IRT 021-A

Flame Detector

Technical Manual

KARF & SCOOT

Technology for Safety

If You Need to Call Customer Service;

Please retain the following information for future reference.

Model Number:
Serial Number [1]:
Purchase Date:
Place of Purchase:

Keep this User's Manual for use for warranty maintenance.

[1] The serial number is located on the back of the device.

Contact Information

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Chapter 1. Overview

1.1 What is a Flame Detector?

A fire is a phenomenon in which a substance burns in the air or oxygen with light, heat or flame, and generally burns with heat, smoke or flame. Especially, the flame shows unique combustion characteristic at the early stage of fire. At this time, a large amount of infrared and ultraviolet energy of different wavelength band of ultraviolet (UV) and infrared (IR), which is not visible to the naked eye, is emitted.

Infrared Flame Detector IRT-021-A is an infrared three-wavelength flame detector employing three digital infrared sensors that detect different wavelength characteristics within the infrared wavelength range (3.9 to 4.7 μm) emitted from the flame.

Effective detection distance is 50m, and it has been improved periodically by using artificial intelligence algorithm to detect energy similar to spark emitted from arc welding, sunlight, halogen lamp, or colored fluorescent lamp over a certain distance.

1.2 Product Features

a. Accurate fire detection function

Infrared energy and ultraviolet energy emitted by the resonance of CO2 and CO at the time of fire occurrence are accurately detected even at long distances and the data value of that energy is analyzed accurately into the flame recognition algorithm built in the flame detector by raising an alarm, we improved confidential treasure to innovation and improved accuracy and reliability.

b. Ultra compact, Ultra lightweight

By adopting the latest digital sensor with built-in digital conversion circuit optimized for IR Sensor, PCB size is minimized, ultra compact, super lightweight realized by applying latest SMT technology.

c. Output

Contact output, RS-485 output (Option)

d. Economical

Low price, excellent performance

1.3 What Comes in the Box?

- Flame detector
- Cable gland and 6P cable
- Mounting bracket, allen hex key
- User Manual

Chapter 2. Safety Hazards, Warnings and Cautions

IMPORTANT

Read and understand the instruction manual before operating or maintaining the equipment.

2.1 General Warnings and Cautions

WARNINGS AND CAUTIONS

1. Since the power supply needs to use a constant voltage, the voltage of the P type receiver circuit and the lamp voltage etc. cannot be used.

2. Please connect the detector to another DC 24V power source or dedicated SMP power board through the rectifier on the receiver before using it.

3. If an external electrical overload occurs, the product can operate the original reset circuit to reset itself, in which case it will not alarm.

4. When cleaning the product or doing other work within 1 meter of the sensor windows, the monitoring function may be impaired due to close range operation. Be sure to turn off the monitoring/alarm functions before performing cleaning or other tasks.

5. When cleaning the product or performing other work within 1m from the sensor window, the monitoring function may be affected or the detector may give a false alarm. Be sure to shut off the monitoring and alarm functions before performing the work.

6. To be explosion-proof, the effective use conditions should be checked, and the conditions should not be exceeded.

7. Users should not open product.

8. For product installation, inspection, and maintenance, please refer to IEC / EN 60079-14 and IEC/EN 60079-17.

9. Fasteners with property class A2-50 should be used.

10. Cable glands must use Ex db IIC, Ex tb IIIC, IP66 / 67 or higher rating.

11. Identification of thread size and type: NPT 1/2

2.2 Important Information

This manual is for use with IRT-021-A Series Flame Detectors only.

Karf & Scoot accepts no responsibility for the installation and/or use of the equipment unless the installation and/or use of its equipment is done in accordance with the User's Manual.

The reader of this manual should ensure that it complies with all the details of the equipment to be installed and/or operated. If in doubt, contact Karf & Scoot for advice.

The following types of alerts are used in this User's Manual:

WARNING
Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION
Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It is also used to alert the user to unsafe working practices and potential damage to equipment.

Every effort has been made to ensure the accuracy of this document; however, Karf&Scoot cannot be held responsible for any errors or omissions in this document or their consequences.

Karf & Scoot will be pleased to be aware of any errors or omissions that may be found in the content of this document.

For information not included in this document or if there is an obligation to post comments/corrections on this document, please contact Karf & Scoot using the contact details provided on the front page.

Karf & Scoot reserves the right to notify any person or entity of any renewal/change to the information provided in this document without prior notice and consent.

Chapter 3. Specifications

3.1 General Specifications

a. Detector Type

- Model: IRT-021-A, Reusable, Use indoor/outdoor, Waterproof
- Infrared 3 wavelength, DC24V
- View angle 90˚, maximum detection range 50m

b. Infrared detection wavelength band: 3.9 ~ 4.85 μm

c. False alarm immunity (KFI type approval test conditions):

- Arc welding: Immune more than 3m
- Sunlight: KFI type approval test conditions
- Halogen lamp: KFI type approval test conditions
- Fluorescent scent lamp: KFI type approval test conditions
- Colored lamp: KFI type approval test conditions

d. Response time: 2 Sec - 30 Sec

e. Detection area: 90˚ Cone-shaped monitoring

3.2 Mechanical Specifications

a. Case material: SUS-316 (Stainless-steel)

b. Case color: Silver

c. Size and weight:

- Diameter 50mm (Cable gland exclude)
- 630g (Includes cable gland)

3.3 Electrical Specifications

a. **Operation voltage and current:** DC 24V ±%20 (19.2V ~ 28.8V DC), 50mA

b. **Power consumption:** At standby and fire detection; less than 1.5W

c. **Contact Output:** ON/OFF relay contact output

d. **RS-485:** 4-20mA (Option)

e. **LED color:** There are 2 LEDs on the front of the IRT 021-A series flame detectors; red and green.

3.4 Environmental Specifications

a. **Operating temperature:** -40°C ~ +85°C

b. **Operating humidity:** 0 to 90 % RH

c. **Installation place:** Indoor or outdoor installation, there is no location restriction.

Note: It is recommended to place a stainless-steel hood or shield over the flame detector to protect it from sunlight, rain, and snow.

3.5 Sensors and LEDs

Figure 2 shows the locations of the sensor and indication LEDs of the IRT-021-A flame detector.

1- Red and Green Indication LEDs

2- IR Sensor G1

3- IR Sensor G20

4- IR Sensor G3

Figure 2: Sensors and LEDs of detector

3.6 Structure Classification and Temperature Rating

Explosion-proof Specification	
Type	[Ex db IIC T6 Gb IP66/67] [Ex tb IIIC T85 Db IP66/67]
Ambient Temperature Range	-20°C ~ +50°C
Maximum Surface Temperature	Below 85°C (T6)

Table 1: Explosion-proof Specification

3.7 Specifications Table

General	**Category**	Flame Detector (IR3)
	Type	DC24V, Normal, Explosion-proof, can be restored, Indoor/Outdoor, IR Type, Waterproof, 90˚ Cone-shaped monitoring, 50m detection range
	Model	IRT-021-A (IR-3Digital_EX)
Material	**Material**	Stainless-steel (SUS-316R)
	Color	Silver
Electrical Specifications	**Power**	DC24V ±20% (19.2~28.8V)
	Electrical Current	Standby: 40mA Operation: 50mA
	Contact Output	ON/OFF
	Communication Port	RS-485 / 4~20mA(Option)
Working Conditions	**Operating Temperature**	-20°C ~ + 50°C
	Operating Humidity	0 ~ 90% RH
	Installation Place	Indoor/Outdoor
Other Specifications	**Size**	Diameter:50mm Length: 42mm
	Weight	630g (Includes cable gland)
	Glass	Sapphire
	Explosion Proof	Ex tb IIIC T85 Db IP66/67, Ex db IIC T6 Gb IP66/67

Chapter 4. Product Installation

This section provides basic instructions for installing the detector. It does not attempt to cover all the standard practices and rules of the installation. Instead, it highlights specific aspects and provides some general guidelines for qualified personnel. Where applicable, special safety precautions are emphasized.

CAUTION

The detector is waterproof (IP67 class) so water does not leak through the case or cable gland. It is also recommended that the part connected to the fire boat (other end of cable) be thoroughly waterproofed so that it is not affected by external influences. Product damage due to improper wiring is not covered by the warranty.

4.1 General Rules

To ensure optimum performance and an efficient installation, consider the following guidelines:

a. Sensitivity

- To determine the sensitivity level, consider the following items:
- The size of the fire at the required distance to be detected,
- Combustible material type.

b. Wiring

- To protect against interference, the cable to the detector must be shielded and the detector grounded.

c. Environment

- Dust, snow, or rain may reduce the sensitivity of the detection and require further maintenance.
- The presence of high intensity and flickering IR sources can affect detector sensitivity.

4.2 Selecting Installation Position

The type and placement of fire detectors should be determined in consultation with Karf&Scoot expert technical consultants or site experts.

Note that the IRT-021-A series is flame detector only; they cannot detect flammable gas or dust environments. Please contact Karf & Scoot if you need a gas detection system.

a. Detector's viewing angle: Conical 90˚

b. Maximum detection range: 50m (For n-heptane fire 1ft2 (0.1m2))

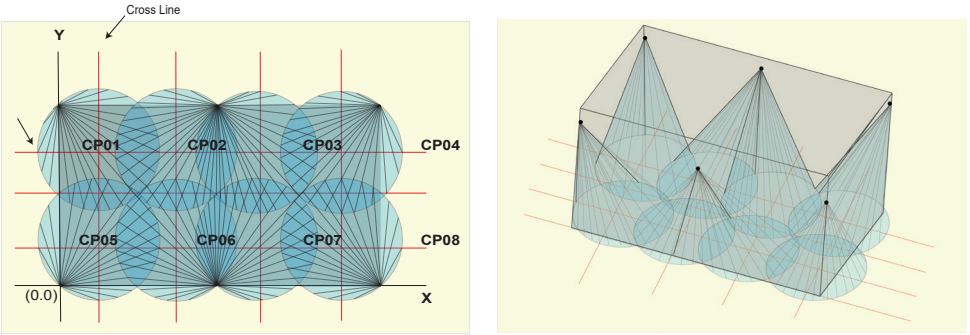


Figure 3: The Concept of Surveillance Space (CP: Center Point)

c. Things to consider when choosing the installation location:

1. Please install the detector around the expected fire area.
2. Minimize blind spots.
3. Install in the surveillance zone so that there are no gaps against the base of the surveillance zone.
4. Avoid direct sunlight and severe electromagnetic interference as much as possible.
5. The support point where the detector will be mounted must be capable of supporting the weight of the detector.
6. When choosing the detector location, choose a location free from physical shock and vibration to make maintenance/repair easy.

7. Install considering changes in ambient temperature.
8. Do not install the detector where there may be frost on the sensor window.
9. Install using the rated power (SMPS).
10. If you install the detector in a dusty environment, you should check and clean it frequently.
11. Install away from welding, halogen lamps, heater etc. to prevent false alarms.
12. As flame detector is electrically connected to the enclosure and internal ground (for the purpose of passing the 6kV withstand voltage test), it may have an effect on the detector when installed on a steel frame or steel material. It is recommended to install it through a non-electrical plastic or wooden plank.
13. The flame detector is waterproof (IP67), so water does not leak through the case or cable gland. It is recommended that the part connected to the ex-proof junction box be completely waterproof in order not to be affected by external influences. The cable port is not covered under warranty unless it is stored in a waterproof container.
14. Cable splicing in the area where ex-proof product is installed should be done only in ex-proof junction box.
15. When connecting the flame detector to the power panel, it should be connected according to +24V (red) and – 0V (black) poles.

4.3 Detector Installation

Please install the transmission window of the detector facing down 45° to prevent accumulating of dirt or dust on it.

The detector assembly steps are shown in Figure 4 and Figure 5.

Stage-1: Attach detector on the upper end of the wall firmly. (Figure 4)

Stage-2: Position the sensor in the monitoring direction and secure the screw securely. (Figure 5)

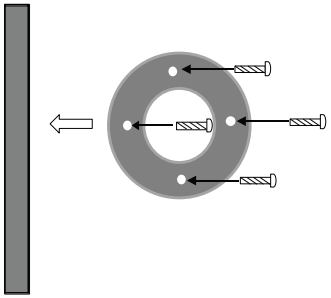


Figure 4: Detector Installation Stage-1

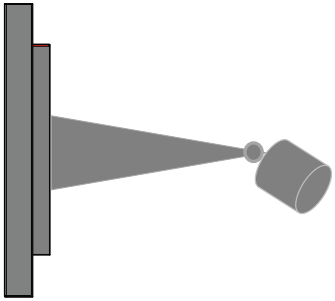


Figure 5: Detector Installation Stage-2

4.4 Operation

a. Display LEDs and First Boot

There are 2 LEDs on the screen of the IRT-021-A series flame detectors; red and green.

Solid Green: Power is ON, and the detector is operating normally.

Solid Red: Alarm.

During the first boot, the red LED will flash 5 times then; The green LED will flash 5 times, the green LED stays steady and detector surveillance starts.

b. Normal Working Condition

The green LED is on when the detector is operating normally.

c. Alarm Condition

When the detector detects an alarm condition, the green normal operation LED will turn off and the red alarm LED will blink continuously. The relay output is triggered during an alarm condition. The alarm (under default settings) remains locked (kept open) until the event is under control and the alarm is reset. *

* Products manufactured after 2022, the alarm can be automatically reset after few seconds.

4.5 Cone of Vision

The IRT-021-A flame detector has a 90° cone of vision so it can monitor a floor-to-ceiling area and extends up to 50 meters.

Horizontal field of view (90°) and vertical field of view (+45° down, -45° up) are shown in Figure 6 and Figure 7.

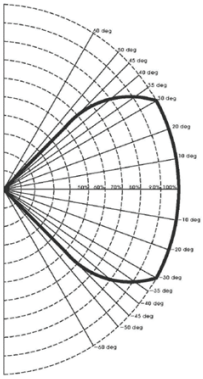


Figure 6: Vertical Field of View

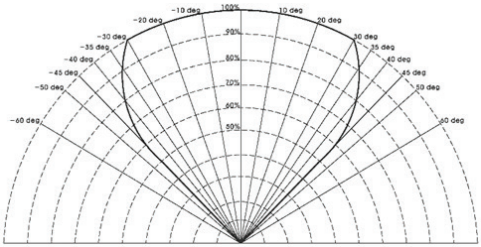


Figure 7: Horizontal Field of View

CAUTION

Lowering the detector's height above the tracked item will increase the size of the shadow areas. See Shadow Effect.

4.6 Shadow Effect

If you are monitoring a solid object, the mounting height "hd" of the flame detector must be at least twice the height "h" of the highest object in the monitored area, in order to reduce shadow effect.

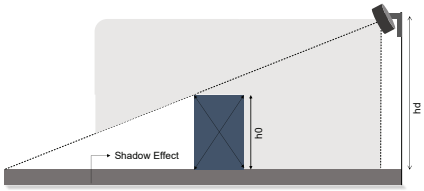


Figure 8: Shadow Effect

4.7 Under Ceiling Installation

During a fire, smoke rises and can form a thick layer at ceiling height before flames appear. Dense smoke can block some wavelengths of light emitted by flames. This can reduce the sensitivity and speed of the flame detector.

To prevent smoke from blocking the field of view; It is necessary to leave a distance between the flame detectors and the ceiling during installation. (Figure 9)
(About 20% of total wall hight, down from ceiling)

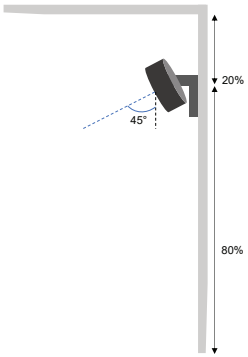


Figure 9: Under Ceiling Installation

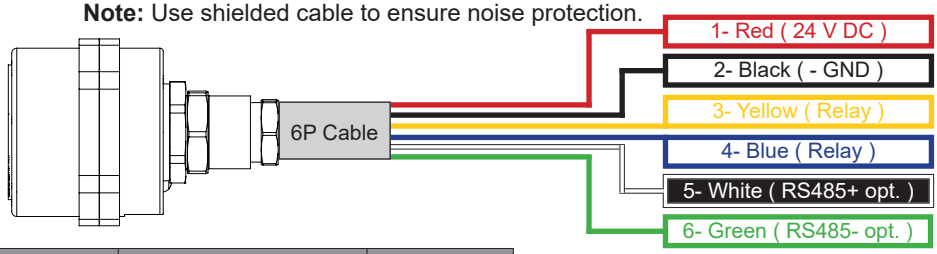
CAUTION

Flame detectors may alarm in the presence of hot work such as a welding operation, this must be considered when issuing work permits.

4.8 Wiring

a. Alarm Relay Output Only (default configuration)

Note: Use shielded cable to ensure noise protection.

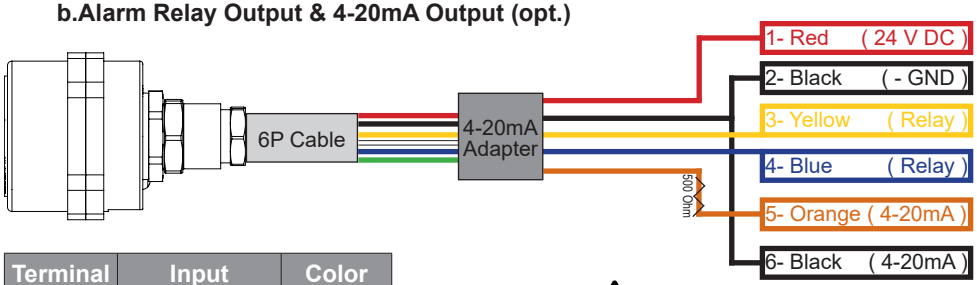


Terminal	Input	Color
1	24 DC	Red
2	- GND	Black
3	Relay Output 1	Yellow
4	Relay Output 2	Blue
5	RS485+ (opt.) / Term.Resistor	White
6	RS485- (opt.) / Term.Resistor	Green

About Relay Output

Relay output is **N**ormally **O**pened. When a flame is detected, the device switches to the alarm state, the relay becomes closed and allows current to flow.

b.Alarm Relay Output & 4-20mA Output (opt.)



Terminal	Input	Color
1	24 DC	Red
2	- GND	Black
3	Relay Output 1	Yellow
4	Relay Output 2	Blue
5	(+) 4-20mA	Orange
6	(-) 4-20mA	Black

CAUTION

For installation in an explosive environment, the cable connection must be made in a certified junction box. Make sure the cable gland is installed correctly and fully tightened. All unused cable/duct entries and exits must be sealed with an appropriately approved sealing plug.

Chapter 5. Maintenance

Inspect the IRT-021-A flame detector and wiring regularly for signs of physical damage. Do not use solvents or abrasive cleaners on the detector and its optics. Clean only with microfiber cloths moistened with pure alcohol, without touching your hands, or use optical grade wipes.

WARNING- EXPLOSION HAZARD

Contact of the mounting bracket with the wet area can cause static discharges that may cause an explosion in a flammable atmosphere. In hazardous areas, use only a clean, damp cloth (dampened with water) to clean the mounting bracket.

No special preventive maintenance other than cleaning is required. Routine inspection of the flame detector is recommended as follows:

1. Check the position and alignment of the flame detectors.

2. Check that there are no possible sources of false alarms in the field of view.

3. Check if there are any obstructions blocking the field of view.

4. Wipe the detector window with an airbrush or with clean and soft cloth moistened with anhydrous ethyl alcohol (99.9%) without touching with hands and be sure that fingerprints and other foreign matter do not adhere.

5. The transmission window of the sensor is fragile, and the sensitivity decreases when foreign matter adheres. You should be careful in cleaning and maintenance.

6. The lifetime of the sensor is inversely proportional to the number of detections. If there are many tests and fire detections, the life of the sensor may be shortened due to the reduction of the insulation material inside the sensor.

7. To ensure that the flame detection capability of the flame detector is maintained, periodic inspections should be made to ensure that it is not contaminated by permeable dust and similar substances.

8. The flame detector should be stored in a clean and dry place. Temperature and humidity data must be within the ranges specified in section 3.4.

9. Cables and conduits from flame detectors to the controller; Check for damage, security and loose connections.

Note:

1. The user is responsible for keeping the equipment in top condition. Contact Karf & Scoot Technical Support if you have any concerns about the serviceability/operation of the IRT-021-A flame detectors or need assistance with this manual.

2. Do not use liquid cleaning agents to clean the flame detector.

Chapter 6. Troubleshooting

This section is a guide for correcting problems that may occur during normal operation.

If the solutions cannot be fulfilled, please contact us.

Problem	Cause	Solution
The green LED lighting problem	There is a problem in the wiring of the flame detector, it has created a short circuit.	Please check the power connection after making the control connection.
	Power connection is off.	
The detector gives an alarm when there is no flame source.	Some devices around the flame detector emit energy like the detection wave.	Please check the devices around the detector and change the position/orientation of the detector.
Unable to process.		Please contact Karf & Scoot technical support team.

Contact

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