



BSI Standards Publication

Explosive atmospheres

Part 20-2: Material characteristics - Combustible dusts
test methods (ISO/IEC 80079-20-2:2016)

National foreword

This British Standard is the UK implementation of EN ISO/IEC 80079-20-2:2016, incorporating corrigendum March 2017. It supersedes BS EN 13821:2002 and BS EN 61241-2-2:1996, which are withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EXL/23, Explosion and fire precautions in industrial and chemical plant.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Amendments/corrigenda issued since publication

Date	Text affected
30 April 2018	Implementation of ISO/IEC corrigendum March 2017 correcting Figures 1, 2 and 3. Annex ZA and European foreword updated, including supersession information.

English Version

**Explosive atmospheres - Part 20-2: Material
characteristics - Combustible dusts test methods (ISO/IEC
80079-20-2:2016)**

Atmosphères explosives - Partie 20-2: Caractéristiques
des produits - Méthodes d'essai des poussières
combustibles (ISO/IEC 80079-20-2:2016)

Explosionsfähige Atmosphären - Teil 20-2:
Werkstoffeigenschaften - Prüfverfahren für brennbare
Stäube (ISO/IEC 80079-20-2:2016)

This European Standard was approved by CEN on 18 February 2016.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

European foreword

This document (EN ISO/IEC 80079-20-2:2016) has been prepared by Technical Committee ISO/TMBG "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of an identical text or by endorsement, at the latest by September 2016, and conflicting national standards shall be withdrawn at the latest by September 2016.

The significant changes with respect to EN 13821:2002 and EN 61241-2-2:1995 are included in Annex ZB "*Significant changes with respect to EN 13821:2002, IEC 61241-2-1:1994, EN 61241-2-2:1993 and IEC 61241-2-3:1994*".

This document supersedes EN 13821:2002 and EN 61241-2-2:1995.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of 2014/34/EU.

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

Extensions to the marking scheme described in the Directive are found in the ATEX Guidelines published by the European Commission. These are particularly useful for equipment that conforms to more than one category.

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Endorsement notice

The text of ISO/IEC 80079-20-2:2016 has been approved by CEN as EN ISO/IEC 80079-20-2:2016 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/BC/CEN/92/46 to provide one voluntary means of conforming to essential requirements of Directive 2014/34/EU "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)/sub-clause(s) of this EN	Remarks/Notes
Annex II, Clause 1.01; 1.0.6a; 1.0.6b; 1.2.1; 1.2.4; 1.5.7	5, 6, Annex G	

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."

3 Modifications to Annex ZB

Replace the title of Annex ZB by the following:

"Significant changes with respect to EN 13821:2002, IEC 61241-2-1:1994, EN 61241-2-2:1993 and IEC 61241-2-3:1994"

Replace the first sentence by the following:

"This European Standard supersedes EN 13821:2002, IEC 61241-2-1:1994, EN 61241-2-2:1993 and IEC 61241-2-3:1994."

Replace the table title by the following:

"Significant changes with respect to EN 13821:2002, IEC 61241-2-1:1994, EN 61241-2-2:1993 and IEC 61241-2-3:1994"

Annex ZB (informative)

Significant changes with respect to IEC 61241-2-1:1994, EN 61241-2-2:1993 and IEC 61241-2-3:1994

This European Standard supersedes IEC 61241-2-1:1994, EN 61241-2-2:1993 and IEC 61241-2-3:1994

**Table ZB.1 — Significant changes with respect to IEC 61241-2-1:1994, EN 61241-2-2:1993 and
IEC 61241-2-3:1994**

Explanation of the significance of the changes	Clause	Type		
		Minor and editorial changes	Extension	Major technical changes
Normative references	2	X		
Terms and Definitions	3	X		
Dust sample Requirements	4	X		
Combustible Dust Determination	5	X		
Procedure for Characterisation of combustible dust or combustible flying	6	X		
Test methods for determination of a combustible dust or a combustible flying	7	X		
MIT of a dust cloud	8.1	X		
MIT of a dust layer	8.2	X		
MIE of a dust/air mixture	8.3	X		
Tests on resistivity	8.4	X		
Measurement of temperature distribution on the surface of the hot plate	Annex A	X		
Godbert-Greenwald oven	Annex B	X		
Examples of spark-generating systems	Annex C	X		

Table ZB.1 (continued)

		Type		
Explanation of the significance of the changes	Clause	Minor and editorial changes	Extension	Major technical changes
Vertical tube apparatus	Annex D	X		
20-litre sphere	Annex E	X		
BAM oven	Annex F	X		
Data for dust explosion characteristics	Annex G	X		
1m ³ vessel	Annex H	X		

NOTE 1 The technical changes referred to include the significant technical changes from the revised EN but this is not an exhaustive list of all modifications from the previous version.

Explanations:

A) Definitions

Minor and editorial changes

clarification
decrease of technical requirements
minor technical change
editorial corrections

Changes in a standard classified as 'Minor and editorial changes' refer to changes regarding the previous standard, which modify requirements in an editorial or a minor technical way. Also changes of the wording to clarify technical requirements without any technical change are classified as 'Minor and editorial changes'.

A reduction in level of existing requirement is also classified as 'Minor and editorial changes'

Extension

addition of technical options

Changes in a standard classified as 'extension' refers to changes regarding the previous standard, which add new or modify existing technical requirements, in a way that new options are given, but without increasing requirements for equipment that was fully compliant with the previous standard. Therefore these 'extensions' will not have to be considered for products in conformity with the preceding edition.

Major technical changes

addition of technical requirements
increase of technical requirements

Changes in a standard classified as 'Major technical change' refer to changes regarding the previous standard, which add new or increase the level of existing technical requirements, in a way that a product in conformity with the preceding standard will not always be able to fulfil the requirements given in the standard. 'Major technical changes' have to be considered for products in conformity with the preceding edition. For every change classified as 'Major Technical Change' additional information is provided in clause B) of the Annex ZB.

NOTE 2 These changes represent current technological knowledge¹. However, these changes should not normally have an influence on equipment already placed on the market.

B) Information about the background of 'Major Technical Changes'

None

¹ see also ATEX Guideline 10.3 and Annex ZA

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXPLOSIVE ATMOSPHERES –

Part 20-2: Material characteristics – Combustible dusts test methods

FOREWORD

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International Standard ISO/IEC 80079-20-2 has been prepared by subcommittee 31M: Non-electrical equipment and protective systems for explosive atmospheres, of IEC 31: Equipment for explosive atmospheres.

It is published as a double logo standard.

This first edition cancels and replaces the first edition of IEC 61241-2-1 published in 1994, the first edition of IEC 61241-2-2 published in 1993 and the first edition of IEC 61241-2-3 published in 1994, combining the requirements into a single document, and is considered to constitute a technical revision.

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

FDIS	Report on voting
31M/102/FDIS	31M/108/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. In ISO, the standard has been approved by 15 P-members out of 21 having cast a vote.

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

"A list of all parts in the IEC 60079 series, under the general title *Explosive atmospheres*, as well as the International Standard 80079 series, can be found on the IEC website."

The committee has decided that the contents of this publication will remain unchanged until the stability 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.

Significant changes with respect to IEC 61241-2-1:1994, IEC 61241-2-2:1993 and IEC 61241-2-3:1994

Explanation of the significance of the changes	Clause	Type		
		Minor and editorial changes	Extension	Major technical changes
Normative references	2	X		
Terms and Definitions	3	X		
Dust sample Requirements	4	X		
Combustible Dust Determination	5	X		
Procedure for Characterisation of combustible dust or combustible flying	6	X		
Test methods for determination of a combustible dust or a combustible flying	7	X		
MIT of a dust cloud	8.1	X		
MIT of a dust layer	8.2	X		
MIE of a dust/air mixture	8.3	X		
Tests on resistivity	8.4	X		
Measurement of temperature distribution on the surface of the hot plate	Annex A	X		
Godbert-Greenwald oven	Annex B	X		
Examples of spark-generating systems	Annex C	X		
Vertical tube apparatus	Annex D	X		
20-litre sphere	Annex E	X		
BAM oven	Annex F	X		
Data for dust explosion characteristics	Annex G	X		
1m ³ vessel	Annex H	X		

EXPLOSIVE ATMOSPHERES –

Part 20-2: Material characteristics – Combustible dusts test methods

1 Scope

This part of ISO/IEC 80079 describes the test methods for the identification of combustible dust and combustible dust layers in order to permit classification of areas where such materials exist for the purpose of the proper selection and installation of electrical and mechanical equipment for use in the presence of combustible dust.

The standard atmospheric conditions for determination of characteristics of combustible dusts are:

- temperature $-20\text{ }^{\circ}\text{C}$ to $+60\text{ }^{\circ}\text{C}$,
- pressure 80 kPa (0,8 bar) to 110 kPa (1,1 bar) and
- air with normal oxygen content, typically 21 % v/v.

The test methods defined do not apply to:

- recognized explosives, propellants (e.g. gunpowder, dynamite), or substances or mixtures of substances which may, under some circumstances, behave in a similar manner or
- dusts of explosives and propellants that do not require atmospheric oxygen for combustion, or to pyrophoric substances.

2 Normative references

None.

3 Terms and definitions

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

3.1

combustible dust

finely divided solid particles, 500 μm or less in nominal size, which may form explosive mixtures with air at standard atmospheric pressure and temperatures

Note 1 to entry: This includes dust and grit as defined in ISO 4225.

Note 2 to entry: The term 'solid particles' is intended to address particles in the solid phase but does not preclude a hollow particle.

3.1.1

conductive dust

combustible metal dusts and other combustible dusts with electrical resistivity equal to or less than $1 \times 10^3\ \Omega\cdot\text{m}$

Note 1 to entry: Metal dust is treated as conductive dust because it is assumed that surface oxidation cannot be depended upon to always ensure electrical resistivity greater than $1 \times 10^3\ \Omega\cdot\text{m}$

3.1.2**non-conductive dust**

combustible dust with electrical resistivity greater than $1 \times 10^3 \Omega \cdot m$

3.2**combustible flyings**

solid particles, including fibres, where one dimension is greater than 500 µm in nominal size, which may form an explosive mixture with air at standard atmospheric pressure and temperature

Note 1 to entry: The ratio of length to width is 3 or more.

Note 2 to entry: Examples of flyings include carbon fibre, rayon, cotton (including cotton linters and cotton waste), sisal, jute, hemp, cocoa fibre, oakum and baled waste kapok.

3.3**explosive dust atmosphere**

mixture with air, under atmospheric conditions, of combustible substances in the form of dust, fibres, or flyings which, after ignition, permits self-sustaining propagation

3.4**minimum ignition temperature of a dust layer**

lowest temperature of a hot surface at which ignition occurs in a dust layer under specified test conditions

3.5**minimum ignition temperature of a dust cloud**

lowest temperature of a hot surface on which the most ignitable mixture of the dust with air is ignited under specified test conditions

3.6**minimum ignition energy (of a combustible dust/air mixture)**

lowest electrical energy stored in a capacitor which upon discharge is sufficient to effect ignition of the most sensitive dust/air mixture under specified test conditions

4 Dust sample requirements**4.1 Receipt of sample for testing**

A material safety data sheet or equivalent with the sample.

The test material shall be provided in suitable packaging, labelled according to relevant guidelines labelled according to relevant guidelines, and appropriate transportation.

NOTE It is usual to provide a quantity of at least 0,5 kg for testing. If sample preparation is required this may be insufficient. If only a smaller volume of material is available then the full range of testing may not be possible.

4.2 Characterisation of sample

The sample shall be representative of the material as it appears in the entire process operated.

NOTE Many unit operations such as extract systems will separate dust into finer fractions than seen in the main processing equipment and this is accounted for when taking the sample.

If the sample is not representative of the material as found in the process then sample preparation shall be carried out to apply the worst case conditions.

At least the following information about the sample shall be provided:

- minimum particle size,
- median particle size,
- maximum particle size,
- particle distribution,
- moisture content, and
- method of determination (e.g. optical methods or sieving).

If the applicant cannot provide usable data then this shall be determined separately.

4.3 Preparation of sample

If it is not possible to test the sample as received, or if the sample is no longer representative of the process material then it may be necessary to condition or alter the sample for testing. This may include

- grinding/sieving,
- drying and
- humidifying.

Any apparent changes noted in the properties of the dust during preparation of the sample, for example, by sieving or owing to temperature or humidity conditions, shall be stated in the test report.

NOTE 1 Sample preparation such as grinding and sieving, or drying can alter the material characteristics. Where finer fractions are present in a facility it is appropriate to take fractions of less than 63 µm to give the most easily ignitable mixtures. When the sample is a mixture of substances, the sample preparation can result in a change to the sample's composition.

NOTE 2 The presence of solvents can become altered in the sample preparation process.

4.4 Test conditions

The tests shall be carried out at standard atmospheric temperature of 20^{+10}_{-10} °C and standard atmospheric pressure of 80 kPa to 110 kPa (0,8 bar to 1,1 bar) unless otherwise specified.

5 Combustible dusts and combustible flyings determination

5.1 Test sequence

The sequence followed for the determination of the material properties of combustible dust and combustible flyings is given in 5.2, Clause 6 and Figure 1, Figure 2 and Figure 3.

NOTE 1 Refer also to the information referenced in Annex G.

NOTE 2 Testing in the Hartman tube is a screening method. The test procedure can be directly started with the 20 litre sphere or the GG Oven.

5.2 Tests to determine whether material is a combustible dust or combustible flying

5.2.1 Visual inspection

Make a visual inspection of the test material (by microscope if necessary) to determine whether the material consists of combustible flyings:

- If the material consists of combustible flyings with dust then continue the test procedure in a Hartmann tube (see 5.2.3) to determine whether the combination of the two is combustible dust.
- If the material consists only of combustible flyings then continue the test procedure in a Hartmann tube (see 5.2.3) to determine whether it is combustible flyings.