BS EN 60079-18:2009



BSI Standards Publication

Explosive atmospheres

Part 18: Equipment protection by encapsulation "m"

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

raising standards worldwide™

National foreword

This British Standard is the UK implementation of EN 60079-18:2009. It is identical to IEC 60079-18:2009. It supersedes BS EN 60079-18:2004 and BS EN 61241-18:2004 which are withdrawn.

The UK Committee GEL/31 does not endorse Annex ZY in its current form and a revision is currently under way between the Joint Working Group of CEN TC305 and CLC TC31. A replacement Annex ZY will become available at some time in the future.

The UK participation in its preparation was entrusted to Technical Committee GEL/31/17, Pressurization and other techniques.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© BSI 2010

ISBN 978 0 580 56290 7

ICS 29.260.20

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 September 2010.

Amendments/corrigenda issued since publication

Date	Text affected

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60079-18

December 2009

ICS 29.260.20

Supersedes EN 60079-18:2004 + corr. April 2006 and EN 61241-18:2004

English version

Explosive atmospheres - Part 18: Equipment protection by encapsulation "m"

(IEC 60079-18:2009 + corrigendum 2009)

Atmosphères explosives - Partie 18: Protection du matériel par encapsulage "m" (CEI 60079-18:2009 + corrigendum 2009)

Explosionsfähige Atmosphäre - Teil 18: Geräteschutz durch Vergusskapselung "m" (IEC 60079-18:2009 + Corrigendum 2009)

This European Standard was approved by CENELEC on 2009-10-01. 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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, 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 and the United Kingdom.

CENELEC

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

Central Secretariat: Avenue Marnix 17, B - 1000 Brussels

© 2009 CENELEC - All rights of exploitation in any form and by any means reserved worldwide for CENELEC members.

Ref. No. EN 60079-18:2009 E

Foreword

The text of document 31/784/FDIS, future edition 3 of IEC 60079-18, prepared by IEC TC 31, Equipment for explosive atmospheres, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60079-18 on 2009-10-01.

This European Standard supersedes EN 60079-18:2004 + corrigendum April 2006 and EN 61241-18:2004.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2010-07-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2012-10-01

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association and covers essential requirements of EC Directive ATEX (94/9/EC). See Annex ZZ.

CENELEC/TC 31 as the responsible committee has concluded that this new edition of EN 60079-18 does not contain substantial changes regarding the ESRs.

The State of the Art is included in Annex ZY "*Significant changes between this European Standard and EN 60079-18:2004".*

Annexes ZA, ZY and ZZ have been added by CENELEC.

———————

Endorsement notice

The text of the International Standard IEC 60079-18:2009 + corrigendum June 2009 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 60079-1	NOTE	Harmonized as EN 60079-1:2007 (not modified).
IEC 60079-2	NOTE	Harmonized as EN 60079-2:2007 (not modified).
IEC 60079-5	NOTE	Harmonized as EN 60079-5:2007 (not modified).
IEC 60079-6	NOTE	Harmonized as EN 60079-6:2007 (not modified).
IEC 60079-10	NOTE	Harmonized as EN 60079-10:2003 (not modified).
IEC 60079-14	NOTE	Harmonized as EN 60079-14:2008 (not modified).
IEC 60079-26	NOTE	Harmonized as EN 60079-26:2007 (not modified).
IEC 60079-28	NOTE	Harmonized as EN 60079-28:2007 (not modified).
IEC 60086-1	NOTE	Harmonized as EN 60086-1:2007 (not modified).
IEC 60622	NOTE	Harmonized as EN 60622:2003 (not modified).
IEC 60664-1	NOTE	Harmonized as EN 60664-1:2007 (not modified).
IEC 61241-10	NOTE	Harmonized as EN 61241-10:2004 (not modified).
IEC 61951-1	NOTE	Harmonized as EN 61951-1:2003 (not modified).

IEC 61951-2 NOTE Harmonized as EN 61951-2:2003 (not modified).

IEC 61960-1 NOTE Harmonized as EN 61960-1:2001 (not modified).

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.

Publication	Year	Title	EN/HD	Year
IEC 60079-0	-[1)]	Explosive atmospheres - Part 0: Equipment - General requirements	EN 60079-0	2009[2)]
IEC 60079-7	-[1)]	Explosive atmospheres - Part 7: Equipment protection by increased safety "e"	EN 60079-7	2007[2)]
IEC 60079-11	-[1)]	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"	EN 60079-11	2007[2)]
IEC 60079-15	-[1)]	Explosive atmospheres - Part 15: Equipment protection by type of protection "n"	EN 60079-15	200X[3)]
IEC 60079-26	-[1)]	Explosive atmospheres - Part 26: Equipment with equipment protection level (EPL) Ga	EN 60079-26	2007[2)]
IEC 60079-31	-[1)]	Explosive atmospheres - Part 31: Equipment dust ignition protection by enclosure "t"	EN 60079-31	2009[2)]
IEC 60127	Series	Miniature fuses	EN 60127	Series
IEC 60243-1	-[1)]	Electrical strength of insulating materials - Test methods - Part 1: Tests at power frequencies	EN 60243-1	1998[2)]
IEC 60691	-[1)]	Thermal-links - Requirements and application guide	EN 60691	2003[2)]
IEC 60730-2-9 (mod)	-[1)]	Automatic electrical controls for household and similar use - Part 2-9: Particular requirements for temperature sensing controls	-	-
IEC 60738-1	-[1)]	Thermistors - Directly heated positive temperature coefficient - Part 1: Generic specification	EN 60738-1	2006[2)]
IEC 61241-11	-[1)]	Electrical apparatus for use in the presence of combustible dust - Part 11: Protection by intrinsic safety 'iD'	EN 61241-11	2006[2)]

[1)] Undated reference.

[2)] Valid edition at date of issue.

[3)] To be ratified.

Publication	Year	Title	EN/HD	Year
IEC 61558-2-6	-[1)]	Safety of power transformers, power supply units and similar - Part 2-6: Particular requirements for safety isolating transformers for general use	EN 61558-2-6	2009[2)]
IEC 62326-4-1	-[1)]	Printed boards - Part 4: Rigid multilayer printed boards with interlayer connections - Sectional specification - Section 1: Capability Detail Specification - Performance levels A, B and C	EN 62326-4-1	1997[2)]
ISO 62	-[1)]	Plastics - Determination of water absorption	-	-
ANSI/UL 248-1	-[1)]	Standard for low-voltage fuses - Part 1: General requirements	-	-
ANSI/UL 746B	-[1)]	Standard for polymeric materials - Long-term property evaluations	-	-

Annex ZY
(informative)

Significant changes between this European Standard and EN 60079-18:2004

The significant changes with respect to EN 60079-18:2004 are as listed below.

	Type		
	Minor and editorial changes	Extension	Substantial change regarding ESR´s [a]
Incorporation of level of protection "mc"		X	
Equipment protection levels (EPL Ma, Ga, Da, Mb, Gb, Db, Gc, Dc)		X	
Incorporation of the dust requirements		X	
Incorporation of switching contacts for level of protection "ma"		X	
[a] ESR = Essential Health and Safety Requirements (Annex II of Directive 94/9/EC)			

General conclusion on the change of the State of the Art by this standard

CENELEC/TC 31 as the responsible committee has concluded that this new edition of EN 60079-18 does not contain substantial changes regarding the ESRs.

Annex ZZ
(informative)

Coverage of Essential Requirements of EC Directives

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

- ER 1.0.1, ER 1.0.2 (partly), ER 1.0.5 (partly)
- ER 1.1 (partly)
- ER 1.2.4, ER 1.2.8
- ER 1.3.1
- ER 1.6.4 (partly)
- ER 2.0.1 (partly)
- ER 2.0.2.1 (partly), ER 2.0.2.3 (partly)
- ER 2.1.1.1 (partly), ER 2.1.1.2 (partly)
- ER 2.1.2.1 (partly), ER 2.1.2.3 (partly)
- ER 2.2.1.1 (partly), ER 2.2.1.2 (partly)
- ER 2.2.2.1 (partly), ER 2.2.2.2 (partly)
- ER 2.3.1.1, ER 2.3.1.2
- ER 2.3.2.1, ER 2.3.2.2

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

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

———————

This page deliberately left blank

CONTENTS

1 Scope 6
2 Normative references 6
3 Terms and definitions 7
4 General 9
4.1 Level of protection (Equipment protection level (EPL)) 9
4.2 Additional requirements for level of protection “ma” 9
4.3 Rated voltage and prospective short circuit current 9
5 Requirements for compounds 9
5.1 General 9
5.2 Specification 9
5.3 Properties of the compound 10
5.3.1 Water absorption 10
5.3.2 Dielectric strength 10
6 Temperatures 10
6.1 General 10
6.2 Determination of the limiting temperature 10
6.2.1 Maximum surface temperature 10
6.2.2 Temperature of the compound 10
6.3 Temperature limitation 10
7 Constructional requirements 11
7.1 General 11
7.2 Determination of faults 11
7.2.1 Fault examination 11
7.2.2 Components considered as not subject to fail 12
7.2.3 Isolating components 12
7.2.4 Infallible separation distances 12
7.3 Free space in the encapsulation 13
7.3.1 Group III “m” equipment 13
7.3.2 Group I and Group II “m” equipment 14
7.4 Thickness of the compound 15
7.4.1 “m” equipment 15
7.4.2 Windings for electrical machines 17
7.4.3 Rigid, multi-layer printed wiring boards with through connections 17
7.5 Switching contacts 18
7.5.1 Level of protection “ma” 18
7.5.2 Level of protection “mb” 18
7.5.3 Level of protection “mc” 18
7.6 External connections 19
7.6.1 General 19
7.6.2 Additional requirements for “ma” equipment 19
7.7 Protection of bare live parts 19
7.8 Cells and batteries 19
7.8.1 General 19
7.8.2 Prevention of gassing 19
7.8.3 Protection against inadmissible temperatures and damage to the cells 20

7.8.4 Reverse current 20
7.8.5 Current limitation 20
7.8.6 Protection against the polarity inversion and deep discharge of the cells 20
7.8.7 Charging of cells or batteries 21
7.8.8 Requirements for control safety devices for cells or batteries 21
7.9 Protective devices 21
7.9.1 General 21
7.9.2 Electrical protective devices 22
7.9.3 Thermal protective devices 23
7.9.4 Built-in protective devices 23
8 Type tests 23
8.1 Tests on the compound 23
8.1.1 Water absorption test 23
8.1.2 Dielectric strength test 24
8.2 Tests on the apparatus 24
8.2.1 Test sequence 24
8.2.2 Maximum temperature 24
8.2.3 Thermal endurance test 24
8.2.4 Dielectric strength test 25
8.2.5 Cable pull test 25
8.2.6 Pressure test for Group I and Group II electrical equipment 26
8.2.7 Test for resettable thermal protective device 26
8.2.8 Sealing test for build-in protective devices 27
9 Routine verifications and tests 27
9.1 Visual inspections 27
9.2 Dielectric strength test 27
10 Marking 27
Annex A (informative) Basic requirements for compounds for “m” equipment 29
Annex B (normative) Allocation of test samples 30
Bibliography 31

Figure 1 – Dimensional key for thickness through the compound 16
Figure 2 – Minimum distances for multi-layer printed wiring boards 18
Figure 3 – Fitting of blocking diodes 20
Figure A.1 – Basic requirements for compounds for “m” equipment 29

Table 1 – Distances through the compound 13
Table 2 – Minimum thickness of compound adjacent to free space for Group III “m” equipment 13
Table 3 – Minimum thickness of compound adjacent to free space for Group I and Group II “m” equipment 14
Table 4 – Thickness of the compound 16
Table 5 – Minimum distances for multi-layer printed wiring boards 17
Table 6 – Test pressure 26
Table B.1 – Allocation of test samples 30

EXPLOSIVE ATMOSPHERES –

Part 18: Equipment protection by encapsulation “m”

1 Scope

This part of IEC 60079 gives the specific requirements for the construction, testing and marking of electrical equipment, parts of electrical equipment and Ex components with the type of protection encapsulation “m” intended for use in explosive gas atmospheres or explosive dust atmospheres.

This part applies only for encapsulated electrical equipment, encapsulated parts of electrical equipment and encapsulated Ex components (hereinafter always referred to as “m” equipment) where the rated voltage does not exceed 11 kV.

The application of electrical equipment in atmospheres, which may contain explosive gas as well as combustible dust simultaneously may require additional protective measures.

This standard does not apply to dusts of explosives, which do not require atmospheric oxygen for combustion, or to pyrophoric substances

This standard does not take account of any risk due to an emission of flammable or toxic gas from the dust.

This standard supplements and modifies the general requirements of IEC 60079-0. Where a requirement of this standard conflicts with a requirement of IEC 60079-0, the requirement of this standard shall take precedence.

2 Normative references

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.

IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

IEC 60079-7, *Explosive atmospheres – Part 7: Equipment protection by increased safety “e”*

IEC 60079-11, *Explosive atmospheres – Part 11: Equipment protection by intrinsic safety “i”*

IEC 60079-15, *Explosive atmospheres – Part 15: Equipment protection by type of protection "n"*

IEC 60079-26, *Explosive atmospheres – Part 26: Equipment with equipment protection level (EPL) Ga*

IEC 60079-31, *Explosive atmospheres – Part 31: Equipment dust ignition protection by enclosures “t”*

IEC 60127 (all parts), *Miniature fuses*