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INTERNATIONAL STANDARD

Explosive atmospheres –
Part 49: Flame arresters – Performance requirements, test methods and limits for use



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IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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EXPLOSIVE ATMOSPHERES –

Part 49: Flame arresters – Performance requirements, test methods and limits for use

FOREWORD

1) ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.
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ISO/IEC 80079-49 has been prepared by subcommittee 31M: Non-electrical equipment and protective systems for explosive atmospheres, of ISO/IEC joint technical committee 1: Information technology.

This edition cancels and replaces ISO 16852:2016, which has been technically revised. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to ISO 16852:2016:

a) adaptation of the relevant IEC TC 31 requirements on standards;
b) modification of the upper limit of the temperature range from 150 °C to 200 °C under the condition that T_0 shall be not larger than 80 % of the auto ignition temperature of the gas-air-mixture;
c) change of the term "explosion group" to "equipment group" due to editorial requirements in IEC/TC 31;
d) clarification of the conditions and requirements for flame arresters whose intended operating conditions are outside the atmospheric conditions in 7.3.4 and 7.3.5;

e) clarification of the requirements on the information for use in Clause 12 f) concerning the burn time;

f) addition of a permission to the construction requirements both in 7.1 and 14.1 to substitute visual inspection by performing a flow test;

g) addition of a flow chart for the evaluation of test results as Annex D.

The text of this International Standard is based on the following documents:

Draft	Report on voting
31M/212/FDIS	31M/223/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

A list of all parts in the ISO/IEC 80079 series, published under the general title *Explosive atmospheres*, can be found on the IEC website.

NOTE The following print types are used:

- Words in *italic* font in the text are defined in Clause 3.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1, available at www.iec.ch/members_experts/refdocs and www.iso.org/directives.

INTRODUCTION

Flame arresters are protective systems fitted to openings of enclosures or to pipe work and are intended to allow fluid flow but prevent flame transmission if a flammable mixture is ignited. They have widely been used for decades in the chemical and oil industry, and a variety of national standards is available. This document was prepared with an aim to establish an international basis by harmonizing and incorporating recent national developments and standards as far as reasonable.

This document addresses performance requirements and test methods, as well as limits for use for flame arresters.

Only the minimum safety requirements for flame arresters to prevent flame transmission are specified.

The hazard identification of common applications found in industry leads to the specification of the test methods. These test methods reflect standard practical situations and, as such, form the heart of this document because they also allow classification of the various types of flame arresters and then determination of the limits of use.

A considerable number of test methods and test conditions had to be taken into account for two main reasons.

a) Different types of flame arresters are covered with respect to the operating principle (static, hydraulic, liquid, dynamic) and each type clearly needs its specific test set-up and test procedure.
b) It is necessary to adapt flame arresters to the special conditions of application (gas, installation) because of the conflicting demands of high flame quenching capability and low pressure loss. This situation is completely different from the otherwise similar principle of protection by flameproof enclosure, for example for electrical equipment, where the importance of process gas flow through any gaps is negligible and importance is placed on the flame quenching effect of the gap.

Consequently, in this document, the testing and classification related to Equipment Groups and installation conditions have been subdivided more than is usually the case in other parts of the ISO/IEC 80079 and IEC 60079 series of standards. In particular,

– Equipment Group IIA is subdivided into sub-groups IIA1 and IIA,
– Equipment Group IIB is subdivided into sub-groups IIB1, IIB2, IIB3 and IIB, and
– the type "detonation arrester" is divided into four sub-types, which take into account specific installation situations.

The test conditions lead to the limits for use which are most important for the user. This document specifies this safety relevant information and its dissemination through the manufacturer's written instructions for use and the marking of the flame arresters.

The limits for use are also a link to more general (operational) safety considerations and regulations, which remain the responsibility the user and regulators. Annex B and Annex C offer some guidance on these aspects.

EXPLOSIVE ATMOSPHERES –

Part 49: Flame arresters – Performance requirements, test methods and limits for use

1 Scope

This document specifies the requirements for flame arresters that prevent flame transmission when explosive gas-air or vapour-air mixtures are present. It establishes uniform principles for the classification, basic construction and information for use, including the marking of flame arresters, and specifies test methods to verify the safety requirements and determine safe limits of use.

This document is applicable to pressures ranging from 80 kPa to 160 kPa and temperatures ranging from −20 °C to +200 °C.

NOTE 1 For flame arresters with operational conditions inside the scope, but outside atmospheric conditions, see Annex E.

NOTE 2 In designing and testing flame arresters for operation under conditions other than those specified above, this document can be used as a guide. This document can also be used to design any additional testing related to the specific conditions of use. This is particularly important when high temperatures and pressures are applied. The test mixtures might need to be modified in these cases.

This document does not apply to the following:

– external safety-related measurement and control equipment that might be required to keep the operational conditions within the established safe limits;

  NOTE 3 Integrated measurement and control equipment, such as integrated temperature and flame sensors as well as parts which, for example, intentionally melt (retaining pin), burn away (weather hoods) or bend (bimetallic strips), are within the scope of this document.

– flame arresters used for explosive mixtures of vapours and gases, which tend to self-decompose (for example, acetylene) or which are chemically unstable;

– flame arresters used for carbon disulfide, due to its special properties;

– flame arresters whose intended use is for mixtures other than gas-air or vapour-air mixtures (for example, higher oxygen-nitrogen ratio, chlorine as oxidant);

– flame arrester test procedures for reciprocating internal combustion engines;

  NOTE 4 Flame arresters for specific applications (e.g. reciprocating internal combustion engines) can use this document as a guide for design but be subject to testing related to their specific use.

– fast acting valves, extinguishing systems and other explosion isolating systems;

– Flame arresters used in gas detectors (those being covered for example, by IEC 60079-29-1 and IEC 62990-1).

2 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. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-1, *Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures "d"*

ISO/IEC 80079-34, *Explosive atmospheres – Part 34: Application of quality management systems for Ex Product manufacture*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60079-0 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
flame arrester
device fitted to the opening of an enclosure, or to the connecting pipe work of a system of enclosures, and whose intended function is to allow flow but prevent the transmission of flame

3.2
housing
portion of a *flame arrester* (3.1) whose principal function is to provide a suitable enclosure for the *flame arrester element* (3.3) and allow mechanical connections to other systems

3.3
flame arrester element
portion of a *flame arrester* (3.1) whose principal function is to prevent flame transmission

3.4
stabilized burning
steady burning of a flame stabilized at, or close to, the *flame arrester element* (3.3)

3.5
short time burning
stabilized burning (3.4) for a specified time

3.6
endurance burning
stabilized burning (3.4) for an unlimited time