



BSI Standards Publication

Degrees of protection provided by enclosures (IP Code)

National foreword

This British Standard is the UK implementation of EN 60529:1992+A2:2013. It is identical to IEC 60529:1989, incorporating amendments 1:1989 and 2:2013 and corrigenda January 2003, September 2007, October 2009, October 2013 and January 2019. It supersedes BS EN 60529:1992, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment A1 is indicated by A1 A1.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by IEC corrigendum January 2019 is indicated in the text by AC1 AC1.

The UK participation in its preparation was entrusted to Technical Committee GEL/70, Protective enclosures of electrical apparatus.

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

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 60529/A2

October 2013

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English version

Degrees of protection provided by enclosures (IP Code)
(IEC 60529:1989)

Degrés de protection procurés par
les enveloppes (Code IP)
(CEI 60529:1989)

Schutzarten durch Gehäuse
(IP-Code)
(IEC 60529:1989)

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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.

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CENELEC

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

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Ref. No. EN 60529:1991/A2:2013 E

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European foreword

The CENELEC questionnaire procedure, performed for finding out whether or not the International Standard IEC 529:1989 could be accepted without textual changes, has shown that no CENELEC common modifications were necessary for acceptance as European Standard.

The reference document was submitted to the CENELEC members for formal vote and was approved by CENELEC as EN 60529 on 25 June 1991.

This European Standard supersedes HD 365 S3:1985.

The following dates were fixed:

- latest date of publication of an identical national standard (dop) 1992-07-01
- latest date of withdrawal of conflicting national standards (dow) 1992-07-01

Annexes designated "normative" are part of the body of the standard.
In this standard, annex ZA is normative.

Endorsement notice

The text of the International Standard IEC 60529:1989 was approved by CENELEC as a European Standard without any modification.

Foreword to amendment A1

The text of document 70/91/FDIS, future amendment 1 to IEC 60529, prepared by IEC TC 70, Degrees of protection provided by enclosures, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 60529:1991 on 2000-01-01.

The following dates were 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) 2000-10-01
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2003-01-01

Annexes designated "normative" are part of the body of the standard.

In this standard, annex ZA is normative.

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60529:1989/A2:2013 was approved by CENELEC as a European Standard without any modification.

Foreword to amendment A2

The text of document 70/122/CDV, future IEC 60529:1989/A2, prepared by IEC/TC 70 "Degrees of protection provided by enclosures" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60529:1991/A2:2013.

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) 2014-07-03
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2016-10-03

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 standard covers the Principle Elements of the Safety Objectives for Electrical Equipment Designed for Use within Certain Voltage Limits (LVD - 2006/95/EC).

Endorsement notice

The text of the International Standard IEC 60529:1989/A2:2013 was approved by CENELEC as a European Standard without any modification.

Annex ZA
(normative)**Normative references to international publications
with their corresponding European publications**

Addition:

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-195	1998	International Electrotechnical Vocabulary (IEV) Chapter 195: Earthing and protection against electric shock	—	—
IEC 60050-826	1982	Chapter 826: Electrical installations of buildings	HD 384.2 S1	1986
IEC 60068-1	1988	Environmental testing Part 1: General and guidance	EN 60068-1 ¹⁾	1994
IEC 60068-2-68	1994	Part 2: Tests - Test L: Dust and sand	EN 60068-2-68	1996
IEC 60071-2	1996	Insulation co-ordination Part 2: Application guide	EN 60071-2	1997

1) EN 60068-1 includes the corrigendum October 1988 and A1:1992 to IEC 60068-1

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**DEGREES OF PROTECTION PROVIDED
BY ENCLOSURES (IP Code)**

FOREWORD

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International Standard IEC 60529 has been prepared by technical committee 70: Degrees of protection by enclosures.

Annexes A and B are for information only.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of the base publication and its amendments 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.

The contents of the corrigenda of October 2013, May 2015 and January 2019 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 publication using a colour printer.

INTRODUCTION

This standard describes a system for classifying the degrees of protection provided by the enclosures of electrical equipment. Whilst this system is suitable for use with most types of electrical equipment, it should not be assumed that all the listed degrees of protection are applicable to a particular type of equipment. The manufacturer of the equipment should be consulted to determine the degrees of protection available and the parts of equipment to which the stated degree of protection applies.

The adoption of this classification system, wherever possible, Will promote uniformity in methods of describing the protection provided by the enclosure and in the tests to prove the various degrees of protection. It should also reduce the number of types of test devices necessary to test a wide range. of products.

This second edition of IEC 60529 takes account of experiences with the first edition, and clarifies the requirements. It provides for an optional extension of the IP Code by an additional letter A, B, C, or D if the actual protection of persons against access to hazardous parts is higher than that indicated by the first characteristic numeral.

In general, enclosures with an IP coding to the first edition would be eligible for the same code according to this edition.

INTRODUCTION TO AMENDMENT 2

This Amendment 2 introduces a new degree of protection IP X9 whereas no modifications of the existing degrees of protection are made.

Thus neither additional tests nor modifications of the existing certificates should be requested in case of enclosures providing a different IP code.

DEGREES OF PROTECTION PROVIDED BY ENCLOSURES (IP Code)

1 Scope and object

This standard applies to the classification of degrees of protection provided by enclosures for electrical equipment with a rated voltage not exceeding 72,5 kV.

The object of this standard is to give:

- a) *Definitions* for degrees of protection provided by enclosures of electrical equipment as regards:
 - 1) protection of persons against access to hazardous parts inside the enclosure;
 - 2) protection of the equipment inside the enclosure against ingress of solid foreign objects;
 - 3) protection of the equipment inside the enclosure against harmful effects due to the ingress of water.
- b) *Designations* for these degrees of protection.
- c) *Requirements* for each designation.
- d) *Tests* to be performed to verify that the enclosure meets the requirements of this standard.

It will remain the responsibility of individual technical committees to decide on the extent and manner in which, the classification is used in their standards and to define “enclosure” as it applies to their equipment. However, it is recommended that for a given classification the tests do not differ from those specified in this standard. If necessary, complementary requirements may be included in the relevant product standard. A guide for the details to be specified in relevant product standards is given in annex B.

For a particular type of equipment, a technical committee may specify different requirements provided that at least the same level of safety is ensured.

This standard deals only with enclosures that are in all other respects suitable for their intended use as specified in the relevant product standard and which from the point of view of materials and workmanship ensure that the claimed degrees of protection are maintained under the normal conditions of use.

This standard is also applicable to empty enclosures provided that the general test requirements are met and that the selected degree of protection is suitable for the type of equipment  to be protected .

Measures to protect both the enclosure and the equipment inside the enclosure against external influences or conditions such as

- mechanical impacts
- corrosion
- corrosive solvents (for example, cutting liquids)
- fungus
- vermin
- solar radiation
- icing
- moisture (for example, produced by condensation)
- explosive atmospheres

and the protection against contact with hazardous moving parts external to the enclosure (such as fans), are matters for the relevant product standard to be protected.

Barriers external to the enclosure and not attached to it and obstacles which have been provided solely for the safety of personnel are not considered as a part of the enclosure and are not dealt with in this standard.

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 60050-195:1998, *International Electrotechnical Vocabulary (IEV) – Part 195: Earthing and protection against electric shock*

IEC 60050(826):1982, *International Electrotechnical Vocabulary (IEV) – Chapter 826: Electrical installations of buildings*

IEC 60068-1:1988, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-68:1994, *Environmental testing – Part 2: Tests – Test L: Dust and sand*

IEC 60071-2:1996, *Insulation co-ordination – Part 2: Application guide* 

3 Definitions

For the purpose of this standard, the following definitions apply:

3.1

enclosure

a part providing protection of equipment against certain external influences and, in any direction, protection against direct contact [IEV 826-03-12]*.

NOTE This definition taken from the existing International Electrotechnical Vocabulary (IEV) needs the following explanations under the scope of this standard:

- 1) Enclosures provide protection of persons or livestock against access to hazardous parts.
- 2) Barriers, shapes of openings or any other means – whether attached to the enclosure or formed by the enclosed equipment – suitable to prevent or limit the penetration of the specified test probes are considered as a part of the enclosure, except when they can be removed without the use of a key or tool.

3.2

direct contact

contact of persons or livestock with live parts [IEV 826-03-05]

NOTE This IEC definition is given for information. In this standard “direct contact” is replaced by “access to hazardous parts”.

3.3

degree of protection

the extent of protection provided by an enclosure against access to hazardous parts, against ingress of solid foreign objects and/or against ingress of water and verified by standardized test methods

3.4

IP Code

a coding system to indicate the degrees of protection provided by an enclosure against access to hazardous parts, ingress of solid foreign objects, ingress of water and to give additional information in connection with such protection

* IEC 60050(826).

3.5

hazardous part

a part that is hazardous to approach or touch

3.5.1

hazardous live part

a live part which, under certain conditions of external influences, can give an electric shock
( see IEC 60050-195, 195-06-05) (

3.5.2

hazardous mechanical part

a moving part, other than a smooth rotating shaft, that is hazardous to touch

3.6

protection provided by an enclosure against access to hazardous parts

the protection of persons against

- contact with hazardous low-voltage live parts
- contact with hazardous mechanical parts
- approach to hazardous high-voltage live parts below adequate clearance inside an enclosure

NOTE This protection may be provided

- by means of the enclosure itself,
- by means of barriers as part of the enclosure or distances inside the enclosure.

3.7

adequate clearance for protection against access to hazardous parts

a distance to prevent contact or approach of an access probe to a hazardous part

3.8

access probe

a test probe simulating in a conventional manner a part of a person or a tool, or the like, held by a person to verify adequate clearance from hazardous parts

3.9

object probe

a test probe simulating a solid foreign object to verify the possibility of ingress into an enclosure

3.10

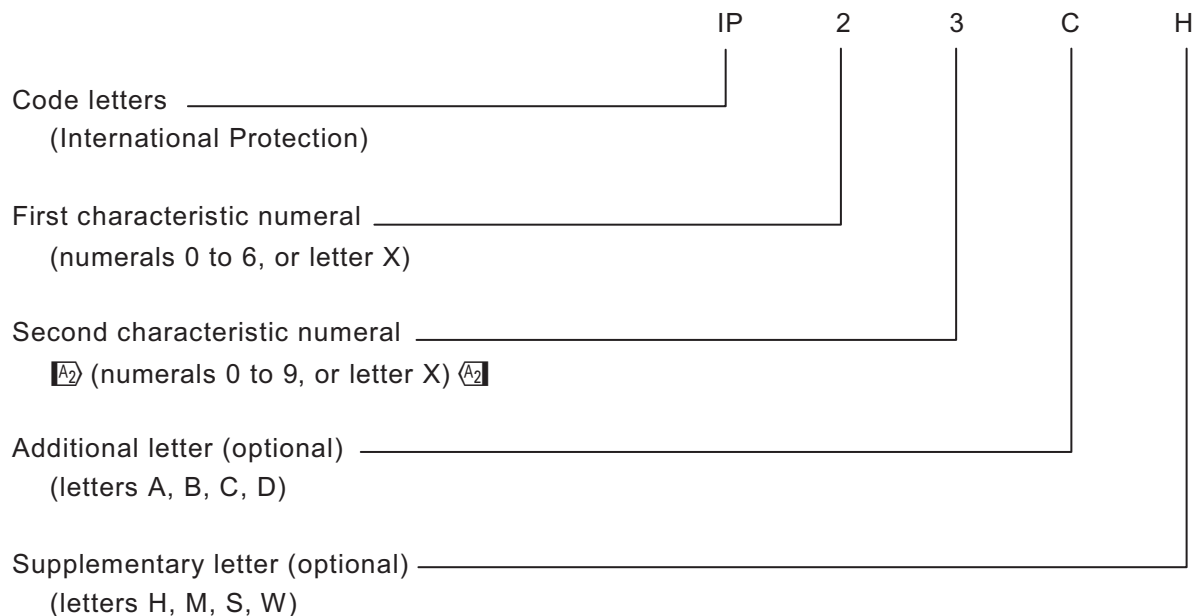
opening

a gap or aperture in an enclosure which exists or may be formed by the application of a test probe at the specified force

4 Designations

The degree of protection provided by an enclosure is indicated by the IP Code in the following way:

4.1 Arrangement of the IP Code



Where a characteristic numeral is not required to be specified, it shall be replaced by the letter “X” (“XX” if both numerals are omitted).

Additional letters and/or supplementary letters may be omitted without replacement.

Where more than one supplementary letter is used, the alphabetic sequence shall apply.

If an enclosure provides different degrees of protection for different intended mounting arrangements, the relevant degrees of protection shall be indicated by the manufacturer in the instructions related to the respective mounting arrangements.

Details for the marking of an enclosure are given in clause 10.

4.2 Elements of the IP Code and their meanings

A brief description of the IP Code elements is given in the following chart. Full details are specified in the clauses indicated in the last column.

Element	Numerals or letters	Meaning for the protection of <i>equipment</i>	Meaning for the protection of <i>persons</i>	Ref.
Code letters	IP	–	–	–
First characteristic numeral	0 1 2 3 4 5 6	Against ingress of solid foreign objects (non-protected) ≥ 50 mm diameter ≥ 12,5 mm diameter ≥ 2,5 mm diameter ≥ 1,0 mm diameter dust-protected dust-tight	Against access to hazardous parts with (non-protected) back of hand finger tool wire wire wire	Cl. 5
Second characteristic numeral	0 1 2 3 4 5 6 7 8 A ₂ 9	Against ingress of water with harmful effects (non-protected) vertically dripping dripping (15° tilted) spraying splashing jetting powerful jetting temporary immersion continuous immersion High pressure and temperature water jet A ₂	–	Cl. 6
Additional letter (optional)	A B C D	–	Against access to hazardous parts with: back of hand finger tool wire	Cl. 7
Supplementary letter (optional)	H M S W	Supplementary information specific to: High voltage apparatus Motion during water test Stationary during water test Weather conditions	–	Cl. 8

4.3 Examples for the use of letters in the IP Code

The following examples are to explain the use and arrangement of letters in the IP Code.

For more comprehensive examples see clause 9.

- IP44 – no letters, no options;
- IPX5 – omitting first characteristic numeral;
- IP2X – omitting second characteristic numeral;
- IP20C – using additional letter;
- IPXXC – omitting both characteristic numerals, using additional letter;
- IPX1C – omitting first characteristic numeral, using additional letter;
- IP3XD – omitting second characteristic numeral, using additional letter;
- IP23S – using supplementary letter;
- IP21CM – using additional letter and supplementary letter;