MINERVA® S200Plus Infrared Flame Detector

Triple Waveband Infrared Flame Detectors

The MINERVA S200 Plus flame detectors are the latest step in over 30 years' experience of developing and manufacturing infrared, solar blind and multi-channel infrared flame detectors with low power consumption and high false alarm immunity.

The MINERVA S200 Plus range of advanced flame detectors is the most comprehensive range available. The devices are available in both Intrinsically Safe and Flameproof versions incorporating a variety of electrical interfaces compatible with the VIGILANT and SIMPLEX range of fire control panels and a wide range of other control equipment.

S200+ Features

- IECEx Approval
- ATEX Approval
- Unrivalled blackbody rejection over a wide range of source temperatures
- Triple waveband infrared solar blind flame detection for optimum false alarm immunity
- Discrimination of optical faults (dirty windows) from other faults in the built-in self test
- Range adjustable to 50 metres for a 0.1m^2 n-heptane pan fire
- Collective versions using 2-wire circuits
- Relay interface, 4-20mA, and Addressable versions

Flameproof Applications

The flameproof models are suffixed by the letter "f" and meet the requirements of EN50018 and are IECEX & ATEX certified EEx d IIC T5 or T6. The detectors are suitable for zones 1 and 2 where group IIC gases or lesser hazards can be intermittently present in explosive concentrations.

Intrinsically Safe Applications

The intrinsically safe models are suffixed by the letter " i " and meet the requirements of EN50020 part 7 and are IECEX & ATEX certified EEx ia IIC T5 or T4.
As part of an intrinsically safe circuit, it is suitable for zones 0, 1 and 2 where group IIC gases or lesser hazards can be continuously present in explosive concentrations.

Performance

The detector is designed to respond after a minimum of 3 seconds, this being the optimum signal processing time constant of the circuitry. Varying sizes of fire will be detected at given distances in the same time and figure 1 shows the typical ranges for the detection of flames, for given areas of liquid fuels. The time taken by the fire to reach equilibrium depends on the initial temperature of the fuel. If kerosene was pre-heated to a temperature above its flash point, then its behaviour would be equivalent to that of petrol at 25°C.

Directional Sensitivity and Range

The polar diagram in figure 2a shows the directional sensitivity in the horizontal plane for a 0.1m^2 n-heptane fire.
Figure 2b shows the same information in the vertical plane. These figures show maximum detector sensitivity to the extremities of its coverage.

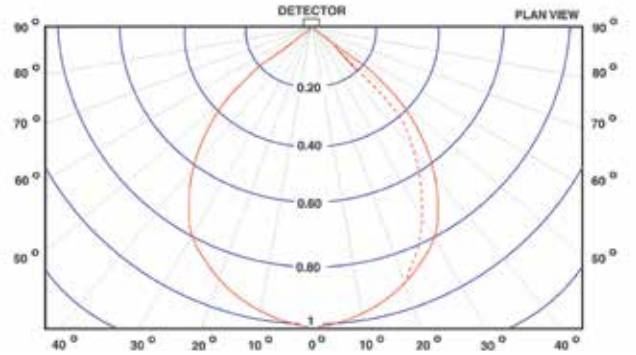

Figure 2a
Pan Fires - Relative Range vs Angle of Incidence - Horizontal Plane. Dotted Line Shows Flameproof Version with Steel Guard Fitted; Solid Line Shows I.S. Version.

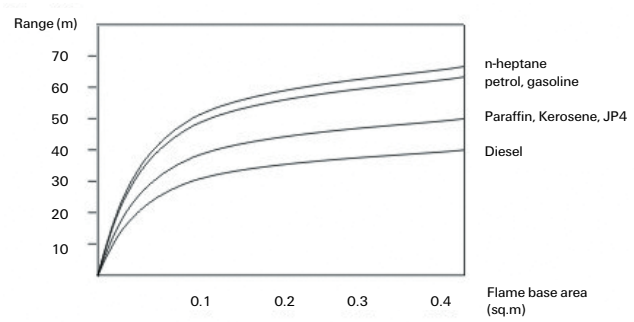

Figure 1 - Fire Range Test Data
Note: These results are based upon the fire reaching equilibrium rates of combustion in still atmosphere

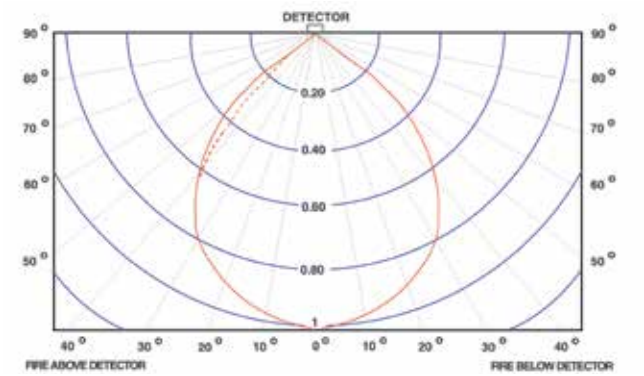

Figure 2b
Pan Fires- Relative Range vs Angle of Incidence - Vertical Plane. Dotted Line Shows Flameproof Version with Steel Guard Fitted; Solid Lines Shows I.S. Version.

Typical Response

The MINERVA S200+ offers a significantly increased sensitivity to flame with the ability to detect a fully developed 0.1 m2 n-heptane pan fire at up to 50 m. This increase is made possible by precisely predicting non-flame energy in the flame detection waveband thus enabling discrimination of the signal from a smaller flame. These detectors include three range settings. Maximum range is 50 m, default range is 25 m and there is a short range of 12.5 m.

Flame Detection Operation

The MINERVA S200+ flame detector uses the same, well proven, flame detection techniques employed in other MINERVA IR flame detectors. This is based on monitoring for modulated infrared radiation in the 4.3 µm waveband, which corresponds to CO_2 emission. It incorporates our patented techniques :

(a) for improved rejection of solar energy by using a dual 4.3 µm filter combination.
(b) Gaussian noise rejection is achieved by averaging the output signal of two separate sensor elements.

Three separate fire alarm delays of 3s, 6s and 12s are provided in all versions of the MINERVA S200+.

Triple IR Blackbody Rejection

The MINERVA S200+ implements a new concept for eliminating nuisance alarms from modulated blackbody sources. The design incorporates a novel optical filter which enables a single infrared sensor to measure the radiated energy present in two separate wavebands placed on either side of the flame detection waveband, at 3.8 µm and 4.8 µm respectively (see figure 3). The signal obtained from this "guard" channel is cross-correlated with the signal from the flame detection channel to provide an accurate prediction of the non-flame energy present in the flame detection waveband. This prediction is independent of the temperature of the radiation source, allowing the MINERVA S200+ to provide blackbody rejection over a wide range of source temperatures. The use of an optical processing technique as opposed to the use of two separate electronic sensors improves the overall reliability of the detector by reducing the number of components and eliminating the need for complex calibration procedures during manufacture.

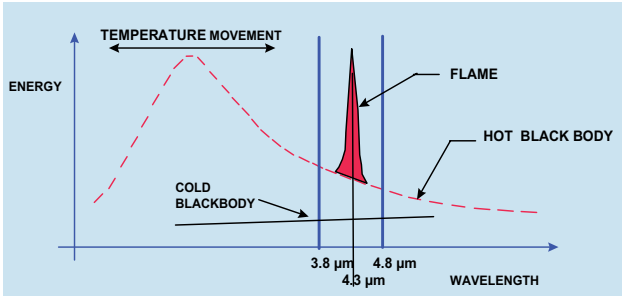

Figure 3. Blackbody Rejection

Flame Detection in the Presence of Blackbody Radiation

The sensitivity of the MINERVA S200+ is essentially not affected by the presence of blackbody radiation in the same field of view as the flame. The ability of the detector to accurately determine the amount of non-flame radiation received, allows the detector to set a variable alarm threshold. Refer to figure 4. This threshold is calculated so that the sensitivity of the detector remains largely unchanged in the presence of blackbody sources of differing temperatures and intensity.

Built-in Self Test

The MINERVA S200+ incorporates a sophisticated self test facility that tests the detector for window contamination and electronic functionality. It incorporates two different coloured LEDs. Different flash rates provide separate indication of alarm, detector (electronic) fault and "dirty" window (optical integrity monitoring). The S241+, S251+ and S271+ provide separate analogue output currents, signalling electronic fault and "dirty" window conditions to their respective control equipment.

MINERVA S200+ Product Range

Product designation S2XXx+

3 = Collective
4 = 4 to 20 mA
5 = Analogue Addressable
6 = Relay Interface
7 = *MX* Digital Addressable

1 = BASEEFA certified
2 = FM listed
3 = not used

i = Intrinsically Safe
f = Flameproof

S231i+, S231f+, S232f+ Collective 2 wire Interface

These models are suitable for connection to a 20 Vdc current monitored fire alarm panel. This is achieved over a standard two core cable. A wide range of compatible control panels with various land and marine approvals are available. The number of devices permitted on any single detection zone may vary, depending on the control panel to be used.*

S241f+ 4-20mA Current Loop Interface

This model provides a 4-20 mA output (current sink) that can be linked to a PLC type logic controller with the pre-set alarm currents provided for electronic fault, optical fault (dirty window), normal and fire alarm conditions. The interface can be achieved over a 3 core cable.

S261f+ Relay Interface

The S261f+ provides a relay interface for alarm and fault condition. The alarm and fault relay can be programmed for either latching or non-latching operation.
Both relays are rated at 2A at 30 Vdc.

*Always consult your supplier with regard to intrinsically safe systems designs

S271f+, S271i+ *MX* Digital Addressable Interface

This unique detector may be interfaced to the LPCB/VdS Approved *MX* Digital Addressable and compatible VIGILANT fire control panels. Communication is achieved over a 2 core cable thus providing cost effective installation.

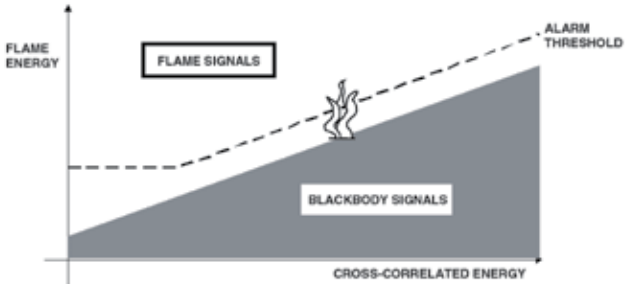

Figure 4. Variable Alarm Threshold

System Solutions

The S23Xx+, S25Xx+ and S271x+ models operate with a variety of MINERVA, VIGILANT and SIMPLEX fire control panels which provide interfacing to standard industrial fieldbus protocols such as MODBUS. Consult individual fire control panel specifications for detector compatibility and protocols supported.

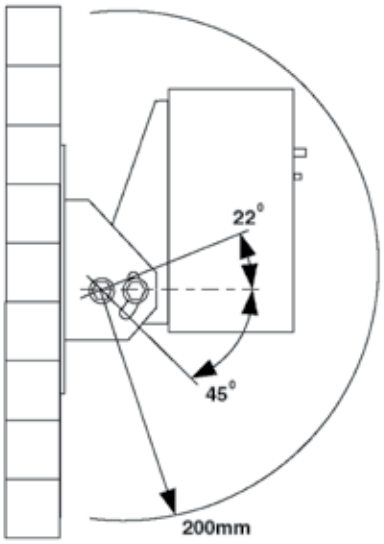

Figure 5. S200 Mounting Bracket

Mounting Bracket

The MINERVA S200+ can be bulkhead mounted or for greater flexibility a 316 Stainless Steel bracket provides horizontal and vertical adjustment, thus allowing the detector to be positioned to give an accurate cone of vision to the risk area. The bracket provides axial rotation of 50° and an elevation of 67°. Refer to figure 5.

Test Equipment

The MINERVA S200+ is supported by the T210+ calibrated IR test source for testing detectors in situ. The T210+ test source can be presented to the detectors, using a range of telescopic poles. The T210+ test source is IECEX certified Ex e ib IIC T4.

Triple Waveband Infrared Flame Detectors

Specifications

Mechanical

Detector Material	Stainless Steel 316L
Dimension (WLD)	167 x 167 x 89 mm
Weight	4.5kg
Gland Entry	3 x 20mm

Electrical

Supply Voltage	15 to 28 Vdc
Quiescent Current	S231i+/S231f+ 350µ A max. at 20 Vdc S241i+/S241f+ 350µA max. at 20 Vdc S261f+ 17mA max. at 20 Vdc S271i+/S271f+ Determined by controller
Alarm Current	S231i+/S231f+ 33mA (typical) S241i+/S241f+ Signalled on current loop S261f+ 30mA (typical) S271i+/S271f+ (Quiescent Current) 350µA max. at 20 Vdc
Connections	One way 2.5mm heavy duty terminal block
Electrical Interface	See manual for details

Environmental

Operating Temp Range	-40°C to + 80°C (non-hazardous installations)
Storage Temperature	-40°C to + 80°C
Relative Humidity	95% non-condensing (100% intermittently)
Ingress Protection	IP66 and IP67
Heat Radiation from sun	0 to 1000Wm^2 typical

Performance

Range	0.1m^2 n-heptane at 50m 0.4m^2 n-heptane at 60m
Max Field of View	90° - Flameproof Versions 100° - Intrinsically safe versions
Response Time	Field Selectable 3, 6 and 12 seconds
Sensitivity	3 range settings - 12.5, 25, 50 metres

Mounting Bracket

Weight	1.1 kg
Construction	Bright 316 Stainless Steel to BS1449 Pt2
Adjustment	Axial Rotation 50°, Elevation 67°
Fixing Details	M8 bolts (location template provided)

Part Numbers

S231i+	S231i+ Collective I/F - BASEEFA Ex ia
S231f+	S231f+ Collective I/F - BASEEFA Ex d
516.037.015	S232f+ Collective I/F - FM Ex d
516.038.003	S241f+ 4-20mA I/F - BASEEFA Ex d
516.038.004	S241i+ 4-20mA I/F - BASEEFA Ex ia
516.040.002	S261f+ Relay I/F - BASEEFA Ex d
516.041.003	S271f+ *MX* Addressable Ex d - *Contact TFPP*
517.041.004	S271i+ *MX* Addressable Ex ia - *Contact TFPP*
517.001.184	S200 Mounting Bracket
517.001.263	S200 Weather Protection Assembly
592.001.014	T210+ Adaptor for S200
592.001.016	T210+ Test Source (Ex rated)

Benefits of the MINERVA S200+

- Very low power consumption (0.35mA)
- Models available with Conventional or *MX* Analogue Addressable interface (requires 2 core cable only)
- Models also available with relay or 4-20mA outputs
- Patented dual filter solar blindness for complete solar blindness in outdoor use
- Available in Intrinsically Safe and Flameproof variants. Housing designed for easy installation of cabling
- Flexible mounting and angular adjustment . 2 x 20mm field cable entries . IP66/67 housing designed for external use
- Rugged stainless steel ANC4 LM25 alloy housing and mounting bracket
- Operating temperature -40°C to +80°C
- Variable response times and sensitivity settings
- Remote self test and range setting. True window test in detection area (i.e. not in the edge of the window)
- Terminals provided for Remote LED
- ATEX & IECEX certified with other approvals for selected models . Meets the requirements of EN54 Pt 10
- FM, Lloyds, DNV approved variants available
- Designed and manufactured in the UK

Approvals

The S231f+, S231i+ and S261f+ Flame Detectors are ActivFire listed as complying to European Standard prEN54: Part 10: 1997E Fire detection and fire alarm systems. Part 10: Flame detectors - point detectors.

ActivFire Listed	afp-1443
FPANZ Listed:-	
S231i+	VF/338
S231f+	VF/339
S261f+	VF/340
S271f+	VF/349
S271i+	VF/350

Flameproof
IECEx: BAS 05.0056
ATEX: BASEEFA02ATEX0185

Intrinsically Safe
IECEx: BAS 05.0051
ATEX: BASEEFA02ATEX0257

S200broTFPP1310

Australia | **Phone** +61 3 9313 9700 | **Email** tfppcustservice.au@tycofp.com
New Zealand | **Phone** +64 9 635 0760 | **Email** tsp.sales.nz@tycoint.com

Website | www.tycosafetyproducts-anz.com