



Member of the FM Global Group

Examination Standard for Nitrogen Generators

Class Number 1035

September 2024

Foreword

This standard is intended to verify that the products and services described will meet stated conditions of performance, safety and quality useful to the ends of property conservation. The purpose of this standard is to present the criteria for examination of various types of products and services.

Examination in accordance with this standard shall demonstrate compliance and verify that quality control in manufacturing shall ensure a consistent and reliable product.

TABLE OF CONTENTS

1. INTRODUCTION	1
1.1 Purpose	1
1.2 Scope	1
1.3 Basis For Requirements	1
1.4 Basis For Certification	1
1.5 Basis For Continued Certification	1
1.6 Effective Date	2
1.7 System Of Units	2
1.8 Normative References	2
1.9 Terms And Definitions	2
2. GENERAL INFORMATION	5
2.1 Product Information	5
2.2 Certification Application Requirements	5
2.3 Requirements for Samples for Examination	5
3. GENERAL REQUIREMENTS	6
3.1 Review of Documentation	6
3.2 Physical or Structural Features	6
3.3 Materials	7
3.4 Conditioning of Compressed Air	7
3.5 Bypass Mode Operation	7
3.6 Markings	7
3.7 Manufacturer's Installation and Operation Instructions	8
3.8 Calibration	8
3.9 Tolerances	8
4. PERFORMANCE REQUIREMENTS	9
4.1 Examination	9
4.2 Bypass Mode Capacity	9
4.3 Nitrogen Generation Capacity	9
4.4 Service Assessment	10
4.5 Pressure Integrity	10
4.6 System Durability	11
4.7 Control Panel Cycling (dual tower systems only)	11
4.8 Dielectric Strength	11
5. MANUFACTURER'S REQUIREMENTS	12
5.1 Demonstrated Quality Control Program	12
5.2 Surveillance Audit	13
5.3 Product Modification	13
5.4 Manufacturing and Production Tests	13
6. BIBLIOGRAPHY	13
APPENDIX A: TESTING TOLERANCES	14
APPENDIX B: SAMPLE LISTINGS	15

1. INTRODUCTION

1.1 Purpose

- 1.1.1 This standard states testing and certification requirements for nitrogen generators for use in dry pipe and preaction fire protection systems. Nitrogen generators provide pressurized nitrogen to the sprinkler piping to minimize interior pipe corrosion.
- 1.1.2 Testing and certification criteria may include performance requirements, marking requirements, examination of manufacturing facility(ies), audit of quality assurance procedures, and a surveillance program.

1.2 Scope

- 1.2.1 This standard encompasses the design and performance requirements for nitrogen generators.
- 1.2.2 Nitrogen generators may use membranes or pressure swing adsorption as the nitrogen separation mechanism. Other technologies may be evaluated on a case-by-case basis. The use of nitrogen storage bottles or plant nitrogen is not in the scope of this standard.

1.3 Basis for Requirements

- 1.3.1 The requirements of this standard are based on experience, research and testing, and/or the standards of other organizations. The advice of manufacturers, users, trade associations, jurisdictions, and/or loss control specialists was also considered.
- 1.3.2 The requirements of this standard reflect tests and practices used to examine characteristics of nitrogen generators for the purpose of obtaining certification.

1.4 Basis for Certification

Certification is based upon satisfactory evaluation of the product and the manufacturer in the following major areas:

- 1.4.1 Examination and tests on production samples shall be performed to evaluate:
 - the suitability of the product;
 - the performance of the product as specified by the manufacturer and required for certification,
 - the durability and reliability of the product.
- 1.4.2 An examination of the manufacturing facilities and audit of quality control procedures may be conducted to evaluate the manufacturer's ability to consistently produce the product which is examined and tested, and the marking procedures used to identify the product. Subsequent surveillance may be required by the certification agency in accordance with the certification scheme to ensure ongoing compliance.

1.5 Basis for Continued Certification

The basis for continual certification may include the following based upon the certification scheme and requirements of the certification agency:

- production or availability of the product as currently certified;
- the continued use of acceptable quality assurance procedures;

- compliance with the terms stipulated by the certification;
- satisfactory re-examination of production samples for continued conformity to requirements; and
- satisfactory surveillance audits conducted as part of the certification agency's product surveillance program.

1.6 Effective Date

The effective date of this examination standard mandates that all products tested for certification after the effective date shall satisfy the requirements of this standard.

The effective date of this standard is eighteen (18) months after the publication date of the standard for compliance with all requirements.

1.7 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. Conversion of U.S. customary units is in accordance with ANSI/IEEE/ASTM SI 10.

Two units (liter and bar), outside of but recognized by SI, are commonly used in international fire protection and are used in this standard.

1.8 Normative References

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the cited edition applies:

ASME B16.5, *Pipe Flanges and Flanged Fittings: NPS ½ through NPS24 Metric/Inch Standard*

ANSI/AWWA C606, *Grooved and Shouldered Joints*

ASME B1.20.1, *Pipe Threads, General Purpose (Inch)*

ASME Boiler and Pressure Vessel Code, Section VIII, Division 1 – *Rules for Construction of Pressure Vessels*

ANSI/IEEE/ASTM SI 10, *American National Standard for Metric Practice*

SAE International J10, *Automotive and Off-Highway Air Brake Reservoir Performance and Identification Requirements – Truck and Bus*

Code of Federal Regulations Title 49, Section 178.61 – *Specification 4BW welded steel cylinders with electric-arc welded longitudinal seam.*

1.9 Terms and Definitions

Accepted

This term refers to installations acceptable to the authority enforcing the applicable installation rules. Acceptance is based upon an overall evaluation of the installation. Acceptance is not a characteristic of a product. It is installation specific. A product accepted for one installation may not be acceptable elsewhere.

Air Pressure Maintenance Device

This term refers to a device that automatically maintains the air pressure within a dry pipe or pre-action sprinkler system within pre-set limits. These devices may also be used with pressurized nitrogen in a nitrogen filled system.

Bypass Mode

Most nitrogen generators cannot produce enough nitrogen to completely fill the sprinkler system in 30 minutes. Therefore, they contain valves that allow the nitrogen separator to be bypassed so the system can be filled with compressed air. For the purposes of this standard the valve settings that bypass the nitrogen separator is called **Bypass Mode**. (Contrast with **Nitrogen Generating Mode**)

Control Panel

The control panel is the portion of the nitrogen generator that contains the controls. Minimum requirements for the control panel are found in Section 3.2.4.

Conditioning Equipment

For the purposes of this standard, conditioning equipment refers to all filters and other devices used to condition the compressed air before it enters the nitrogen separating mechanism.

End Connections

The term “End Connections” refers to the method of connecting components of a fire protection system. Typical end connections in fire protection service are flanged, grooved, threaded, and welding end.

Pressure Swing Adsorption (PSA)

A method of generating nitrogen using the process of adsorption by which a thin layer of molecules temporarily adheres to the surface of another material. A PSA nitrogen generator consists of two or more towers filled with adsorbent material. Air is drawn into one tower and oxygen adheres to the adsorbent material. The remaining atmospheric gas, which is mostly nitrogen, passes through. The towers are cycled so that waste oxygen is being “cleaned” from one tower while the other is used to produce nitrogen, and the two are switched periodically.

Membrane Nitrogen Generator

A method of generating nitrogen using the process of passing compressed air through a membrane. Different gases have different rates of permeation and this can be used to separate nitrogen from the other atmospheric gases. The resulting product is mostly nitrogen.

Nitrogen Generating Mode

Most nitrogen generators cannot produce enough nitrogen to completely fill the sprinkler system in 30 minutes. Therefore, they contain valves that allow the nitrogen separator to be bypassed so the system can be filled with compressed air. For the purposes of this standard, the valve settings that include the nitrogen separator is called **Nitrogen Generating Mode**. (Contrast with **Bypass Mode**)

Purging

Purging is defined as the removal of air/nitrogen from the sprinkler system via a purge valve. The purge valve allows some gas to escape from the system, which then requires the nitrogen generator to supply nitrogen to maintain system pressure. This process therefore increases the nitrogen concentration within the system piping over time. The purge valve and any associated controls are not within the scope of