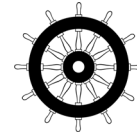# BASE MOUNTED FLAME DETECTOR BRACKET - WITH DECK HEAD MOUNTING BOX

29600-458

The Base Mounted Flame Detector Bracket includes a bracket and Deckhead Mounting Box.

Marine Intelligent
Base Mounted Flame Detectors

CE 0832

Product overview

Product	Marine Intelligent Base Mounted UV Flame Detector
Part No.	**55000-027MAR**
Product	Marine Intelligent Base Mounted UV/Dual IR Flame Detector
Part No.	**55000-028MAR**
Product	Marine Intelligent Base Mounted Triple IR Flame Detector
Part No.	**55000-029MAR**
Product	Flame detector test unit
Part No.	**29600-226**
Product	Adjustable mounting bracket including deckhead mounting box
Part No.	**29600-458**

Technical Data

All data is supplied subject to change without notice. Specifications are typical at 24V, 73°F and 50% RH unless otherwise stated.

	UV	UV/Dual IR	Triple IR
Supply voltage	17 - 28 V dc	17 - 28 V dc	17 - 28 V dc
Protocol peak to peak	5 - 9 V	5 - 9 V	5 - 9 V
Quiescent current	2.3 mA	2.8 mA	2.5 mA
Alarm current	4.2 mA	4.2 mA	4.2 mA
Surge current	9 mA (peak) for 110 ms	9 mA (peak) for 85 ms	9 mA (peak) for 85 ms
Maximum power-up time	4 seconds	4 seconds	4 seconds
Remote output characteristics	Connects to positive line through 4.5 kΩ (5 mA maximum)	Connects to positive line through 4.5 kΩ (5 mA maximum)	Connects to positive line through 4.5 kΩ (5 mA maximum)
Operating range	0.1 m^2 n-heptane at 25 m	0.1 m^2 n-heptane at 25 m	0.1 m^2 n-heptane at 25 m
Sensitivity	Class 1 or 3, EN 54-10	Class 1 or 3, EN 54-10	Class 1 or 3, EN 54-10
Field of view	90° cone	90° cone	90° cone
Spectral response	UV 185 to 260 nm	UV 185 to 260 nm, IR 0.75 to 2.7 μm	0.75 to 2.7 μm
Operating temperature (no condensing or icing)	-40°C to +70°C	-40°C to +70°C	-40°C to +70°C
Storage temperature	-40°C to +85°C	-40°C to +70°C	-40°C to +70°C
Relative humidity	95% non-condensing	95% non-condensing	95% non-condensing
IP rating	IP66	IP66	IP66
Dimensions	100 mm x 40 mm detector only 100 mm x 48 mm detector and base	100 mm x 40 mm detector only 100 mm x 48 mm detector and base	100 mm x 40 mm detector only 100 mm x 48 mm detector and base
Weight	150 g - detector only 210 g - detector and base	150 g - detector only 210 g - detector and base	150 g - detector only 210 g - detector and base
Materials: Housing	White polycarbonate, V-0 rated to UL94	White polycarbonate, V-0 rated to UL94	White polycarbonate, V-0 rated to UL94
Sensing window	2 mm Quartz	2 mm Quartz	2 mm Float glass
Terminals	Nickel plated stainless steel	Nickel plated stainless steel	Nickel plated stainless steel
Isolator count: 20D	7	7	7
20i	20	20	20

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LPCB UKAS MANAGEMENT SYSTEMS 0007
Assessed to ISO 9001:2008
Cert/LPCB ref. 010

LPCB UKAS MANAGEMENT SYSTEMS 0007
Assessed to ISO 14001:2004
Cert/LPCB ref. 010 EMS

LPCB UKAS PRODUCT CERTIFICATION 0007
Cert/LPCB ref. 010

Product information

The Marine Intelligent Base Mounted Flame Detectors are designed to protect areas where open fires may be present.

Marine Intelligent Base Mounted UV Flame Detector

The Marine Intelligent UV Base Mounted Flame Detector is sensitive to ultraviolet (UV) radiation emitted by flames during combustion. Since it requires only UV radiation the detector responds even to stationary flames with no flicker such as cigarette lighters and blue gas flames.

The detector is set to respond to UV radiation (185 - 260 nm) emitted by almost all flames including those invisible to the naked eye, e.g. hydrogen fires.

The detector has a single UV sensor with a narrow spectral response in order to discriminate between flames and most spurious sources of radiation and is designed for use in internal fully enclosed areas.

CAUTION: The detector will also detect electrical discharges from lightning or arc welding.

Marine Intelligent Base Mounted UV/Dual IR Flame Detector

The Marine Intelligent Base Mounted UV/Dual IR Flame Detector is sensitive to UV and low-frequency, flickering infra-red (IR) radiation emitted by flames during combustion. Since it requires both UV and IR radiation the detector can operate in applications where a basic single UV or single IR detector would be inappropriate. The detector is set to respond to UV (185 - 260 nm) and low-frequency, flickering IR (0.75 - 2.7 μm) radiation at 1 - 15 HZ in order to detect all flickering flames, including those invisible to the naked eye, e.g. hydrogen fires. The detector has one UV and two IR sensors responding to different wavelengths in order to discriminate between flames and spurious sources of radiation. False alarms due to electrical discharges or arc welding and flickering sunlight are minimised by combining the UV/IR signals.

Marine Intelligent Triple IR Base Mounted Flame Detector

The detector is sensitive to low frequency, flickering IR radiation emitted by flames during combustion. Since it responds to flickering radiation the detector can operate even if the lens is contaminated by a layer of oil, dust water-vapour or ice. The detector is set to respond to low-frequency radiation at 1 - 15 Hz (0.75 - 2.7 μm) in order to detect all flickering flames, including those invisible to the naked eye, e.g. hydrogen fires. The detector has three IR sensors that respond to different IR wavelengths in order to discriminate between flames ans spurious sources of radiation. False alarms due to factors such as flickering sunlight are avoided by a combination of filters and signal processing techniques.

Applications for Marine Intelligent Base Mounted Flame Detectors*

UV

UV detectors are used when detection is required to be unaffected by convection currents, draughts or winds. These include engine rooms in ships, factories affected by draughts or wind and warehouses.

They are fast reacting and respond to a flame more than 25 m away. The UV flame detector is affected by arc welding, electrical sparks, lightning, nuclear radiation and UV light sources. For applications where these phenomena are present a UV flame detector should not be used.

UV/Dual IR

These detectors are not affected by any of the sources mentioned above. They are suitable for use in aircraft hangars, generator rooms (diesel and gas turbines) and paint works.

Triple IR

These detectors are also fast reacting but is also tolerant of fumes, vapours, steam, dust and mist, whilst being unaffected by the phenomena listed above. It may, however, be affected by modulated IR radiation. Triple IR flame detectors are used in waste handling, colour printing and paper manufacturing applications.

* For a full list of applications for Apollo Marine Intelligent Base Mounted Flame Detectors, please refer to PP2409, available on request or from www.apollo-fire.co.uk

Protocol compatibility

The detectors operate with control equipment using the XP95 or Discovery digital protocols.

Protocol usage

Output Bits	
2	LED
1	Test
0	Remote LED
Interrupt	No
Analogue value	
Quiescent	25
Alarm	55 - 64
Fault	4
Input Bits	
2	LED confirmed
1	Test confirmed
0	Remote LED confirmed
Flag settings	
XP95 flag	Yes
Alarm flag	Yes

Electrical considerations

The Marine Intelligent Base Mounted Flame Detectors are loop-powered and require no external supply. A remote LED alarm indication may be connected to the flame detector.

The field of view for the Marine Intelligent Base Mounted Flame Detectors is shown in Figure 1. The illustration also includes information on the size of fire detectable at various distances.

The flame detectors 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. Figure 2 shows the angle of view to help you establish the detectors performance. The area of detection is dependent upon the detectors height above the likely source of flame.

The detectors have a 90° conical field of view or 45° either side of the viewing axis centre line. The maximum ceiling height is 20 m. If the detector is perpendicular to the floor and at a height of 10 m, the detector will view a circular floor area below with a 10 m radius (20 m diameter circle).
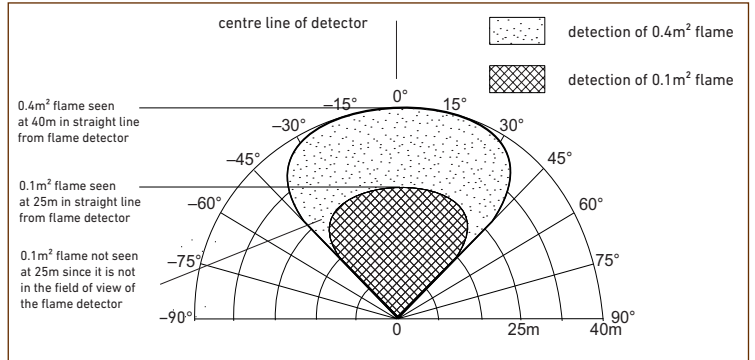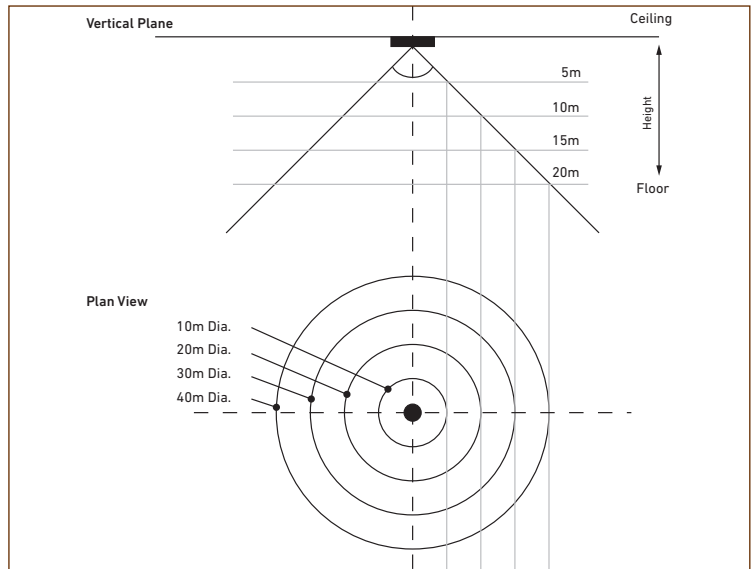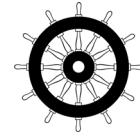

Figure 1: Field of view

Figure 2: Ceiling mounting measurements

Marine Series 65
Base Mounted Flame Detector

CE 0832

Product overview

Product	Marine Series Base Mounted UV Flame Detector
Part No.	55000-026MAR

Product information

The Marine Series 65 Base Mounted Ultraviolet (UV) Flame Detector is designed to protect areas where flaming fires may be expected.

The detector is sensitive to UV radiation emitted by flames during combustion. Since it requires only UV radiation the flame detector responds even to stationary flames with no flicker like cigarette lighters and blue gas flames.

The detector is set to respond to UV radiation (185 to 260 nm) emitted by almost all flames including those invisible to the naked eye, e.g. hydrogen fires.

The detector has a single UV sensor with a narrow spectral response in order to discriminate between flames and most spurious sources of radiation and is designed for use in internal, fully enclosed areas.

⚠️ *CAUTION: The detector will also detect electrical discharges from lightning or arc welding.*

Technical Data

All data is supplied subject to change without notice. Specifications are typical at 24V, 73°F and 50% RH unless otherwise stated.

Supply voltage	17 - 28 V dc	
Quiescent current	550 µA	
Alarm voltage	6 to 33 V dc	
Alarm current	61 mA at 28 V 54 mA at 24 V 20 mA at 10 V	
Terminal functions	L1 In and Out	Supply positive
	L2	Supply negative
	–R	Remote indicator negative connection
Remote output characteristics	Remote is a current sink to the negative line limited to 17 mA	
Alarm indicator	Red light emitting diode	
Design alarm load	420 Ω in series with a 2 V drop	
Holding voltage	6 V min	
Holding current	10 mA min	
Minimum voltage required to illuminate indicators	12 V	
Alarm reset voltage	< 1 V	
Alarm reset time	1 second	
Range of view	0.1 m² n-heptane at 25 m	
Sensitivity	Class 1, EN 54-10	
Field of view	90° cone	
Spectral response	UV 180 to 260 nm	
Operating temperature (no condensing or icing)	-40°C to +70°C	
Storage temperature	-40°C to +85°C	
Relative humidity	95% non-condensing	
IP rating	IP66	
Dimensions	100 mm x 40 mm detector only 100 mm x 48 mm detector and base	
Weight	150 g - detector only 210 g - detector and base	
Materials:	Housing	White polycarbonate, V-0 rated to UL94
	Terminals	Nickel plated stainless steel

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Assessed to ISO 9001:2008 Cert/LPCB ref. 010
Assessed to ISO 14001:2004 Cert/LPCB ref. 010 EMS
Cert/LPCB ref. 010

Electrical considerations

The detector signals an alarm state by switching an alarm latch on increasing the current drawn from the supply from 550 μA to a maximum of about 75 mA. This fall in the impedance of the detector is recognised by the control panel as an alarm signal.

The alarm current also illuminates the detectors integral LEDs. A remote indicator connected between the L1 In terminal and the -R terminal will have a voltage equal to the supply voltage less one volt across it and so will illuminate.

To ensure correct operation of the detector the control panel must be arranged to supply a maximum of 33 V dc and a minimum of 12 V dc in normal operation.

The supply may fall to 6 V dc in alarm conditions if a supply current of at least 10 mA is available at this voltage.

To ensure effective illumination of the integral LEDs and any remote indicator, the supply to the detector should exceed 12 V.

To restore the detector to quiescent condition, ensuring all flames are extinguished interrupt the supply to the detector for a minimum of one second.

Note: When using the detector the following must be avoided; outside viewing, UV lamps, electrical sparking, welding and sources of radiation, UV light sources, prolonged ambient temperatures above 60°C and obstructions to the field of view.

Applications for UV flame detectors

UV flame detectors are designed for use in enclosed spaces and require a clear line of sight within the area to be protected. They are unaffected by draughts or convection currents.

They are fast acting and respond to a flame more than 25 m away (refer to Figure 1).

Installation

If fitting to an XP95 Zone Monitor do not fir more than one device per zone.

If fitting to a conventional control panel please verify the quantity per zone with the panel manufacturer.
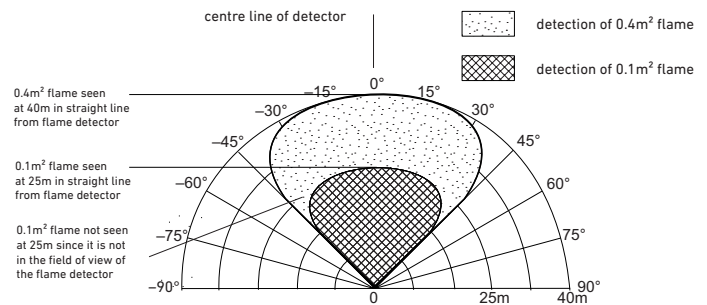

Figure 1: Field of view

The field of view of the flame detector is shown in Figure 1. This also provides information on the size of fire that is detectable at various distances.
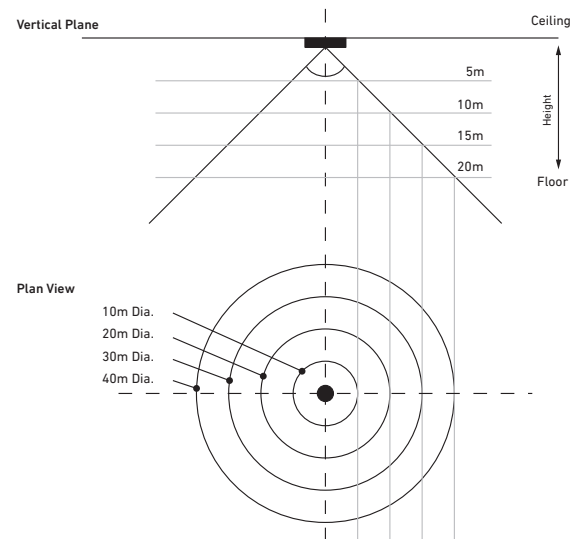

Figure 2: Ceiling mounting example

The flame detectors 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 - Figure 2 - 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. The maximum ceiling height is 20 m. If the detector is perpendicular to the floor and at a height of 10 m then the detector will view a circular floor area below with a 10 m radius - 20 m diameter circle.

Intelligent
Base Mounted Flame Detectors

CE 0832

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Product overview

Product	**Intelligent Base Mounted UV Flame Detector**
Part No.	**55000-022**
Product	**Intelligent Base Mounted UV/IR Flame Detector**
Part No.	**55000-023**
Product	**Triple IR Flame Detector**
Part No.	**55000-024**
Product	**Flame detector test unit**
Part No.	**29600-226**
Product	**Adjustable mounting bracket including deckhead mounting box**
Part No.	**29600-458**

Technical Data

All data is supplied subject to change without notice. Specifications are typical at 24V, 73°F and 50% RH unless otherwise stated.

	UV	UV/Dual IR	Triple IR
Supply voltage	17 - 28 V dc	17 - 28 V dc	17 - 28 V dc
Protocol peak to peak	5 - 9 V	5 - 9 V	5 - 9 V
Quiescent current	2.3 mA	2.8 mA	2.5 mA
Alarm current	4.2 mA	4.2 mA	4.2 mA
Surge current	9 mA (peak) for 110 ms	9 mA (peak) for 85 ms	9 mA (peak) for 85 ms
Maximum power-up time	4 seconds	4 seconds	4 seconds
Remote output characteristics	Connects to positive line through 4.5 kΩ (5 mA maximum)	Connects to positive line through 4.5 kΩ (5 mA maximum)	Connects to positive line through 4.5 kΩ (5 mA maximum)
Operating range	0.1 m^2 n-heptane at 25 m	0.1 m^2 n-heptane at 25 m	0.1 m^2 n-heptane at 25 m
Sensitivity	Class 1 or 3, EN 54-10	Class 1 or 3, EN 54-10	Class 1 or 3, EN 54-10
Field of view	90° cone	90° cone	90° cone
Spectral response	UV 185 to 260 nm	UV 185 to 260 nm, IR 0.75 to 2.7 μm	0.75 to 2.7 μm
Operating temperature (no condensing or icing)	-40°C to +70°C	-40°C to +70°C	-40°C to +70°C
Storage temperature	-40°C to +85°C	-40°C to +70°C	-40°C to +70°C
Relative humidity	95% non-condensing	95% non-condensing	95% non-condensing
IP rating	IP66	IP66	IP66
Dimensions	100 mm x 40 mm detector only 100 mm x 48 mm detector and base	100 mm x 40 mm detector only 100 mm x 48 mm detector and base	100 mm x 40 mm detector only 100 mm x 48 mm detector and base
Weight	150 g - detector only 210 g - detector and base	150 g - detector only 210 g - detector and base	150 g - detector only 210 g - detector and base
Materials: Housing	White polycarbonate, V-0 rated to UL94	White polycarbonate, V-0 rated to UL94	White polycarbonate, V-0 rated to UL94
Sensing window	2 mm Quartz	2 mm Quartz	2 mm Float glass
Terminals	Nickel plated stainless steel	Nickel plated stainless steel	Nickel plated stainless steel
Isolator count: 20D	7	7	7
20i	20	20	20

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Intelligent Base Mounted Flame Detectors

Product information

The Intelligent Base Mounted Flame Detectors are designed to protect areas where open fires may be present.

Intelligent Base Mounted UV Flame Detector

The Intelligent UV Base Mounted Flame Detector is sensitive to ultraviolet (UV) radiation emitted by flames during combustion. Since it requires only UV radiation the detector responds even to stationary flames with no flicker such as cigarette lighters and blue gas flames.

The detector is set to respond to UV radiation (185 - 260 nm) emitted by almost all flames including those invisible to the naked eye, e.g. hydrogen fires.

The detector has a single UV sensor with a narrow spectral response in order to discriminate between flames and most spurious sources of radiation and is designed for use in internal fully enclosed areas.

⚠️ **CAUTION:** The detector will also detect electrical discharges from lightning or arc welding.

Intelligent Base Mounted UV/Dual IR Flame Detector

The Intelligent Base Mounted UV/Dual IR Flame Detector is sensitive to UV and low-frequency, flickering infra-red (IR) radiation emitted by flames during combustion. Since it requires both UV and IR radiation the detector can operate in applications where a basic single UV or single IR detector would be inappropriate. The detector is set to respond to UV (185 - 260 nm) and low-frequency, flickering IR (0.75 - 2.7 μm) radiation at 1 - 15 HZ in order to detect all flickering flames, including those invisible to the naked eye, e.g. hydrogen fires. The detector has one UV and two IR sensors responding to different wavelengths in order to discriminate between flames and spurious sources of radiation. False alarms due to electrical discharges or arc welding and flickering sunlight are minimised by combining the UV/IR signals.

Triple IR

The detector is sensitive to low frequency, flickering IR radiation emitted by flames during combustion. Since it responds to flickering radiation the detector can operate even if the lens is contaminated by a layer of oil, dust water-vapour or ice. The detector is set to respond to low-frequency radiation at 1 - 15 Hz (0.75 - 2.7 μm) in order to detect all flickering flames, including those invisible to the naked eye, e.g. hydrogen fires. The detector has three IR sensors that respond to different IR wavelengths in order to discriminate between flames ans spurious sources of radiation. False alarms due to factors such as flickering sunlight are avoided by a combination of filters and signal processing techniques.

Applications for Intelligent Base Mounted Flame Detectors*

UV

UV detectors are used when detection is required to be unaffected by convection currents, draughts or winds. These include engine rooms in ships, factories affected by draughts or wind and warehouses.

They are fast reacting and respond to a flame more than 25 m away. The UV flame detector is affected by arc welding, electrical sparks, lightning, nuclear radiation and UV light sources. For applications where these phenomena are present a UV flame detector should not be used.

UV/Dual IR

These detectors are not affected by any of the sources mentioned above. They are suitable for use in aircraft hangars, generator rooms (diesel and gas turbines) and paint works.

Triple IR

These detectors are also fast reacting but is also tolerant of fumes, vapours, steam, dust and mist, whilst being unaffected by the phenomena listed above. It may, however, be affected by modulated IR radiation. Triple IR flame detectors are used in waste handling, colour printing and paper manufacturing applications.

Protocol compatibility

The detectors operate with control equipment using the XP95 or Discovery digital protocols.

Protocol usage

Output Bits	
2	LED
1	Test
0	Remote LED
Interrupt	No
Analogue value	
Quiescent	25
Alarm	55 - 64
Fault	4
Input Bits	
2	LED confirmed
1	Test confirmed
0	Remote LED confirmed
Flag settings	
XP95 flag	Yes
Alarm flag	Yes

Electrical considerations

The Intelligent Base Mounted Flame Detectors are loop-powered and require no external supply. A remote LED alarm indication may be connected to the flame detector.

The field of view for the Intelligent Base Mounted Flame Detectors is shown in Figure 1. The illustration also includes information on the size of fire detectable at various distances.

The flame detectors 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. Figure 2 shows the angle of view to help you establish the detectors performance. The area of detection is dependent upon the detectors height above the likely source of flame.

The detectors have a 90° conical field of view or 45° either side of the viewing axis centre line. The maximum ceiling height is 20 m. If the detector is perpendicular to the floor and at a height of 10 m, the detector will view a circular floor area below with a 10 m radius (20 m diameter circle).
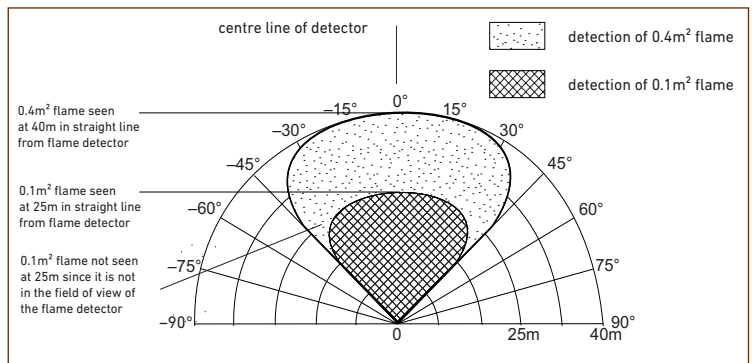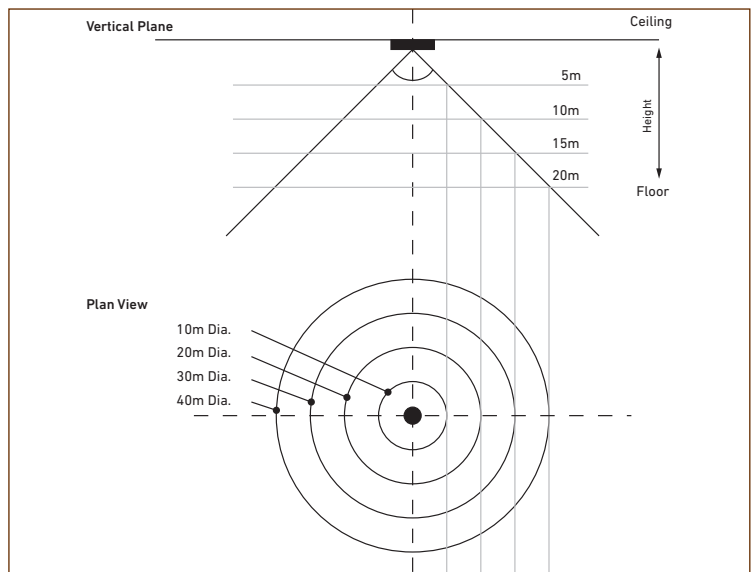

Figure 1: Field of view

Figure 2: Ceiling mounting measurements

Series 65
Base Mounted Flame Detector

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Product overview

Product	Series Base Mounted UV Flame Detector
Part No.	55000-025
Product	Adjustable Mounting Bracket - complete with Deckhead Mounting Box
Part No.	29600-458

Product information

The Series 65 Base Mounted Ultraviolet (UV) Flame Detector is designed to protect areas where flaming fires may be expected.

The detector is sensitive to UV radiation emitted by flames during combustion. Since it requires only UV radiation the flame detector responds even to stationary flames with no flicker like cigarette lighters and blue gas flames.

The detector is set to respond to UV radiation (185 to 260 nm) emitted by almost all flames including those invisible to the naked eye, e.g. hydrogen fires.

The detector has a single UV sensor with a narrow spectral response in order to discriminate between flames and most spurious sources of radiation and is designed for use in internal, fully enclosed areas.

⚠️ CAUTION: The detector will also detect electrical discharges from lightning or arc welding.

Technical Data

All data is supplied subject to change without notice. Specifications are typical at 24V, 23°C and 50% RH unless otherwise stated.

Supply voltage	17 - 28 V dc	
Quiescent current	550 μA	
Alarm voltage	6 to 33 V dc	
Alarm current	61 mA at 28 V 54 mA at 24 V 20 mA at 10 V	
Terminal functions	L1 In and Out	Supply positive
	L2	Supply negative
	–R	Remote indicator negative connection
Remote output characteristics	Remote is a current sink to the negative line limited to 17 mA	
Alarm indicator	Red light emitting diode	
Design alarm load	420 Ω in series with a 2 V drop	
Holding voltage	6 V min	
Holding current	10 mA min	
Minimum voltage required to illuminate indicators	12 V	
Alarm reset voltage	< 1 V	
Alarm reset time	1 second	
Range of view	0.1 m² n-heptane at 25 m	
Sensitivity	Class 1, EN 54-10	
Field of view	90° cone	
Spectral response	UV 180 to 260 nm	
Operating temperature (no condensing or icing)	-40°C to +70°C	
Storage temperature	-40°C to +85°C	
Relative humidity	95% non-condensing	
IP rating	IP66	
Dimensions	100 mm x 40 mm detector only 100 mm x 48 mm detector and base	
Weight	150 g - detector only 210 g - detector and base	
Materials:	Housing	White polycarbonate, V-0 rated to UL94
	Terminals	Nickel plated stainless steel

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Assessed to ISO 9001:2008 Cert/LPCB ref. 010

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UKAS MANAGEMENT SYSTEMS 0007
Assessed to ISO 14001:2004 Cert/LPCB ref. 010 EMS

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UKAS PRODUCT CERTIFICATION 0007
Cert/LPCB ref. 010

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Electrical considerations

The detector signals an alarm state by switching an alarm latch on increasing the current drawn from the supply from 550 µA to a maximum of about 75 mA. This fall in the impedance of the detector is recognised by the control panel as an alarm signal.

The alarm current also illuminates the detectors integral LEDs. A remote indicator connected between the L1 In terminal and the -R terminal will have a voltage equal to the supply voltage less one volt across it and so will illuminate.

To ensure correct operation of the detector the control panel must be arranged to supply a maximum of 33 V dc and a minimum of 12 V dc in normal operation.

The supply may fall to 6 V dc in alarm conditions if a supply current of at least 10 mA is available at this voltage.

To ensure effective illumination of the integral LEDs and any remote indicator, the supply to the detector should exceed 12 V.

To restore the detector to quiescent condition, ensuring all flames are extinguished interrupt the supply to the detector for a minimum of one second.

Note: When using the detector the following must be avoided; outside viewing, UV lamps, electrical sparking, welding and sources of radiation, UV light sources, prolonged ambient temperatures above 60°C and obstructions to the field of view.

Applications for UV flame detectors

UV flame detectors are designed for use in enclosed spaces and require a clear line of sight within the area to be protected. They are unaffected by draughts or convection currents.

They are fast acting and respond to a flame more than 25 m away (refer to Figure 1).

Installation

If fitting to an XP95 Zone Monitor do not fir more than one device per zone.

If fitting to a conventional control panel please verify the quantity per zone with the panel manufacturer.
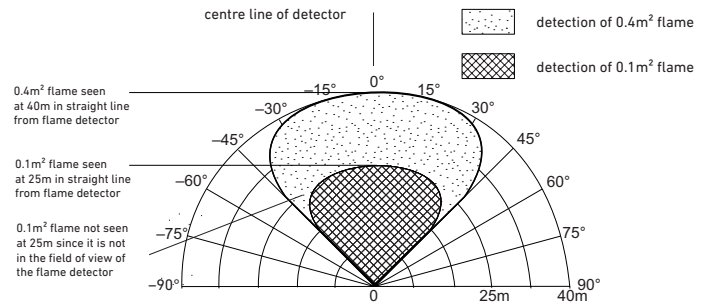

Figure 1: Field of view

The field of view of the flame detector is shown in Figure 1. This also provides information on the size of fire that is detectable at various distances.
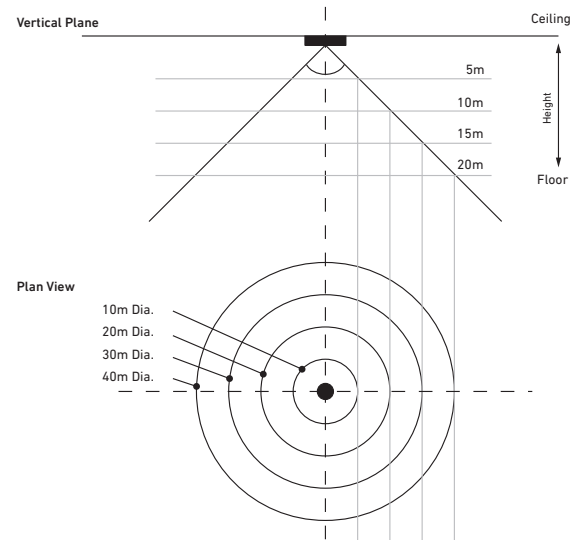

Figure 2: Ceiling mounting example

The flame detectors 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 - Figure 2 - 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. The maximum ceiling height is 20 m. If the detector is perpendicular to the floor and at a height of 10 m then the detector will view a circular floor area below with a 10 m radius - 20 m diameter circle.