American National Standard for Spark Detection and Extinguishing Systems

ANSI /FM Approvals 3265
Approved January 30, 2017

January 2017

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Foreword

NOTE: This foreword is introductory only and is not part of American National Standard/FM Approvals 3265.

This standard sets performance requirements for Spark Detection and Extinguishing Systems.

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The American National Standards Institute does not develop standards nor will it in any circumstances give an interpretation of any American National Standard. Requests for interpretations of this test standard should be addressed to FM Approvals.

ANSI regulations require that this American National Standard shall be revised, reaffirmed or withdrawn within five years of the date of publication.

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1 INTRODUCTION

1.1 Scope

1.1.1 This standard applies to systems for protection of ducting, conveyors or chutes used in pneumatic materials handling systems and most often used in the woodworking and textile industries. Other installation types may also be applicable. Spark radiation detectors are mounted to view in the duct to sense ignition sources. These detectors send signals to a control device, which in turn actuates a valve for a predetermined extinguishing cycle. The valve supplies one or more water-spray nozzles mounted downstream of the detectors; the water discharge is timed to ensure suppression of the ignition source and the material shortly before and after the particle. Because such a system is intended only for protection from a specific hazard, it should not be considered a substitute for general fire protection, including appropriate sprinkler protection.

1.1.2 Spark-extinguishing systems are very effective in reducing the frequency of combustible dust deflagrations. However, they do not reduce the severity of a deflagration, and are not an alternative to deflagration protection in downstream equipment.

1.1.3 These are complicated systems which require careful installation. Many factors, including particle velocity, the radiation characteristics of heated particles, and the ignition energy requirements of the material in dust form affect the ability of this system to protect the property. The manufacturer's instructions should be followed carefully. Access for service must be provided near the detectors and near the water spray nozzles and a regular program of maintenance and testing should be established.

1.1.4 Spark extinguishing systems are typically considered as a special hazards protection or process protections and would not in itself cause a building evacuation. They may connect to the existing protected premises fire alarm system for additional evacuation capability although this is not common.

1.1.5 This standard provides the operating basis for the complete spark extinguishing system, including the alarm initiating (spark detectors), alarm signaling processing (control unit) as well as the water-spray or extinguishing sets for use in ordinary dry locations. It does not by itself cover the use in damp, wet or hazardous (classified) locations (other standards apply). This equipment covered by this standard, may be combined with additional standards for use in other areas.

1.1.6 This standard considers applications involving the detection and extinguishing of small wood, fiber and metal combustibles with spark sensing detectors during the transport of particulate solid materials through pneumatic conveyor ducts within a 8 in. to 118 in. (0.2 to 3.0m) diameter or mechanical conveyors with velocities ranging from 200 to 10,000fpm (1-50mps).

1.2.6 Operation outside of theses parameters is possible with additional testing and would be indicated in the product listing for the particular system.

1.2 Basis for Requirements

The requirements of this standard are based on experience, research and testing, and/or the standards of other organizations.

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1.3 System of Units

Units of measurement used in this standard are United States (U.S.) customary units. These are followed by their arithmetic equivalents in International System (SI) units, enclosed in parentheses. The first value stated shall be regarded as the requirement. The converted equivalent value may be approximate. Appendix A lists the selected units and conversions to SI units for measures appearing in this standard. Conversion of U.S. customary units is in accordance with the American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)/American Society for Testing Materials (ASTM) SI 10-97, "Standard for Use of the International System of Units (SI): The Modern Metric System."
State any exception here, such as the following, which is used in many Hydraulics standards: Two units (liter and bar), outside of but recognized by SI, are commonly used in international fire protection and are used in this standard.

1.4 Applicable Documents

The following standards, test methods, and practices are referenced in this standard:

1. NFPA 15, 2017, *Standard for Water Spray Fixed Systems for Fire Protection*
2. NFPA 72, 2016, *The National Fire Alarm and Signaling Code*
3. NFPA 70, 2017, *The National Electrical Code*
4. NEMA 250, 2003, *Enclosures for Electrical Equipment*
5. IEC 529 1989-11, *Degrees of protection provided by enclosure (IP Codes)*

1.5 Definitions

For purposes of this standard, the following terms apply:

***Acknowledge* -** To confirm that a message or signal has been received, such as by the pressing of a button or the selection of a software command.

Authority Having Jurisdiction (AHJ) – an organization, or individual responsible for enforcing the requirements of a code or standard, or for approving the equipment, materials, an installation, or a procedure.

***Annunciator* -** A unit containing one or more indicator lamps, alphanumeric displays, or other equivalent means in which each indication provides status information about a circuit, condition, or location.

***Compatibility* -** A process where the equipment (controls & peripherals) are verified as suitably rated to operate or communicate properly as a system and as intended**.** Equipment can specifically be tested for compatibility and often applies to initiating devices, two-wire and digital communication type to designate operation with certain control equipment. The compatibility of spark detectors are often determined through electrical rating comparisons and testing.

***Fire Alarm Signal* –** A signal following multiple (or continuous) spark or ignition signals requiring that a general alarm signal be sent to the local protective signaling system at the protected property, if so equipped.

***Fire Alarm System (Local)* -** A life safety system arranged to monitor and annunciate the status of fire alarm or supervisorysignal-initiating devices and to initiate the appropriate response (evacuation or otherwise) to those signals.

Half Power Field of View – The half power field of view (HPFV) is defined as the off-axis angle where the detector responds to a spark source at no less than ½ the distance it is capable of detecting to on-axis.

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Spark – A moving particle of solid material that emits energy due to either its temperature or the process of combustion on its surface.

Spark/Ember Detector – A low-energy sensing fire detector that is designed to detect the energy created by sparks, embers, or both. These devices are normally intended to operate in dark environments and in the infrared part of the spectrum.

Spark Detector Circuit – A circuit strictly limited to the connection of specific spark detectors and not other conventional devices such as; manual stations or smoke detectors.

Spark Extinguishing System - A system that monitors the transport of particulate solid materials through pneumatic conveyor ducts or mechanical conveyors and annunciates the status of spark/ember detector, supervisory devices that support the system and activation of the appropriate response to those signals. This is most commonly a timed release of water into the duct but can also include the diversion or dumping of product for a timed period also and process shutdown if desired.

Spark/Ember Detector Sensitivity – The quantity of energy or power (expressed in Watts) from a point source radiator, applied as a unit step signal at the wavelength of maximum detector sensitivity necessary to produce an alarm signal from the spark/ember detector.

Spray Establishment Time – The sum of several different factors including; a) detector response time, b) system response time and c) extinguishing response time necessary to establish total flooding of the duct being protected. The SET can then be used with the rated duct velocity up to but not exceeding 10,000 fpm (50 mps) times to determine the minimum distance in feet (m) between spark detection zone and spray extinguishing zone.

Supervisory Signal – A signal that results from the detection of a supervisory condition that impairs the proper operation of the Spark Extinguishing System, such as closed water supply valve.

Trouble Signal – A signal that results from the detection of a trouble condition within the Spark Extinguishing System or its supervised components, such as faulty wiring or other equipment problems.

Initiating Device - A system component that originates transmission of a change-of-state condition, such as in a spark/ember detector, manual fire alarm box, or supervisory switch.

Notification Appliance - A fire alarm system component such as a bell, horn, speaker, light, or text display that provides audible, tactile, or visible outputs, or any combination thereof.

Pre-Alarm Signal – A signal where the operation of an input device (spark detector) actuating only a pre-determined selective or partial extinguishing operation or notification of key personnel who then have the option of manually initiating a general alarm.

Response Time - The time interval from the occurrence of an input status change, (alarm, trouble or supervisory) to the activation of a system output.

Reset - A control function that attempts to return a system or device to its normal, non-alarm state.

Supplementary - Equipment, circuits, features or options that are not required by NFPA 72, *The National Fire Alarm Code* or this standard. The use of, or faults from, supplemental equipment shall not interfere with the normal operation of the equipment.

Zone - A defined area within the protected premises from which a signal can be received, an area to which a signal can be sent, or an area in which a form of control can be executed.

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1.6 References

1. FM 3011, 1999, *Central Station Service for Fire Alarm Systems & Protective Equipment Supervision*
2. FM 3150, 2003, *Audible Notification for Automatic Fire Alarm Signaling*
3. FM 3210, 2007, *Heat Detectors for Automatic Fire Alarm Signaling*
4. FM 3230 & 3250, 2010, *Smoke Actuated Detectors for Automatic Fire Alarm Signaling*
5. FM 3232, 2011, *Video Image Smoke Detection for Automatic Fire Alarm Signaling*
6. ANSI/FM 3260- 2004 (R2014), *Radiant Energy Sensing Fire Detectors for Automatic Fire Alarm Signaling*

2 GENERAL INFORMATION

2.1 Product Information

Spark extinguishing equipment is comprised of electronic components that when combined in accordance with the manufacturer's instructions make up a spark extinguishing system. They may be fabricated and shipped as complete assemblies or sub-assemblies.

2.2 Requirements for Samples for Examination

2.2.1 The manufacturer shall submit samples for examination and testing based on the following:

2.2.2 Sample requirements to be determined following review of the preliminary information and defined in the test proposal or quotation provided. A typical program will require a minimum of 4 spark detector samples of each model, 2 extinguishing sets of each model and a minimum of one operational control panel.

2.2.3 Requirements for samples may vary depending on design features, results of prior or similar testing, and results of any foregoing tests.

2.2.4 The manufacturer shall submit samples representative of production.

2.2.5 It is the manufacturer's responsibility to provide any necessary test fixtures, such as those which may be required to evaluate the maximum rated load capabilities, maximum system configurations and the devices necessary for the determination of peripheral compatibility with the fire alarm signaling equipment.

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3 GENERAL REQUIREMENTS

3.1 Review of Documentation

During the initial investigation and prior to physical testing, the manufacturer's specifications and details shall be reviewed to assess the practicality of installation and use. The design, installation, operation and maintenance manual must define the limits of the spark extinguishing equipment (e.g. max duct diameter as well as the minimum and maximum duct velocities).

3.2 Physical or Structural Features

3.2.1 Required Features

3.2.1.1 Means shall be provided to mount the spark extinguishing equipment securely and independently of the wiring.

3.2.1.2 The spark extinguishing equipment shall be capable of withstanding normal handling and installation.

3.2.1.3 Spark extinguishing equipment intended for use in hazardous (classified) locations shall comply with suitable for hazardous (classified) location electrical equipment in addition to this standard.

3.2.1.4 The spark extinguishing equipment and enclosure shall be suitable for the intended environmental exposures as determined by testing in accordance with acceptable national, regional, or international codes and standards.

3.2.1.5 The spark extinguishing equipment shall accommodate secure wiring methods in accordance with NFPA 70, *National Electrical Code* and NFPA 72, *National Fire Alarm Code*.

3.2.1.6 The spark extinguishing system output circuits shall be compatible with an Approved or Listed fire alarm control unit that will produce distinctive alarm, supervisory and trouble signals.

3.2.1.7 The spark extinguishing equipment shall have response times in accordance with NFPA 72 *The National Fire Alarm Code* and within those defined in the manufacturer's specifications and installation and operational manual. The maximum response values as found in NFPA 72 are as follows:

- Alarm - 10 seconds (6.8.1.1) (*applies when connected to a local alarm system)*
- Supervisory – 90 seconds (4.4.3.2.3)
- Trouble – 200 seconds (4.4.3.5.1)

Note: Typical spark detection occurs in milliseconds and creates what is in effect a Pre-Signal at the Spark Extinguishing System. Alarm response to the local protected property Fire Alarm Signaling Systems occurs following multiple ignition events. While the exact number of spark events is not defined, when the Spark Detection System is interfaced with a Fire Alarm Signaling System, the Alarm Response cannot exceed 10 seconds of continuous spark event or recognition as specified in the Manufactures documentation.

3.2.1.8 Equipment rated at or above 30 V ac and 60 V dc requires a proper (protective) ground terminal to be provided.

3.2.1.9 For products intended for use in unsecured (public) areas, the controls for signal acknowledgement, reset, optional program initiation, manual override of any control sequence, or altering of system parameters, shall be of restricted access requiring software security code or other equivalent protection.

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