

30-3003 Explosion-Proof Smoke Detector

Section: Conventional Initiating Devices

GENERAL

The Pyrotector Model 30-3003 Explosion Proof Smoke Detector is a sensitive yet rugged protection device that is designed for use in hazardous industrial and commercial locations. The detector is designed to operate effectively with both slow smoldering and fast burning fires.

FEATURES

- Rugged construction.
- Self checking and compensating circuitry maintains desired sensitivity.
- Heightened sensitivity triggered when smoke is increasing, but has not yet reached the preset sensitivity setting.
- Form A (SPST) N.O. contacts for connection to alarm output circuitry.
- SPST N.C. contacts for supervision of input power.
- 2.3% fixed sensitivity.

APPLICATIONS

- Combustible storage facilities.
- Munitions manufacturing.
- Volatile chemical storage.
- Chemical processing plants.
- Petroleum refineries.
- Turbine enclosures.

CONSTRUCTION & OPERATION

The photoelectric smoke detector uses a solid-state infrared-emitting diode (IRED) and a light-sensing photovoltaic cell arranged in a labyrinth assembly. The labyrinth permits free access to smoke but restricts external light. Because of its critical function to the operation of the detector, each IRED is selected with extreme care and is subjected to rigorous pre-production testing to ensure long-term reliability and performance.

During normal operation (no smoke), the detector samples the air approximately every four seconds for a period of less than one millisecond. The photovoltaic smoke cell, which is placed at an angle to the pulsed invisible light source, is sensitive to the infrared light in the specified frequency emitted by the IRED light source and is designed to receive a signal only when the pulsed IRED source is activated. See *Figure 1*.

When smoke enters the chamber, the light from the IRED reflects off the smoke particles and reaches the photovoltaic smoke cell. When the amount of light reflected by smoke reaches the factory-set threshold level, the smoke alarm circuit is actuated.

The detector will respond to a slow smoldering fire when smoke in the chamber reaches the preset sensitivity setting, typically 2.3%.

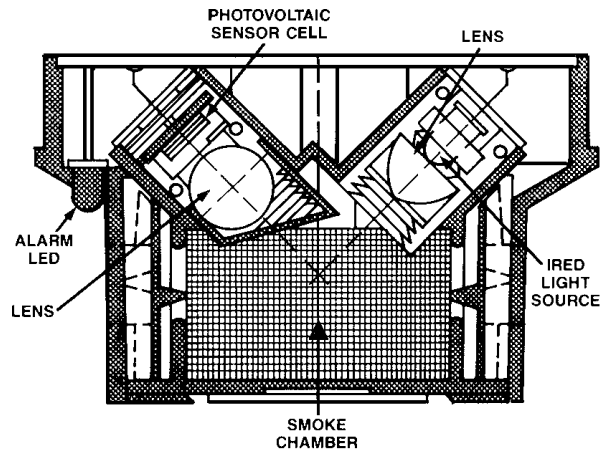


Figure 1— Cross Section of Sensing Chamber Assembly

If a fast-burning fire should occur, including fires in flammable liquids and other materials such as plastics that generate black smoke, the abnormally rapid movement of smoke into the detection chamber is sensed by a special rate-compensating circuit. An increase in smoke within the detection chamber that exceeds a preset rate causes the rate-compensation circuit to increase the intensity of the light source, which increases detector sensitivity. If the smoke continues to build at this rate, an amplifier circuit is triggered and the unit generates an alarm. If not, the detector reverts to normal sensitivity.

In normally smoky atmospheres, the detector will not go into alarm as long as the concentration is less than the fixed sensitivity of the detector. This results in a sensitive and posi-

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tive response with a very low potential for unwanted alarms.

The main enclosure of the detector contains the electronic circuitry, alarm relay, and supervision relay.

Fail-safe Operation. To ensure reliable operation, the Model 30-3003 is equipped with self-checking circuitry. A regulation photodiode, which is matched to the smoke detection circuit, continuously monitors the output intensity of the IRED and adjusts it as necessary to compensate for an accumulation of dust or other contaminants, or any other variation that can occur with temperature and time. A power supervision relay in the detector provides a trouble output signal in the event of an input power failure.

The detector uses extensive filtering against RF and transient interference. In addition, there is a two-second time delay before an alarm is generated.

The printed circuit board inside the detector is coated to minimize the possibility of problems caused by moisture accumulation.

Detector Outputs. The detector provides a set of Form A (SPST) N.O. contacts for connection to the alarm output circuitry and a set of SPST N.C. contacts for supervision of input power. The alarm output latches on in the event of an alarm and an LED located on the outer surface of the housing is illuminated to provide a visual indication that an alarm condition has occurred. The detector is reset by momentarily interrupting input power.

Classification. The Model 30-3003 is designed to meet NEC requirements for Class I, Groups C and D; Class II, Groups E, F, and G; and Class III hazardous areas.

Explosion-Proof Certification. The Model 30-3003 is certified by the German Electric Industry Association, VDE, to meet Standards 0171/ "Special Protection" (Ex)sG5 (sand encapsulated), and PTB/CENELEC approved as EEx q II T5.

SPECIFICATIONS

Operating voltage: 20 to 28 volts DC.

Operating current: Standby: 10 milliamperes. **Alarm:** 35 milliamperes.

Temperature range: -4°F to +140°F (-20°C to +60°C).

Maximum air velocity: 3960 feet per minute.

Relay contact rating: 2 amperes at 30 VDC, 0.5 ampere at 125 VAC.

Dimensions: Diameter: 5-5/16". **Depth:** 3-1/2".

INSTALLATION

The Model 30-3003 is intended for surface mounting. The mounting screw holes are counterbored for No. 8 flat-head screws. Six pigtail wires are brought through a strain relief and compound sealed within an aluminum adapter. A close nipple is furnished to permit coupling of the detector assembly to the furnished junction box. All connections between the pigtail wires and external system wiring are contained within the junction box.

DETECTOR LOCATION

The smoke detector is normally mounted on the ceiling not less than six inches from a side wall. The exact location of the detector must be determined by an evaluation based on engineering judgment supplemented, if possible, by field tests.

For additional information on detector location and spacing, contact the National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269, and request a copy of NFPA Number 72E, the Standard on Automatic Fire Detectors.

DETECTOR CONNECTIONS

The Model 30-3003 contains two sets of relay contacts.

1. One set of N.O. Alarm contacts (violet) close upon detection of smoke.
2. One set of N.C. Trouble contacts (yellow) close when the detector is powered.

Power is applied to the detector at the red (positive) and black (negative) pigtails.

MAINTENANCE

Regularly scheduled maintenance is normally not needed, however, periodic cleaning of the smoke chamber may be necessary when detectors are located in abnormally dirty or dusty environments. Vacuuming around the smoke chamber housing prior to blowing out the chamber with a "dry air" hose is recommended.

NOTE: The Model 30-3003 is **NOT** designed to be serviced or repaired in the field. Disassembly of the detector in the field will **VOID** both the explosion-proof rating and the warranty. If service or repairs are required, **RETURN THE ENTIRE UNIT TO THE FACTORY.**

The smoke detector can be tested using the same methods employed for any photoelectric detector.

DO NOT USE canned aerosol smoke devices to test the detector, since damage can result.

ENGINEERING SPECIFICATIONS

The detector shall be a 2.3% fixed sensitivity photoelectric smoke detector, providing minimum response time to all fire types.

The detection chamber shall extend beyond the main housing into the area to be protected, to provide maximum smoke entry capability into the chamber from any direction.

The detector light source shall be an IRED (Infrared Emitting Diode). Typical detector current consumption in the standby condition shall be 10 milliamperes.

The detector shall lock in on alarm and have a visible alarm indicator LED.

The detector shall have SPST alarm relay contacts for connection to the fire alarm control panel and also power supervision contacts.

The detector enclosure shall be an explosion-proof flanged housing designed to meet NEC classifications of:

- Class I, Groups C and D.
- Class II, Groups E, F, and G.
- Class III hazardous areas.

The detector shall be intended for surface mounting and connection to the system wiring shall be by means of pigtails in a rated enclosure (furnished).

PRODUCT LINE INFORMATION

30-3003 Explosion-Proof Smoke Detector.