

**FIRE DETECTION AND ALARM SYSTEM**

Scope

Furnish a complete 24V DC conventional, electrically supervised, zone annunciated, fire detection and alarm system as specified herein and indicated on the drawings. The system shall include but not be limited to, a control panel or panels with integral power supply to provide the 24V DC, signal initiating devices, audible and visual alarm devices, and all accessories required to provide a complete and operating system.

The fire alarm system shall be wired with 2 core signal and sounder circuits with an option to connect both detectors and call points to the same 2 core cable as the sounders. 24V DC power wiring shall be installed to alarm sounders via a conventional monitored sounder outputs within the control panel.

Codes and Standards

The following codes and standards shall apply to work of this section.

- EN54-2 and EN54-4 - Fire Alarm CIE and PSE
- ISO9001 - Quality control
- BS 5839:part 1 - Fire Detection and Alarm Systems for Buildings

Qualifications of Manufacturers

Manufacturers of the products supplied for the fire alarm system shall have been in the business of manufacturing Fire Alarm products for at least five years. They shall confirm compliance to the above codes and standards.

Fire Alarm Control Panel (FACP)

Functional Description

The fire alarm control panel (FACP) shall be the central processing unit of the system, receiving and analysing signals from fire sensors, providing audible and visual information to the user, initiating automatic alarm response sequences and providing the means by which the user interacts with the system.

The FACP shall be certified as meeting the requirements of EN54-2 and EN54-4 by a suitable, notified body. A certificate and test report shall be made available for inspection as evidence of certification.

The FACP shall be easily configurable to meet the exact detection zone and output mapping requirements of the building.

The FACP shall be microprocessor based and operate under a multitasking software program. Operating programs and configuration data shall be contained in re-configurable non-volatile memory. Retention of the memory shall not rely on any form of battery or capacitor back-up device.

Additional Components

It shall be possible to fit the FACP with up to 7 Fire alarm repeater panels, 8 way sounder boards or ancillary relay boards.

Fire alarm repeater panels and ancillary boards shall be connected via a four core cable carrying power and serial data.

Fire alarm repeater panels, ancillary boards and sounder boards shall be allocated a bus address. Once connected and accepted by the FACP, removal or disconnection of any Fire alarm repeater, ancillary board or sounder board shall be announced as a fault condition at the FACP.

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## Configuration

It shall be possible to perform configuration updates on site using the panel's controls only.

## Control panel

- a) Type of detection circuit ("two wire" system i.e. sounders fitted to detection circuits)
- b) Sounder ringing mode (common, zonal or 2 – stage)
- c) Sounder delay time (up to 9 minutes)
- d) Select delays for detectors and call points separately for each zone.
- e) Configure each zone for operation through an I.S. barrier
- f) Configure each zone to activate the alarm condition in response to a short circuit on the zone input.
- g) Select zones to contribute to the coincidence output on ancillary boards.
- h) Select each zone to be latching or non-latching.
- i) Select each zone to not operate sounder outputs.
- j) Select each zone to have an input delay (zone must be activated for 30 seconds before alarm condition is announced).
- k) Select each zone to be "two wire" or standard.
- l) Select each zone to not operate the common Fire relay.
- m) Disable the Fire relay output
- n) Disable the fault relay output.
- o) Disable the fire buzzer.
- p) Disable earth fault monitoring.
- q) Provide a 1 second on 1 second off pulse at Auxiliary 24V terminals.
- r) Remove Auxiliary 24V DC output for 3 seconds when reset button is pressed.

## Panel Construction

The housing containing the FACP shall be of metal construction and shall be capable of being surface or semi-flush mounted. It shall be complete with cable knock-outs in sufficient quantity to accommodate all likely cabling requirements.

The housing shall afford a minimum ingress protection to IP30 and it shall not be possible to open the FACP without the use of a special tool or key.

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## Panel Indications

The FACP shall monitor the status of all devices for fire, short-circuit fault, open-circuit fault and unauthorised device removal.

The FACP shall also monitor the status of internal connections and interfaces including charger and batteries.

The FACP shall provide the following discrete visual indications:

a) POWER ON	green LED indicator
b) FIRE ALARM	red LED indicator
c) TEST MODE	yellow LED indicator
d) ALARM/FAULT WARNING SILENCED	yellow LED indicator
e) DELAY ON	yellow LED indicator
f) GENERAL DISABLEMENT	yellow LED indicator
g) GENERAL FAULT	yellow LED indicator
h) POWER FAULT	yellow LED indicator
j) SYSTEM FAULT	yellow LED indicator
k) SOUNDER FAULT/DISABLED	yellow LED indicator
l) ZONAL FIRE	red LED indicator
m) ZONAL FAULT	yellow LED indicator

## Display

In addition to the indications above, the FACP shall have integral 7 segment LED displays.

The LED displays shall indicate codes at access level 2 and access level 3 to enable test, disablement and configuration options to be set using the panel controls.

## Panel Controls

The panel shall be provided with at least the following manual controls: -

- a) SILENCE/SOUND ALARM
- b) ALARM/FAULT WARNING SILENCE
- c) RESET
- d) LAMP TEST
- e) MODE
- f) SELECT
- g) ENTER

## Remote Monitoring Signals

The FACP shall contain at least two outputs to allow interconnection to other systems.

The FACP shall be capable of monitoring and controlling remote site devices, such as relays for the control of plant and dampers from serially connected ancillary boards.

## Sounders

The FACP shall provide the necessary outputs to separately operate a minimum of two monitored circuits of common system sounders with a total sounder load of 1.6A.

- The FACP shall be capable of providing a two-stage alarm sounder facility that can be programmed, either on a zonal basis or common system basis, to meet the requirements of the fire authority.

## Fault Reporting

The FACP shall monitor all critical system components and interconnections, internal and external, such that a failure, which would prevent the correct operation of the alarm functions, causes the FAULT indicator to light.

The following faults shall be reported in the manner described above: -

- a. Zonal Short Circuit
- b. Zonal Open Circuit
- c. Device missing
- d. System fault (processor)
- e. Low battery
- f. Charger failure
- g. Earth fault monitoring
- h. Battery Fault
- i. Mains Failure
- j. Sounder Wiring Open Circuit (per circuit)
- k. Sounder Wiring Short Circuit (per circuit)

## Power supply

The FACP shall incorporate a 24V DC power supply and battery charger. The power supply shall be capable of delivering up to 3 Amps at 28V DC. The battery charger shall be capable of charging 24V batteries of up to 7Ah capacity.

The power supply shall have a nominal input voltage of 230V AC.

## System Management

The FACP shall incorporate the following system management facilities:

- a. Disable/enable individual zones
- b. Disable/enable individual sounder circuits
- c. Disable/enable volt-free contacts
- d. Walk-test of a selected zone to verify detectors and sounders

Access to the facilities describe above shall be restricted to user Engineer level or above.

## Automatic Fire Detectors (General)

### General

The manufacturer shall have available the following types of a sensors, for direct connection to the system.

- Ionisation smoke sensors
- Photoelectric smoke sensors
- Heat sensors

### Other Units

The manufacturer shall have available the following types of detectors, manual call points and ancillary units for connection to the system.

- Photoelectric beam smoke detectors
- Ultra-violet flame detectors
- Manual call points for indoor use
- Manual call points for outdoor use
- Remote indicator units
- Sounders
- Detector bases
- Diode detector bases
- Two wire detector bases

The manufacturer shall have available suitable equipment to test and remove or exchange all three main types of automatic point-type detectors when installed.

Ionisation Smoke Detectors

The ionisation smoke detectors shall be capable of detecting visible and invisible combustion gases emanating from fires, using a dual ionisation chamber in which the air is ionised by a single radioactive source.

The radioactive source used shall be AM 241 of one microcurie or less.

The ionisation smoke detectors shall be designed to have high resistance to contamination and corrosion and shall include RFI screening to minimise the effect of radiated and conducted electrical interference.

The ionisation smoke detectors shall be suitable for operation in air speeds of up to 10m/s and shall incorporate screens to minimise the effects of small insects.

The ionisation smoke detector shall incorporate LED's, clearly visible from the outside, to provide indication of alarm actuation.

In locations where the detector is not readily visible, remote indicator units shall be provided.

Photoelectric Smoke Detectors

The photoelectric smoke detectors shall be capable of detecting visible combustion gases emanating from fires and shall employ the forward light-scatter principle.

The point-type photoelectric smoke detectors shall be equally sensitive to a wide range of combustible materials.

The design of the point-type photoelectric smoke detector sensing chamber shall be optimised to minimise the effect of dust deposit over a period of time. The chamber cover shall be removable for ease of cleaning or replacement.

The point-type photoelectric smoke detectors shall incorporate screens designed to prevent all but the very smallest of insects from entering the sensing chamber, (50 holes per square centimetre or more).

The photoelectric smoke detectors shall be designed to have high resistance to contamination and corrosion and shall include RFI screening to minimise the effect of radiated and conducted electrical interference.

- Normal sensitivity
- Normal sensitivity – delayed response
- Normal sensitivity – Intrinsically Safe

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The photoelectric smoke detector shall incorporate two LED's, clearly visible from the outside, to provide indication of alarm actuation.

In locations where the detector is not readily visible, remote indicator units shall be provided.

#### Duct smoke detectors

The manufacturer shall produce standard equipment for the installation of smoke detectors in air ducts. This equipment shall be designed to accommodate the manufacturer's standard smoke detectors and bases.

#### Heat detectors

The heat detectors shall be capable of detecting rapid rise in temperature and/or fixed absolute temperatures.

The heat detectors shall employ two heat-sensing elements with different thermal characteristics to provide a rate of rise dependent response.

The heat detectors shall include RFI screening to minimise the effect of radiated and conducted electrical interference.

The manufacturer shall have available the following versions of heat detectors to meet different applications:

- Grade 1
- Grade 2
- Range 1
- Static 60°C
- Static 90°C

The heat detectors shall incorporate LED's, clearly visible from the outside, to provide an indication of alarm actuation.

In locations where the detector is not readily visible, remote indicator units shall be provided.

#### Detector Base

The automatic point-type fire detectors shall be fixed to the installation by means of plug-in bases.

The three types of bases specified above shall incorporate the optional feature of being able to lock the detectors in place once plugged in. Termination facilities shall be available for earthing.

Bases shall not contain any electronic circuitry. This shall enable insulation and continuity checks to be completed on the wiring with the detector heads removed.



Other devices

Photoelectric beam smoke detectors

The photoelectric beam smoke detectors shall be capable of detecting visible combustion gases emanating from fires and shall utilise the light obscuration principle. The emitter shall project a near infra red beam to the receiver.

Two types are acceptable:

1. The photoelectric beam smoke detectors shall consist of an emitter and a receiver pair. The detectors shall operate over a 5 – 100 metre range.
2. A Photoelectric reflective beam smoke detector consisting of a combined control unit and a separate reflector. The detector shall operate over a 5-30 metre range.

The photoelectric beam smoke detectors shall have automatic recalibration in order to adjust for contamination.

The photoelectric beam smoke detectors shall be designed to have high resistance to corrosion and shall include RFI screening to minimise the effect of radiated and conducted electrical interference.

The photoelectric beam smoke detectors shall incorporate two LED's, clearly visible from the outside and below, to provide indication of alarm actuation and fault.

Ultra-violet flame detectors

The flame detector shall be of a point-type. It shall be mounted on its base using a simple twist action for ease of installation and removal.

The flame detector shall be able to detect weak ultra-violet rays in a 120° cone of vision, in a direct line of sight.

Remote Indicator Unit

The remote indicator unit shall provide a remote indication for any detector that may be located in an enclosed or locked compartment.

The remote indicator unit shall be driven directly from its associated local detector. It shall be either flush or surface mountable.

Sounders

Sounders shall be flush or surface mountable, red in colour. They shall have a minimum sound output of 95 dB (A) at 1 meter distance and shall have a maximum current consumption at 24V DC of 100 mA.

Alarm Bells

Fire alarm bells shall be under dome type with a high resonance pressed alloy-steel gong to ensure a load clear-tone ring. They shall be fully suppressed and polarised.

The operating mechanism shall be fully enclosed and the gong shall be red stove enamelled for long life.

Alarm bells shall have a minimum sound output of 95 dB (A) at 1 metre distance, and shall have a maximum current consumption at 24V DC of 30 mA.

**END OF SPECIFICATION**