



# UL 80079-20-1

## STANDARD FOR SAFETY

Explosive Atmospheres – Part 20-1:  
Material Characteristics for Gas and  
Vapour Classification – Test Methods  
and Data

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UL Standard for Safety for Explosive Atmospheres – Part 20-1: Material Characteristics for Gas and Vapour Classification – Test Methods and Data, UL 80079-20-1

First Edition, Dated June 2, 2020

### **Summary of Topics**

***This First Edition of ANSI/UL 80079-20-1, the Standard for Explosive Atmospheres – Part 20-1: Material Characteristics for Gas and Vapour Classification – Test Methods and Data, is an adoption of ISO/IEC 80079-20-1 (first edition, issued by ISO/IEC December 2017) and Corrigendum 1 (issued 2018).***

***UL 80079-20-1 is an IEC-based UL standard with US Differences.***

The new requirements are substantially in accordance with Proposal(s) on this subject dated December 6, 2019 and February 21, 2020.

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UL 80079-20-1

**Standard for Explosive Atmospheres – Part 20-1: Material Characteristics  
for Gas and Vapour Classification – Test Methods and Data**

**First Edition**

**June 2, 2020**

This ANSI/UL Standard for Safety consists of the First Edition.

The most recent designation of ANSI/UL 80079-20-1 as an American National Standard (ANSI) occurred on June 2, 2020. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or Preface. The National Difference Page and IEC Foreword are also excluded from the ANSI approval of IEC-based standards.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at <https://csds.ul.com>.

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## Preface (UL)

This UL Standard is based on ISO/IEC Publication 80079-20-1: First edition, Explosive Atmospheres – Part 20-1: Material Characteristics for Gas and Vapour Classification – Test Methods and Data. ISO/IEC publication 80079-20-1 is copyrighted by the IEC.

This edition has been issued to satisfy UL Standards policy.

This is the UL Standard for Safety for Explosive Atmospheres – Part 20-1: Material Characteristics for Gas and Vapour Classification – Test Methods and Data.

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Note – Although the intended primary application of this Standard is stated in its Scope, it is important to note that it remains the responsibility of the users of the Standard to judge its suitability for their particular purpose.

The following people served as members of STP 60079 and participated in the review of this standard:

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## National Differences

National Differences from the text of International Electrotechnical Commission (IEC) Publication 80079-20-1, Explosive atmospheres – Part 20-1: Material characteristics for gas and vapour classification – Test methods and data, copyright 2017, are indicated by notations (differences) and are presented in bold text.

There are five types of National Differences as noted below. The difference type is noted on the first line of the National Difference in the standard. The standard may not include all types of these National Differences.

**D1** – These are National Differences which are based on **basic safety principles and requirements**, elimination of which would compromise safety for consumers and users of products.

**D2** – These are National Differences from IEC requirements based on existing **safety practices**. These requirements reflect national safety practices, where empirical substantiation (for the IEC or national requirement) is not available or the text has not been included in the IEC standard.

**DC** – These are National Differences based on the **component standards** and will not be deleted until a particular component standard is harmonized with the IEC component standard.

**DE** – These are National Differences based on **editorial comments or corrections**.

**DR** – These are National Differences based on the **national regulatory requirements**.

Each national difference contains a description of what the national difference entails. Typically one of the following words is used to explain how the text of the national difference is to be applied to the base IEC text:

**Addition / Add** - An addition entails adding a complete new numbered clause, subclause, table, figure, or annex. Addition is not meant to include adding select words to the base IEC text.

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**Modification / Modify** - A modification is an altering of the existing base IEC text such as the addition, replacement or deletion of certain words or the replacement of an entire clause, subclause, table, figure, or annex of the base IEC text.

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# FOREWORD

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

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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6) All users should ensure that they have the latest edition of this publication.

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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  $\geq 4\%$  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.

**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

**1DV DR Modification of Clause 1 to replace with the following:**

This ~~standard part of ISO/IEC 80079~~ provides guidance on classification of gases and vapours for the purpose of area classification in accordance with NFPA 70, National Electrical Code (NEC) as hazardous (Classified) locations. 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.

Where references are made to IEC standards, the referenced requirements found in these standards shall apply as modified by any applicable US National Differences for the standard (see Clause 2).

## 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.

**2DV DR Modification of Clause 2 references to replace with the following:**

**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**~~

## **NFPA 70 National Electrical Code (NEC)**

### **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>

#### **3.1**

##### **auto-ignition**

reaction which is evidenced by a clearly perceptible flame and/or explosion, and for which the ignition delay time does not exceed 5 min

Note 1 to entry: See [7.2.2](#) for a test method.

#### **3.2**

##### **ignition delay time**

time between the completed injection of the flammable material and the ignition

#### **3.3**

##### **auto-ignition temperature**

##### **AIT**

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

Note 1 to entry: See Clause [7](#) for a test method.

#### **3.4**

##### **maximum experimental safe gap**

##### **MESG**

maximum gap of a joint of 25 mm in width which prevents any transmission of an explosion during tests made under the conditions specified in this document

Note 1 to entry: See Clause [6](#) for a test method.

#### **3.5**

##### **minimum igniting current**

##### **MIC**

minimum current in a specified test circuit that causes the ignition of the explosive test mixture in the spark test apparatus according to IEC 60079-11

Note 1 to entry: See [5.1.6](#) for the test circuit.

#### **3.6**

##### **flammable limits**

lower flammable limit (LFL) and upper flammable limit (UFL) of gas in a gas-air mixture, between which a flammable mixture is formed

Note 1 to entry: The term “explosive limits” is used especially in European standardization and regulations interchangeably to describe these limits.

Note 2 to entry: The concentration can be expressed as either a volume fraction or a mass per unit volume.

### 3.6.1

#### **lower flammable limit**

##### **LFL**

concentration of flammable gas or vapour in air, below which an explosive gas atmosphere does not form

Note 1 to entry: For the purposes of Ex Equipment, this was previously referred to as the lower explosive limit (LEL).

Note 2 to entry: The concentration can be expressed as either a volume fraction or a mass per unit volume.

### 3.6.2

#### **upper flammable limit**

##### **UFL**

concentration of flammable gas or vapour in air, above which an explosive gas atmosphere does not form

Note 1 to entry: For the purposes of Ex Equipment, this was previously referred to as the upper explosive limit (UEL).

Note 2 to entry: The concentration can be expressed as either a volume fraction or a mass per unit volume.

### 3.7

#### **equipment grouping**

classification system of equipment related to the explosive atmosphere for which they are intended to be used

Note 1 to entry: IEC 60079-0 identifies three equipment groups:

Group I – equipment for mines susceptible to fire damp;

Group II, which is sub-divided into groups IIA, IIB and IIC – equipment for all places with an explosive gas atmosphere other than mines susceptible to fire damp;

Group III, which is sub-divided into groups IIIA, IIIB and IIIC – equipment for all places with an explosive dust atmosphere other than mines susceptible to fire damp.

### 3.8

#### **flash point**

##### **FP**

lowest liquid temperature at which, under specified test conditions, a liquid gives off vapours in quantity such as to be capable of forming an ignitable vapour-air mixture

### 3.9

#### **gas**

gaseous phase of a substance that cannot reach equilibrium with its liquid or solid state in the temperature and pressure range of interest

Note 1 to entry: This is a simplification of the scientific definition, and merely requires that the substance is above its boiling point or sublimation point at the ambient temperature and pressure.

### 3.10

#### **vapour**

gaseous phase of a substance that can reach equilibrium with its liquid or solid state in the temperature and pressure range of interest