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Explosive atmospheres – Part 49: Flame arresters – Performance requirements, test methods and limits for use (ISO/IEC 80079-49:2024)

DANSK STANDARD
Danish Standards Association

Göteborg Plads 1
DK-2150 Nordhavn

Tel: +45 39 96 61 01
dansk.standard@ds.dk
www.ds.dk

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CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents

Page

European foreword

This document (EN ISO/IEC 80079-49:2024) has been prepared by Technical Committee ISO/TMB "Technical Management Board - groups" in collaboration with Technical Committee CEN/TC 305 “Potentially explosive atmospheres - Explosion prevention and protection” the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2025, and conflicting national standards shall be withdrawn at the latest by October 2025.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 16852:2016.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annex ZA, which is an integral part of this document.

Any feedback and questions on this document should be directed to the users’ national standards body/national committee. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Endorsement notice

The text of ISO/IEC 80079-49:2024 has been approved by CEN as EN ISO/IEC 80079-49:2024 without any modification.

Annex ZA
(informative)

Relationship between this European Standard and the essential requirements of Directive 2014/34/EU aimed to be covered

This European Standard has been prepared under a Commission's standardization request M/596 to provide one voluntary means of conforming to essential requirements of Directive 2014/34/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres (recast).

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZA.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Directive 2014/34/EU

Essential Requirements of Directive 2014/34/EU	Clause(s)/subclause(s) of this EN	Remarks/Notes
1.0.1 Principles of integrated explosion safety	Clause 5; 14.1; 14.2; 14.3; Annex E.1	
1.0.2 Design and manufacture considerations	7.1; 7.2; Clause 14; Annex C; Annex E.1	
1.0.3 Special checking and maintenance conditions	Annex C; Clause 12	
1.0.4 Surrounding area conditions	14.1; Annex E.1	
1.0.5 Marking	Clause 13	
1.0.6 Instructions	Clause 12; Annex E	
1.1.1 Operational stresses on material	7.1; 14.1;Annex C; Annex E.1	
1.1.2 Reaction of material	14.1;Annex C; Annex E.1	
1.1.3 Wear of material	7.1; 14.1; Annex E.1	
1.2.1 Design and construction for safe operation	5.1; 14.1, Annex E.1; 14.2; 14.3; 14.4; 7.1	
1.2.3 Enclosed structures and prevention of leaks	14.5; 14.2	
1.2.5 Additional means of protection	Clause 12	
1.2.8 Overloading of equipment	7.3.4; 10.1; 11.1	

Essential Requirements of Directive 2014/34/EU	Clause(s)/subclause(s) of this EN	Remarks/Notes
1.2.9 Flameproof enclosure systems	7.3; 14.2; 14.3	
1.3.1 Hazards arising from different ignition sources	14.1; Annex E.1	
1.3.2 Hazards arising from static electricity	Annex B; Annex C	
1.4.1 External effects	14.1; Annex E.1	
1.4.2 Mechanical, thermal and chemical stresses	14.1; Annex E.1	
1.6.4 Hazards arising from connections	14.3	
3.0.1 Dimensioning	Clauses 6; 7; 8; 9; 10; 11	
3.0.2 Design and position	Clauses 6; 7; 8; 9; 10; 11	
3.0.4 Outside interference	13.3	
3.1.2 Shock waves	14.4; 7.3.3	

Table ZA.2 — Applicable Standards to confer presumption of conformity as described in this Annex ZA

Column 1 Reference in Clause 2	Column 2 International Standard Edition	Column 3 Title	Column 4 Corresponding European Standard Edition
ISO/IEC 80079-34	ISO/IEC 80079-34:2020	Explosive atmospheres – Part 34: Application of quality systems for ex product manufacture	EN ISO/IEC 80079-34:2020
IEC 60079-0	IEC 60079-0:2017	Explosive atmospheres – Part 0: Equipment – General requirements	EN IEC 60079-0:2018[1]
IEC 60079-1	IEC 60079-1:2014	Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures "d"	EN 60079-1:2014[2]

[1] As impacted by EN IEC 60079-0:2018/AC:2020-02

[2] As impacted by EN IEC 60079-1:2014/AC:2018-09

The documents listed in the Column 1 of Table ZA.2, in whole or in part, are normatively referenced in this document, i.e. are indispensable for its application. The achievement of the presumption of conformity is subject to the application of the edition of Standards as listed in Column 4 or, if no European Standard Edition exists, the International Standard Edition given in Column 2 of Table ZA.2.

WARNING 1 — Presumption of conformity stays valid only as long as a reference to this European Standard is maintained in the list published in the Official Journal of the European Union. Users of this standard should consult frequently the latest list published in the Official Journal of the European Union.

WARNING 2 — Other Union legislation may be applicable to the product(s) falling within the scope of this standard.

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INTERNATIONAL STANDARD

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

ISO/IEC 80079-49:2024-05(en)

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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INTERNATIONAL STANDARD

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

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CONTENTS

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*