.1 ft. (4 m)
98.4 ft. (30 m)	20 ft. (6 m)
147.6 ft. (45 m)	26.2 ft. (8 m)

3. Using the mechanical sight, aim the flame simulator toward the center of the detector. Push the **Activate** button and direct the laser spot toward the center of the detector.

After you press the trigger, there will be an initial 2-second delay. Then the equipment will operate for a maximum of 60 seconds. After that, it will not be able to operate for a minimum of 30 seconds.

Postrequisites

For full instructions on testing with a Flame Simulator, see the Spectrex SharpEye™ FS-1100 Flame Simulator Reference Manual.

4 Initial setup

4.1 Continuous feature test

The detector is supplied with default settings, including a continuous feature test.

To change these settings, refer to the Spectrex SharpEye 20/20Q Flame Detectors Modbus® Manager Manual.

During normal operation, the detector tests itself continuously and indicates a fault if a failure is found. This type of test complies with Safety Integrity Level (SIL)-3 requirements.

The detector continuously tests:

- Input voltage level
- All internal regulator voltage level
- 0–20 mA level output
- Relays operation
- Processor watch dog
- Software
- Memory
- Oscillator frequency

4.2 Response to fault indication

If a failure is found, the detector indicates by:

- Light-emitting diode (LED): Amber flashes (4 Hz)
- Fault relay opens
- 0–20 mA: 1 mA default

Note
The fault indications remain until the detector is turned off. The fault indications return if the fault is still found when power is restored.

4.3 Built-in test (BIT)

The detector's BIT checks the following:

- Dedicated sensors' internal BIT
- Window cleanliness
- Electronic circuitry

The detector can be set to perform the BIT in the following modes:

- Automatic and manual
- Manually only

BIT operation

The BIT is intended to check optical integrity and electronic circuitry. The detector's status remains unchanged if the result of a BIT is the same as the current status (**Normal** or **BIT Fault**). The detector's status changes if the BIT differs from the current status.

Note
In **BIT Fault** status, the detector can continue to detect a fire in most cases.

Automatic BIT

The detector automatically performs a BIT every 15 minutes. A successful BIT sequence does not activate any indicator.

If required, you can modify the automatic BIT interval using the RS-485 Modbus® Manager.

In case of a BIT fault, this sequence continues until a successful BIT occurs, when the detector resumes normal operation.

- As the result of a **successful** automatic/manual BIT, the fault relay remains **energized**.
- As the result of an **unsuccessful** automatic/manual BIT (which occurs after three failures), the fault relay **de-energizes**.

Manual BIT

You can initiate the manual BIT using the Modbus Manager. You can also use the Modbus Manager to configure the manual BIT's alarm duration.

5 Maintenance

5.1 Keep maintenance records

Record all maintenance operations performed on a detector in accordance with site guidance and requirements.

5.2 Clean the detector

Procedure

1. Disconnect power from the flame detector.
2. Wipe the detector housing with clean water and a damp cloth.

NOTICE

Do not use a brush or sharp tools.

3. Identify where dust, dirt, or moisture accumulates on the detector window:
   a) Clean with a soft optical cloth.
   b) Rinse with clean water.

6 Troubleshooting

6.1 Light-emitting diode (LED) is OFF, fault relay is open, 0–20 mA shows 0 mA

Potential cause

No power to the device.

Recommended actions

1. Check that the operating voltage is correct, according to the electrical specifications.
2. Check power polarity.
3. Check the terminal wiring.

6.2 Light-emitting diode (LED) flashes amber at 4 Hz, fault relay is open, 0–20 mA shows 1 mA

Potential cause

Low voltage

Recommended action

Check that the operating voltage is correct, according to the electrical specifications.

Potential cause

Faulty detector

Recommended action

Re-power the detector.

6.3 Light-emitting diode (LED) flashes amber at 4 Hz, relay is open, 0–20 mA shows 2 mA

Potential cause

Built-in test (BIT) fault

Recommended action

Ensure the detector window and reflector mirror are clean.

Potential cause

Faulty detector

Recommended action

Re-power the detector.

6.4 Light-emitting diode (LED) constantly red, alarm relay energized, 0–20 mA indicates alarm

Potential cause

Existing alarm condition

Recommended action

Check cause of alarm.

Potential cause

Alarm latched

Recommended action

Ensure the alarm latch is not enabled in the detector settings.

Potential cause

Faulty detector

Recommended action

Re-power the detector.

7 Specifications

Table 7-1: Detection Ranges

At the highest sensitivity setting for 1 ft.^{2}/0.1 m^2 pan fire.

Fuel	Range
Gasoline	150 ft. (45 m)
N-heptane	150 ft. (45 m)
JP5	107 ft. (32 m)
Kerosene	107 ft. (32 m)
Diesel fuel	107 ft. (32 m)
Ethanol 95%	100 ft. (30 m)
Isopropyl alcohol (IPA)	100 ft. (30 m)
Methanol	100 ft. (30 m)
Methane(1)	107 ft. (32 m)
Liquefied petroleum gas (LPG)(1)	107 ft. (32 m)
Paper	57 ft. (17 m)
Polypropylene	83 ft. (25 m)
Gun powder(2)	100 ft. (30 m)
Fireworks (10 pieces per test)	17 ft. (5 m)
Cooking oil	107 ft. (32 m)
Mineral oil (20W-50)	107 ft. (32 m)
Wood	57 ft. (17 m)
Ethylene glycol	83 ft. (25 m)
Butyl acrylate	123 ft. (37 m)
Vinyl acetate	123 ft. (37 m)
Flammable adhesive (flash point < +140 °F [+60 °C])	107 ft. (32 m)
Solvents	123 ft. (37 m)
Oil paint	107 ft. (32 m)
Jet A1	107 ft. (32 m)
Oil (10W-40)	107 ft. (32 m)

(1) 30-in. (0.75 m) high, 10-in. (0.25 m) wide plume fire
(2) 1.5 x 1.5-in. (3.8 x 3.8 cm) wide, 4-in. (10 cm) tall

Table 7-2: General Specifications

Spectral response	4 infrared (IR) bands between 4 µm and 5 µm
Detection response time	Typically < 5 s

Table 7-2: General Specifications *(continued)*

Sensitivity ranges	• 9.8 ft. (3 m) • 32.8 ft. (10 m) • 65.6 ft. (20 m) • 98.4 ft. (30 m) • 147.6 ft. (45 m)
Field of view	Horizontal: 100° (at 50% of maximum distance) Vertical: 95° (at 50% of maximum distance)
Temperature range	Operating: –40 to +158 °F (–40 to +70 °C) Storage: –40 to +158 °F (–40 to +70 °C)
Humidity	Non-condensing relative humidity up to 100%

Table 7-3: Electrical Specifications

Operating voltage	24 Vdc nominal (12 to 32 Vdc)
Cable entries	1 x M20
Electrical input protection	According to EN 50130
Electromagnetic compatibility	Electromagnetic interference (EMI)/radio frequency interference (RFI) protected to EN61000-6-3, EN61000-6-4, EN61000-6-6, and EN 50130
Electrical interface	9 terminals and a single cable conduit

Table 7-4: Typical Power Consumption (24 Vdc)

Power consumption	mA	Watts
Normal	25	0.6

Table 7-5: Outputs

Relays	**Fault**: Normally closed (NC) **Alarm**: Normally open (NO) SPST volt-free contacts rated 2 A at 30 Vdc **Note** Fault relay wiring option is Normally Open (NO), the relay contact is closed in normal status (energized) and open in fault status (de-energized).
0–20 mA (stepped) default(1)	**Fault**: < 1.1 mA **Built-in test (BIT) fault**: 2 mA ± 0.3 mA **Normal**: 4 mA ± 0.3 mA **Warning**: 16 mA ± 0.3 mA **Alarm**: 20 mA ± 0.3 mA
RS-485	RS-485 Modbus®-compatible communication link that can be used in computer-controlled installations

(1) This output is configurable.

Table 7-6: Mechanical Specifications

Enclosure options	Low-copper aluminum polyurethane painted
Tilt mount	Stainless steel 316
Dimensions	Detector: 4.25 x 3.15 x 4.64 in. (108 x 80 x 118 mm)
Weight	Detector: 1.65 lb. (0.75 kg) Tilt mount: 1.54 lb. (0.7 kg)
Enclosure ratings	IP66 and IP68 UL50E Type 4X EN60529 NEMA® 250 6P

7.1 Factory default settings

Alarm delay	Anti-flare
Sensitivity	20
Alarm latch	Disabled
Alarm relay on successful manual built-in test (BIT)	Disabled
RS-485 address	1
Fault count	3
Period	15

A Reference data

A.1 Ordering information, specifications, and drawings

To view current ordering information, specifications, and drawings:

Procedure

See the Spectrex 20/20Q Product Data Sheet.

A.2 Product certifications

For product certifications, see the Spectrex 20/20Q Product Certifications.

B False alarms prevention

Table B-1: Immunity to False Alarm Sources

Radiation source	Immunity distance
Modulated and non-modulated direct and reflected sunlight	Immune at any distance
Vehicle headlights (low beam) conforming to MS53023-1	Immune at any distance
Incandescent frosted glass light, 300 W	Immune at any distance
Fluorescent light with white enamel reflector, standard office or shop, 80 W (or two 40 W)	Immune at any distance
Electric arc (15/32 in. [12 mm] gap at 4,000 Vac, 60 Hz)	Immune at any distance
Arc welding (5/16 in. [6 mm] rod; 210 A)	See Table B-2
Ambient light extremes (darkness to bright light with snow, water, rain, desert glare, and fog)	Immune at any distance
Bright-colored clothing, including red and safety orange	Immune at any distance
Electronic flash (180 W-seconds minimum output)	Immune at any distance
Movie light, 625 W quartz DWY lamp (Sylvania S.G. - 55 or equivalent)	> 6.5 ft. (2 m)
Blue-green dome light conforming to M251073-1	Immune at any distance
Flashlight (MX 991/U)	Immune at any distance
Radiation heater, 3,000 W	Immune at any distance
Radiation heater, 1,000 W with fan	Immune at any distance
Quartz lamp (1,000 W)	> 3 ft. (1 m)
Mercury vapor lamp	Immune at any distance
Grinding metal	Immune at any distance
Lit cigar	> 1 ft. (0.3 m)
Lit cigarette	> 1 ft. (0.3 m)
Match, wood, stick, including flare up	> 10 ft. (3 m)

Table B-2: Welding Immunity Distance

Level	Detection range	Distance
1	10 ft. (3 m)	> 1.6 ft. (0.5 m)
2	33 ft. (10 m)	> 6 ft. (2 m)
3	67 ft. (20 m)	> 12 ft. (4 m)
4	100 ft. (30 m)	> 17 ft. (6 m)
5	150 ft. (45 m)	> 25 ft. (7.5 m)

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For more information: **Spectrex.net**

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