Manual
00909-0100-4975, Rev AD
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Spectrex SharpEye™ 40/40C and 40/40D Series

Flame Detectors

SPECTREX

Legal notice

Safety precautions

⚠ WARNING

Follow installation guidelines.

Failure to follow these installation guidelines could result in death or serious injury.

Ensure that only qualified personnel perform the installation.

⚠ WARNING

Do not open the housing while the power is on.

⚠ 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 to protecting your system. Restrict physical access by unauthorized personnel to protect end users' assets. This is true for all systems used within the facility.

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 in 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
HART®	Highway addressable remote transducer - communication protocol
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 40/40 series is based on proven Spectrex technologies, including triple infrared (IR3) and ultraviolet infrared (UV/IR). The SharpEye 40/40 series features QuadSense technology, providing the fastest response to fire, longest distance detection, and revolutionary UV/IR technology, coupled with superior immunity to false alarms, functioning in harsh conditions with unparalleled reliability and durability.

The series is suited to meet the challenges of wide range of industrial and commercial applications with long distance and fast response detection, providing superior protection of high value property and personnel to keep a SharpEye on your safety.

Detection performance can be easily adapted to all environments, applications, and requirements, by changing the detector's configuration parameters. Adjusting these parameters, as well as performing other maintenance and monitoring tasks, is possible by means of RS-485-based Modbus® communication or HART® communication.

1.2 Models

The SharpEye 40/40 Flame Detectors are electro-optical devices designed to identify fire events, enabling alarm activation. The detectors are intended for indoor or outdoor use and can be used stand alone or connected to an alarm or automatic extinguishing system.

The SharpEye 40/40 series comprises the following detectors:

SharpEye 40/40C-I

The SharpEye 40/40C-I Multispectrum Quad-Sense Flame Detector detects hydrocarbon fuel and gas fires with enhanced performance, advanced long distance detection of hydrocarbon fires, fast detection in under five seconds, and strengthened reliability. The SharpEye 40/40C-I is based on proven triple infrared (IR3) technology, ensuring high sensitivity with superior immunity to false alarms.

SharpEye 40/40C-M

The SharpEye 40/40C-M Multispectrum Quad-Sense IR Flame Detector is specifically designed for the detection of hydrocarbon and hydrogen flames with enhanced performance, advanced long distance detection of hydrogen and hydrocarbon fires, fast detection in under five seconds, and strengthened reliability. The SharpEye 40/40C-M is based on proven triple IR (IR3) technology, ensuring high sensitivity with superior immunity to false alarms.

SharpEye 40/40C-LB

The SharpEye 40/40C-LB Dual Spectrum Ultraviolet (UV)/IR Flame Detector is designed to provide fast detection in under five seconds of a range of fires, such as hydrocarbon-based fuel and gas, hyrdoxyl, hydrogen, metal, and inorganic.

SharpEye 40/40C-L4B

The SharpEye 40/40C-L4B Dual Spectrum UV/IR Flame Detector is designed to provide fast detection in under five seconds of hydrocarbon-based fuel and gas fires.

SharpEye 40/40D-I

The SharpEye 40/40D-I Ultra Fast Multispectrum Quad-sense IR3 flame detector provides superior, longest distance detection of hydrocarbon fires at up to 300 ft. (90 m), exceptional ultra-fast detection in under 50 msec, and unparalleled reliability. The SharpEye 40/40D-I is based on proven Triple IR (IR3) technology, ensuring highest sensitivity with best immunity to false alarms.

SharpEye 40/40D-M

The SharpEye 40/40D-M Multispectrum Quad-Sense IR Flame Detector provides superior, longest distance detection of hydrogen (at up to 165 ft. [50 m]) and hydrocarbon (at up to 300 ft. [90 m]) fires, exceptional ultra-fast detection in under 50 msec, and unparalleled reliability. The SharpEye 40/40D-M is designed to deal with the challenges of invisible fires based on proven IR3 technology, ensuring highest sensitivity with best immunity to false alarms.

SharpEye 40/40D-LB

The SharpEye 40/40D-LB Ultra Fast UV/IR Flame Detector can detect fire in under 20 msec and features a unique dual sensor with selectable UV and IR channels that can be used separately or combined. The detector is designed to detect a range of fires, such as hydrocarbon-based fuel and gas, hydroxyl, hydrogen, metal, and inorganic.

SharpEye 40/40D-L4B

The SharpEye 40/40D-L4B Ultra Fast UV/IR Flame Detector can detect fire in under 20 msec and features a unique dual sensor with selectable UV and IR channels that can be used separately or combined. The detector is designed to detect hydrocarbon-based fuel and gas fires.

Table 1-1: SharpEye 40/40 Series general technical specifications

Spectral response	Infrared and ultraviolet bands
Response time	Varies according to model, typically under 5 seconds
Field of view	Varies according to model, up to 100 degrees
Output	4-20 mA, relays, communication
Enclosure	Stainless steel 316 or aluminum polyurethane painted
Operating voltage	18-32 VDC
Relay contacts	2A/30 VDC
Over voltage category	2
Relative humidity	Non-condensing relative humidity up to 100%

Table 1-2: Typical current consumption

Typical current consumption	**40/40C-I 40/40C-M**	**40/40C-LB 40/40C-L4B**	**40/40D-I 40/40D-M**	**40/40D-LB 40/40D-L4B**
Normal power consumption without heater - mA (Watts)	60 (1.4)	90 (2.2)	60 (1.4)	90 (2.2)
Normal power consumption without heater with alarm - mA (Watts)	90 (2.2)	120 (2.9)	90 (2.2)	120 (2.9)

Table 1-2: Typical current consumption *(continued)*

Typical current consumption	40/40C-I 40/40C-M	40/40C-LB 40/40C-L4B	40/40D-I 40/40D-M	40/40D-LB 40/40D-L4B
Low power heater with alarm - mA (Watts)	N/A	N/A	140 (3.4)	180 (4.3)
Standard power mode heater with alarm - mA (Watts)	280 (6.7)	320 (7.7)	280 (6.7)	320 (7.7)

NOTICE

- If the product is used outside of specified limits, this voids the product certification, and our company 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 Installation guidelines

Installation should comply with the National Fire Protection Association (NFPA) 72E or any other local and international regulations and standards, as applicable to flame detectors and installation of Ex approved products. To ensure optimal performance and efficient installation, consider the following guidelines.

Sensitivity

To determine the level of sensitivity, consider the following:

- Size of fire at the required distance to be detected
- Type of flammable materials
- Proximity to false alarm sources

Wiring

The wire gauge must be designed according to the distance from the detector to the controller and the number of detectors on the same power line.

To fully comply with EMC directive and protect against interference caused by radio frequency interference (RFI) and electromagnetic interference (EMI), the cable to the detector must be shielded and the detector must be grounded. The shield should be grounded at the detector end.

Spacing and location

The number of detectors and their locations in the protected area are determined by:

- Size of the protected area
- Sensitivity of the detectors
- Obstructed lines of sight
- Cone of view of the detectors

Environment

Dust, snow, or rain can reduce the detector's sensitivity and require more maintenance activities.

The presence of high intensity emission sources may affect sensitivity.

2.2 Preparation for use

The installation sequence may vary according to the physical structure of the site.

Note
Installation steps are also detailed in the Spectrex 40/40 Quick Start Guide supplied with the detector.

The following tools are required for installation. These are standard tools and are not supplied with the detector.

Table 2-1: Required tools

Tool	Function
Hex key 1.5 mm	Fasten back cover security screw.
Hex key 6 mm	Adjust the tilt mount.
Hex key 10 mm	Affix the detector to the tilt mount.
Hex key ⅛-in	Attach protective cover to detector.
Flat screwdriver 6 mm	Connect ground terminal.
Flat screwdriver 2.5 mm	Connect wires to the terminal blocks.
Hex key ⅜-in	Stop plug ¾-in. NPT.
Open wrench 28 mm	Stop plug M25 only.

2.2.1 Field of view

Note
The field of view at maximal distance corresponds to the angle specification required in EN 54-10.

Figure 2-1: Horizontal field of view for SharpEye 40/40C-I, 40/40D-I

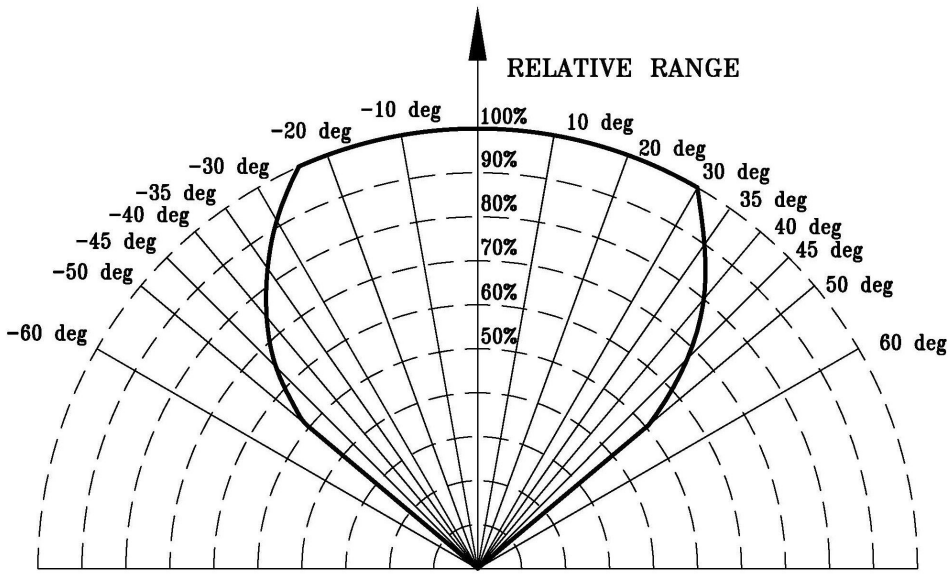
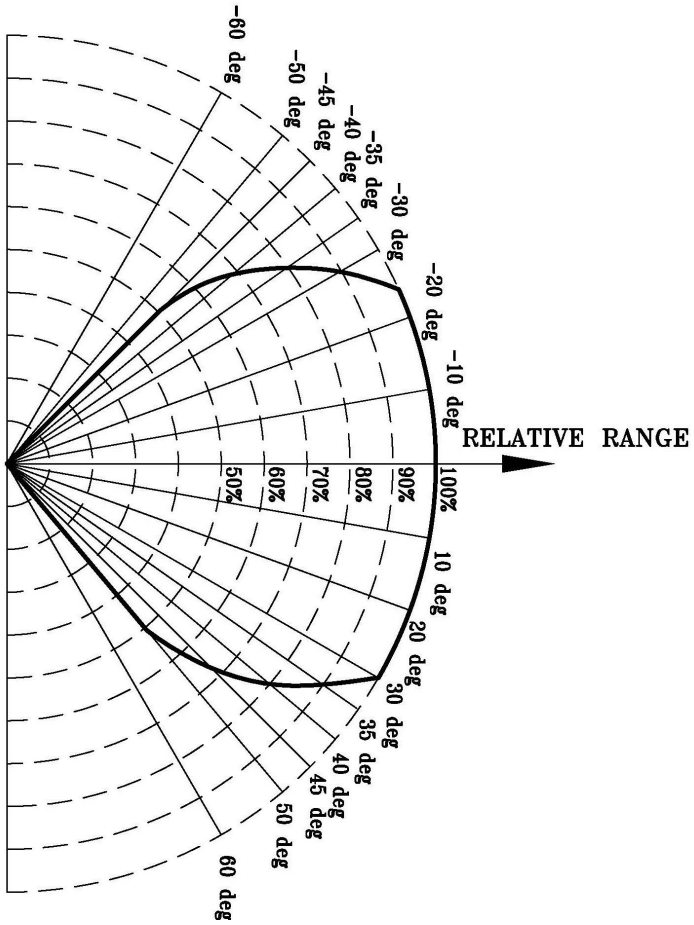


Figure 2-2: Vertical field of view for SharpEye 40/40C-I, 40/40D-I



- +50 ° (down)
- -45 ° (up)

Figure 2-3: Horizontal field of view for SharpEye 40/40C-LB, 40/40D-LB, 40/40C-L4B, 40/40D-L4B

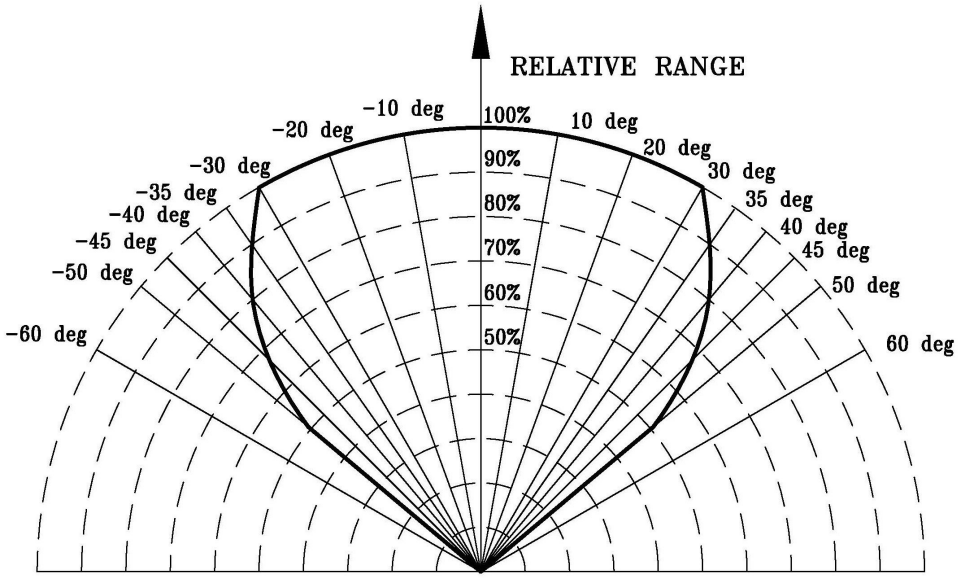
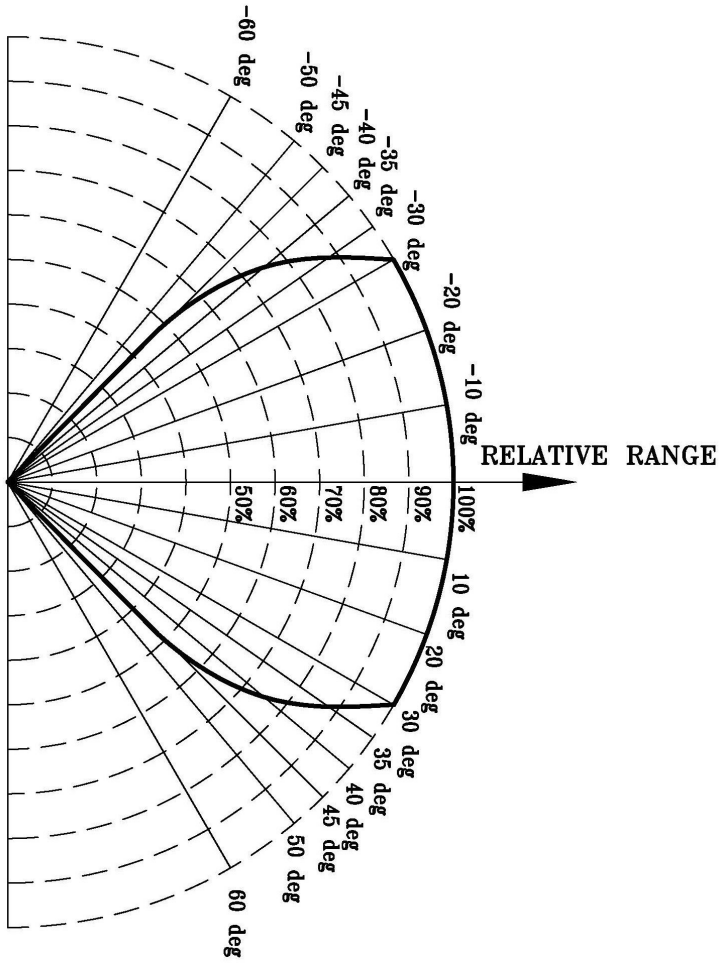


Figure 2-4: Vertical field of view for SharpEye 40/40C-LB, 40/40D-LB, 40/40C-L4B, 40/40D-L4B

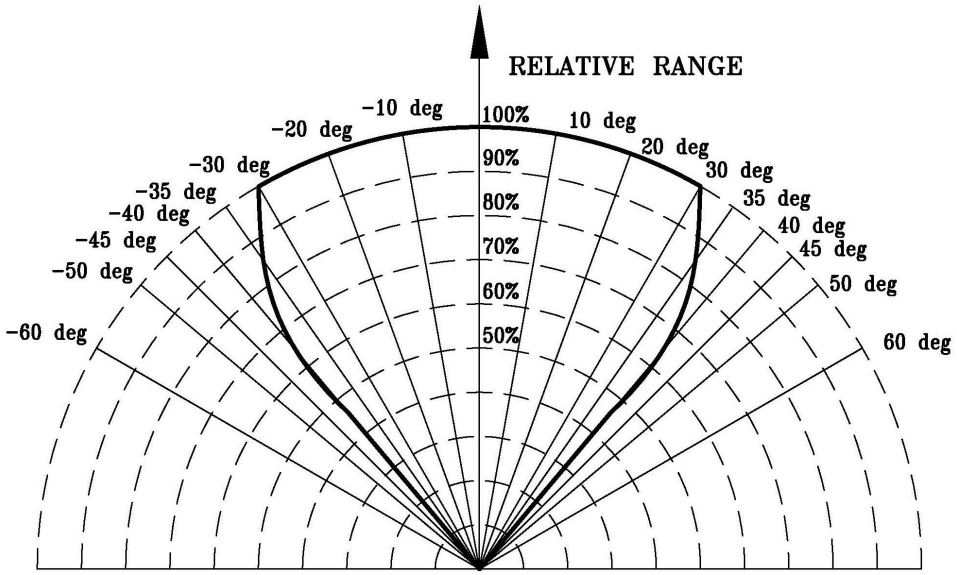


Gasoline

For SharpEye 40/40C-M and D-M

- Horizontal: 80 °
- Vertical: 80 °

Figure 2-5: Vertical and horizontal field of view for gasoline



Hydrogen

For SharpEye 40/40C-M and D-M

- Horizontal: 90°
- Vertical: 90°

Figure 2-6: Horizontal field of view for hydrogen

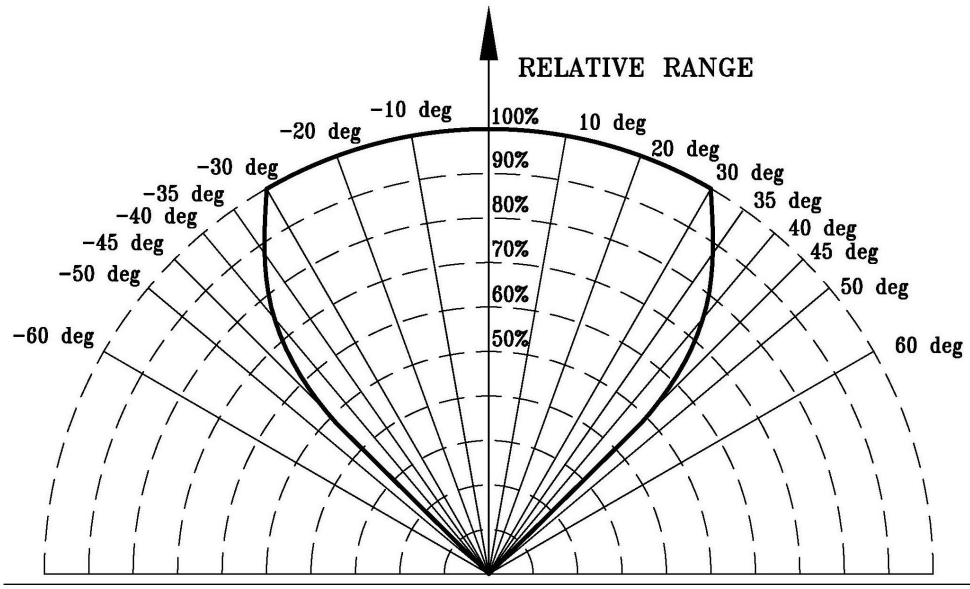
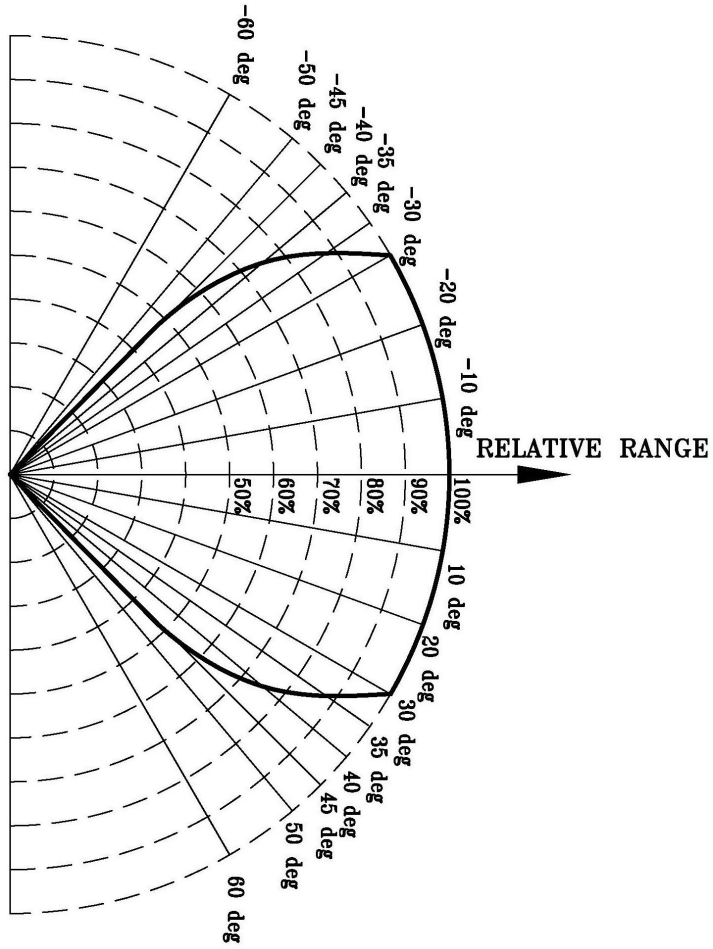
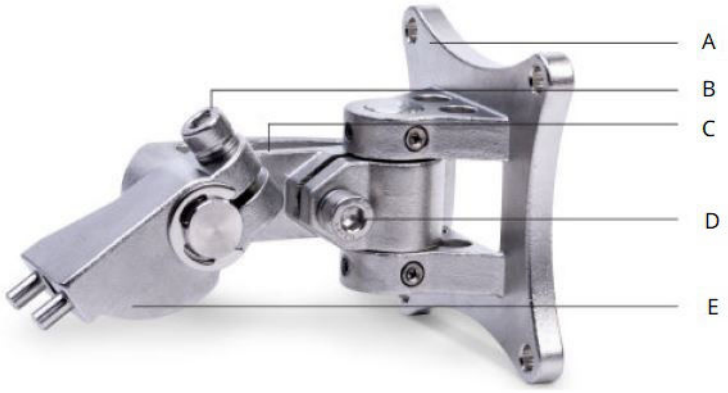


Figure 2-7: Vertical field of view for hydrogen



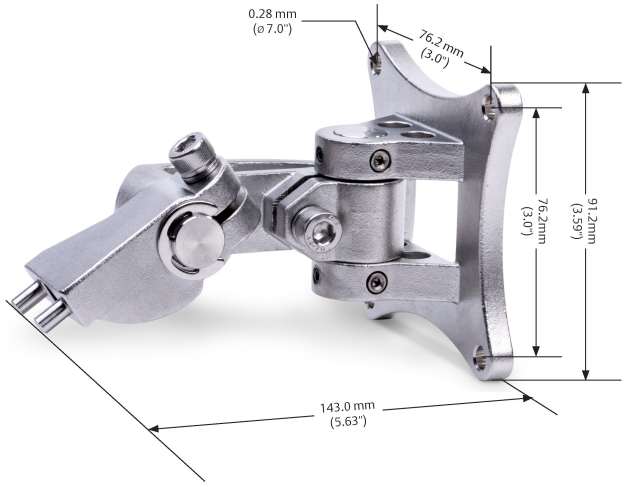
2.3 Attach detector to tilt mount

Figure 2-8: Tilt mount



A. Tilt holding plate
B. Horizontal locking screw
C. Tilt mount
D. Vertical locking screw
E. Detector holding plate

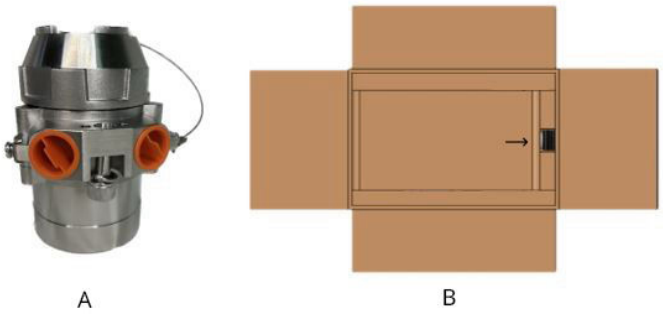
Figure 2-9: Tilt mount with dimensions



Procedure

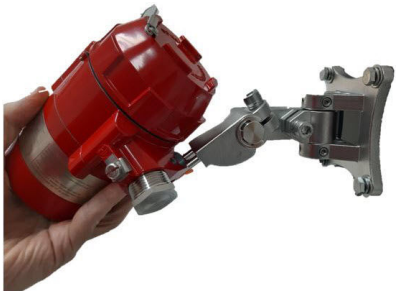
1. Unpack the detector.
2. The device is provided with two plastic plugs (See image below). The stainless-steel stop plug used to seal the unused conduit will be included in the device.

   Remember, seal the detector with the stainless-steel plug before use. Refrain from losing the plug in any case



A. Detector with two plastic plugs
B. Product packaging with stainless-steel plug attachment

3. Insert location pins on the tilt mount into the openings on detector housing.



4. Thread the holding screw and tighten it.

Note
To change the detector field of view, release the horizontal and vertical locking screws.

5. Point the detector toward the protected area and ensure the view of the area is unobstructed.
6. Secure the detector in that position by tightening the locking screws on the tilt mount.
The detector is now correctly located, aligned, and ready to be connected to the system.

2.4 Open the back cover

Procedure

1. Loosen the back cover security screw.

A. Back cover security screw
B. Protective plug

2. Unscrew the back cover.

Note
The back cover is attached by a security cable.

3. Remove the protective plug.

2.5 Wire terminals and ground cable

NOTICE

Improper wiring may damage the detector.

Procedure

1. Connect the terminals according to Table 2-2.
   The terminal details are also on the inside back cover.

Figure 2-10: Terminal box

Table 2-2: Terminal box

Terminal	Function
T1	24 VDC (+)
T2	24 VDC (-)
T3	External built-in test (BIT) switch
T4	Fault relay - normally open (NO)
T5	Fault relay
T6	Fault relay - normally closed (NC)
T7	Alarm relay - NO
T8	Alarm relay
T9	Alarm relay - NC
T10	0-20 mA (+)
T11	0-20 mA (-)
T12	Alarm output (40/40D models)
T13	RS-485 (+)
T14	RS-485 (-)
T15	Accessory relay - normally open
T16	Accessory relay
T17	Accessory relay - normally closed

When the fault relay wiring option is NC, the relay contact is open in normal status (energized) and closed in fault status (de-energized).

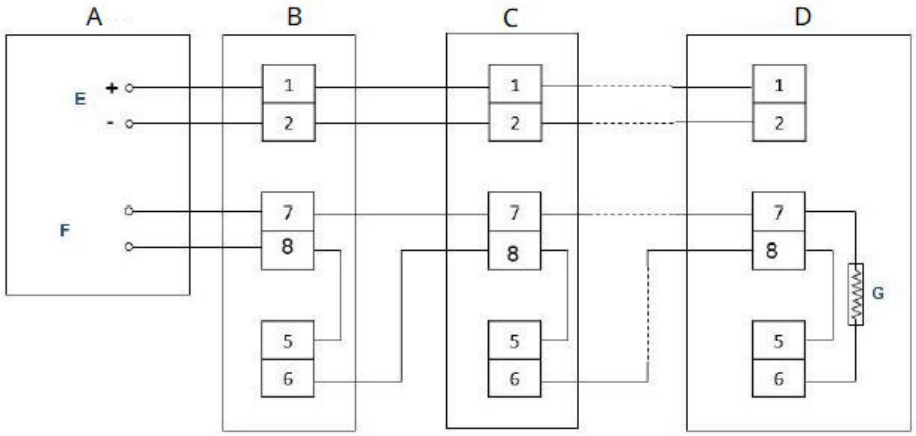
When the fault relay wiring option is NO, the relay contact is closed in normal status (energized) and open in fault status (de-energized).

When the alarm/accessories relay wiring option is NC, the relay contact is closed in normal status (de-energized) and open in alarm status (energized).

When the alarm/accessories relay wiring option is NO, the relay contact is open in normal status (de-energized) and closed in alarm status (energized).

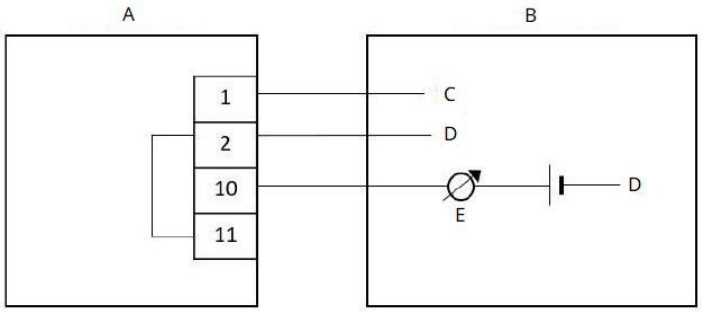
2. Use Figure 2-11, Figure 2-12, Figure 2-13, and Figure 2-14 for typical wiring configurations.

Figure 2-11: Typical wiring for four-wire controllers



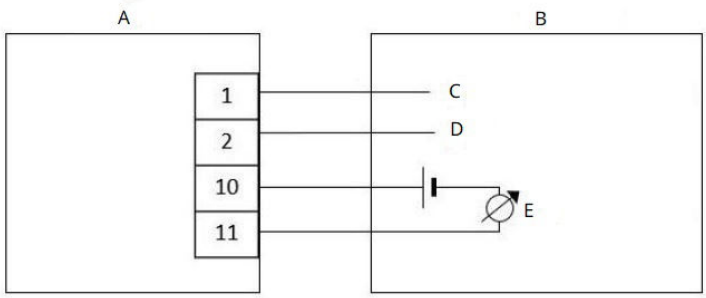
A. Controller
B. First detector
C. Second detector
D. Last detector
E. Power supply
F. Alarm loop
G. End of line

Figure 2-12: Non-isolated sink (three wires)



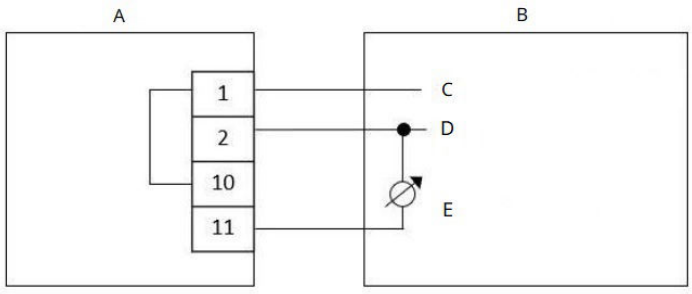
A. Detector
B. Controller
C. Input power: 18 to 32 VDC
D. Return
E. 0-20 mA meter

Figure 2-13: Sink four-wire



A. Detector
B. Controller
C. Input power: 18 to 32 VDC
D. Return
E. 0-20 mA meter

Figure 2-14: Source three-wire



A. Detector
B. Controller
C. Input power: 18-32 VDC
D. Return
E. 0-20 mA meter

Note
For additional configuration options, refer to the SharpEye Next Generation 40/40 Series Flame Detectors.

3. Check the wires for secure mechanical connection and press them neatly against the terminal to prevent them from interfering while closing the back cover.
4. Close the terminal compartment by screwing the back cover on to the housing.

5. Tighten the back cover security screw.

Figure 2-15: Tilt mount

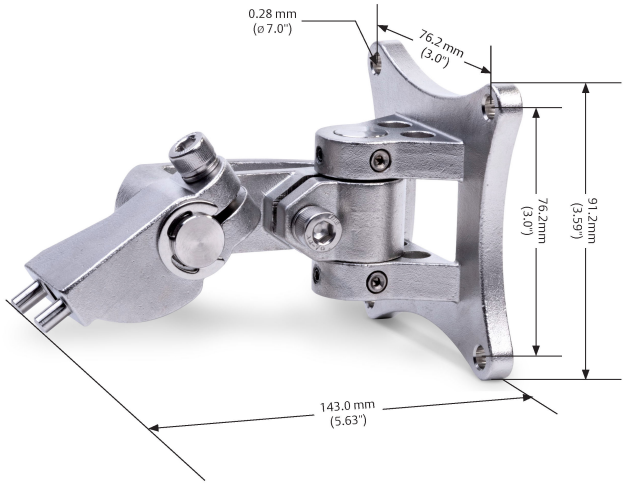


Figure 2-16: Closing security screw

A. Back cover security screw
B. Ground cable connection point

6. Connect the ground cable.

NOTICE

When the enclosed threaded plug is utilized in the conduit opening, it must be installed with a minimum thread engagement in order to comply with explosion-proof requirements. For straight threads, a minimum of seven threads must be engaged. For tapered threads, a minimum of five threads must be engaged.

Plug and seal the unused conduit connection with the provided conduit plug.

NOTICE

To comply with 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.

2.6 Install the protective cover

NOTICE

Always install the protective cover with the detector.

The protective cover is available in ABS plastic or stainless steel.

Table 2-3: Protective cover

Material	Part number
ABS plastic	PN 877263
Stainless steel	PN 877163

Procedure

1. Place the protective cover on top of the detector.

2. Secure the protective cover by tightening the screw.

Note
When installing the stainless steel protective cover, the same installation instructions apply.

2.7 Aim the detector

Aim the detector toward the center of the detection zone and make sure you have a completely unobstructed view of the protected area.

We recommend positioning the detector tilted down at a 45° angle to maximize coverage and prevent accumulation of dust and dirt.

Do not begin installation until all conceivable considerations regarding detection location have been taken into account.

2.8 Changing default detector settings

The Main settings that can be modified using the Modbus® Manager or HART® communication include:

- Built-in test (BIT)
- Detection options
- Lock option
- 4-20 mA settings
- Modbus Manager settings
- Sensitivity
- Response time
- Heated optics functionality
- Alarm delay
- Accessory relay options
- Alarm latch
- Field of view integrity indication

Refer to the Spectrex SharpEye 40/40C and D Series Flame Detectors Modbus Manager Manual or the *Spectrex SharpEye 40/40C and D Series Flame Detectors HART Manual* for instructions on changing these settings.

3 Operation

3.1 Power up the detector

Procedure

After connecting the detector to power, wait up to 60[(1)] seconds for the detector to completed the initial start-up procedure.

Note

Turning on the detector initiates the following sequence of events:

a. The yellow light-emitting diode (LED) flashes at 4 Hz.

b. The built-in test (BIT) is executed.

c. BIT completes.

d. Detector enters Normal mode, indicated by:
   - Flashing green LED at 1 Hz.
   - Fault relay contacts closing.
   - mA output is 4 mA (for models featuring analog [voltage] output, this will be 2 V).

3.2 Testing procedures

This section describes the explosion proof testing procedure using the Spectrex explosion proof FS flame simulator series. The detector can also be tested using the manual built-in test (BIT).

Table 3-1: Flame simulator compatibility

Spectrex model flame simulator	Suitable with detectors
FS-1100	Spectrex 40/40C-I and 40/40D-I
FS-1200	Spectrex 40/40C-LB, 40/40C-L4B, 40/40D-LB, and 40/40D-L4B
FS-1400	Spectrex 40/40C-M and 40/40D-M

To perform a flame simulator test:

1. Power up the system and wait for up to 60 seconds for the detector to return to normal status.
   The ***Power*** LED turns on.
2. Ensure all indicators show normal.

For full instructions on operating a flame simulator test, see the relevant manual.

(1) During startup, the device conducts an automated System Verification Self-Test (SVST) to validate the proper functioning of all components and systems. It will remain in standby mode until the SVST successfully completes, confirming the device's operational readiness for accurate measurements. The SVST may trigger the 4-20 output for period of maximum 10 ms.

Table 3-2: Flame simulator manuals

Flame simulator	Manual
Spectrex FS-1100	TM380002
Spectrex FS-1200	TM380102
Spectrex FS-1400	TM380302

Related information

Power up the detector

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 40/40C and D Series 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 SIL-3 requirements.

The detector continuously tests:

- Input voltage level
- All internal regulator voltage level
- Voltage level status of sensor and sensor circuitry for noise or disconnection in the electronic circuitry
- 0-20 mA level output
- Relays and heater 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): yellow flashes (4 Hz)
- Fault relay opens
- 0-20 mA: 1 mA default
- Analog voltage output: 0 V output
  (SharpEye 40/40D models only)

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:

- Sensors
- Window cleanliness
- Electronic circuitry

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

- Automatically and manually
- 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 or HART® communicator. 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 manual BIT using the Modbus Manager or HART communicator or by connecting terminal **3** to ground. You can also use the Modbus Manager or HART communicator to configure the manual BIT's alarm duration.

5 Maintenance

5.1 Keeping 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, analog voltage output is 0 V

Note
Analog voltage output applies to SharpEye 40/40D models only.

Potential cause

No power to the unit.

Recommended actions

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

6.2 Light-emitting diode (LED) flashes yellow 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 Electrical specifications.

Potential cause

Faulty detector.

Recommended action

Re-power the detector.

6.3 Light-emitting diode (LED) flashes yellow 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.

6.5 No HART® communication, 0-20 mA shows 0 mA

Potential cause

No HART is available at 0 mA level.

Recommended action

For Fault mode, the default indication is 1 mA. Configure this to 0 mA.

Spectrex does not recommend this when using a HART connection in order to preserve the HART communication.

7 Specifications

7.1 Technical specifications

Spectral response

SharpEye 40/40C-I	Four infrared (IR) bands between 4 µm and 5 µm
SharpEye 40/40C-M	Four IR bands between 2 µm and 5 µm
SharpEye 40/40C-LB	Ultraviolet (UV): 0.185 - 0.260 µm IR: 2.5-3.0 µm
SharpEye 40/40C-L4B	UV: 0.185 - 0.260 µm IR: 4.3 – 4.8µm
SharpEye 40/40D-I	Four infrared (IR) bands between 4 µm and 5 µm
SharpEye 40/40D-M	Four IR bands between 2 µm and 5 µm
SharpEye 40/40D-LB	Ultraviolet (UV): 0.185 - 0.260 µm IR: 2.5-3.0 µm
SharpEye 40/40D-L4B	UV: 0.185 - 0.260 µm IR: 4.3 – 4.8µm

Detection range per fuel (ft./m)

Note
The ranges shown are at highest sensitivity setting for 1 ft.^{2} (0.1 m^2) pan fire.

Table 7-1: SharpEye 40/40C Models

Fuel	SharpEye 40/40C-I	SharpEye 40/40C-M	SharpEye 40/40-LB	SharpEye 40/40-L4B
Gasoline	215 ft. (65 m)		50 ft. (15 m)	93 ft. (28 m)
N-Heptane	215 ft. (65 m)		50 ft. (15 m)	93 ft. (28 m)
Diesel fuel	150 ft. (45 m)		37 ft. (11 m)	70 ft. (21 m)
Kerosene	150 ft. (45 m)		37 ft. (11 m)	70 ft. (21 m)
Alcohol 95%	135 ft. (40 m)		30 ft. (9 m)	57 ft. (17 m)
IPA	135 ft. (40 m)		37 ft. (11 m)	70 ft. (21 m)
Methanol	135 ft. (40 m)		30 ft. (9 m)	57 ft. (17 m)
Methane	150 ft. (45 m)		33 ft. (10 m)	60 ft. (18 m)
LPG	150 ft. (45 m)		33 ft. (10 m)	60 ft. (18 m)
Polypropylene	115 ft. (35 m)		33 ft. (10 m)	60 ft. (18 m)
Paper	82.0 ft (25 m)		16.4 ft (5 m)	33 ft. (10 m)
Hydrogen	N/A	118.1 ft (36 m)	37 ft. (11 m)	N/A
Magnesium alloy(1)	N/A		16.4 ft (5 m)	33 ft. (10 m)
Gun powder	141.1 ft (43 m)		32.8 ft (10 m)	91.9 ft (28 m)
Fireworks	23.0 ft (7 m)		5.25 ft (1.6 m)	9.8 ft (3 m)

Table 7-1: SharpEye 40/40C Models *(continued)*

Fuel	SharpEye 40/40C-I	SharpEye 40/40C-M	SharpEye 40/40-LB	SharpEye 40/40-L4B
Cooking oil	147.6 ft (45 m)		37 ft. (11 m)	70 ft. (21 m)
Mineral oil: 20w50	150 ft. (45 m)		37 ft. (11 m)	70 ft. (21 m)
Wood	82 ft. (25 m)		16 ft. (5 m)	33 ft. (10 m)
Ethylene glycol	118 ft. (36 m)		12 ft. (3.7 m)	23 ft. (7 m)
Butyl acrylate	175 ft. (54 m)		37 ft. (11 m)	70 ft. (21 m)
Vinyl acetate	175 ft. (54 m)		37 ft. (11 m)	70 ft. (21 m)
Flammable adhesive	150 ft. (45 m)		37 ft. (11 m)	70 ft. (21 m)
Solvents	175 ft. (54 m)		37 ft. (11 m)	70 ft. (21 m)
Oil paint	150 ft. (45 m)		37 ft. (11 m)	70 ft. (21 m)
Jet fuel JP5	150 ft. (45 m)		37 ft. (11 m)	70 ft. (21 m)
Jet fuel A1	150 ft. (45 m)		37 ft. (11 m)	70 ft. (21 m)
Battery(2)	200 ft. (61 m)		39 ft. (12 m)	75 ft. (23 m)

(1) Contact Spectrex representative for guidance on detecting Magnesium alloy.
(2) One battery cell.

Table 7-2: SharpEye 40/40D Models

Fuel	SharpEye 40/40D-I	SharpEye 40/40D-M	SharpEye 40/40D-LB	SharpEye 40/40D-L4B
Gasoline	300 ft. (90 m)		93 ft. (28 m)	
N-Heptane	300 ft. (90 m)		93 ft. (28 m)	
Diesel fuel	207 ft. (63 m)		70 ft. (21 m)	
Kerosene	207 ft. (63 m)		70 ft. (21 m)	
Alcohol 95%	185 ft. (55 m)		57 ft. (17 m)	
Isopropyl alcohol (IPA)	185 ft. (55 m)		70 ft. (21 m)	
Methanol	185 ft. (55 m)		57 ft. (17 m)	
Methane	207 ft. (63 m)		60 ft. (18 m)	
Liquified petroleum gas (LPG)	207 ft. (63 m)		60 ft. (18 m)	
Polypropylene	160 ft. (49 m)		60 ft. (18 m)	
Paper	112 ft. (34 m)		33 ft. (10 m)	
Hydrogen	N/A	164 ft. (50 M)	70 ft. (21 m)	N/A
Magnesium alloy(1)	N/A		33 ft. (10 m)	
Gun powder	197 ft. (60 m)		66 ft. (20 m)	93 ft. (28 m)
Fireworks	33 ft. (10 m)		10 ft. (3 m)	

Table 7-2: SharpEye 40/40D Models *(continued)*

Fuel	SharpEye 40/40D-I	SharpEye 40/40D-M	SharpEye 40/40D-LB	SharpEye 40/40D-L4B
Cooking oil	207 ft. (63 m)		70 ft. (21 m)	
Mineral oil: 20 w 50	207 ft. (63 m)		70 ft. (21 m)	
Wood	112 ft. (34 m)		33 ft. (10 m)	
Ethylene glycol	164 ft. (50 m)		23 ft. (7 m)	
Butyl acrylate	246 ft. (75 m)		70 ft. (21 m)	
Vinyl acetate	246 ft. (75 m)		70 ft. (21 m)	
Flammable adhesive	207 ft. (63 m)		70 ft. (21 m)	
Solvents	246 ft. (75 m)		70 ft. (21 m)	
Oil paint	207 ft. (63 m)		70 ft. (21 m)	
Jet fuel JP5	207 ft. (63 m)		70 ft. (21 m)	
Jet fuel A1	207 ft. (63 m)		70 ft. (21 m)	
Battery(2)	279 ft. (85 m)		75 ft. (23 m)	
Ammonia fire(3)	N/A	117 ft. (35 m)	30 ft. (9 m)	17.5 ft. (5 m)
Silane fire(4)	N/A	N/A	67 ft. (20 m)	N/A

(1) Contact Spectrex representative for guidance on detecting magnesium alloy.
(2) One battery cell.
(3) Available for SharpEye 40/40D-M, 40/40D-LB and 40/40D-L4B only.
(4) Available for SharpEye 40/40D-LB only.

Standard response time

Table 7-3: SharpEye 40/40C Models

Spectrex 40/40C-I	Spectrex 40/40C-M	Spectrex 40/40C-LB	Spectrex 40/40C-L4B
Typically <5 sec			

Table 7-4: SharpEye 40/40D Models

SharpEye 40/40D-I	SharpEye 40/40D-M	SharpEye 40/40D-LB	SharpEye 40/40D-L4B
Typically <2 sec at 131 ft. (40 m) 10 sec at 300 ft. (90 m)		Typically 5 sec at 93 ft. (28 m)	

Ultra fast response time

Table 7-5: SharpEye 40/40C Models

Spectrex 40/40C-I	Spectrex 40/40C-M	Spectrex 40/40C-LB	Spectrex 40/40C-L4B
N/A			

Table 7-6: SharpEye 40/40D Models

SharpEye 40/40D-I	SharpEye 40/40D-M	SharpEye 40/40D-LB	SharpEye 40/40D-L4B
Typically <1 sec at 100 ft. (30 m)		20 msec for flash fire at 10 ft. (3 m)	

High speed response time

Table 7-7: SharpEye 40/40C Models

Spectrex 40/40C-I	Spectrex 40/40C-M	Spectrex 40/40C-LB	Spectrex 40/40C-L4B
N/A			

Table 7-8: SharpEye 40/40D Models

SharpEye 40/40D-I	SharpEye 40/40D-M	SharpEye 40/40D-LB	SharpEye 40/40D-L4B
50 msec for 1 ft.^{2} (0.1 m^2) diameter sphere LPG-air mixture explosion at 66 ft. (20 m)		50 msec for 1 ft.^{2} (0.1 m^2) diameter sphere LPG-air mixture explosion at 33 ft. (10 m)	

Sensitivity ranges

Note
All distances relate to detection of a 1 ft.^{2} (0.1 m^2) n-heptane fire.

Table 7-9: SharpEye 40/40C Models

Spectrex 40/40C-I	Spectrex 40/40C-M	Spectrex 40/40C-LB	Spectrex 40/40C-L4B
Five ranges: • 10 ft. (3 m) • 50 ft. (15 m) • 100 ft. (30 m) • 150 ft. (45 m) • 215 ft. (65 m)		Two ranges: • 10 ft. (3 m) • 50 ft. (15 m)	Three ranges: • 10 ft. (3 m) • 50 ft. (15 m) • 92 ft. (28 m)

Table 7-10: SharpEye 40/40D Models

SharpEye 40/40D-I	SharpEye 40/40D-M	SharpEye 40/40D-LB	SharpEye 40/40D-L4B
Six ranges: • 10 ft. (3 m) • 50 ft. (15 m) • 100 ft. (30 m) • 150 ft. (45 m) • 215 ft. (65 m) • 300 ft. (90 m)		Three ranges: • 10 ft. (3 m) • 50 ft. (15 m) • 92 ft. (28 m)	

Field of view

Table 7-11: SharpEye 40/40C Models

Spectrex 40/40C-I	Spectrex 40/40C-M	Spectrex 40/40C-LB	Spectrex 40/40C-L4B
H: 100° V: 95°	Hydrogen: H: 90° V: 90°	H: 100° V: 95°	
H: 100° V: 95°	Other fuels: H: 80° V: 80°	H: 100° V: 95°	

Table 7-12: SharpEye 40/40D Models

SharpEye 40/40D-I	SharpEye 40/40D-M	SharpEye 40/40D-LB	SharpEye 40/40D-L4B
Horizontal: 100° Vertical: 95°	Hydrogen Horizontal: 90° Vertical: 90°	Horizontal: 100° Vertical: 95°	
	Other fuels Horizontal: 80° Vertical: 80°		

Temperature range (operating and storage)

Table 7-13: SharpEye 40/40C Models

Spectrex 40/40C-I	Spectrex 40/40C-M	Spectrex 40/40C-LB	Spectrex 40/40C-L4B
-40 °F (40 °C) to +167 °F (+75 °C)			

Table 7-14: SharpEye 40/40D Models

SharpEye 40/40D-I	SharpEye 40/40D-M	SharpEye 40/40D-LB	SharpEye 40/40D-L4B
-76 °F (-60 °C) to +185 °F (+85 °C)			

Humidity

Non-condensing relative humidity up to 100 percent.

7.2 Electrical specifications

The electrical specifications apply to all models unless stated otherwise.

Operating voltage	24 Vdc nominal (18-32 Vdc)
Cable entries	2 x ¾-in - 14 NPT conduits or 2 x M25 x 1.5 mm International Organization for Standardization (ISO)
Electrical input protection	According to EN 50130
Electromagnetic capability	Electromagnetic interference/Radio frequency interference (EMI/RFI) protected to EN61000-6-3 and EN 50130
Electrical interface	The detector includes 17 terminals, one wiring option.

Table 7-15: Typical current consumption

Typical current consumption	Spectrex 40/40C-I and 40/40C-M	Spectrex 40/40C-LB and 40/40C-L4B	Spectrex 40/40D-I and 40/40D-M	Spectrex 40/40D-LB and 40/40D-L4B
Normal power consumption without heater: mA (Watts)	60 (1.4)	90 (2.2)	60 (1.4)	90 (2.2)
Normal power consumption without heater with alarm: mA (Watts)	90 (2.2)	120 (2.9)	90 (2.2)	120 (2.9)
Low power heater with alarm: mA (Watts)	Not applicable	Not applicable	140 (3.4)	180 (4.3)

Table 7-15: Typical current consumption *(continued)*

Typical current consumption	Spectrex 40/40C-I and 40/40C-M	Spectrex 40/40C-LB and 40/40C-L4B	Spectrex 40/40D-I and 40/40D-M	Spectrex 40/40D-LB and 40/40D-L4B
Standard power mode heater with alarm: mA (Watts)	310 (7.5)	320 (7.7)	280 (6.7)	320 (7.7)

Electrical input protection

The input circuit is protected against voltage-reversed polarity, voltage transients, surges, and spikes according to EN 54-10.

Outputs

Relays
Alarm, fault, and auxiliary
SPDT volt-free contacts rated 2A at 30 Vdc

Analog
5 V at detection, 0 V at fault, 2 V at normal

0-20 mA (stepped)

SharpEye 40/40C Models
Fault: 0 +1 mA
BIT fault: 2mA ± 0.3mA
Normal: 4mA ± 0.3mA
Warning: 16mA ± 0.3mA
Alarm: 20mA ± 0.3mA

SharpEye 40/40D Models
Fault: 0 +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

Heated optics

The front window can be heated to improve performance in ice, condensation, and snow conditions. The heater increases the temperature of the optical surface by 5 °C to 25 °C above the ambient temperature(2). The heated optics can be configured in three ways:

OFF Heating is always OFF.

ON-LOW Heating is always ON - low power

ON-HIGH Heating is always ON - high power

AUTO - LOW Low power

AUTO - HIGH High power

Note
In Auto mode, the starting heat temperature can be defined between 32 °F (0 °C) and 95 °F (35 °C). The detector stops heating the window when the temperature is 15 °C above the start temperature.

(2) SharpEye 40/40D models have a low power heater option.

7.3 Mechanical specifications

Enclosure options

SharpEye 40/40C Models	Heavy duty copper free aluminum (less than 1%), polyurethane painted
SharpEye 40/40D Models	Stainless steel 316 with electropolish finish Heavy duty copper free aluminum (less than one percent), polyurethane painted

Tilt mount

Stainless steel 316 with electropolish finish

Detector dimensions

4 in. (100.6 mm) x 4.6 in. (117 mm) x 6.18 in. (155 mm)

Weight

SharpEye 40/40C Models	Detector: 2.8 lb (1.3 kg) Tilt mount 2.5 lb (1.13 kg)
SharpEye 40/40D Models	Stainless steel detector: 6.3 lb (2.9 kg) Aluminum detector: 2.8 lb (1.3 kg) Tilt mount 2.5 lb (1.13 kg)

Environmental standards

DNV 2-4[(3)]

Water and dust

IP66 and IP68 per EN 60529

(3) SharpEye 40/40D Models only

A Reference data

A.1 Ordering information, specifications, dimensional drawings, and installation drawings

To view current SharpEye 40/40 Series ordering information, specifications, and dimensional drawings, follow these steps:

Procedure

1. Go to https://www.spectrex.net/en-us/flame-gas-detectors/flame-detectors/sharpeye-40-40-next-generation-series-flame-detectors.
2. Select the appropriate product.
3. Scroll down to ***Documents and Drawings***.
4. Select **DATA SHEETS & BULLETINS**.
5. Select the appropriate Product Data Sheet.

A.2 Product certifications

To view current SharpEye 40/40 Series product certifications, see Spectrex 40/40C and 40/40D Series Flame Detectors Certification Information.

B FM fuel test responses

Results of the FM fuel tests are as follows:

Table B-1: SharpEye 40/40C Models

Ranges are in feet (meters).

Fuel	SharpEye 40/40C-I	SharpEye 40/40C-M	SharpEye 40/40C-LB	SharpEye 40/40C-L4B
Gasoline(1)	215 (65)		50 (15)	93 (28)
N-Heptane(1)	215 (65)		50 (15)	93 (28)
Diesel fuel(1)	150 (45)		37 (11)	70 (21)
JP5(1)	150 (45)		37 (11)	70 (21)
Kerosene(1)	150 (45)		37 (11)	70 (21)
Ethanol 95%(1)	135 (40)		29.5 (9)	57 (17)
Isopropyl alcohol (IPA)(1)	135 (40)		37 (11)	70 (21)
Methanol(1)	135 (40)		29.5 (9)	57 (17)
Methane(2)	150 (45)		33 (10)	60 (18)
LPG(2)	150 (45)		33 (10)	60 (18)
Polypropylene(1)	115 (35)		33 (10)	60 (18)
Paper(1)	83 (25)		16 (5)	33 (10)
Hydrogen(2)	N/A	118 (36)	37 (11)	N/A
Magnesium alloy(3)	N/A		16 (5)	33 (10)
Gun powder(4)	141 (43)		33 (10)	93 (28)
Fireworks(5)	23 (7)		5 (1.6)	10 (3)
Cooking oil(1)	150 (45)		37 (11)	70 (21)
Mineral oil: 20w50(1)	150 (45)		37 (11)	70 (21)
Wood(1)	83 (25)		16 (5)	33 (10)
Ethylene glycol(1)	118 (36)		12 (3.7)	23 (7)
Butyl acrylate(1)	177 (54)		37 (11)	70 (21)
Vinyl acetate(1)	177 (54)		37 (11)	70 (21)
Flammable adhesive (1)	150 (45)		37 (11)	70 (21)
Solvents(1)	177 (54)		37 (11)	70 (21)
Oil paint(1)	150 (45)		37 (11)	70 (21)
Jet fuel A1(1)	150 (45)		37 (11)	70 (21)
Battery(6)	200 (61)		39 (12)	75 (23)

(1) 1 ft.^{2} (0.1 m^2) pan fire
(2) Plume fire: 2.5 ft. (0.75 m) high, 0.8 ft. (0.25 m) wide
(3) Only for UV detector
(4) 1.5 in.^{2} (10 cm^2) pan fire
(5) 10 pieces per test

(6) One battery cell

Table B-2: SharpEye 40/40D Models

Fuel	SharpEye 40/40D-I	SharpEye 40/40D-M	SharpEye 40/40D-LB	SharpEye 40/40D-L4B
Gasoline(1)	300 (90)		93 (28)	
N-Heptane(1)	300 (90)		93 (28)	
Diesel fuel(1)	210 (63)		70 (21)	
JP5(1)	210 (63)		70 (21)	
Kerosene(1)	210 (63)		70 (21)	
Alcohol 95%(1)	185 (55)		57 (17)	
Isopropyl alcohol(1)	185 (55)		70 (21)	
Methanol(1)	185 (55)		56 ft	
Methane(2)	210 (63)		60 (18)	
Liquified petroleum gas (LPG)(1)	210 (63)		60 (18)	
Polypropylene(1)	163 (49)		60 (18)	
Paper(1)	115 (34)		33 (10)	
Hydrogen(1)	N/A	166 (50)	70 (21)	N/A
Magnesium alloy(3)	N/A		33 (10)	
Gun powder(4)	197 (60)		66 (20)	93 (28)
Fireworks(5)	33 (10)		10 (3)	
Cooking oil(1)	210 (63)		70 (21)	
Mineral oil: 20 w 50(1)	210 (63)		70 (21)	
Wood(1)	111 (34)		33 (10)	
Ethylene glycol(1)	164 (50)		23 (7)	
Butyl acrylate(1)	246 (75)		70 (21)	
Vinyl acetate(1)	246 (75)		70 (21)	
Flammable adhesive (1)	210 (63)		70 (21)	
Solvents(1)	246 (75)		70 (21)	
Oil paint(1)	210 (63)		70 (21)	
Jet fuel A1(1)	210 (63)		70 (21)	
Battery(6)	279 (85)		75 (23)	

(1) 1 ft.^{2} (0.1 m^2) pan fire
(2) Plume fire: 2.5 ft. (0.75 m) high, 0.8 ft. (0.25 m) wide
(3) Only for ultraviolet (UV) detector
(4) 1.5 in.^{2} (10 cm^2) pan fire
(5) Ten pieces per test
(6) One lithium ion battery. Height: 2.6 in. (65 mm). Diameter: 0.7 in. (18.4 mm)

C Immunity to false alarm sources

Table C-1: Immunity to false alarm sources

IAD: Immunity at any distance

Radiation source	Immunity distance			
	SharpEye 40/40C-I and D-I	SharpEye 40/40C-M and D-M	SharpEye 40/40C-LB and D-LB	SharpEye 40/40C-L4B and D-L4B
Indirect or reflected sunlight	IAD	IAD	IAD	IAD
Vehicle headlights (low beam) conforming to MS53023	IAD	IAD	IAD	IAD
Incandescent frosted glass light, 300 W	IAD	IAD	IAD	IAD
Fluorescent light with white enamel reflector, standard office or shop, 80 W (or two 40 W)	IAD	IAD	IAD	IAD
Electric arc (15/32-in (12 mm)) gap at 4000 Vac, 60 Hz	IAD	IAD	IAD	IAD
Arc welding (5/16-in (6 mm)) rod, 210 A	See Table C-2.			
Ambient light extremes (darkness to bright light with snow, water, rain, desert glare, or fog)	IAD	IAD	IAD	IAD
Bright colored clothing, including red and safety orange	IAD	IAD	IAD	IAD
Electronic flash (180 W seconds minimum output)	IAD	IAD	IAD	IAD
Movie light, 625 W quartz DWY lamp (Sylvania S.G. 55 or equivalent)	>6.5 ft. (2 m)	>6.5 ft. (2 m)	>13 ft. (4 m)	>3 ft. (1 m)
Blue green dome light conforming to M251073	IAD	IAD	IAD	IAD
Flashlight (MX 991/U)	IAD	IAD	IAD	IAD
Radiation heater, 3000 W	>3 ft. (1 m)	>3 ft. (1 m)	IAD	IAD
Radiation heater, 1000 W with fan	IAD	IAD	IAD	IAD
Quartz lamp (1000 W)	>3 ft. (1 m)	>3 ft. (1 m)	See Table C-3.	
Mercury vapor lamp	IAD	IAD	IAD	IAD
Grinding metal	IAD	IAD	IAD	IAD
Lit cigar	>1 ft. (0.3 m)	>1 ft. (0.3 m)	IAD	IAD
Lit cigarette	>1 ft. (0.3 m)	>1 ft. (0.3 m)	IAD	IAD
Match, wood, stick, including flare up	>20 ft. (6 m)	>10 ft. (3 m)	>7 ft. (2 m)	>7 ft. (2 m)
Vehicle exhaust diesel fume For SharpEye 40/40D-IH only	IAD	IAD	N/A	N/A

Table C-2: Welding immunity distance

Level	Range	Distance
1	>10 ft. (3 m)	>1.6 ft. (0.5 m)
2	>50 ft. (15 m)	>6 ft. (2 m)
3	>100 ft. (30 m)	>12 ft. (4 m)
4	>150 ft. (45 m)	>17 ft. (6 m)
5	>215 ft. (65 m)	>25 ft. (7.5 m)
6	>295 ft. (90 m)	>33 ft. (10 m)

Table C-3: Halogen immunity distance

Sensitivity level	Detection range	Halogen distance			
		SharpEye 40/40C-LB and D-LB		SharpEye 40/40C-L4B and D-L4B	
		750 W	1000 W	750 W	1000 W
1	10 ft. (3 m)	>13 ft. (4 m)	>15 ft. (4.5 m)	>6 ft. (2 m)	>8 ft. (2.5 m)
2	50 ft. (15 m)	>43 ft. (13 m)	>50 ft. (15 m)	>15 ft. (4.5 m)	>16 ft. (5 m)
3	93 ft. (28 m)	>66 ft. (20 m)	>70 ft. (21 m)	>27 ft. (8 m)	>30 ft. (9 m)

D Wiring instructions

D.1 General instructions for electrical wiring

Prerequisites

Follow the instructions detailed in this section for determining the correct wire gauge to be used for the installation.

Procedure

1. Use Table D-1 to determine the required wire gauge/size for general wiring,such as relay wiring. Calculate the permitted voltage drop with respect to load current, wire gauge, and length of wires.

   Table D-1: Maximum DC resistance at 68 °F/20 °C for copper wire

AWG No.	mm ²	Ohm per 100 ft	Ohm per 100 m
20	0.51 – 0.61	1.07	3.50
18	0.81 – 0.96	0.67	2.20
16	1.22 – 1.43	0.43	1.40
14	1.94 – 2.28	0.27	0.88

2. Use Table D-2 to select wire gauge for power supply wires. **DO NOT** connect any circuit or load to detectors' supply inputs.
   - Select **number of detectors** connected in 1 circuit.
   - Select wiring **length** per your installation requirements.
   - Refer to **power supply** range for voltage extreme applied.

   Table D-2: Wiring length (ft/m)

Number of detectors	Recommended Wire Diameter (AWG)					Power supply range (VDC)
24	18	16	14	-	-	22-32
20	18	16	14	-	-	22-32
16	20	18	16	14	-	22-32
12	20	18	16	14	-	20-32
8	20	18	16	14	-	20-32
4 and less	20	18	16	16	14	20-32
ft/m	164/50	328/100	492/150	656/200	820/240	
	Maximum length from power supply to last detector					

3. Use Table D-3 to select the compatible ferrule size for the wire.
   - The **minimum ferrule length** required is 10mm of ferrule conductive material.

- The **bridge connection** between Vin to 4-20+ terminal should be with 20 AWG wire.

Table D-3: Ferrule size

Single wire connection		**Dual wire connection**	
Wire size (AWG)	Ferrule size (AWG)	Wire size (AWG)	Ferrule size (AWG)
20	20	20 + 20	16
18	18	18 + 20	16
16	16	16 + 20	16
14	14	14 + 20	14

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