IPES-IR3 Flame Detector
Operating Manual

820-0003

ESP SAFETY INC

Technology of the Future...Protection for today

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Operating Manual
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ESP Safety, Inc.
555 North First Street San Jose,
CA 95112 USA 408-886-9746

May 2020

Revision History: 820-0003

Date	Revision	Description	Approved
3/14/13	02	Addition; Appendix C Warranty & Return Policy	Burgos
3/25/13	03	Reformat	Burgos
2/28/14	04	Updated Functional Test Procedure	**Burgos**
10/31/14	A	Update FM references; change PN from 80010-001; steel enclosure only	ECO 141103
10/19/2016	B	New Terminal Board Connections FOV Diagram. Self Test Output	Martinez
05/01/2020	C	HART Communication	Wong

Table of Contents

> ⚠ *It is important that this entire manual be thoroughly read and understood prior to installing or operating the IPES-IR3. Any deviation from the recommendations in this manual may impair system performance and compromise safety.*

1.0 Introduction

Introduction
The IPES-IR3 flame detector's advanced microprocessor based technology ensures rapid flame recognition and alarm signaling. In addition, the IPES-IR3's selective, multiple spectrum technology virtually eliminates false alarms from a variety of sources including:

- Direct or indirect sunlight
- Arc welder flash, resistive heaters
- Fluorescent, halogen
- Incandescent light
- Nuclear radiation

The IPES-IR3 generates an alarm signal only when detection from three different IR wavelengths agree that a flame or fire is present in the field of view. Upon confirmation of flame or fire, the IPES-IR3 triggers alarm relays and provides alarm signals via RS-485 Modbus and industry standard +4 to 20mA current loop to the users' receiving devices and alarm systems.

For ease of operation status and alarm condition the IPES-IR3 provides an easily visible high illumination Tri State LED that follows an Industry Standard protocol:

- Green for normal operation
- Yellow for fault condition
- Red for alarm Conditions

The IPES-IR3 provides superior false alarm processing making it the detector of choice. Alarms occur instantly after our proprietary False-Positive Algorithm determines possible alarm states. This makes IPES-IR3 the industry standard for several industrial applications:

Our Mission
ESP Safety, Inc.'s mission is to provide complete turn-key protection solutions beginning with the design stage, through system installation and commissioning, and on-going field service in hazardous environments. Our line of industry-leading products, services, and systems benefits society, saves lives, and preserves capital resources.

ESP Safety, Inc. Contact Information
Telephone: 408-886-9746
FAX: 408-886-9757
Address: 555 North First Street, San Jose, CA 95112 USA

2.0 Description

Application

The IPES-IR3 design and explosion-proof ratings make it an excellent choice for indoor and outdoor applications, including:

- Drilling and production
- Automated and manned ocean based platforms.
- Fuel loading and transfer facilities
- Refineries
- Bulk terminals
- Tank farms and storage facilities
- LNG/LPG processing and storage
- Compressor stations
- Pipelines and pump stations
- Petrochemical processing
- Fertilizer production

- Paint production
- Power Plants- Nuclear, Coal, Oil, Natural Gas, Solar Process, MHD
- Shipping Tankers, Freighters. Virtually any vessels that may potential fire hazard.
- Laboratory and Plasma Study/Process
- Transportation facilities, Airports, Subways, Aircraft hangers
- Oil and Gas Boilers
- Stage and entertainment special effects

Specifications

The IPES-IR3 meets industry certifications and requirements for Hazardous Locations.

Detection Type: Optical

Detection Method: Multiple Spectrum Infrared Radiation Source Spectral Range: Three points in a range of 4.0 to 5.0 ⊠m

Detection Process Time:

4.5 to 7 Seconds

(Complies with FM Standard 3260)

Refer to Section 4.0

Detection Distance: Minimum 211 feet (64meters) depending on detected fuel.

Detection Cone of Vision: Up to 90° (45° Left/Right of center)

Sensitivity: User Selectable for distance and False/Positive process time

Power requirements: 24VDC nominal (18-32VDC range)

Power Consumption: 3 VA (3 Watt) Max

Outputs:

- Industry Standard +4 to 20mA
- 1 Alarm Relays (SPDT/Form-C latching)
- 1 Fault condition (NO/Form-A)

*All Relays Contact Rating 1 Amp@125VAC/30VDC

- Digital RS-485 Modbus
- HART Communication Protocol

Cable Distance: 6200ft (1900m) 18 AWG

Ingress Protection: IP66

Vibration: Meets FM 3260: 2000

Impact Resistance: 1.9 Joules

Test Method: ITES Test Lamp

RFI-resistant to interference by EMI and RFI: EMC Directive compliant with CE mark. Not susceptible to keying 5 watt walkie-talkie at distances greater than 1 foot.

Optical Integrity: IPES-IR3 performs an automatic calibrated performance test once per minute to verify complete detector operation capabilities.

Operating Temperature: -40°F to +185°F (-40°C to 85°C)

Storage Temperature: -76°F to +185°F (-60°C to 85°C)

Humidity Range: 0 to 95% relative humidity

(can withstand 100% condensing humidity for short periods of time)

Conduit Entry: ¾" NPT

Enclosure Material: Stainless Steel Grade 316

Weight: Stainless Steel 11lbs (5.0kg)

3.0 Safety Considerations

⚠ *Before installing and operating the IPES-IR3, be sure to read this entire manual. Failure to follow these guidelines could result in impaired product performance and safety hazards.*

Guidelines

For maximum safety:

- Only persons who have thoroughly read and understood this manual, are trained in safety techniques, and have electric-safety certificates are permitted to install and operate the IPES-IR3.
- Never operate the IPES-IR3 if the casing is damaged.
- Do not open, separate or disassemble the IPES-IR3 when energized.
- Refer to the Appendices and diagrams in this manual to ensure that the wiring is in compliance with local ordinances and the NEC.
- Perform regular testing and maintenance as outlined in the Maintenance section.
- Ensure that fire-alarm and fire-extinguishing systems and controls are switched off before any testing or maintenance to avoid unwanted operation of alarms and fire-extinguishing equipment.

Also see the individual sections in this manual for relevant specific safety guidelines.

Explosion Protection Means

The table below describes design features that protect the IPES-IR3 against explosions:

Feature	Protection Means
Enclosure of Current Carrying Parts	The casing includes spigot joints with controlled gaps to meet explosion-proof requirements for installation in Class I, Division I, Group B, C and D, and T4 locations.
Case Mechanical Strength	The high mechanical strength of the case is able to withstand high explosive pressures without rupture or failures of mechanical parts. The case design is in
Manufacturing Control Of Casing	Important parameters include: • Maximum width and minimum length of spigot joints • Surface roughness of the joined parts • The number of complete intact threads at the conduit entry point
Ignition Temperature	The ignition temperature of the surrounding environment is limited by the outside surface temperature of the housing, which does not exceed
Securing of Bolts, Joints and Grounding	Spring washers, lock washers, and lock nuts maintain the integrity of the bolted connections by preventing
Joined Parts Protection	Anti-seize lubricant is applied on the critical joints as described on Appendix A.
Casing Ingress Protection	The design of the casing is protection class IP 66 in accordance with IEC 60529-004.
Sealing Cables at Conduit Entry	Use approved hazardous location sealed conduit fittings. For outdoor installations, ensure sealing meets IP66

4.0 FM Compliance

IPES-IR3   Meets FM (US and Canada) certifications and requirements for Hazardous Location classification: Class I, Division I, Group B, C and D and T4 Case design accords with FM 3600 and FM 3615. Ta = -40°C to +85°C (-40°F to +185°F) IP66

Standards

TITLE	AUTHOR-NUMBER	DATE
National Fire Alarm Code	ANSI/NFPA 72	2002
Radiant Energy-Sensing Fire Detectors for Automatic Fire Alarm Signaling	ANSI/FM – 3260	2004
Radiant Energy-Sensing Fire Detectors for Automatic Fire Alarm Signaling	FM Approvals - 3260	2000
Electrical Equipment For Use In Hazardous (Classified) Locations – General Requirements	FM Approvals – 3600	1998
Explosion proof Electrical Equipment – General Requirements	FM Approvals – 3615	2006
Flame Detectors	ULC/ORD - C386	1990
Standard for Smoke Detectors for Fire Alarm Systems	CAN/ULC - S529	2002
Threaded Conduit Entries	CSA C22.2 No. 0.5 (Reaffirmed)	1982 (1999)
Explosion-Proof Enclosures for Use in Class I Hazardous Locations	CSA C22.2 No. 30 (Reaffirmed)	1986 (2003)
Degrees of Protection Provided by Enclosures (IP Code)	ANSI/IEC 60529 CSA-C22.2 No. 60529	2004 2005
Explosive Atmospheres, General Requirements	ANSI/ISA 60079-0	2009
Explosive Atmospheres, Equipment protection by flameproof "d" enclosures	ANSI/ISA 60079-1	2009

Flame Response Sensitivity   When an IPES-IR3 detector is exposed to a series of test fires along the center line of the sensor as described in the table below, the alarm response of the IPES-IR3 is below the 30- second response time required under FM Standard 3260.

Fuel	Distance	Fire Size	Average Time
n-Heptane	211 ft. (64 m.)	1 ft. x 1 ft. (32.5 cm.) pan	9 sec.
Denatured ethyl alcohol (85.4%)	151 ft. (46 m.)	1 ft. x 1 ft. (32.5 cm.)	11 sec.
JP4	206 ft. (63 m.)	2 ft. x 2 ft. (60 cm.) pan	10 sec.

**False Stimuli
Exposure**

When the IPES-IR3 is exposed to the fires specified above, and are in the presence of the following false stimuli sources – modulated at approximately 1.5 Hz, and un-modulated – no false alarm activation or instability occurs at the minimum distances listed below.

Source	Distance
1.5 kW Heater	36 inches (0.9 m)
Arc welder, 200A, 3/16" – 7018 electrode	9.0 feet (3.7 m)
Fluorescent, (2) 20W (6000 Lux)	0 inches (0 m)
Halogen, 500W	36 inches (0.9 m)
Incandescent, 100W (2000 Lux)	12 inches (0.3 m)
Direct sunlight	Detectors not affected by frequency range of visible light
Indirect sunlight	Detectors not affected by frequency range of visible light

Field of View

The IPES-IR3 has a 90° cone of vision (horizontal) with the highest sensitivity lying along the central axis
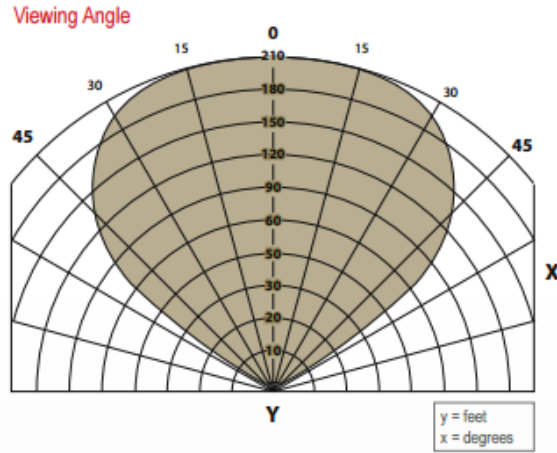
X= Distance in Ft Y= Angle of Vision
Refer to Section 7.0 for testing method

5.0 Performance Characteristics
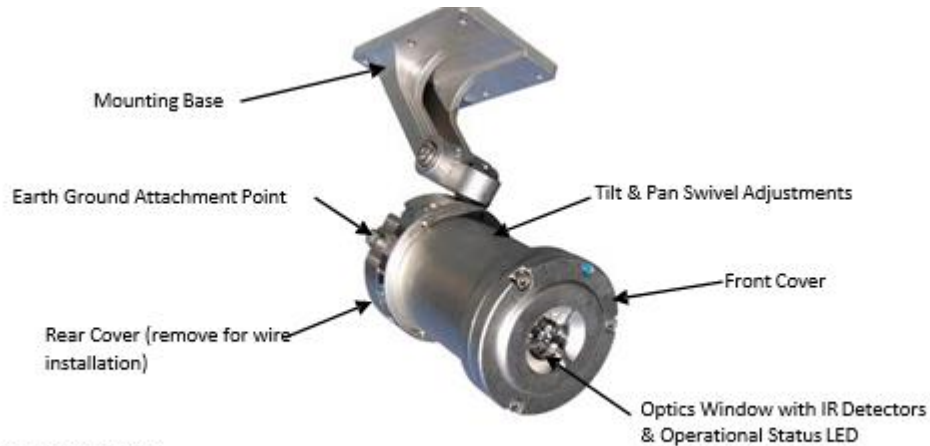
Figure 5-1: IPES-IR3 Components

Appearance

The IPES-IR3 consists of an explosion-proof casing with sensors to detect electromagnetic radiation from flames at three points within a spectral window of 4.0 to 5.0μm. Detection is performed using Infrared Sensors that capture heat and radiating gas signatures emitted by fire. Significantly, the IPES-IR3 can detect fires fueled by hydrocarbon-based liquids and gases that may not be visible to the human eye.

The basic technology is well tested and used for many devices designed for human interaction. These include night vision equipment, FLIR navigation assist, and Spectral Telescopes used in astronomy.

The IPES-IR3 uses microprocessors with proprietary algorithms that transform the detected signal into industry standard analog and digital communication signals, alarms indicators.

Response Time

The IPES-IR3 response time detecting radiation emitted by test sources of n-Heptane combustion in a 12" x 12" (0.3m by 0.3m) pan, and ethyl alcohol combustion in a 12" x 12" (0.3m by 0.3m) pan, at a distance of 150 feet (46 meters) does not exceed 30 seconds.

The sensitivity and response time can be varied in order to reduce unwanted "noise" when the IPES-IR3 identifies a fire, or the distance to the probable place of fire is short ("near/far" and "slow/fast" modes).

Generation of Alarm Signals

The IPES-IR3 takes the following parameters into consideration when generating an alarm signal:

- Magnitude of signals from different optical channels

- Ratios between the signal amplitudes of different channels

- Signal modulation frequency

- Phase relationships among the channels

Elimination of False Alarms

False alarms from detectors used for industrial applications can cost productivity in down time. This is especially noted for automated systems and processes.

Conversely, failure to generate an alarm can have catastrophic results.

The combination of microprocessor, algorithms, multiple sensors and wavelength range settings makes the IPES-IR3 an excellent choice for elimination of false positive indicators caused by non-flame sources of radiation such as artificial lighting, direct and indirect sunlight, lightning, electrical arcs, radiation (nuclear), arc welding and metal grinding.

An Alarm condition will normally override a Fault condition unless a loss of operating power impairs the detector's ability to generate or maintain an alarm. The IPES-IR3 reports both Fault and Alarm conditions exclusive of each other. This means both a Fire and Fault can be reported at the same time if they occur simultaneously.

Serviceability

The IPES-IR3 remains serviceable in non-heated rooms or under sheds at temperatures from – 40°F to +185°F (–40° to +85°C).

LED

Normal, Fire and Fault conditions are indicated by status LEDs located on the cover. Refer to Table 5-1: Determining LED Conditions.

Optical Integrity

To maintain reliability of the IPES-IR3, the optical devices are automatically self-tested for radiation transmission every 25 to 45 minutes. This routine test does not require the use of a test lamp. This test determines whether any dust or other contamination has formed on the detecting windows which would scatter the infrared radiation.

IPES IR3 FRONT VIEW

SELF-TEST LAMPS
(OUTER RING BENEATH STUBS)

STATUS LED
(CENTER RING)

IR DETECTORS
(MIDDLE RING)
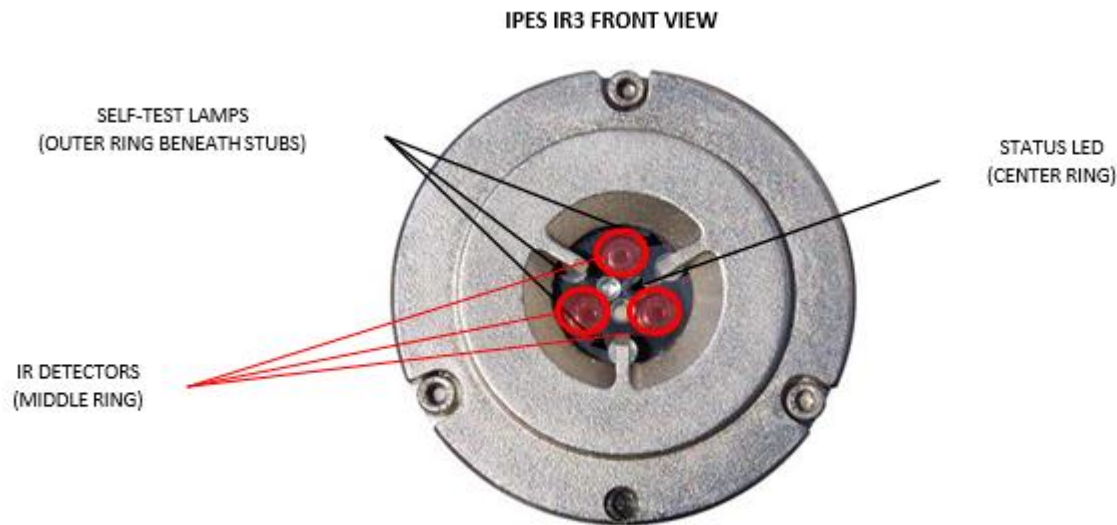
Figure 5-2: IR Detectors and LED Indicators

Table 5-1: Determining LED Conditions

After completing all installation steps, refer to the illustration and LED indicator table below to determine LED conditions.

State	IPES-IR3 status	Fire Relay State Normally open when energized	Fault Relay Status Normally closed when energized	Output signal, am	LED Status Condition
1	No power supply voltage	Open	Open	0mA	Off
2	After switching on during 45 sec.	Open	Open	2mA	Continuous green LED light for the first 10 sec. and then the green LED will begin flashing.
3	Fault or optical interference (dust)	Open	Open	2mA	Alternate flashing of the yellow and green LED lights.
4	Normal (no faults or fires during operation)	Open	Closed	4mA	Continuous lighting of the green LED light.
5	Fire	Closed	Closed	18mA	Continuous lighting of the red LED light.
6	Fire & Fault	Closed	Open	8mA	Alternate flashing of the yellow and green LED light.
7	Test mode (magnetic collar is on)	Open	Open	2mA	Magnetic collar is on. fire relay is blocked.

Analog Signal

Analog signal (4-20 mA)	
Signal level	**Detector State**
(±0.1) mA	Circuit opening
(2 ± 0.1) mA	Fault
(4 ± 0.1) mA	Normal
(18 ± 0.1) mA	Fire
(2 ± 0.1) mA	Magnetic Collar Test
(4.1 ± 0.1) mA	Self-Test-Every 35 minutes

Digital Signal

Informational digital signals are standard RS-485 communication with Modbus:

- Hardware self-test Fault
- Optical interference Fault
- Fire detected

(The digital channel protocol Modbus RTU is described in Appendix B.)

Relay Dry Contact Signal

Relay dry contact signal:

- Operation of the normally open Fire relay dry contacts*
  - FIRE relay – two-directional single-pole contact, which allows the state to be changed at the output to normally closed or normally open. Relay state is set at the factory. Default setting is Normally Open (Closes when in Fire Alarm mode). The contact relay is rated for currents ranging from 10 mA to 5 A at DC voltage of 30 V. The output signal "Fire" can be cleared after eliminating the source of the alarm signal.

    * A normally closed condition of the Fire relay contacts does not comply with the requirements of NFPA 72 or ULC/ORD – C386 and is not approved by FM approvals.
- Operation of the normally open Fault relay dry contacts
  - FAULT relay – single-direction pole contact which is normally open. The relay is designed to handle currents of 10 mA to 5 A at DC voltage of 30 V.

Operating Modes

Refer to Table 5-1: Determining LED Conditions above.
Possible detector configurations using ESP Commander

The IPES–IR3 has the following detector operating modes:

- "Near/far" and "slow/fast" modes – To provide maximum sensitivity.

- "Latching/non-latching mode"– To select either latching or non-latching functionality of the fire relay, which provides latching alarm state for the fire-alarm relay in compliance with NFPA 72 and ULC/ORD – C386.

The manufacturer's default settings correspond to far and fast. To change the manufacturer's settings, connect the flame detector to the computer and use the ESP Commander program.

HART Protocol Communication

The HART communication is used to monitor status of the flame detectors and provides the flexibility to make configuration changes in the field. The important status monitored are the process value (value to determine fault, or alarm conditions). In addition, the user can test the built-in test, which occurs automatically every 35 mins. For more details, HART menu tree and connection diagram, please refer to the Appendix C.

6.0 Installation

Component Parts and Delivery Set

The IPES-IR3 detector component parts and delivery set consists of the following:

- One IPES-IR3 Fire Detector
- One Adjustable Mounting Bracket
- One Operating Manual
- IPES Mounting Hardware (bolts, nuts, washers, etc.).
- One Sunshade Hood
- Optional magnetic collar (delivered only by special request).

Compare the contents of the set to the packing list to be sure all items were received. If any items are missing, contact ESP Safety Inc.

Visual Examination

- The nameplates and warning labels are in place.

- The external surfaces of the elements and joined surfaces of the casing are free of dents or damage.

- The tamper-proof screw is intact on the front cover

Pre-Installation Steps

Make sure all removable parts are joined to the casing as tightly as possible.

> ⚠️ **Warning:** *Do not open, separate or disassemble casing when energized! Separating the casing can result in serious damage to the detector which could go undetected, resulting in failure to detect fires.*

Installation

Positioning the Detector

1. Position the detector to provide an unobstructed view of the area to be protected. The detector's 90° viewing angle is most sensitive along the central axis; therefore, position the central axis so that it has the best unobstructed view of the place of probable fire. Use line of sight or laser level for more precise targeting.

2. Identify all high-risk fire sources, to determine the number of detectors needed for adequate coverage.

3. Locate the detector(s) for ease of cleaning and servicing. Ensure that probable fire sources are within the detector(s) field of view and detection range.

4. When installing multiple detectors in the same area, be aware of overlapping fields of view and detector hierarchy. Overlapping fields of view can be used to provide additional protection against false positives or false negatives, depending on the control system logic connected to the detectors.

   Note: To mitigate false positives, position the detector so that its field of view does not cover any areas outside the hazardous area.

5. Mount the detector on a rigid surface which minimizes vibrations. Use the mounting hardware provided along with the rubber bushings to further isolate the detector from vibrations

   Note: ESP Safety Inc. recommends bolting the mounting base plate to the mounting surface. If bolting is not possible, the mounting plate can be welded to the mounting surface if it is a similar metal (either 316 Stainless Steel or 6061 aluminum). Before welding, be sure to remove the detector from the base plate before attempting any weld operation.

Moisture Damage Protection

- It is the responsibility of the installer to take proper precautions during installation to protect the electrical connections and components from moisture.

- Anti-seize lubricant is provided for easy assembly and corrosion protection of the joints between the enclosure/cover and enclosure/base. After disassembly, wipe these surfaces clean with a soft cotton or wool cloth and then re-apply a thin layer of lubricant prior to assembly.

- If installing wiring cable in conduit, do not use conduit for wiring to other equipment.

- Care should be taken to not install the detector where heavy condensate, rain, or fog can cover the lens and reduce the sensitivity of the detector.

General Wiring Requirements

> ⚠️ *Caution: All cable/conduit entries must be sealed with an appropriate and certified sealing plug and cable gland. The use of industrial grade, armored field cable is recommended.*

Cabling Guidelines

If installing connection cables in an explosion proof conduit, do not use the same conduit to carry wiring for any other purpose or equipment.

Minimum 14 AWG (2.08 mm2) shielded cable conductors are required for optimal performance. The gauge of the wire used determines the maximum distance between the 24VDC power sources.

When using Modbus, power and signal must be separate shielded twisted pair conductors

24VDC Requirements

The IPES-IR3 detector has a maximum power draw of 3VA/Watt in an active alarm state with all relays and optics heater active. (Fault, Alarm1) Select a power supply with adequate capability for the calculated load. Ensure that the 24VDC (+/-8VDC) power positive and common connections are from the same source

> ⚠️ *Warning: System ground must be provided at the point of origination for 24VDC. Failure to do this may result in loss of range and/or signal integrity.*
>
> *Avoid low frequency, high voltage, and non-signaling conductors to prevent potential EMI problems.*

Earth Grounding

The enclosure of the IPES-IR3 must be earthed/grounded for electrical safety and to limit the effects of radio frequency interference. An earth/ground point is provided on the outside of the IPES-IR3 Explosion Proof enclosure.

Use 14 AWG copper (Stranded, or Solid), wire.

Loosen the nut sufficiently to enable wrapping of the wire or wire terminated with a crimped lug around the thread in a "U" shape. Raise the flat and lock washers and position the wire between the 2 flat washers and ground base.

*Note: Earth and System Grounds are separated to prevent ground loop potential plus maintain signal and current output integrity

Power Cable Conductor Size affects Cable Length

The IPES-IR3 detector must receive a nominal voltage of 24 VDC (+/- 8VDC) to operate properly. Wire size requirements are dependent upon power supply voltage and wire length.

There are several possible methods to electrically connect an IPES-IR3 that are determined by each user's application.

These can run from a single IPES-IR3 running on 24VDC that is operating as an isolated device and is connected directly to a warning system of alarms and/or lights to a network of devices that are connected in series that can provide any mix of RS-485 Modbus, +4 to 20 am, and relays to separate devices.

22 AWG 0.326mm^2)	40.5Ω	750	2460
20 AWG 0.518mm^2)	40.8	1200	3936
18 AWG 0.823mm^2)	40.7Ω	1900	6232
16 AWG (1.31mm^2)	40.2Ω	3000	9840

IPES-IR3 Terminal Block
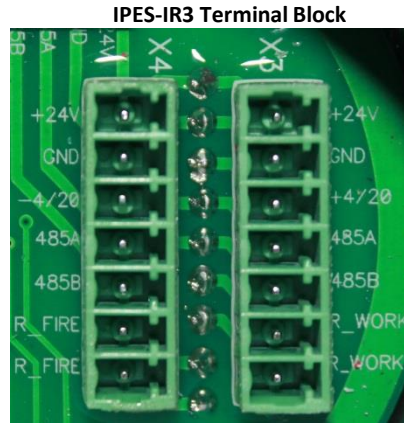
Table 6-1: Arrangement of Electrical Connections

Terminal Block	Pin	Function
X3	+24V	24VDC from system power source (External User Provided)
	GND	System Ground from system power source (External User Provided)
	+4/20	Industry Standard +4-20mA current loop output
	RS485A	RS-485 MODBUS
	RS485B	RS-485 MODBUS
	R_WORK R_WORK	Fault / Obstruction Relay Normally Closed (NC Type B) When Energized
X4	+24V	Output to next device if required
	GND	Output to next device if required
	-4/20	Industry Standard +4-20mA current loop output
	RS485A	Output to next device if required
	RS485B	Output to next device if required
	R_FIRE R_FIRE	Alarm Relay Normally Open (NO Type A) When Energized
X5		Factory Use
X6		Factory Use

Arrangement of Electrical Connections

Arrange the electrical connections as described in Table 6-1, Table 6-2 and Figure 6-3 below.

To connect the IPES-IR3 to external devices, use armored control cables 4 x 1.5, which are used in all classes of explosive zones including indoor and outdoor sites, channels, tunnels, ground (trenches) with corrosive medium, and in zones containing roaming currents.

Setting the Modbus Address and Baud Rate

To ensure proper communications, a unique address must be assigned to each device, as duplicate addresses are not automatically detected. Modules with duplicate addresses will report with the same address, confusing latest updates. Record all addresses and device types after completing the installation.

Refer to Appendix B for setting the Modbus address and baud rate.

When using an RS-485 bus connection, it is advisable to connect the IPES-IR3 to the bus via the terminal box. To connect the detector to the terminal box, use a cable not longer than 1.64 feet (0.5 m). The cable characteristics should meet the requirement of the cable entries mounted on the IPES-IR3 casing and those of the terminal box.

Completing the Installation

For the following,

1. Unscrew the M5 Socket Head Cap screws from the base. Remove the detector from the base.

2. Detach NPT conduit bushing from base.

3. Install the base on a suitable work platform and secure using the 4 mounting screws, washers, nuts, and rubber grommets.

4. Run the power, control, and ground wires from the conduit into the conduit bushing and connect to the wiring terminals in the base. Follow Figure 6-2, Arrangement and Functions of Mounting Connection Terminals, for details.

5. Tighten the conduit bushing to 4-1/2 +- 1 turns of engagement. **Seal** the conduit entry with an approved hazardous location conduit sealant.

6. Run the earth ground wire to the external ground stud on the base.

7. After completing all wiring, refer to Table 6-1 to verify the functionality of the front cover LEDs.

8. Inspect base and re-apply a thin film of anti-seize compound if required; re-install the detector on the base and evenly tighten the M5 screws to 40 in-lbs.

9. Upon completing the installation, check the resistance of the earth ground lug to ground which should not exceed 1 ohm.

10. Arrange the power-supply system so that the power-supply voltage across the device terminals ranges from 18 to 32 V (taking into account the IPES-IR3 consumption).

IPES-IR3 3 Wire +4 to 20 mA Current Loop Wiring Diagram

When using the current loop method of connection the circuit is a point- to-point connection between a single IPES-IR3 and a threshold detection device. In most cases the threshold device will provide the 24VDC power and will operate in a closed loop. Refer to Appendix C for interpretation of

+4 to 20ma indications.

If 24VDC is from a common source, use of a connection bus-block is recommended to provide connect/disconnect capability without disruption to any other devices using the same power source.
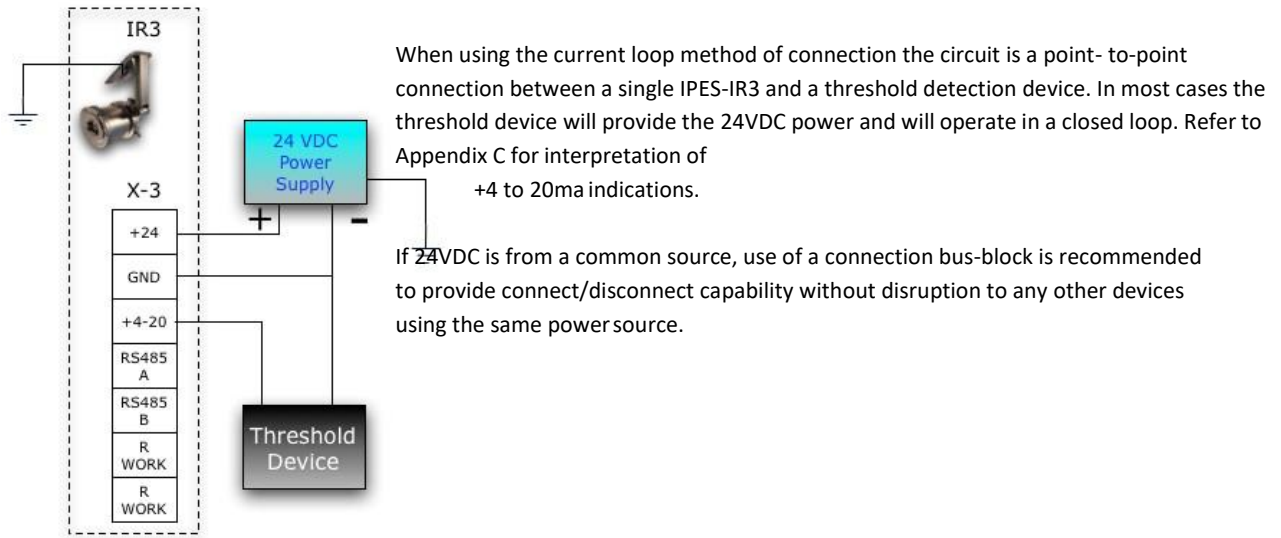
Figure 6-3: IPES-IR3 Connection to Analog +4 to 20 mA Current Loop

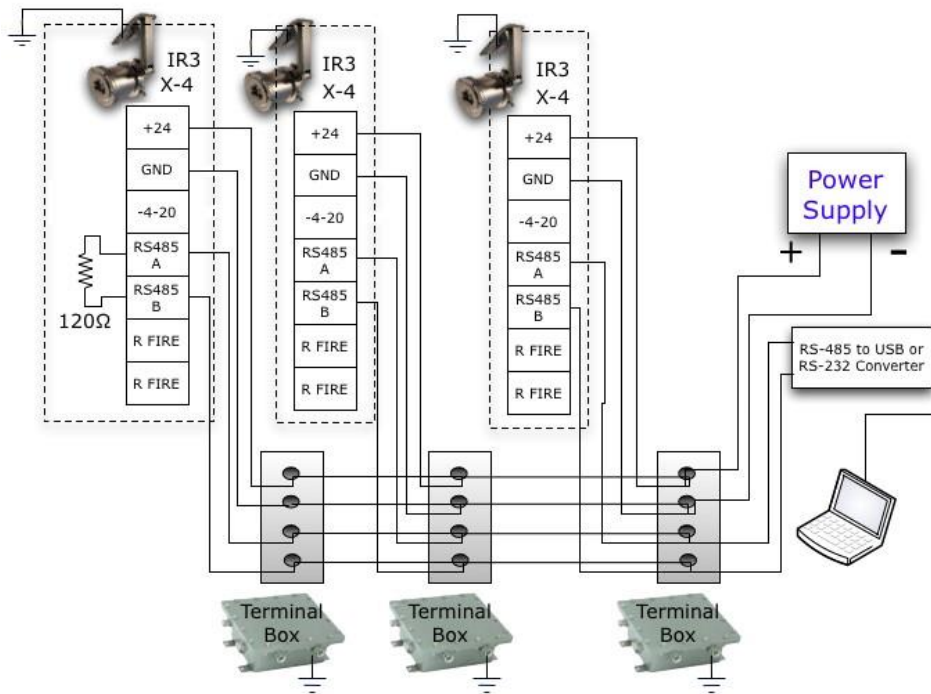**Connection to Digital RS-485 Circuit**

Figure 6-4: IPES-IR3 Connection to Digital RS-485 Circuit

7.0 Startup and Operation

Installation Review Prior to Startup Once the mounting, cabling, and alarm relay installation has been completed, the IPES IR3 is ready to begin the power-on sequence.

Before applying power to the system for the first time, review the steps below:

- Verify that the IPES IR3 has been properly mounted.

- Verify that all conduit / cable gland entries have been tightened and sealed if necessary.

- Verify that all sensor wiring has been installed correctly.

- Verify that the enclosure has been connected to an earth/ground.

- Verify that the IPES IR3 cover is securely installed

- Disconnect or power down all output devices and alarms to prevent false actuation.

Once you are ready to begin startup, verify that the power supply is connected properly and verify the power supply voltage with the IPES IR3 is disconnected at the source. The IPES IR3 is powered by 24 VDC (18 to 32 VDC voltage range).

Performance Test Test Equipment After installation is complete, conduct a performance test as follows, to ensure that the detector is functioning properly. ESP Safety, Inc.'s ITES Dual-Test Lamp (part number 120-0007) is designed to assist in the functional testing of the detectors without the need to remove the detector from the application. The Test Lamp generates directed modulated radiation with sufficient intensity to signal a flame or fire response to the detector, indicated by a flashing red LED on the IPES-IR3.

Each Test Lamp is supplied pre-assembled with an emission source, housing, batteries, and an Operating Manual.

ITES Dual-Test Lamp (Part Number 120-0007)

Power-On Self-Test After supplying power to the detector (24VDC +/-8VDC) the unit will perform a self-test procedure

1. When power is applied, the status indicator led lights up for 3 seconds in a solid yellow color. In three seconds, the status led will blink yellow for 7-8 seconds, after this, the self-testing of the device starts (three self-test lamps beneath the cantilevers of the optics window will flash three times).

   a. The 'Working order' relay (R_WORK on the IPES-IR3 X3 receptacle) will be open (Fault Indication) during portions of the initial self-test cycle.

   b. The analog +4 to 20mA output will be at 2.0mA indicating the IR 3 is in the power on mode

2. After the self-test, the LED will glow with a solid color depending on the test results: yellow-test failed, green-the device is operable

IPES-IR3 in Self-Test Mode

After a successful test, the output signals of the IPES-IR3 will be in the following states:

- Actuation (closure of contacts) of 'Fault relay, indicating a 'Working order'/operational condition.

- Indicator led has a solid green light, which corresponds to the 'Normal work'/operational mode of the detector as detailed in the next image.

- The +4-20mA analog output will be at (4±0,1) mA (Operational Status)

Fire Detection Test

After installation is complete, conduct a fire detection test to ensure that the detector properly detects a fire condition.

An optional Test Lamp in conjunction with a magnetic Test collar are used to perform the test on the IPES-IR3.

Magnetic Test Collar

Fig 7-1: Placement of Magnetic Collar and Testing with Test Lamp

- Attach the Magnetic Collar with the Magnet placed into the slot on the enclosure. This will put the IPES-IR3 into Fault Mode and the status LED will change from Green to Yellow indicating a Test function.

- Point the laser beam at the mid-range sensor 4.45 uM IR detector. This will set the IPES-IR3 into fire indication mode. The status indicator will now blink yellow-red indicating both Fault and Fire conditions.

- To prevent a false alarm during this test, the Fault relay will be actuated (In an open state) and the Fire relay will remain in a not active state (Open)

- The Analog +4 to 20mA will indicate 2mA for Test Mode

- Once testing is successfully completed, remove magnetic collar to return the IPES-IR3 into operation.

**Photonic Detector
Locations**
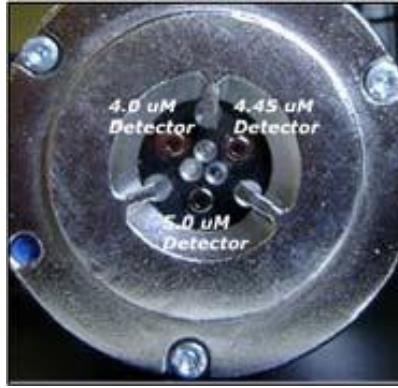
**Dust/ Obstruction
Fault Test**

Simulation of dust or obstruction on optical window of the IPES-IR3 is done by placing a non-transparent material with good reflective properties (white sheet of paper) in front of the optical window of IR channel for 15-20 sec.
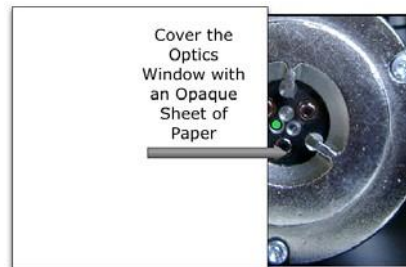
If the Dust/obstruction detection function is working properly, the FAULT Relay will activate (Open) and the status LED will alternate YELLOW-GREEN to indicate the fault.

When the obstruction is removed, the status indicator will return to the GREEN- Operational State and the Fault Relay will return to the normal closed state.

8.0 Troubleshooting

> ⚠️ **The sensor module ("front" half of the detector) contains no user-serviceable components and should never be opened. The terminal compartment is the only part of the enclosure that should be opened by the user in the field.**

Troubleshooting Table

If testing reveals a Fault condition or failure to detect a flame, follow the troubleshooting procedures in the table below. The table describes a variety of possible failures and corrective actions.

If the troubleshooting procedures do not correct the problem, contact ESP Safety Inc.

Failure Symptoms	Possible Cause	Corrective Procedure
Red LEDs do not glow.	No power supply.	Detach the base with the cable entry from the IPES-IR3 enclosure and make sure that the terminals are supplied with a voltage of 24±8 VDC.
Fault relay contacts are open; signaling LEDs blink frequently.*	Optical interference (dust)	Clean the IPES-IR3 window with: • *Commercially available optical lens cleaning pads* • *Optical Lens Cleaning Solution and optical grade suede chamois* • *Flushing the surface with Isopropyl Alcohol* A clean soft cloth or cotton swab dampened with Isopropyl Alcohol. After wiping the surface with alcohol, wipe it again with a dry cloth in order to remove residual film.
IPES does not react to the test flame.	Optical interference (dust, or contaminated with substances) preventing passage of radiation to the detector.	Wipe the protection windows with a soft cloth wetted with denatured isopropyl alcohol (IPA) and then wipe with a clean dry cloth to remove any residue of dirt.

9.0 Maintenance

> ⚠️ **Disconnect or power down all output devices and alarms to prevent false actuation.**

Maintenance Activities

IPES-IR3 maintenance includes the following activities:
- Visual examination
- Cleaning
- Checking the grounding and explosion-protection systems
- Performance test.

This section describes maintenance activities to be performed once a day or every six months. Automatic testing is also discussed.

Daily Maintenance

Visual Examination

Perform a daily examination of the IPES-IR3, checking for any visible mechanical damage such as dents to the enclosure or a cracked lens. If any damage is noted, immediately pull the detector from service and replace with a new detector.

Every Six Months

Every six months, or as required, perform the following:

Cleaning

Clean the IPES-IR3 every six months (if there is no visible severe contamination) or as required if the signal "Fault" arises; also clean the surface of the detector if it is covered with dust. To clean the detector:

- **Enclosure** - Remove dust from the enclosure with a brush or a soft cloth slightly wetted with denatured isopropyl alcohol (IPA). After wiping the surface with alcohol, wipe again with a clean dry cloth to remove any residual dirt.

- **Protection windows** – Clean with a soft cloth wetted with denatured isopropyl alcohol (IPA). After wiping the surface with alcohol, wipe again with a clean dry cloth to remove any residual dirt.

Grounding and Explosion-Protection Systems

Check to be sure that the joints are sufficiently tight. Thoroughly clean the external grounding wire and apply anti-seize lubricant (supplied by the manufacturer) on the critical joints.

Perform this test on all detectors in the system.

1. Apply power to the detector. After 1 to 5 seconds, the output current will increase to 4 mA, and the indicating LEDs will start blinking.
2. If it is necessary to isolate the detector fire relay from the alarm system, apply the magnetic collar over the enclosure as shown in Figure 7-1. Placing the collar over the enclosure as shown allows the fire relay contacts to remain in the non-alarm state during testing.
3. Perform the test with the ITES Test Lamp as follows:
   - Attach the Magnetic Collar with the Magnet placed into the slot on the enclosure. This will put the IPES-IR3 into Fault Mode and the status LED will change from Green to Yellow indicating a Test function.
   - Point the laser beam at the mid-range sensor 4.45 uM IR detector. This will set the IPES-IR3 into fire indication mode. The status indicator will now blink yellow-red indicating both Fault and Fire conditions.
   - To prevent a false alarm during this test, the Fault relay will be actuated (In an open state) and the Fire relay will remain in a not active state (Open)
   - The Analog +4 to 20mA will indicate 2mA for Test Mode with magnetic collar on
   If any detector fails this test, refer to Section 8.0, Troubleshooting.
4. Once testing is complete, remove the magnetic collar before reconnecting the detector to the fire-alarm or burglar-fire alarm system.

NOTES:

- Always make sure that the ITES Test Lamp has fresh batteries.

- Keep the Test Lamp lens free from dust, dirt, and moisture. If necessary, clean the lens with a soft wool or cotton cloth.

Automatic Testing   If the lens becomes dirty or coated, a change in radiation transmissibility could reduce the detector's sensitivity. To safeguard against this, the IPES-IR3 continuously tests the lens for optical clarity and sends a Fault alarm when the radiation transmissibility reaches a critical threshold.

In addition, the sensors are routinely tested every 25 to 45 minutes by use of internal test lamps. If the IPES-IR3 does not pass the self-test, a Fault alarm is sent. This routine test does not require the use of an external ITES Test Lamp.

10.0 Transportation and Storage

Transportation   When shipped in the factory-supplied carton, the model IPES-IR3 can be shipped via any method of transportation from the manufacturer's site to any destination regardless of distance.

Storage   Until use, store the detector in the manufacturer's original carton. The storage facility should be free of dust, acid and alkaline vapors, corrosive gases and other harmful substances.

11.0 Warranties

ESP Safety, Inc. ("ESP") warrants the IPES-IR3 Flame Detector to be free from defects in material and workmanship under normal use and service for a period of five (5) years, beginning on the date of shipment to the buyer. This warranty extends only to the sale of new and unused products to the original buyer. ESP's warranty obligation is limited, at ESP's option, to refund of the purchase price, repair, or replacement of a defective product or a component thereof, to the extent that the product is properly returned to ESP within the warranty period.

This warranty does not include:

a)   fuses, disposable batteries or the routine replacement of parts due to the normal wear and tear of the product arising from use;

b)   any product or component which in ESP's opinion, has been misused, altered, abused, tampered with, improperly maintained or used, neglected or otherwise damaged by accident or abnormal conditions of operation, handling or use, or to have deteriorated due to aging of any component made of rubber or any other elastomer; or

c)   any damage or defect attributable to repair of the product by any person other than an authorized dealer, or the installation of unapproved parts on the product.

The obligations set forth in this warranty are conditional on:

a)   proper storage, installation, calibration, use, maintenance and compliance with the product manual instructions and any other applicable recommendations of ESP;

b)   the buyer promptly notifying ESP of any defect and, if required, promptly making the product available for correction. No goods shall be returned to ESP until receipt by buyer of shipping instructions from ESP. A return authorization number must be obtained from ESP prior to shipment; and

c)   all warranty returns being shipped directly to ESP Safety, Inc.;

d)   the right of ESP to require that the buyer provide proof of purchase such as the original invoice, bill of sale or packing slip to establish that the product is within the warranty period.

THE BUYER AGREES THAT THIS WARRANTY IS THE BUYER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. ESP SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES. ESP WILL NOT BE LIABLE FOR LOSS OR DAMAGE OF ANY KIND CONNECTED TO THE USE OF ITS PRODUCTS OR FAILURE OF ITS PRODUCTS TO FUNCTION OR OPERATE PROPERLY. IN NO EVENT SHALL ESP'S LIABILITY HEREUNDER EXCEED THE PURCHASE PRICE ACTUALLY PAID BY THE BUYER FOR THE PRODUCT.

To the extent any provision of this warranty is held invalid or unenforceable by a court of competent jurisdiction; such holding will not affect the validity or enforceability of any other provision.

Expected Service Life of Unit: The average expected life of the IPES-IR3 is not less than 10 years.

12.0 Repair and Return

Field Repair   The IPES-IR3 detector is not intended to be repaired in the field. If a problem should develop, refer to Section 8.0 Troubleshooting of this manual. If it is determined that the problem is caused by a manufacturing defect, please return the device to the factory for repair or replacement.

Return Material Authorization (RMA) Number   Contact ESP Safety Inc. at +1-408-886-9746 to obtain a Return Material Authorization (RMA) number. Please provide the following information during your call:
- Your Company Name
- Product Type
- Serial Number
- Date of Shipment
- Brief explanation of malfunction

Pack the unit properly to ensure that no shipping damage occurs and ship to:
ESP Safety, Inc.
555 North First Street San Jose, CA 95112 USA

Write the RMA number on the front of the shipping carton

ESP Safety, Inc. recommends that an inventory of spare detectors be kept on hand to enable rapid field replacement and minimize downtime.

13.0 Parts Ordering Information

The following items for the IPES-IR3 may be ordered:

- Adjustable Mounting Bracket 125-0003
- IPES Mounting Hardware (bolts, nuts, washers, etc.), part number 125-0001
- Magnetic collar, part number 120-0006
- Sunshade Hood 125-0005
- ITES Test Lamp, part number 120-0007

Order from: ESP Safety Inc.
555 North First Street San Jose, CA
95112 USA Ph: 408-886-9746
Fax: 408-886-9757

Please note that shipping charges will be added to your order.

14.0 Certifications

The IPES–IR3 meets the following certifications:

FM (U.S. & Canada) **Hazardous Locations** **Zone Locations**	Class I, Division 1, Groups B, C & D, T4, Ta = -40ºC to +85ºC (-40ºF to +185ºF) IP66 Class I, Zone 1, AEx d IIC, T4, Gb 1. ISO Class 12.9, M5 X 20 socket-head cap screws (Yield Stress 1100 MPa) shall be used to replace the cover fasteners. 2. ISO Class 12.9, M5 X 25 socket-head cap screws (Yield Stress 1100 MPa) shall be used to replace the base fasteners.
Fire Protection Equipment	Approval Standards: FM3260 (2000); FM3600 (1998); FM3615 (2006); ANSI/ISA 60079-0 (2009); ANSI/ISA 60079-1 (2009); CAN/CSA-C22.2 No. 60079-0 (2007); CAN/CSA-C22.2 No. 60079-1 (2007) Supporting Standards: ANSI/FM3260 (2004); ANSI/NFPA 72 (2002); ULC/ORD – C386 (1990); CAN/ULC – S529 (2002); CSA C22.2 No. 0.5 (reaffirmed 1999); C22.2 No. 32 (reaffirmed 2003); ANSI/IEC 60529 (2004); CSA-C22.2 No. 60259 (2005)
ABS	Class I, Division 1, Groups B, C & D, T4 Ta = -40ºC to +85ºC (-40ºF to +185ºF) IP66
ATEX/CE	Flameproof "d" Ex d IIC T4 Gb Ta = -40ºF to +185ºF (-40ºC to +85ºC) Supporting Standards: EN 60079-0:2009; EN 60079-1:2007 ATEX Certificate Number: FM11ATEX0045X **Specific Conditions of Use:** 1. ISO Class A2-70, M5 X 16 socket-head cap screws (Yield Stress 450 MPa) shall be used to replace the cover fasteners. 2. ISO Class A2-70, M5 X 16 socket-head cap screws (Yield Stress 450 MPa) shall be used to replace the base fasteners. 3. Consult the manufacturer if dimensional information on the flameproof joints is necessary. Certificate of Conformity: CE Mark for EMC (TUV) CE Mark for ATEX IP66

IEC/IECEx	Flameproof "d"
	
	Ex d IIC T4 Gb Ta = -40ºF to +185ºF (-40ºC to +85ºC)
	
	Supporting Standards: IEC 60079-0:2007; IEC 60079-1:2007
	
	IECEx Certificate Number: IECEx FMG 11.0012X
	
	Specific Conditions of Use:
	
	  1. ISO Class A2-70, M5 X 16 socket-head cap screws (Yield Stress 450 MPa) shall be used to replace the cover fasteners.
	
	  2. ISO Class A2-70, M5 X 16 socket-head cap screws (Yield Stress 450 MPa) shall be used to replace the base fasteners.
	
	  3. Consult the manufacturer if dimensional information on the flameproof joints is necessary.

Ingress Protection	IP66 = Dust Tight, Powerful Jetting

Appendix A: IPES-IR3 Explosion Protection Means

Feature	Protection Means
Enclosure of Current Carrying Parts	The casing includes spigot joints with controlled gaps to meet explosion-proof requirements for installation in Class I, Division I, Group B, C and D, and T4 locations.
Case Mechanical Strength	The high mechanical strength of the case is able to withstand high explosive pressures without rupture or failures of mechanical parts. The case design is in accordance with FM 3600 and FM 3615.
Manufacturing Control Of Casing	Important parameters include: ● Maximum width and minimum length of spigot joints ● Surface roughness of the joined parts ● The number of complete intact threads at the conduit entry point
Ignition Temperature	The ignition temperature of the surrounding environment is limited by the outside surface temperature of the housing, which does not exceed 275°F (135°C).
Securing of Bolts, Joints and Grounding	Spring washers, lock washers, and lock nuts maintain the integrity of the bolted connections by preventing loosening of the bolts.
Joined Parts Protection	Anti-seize lubricant is applied on the critical joints.
Casing Ingress Protection	The design of the casing is protection class IP 66 in accordance with IEC 60529-004.
Sealing Cables at Conduit Entry	Use approved hazardous location sealed conduit fittings. For outdoor installations, ensure sealing meets IP66 requirements.

Appendix B: IPES Digital Communications Protocol

IPES Commands   In addition to supporting analog signals (current loop and relays), IPES-IR3 flame detectors are also capable of digital communications with remote consoles. IPES-IR3 detectors use a standard RS-485 interface with a Modbus RTU protocol layer defining the transactions between the IPES-IR3 and the console. Refer to the document "MODBUS APPLICATION PROTOCOL SPECIFICATION v1.1bx" available online at www.modbus.org for complete details of the Modbus protocol.

Setting Address/ Baud Rate Command   The factory default Modbus address for the IPES-IR3 is 247. The factory default baud rate for each detector is 9600.

The following 8-byte Modbus command must be sent to the IPES-IR3 in order for the Modbus address and baud rate to be changed:

Set address/baud rate command	
Byte	Description
0	Current Modbus address (247 if IPES-IR3 set to factory default)
1	6 (Modbus function code for writing to the device)
2	0
3	0
4	New Modbus address (must be in the range 1 to 247)
5	New baud rate (must be one of the following values): 1 – 1200 baud 2 – 2400 baud 4 – 4800 baud 8 – 9600 baud 16 – 19200 baud
6	Low byte of 16-bit CRC
7	High byte of 16-bit CRC

> *The Modbus address and baud rate are stored in non-volatile memory with a write endurance of 10000 erase-write cycles. Repeated transmission of the set address/baud rate command to the IPES-IR3 detector can potentially degrade the memory beyond its ability to retain the data being written to it. The address and baud rate should be changed only when necessary to connect the IPES-IR3 detector to a remote console.*

The IPES-IR3 will respond to the host by transmitting an identical packet to the host at the original baud that was used to receive the command. After the response has been transmitted, the IPES-IR3 will change its Modbus address and baud rate to the ones specified in the command. At that point, the remote console must change its baud rate in order to communicate further with the detector. The new Modbus address and baud rate are stored in non-volatile memory and these parameters will be retained through power cycles.

Poll Status Command

The following 8-byte Modbus command may be sent in order to poll the status of the IPES- IR3:

8-byte Modbus command	
Byte	Description
0	Current Modbus address (247 if IPES-IR3 set to factory default.
1	4 (Modbus function code for reading from the device)
2	0
3	1
4	0
5	1
6	Low byte of 16-bit CRC
7	High byte of 16-bit CRC

The IPES-IR3 responds with a 7-byte packet with the following format:

7 byte Poll Status Command	
Byte	Description
0	Current Modbus address
1	4 (Modbus function code for reading from the device)
2	2
3	Status: Bit 0: 1 = fast detection, 0 = slow detection Bit 1: 1 = high sensitivity, 0 = medium sensitivity Bit 2: 1 = latching on, 0 = latching off Bit 3: 1 = fire relay enable, 0 = fire relay disable Bit 4: 1 = fault relay enable, 0 = fault relay disable Bit 5: 1 = heater enable, 0 = heater disable Bit 6: 1 = very high sensitivity enable, 0 = very high sensitivity disable Bit7: not used
4	Detector status Bit 0: 1 = fire detected, 0 = no fire detected Bit 1: 1 = hardware fault, 0 = no hardware fault Bit 2: 1 = dust fault, 0 = no dust fault Bits 3-7: not used.
5	Low byte of 16-bit CRC
6	High byte of 16-bit CRC

> ⚠ *Sending any commands other than the ones specified is not permitted.*

Appendix C: HART Communication Protocol

Connection to HART Protocol (3-Wire)

Note: For providing of correct work of HART interface, a 250 Ohm resistor is required. In the case of low resistance of the controller 4-20 mA, the resistor can be installed in the controller input instead of IR3 output.
1. To power the IR3, connect the power cable from the 18-32 VDC power supply to X4 terminal (+24V & COM)
2. The common ground cable shall then connect to one side of the Field communicator terminal
3. Connect a cable to X3 terminal (+4/20) that is in series with a 250 Ohm resistor. This cable shall then connect to another side of the Field communicator terminal
4. Power up the IR3 and Field communicator.
5. Follow the HART menu tree to navigate to the corresponding function.
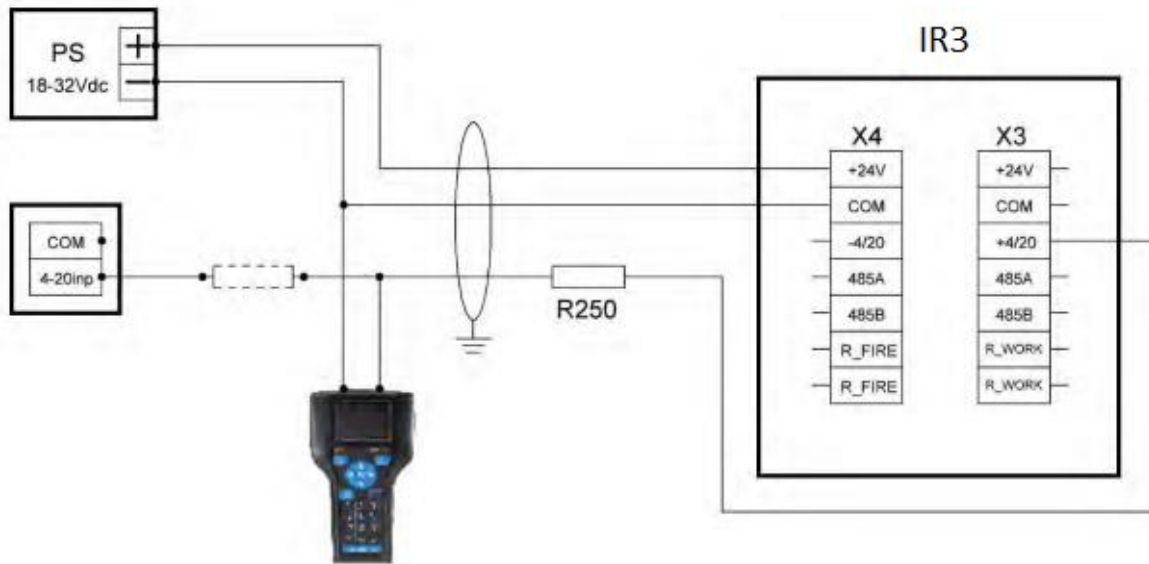
IPES-IR3 Connection to HART Communicator Handheld Device (3-Wire)

Connection to HART Protocol (4-Wire)

> **Note: For providing of correct work of HART interface, a 250 Ohm resistor is required. In the case of low resistance of the controller 4-20 mA, the resistor can be installed in the controller input instead of IR3 output.**
> 1. **To power the IR3, connect the power cable from the 18-32 VDC power supply to X4 terminal (+24V & COM)**
> 2. **Connect a cable to X4 terminal (-4/20). This cable shall then connect to one side of the Field communicator terminal**
> 3. **Connect a cable to X3 terminal (+4/20) that is in series with a 250 Ohm resistor. This cable shall then connect to another side of the Field communicator terminal**
> 4. **The connection shall form a parallel circuit with the 250 Ohm resistor**
> 5. **Power up the IR3 and Field communicator.**
> 6. **Follow the HART menu to navigate to the corresponding function.**

IPES-IR3 Connection to HART Communicator Handheld Device (4-Wire)

IPES-IR3 Main Menu

IPES-IR3
Device setup	→
Device information	→
State	0xXXXXXXXXX
Temperature	xx.xx degC
Dust	xxxx
Dust thres	xxxx ›
Work Time	xxx
PV loop current	x.xxx mA

Device information
(see page 2)

Device setup
Basic setup	→
Detailed setup	→

Basic setup
Tag	xxxxxxx ›
Long Tag	xxxxxxxxxxxxxx ›
PV Unit	None
PV xfer fnctn	xxxxx
PV Damp	x.x s
Device information	→

Detailed setup
Sensors	→
Output condition	→
Device information	→
Modbus settings	→

Sensors
Device flags	→
Device temperature sensor	→
Max dev var	11

Device flags
Dust thres	xxxx ›
State	0xXXXXXXXXX ›
Settings	0xXXXXXXXXX ›

State flags
- Device FAULT
- Fire
- Dust
- Tmpr high
- Relay No fault active
- Relay Fire active
- Tmpr low
- Selftest
- Heater ON
- Cold start

Modbus settings
Modbus address	xxx ›
Modbus baud rate	XXXX ›

Device temperature sensor
Temperature	xx.xx degC
Sensor information	→

Sensor information
Temperature Class	Temperature
Temperature PDQ	xxxx
Temperature LS	xxxxxxxxxx

State settings
- Fast response
- Far object
- Relay FIRE Locked
- Relay FIRE Enabled
- Relay NO FAULT Enabled
- Heater enabled
- Factory settings
- Fire reset
- Switch to Modbus
- Perform BIT Test
- LED Polarity

Output condition
Analog output	→
HART output	→

Analog output
PV loop current	xx.xx mA
PV Alrm. Typ	xxxxxxx
PV Channel flags	0xXX
Loop current mode	xxxxxxxx

PV Channel flags]
- Analog Output Channel

Device unit information
Distributor	ESP Safety
Model	IPES-IR3
Dev ID	xxx
Cfg chng count	xx
Tag	xxxxxxx ›
Long Tag	xxxxxxxxxxxxxx ›
Date	xx/xx/xxxx ›
Write protect	None
Descriptor	xxxxx ›
Message	xxxxx ›
Final asmbly num	xxx

HART output
Poll Addr	x ›
Num req preams	x
Num resp preams	x
ACK Count	x
BACK Count	x
STX Count	xxxx

Device information
Process variables →
All dev vars →
Status →
Review →
Revision #'s →

Process variables
PV	x
PV loop current	xx.xxx mA
SV	xx.xx degC
TV	xxxx
4V	xxxx

All dev vars
State	x.x
Temperature	xx.xx degC
Dust	xxxx
Dust thres	xxxx ›
U 4.00 um	xxx
U1 4.45 um	xxx
U1 4.45 um	xxx
U 5.00 um	xxx
TV	xxxx
4V	xxxx
Ratio 1	xxx.xx
Ratio 2	xxx.xx
Heater power	xxx ›
Heater thres	xxx ›

Status
Status group 0	0xXX
Status group 1	0xXX
Status group 2	0xXX
Status group 3	0xXX
Status group 4	0xXX
Status group 5	0xXX
Ext dev status	0xXX

Review
Model	IPES-IR3
Distributor	ESP Safety
Write protect	None
Dev ID	xxx
Cfg chng count	xx
Max dev var	11
Tag	xxxxxxx ›
Long Tag	xxxxxxxxxxxxxx ›
descriptor	xxxxx ›
Message	xxxxx ›
Date	xx/xx/xxxx ›
Final asmbly num	xxx
Universal Rev	x
Fld Dev Rev	x
Software Rev	x
Poll Addr	x
Loop current mode	XXXX
Num req preams	x
Num resp preams	x

Revision #'s
Universal Rev	x
Fld Dev Rev	x
Software Rev	x
Hardware Rev	x