

**Technical Data**

Supply voltage 17–28V DC  
 Protocol 5-9V  
 Quiescent current 2.5mA  
 Alarm current 4.2mA  
 Switch-on surge current 9mA (peak) for 85ms  
 Power-up time 4 seconds  
 Remote output characteristics connects to positive through 4.5K $\Omega$   
 (5mA Maximum)

Fire alarm threshold Analogue value 55 returned after 10Hz flame  
 flicker for 1.5 seconds  
 Operating range 25m for 0.1m<sup>2</sup> n-heptane fire  
 (EN54-10, Class 1)

Operating temperature –40°C to +70°C (no condensation or icing)  
 Storage temperature –40°C to +70°C  
 Relative humidity 0-95% (no condensation)  
 IP rating 66

Housing material white polycarbonate  
 V-0 rated to UL94  
 Dimensions 100mm diameter  
 40mm height, 48mm in base  
 Weight 150g detector, 210g in base

**Additional Equipment**

Portable flame detector test unit Part no. 29600-226  
 Adjusted Mounting Bracket Part no. 29600-458



## Intelligent Base Mounted IR<sup>3</sup> Flame Detector, Installation & Maintenance Guide

**General**

The Intelligent Base Mounted Triple Infra-red (IR<sup>3</sup>) Flame Detector, part no 55000-024, is designed for use where open flaming fires may be expected. It is sensitive to low-frequency, flickering infra-red radiation emitted by flames during combustion. False alarms due to such factors as flickering sunlight are avoided by a combination of filters and signal processing techniques. This product is not compatible with the 45681-321 isolator base.

**Response to flames**

In quiescent condition, i.e., in the absence of a flame, the detector returns an analogue value of 25. When a flame is visible, the detector signals an alarm by increasing the analogue value returned to 55, usually within 1.5 seconds. The analogue value may continue to rise until it reaches a pre-set maximum of 64.

In the alarm state the IR<sup>3</sup> Flame Detector latches for 20 seconds, with the analogue value decreasing to 25 once the flame is no longer detected.

**Electrical considerations**

The IR<sup>3</sup> Flame Detector is loop powered and needs no external supply. It is connected to a control panel using either the XP95<sup>®</sup> or Discovery<sup>®</sup> protocol. A remote LED alarm indicator may be connected to the flame detector.

**Sensor window contamination**

It is important to keep the sensor window clean and checks should be carried out at regular intervals—determined locally according to the type and degree of contamination encountered—to ensure optimal performance of the flame detector. Although flames can be detected when the window is contaminated, there may be a reduction of sensitivity as shown in the table overleaf.

It is recommended that the IR<sup>3</sup> Flame Detector be disabled when the window is being cleaned.

Contaminant	Typical percentage of normal response
Water spray	75
Steam	75
Smoke	75
Oil film	86
Salt water film	86
Dry salt deposits	86

**Table 1** Sensor window contamination

### Applications for IR<sup>3</sup> Flame Detectors

IR<sup>3</sup> Flame Detectors are used when detection is required to be unaffected by convection currents, draughts or wind; tolerant of fumes, vapours, steam, dust and mist; responsive to a flame more than 25m away and fast reacting.

Typical applications examples are:

- agriculture – grain and malt processing, animal feed manufacture
- aircraft hangars
- automotive industry – spray booths, parts manufacture
- chipboard and MDF manufacture
- power plants
- printing
- transformer stations

Applications and locations to avoid:

- ambient temperatures above 55°C (continuous)
- sunlight falling directly onto IR optics
- exposure to severe rain and ice
- flickering or moving hot objects
- flood or spot lighting falling directly on IR optics
- large amounts of flickering reflections
- large IR sources above 200°C – heaters, burners, flare stacks
- microwave ovens and dryers
- obstructions to field of view

### Functional testing

When polled by a compatible panel or test set, the IR<sup>3</sup> Flame Detector, in quiescent condition, should return an analogue value of 25 and input bits set to '0'.

When output bit 2 is set to logic 1 on two or more consecutive pollings, the red LED on the flame detector will illuminate.

When output bit 1 is set to 1 on two or more consecutive pollings the flame detector will perform a self test. It does this by causing internal LEDs to flicker in the field of view of the flame detector, thus simulating the behavior of flames.

When output bit 0 is set to 1 on two or more consecutive pollings the IR<sup>3</sup> Flame Detector will switch on a remote LED.

Finally, provided it is safe to do so, carry out a flame test using a flickering flame source, such as a portable bunsen burner. A still, non-flickering flame will not produce a response from the detector.

### Maintenance Guide

The IR<sup>3</sup> Flame Detector is designed to give years of trouble-free operation with minimal attention. However the periodic maintenance steps listed below are essential to maintain reliable fire protection.

1. Inform all appropriate personnel of intention to work on the flame detector.
2. Disable any automatic systems that may be activated by the flame detector if not required as part of the maintenance check.

Alarms	Extinguishers	Control
Audio/Visual	Gas systems	Plant stops
Auto diallers	Water sprays	Dampers/doors

3. Check that the flame detector's control panel is functioning correctly and shows no faults.
4. Inspect the detector viewing window for any build-up of dust or other contaminants on the optical surface. If necessary clean the optical surface with a cotton wipe and commercial liquid glass cleaner and wipe clean.

The detector specification for performance is with a clean optical sensor window. Contaminants like dust, oil and paint will reduce sensitivity.

5. Ensure the detector still has a clear line of sight of the area it is protecting and no obstacles obstruct its view.
6. Check that the detector is securely fitted.
7. Visually check the exterior of the detector for any mechanical or corrosive damage.
8. Test the operation of the detector with either a portable flame sensor test unit or if practical a flickering yellow flame.
9. Reinstate any automatic system disabled during maintenance.
10. Inform all appropriate personnel on completion of the maintenance work and if necessary record this work.

### Sensitivity setting

A sensitivity switch is used to set the sensitivity of the IR<sup>3</sup> Flame Detector to Class 1 or Class 3. For most practical purposes the switch should be set to Class 1 (default setting), the sensitivity required to detect flames as described in the section 'Quantities required and positioning of detectors'.

In exceptional cases the IR<sup>3</sup> Flame Detector may be set to Class 3 operation in order to avoid nuisance alarms being caused by radiation sources that are close to the detector and can not be moved.

The rotary sensitivity switch is located on the detector rear behind the label. To set to Class 3, rotate the switch 90° clockwise. To return the sensitivity switch to the Class 1 setting, rotate the switch 90° counter clockwise. Reseal label or seal hole with suitable sealant if the sensitivity has been changed.

### Installation

The IR<sup>3</sup> Flame Detector is mounted on any XP95 or Discovery base and would normally be wall or ceiling mounted preferably on an adjustable bracket to adjust the angle of view.

The standard base mounting is used for horizontal viewing, e.g., along corridors or along the length of industrial processes or vertical viewing inside fume cupboards or over hoppers.

Flame detectors should be fitted to solid walls or rigid constructions that do not move and are not subject to vibration.

The IR<sup>3</sup> Flame Detector must be assigned an address by addressing the XPERT card in the usual way. A list of address settings is shown in Table 2.

### Wiring

The flame detector has five connections: – Line 1, + Line 2, +Remote, –Remote and functional earth/screen. The connections are accessed by removing the detector from its base. See Fig 4 for connection diagram.

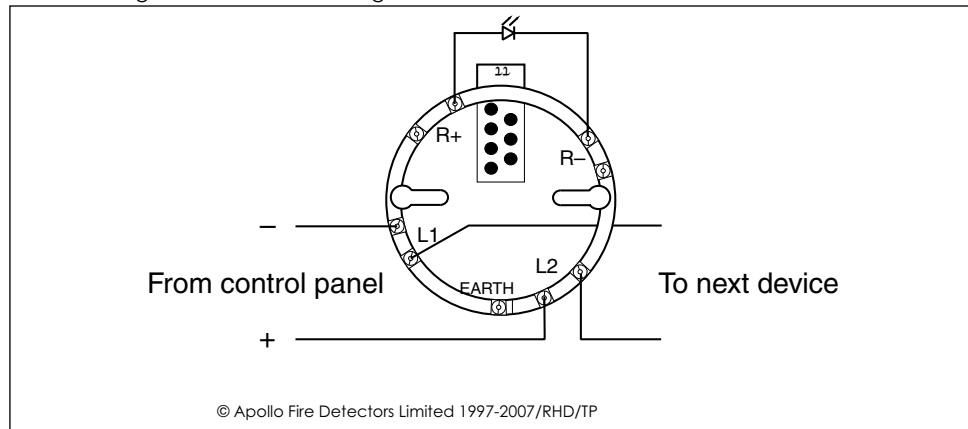


Fig 4 IR<sup>3</sup> Flame Detector base connections

### Terminal Descriptions

1	+L2	+Line IN and OUT
2	-L1	-Line IN and OUT
3	+R	+Remote LED
4	-R	-Remote LED
5	EARTH	Functional Earth/Screen (Isolated)

### Quantities required and positioning of detectors

The number of detectors required and their positioning depends on:

- the anticipated size of the flame
- the distance of the flame from the detector and
- the angle of view of the flame detector

The IR<sup>3</sup> Flame Detector is designed to operate to Class 1 performance as defined in EN54: Part 10. The detector will, therefore, detect a yellow flickering flame of approximately 0.1m<sup>2</sup> or a clear flame of 0.25m<sup>2</sup> at 25m.

In fact, the flame detector will detect fires at distances of up to 40 metres, but the flame size at such distances needs to be proportionally greater in order to be sure of reliable detection. Thus the yellow flickering flame that can be detected at 25m, provided that its size is not less than 0.1m<sup>2</sup>, will have to be 0.4m<sup>2</sup> in order to be detected at 40 metres. In a rectangular room the distance from the flame detector to the fire is calculated by the formula:

$$\sqrt{L^2 + W^2 + H^2}$$

In the example shown in Fig 1 the room in which the flame detector is to be installed measures 20m x 10m x 5m; the distance from the detector to the flame will therefore be:

$$\sqrt{20^2 + 10^2 + 5^2}$$

$$= 22.9\text{m}$$

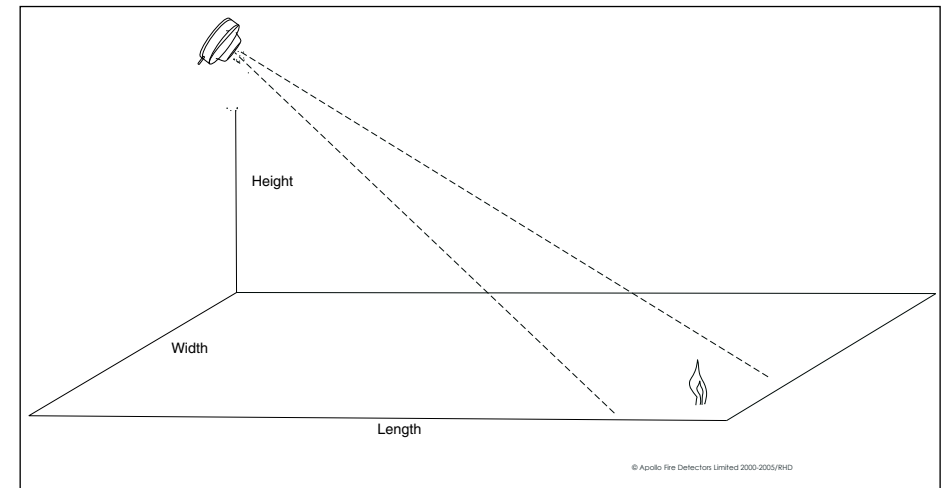
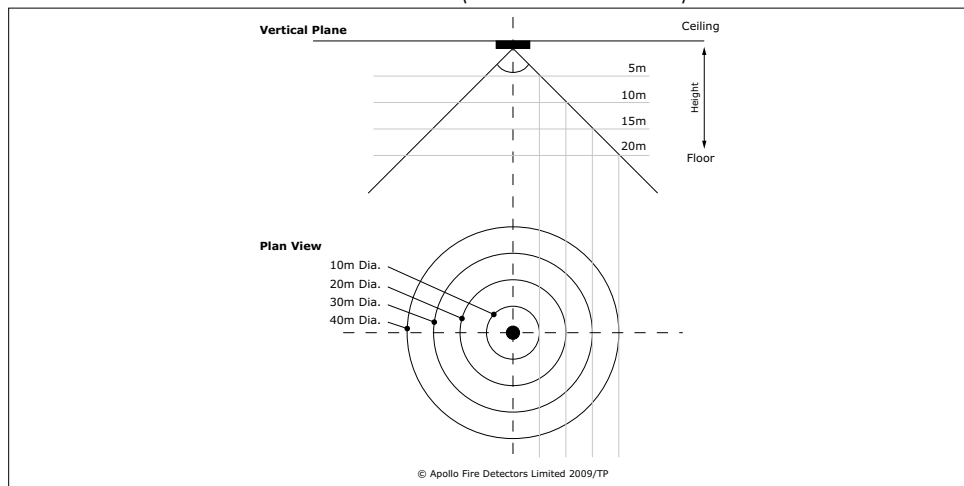


Fig 1 Calculation of distance from detector to flame

The IR<sup>3</sup> Flame Detector is often positioned at the perimeter of the room, pointing directly at the area of the anticipated flame or at the centre of the area to be protected. If the detector cannot 'see' the whole of the area to be protected, one or more additional detectors may be required.

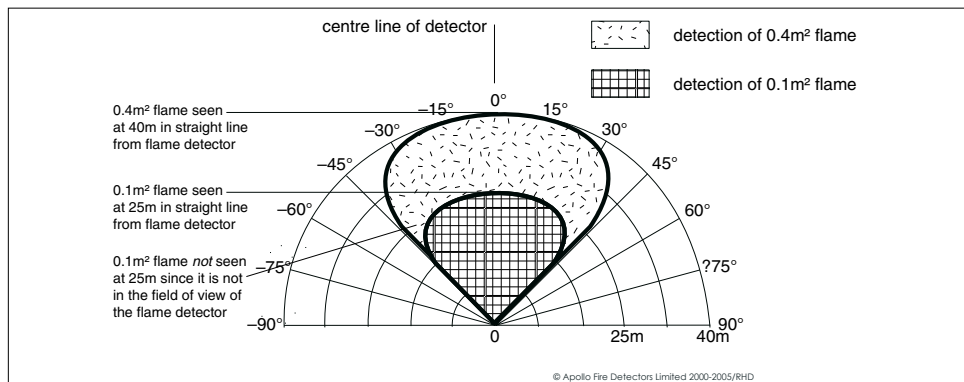
The IR<sup>3</sup> Flame Detector is not affected by normal light sources but should be positioned so that sunlight does not fall directly onto the viewing window.

The IR<sup>+</sup> Flame Detector can also be ceiling mounted, positioned above the anticipated flame source or at the centre of the area to be protected, perpendicular to the floor below. If the detector cannot see the whole of the area to be protected, one or more additional detectors may be required. Refer to the angle of view diagram Fig. 3 to establish the detector performance. The area of detection is dependent on the detectors height above the likely source of flame. The detector has a 90° conical field of view or 45° either side of the viewing axis centre line. If the detector is perpendicular to floor and at a height of 10m then the detector will view a circular floor area below with a 10m radius (20m diameter circle).



**Fig 2** Ceiling mounting example

The IR<sup>+</sup> Flame Detector has an angle of view of approximately 90°, as shown in the diagram below.



**Fig 3** Angle of view of IR<sup>+</sup> Flame Detector

To meet the requirements of EN54:10 clause 5.4, were the ratio of the response points  $D_{max}:D_{min}$  should not exceed 1.41. The horizontal and vertical viewing angles  $\alpha_{max}$  should not exceed  $\pm 32.5$

**Loop design**

The IR<sup>+</sup> Flame Detector is powered from the loop; it draws 2.5mA in quiescent state and 4.2mA in alarm. In order to determine the number of flame detectors that can be connected to a given loop, please refer to the Loop Calculation program, which can be downloaded from the Apollo website.

**Address Setting**

Before installing the IR<sup>+</sup> Flame Detector it is necessary to set the address using the XPERT card, select the desired address and remove pips indicated in black. Remove with a small screwdriver.

A complete list of address settings is shown in the table below.

**Table 2** XPERT card address settings