

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Explosive atmospheres –
Part 36: Non-electrical equipment for explosive atmospheres – Basic method
and requirements**

**Atmosphères explosives –
Partie 36: Appareils non électriques destinés à être utilisés en atmosphères
explosives – Méthodologie et exigences**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

EXPLOSIVE ATMOSPHERES –**Part 36: Non-electrical equipment for explosive atmospheres –
Basic method and requirements**

FOREWORD

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International Standard ISO 80079-36 has been prepared by IEC sub-committee 31M: Non-electrical equipment and protective systems for explosive atmospheres, of IEC 31: Equipment for explosive atmospheres.

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

FDIS	Report on voting
31M/103/FDIS	31M/109/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 22 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- withdrawn,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.

INTRODUCTION

This part of ISO/IEC 80079 addresses for the first time basic requirements and protection concepts for mechanical explosion protected equipment on an international level. Up to now, with some exceptions, only the design, manufacture, installation and operation of electrical equipment in explosive atmospheres have been addressed in ISO and IEC standards. Examples of non-electrical equipment are: couplings, pumps, gearboxes, brakes, hydraulic and pneumatic motors and any combination of devices to realise a machine, fan, engine, compressor, assemblies, etc.

Although many but not all of such machines use an explosion protected electric motor for motive power the measures needed to reduce the risk of ignition in mechanical equipment as part of the machine may be different to those applied to electrical equipment.

Whereas electrical equipment working within design parameters often contains effective ignition sources such as sparking parts, this is not necessarily true for mechanical equipment which is designed to operate without break-down between predetermined maintenance operations.

Generally there are two mechanical ignition scenarios that need to be considered. These are, ignition resulting from a failure in the machine such as a bearing over-heating or ignition created by the normal functioning of the machine such as a hot brake surface.

Experience has shown that it is essential to perform a comprehensive ignition hazard assessment on the complete mechanical equipment to identify all potential ignition sources and determine if they can become effective ignition sources during the expected lifetime of the mechanical equipment. Once these ignition risks are understood and documented it is then possible to assign protective measures, depending on the required Equipment Protection Level (EPL), to minimise the probability that these ignition sources will become effective.

This standard addresses mechanical equipment and assemblies intended for the generation, transfer, storage, measurement, control and conversion of energy and/or the processing of material and which are capable of causing an explosion through their own potential sources of ignition.

Potential ignition sources are not limited to those created by the equipment but include any ignition sources created by the operation of the equipment; for example hot surfaces when pumping hot fluids or electrostatic charging when handling plastics.

If the only source of ignition of an item comes from the external process such items are not considered to have their own source of ignition, and they are not in the scope of this part of ISO/IEC 80079.

NOTE Examples are items made from plastics (polymers) like plastic pipes and containers that can become charged due to an external process (and not by the operation of the equipment), or items that can become hot due to an external process (like a pipe). These are not considered to be "non-electrical equipment" on their own. If on the other hand such items are incorporated into non-electrical equipment, and could become an ignition source by the intended operation of the equipment, they need to be assessed together with the equipment under consideration (for example a plastic pipe as part of a petrol dispenser could become charged due to the operation of this dispenser).

EXPLOSIVE ATMOSPHERES –

Part 36: Non-electrical equipment for explosive atmospheres – Basic method and requirements

1 Scope

This part of ISO/IEC 80079 specifies the basic method and requirements for design, construction, testing and marking of non-electrical Ex equipment, Ex Components, protective systems, devices and assemblies of these products that have their own potential ignition sources and are intended for use in explosive atmospheres.

Hand tools and manually operated equipment without energy storage are excluded from the scope of this standard. This standard does not address the safety of static autonomous process equipment when it is not part of equipment referred to in this standard.

NOTE 1 Static autonomous process equipment includes items such as tanks, vessels, fixed pipework and hand operated valves which do not have their own source of energy that could create a potential ignition source during operation.

This standard does not specify requirements for safety, other than those directly related to the risk of ignition which may then lead to an explosion. The standard atmospheric conditions (relating to the explosion characteristics of the atmosphere) under which it may be assumed that equipment can be operated are:

- temperature -20 °C to +60 °C;
- pressure 80 kPa (0,8 bar) to 110 kPa (1,1 bar); and
- air with normal oxygen content, typically 21 % v/v.

Such atmospheres can also exist inside the equipment. In addition, the external atmosphere can be drawn inside the equipment by natural breathing produced as a result of fluctuations in the equipment's internal operating pressure, and/or temperature.

NOTE 2 Although the standard atmospheric conditions above give a temperature range for the atmosphere of -20 °C to +60 °C, the normal ambient temperature range for the equipment is -20 °C to +40 °C, unless otherwise specified and marked. It is considered that -20 °C to +40 °C is appropriate for most equipment and that to manufacture all equipment to be suitable for a standard atmosphere upper ambient temperature of +60 °C would place unnecessary design constraints.

NOTE 3 The requirements of this standard can also be helpful for the design, construction, testing and marking of equipment intended for use in atmospheres outside the validity range stated above. In this case however, the ignition hazard assessment, ignition protection provided, additional testing (if necessary), manufacturer's technical documentation and instructions to the user, clearly demonstrate and indicate the equipment's suitability for the conditions it may encounter. It is also recognized that changes in temperature and pressure can have a significant influence on characteristics of the explosive atmosphere, such as ignitability.

This part of ISO/IEC 80079 specifies the requirements for the design and construction of equipment, intended for explosive atmospheres in conformity with all Equipment Protection Levels (EPLs) of Group I, II and III.

NOTE 4 It is not unusual for equipment designed and constructed in accordance with this standard for a particular EPL to be used in areas requiring an EPL with a higher level of safety by including the application of additional measures. Such measures include for example inerting, suppression, venting or containment or for example by dilution, drainage, monitoring and shut-down. Such measures are outside the scope of this standard.

This standard supplements and modifies the general requirements of IEC 60079-0, as shown in Table 1. Where a requirement of this standard conflicts with a requirement of IEC 60079-0, as far as applicable for non-electrical equipment, the requirement of this standard takes precedence.

This standard is supplemented or modified by the following standards concerning specific types of protection:

- ISO 80079-37, *Explosive atmospheres – Part 37: Non-electrical equipment for explosive atmospheres – Non-electrical type of protection constructional safety "c", control of ignition source "b", liquid immersion "k"*
- IEC 60079-1, *Explosive atmospheres – Part 1: Equipment protection by flameproof enclosures "d"*
- IEC 60079-2, *Explosive atmospheres – Part 2: Equipment protection by pressurized enclosures "p"*
- IEC 60079-31, *Explosive atmospheres – Part 31: Equipment dust ignition protection by enclosure "t"*

The nature and ignition sources of non-electrical equipment shall be considered when applying types of protection "d", "p", or "t" on non-electrical equipment (see Annex G).

Table 1 – Applicability of specific clauses of IEC 60079-0 (1 of 5)

Clause of IEC 60079-0		IEC 60079-0 application to			
Ed 6.0 (2011) (Inf.)	Clause / Sub-Clause Title (Normative)	ISO 80079-36	ISO 80079-37		
			"c"	"b"	"k"
4	Equipment grouping	Modified (see Clause 4)	(*)	(*)	(*)
4.1	Group I	Applies	(*)	(*)	(*)
4.2	Group II	Applies	(*)	(*)	(*)
4.3	Group III	Modified (see 4.4)	(*)	(*)	(*)
4.4	Equipment for a particular explosive atmosphere	Applies	(*)	(*)	(*)
5	Temperatures	Modified (see 6.2 and Table 2)	(*)	(*)	(*)
5.1	Environmental influences	Applies	(*)	(*)	(*)
5.1.1	Ambient temperature	Applies <i>to be read as non-electrical equipment</i>	(*)	(*)	(*)
5.1.2	External source of heating or cooling	Applies <i>to be read as non-electrical equipment</i>	(*)	(*)	(*)
5.2	Service temperature	Applies <i>to be read as non-electrical equipment</i>	(*)	(*)	(*)
5.3.1	Determination of maximum surface temperature	Modified (see 6.2.3) non-electrical	(*)	(*)	(*)
5.3.2.1	Group I electrical equipment	Modified (see 6.2.4) non-electrical	(*)	(*)	(*)
5.3.2.2	Group II electrical equipment	Modified (see 6.2.5) non-electrical	(*)	(*)	(*)
5.3.2.3	Group III electrical equipment	Modified (see 6.2.7) non-electrical	(*)	(*)	(*)

Table 1 (2 of 5)

Clause of IEC 60079-0		IEC 60079-0 application to			
Ed 6.0 (2011) (Inf.)	Clause / Sub-Clause Title (Normative)	ISO 80079-36	ISO 80079-37		
			"c"	"b"	"k"
5.3.3	Small component temperature for Group I and Group II electrical equipment	Modified (see 6.2.6) non-electrical	(*)	(*)	(*)
6.	Requirements for all electrical equipment	Applies <i>to be read as non-electrical equipment</i>	(*)	(*)	(*)
6.1	General	Applies <i>to be read as non-electrical equipment</i>	(*)	(*)	(*)
6.2	Mechanical strength of equipment	Applies	(*)	(*)	(*)
6.3	Opening times	Modified (see 7.3)	(*)	(*)	(*)
6.4	Circulating currents in enclosures (e.g. of large electrical machines)	Applies	(*)	(*)	(*)
6.5	Gasket retention	Applies	(*)	(*)	(*)
6.6	Electromagnetic and ultrasonic energy radiating equipment	Excluded	-	-	-
7	Non-metallic enclosures and non-metallic parts of enclosures	Applies	(*)	(*)	(*)
7.1	General	Applies	(*)	(*)	(*)
7.1.1	Applicability	Applies	(*)	(*)	(*)
7.1.2	Specification of materials	Applies	(*)	(*)	(*)
7.2	Thermal endurance	Applies	(*)	(*)	(*)
7.3	Resistance to light	Applies	(*)	(*)	(*)
7.4	Electrostatic charges on external non-metallic materials	Modified (see 6.7.4, 6.7.5 and 6.7.6)	(*)	(*)	(*)
7.5	Accessible metal parts	Applies	(*)	(*)	(*)
8	Metallic enclosures and metallic parts of enclosures	Modified (see 6.4.2.1 Footnote 1) and ref. to ISO 6507-1	(*)	(*)	(*)
8.1	Material composition	Modified (see 6.4.2.1 Footnote 1) and ref. to ISO 6507-1	(*)	(*)	(*)
8.2	Group I	Modified (see 6.4.2.1 Footnote 1) and ref. to ISO 6507-1	(*)	(*)	(*)
8.3	Group II	Modified (see 6.4.2.1 Footnote 1) and ref. to ISO 6507-1	(*)	(*)	(*)

Table 1 (3 of 5)

Clause of IEC 60079-0		IEC 60079-0 application to			
Ed 6.0 (2011) (Inf.)	Clause / Sub-Clause Title (Normative)	ISO 80079-36	ISO 80079-37		
			"c"	"b"	"k"
8.4	Group III	Modified (see 6.4.2.1 Footnote 1) and ref. to ISO 6507-1	(*)	(*)	(*)
9	Fasteners	Excluded	-	-	-
10	Interlocking devices	Excluded	-	-	-
11	Bushings	Excluded	-	-	-
12	Materials used for cementing	Applies (see 7.6)	(*)	(*)	(*)
13	Ex Components	Applies	(*)	(*)	(*)
14	Connection facilities and termination compartments	Excluded	-	-	-
15	Connection facilities for earthing or bonding conductors	Excluded	-	-	-
16	Entries into enclosures	Excluded	-	-	-
17	Supplementary requirements for rotating machines	Excluded	-	-	-
18	Supplementary requirements for switchgear	Excluded	-	-	-
19	Supplementary requirements for fuses	Excluded	-	-	-
20	Supplementary requirements for plugs, socket outlets and connectors	Excluded	-	-	-
21	Supplementary requirements for luminaires	Excluded	-	-	-
22	Supplementary requirements for caplights and handlights	Excluded	-	-	-
23	Equipment incorporating cells and batteries	Excluded	-	-	-
24	Documentation	Modified (see 9)	(*)	(*)	(*)
25	Compliance of prototype or sample with documents	Applies	(*)	(*)	(*)
26	Type Tests	Modified (see 8)	(*)	(*)	(*)
26.1	General	Applies	(*)	(*)	(*)
26.2	Test configuration	Applies <i>to be read as non-electrical equipment</i>	(*)	(*)	(*)
26.3	Tests in explosive test mixtures	Applies	(*)	(*)	(*)

Table 1 (4 of 5)

Clause of IEC 60079-0		IEC 60079-0 application to			
Ed 6.0 (2011) (Inf.)	Clause / Sub-Clause Title (Normative)	ISO 80079-36	ISO 80079-37		
			"c"	"b"	"k"
26.4.1	Order of tests	Excluded	-	-	-
26.4.2	Resistance to impact	Applies (see 8.3.1)	(*)	(*)	(*)
26.4.3	Drop test	Applies (see 8.3.2)	(*)	(*)	(*)
26.4.4	Acceptance criteria	Applies (see 8.3.3)	(*)	(*)	(*)
26.4.5	Degree of protection (IP) by enclosure	Applies	(*)	(*)	(*)
26.5.1.1	General	Applies	(*)	(*)	(*)
26.5.1.2	Service temperature	Applies	(*)	(*)	(*)
26.5.1.3	Maximum surface temperature	Modified (see 8.2)	(*)	(*)	(*)
26.5.2	Thermal shock test	Applies	(*)	(*)	(*)
26.5.3	Small component ignition test (Group I and Group II)	Excluded	-	-	-
26.6	Torque test for bushings	Excluded	-	-	-
26.7	Non-metallic enclosures or non-metallic parts of enclosures	Applies	(*)	(*)	(*)
26.8	Thermal endurance to heat	Applies (see 8.4.4)	(*)	(*)	(*)
26.9	Thermal endurance to cold	Applies (see 8.4.5)	(*)	(*)	(*)
26.10	Resistance to light	Applies	(*)	(*)	(*)
26.11	Resistance to chemical agents for Group I electrical equipment	Applies (see 8.4.6)	(*)	(*)	(*)
26.12	Earth continuity	Excluded	-	-	-
26.13	Surface resistance test of parts of enclosures of non-metallic materials	Applies	(*)	(*)	(*)
26.14	Measurement of capacitance	Excluded	-	-	-
26.15	Verification of ratings of ventilating fans	Excluded	-	-	-
26.16	Alternative qualification of elastomeric sealing O-rings	Applies	(*)	(*)	(*)
27	Routine tests	Applies	(*)	(*)	(*)
28	Manufacturer's responsibility	Modified (see 9.1)	(*)	(*)	(*)
29	Marking	Modified (see 11)	(*)	(*)	(*)

Table 1 (5 of 5)

Clause of IEC 60079-0		IEC 60079-0 application to			
Ed 6.0 (2011) (Inf.)	Clause / Sub-Clause Title (Normative)	ISO 80079-36	ISO 80079-37		
			"c"	"b"	"k"
30	Instructions	Modified (see 10)	(*)	(*)	(*)
30.1	General	Applies	(*)	(*)	(*)
30.2	Cells and batteries	Excluded	-	-	-
30.3	Electrical machines	Excluded	-	-	-
30.4	Ventilating fans	Excluded	-	-	-
(*) This requirement concerns also equipment protected by types of protection "c", "b" and "k".					
Applies – This requirement of IEC 60079-0 is applied without change.					
Excluded – This requirement of IEC 60079-0 does not apply.					
Modified – This requirement of IEC 60079-0 is modified as detailed in this standard.					
The applicable requirements of IEC 60079-0 are identified by the clause title which is normative. This document was written referring to the specific requirements of IEC 60079-0 Ed. 6.0:2011, The clause numbers for the 6th edition are shown for information only. This is to enable the General Requirements IEC 60079-0 Ed. 5.0:2007 to be used where necessary with this part of ISO 80079. Where there were no requirements for the 5th edition or where there is a conflict between requirements, the 6th edition requirements should be considered.					

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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"*

IEC 60079-2, *Explosive atmospheres – Part 2: Equipment protection by pressurized enclosure "p"*

IEC 60079-28, *Explosive atmospheres – Part 28: Protection of equipment and transmission systems using optical radiation*

IEC 60079-31, *Explosive atmospheres – Part 31: Equipment dust ignition protection by enclosure "t"*

ISO 80079-37:—, *Explosive atmospheres – Part 37: Non-electrical equipment for explosive atmospheres – Non-electrical type of protection constructional safety "c", control of ignition source "b", liquid immersion "k" ¹*

¹ (to be published)

ISO/IEC 80079-38, *Explosive Atmospheres – Part 38: Equipment and components in explosive atmospheres in underground mines*

ANSI/UL 746B, *Polymeric Materials – Long Term Property Evaluations*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60079-0 as well as the following apply.

3.1

Ignition source scenarios

3.1.1

possible ignition source

type of ignition source to be considered for the identification of ignition hazards

Note 1 to entry: Possible ignition sources include:

- Hot surfaces
- Flames and hot gases (including hot particles)
- Mechanically generated sparks
- Electrical source
- Stray electric currents, cathodic corrosion protection
- Static electricity
- Lightning
- Radio frequency (RF) electromagnetic waves from 10^4 Hz to 3×10^{12} Hz
- Electromagnetic waves including optical radiation from 3×10^{11} Hz to 3×10^{15} Hz
- Ionizing radiation
- Ultrasonics
- Adiabatic compression and shock waves
- Exothermic reactions, including self-ignition of dusts

Note 2 to entry: See also Annex B for information of possible ignition sources.

Note 3 to entry: See Figure 1.

3.1.2

equipment related ignition source

possible ignition source which could be caused by the equipment under consideration regardless of its ignition capability

Note 1 to entry: These are sometimes called "relevant ignition sources", however this can lead to misunderstanding as to whether the ignition source is relevant in terms of it being present, in terms of its ignition capability or in terms of whether it is present in the equipment or not.

Note 2 to entry: All equipment related ignition sources are considered in the ignition hazard assessment to determine whether they are potential ignition sources.

Note 3 to entry: See Figure 1.

3.1.3

potential ignition source

equipment related ignition source which has the capability to ignite an explosive atmosphere (i.e. to become effective)

Note 1 to entry: The likelihood of becoming effective determines the EPL (they may arise in normal operation, expected malfunction, rare malfunction).