XP95 ENGINEERING PRODUCT GUIDE

XP95

Ionisation Smoke Detector
Optical Smoke Detector
Heat Detector
Multisensor Detector
Manual Call Point
Isolating Base
Sounders & Beacons

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FIRE DETECTORS LIMITED

XP95 IONISATION SMOKE DETECTOR

XP95 Ionisation Smoke Detector ▲ REF.: SI: XP95-500

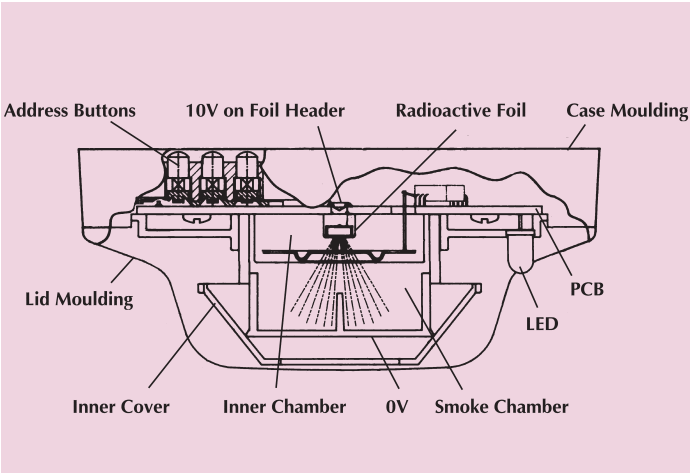

Fig.1 Sectional view - XP95 Ionisation Smoke Detector

OPERATING PRINCIPLES

The XP95 ionisation smoke detector has a moulded self-extinguishing white polycarbonate case with wind resistant smoke inlets. Stainless steel wiper contacts connect the detector to the terminals in the mounting base. Inside the detector case is a printed circuit board that has the ionisation chamber mounted on one side and the address capture, signal processing and communications electronics on the other.

The ionisation chamber system is an inner reference chamber contained inside an outer smoke chamber (Fig 1). The outer smoke chamber has smoke inlet apertures that are fitted with an insect resistant mesh.

The radioactive source holder and the outer smoke chamber are the positive and negative electrodes respectively. An Americium 241 radioactive source mounted within the inner reference chamber irradiates the air in both chambers to produce positive and negative ions. On applying a voltage across these electrodes an electric field is formed as shown in Fig 2. The ions are attracted to the electrode of the opposite sign, some ions collide and recombine, but the net result is that a small electric current flows between the electrodes. At the junction between the reference and smoke chambers is the sensing electrode that is used to convert variations in the chamber currents into a voltage.

When smoke particles enter the ionisation chamber, ions become attached to them with the result that the current flowing through the ionisation chamber decreases. This effect is greater in the smoke chamber than in the reference chamber and the imbalance causes the sensing electrode to go more positive.

The voltage on the sensing electrode is monitored by the sensor electronics and is processed to produce a signal that is translated by the A/D converter in the communications ASIC ready for transmission when the device is interrogated.

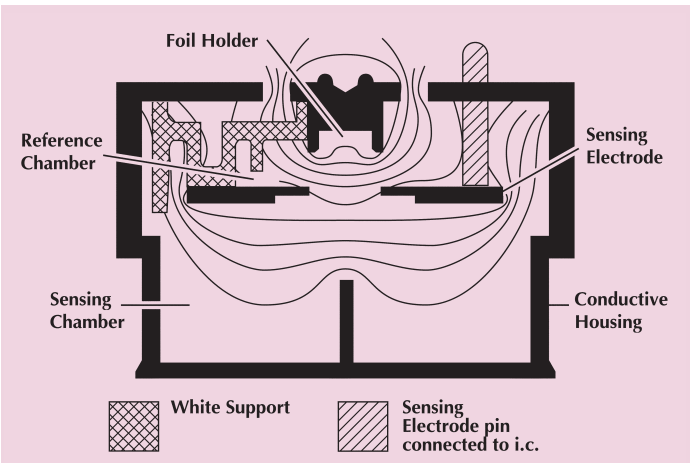

Fig.2 Diagram showing lines of equipotential for the XP95 Ionisation Smoke Monitor

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ELECTRICAL DESCRIPTION

The detector is designed to be connected to a two wire loop circuit carrying both data and a 17V to 28V dc supply. The detector is connected to the incoming and outgoing supply via terminals L1 and L2 in the mounting base. A remote LED indicator requiring not more than 4mA at 5V may be connected between +R and -R terminals. An earth connection terminal is also provided, although this is not required for the functioning of the detector.

When the device is energised the ASICs regulate the flow of power and control the data processing. The ionisation chambers are energised and the ultra low leakage sensor ASIC provides a conditioned analogue signal to the analogue to digital (A/D) converter within the communications and processing ASIC. When smoke enters the ionisation chambers through the integral gauze, the voltage at the sensing electrode increases to produce an analogue signal. An A/D conversion of the signal from the ionisation chambers is carried out once per second or when either the detector or preceding address is being interrogated. Whenever the device is interrogated this data is sent to the control equipment. EN54 threshold alarm levels are calibrated within the processing ASIC. If the device is not addressed within 1 second of its last polling and the analogue value is greater than 55 the alarm flag is initiated and the device address is added to the data stream every 32 polling cycles from its last polling for the duration of the alarm level condition, except when the alarming device is being interrogated. This can provide a location identified alarm from any device on the loop in approximately two seconds.

The detector is calibrated to give an analogue value of 25±7 counts in clean air. This value increases with smoke density. A count of 55 corresponds to the EN54 alarm sensitivity level. See Fig 3. Counts of 8 or less indicate fault conditions. Count levels between 45 counts and 55 counts can be used to provide an early warning of fire.

ENVIRONMENTAL CHARACTERISTICS

XP95 ionisation smoke detectors are designed to operate in a wide variety of environments (See Figs 4 to 6). There are only small effects from temperature, humidity, atmospheric pressure and wind. Detectors are well protected against electromagnetic interference over a wide frequency range.

The XP95 ionisation detector, like all ionisation detectors, has some sensitivity to air movement (wind). The extent to which the analogue value will change depends on the wind speed and on the orientation of the detector relative to the wind direction. Relatively small changes in wind direction can cause significant changes in analogue value.

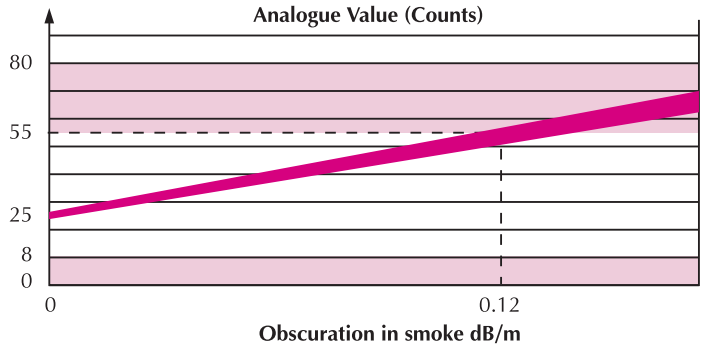

Fig.3 Typical response characteristics - XP95 Ionisation Detector

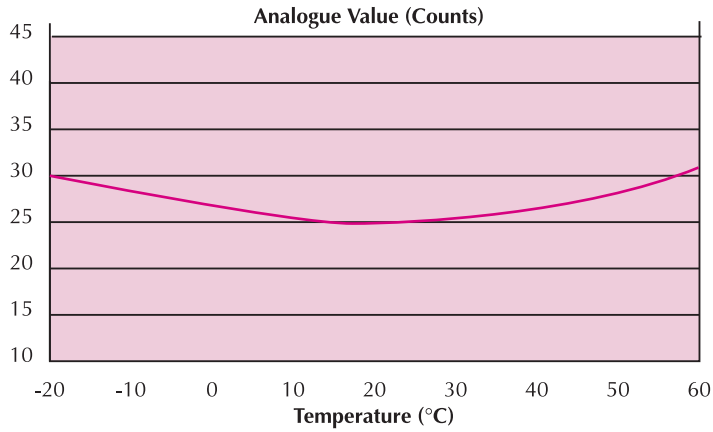

Fig.4 Typical temperature response - XP95 Ionisation Detector

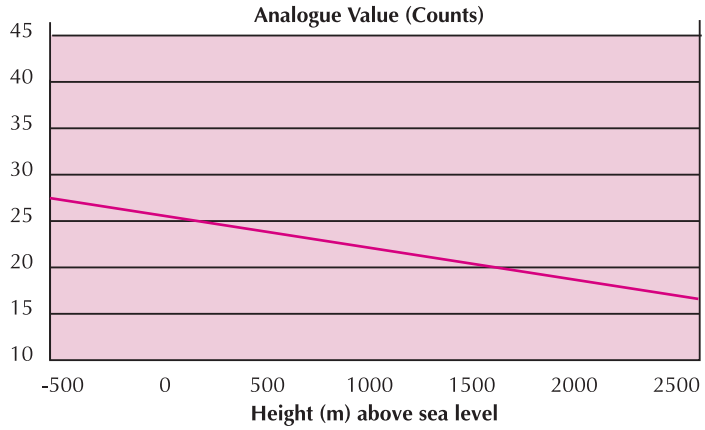

Fig.5 Typical pressure response - XP95 Ionisation Detector

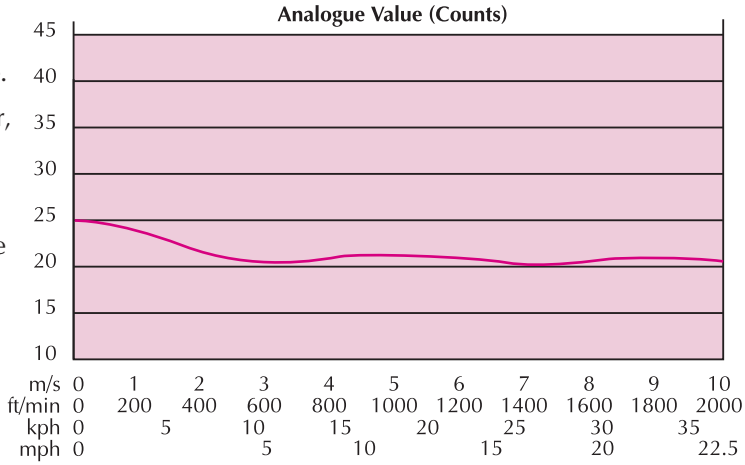

Fig.6 Typical wind speed response - XP95 Ionisation Smoke Detector

TECHNICAL DATA

XP95 Ionisation Detector
REF.: SI: XP95-500
Base Part No 45681-210

Specifications are typical and given at 23°C and 50% relative humidity unless otherwise stated.

Detector Type:
Point type smoke detector for fire detection and fire alarm systems for buildings

Detection Principle:
Ionisation Chamber

Chamber Configuration:
Twin compensating chambers using one single sided ionising radiation source

Radioactive Isotope:
Americium 241

Activity:
33.3kBq, 0.9µCi

Sampling Frequency:
Continuous

Sensitivity:
Nominal threshold y value of 0.7 to EN54–7:2000

Supply Wiring:
Two wire supply, polarity insensitive

Terminal Functions:

L1&L2	supply in and out connections (polarity insensitive)
+R	remote indicator positive connection (internal 2.2kΩ resistance to supply +ve)
-R	remote indicator negative connection (internal 2.2kΩ resistance to supply - ve)

Supply Voltage:
17 to 28 Volts dc

Modulation Voltage at Detector:
5 to 9 Volts peak to peak

Quiescent Current:
280µA average, 500µA peak

Power-up Surge Current:
1mA

Duration of Power-up Surge Current:
0.3 seconds

Maximum Power-up Time:
4 seconds for communications (measured from application of power and protocol)
10 seconds to exceed 10 counts 15 seconds for stable clean air value

Clean Air Analogue Value:
25±7 counts

Alarm Level 55 Counts:
EN54 y value of 0.7

Alarm Indicator:
Red light emitting diode (LED)

Alarm LED Current:
2mA

Remote LED Current:
4mA at 5V (measured across remote load)

Type Code:
(210 43) 011 00

Storage Temperature:
-30°C to +80°C

Operating Temperature:
-20°C to +70°C

Guaranteed Temperature Range:
(No condensation or icing)
-20°C to +60°C

Humidity:
(No condensation or icing)
0% to 95% relative humidity

Wind Speed:
10m/s maximum

Atmospheric Pressure:
Automatic compensation by dual chambers to maintain sensitivity up to a height of 2000m above sea level

Vibration, Impact & Shock:
To EN54–7:2000

Electro-magnetic Compatibility:
See page 21 for full details

IP Rating:
23D

Approvals & Regulatory Compliance:
See page 21 for full details

Dimensions: (diameter x height)
Detector: 100mm x 42mm
Detector in Base: 100mm x 50mm

Weights:
Detector: 105g
Detector in Base: 161g

Materials:
Detector Housing: White polycarbonate V-0 rated to UL 94
Terminals: Nickel plated stainless steel

CE
0832

technical data

For wind speeds up to 1m/s (200ft/min) the change in analogue value will not exceed 5 counts. Continuous operation in wind speeds greater than 2m/s (400ft/min) is not recommended. However, wind speeds up to 10m/s (2000ft/min) can be tolerated for short periods and will not under any conditions increase the probability of false alarms.

SAFETY NOTE

In the United Kingdom, ionisation smoke detectors are subject to the requirements of the Radioactive Substances Act 1993 and to the Ionising Radiations Regulations 1999 made under the provisions of the Health and Safety at Work Act 1974.

The detectors, independently tested by the National Radiological Protection Board (NRPB), conform to all the requirements specified in the 'Recommendations for ionisation smoke detectors in implementation of radiation standards' published by the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD) 1977.

There is no limit to the number of ionisation smoke detectors which may be installed in any fire protection system within the UK. See Certificate of Approval No. TA1 of 1999 issues by the HSE for further details.

Storage regulations depend on local standards and the legislation, but, in the UK, the number of ionisation smoke detectors in any building or premises shall be less than 500. See Certificate of Approval No. TA3 of 1999 issued by the HSE for further details.

At the end of their recommended working life of ten years, ionisation smoke detectors should be returned to Apollo for safe disposal or disposed of in an otherwise locally approved and environmentally safe manner. Please see "A Guide to the Care, Maintenance and Servicing of Apollo Products", PP2055.

Guidance on storage can be given by Apollo Fire Detectors and full details can be requested from:

Radioactive Substances Regulation Function
Environment Agency
Rio House, Waterside Drive
Aztec West, Almondsbury,
Bristol, BS32 4UD

Outside the UK, please contact the relevant national agency.

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