ISO/IEC 80079-20-1

Edition 1.0 2017-12

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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

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

ISO/IEC 80079-20-1:2017-12(en-fr)

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2017 ISO/IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about ISO/IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'ISO/IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

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

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue
The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

Electropedia - www.electropedia.org
The world's leading online dictionary of electronic and electrical terms containing 20 000 terms and definitions in English and French, with equivalent terms in 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary
65 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: csc@iec.ch.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Catalogue IEC - webstore.iec.ch/catalogue
Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

Recherche de publications IEC - www.iec.ch/searchpub
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,…). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

Electropedia - www.electropedia.org
Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Glossaire IEC - std.iec.ch/glossary
65 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: csc@iec.ch.

ISO/IEC 80079-20-1

Edition 1.0 2017-12

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

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

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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 13.230; 29.260.20

ISBN 978-2-8322-5164-5

Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

CONTENTS

FOREWORD 5
1 Scope 7
2 Normative references 7
3 Terms and definitions 7
4 Classification of gases and vapours 9
4.1 General 9
4.2 Classification according to the maximum experimental safe gap (MESG) 9
4.3 Classification according to the minimum igniting current ratio (MIC ratio) 10
4.4 Classification according to the similarity of chemical structure 10
4.5 Classification of mixtures of gases 10
5 Data for flammable gases and vapours, relating to the use of equipment 11
5.1 Determination of the properties 11
5.1.1 General 11
5.1.2 Equipment group 11
5.1.3 Flammable limits 11
5.1.4 Flash point (FP) 11
5.1.5 Temperature class 12
5.1.6 Minimum igniting current (MIC) 12
5.1.7 Auto-ignition temperature (AIT) 12
5.2 Properties of particular gases and vapours 12
5.2.1 Coke oven gas 12
5.2.2 Ethyl nitrite 12
5.2.3 MESG of carbon monoxide 12
5.2.4 Methane, Equipment Group IIA 13
6 Method of test for the maximum experimental safe gap (MESG) 13
6.1 Outline of method 13
6.2 Test apparatus 13
6.2.1 General 13
6.2.2 Material and mechanical strength 14
6.2.3 Exterior chamber 14
6.2.4 Interior chamber 14
6.2.5 Gap adjustment 14
6.2.6 Injection of mixture 14
6.2.7 Position of ignition source 14
6.3 Procedure 14
6.3.1 Preparation of gas mixtures 14
6.3.2 Temperature and pressure 14
6.3.3 Gap adjustment 15
6.3.4 Ignition 15
6.3.5 Observation of the ignition process 15
6.4 Determination of maximum experimental safe gap (MESG) 15
6.4.1 General 15
6.4.2 Preliminary tests 15
6.4.3 Confirmatory tests 15
6.4.4 Reproducibility of maximum experimental safe gaps (MESG) 15
6.4.5 Tabulated values 16

6.5 Verification of the MESG determination method ... 16
7 Method of test for auto-ignition temperature (AIT) ... 16
7.1 Outline of method ... 16
7.2 Apparatus ... 16
7.2.1 General ... 16
7.2.2 Test vessel and support ... 17
7.2.3 Thermocouples ... 17
7.2.4 Oven ... 17
7.2.5 Metering devices ... 18
7.2.6 Mirror ... 18
7.2.7 Timer ... 18
7.2.8 Equipment for purging the test vessel with air ... 18
7.2.9 Automated apparatus ... 18
7.3 Sampling, preparation and preservation of test samples ... 19
7.3.1 Sampling ... 19
7.3.2 Preparation and preservation ... 19
7.4 Procedure ... 19
7.4.1 General ... 19
7.4.2 Sample injection ... 20
7.4.3 Determination of the auto-ignition temperature (AIT) ... 20
7.5 Auto-ignition temperature (AIT) ... 21
7.6 Validity of results ... 21
7.6.1 Repeatability ... 21
7.6.2 Reproducibility ... 21
7.7 Data ... 22
7.8 Verification of the auto-ignition temperature determination method ... 22
Annex A (normative) Ovens of test apparatus for the tests of auto-ignition temperature ... 23
A.1 General ... 23
A.2 “IEC oven” ... 23
A.3 “DIN oven” ... 23
Annex B (informative) Tabulated values ... 30
Annex C (informative) Determination of cool flames ... 84
Annex D (informative) Volume dependence of auto-ignition temperature ... 86
Bibliography ... 87

Figure 1 − Test apparatus ... 13
Figure A.1 − Test apparatus: assembly ... 24
Figure A.2 − Section A-A (flask omitted) ... 25
Figure A.3 − Base heater (board made of refractory material) ... 25
Figure A.4 − Flask guide ring (board made of refractory material) ... 26
Figure A.5 − Neck heater (board made of refractory material) ... 26
Figure A.6 − Oven ... 27
Figure A.7 − Lid of steel cylinder ... 28
Figure A.8 − Lid of steel cylinder ... 29
Figure A.9 − Injection of gaseous sample ... 29
Figure C.1 − Additional thermocouple to detect cool flames ... 84

Figure C.2 − ‘Negative temperature coefficient’ shown for butyl butyrate as an example 85
Figure D.1 − Volume dependence of auto-ignition temperature 86

Table 1 − Classification of temperature class and range of auto-ignition temperatures.....12
Table 2 − Values for verification of the apparatus 16
Table 3 − Values for verification of the apparatus 22
Table B.1 − Material data.....32

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.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 80079-20-1 has been prepared by subcommittee 31M: Non-electrical equipment and protective systems for explosive atmospheres, of IEC technical committee 31: Equipment for explosive atmospheres.

This first edition of ISO/IEC 80079-20-1 cancels and replaces IEC 60079-20-1:2010. It constitutes a technical revision. This edition includes the following significant technical changes with respect to the previous edition:

The classifications for the temperature class or equipment group were changed in the informative Annex B for the following materials: CAS-No. 64-17-5; 78-93-3; 107-31-3:

- For dry Ethanol (CAS-No. 64-17-5), equipment group remains IIB, but for Ethanol in air with ≥4% water vapour, as in common atmospheres, a second line has been added to indicate IIA;

- For 2-Butanone (CAS-No. 78-93-3), re-measurement indicated change from IIB to IIA was needed; and

- For Formic Acid Methyl Ester (CAS-No. 107-31-3), re-measurement indicated change from T2 to T1 was justified.

No significant changes were made with respect to the normative text of IEC 60079-20-1:2010.

It is published as a double logo standard.

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

FDIS	Report on voting
31M/122/FDIS	31M/126/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 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 website 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.

The contents of the corrigendum of July 2018 have been included in this copy.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

EXPLOSIVE ATMOSPHERES –

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

1 Scope

This part of ISO/IEC 80079 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-air mixtures or vapour-air mixtures under normal conditions of temperature and pressure (20 °C, 101,3 kPa) so as to permit the selection of an appropriate group of equipment. This document also describes a test method intended for use in the determination of the auto-ignition temperature (AIT) of a vapour-air mixture or gas-air mixture at atmospheric pressure, so as to permit the selection of an appropriate temperature class of equipment.

Values of chemical properties of materials are provided to assist in the selection of equipment to be used in hazardous areas. Further data may be added as the results of validated tests become available.

The materials and the characteristics included in a table (see Annex B) have been selected with particular reference to the use of equipment in hazardous areas. The data in this document have been taken from a number of references which are given in the bibliography.

These methods for determining the MESG or the AIT may also be used for gas-air-inert mixtures or vapour-air-inert mixtures. However, data on air-inert mixtures are not tabulated.

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 60050-426, *International Electrotechnical Vocabulary − Part 426: Electrical apparatus for explosive atmospheres* (available at http://www.electropedia.org/)

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 terms and definitions given in IEC 60050-426 and the following apply.

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

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