

CLASS NUMBER 3620

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# Examination Standard for Purged and Pressurized Electrical Equipment for Hazardous (Classified) Locations

## 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.

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## 1 INTRODUCTION

### 1.1 PURPOSE

- 1.1.1 This standard serves as the basis for certification of electrical equipment for use in hazardous (classified) locations employing the type of protection defined as “Purged and Pressurized.”

### 1.2 SCOPE

- 1.2.1 This standard is intended to be used in conjunction with FM Approvals Examination Standard 3600 - Electrical Equipment for Use in Hazardous (Classified) Locations - General Requirements which includes the general requirements that apply to all types of protection for electrical equipment for use in hazardous (classified) locations. This standard contains the basic requirement for the construction and testing of purged and pressurized electrical equipment available in the following configurations:

- Purged and pressurized electrical equipment which are not occupied portions of buildings (control rooms)
- Purged and pressurized electrical equipment having an internal source of gas or vapor.

**Note:** the requirements of this standard do not include purged or pressurized control rooms.

### 1.3 BASIS FOR CERTIFICATION

See FM Approvals Examination Standard 3600.

### 1.4 BASIS FOR CONTINUED CERTIFICATION

See FM Approvals Examination Standard 3600.

### 1.5 BASIS FOR REQUIREMENTS

See FM Approvals Examination Standard 3600.

### 1.6 EFFECTIVE DATE

- 1.6.1 The effective date of this certification standard mandates that all products tested for certification after the effective date shall satisfy the requirements of this standard.
- 1.6.2 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

See FM Approvals Standard Examination 3600.

## 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 edition cited applies.

FM Approvals Examination Standard 3600, Electrical Equipment for Use in Hazardous (Classified) Locations – General Requirements

ANSI/NFPA 496, Purged and Pressurized Enclosures for Electrical Equipment

## 1.9 TERMS AND DEFINITIONS

For the purposes of this standard, the following terms and definitions apply:

<b><i>Pressurization</i></b>	The process of supplying an enclosure with a protective gas with or without continuous flow at sufficient pressure to prevent the entrance of a flammable gas or vapor, a combustible dust, or an ignitable fiber.
<b><i>Purging</i></b>	The process of supplying an enclosure with a protective gas at sufficient flow and positive pressure to reduce the concentration of any flammable gas or vapor initially present to an acceptable level.
<b><i>Type X Pressurizing</i></b>	Reduces the classification within the protected enclosure from Division 1 or Zone 1 to unclassified.
<b><i>Type Y Pressurizing</i></b>	Reduces the classification within the protected enclosure from Division 1 to Division 2 or Zone 1 to Zone 2.
<b><i>Type Z Pressurizing</i></b>	Reduces the classification within the protected enclosure from Division 2 or Zone 2 to unclassified.
<b><i>LFL (Lower Flammable Limit)</i></b>	The concentration of flammable gas or vapour in air, below which an explosive gas atmosphere does not form. This was previously referred to as the lower explosive limit (LEL). (IEC 60050-426-02-09)

**NOTE:** Lower Flammable Limits can be found in ANSI/NFPA 497.

## 2 GENERAL INFORMATION

### 2.1 MARKING INFORMATION

- 2.1.1 Purged and pressurized equipment shall be marked in accordance with the marking information required in the standards identified in 1.2 and 3.1.

### 2.2 CERTIFICATION APPLICATION REQUIREMENTS

See FM Approvals Examination Standard 3600.

### 2.3 REQUIRED DOCUMENTATION FOR EXAMINATION

For the purposes of assessing compliance of equipment with certification requirements, determining what samples shall be required for the program, and providing a means for design modification control, the manufacturer shall submit documents which give a full and correct specification of the critical construction aspects of the equipment. All documents shall identify the following:

- the manufacturer's name
- document number or other form of reference identification
- document title
- date of latest revision of document and/or the revision reference (i.e. number or letter indicating revision level)

One copy (except as noted) of the following documentation as it pertains to the certification request should be assembled in an organized manner and submitted prior to scheduling of the test program.

- Marketing/Ordering Literature showing general specifications and functions of the equipment. These are generally very useful in determining project costs and may also be used as attachments to the final report for equipment certification projects.
- Model Number Breakdown drawing or sales specification sheet showing all model variations and options to be examined. Each model variation must have a unique means of identification.
- Instruction Manual(s) providing installation, operation, and maintenance instructions.
- Quality Control Procedures document(s) detailing routine testing and final inspection procedures.
  - Production Drawings
  - Electrical Schematic(s).
  - Final Assembly drawing and parts lists
  - Sub-assembly drawings or piece-part drawings/assembly drawings sufficient to detail primary circuit components, operator controls, enclosure design, and safety interlocks.
  - Product label drawing(s) showing all required marking information. The label drawing should show proposed artwork indicating the manufacturer's name, address, model and serial numbers, equipment ratings, warning markings, and the certification agency's mark of conformity.
  - Protective Grounding Detail drawing(s) showing the method of protective grounding provided, including location, size, and marking.

**Note 1:** test programs will be scheduled only upon receipt of all the material listed herein.

**Note 2:** a single certification drawing may be provided as an alternative to providing separate production drawings. However, the certification drawing must contain all of the detail required of production drawings.

**Note 3:** drawings in a language other than English may require partial translation for use in a certification program.

## 3 PERFORMANCE AND CONSTRUCTION REQUIREMENTS

### 3.1 APPLICABILITY OF OTHER STANDARDS

Purged and pressurized electrical equipment shall comply with the applicable requirements of ANSI/NFPA 496 along with the following clarifications in Section 3.2.

### 3.2 CLARIFICATION OF ANSI/NFPA 496 REQUIREMENTS

#### 3.2.1 Protection from enclosure over-pressure

Equipment supplied with or intended to be used with a pressure reducing valve (regulator) in the purging/pressurizing supply, shall be supplied with a pressure relieving device. As a result of over-pressure to 300% of the set point of the pressure relieving device or of the maximum enclosure operating pressure, whichever is greater, no rupture of the enclosure shall occur. Permanent deformation of the enclosure is acceptable if the purging/pressurizing system is still functional after testing.

**Criteria for compliance** - Compliance shall be verified by operating the equipment at the required test pressure, in a safety shielded area, for a 1 minute period. The occurrence of leakage as a result of enclosure deformation is not considered a failure.

#### 3.2.2 Enclosure windows

The requirements for MECHANICAL STRENGTH - RESISTANCE TO IMPACT referenced in FM Approvals Examination Standard 3600, are considered not applicable to this type of protection as the required interlocks and alarms provide fail-safe conditions.

#### 3.2.3 Purging

When the internal volume is compartmentalized and concern exists that all compartments may not be purged, purging tests shall be conducted. The internal atmosphere of the pressurized enclosure shall be tested at different points where it is considered that the test gas is most likely to persist. The gas concentration at the test points shall be analyzed or measured throughout the period of the test(s). For example, the pressurized enclosure may be fitted with a number of small-bore tubes, the open ends of which shall be located inside the pressurized enclosure at the sampling points. If necessary, apertures in the pressurized enclosure may be closed to enable the pressurized enclosure to be filled with the specified test gas provided they are reopened for the purging and dilution tests.

##### 3.2.3.1 Pressurized enclosure where the protective gas is air

The pressurized enclosure shall be filled with the test gas to a concentration of not less than 70% at any point. As soon as the pressurized enclosure is filled, the test gas supply shall be turned off and the air supply turned on at the minimum purging rate specified by the manufacturer. The time taken until there is no sample point where there is a test gas concentration in excess of that specified below shall be measured and noted as the purging time. If a second test is required, the pressurized enclosure shall be filled with a second test gas, representing the other end of the density range, to a concentration of not less than 70% at any point and the purging time for the second test shall be measured. The minimum purging duration specified by the manufacturer shall be not less than the measured purging time or the longer of the two measured purging times where two tests are carried out.

The test method shall be as follows:

- when required for specific applications, tests may be carried out for specific flammable gases and vapours. In this case the potentially flammable gases shall be specified and test gas(es) chosen having densities within  $\pm 10\%$  of the heaviest and lightest gas specified.
- in the case of a single specified gas, a single test shall be carried out with a test gas having a density within  $\pm 10\%$  of the specified gas.

- when it is required to cover all flammable gases, two tests shall be carried out. One test shall be done to cover lighter-than-air gases using helium as the test gas. The second test shall be done to cover heavier-than-air gases using either argon or carbon dioxide as the test gas.

**Note 1:** Generally, test gases should be non-flammable and non-toxic.

**Criteria for compliance where the protective gas is air** - The concentration of test gas at the sample points after purging, shall not exceed the following values.

- where test(s) were conducted for specific flammable gases, a value equivalent to 25% of the most onerous LFL.
- where one specific flammable gas is covered, a value equivalent to 25% of its LFL.
- where all flammable gases are covered, 1% for the helium test and 0.25% for the argon or carbon dioxide test.

**Note 2:** These values correspond approximately to 25% of the LFL for light and heavy flammable gases respectively.

**Note 3:** The concentration of helium, argon, or carbon dioxide may be determined with a direct-reading gas analyzer calibrated for the particular gas, or may be inferred by measuring the oxygen concentration of the mixture of air and gas.

Pressurized enclosure where the protective gas is inert gas

The enclosure shall be filled initially with air at normal atmospheric pressure. The enclosure shall then be purged with the inert gas specified by the manufacturer.

**Criteria for compliance where the protective gas is inert** - The time taken until there is no sample point where there is an oxygen concentration exceeding 2%, by volume, shall be measured and noted as the purging time.



## **4 OPERATIONS REQUIREMENTS**

See FM Approvals Examination Standard 3600.

## 5 BIBLIOGRAPHY

ANSI/NFPA 70, National Electrical Code

ANSI/NFPA 497, Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas

IEC 60050 (426), Glossary of Terms – Electrical Apparatus for Explosive Atmospheres

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