

NEMA BS 31043-2023

Guide for Application of Flame Detection

Published by:

National Electrical Manufacturers Association

1300 North 7th Street, Suite 900

Roanoke, Virginia 22209

www.nema.org

© 2024 National Electrical Manufacturers Association. All rights, including translation into other languages, reserved under the Universal Copyright Convention, the Berne Convention for the Protection of Literary and Artistic Works, and the International and Pan American copyright conventions.

Currently in preview, click buy full version

NOTICE AND DISCLAIMER

The information in this publication was considered technically sound by a consensus among persons engaged in its development at the time it was approved. Consensus does not necessarily mean there was unanimous agreement among every person participating in the development process.

The National Electrical Manufacturers Association (NEMA) standards and guideline publications, of which the document herein is one, are developed through a voluntary standards development process. This process brings together volunteers and/or seeks out the views of persons who have an interest in the topic covered by this publication. Although NEMA administers the process and establishes rules to promote fairness in the development of consensus, it does not write the documents, nor does it independently test, evaluate, or verify the accuracy or completeness of any information or the soundness of any judgments contained in its standards and guideline publications.

NEMA disclaims liability for any personal injury, property, or other damages of any nature, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, application, or reliance on this document. NEMA disclaims and makes no guaranty or warranty, express or implied, as to the accuracy or completeness of any information published herein, and disclaims and makes no warranty that the information in this document will fulfill any particular purpose(s) or need(s). NEMA does not undertake to guarantee the performance of any individual manufacturer's or seller's products or services by virtue of this standard or guide.

In publishing and making this document available, NEMA is not undertaking to render professional or other services for or on behalf of any person or entity, nor is NEMA undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstance. Information and other standards on the topic covered by this publication may be available from other sources, which the user may wish to consult for additional views or information not covered by this publication.

NEMA has no power, nor does it undertake to police or enforce compliance with the contents of this document. NEMA does not certify, test, or inspect products, designs, or installations for safety or health purposes. Any certification or other statement of compliance with any health- or safety-related information in this document shall not be attributable to NEMA and is solely the responsibility of the certifier or maker of the statement.

Currently in preview, click buy full version

Foreword

This application guide was developed by NEMA's Fire, Life Safety, Security, and Emergency Communication Section (NEMA BS-SB). Content is obtained by industry subject matter experts and leading manufacturers of flame detection systems and devices.

About NEMA BS-SB

The objective of the section is to serve as the primary source of technical, training, and educational materials essential for the specification, application, and manufacture of reliable life safety products, as well as their installation, performance, and inspection.

NEMA's BS-SB Section represents manufacturers in support of the automatic fire detection and alarm industry and the healthcare communications industry. Fire detection and alarm products include life safety / fire alarm systems and devices that provide early warning of an impending or actual fire or gaseous hazard. The products detect, notify, and initiate control functions in case of hazard to life and property. For more information on life safety, go to www.lifefiresafety.org.

About the National Electrical Manufacturers Association (NEMA)

Founded in 1926 and headquartered near Washington, D.C., NEMA represents nearly 325 member companies that manufacture products used in the generation, transmission and distribution, control, and end use of electricity. These products are used in utility, industrial, commercial, institutional, and residential applications. The association's Medical Imaging & Technology Alliance (MITA) Division represents manufacturers of cutting-edge medical diagnostic imaging equipment, including MRI, CT, x-ray, and ultrasound products. Worldwide sales of NEMA-scope products exceed \$140 billion.

Proposed revisions, comments, and suggestions for the improvement of this document are encouraged. They should be sent to:

NEMA Technical Operations Department
National Electrical Manufacturers Association
1300 North 17th Street, Suite 900
Rosslyn, Virginia 22209

At the time this standard was approved, the NEMA BS-SB Section was composed of the following members:

Bosch Security Systems, LLC
Construction Innovations, LLC
Eaton
Figaro USA, Inc.
Gentex Corporation
Google Nest
Honeywell
HSI Fire & Safety Group LLC
Johnson Controls
Keltron Corporation
New Cosmos USA, Inc.
Parker Electric Signal Company, LLC
SDI LLC
Siemens Industry, Inc.
Space Age Electronics, Inc.
Telecor Inc.

Contents

Foreword	i
SECTION 1 GENERAL.....	1
1.1 Scope.....	1
1.2 Purpose	1
1.3 Abbreviations and Definitions	2
1.4 Referenced Publication	2
SECTION 2 OVERVIEW	3
2.1 What Is a Flame Detector?	3
2.2 Why Install Flame Detectors?.....	4
2.3 Conventional Fire Detection Versus Optical Flame Detection	4
2.4 Flame Characteristics	4
2.5 Fire Characteristics.....	5
2.6 Fire Characteristics and Results on Flame Detector Response	5
SECTION 3 OPTICAL FLAME DETECTORS.....	6
3.1 General.....	6
3.2 Optical Flame-Sensing Technologies.....	6
SECTION 4 DETECTOR TECHNOLOGY DESCRIPTION, STRENGTHS, AND LIMITATIONS.....	7
4.1 Radiation Flame Technologies	7
4.1.1 Ultraviolet (UV) Detectors.....	7
4.1.2 Infrared (IR) Detectors.....	8
4.1.3 Ultraviolet/Infrared (UV/IR) Detectors.....	8
4.1.4 Triple IR (IR3) Detectors.....	9
4.1.5 Multi-Spectrum Infrared (MSIR) Detectors.....	10
4.2 Video Flame Detection (VFD) Technologies	10
4.2.1 General.....	10
4.2.2 Strengths	10
4.2.3 Limitations.....	11
SECTION 5 HOW TO SELECT A FLAME DETECTOR	12
5.1 General.....	12
5.2 Radiation-Absorbing Material	12
5.3 Nuisance Alarm Sources	13
5.4 Considerations When Configuring a Flame Detection System	13
5.4.1 False Alarm Immunity	13
5.4.2 Detection Range and Response Time	13
5.4.3 Field of View (FOV)	14
5.4.4 Inverse Square Law Rule Explained	15
5.4.5 Self-Diagnostics.....	16
5.5 Defining Application Requirements	16
SECTION 7 PERFORMANCE CHARACTERISTICS	18
7.1 General.....	18
7.1.1 Government Regulations.....	18
7.1.2 Certifications	18
7.1.3 Field of View	18
7.1.4 Sensitivity.....	18
7.1.5 Response Time	18
7.1.6 False Alarm Immunity	18
7.1.7 Operating Temperature Range	18
7.1.8 Self-Diagnostics.....	18
7.1.9 Outputs	18
7.1.10 Communication Interface.....	19

7.2 FM 3260 Performance Testing 19
7.3 FM 3260 Fire Size Definitions 19
7.4 Flame Detection Design Guidelines and Principles 19

SECTION 8 TESTING..... 21

SECTION 9 TYPICAL APPLICATIONS 23

ANNEX A APPLICABLE STANDARDS 24

ANNEX B TESTING LABORATORIES 25

Figures

Figure 1 Spectrum of Typical Flame (Free-Burning Gasoline) 3
Figure 2 Detection Range 14
Figure 3 Flame Detector Cone of Vision 15
Figure 4 Example of Inverse Square Law as It Pertains to Flame Detectors 15

Tables

Table 1 Materials and the Detection Bands They Affect..... 12
Table 2 Nuisance Alarm Sources and the Detection Bands They Affect 13
Table 3 Flame Detector Selection Process..... 17

<This page intentionally left blank.>

Currently in preview, click buy full version

Section 1 General

1.1 Scope

This Flame Detection Application Guide is designed to provide information concerning the proper use of flame detection systems. It covers the major technologies used for flame detection, application, selection, installation, and testing. These systems are used in conjunction with fire alarm and fire suppression systems that align with applicable NFPA codes and standards.

1.2 Purpose

This guide will be of value for fire life safety individuals who design, install, and service flame detection systems, as well as plan reviewers and code enforcement agencies.

This document is based on industry expertise and many years of experience. It is intended for use only as a technical guide. Applicable codes and standards, as well as directives of the authorities having jurisdiction (AHJs), must be followed.



Offshore oil and gas platforms, like the one depicted above, are one of the largest market segments for optical flame detectors. Shutterstock photo 110796884.