

# Firefighting SCBA Approvals & Compliance: NIOSH/NFPA and EN Compared



## Overview

Self-contained breathing apparatus (SCBA) that are manufactured for firefighting applications are certified to safety and health standards worldwide. Regulatory requirements and voluntary standards that are used by many nations as base approvals fall into two major groups, North American and European. These collections of requirements and standards have similarities as well as distinct differences.

This paper discusses key differences and similarities among these SCBA certifications, specifically that firefighting SCBA cannot be labeled as both NIOSH-certified/NFPA-compliant *and* EN-compliant, although a given system and its individual components may pass all test parameters. As a result, manufacturers of firefighting SCBA who wish to sell their products globally face considerable challenges when obtaining approvals.

### NORTH AMERICA: NIOSH/NFPA

In North America, SCBA designed for firefighters are certified by the National Institute for Occupational Safety and Health or **NIOSH**. NIOSH, a U.S. federal agency, conducts research to provide recommendations for work-related injury and illness, with a goal of promoting a healthy and safe workforce. NIOSH is part of the U.S. Centers for Disease Control and Prevention within the U.S. Department of Health and Human Services. NIOSH partners with the Occupational Safety and Health Administration or **OSHA**, part of the U.S. Department of Labor. OSHA develops and enforces workplace safety and health regulations. Per OSHA, NIOSH has the authority for testing and certification of respiratory protective devices per *Code of Federal Regulations or 42 CFR Part 84 Respiratory Protective Devices*.

In addition to NIOSH certification, manufacturers may seek voluntary compliance from the National Fire Protection Association or **NFPA**, an international non-profit advocate that seeks to minimize fire's risk and effects. NFPA publishes more than 300 consensus codes and standards to establish criteria for building, processing, design, service, and installation in the U. S. and globally. *NFPA 1981: Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services: 2018* is the most recent version concerning SCBA compliance. At times, NFPA and NIOSH issue joint certification of SCBA and specific components.

42 CFR Part 84 is the first NIOSH approval NFPA compliant sought for the North American market by firefighting and industrial SCBA manufacturers. This federal regulation provides basic minimum approvals for *complete SCBA systems* (facepiece, regulator, electronics, cylinder, carrier and harness, and associated components) used within immediately dangerous to life or health, or **IDLH** atmospheres in occupational settings. NIOSH does not certify individual SCBA components. NFPA 1981 (voluntary compliance) is an *additive* standard that pushes firefighting SCBA to a higher performance level; however, SCBA must be 42 CFR Part 84-approved prior to obtaining NFPA 1981 compliance.

*NFPA 1982 Standard on Personal Alert Safety Systems (PASS)-2018* is a separate standard that details design and performance requirements for electronic devices meant to alert those in close proximity as to a *man-down* situation. NFPA 1982 is stand-alone in that it is *not* required for SCBA to be NFPA 1981-compliant.

SCBA designated for use within chemical, biological, radiological, and nuclear or **CBRN** atmospheres must be both NIOSH 42 CFR Part 84-certified (this approval includes CBRN) and NFPA 1981-compliant.

Manufacturers of high-quality, comprehensive firefighting SCBA for the North American market are likely to seek NIOSH 42 CFR Part 84 approvals, and NFPA 1981 and NFPA 1982 compliance.

## EUROPE: CEN/EN

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The European Committee for Standardization or **CEN**, an international non-profit trade-related association, provides a platform for development of European Standards and other technical specifications. Common European standards reach a large population with reduced development and testing costs. CEN offers voluntary European Standards known as ENs; *EN 136:1998* and *EN 137:2007-01* include many CEN SCBA requirements.

CEN is specific as to the exclusion of facepieces from the rest of SCBA assemblies. EN-compliant firefighting SCBA are not approved as systems; rather facepieces are approved per EN 136:1998; other components per EN 137:2007-01 and additional standards. However, SCBA must employ EN 136-compliant facepieces prior to receiving EN 137 certification.

Separation of EN facepiece approval allows compliant facepieces from different manufacturers to be used interchangeably with EN-compliant SCBA that are fitted with standard connections. Specific custom connections that prevent facepiece interchangeability may also be EN-approved.

Allowing facepiece interchangeability under EN has obvious advantages regarding personal preference, cost and flexibility. However, amenities and conveniences offered by components available only within custom connection systems may outweigh other considerations. The distinction of SCBA approval granted to complete systems compared to those with separate facepiece and assembly approvals necessitates that a given SCBA, despite achieved performance, cannot be labeled as approved/compliant in North America and in Europe.

## Additional Distinctions

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### FACEPIECE TESTS

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North American and European facepiece test types are similar, although NFPA test parameters may be more stringent. NFPA radiant heat testing, the load applied to facepieces, is nearly twice the kilowatt level of EN, although with lesser load duration. Full facepieces tested to EN 136 fall into three categories depending upon their intended use; some are restricted as to metal content.

### SCBA ASSEMBLY CONSTRUCTION MATERIALS

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NIOSH requirements for metals used in SCBA construction are less specific than are EN requirements, as NIOSH's emphasis concerns primarily weight reduction. Most metal used in NIOSH-approved SCBA component housing is anodized aluminum, as NIOSH's weight requirement is equal to or less than 16 kilograms. This requirement results in a weight reduction of one-third as compared to that of EN requirements.

EN lists specific allowable metals and alloys to be used for construction of exposed components, a legacy requirement concerning potential spark generation. Required metal content results in weight requirement of 18 kg, a difference of more than 4 pounds compared to NIOSH-certified SCBA. EN prohibits light metals and accordingly must allow for more weight when compared to the North American 16 kg requirement.

## PRESSURE VESSELS (CYLINDERS)

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NIOSH uses Compressed Gas Association or CGA-required male cylinder threading. Cylinders are tested and approved to rated service time and pressure, typically in 30-, 45- and 60-minute service times. EN requires female cylinder threading, with cylinders approved to capacity (water volume) rather than duration, to pressures of 200 or 300 *bar*. Cylinder inlet and outlet connections must comply with EN 144-1 (inlet connection) and EN 144-2 (outlet connection) requirements. In addition, NIOSH requires a cylinder pressure gauge whereas EN does not; a pressure gauge is optional in Europe.

## PRESSURE INDICATION

North American pressure indication requirements apply to both the pressure vessel and user-visible pressure gauge. NIOSH-approved pressure indicators must offer gauge face displays that provide pressure reading in pounds per square inch gauge, or *psig*, or fractions of total pressure vessel capacity. Both NIOSH and NFPA require a pressure relief device as well as a pressure gauge. NFPA requires inclusion of a heads-up display, or HUD, to indicate estimated remaining time, and a redundant pressure display such as an analog chest gauge.

Pressure indication requirements for EN apply to the user's visible pressure gauge. EN pressure indicators must provide discrete, numeric pressure values within 10 bar increments. Pressure relief valve (in most cases), redundant pressure display and HUD are optional components and are offered as accessories; however these components must adhere to EN requirements if used.

## INTRINSIC SAFETY

NIOSH does not require SCBA to be certified as intrinsically safe; however in North America, UL 913 approval is required for NFPA-compliance. EN's intrinsic safety requirement is more stringent than that of UL, in that SCBA must meet ATEX EEx ia IIc T4 for intrinsic safety certification.

## TEST PARAMETER COMPARISON

As mentioned earlier, SCBA manufactured for North American or European markets may undergo similar tests, although some test parameters may vary significantly. A brief comparison is noted in the chart below.

## Conclusion

North American and European SCBA approvals differ due to several key distinctions as well as a large number of lesser considerations. As firefighting SCBA cannot be labeled as both NIOSH-approved/NFPA-compliant *and* EN-compliant, North American manufacturers seeking EN certification to sell their products worldwide must either allow facepiece interchangeability or sell complete SCBA systems fitted with custom connections.

## SCBA Testing Comparison

TESTS	NIOSH/NFPA	CEN/EN
GENERAL OPERATING TEMPERATURE RANGE	-25°F to 160°F	-30°C to 60°C (-22°F to 140°F)
RADIANT HEAT EXPOSURE	15 kW/m <sup>2</sup> for 5 minutes	8 kW/m <sup>2</sup> for 20 minutes or until visibility is clearly impaired plus an additional minute
HEAT AND FLAME CONDITIONING TEMPERATURE AND DURATION	203°F for 15 minutes, and 500°F for 5 minutes	90°C for 15 minutes (194°F)
HEAT AND FLAME ALLOWABLE AFTER-FLAME DURATION	2.2 seconds	5 seconds

Note: This Bulletin contains only a general description of the products shown. While product uses and performance capabilities are generally described, the products shall not, under any circumstances, be used by untrained or unqualified individuals. The products shall not be used until the product instructions/user manual, which contains detailed information concerning the proper use and care of the products, including any warnings or cautions, have been thoroughly read and understood. Specifications are subject to change without prior notice.

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