



SLOVENSKI STANDARD

SIST EN 60079-11:2012

01-marec-2012

Nadomešča:

SIST EN 60079-11:2007

SIST EN 60079-27:2008

SIST EN 61241-11:2007

Eksplzivne atmosfere - 11. del: Zaščita opreme z lastno varnostjo "i" (IEC 60079-11:2011)

Explosive atmospheres - Part 11: Equipment protection by intrinsic safety i (IEC 60079-11:2011)

iTeh STANDARD PREVIEW

(standards.iteh.ai)

Explosionsgefährdete Bereiche - Teil 11: Geräteschutz durch Eigensicherheit "i" (IEC 60079-11:2011)

[SIST EN 60079-11:2012](#)

[https://standards.iteh.ai/catalog/standards/sist/f7b328d6-0a38-4f24-83bb-](https://standards.iteh.ai/catalog/standards/sist/f7b328d6-0a38-4f24-83bb-1a4d69565faf/sist-en-60079-11-2012)

[1a4d69565faf/sist-en-60079-11-2012](https://standards.iteh.ai/catalog/standards/sist/f7b328d6-0a38-4f24-83bb-1a4d69565faf/sist-en-60079-11-2012)

Atmosphères explosives - Partie 11: Protection de l'équipement par sécurité intrinsèque "i" (CEI 60079-11:2011)

Ta slovenski standard je istoveten z: EN 60079-11:2012

ICS:

29.260.20

Električni aparati za
eksplozivna ozračja

Electrical apparatus for
explosive atmospheres

SIST EN 60079-11:2012

en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60079-11:2012

<https://standards.iteh.ai/catalog/standards/sist/f7b328d6-0a38-4f24-83bb-1a4d69565faf/sist-en-60079-11-2012>

English version

**Explosive atmospheres -
Part 11: Equipment protection by intrinsic safety "i"
(IEC 60079-11:2011)**

Atmosphères explosives -
Partie 11: Protection de l'équipement par
sécurité intrinsèque "i"
(CEI 60079-11:2011)

Explosionsgefährdete Bereiche -
Teil 11: Geräteschutz durch
Eigensicherheit "i"
(IEC 60079-11:2011)

iTeh STANDARD PREVIEW

This European Standard was approved by CENELEC on 2011-08-04. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre 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, Turkey and the United Kingdom.

CENELEC

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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 31G/207/FDIS, future edition 6 of IEC 60079-11, prepared by SC 31G, "Intrinsically-safe apparatus", of IEC/TC 31, "Equipment for explosive atmospheres" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60079-11:2012.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2012-07-06
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2014-08-04

This document supersedes EN 60079-11:2007, EN 61241-11:2006 and partially supersedes EN 60079-27:2008 (see Annex ZY for significant changes).

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

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

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

[SIST EN 60079-11:2012](https://standards.iteh.ai/catalog/standards/sist/f7b328d6-0a38-4f24-83bb-1a4c57568f0e/iec-60079-11-2012)

<https://standards.iteh.ai/catalog/standards/sist/f7b328d6-0a38-4f24-83bb-1a4c57568f0e/iec-60079-11-2012>

[1a4c57568f0e/iec-60079-11-2012](https://standards.iteh.ai/catalog/standards/sist/f7b328d6-0a38-4f24-83bb-1a4c57568f0e/iec-60079-11-2012)

Endorsement notice

The text of the International Standard IEC 60079-11:2011 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60079-15	NOTE	Harmonized as EN 60079-15.
IEC 61086-1:2004	NOTE	Harmonized as EN 61086-1:2004 (not modified).
IEC 62133	NOTE	Harmonized as EN 62133.

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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60079-0	-	Explosive atmospheres - Part 0: Equipment - General requirements	EN 60079-0	-
IEC 60079-7	-	Explosive atmospheres - Part 7: Equipment protection by increased safety "e"	EN 60079-7	-
IEC 60079-25	-	Explosive atmospheres - Part 25: Intrinsically safe electrical systems	EN 60079-25	-
IEC 60085	-	Electrical insulation - Thermal evaluation and designation	EN 60085	-
IEC 60112	-	Method for the determination of the proof and the comparative tracking indices of solid insulating materials	EN 60112	-
IEC 60127	Series	Miniature fuses	EN 60127	Series
IEC 60317-3	-	Specifications for particular types of winding wires - Part 3: Polyester enamelled round copper wire, class 155	-	-
IEC 60317-7	-	Specifications for particular types of winding wires - Part 7: Polyimide enamelled round copper wire, class 220	HD 555.7 S2	-
IEC 60317-8	-	Specifications for particular types of winding wires - Part 8: Polyesterimide enamelled round copper wire, class 180	EN 60317-8	-
IEC 60317-13	-	Specifications for particular types of winding wires - Part 13: Polyester or polyesterimide overcoated with polyamide-imide enamelled round copper wire, class 200	EN 60317-13	-
IEC 60529	-	Degrees of protection provided by enclosures - (IP Code)	-	-
IEC 60664-1	2007	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests	EN 60664-1	2007
IEC 60664-3	2003	Insulation coordination for equipment within low-voltage systems - Part 3: Use of coating, potting or moulding for protection against pollution	EN 60664-3	2003

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 61158-2	-	Industrial communication networks - Fieldbus specifications - Part 2: Physical layer specification and service definition	EN 61158-2	-
IEC 62013-1	-	Caplights for use in mines susceptible to firedamp - Part 1: General requirements - Construction and testing in relation to the risk of explosion	EN 62013-1	-
ANSI/UL 248-1	-	Standard for low-voltage fuses - Part 1: General requirements	-	-

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 60079-11:2012](https://standards.iteh.ai/catalog/standards/sist/f7b328d6-0a38-4f24-83bb-1a4d69565faf/sist-en-60079-11-2012)

<https://standards.iteh.ai/catalog/standards/sist/f7b328d6-0a38-4f24-83bb-1a4d69565faf/sist-en-60079-11-2012>

Annex ZY
(informative)

Significant changes between this European Standard and EN 60079-11:2007

This European Standard supersedes EN 60079-11:2007.

The significant changes with respect to EN 60079-11:2007 are as listed below.

Significant Changes	Clause	Type		
		Minor and editorial changes	Extension	Major technical changes
Inclusion of non-edition specific references to EN 60079-11	Table 1	X		
The merging of the requirements for combustible dust atmospheres from EN 61241-11	e.g. 5.6.5. 6.1.3		X	
The merging of the apparatus requirements for FISCO from EN 60079-27	Annex G		X	
Clarification of the requirements for accessories connected to intrinsically safe apparatus such as chargers and data loggers	6.2.5 7.4.9		X	
Addition of new test requirements for opto-isolators	10.11		X	
Introduction of Annex H about ignition testing of semiconductor limiting power supply circuits	Annex H		X	

<https://standards.iteh.ai/catalog/standards/sist/f7b328d6-0a38-4f24-83bb-1a4d695656ff/sist-en-60079-11-2012>

NOTE: The technical changes referred include the significant technical changes from the EN revised but 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 change

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 ZY.

Note: 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.

Instructions:






The manufacturer or his authorised representative in the Community is to draw up the instructions for use in the required Community languages.

Marking:

The marking in this standard is to be supplemented/modified by the marking according to Directive 94/9/EC. Examples are given below.

European marking examples

(standards.iteh.ai)

Directive part	Standard part	Equipment example
 II 1G	Ex ia IIC T4 -25 °C ≤ Ta ≤ +50 °C	Self-contained intrinsically safe apparatus
 II 2G	Ex ib IIB T4 Ui = 24 V li = 80 mA Pi = 0.48 W	Intrinsically safe apparatus designed to be connected to other apparatus
 I (M2)	[Ex ib] I Uo = 20 V lo = 300 mA Po = 1.5 W	Associated apparatus
 II 2 (1) G	Ex ib [ia IIC Ga] IIB T6 Gb Ui = 30 V, Uo = 12 V, lo = 100 mA	Intrinsically safe apparatus Level of Protection 'ib' with 'ia' outputs
 II 2 (1) G	Ex db [ia Ga] IIB T4 Gb Uo = 12 V, lo = 200 mA Po = 0.6 W	Associated apparatus protected by a flameproof enclosure

¹ see also ATEX Guidelines 10.3 and Annex ZZ.

Annex ZZ
(informative)

Coverage of Essential Requirements of EU Directives

This European Standard has been prepared under a mandate given to CENELEC by the European Union 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 EU Directive 94/9/EC:

- ER 1.0.1 indent 2, ER 1.0.2 (partly), ER 1.0.3 (partly), ER 1.0.4 (partly), ER 1.0.5 (partly), ER 1.0.6 (partly)
- ER 1.1 (partly)
- ER 1.2.1 (partly), ER 1.2.2 (partly), ER 1.2.4 (partly), ER 1.2.6 (partly), ER 1.2.8 (partly)
- ER 1.3.1 (partly)
- ER 1.4 (partly)
- ER 2.0.1.1 to ER 2.0.1.4
- ER 2.0.2.1 (partly), ER 2.0.2.2, ER 2.0.2.3
- ER 2.1.1.1 to ER 2.1.1.3
- ER 2.1.2.1 to ER 2.1.2.4
- ER 2.2.1.1 to ER 2.2.1.3
- ER 2.2.2.1 to ER 2.2.2.4
- ER 2.3.1.1, ER 2.3.1.2
- ER 2.3.2.1 to ER 2.3.2.3

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

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

[SIST EN 60079-11:2012](https://standards.iteh.ai/catalog/standards/sist/f7b328d6-0a38-4f24-83bb-1a4d69565faf/sist-en-60079-11-2012)

<https://standards.iteh.ai/catalog/standards/sist/f7b328d6-0a38-4f24-83bb-1a4d69565faf/sist-en-60079-11-2012>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 60079-11:2012

<https://standards.iteh.ai/catalog/standards/sist/f7b328d6-0a38-4f24-83bb-1a4d69565faf/sist-en-60079-11-2012>



IEC 60079-11

Edition 6.0 2011-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Explosive atmospheres –
Part 11: Equipment protection by intrinsic safety "i"
(standards.itec.ai)

Atmosphères explosives –
Partie 11: Protection de l'équipement par sécurité intrinsèque «i»
(standards.itec.ai)

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

PRICE CODE **XG**
CODE PRIX

ICS 29.260.20

ISBN 978-2-88912-520-3

CONTENTS

FOREWORD.....	7
1 Scope.....	9
2 Normative references.....	14
3 Terms and definitions	15
4 Grouping and classification of intrinsically safe apparatus and associated apparatus	20
5 Levels of protection and ignition compliance requirements of electrical apparatus.....	21
5.1 General	21
5.2 Level of protection "ia"	21
5.3 Level of protection "ib"	22
5.4 Level of protection "ic"	22
5.5 Spark ignition compliance	22
5.6 Thermal ignition compliance	22
5.6.1 General	22
5.6.2 Temperature for small components for Group I and Group II	23
5.6.3 Wiring within intrinsically safe apparatus for Group I and Group II	23
5.6.4 Tracks on printed circuit boards for Group I and Group II	24
5.6.5 Intrinsically safe apparatus and component temperature for Group III	25
5.7 Simple apparatus	26
6 Apparatus construction	27
6.1 Enclosures	27
6.1.1 General	27
6.1.2 Enclosures for Group I or Group II apparatus	27
6.1.3 Enclosures for Group III apparatus	28
6.2 Facilities for connection of external circuits	28
6.2.1 Terminals	28
6.2.2 Plugs and sockets.....	31
6.2.3 Determination of maximum external inductance to resistance ratio (L_0/R_0) for resistance limited power source	31
6.2.4 Permanently connected cable	32
6.2.5 Requirements for connections and accessories for IS apparatus when located in the non-hazardous area	32
6.3 Separation distances	33
6.3.1 General	33
6.3.2 Separation of conductive parts	33
6.3.3 Voltage between conductive parts	37
6.3.4 Clearance	37
6.3.5 Separation distances through casting compound	37
6.3.6 Separation distances through solid insulation	38
6.3.7 Composite separations	38
6.3.8 Creepage distance.....	38
6.3.9 Distance under coating	40
6.3.10 Requirements for assembled printed circuit boards	40
6.3.11 Separation by earthed screens	41
6.3.12 Internal wiring	42
6.3.13 Dielectric strength requirement	42
6.3.14 Relays	42
6.4 Protection against polarity reversal	43

6.5	Earth conductors, connections and terminals	43
6.6	Encapsulation	44
6.6.1	General	44
6.6.2	Encapsulation used for the exclusion of explosive atmospheres	45
7	Components on which intrinsic safety depends	45
7.1	Rating of components	45
7.2	Connectors for internal connections, plug-in cards and components	46
7.3	Fuses	46
7.4	Primary and secondary cells and batteries	47
7.4.1	General	47
7.4.2	Battery construction	48
7.4.3	Electrolyte leakage and ventilation	48
7.4.4	Cell voltages	49
7.4.5	Internal resistance of cell or battery	49
7.4.6	Batteries in equipment protected by other types of protection	49
7.4.7	Batteries used and replaced in explosive atmospheres	49
7.4.8	Batteries used but not replaced in explosive atmospheres	50
7.4.9	External contacts for charging batteries	50
7.5	Semiconductors	50
7.5.1	Transient effects	50
7.5.2	Shunt voltage limiters	50
7.5.3	Series current limiters	51
7.6	Failure of components, connections and separations	51
7.7	Piezo-electric devices	52
7.8	Electrochemical cells for the detection of gases	52
8	Infallible components, infallible assemblies of components and infallible connections on which intrinsic safety depends	53
8.1	Level of Protection "ic"	53
8.2	Mains transformers	53
8.2.1	General	53
8.2.2	Protective measures	53
8.2.3	Transformer construction	53
8.2.4	Transformer type tests	54
8.2.5	Routine test of mains transformers	54
8.3	Transformers other than mains transformers	54
8.4	Infallible windings	55
8.4.1	Damping windings	55
8.4.2	Inductors made by insulated conductors	55
8.5	Current-limiting resistors	56
8.6	Capacitors	56
8.6.1	Blocking capacitors	56
8.6.2	Filter capacitors	57
8.7	Shunt safety assemblies	57
8.7.1	General	57
8.7.2	Safety shunts	57
8.7.3	Shunt voltage limiters	58
8.8	Wiring, printed circuit board tracks, and connections	58
8.9	Galvanically separating components	59
8.9.1	General	59

8.9.2	Isolating components between intrinsically safe and non-intrinsically safe circuits	59
8.9.3	Isolating components between separate intrinsically safe circuits	59
9	Supplementary requirements for specific apparatus.....	60
9.1	Diode safety barriers.....	60
9.1.1	General	60
9.1.2	Construction	60
9.2	FISCO apparatus.....	60
9.3	Handlights and caplights	61
10	Type verifications and type tests	61
10.1	Spark ignition test.....	61
10.1.1	General.....	61
10.1.2	Spark test apparatus	61
10.1.3	Test gas mixtures and spark test apparatus calibration current	62
10.1.4	Tests with the spark test apparatus	63
10.1.5	Testing considerations	64
10.2	Temperature tests.....	65
10.3	Dielectric strength tests.....	66
10.4	Determination of parameters of loosely specified components	66
10.5	Tests for cells and batteries	66
10.5.1	General.....	66
10.5.2	Electrolyte leakage test for cells and batteries	66
10.5.3	Spark ignition and surface temperature of cells and batteries.....	67
10.5.4	Battery container pressure tests	68
10.6	Mechanical tests.....	68
10.6.1	Casting compound.....	68
10.6.2	Determination of the acceptability of fuses requiring encapsulation	68
10.6.3	Partitions.....	68
10.7	Tests for intrinsically safe apparatus containing piezoelectric devices.....	68
10.8	Type tests for diode safety barriers and safety shunts	69
10.9	Cable pull test.....	70
10.10	Transformer tests	70
10.11	Optical isolators tests.....	70
10.11.1	General.....	70
10.11.2	Thermal conditioning, dielectric and carbonisation test.....	70
10.11.3	Dielectric and short-circuit test	72
10.12	Current carrying capacity of infallible printed circuit board connections	72
11	Routine verifications and tests	73
11.1	Routine tests for diode safety barriers	73
11.1.1	Completed barriers	73
11.1.2	Diodes for 2-diode “ia” barriers.....	73
11.2	Routine tests for infallible transformers	73
12	Marking	74
12.1	General	74
12.2	Marking of connection facilities	74
12.3	Warning markings	75
12.4	Examples of marking	75
13	Documentation	77
Annex A (normative)	Assessment of intrinsically safe circuits.....	78

Annex B (normative) Spark test apparatus for intrinsically safe circuits	100
Annex C (informative) Measurement of creepage distances, clearances and separation distances through casting compound and through solid insulation	108
Annex D (normative) Encapsulation	111
Annex E (informative) Transient energy test	118
Annex F (normative) Alternative separation distances for assembled printed circuit boards and separation of components	121
Annex G (normative) Fieldbus intrinsically safe concept (FISCO) – Apparatus requirements	125
Annex H (informative) Ignition testing of semiconductor limiting power supply circuits	130
Bibliography	141
Figure 1 – Separation of intrinsically safe and non-intrinsically safe terminals	31
Figure 2 – Example of separation of conducting parts	36
Figure 3 – Determination of creepage distances	39
Figure 4 – Creepage distances and clearances on printed circuit boards	41
Figure 5 – Examples of independent and non-independent connecting elements	44
Figure A.1 – Resistive circuits	81
Figure A.2 – Group I capacitive circuits	82
Figure A.3 – Group II capacitive circuits	83
Figure A.4 – Inductive circuits of Group I	84
Figure A.5 – Group I inductive circuits	85
Figure A.6 – Group IIC inductive circuits	86
Figure A.7 – Simple inductive circuit	87
Figure A.8 – Simple capacitive circuit	87
Figure A.9 – Equivalent capacitance	99
Figure B.1 – Spark test apparatus for intrinsically safe circuits	104
Figure B.2 – Cadmium contact disc	105
Figure B.3 – Wire holder	105
Figure B.4 – Example of a practical design of spark test apparatus	106
Figure B.5 – Arrangement for fusing tungsten wires	107
Figure C.1 – Measurement of clearance	108
Figure C.2 – Measurement of composite distances	109
Figure C.3 – Measurement of creepage	110
Figure C.4 – Measurements of composite creepage	110
Figure D.1 – Examples of encapsulated assemblies conforming to 6.3.5 and 6.6	113
Figure D.2 – Applications of encapsulation using casting compound without an enclosure	115
Figure D.3 – Examples of assemblies using moulding conforming to 6.6	116
Figure E.1 – Example of test circuit	119
Figure E.2 – Example of output waveform	120
Figure G.1 – Typical system	129
Figure H.1 – Safety factor vs ignition probability	140