SLOVENSKI STANDARD
SIST EN 60079-20-1:2010

01-maj-2010

Eksplozivne atmosfere - 20-1. del: Lastnosti materiala - Razvrstitev plinov in hlapov, preskusne metode in podatki (IEC 60079-20-1:2010)

Explosive atmospheres - Part 20-1: Material characteristics - Gas and vapour classification, test methods and data (IEC 60079-20-1:2010)

Explosionsfähige Atmosphären - Teil 20-1: Stoffliche Eigenschaften zur Klassifizierung von Gasen und Dämpfen - Prüfmethoden und Daten (IEC 60079-20-1:2010)

Atmosphères explosives - Partie 20-1: Caractéristiques des matériaux pour le classement des gaz et des vapeurs, méthodes et données d'essai (CEI 60079-20-1:2010)

Ta slovenski standard je istoveten z: **EN 60079-20-1:2010**

ICS:

29.260.20	Električni aparati za eksplozivna ozračja	Electrical apparatus for explosive atmospheres

SIST EN 60079-20-1:2010 **en,fr**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60079-20-1

February 2010

ICS 29.260.20

English version

Explosive atmospheres - Part 20-1: Material characteristics for gas and vapour classification - Test methods and data

(IEC 60079-20-1:2010)

Atmosphères explosives - Partie 20-1: Caractéristiques des substances pour le classement des gaz et des vapeurs - Méthodes et données d'essai (CEI 60079-20-1:2010)

Explosionsfähige Atmosphären - Teil 20-1: Stoffliche Eigenschaften zur Klassifizierung von Gasen und Dämpfen - Prüfmethoden und Daten (IEC 60079-20-1:2010)

This European Standard was approved by CENELEC on 2010-02-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

Ref. No. EN 60079-20-1:2010 E

Foreword

The text of document 31/837/FDIS, future edition 1 of IEC 60079-20-1, prepared by IEC TC 31, Equipment for explosive atmospheres, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60079-20-1 on 2010-02-01.

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

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2010-11-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2013-02-01

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of EC Directive 94/9/EC. See Annex ZZ.

Annexes ZA and ZZ have been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60079-20-1:2010 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60079-11	-	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"	EN 60079-11	-
IEC 60079-14	-	Explosive atmospheres - Part 14: Electrical installations design, selection and erection	EN 60079-14	-

Annex ZZ
(informative)

Coverage of Essential Requirements of EC Directives

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and within its scope the standard covers only the following essential requirements out of those given in Annex II of the EC Directive 94/9/EC:

– Essential Requirement 1.0.1

– Essential Requirement 1.2.1, 1.2.3, 1.2.9

– Essential Requirement 1.5.7

Compliance with this standard provides one means of conformity with the specified essential requirements of the Directive(s) concerned.

WARNING: Other requirements and other EC Directives may be applicable to the products falling within the scope of this standard.

IEC 60079-20-1

Edition 1.0 2010-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Explosive atmospheres –
Part 20-1: Material characteristics for gas and vapour classification – Test methods and data

Atmosphères explosives –
Partie 20-1: Caractéristiques des substances pour le classement des gaz et des vapeurs – Méthodes et données d'essai

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE
CODE PRIX XC

ICS 29.260.20

ISBN 2-8318-1076-2

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXPLOSIVE ATMOSPHERES –

Part 20-1: Material characteristics for gas and vapour classification – Test methods and data

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60079-20-1 has been prepared by IEC technical committee 31: Equipment for explosive atmospheres.

This first edition of IEC 60079-20-1 cancels and replaces the first edition of IEC 60079-1-1(2002), the second edition of IEC 60079-4 (1975), its amendment 1(1995) and its complement: IEC 60079-4A (1970), the first edition of IEC/TR 60079-12 (1978) and the first edition of IEC 60079-20 (1996). It constitutes a technical revision.

The text of this standard is based on the following documents:

FDIS	Report on voting
31/837/FDIS	31/855/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts of the IEC 60079 series, under the general title: *Explosives atmospheres* can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

EXPLOSIVE ATMOSPHERES –

Part 20-1: Material characteristics for gas and vapour classification – Test methods and data

1 Scope

This part of IEC 60079 provides guidance on classification of gases and vapours. It describes a test method intended for the measurement of the maximum experimental safe gaps (MESG) for gas- or vapour-air mixtures under normal conditions of temperature[1] and pressure so as to permit the selection of an appropriate group of equipment. The method does not take into account the possible effects of obstacles on the safe gaps[2]. This standard describes also a test method intended for use in the determination of the auto-ignition temperature of a chemically pure vapour or gas in air at atmospheric pressure.

The tabulated values of chemical and engineering properties of substances are provided to assist engineers in their selection of equipment to be used in hazardous areas. It is hoped to publish further data from time to time, as the results of tests made in several countries become available.

The scope of these data has been selected with particular reference to the use of equipment in hazardous areas, and notice has been taken of standard measurement methods.

NOTE 1 The data in this standard have been taken from a number of references which are given in the bibliography.

NOTE 2 Some variations in the data may appear when references are compared, but usually the discrepancy is sufficiently small to be of no importance in the selection of equipment.

2 Normative references

The following referenced documents are indispensable for the application 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 60079-11, *Explosive atmospheres – Part 11: Equipment protection by intrinsic safety "i"*

IEC 60079-14, *Explosive atmospheres – Part 14: Electrical installations design, selection and erection*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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1 An exception is made for substances with vapour pressures which are too low to permit mixtures of the required concentrations to be prepared at normal ambient temperatures. For these substances, a temperature 5 K above that needed to give the necessary vapour pressure or 50 K above the flash point is used.

2 The design of the test apparatus for safe gap determination, other than that used for selecting the appropriate group of enclosure for a particular gas, may need to be different to the one described in this standard. For example, the volume of the enclosure, flange width, gas concentrations and the distance between the flanges and any external wall or obstruction may have to be varied. As the design depends on the particular investigation which is to be undertaken, it is impracticable to recommend specific design requirements, but for most applications the general principles and precautions indicated in the clauses of this standard will still apply.

NOTE For the definitions of any other terms, particularly those of a more general nature, reference should be made to IEC 60050(426) or other appropriate parts of the IEV (International Electrotechnical Vocabulary).

3.1
ignition by hot surface (auto-ignition)
a reaction in the test flask described in 7.2.2 which is evidenced by a clearly perceptible flame and/or explosion, and for which the ignition delay time does not exceed 5 min

3.2
ignition delay time
the period of time between the introduction of the ignition source and the actual ignition

3.3
auto-ignition temperature
AIT
lowest temperature (of a hot surface) at which under specified test conditions an ignition of a flammable gas or vapour in mixture with air or air/inert gas occurs

3.4
maximum experimental safe gap
MESG
maximum gap between the two parts of the interior chamber which, under the test conditions specified below, prevents ignition of the external gas mixture through a 25 mm long flame path when the internal mixture is ignited, for all concentrations of the tested gas or vapour in air

3.5
minimum igniting current
MIC
minimum current in resistive or inductive circuits that causes the ignition of the explosive test mixture in the spark-test apparatus according to IEC 60079-11

4 Classification of gases and vapours

4.1 General

Gases and vapours can be classified according to the group or sub-group of equipment required for use in the particular gas or vapour atmosphere.

The general principles used to establish the lists of gases and vapours in the table of Annex B are given below.

4.2 Classification according to the maximum experimental safe gaps (MESG)

Gases and vapours may be classified according to their maximum experimental safe gaps (MESG) into the groups I, IIA, IIB and IIC.

NOTE The standard method for determining MESG should be the vessel described in 6.2, but where determinations have been undertaken only in an 8 l spherical vessel with ignition close to the flange gap these can be accepted provisionally.

The groups for equipment for explosive gas atmospheres are:

Group I: equipment for mines susceptible to firedamp.

Group II: equipment for places with an explosive gas atmosphere other than mines susceptible to firedamp.

Group II equipment is subdivided and, for the purpose of classification of gases and vapours, the MESG limits are:

Group IIA: MESG ≥ 0,9 mm.

Group IIB: 0,5 mm < MESG < 0,9 mm.

Group IIC: MESG ≤ 0,5 mm.

NOTE 1 For gases and highly volatile liquids the MESG is determined at 20 °C.

NOTE 2 If it was necessary to do the MESG determination at temperatures higher than ambient temperature a temperature 5 K above that needed to give the necessary vapour pressure or 50 K above the flash point is used and this value of MESG is given in the table and the classification of the equipment group is based on this result.

4.3 Classification according to the minimum igniting currents (MIC)

Gases and vapours may be classified according to the ratio of their minimum igniting currents (MIC) with the ignition current of laboratory methane. The standard method of determining MIC ratios shall be with the apparatus described in IEC 60079-11, but where determinations have been undertaken in other apparatus these can be accepted provisionally.

Group II equipment is subdivided and, for the purpose of classification of gases and vapours, the MIC ratios are:

Group IIA: MIC > 0,8.

Group IIB: 0,45 ≤ MIC ≤ 0,8.

Group IIC: MIC < 0,45.

4.4 Classification according to MESG and MIC

For most gases and vapours, it is sufficient to make only one determination of either MESG or MIC ratio to classify the gas or vapour.

One determination is adequate when:

Group IIA: MESG > 0,9 mm, or MIC > 0,9.

Group IIB: 0,55 mm ≤ MESG ≤ 0,9 mm, or 0,5 ≤ MIC ≤ 0,8.

Group IIC: MESG < 0,55 mm, or MIC < 0,5.

Determination of both the MESG and MIC ratio is required when:

for IIA: 0,8 ≤ MIC ≤ 0,9 need to confirm by MESG,

for IIB: 0,45 ≤ MIC ≤ 0,5 need to confirm by MESG,

for IIC: 0,5 ≤ MESG ≤ 0,55 need to confirm by MIC.

4.5 Classification according to a similarity of chemical structure

When a gas or vapour is a member of an homologous series of compounds, the classification of the gas or vapour can provisionally be inferred from the data of the other members of the series with lower molecular weights. However, it is best to run the test if it is possible.

4.6 Classification of mixtures of gases

Mixtures of gases should generally be allocated to a group only after a special determination of MESG or MIC ratio. One method to estimate the group is to determine the MESG of the mixture by applying a form of Le Châtelier relationship:

$$MESG_{mix} = \frac{1}{\sum_i \left(\frac{X_i}{MESG_i} \right)}$$

This method should not be applied to mixtures and/or streams that have:

a) acetylene or its equivalent hazard;

b) oxygen or other strong oxidizer as one of the components;

c) large concentrations (over 5 %) of carbon monoxide. Because unrealistically high MESG values may result, caution should be exercised with two component mixtures where one of the components is an inert, such as nitrogen.

For mixtures containing an inert such as nitrogen in concentrations less than 5 % by volume, use an MESG of infinity. For mixtures containing an inert such as nitrogen in concentrations 5 % and greater by volume, use an MESG of 2.

An alternate method that includes stoichiometric ratios is presented in the paper by Brandes and Redeker.

5 Data for flammable gases and vapours, relating to the use of equipment

5.1 Determination of the properties

5.1.1 General

The compounds listed in this standard are in accordance with Clause 4, or have physical properties similar to those of other compounds in that list.

5.1.2 Equipment group

The groups are the result of MESG or MIC ratio determination except where there is no value listed for MESG or MIC ratio. For these, the group is based on chemical similarity (see Clause 4).

NOTE If it was necessary to do the MESG determination at temperatures higher than ambient temperature a temperature 5 K above that needed to give the necessary vapour pressure or 50 K above the Flash Point is used and this value of MESG is given in the table of Annex B and the classification of the equipment group is based on this result.

5.1.3 Flammable limits

Determinations have been made by a number of different methods, but the preferred method is with a low energy ignition at the bottom of a vertical tube. The values (in percentage by volume and mass per volume) are listed in the table of Annex B.

If the flash point is high, the compound does not form a flammable vapour air/mixture at normal ambient temperature. Where flammability data are presented for such compounds the determinations have been made at a temperature sufficiently elevated to allow the vapour to form a flammable mixture with air.

5.1.4 Flash point FP

The value given in the table of Annex B is the “closed cup” measurement. When this data was not available the “open cup” value is quoted. The symbol < (less than), indicates that the flash point is below the value (in degree Celsius) stated, this probably being the limit of the apparatus used.