SLOVENSKI STANDARD
oSIST prEN IEC 60228:2022

01-oktober-2022

Vodniki izoliranih kablov

Conductors of insulated cables

Leiter für Kabel und isolierte Leitungen

Ames des câbles isolés

Ta slovenski standard je istoveten z: **prEN IEC 60228:2022**

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TITLE:

Conductors of insulated cables

PROPOSED STABILITY DATE: 2030

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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CONDUCTORS OF INSULATED CABLES

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International Standard IEC 60228 has been prepared by technical committee 20: Electric cables.

This fourth edition cancels and replaces the third edition published in 2004. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Milliken conductors description

b) Nominal cross-sectional areas above 2500 mm²

c) Guidance for dimensional limits of stranded compacted circular conductors made with pre-shaped wires (Class 2)

d) New 2500 mm² aluminium resistance value.

For legacy systems where the conductor was designed taking into account the values presented in previous editions and no longer tabulated, then the original design can be maintained and still utilized.

The suppliers can furthermore utilize such superseded design either in systems already designed and qualified but not delivered or e.g. to produce repair and additional spare lengths for delivered systems.

The choice of utilizing the original superseded design or a new one based on the new resistance tabulated values is to be agreed between supplier and final users.

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

FDIS	Report on voting
XX/XX/FDIS	XX/XX/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.

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- withdrawn,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.

Conductors described in IEC 60228 are specified in metric sizes.

The National Committees are requested to note that for this publication the stability date is 20XX.

THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE DELETED AT THE PUBLICATION STAGE.

INTRODUCTION

IEC 60228 is intended as a fundamental reference standard for IEC Technical Committees and National Committees in drafting standards for electric cables, and to the National Committees in drafting specifications for use in their own countries. These committees should select from the tables of this general standard the conductors appropriate to the particular applications with which they are concerned and either include the applicable details in their cable specifications or make appropriate references to this standard.

CONDUCTORS OF INSULATED CABLES

Scope

This International Standard specifies the nominal cross-sectional areas, in the range 0,5 mm² to 3500 mm², for conductors in electric power cables and cords of a wide range of types. Requirements for numbers and sizes of wires and resistance values are also included. These conductors include solid, stranded and Milliken, copper, aluminium and aluminium alloy conductors in cables for fixed installations and flexible copper conductors.

The standard does not apply to conductors for telecommunication purposes.

The applicability of this standard to a particular type of cable is as specified in the standard for the type of cable.

Unless indicated to the contrary in a particular clause, this standard relates to the conductors in the finished cable and not to the conductor as made or supplied for inclusion into a cable.

Informative annexes are included giving supplementary information covering temperature correction factors for resistance measurement (Annex B) and dimensional limits of circular conductors (Annex C).

Normative references

There are no normative references in this document.

Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 Metal-coated

Coated with a thin layer of suitable metal, such as tin or tin alloy

3.2 Nominal cross-sectional area

Value that identifies a particular size of conductor but is not subject to direct measurement

NOTE 1 to entry: Each particular size of conductor in this standard is required to meet a maximum resistance value.

3.3 Milliken conductor

Stranded conductor comprising an assembly of shaped conductors, lightly insulated from each other.

Classification

The conductors have been divided into four classes, 1, 2, 5 and 6. Those in classes 1 and 2 are intended for use in cables for fixed installations. Classes 5 and 6 are intended for use in flexible cables and cords but may also be used for fixed installations.

- Class 1: solid conductors.

- Class 2: stranded conductors.
- Class 5: flexible conductors.
- Class 6: flexible conductors made with smaller diameter wires than class 5 for the same nominal conductor cross section.

Materials

5.1 Introduction

The conductors shall consist of one of the following (except for the Milliken central element):

- plain or metal-coated annealed copper;
- aluminium or aluminium alloy.

The wires of Milliken conductors can be oxidised or enamelled.

5.2 Solid aluminium conductors

Circular and shaped solid aluminium conductors shall be made from aluminium such that the tensile strength of the completed conductor is within the following limits:

Nominal cross-sectional area mm²	**Tensile strength** N/mm²
10 and 16	110 to 165
25 and 35	60 to 130
50	60 to 110
70 and above	60 to 90

There are no limits defined for tensile strength of aluminium alloy solid conductors.

5.3 Circular and shaped stranded aluminium conductors

Stranded aluminium conductors shall be made from aluminium such that tensile strength of the individual wires is within the following limits:

Nominal cross-sectional area mm²	**Tensile strength** N/mm²
10	up to 200
16 and above	125 to 205

There are no limits defined for tensile strength of aluminium alloy solid conductors.

This data can only be checked on wires taken before stranding and not on wires taken from a stranded conductor.

Solid conductors and stranded conductors

6.1 Solid conductors (class 1)

6.1.1 Construction

a) Solid conductors or conductor wires shall consist of one of the materials specified in Clause 5.

b) Solid copper conductors shall be of circular cross-section.

NOTE Solid copper conductors having nominal cross-section areas of 25 mm² and above are for particular types of cable, e.g. mineral insulated, and not for general purposes.

c) Solid aluminium and solid aluminium alloy conductors of sizes 10 mm² to 35 mm² shall be of circular cross-section. Larger sizes shall be of circular cross-section for single-core cables and may be of either circular or shaped cross-section for multi-core cables.

6.1.2 Resistance

The resistance of each conductor at 20 ºC, when determined in accordance with Clause 8, shall not exceed the appropriate maximum value given in Table 1.

NOTE For solid aluminium alloy conductors, having the same nominal cross-sectional area as an aluminium conductor the resistance value given in Table 1 should be multiplied by a factor of 1,162 unless otherwise agreed between manufacturer and the purchaser.

6.2 Stranded circular non-compacted conductors (class 2)

6.2.1 Construction

a) Stranded circular non-compacted conductors (class 2) shall consist of one of the materials specified in Clause 5.

b) Stranded aluminium or aluminium alloy conductors shall have a cross-sectional area not less than 10 mm².

c) The wires in each conductor shall all have the same nominal diameter.

d) The number of wires in each conductor shall be not less than the appropriate minimum number given in Table 2.

6.2.2 Resistance

The resistance of each conductor at 20 ºC, when determined in accordance with Clause 8, shall not exceed the appropriate maximum value given in Table 2.

6.3 Stranded compacted circular conductors and stranded shaped conductors (class 2)

6.3.1 Construction

a) Stranded compacted circular conductors and stranded shaped conductors (class 2) shall consist of one of the materials specified in Clause 5. Stranded compacted circular aluminium or aluminium alloy conductors shall have a nominal cross-sectional area not less than 10 mm². Stranded compacted circular copper conductors shall have a nominal cross-sectional area not less than 1,5 mm². Stranded shaped copper, aluminium or aluminium alloy conductors shall have a nominal cross-sectional area of not less than 25 mm².

b) The ratio of the diameters of two different wires in the same conductor shall not exceed 2.

c) The number of wires in each conductor shall be not less than the appropriate minimum number given in Table 2.

These requirements apply to conductors made with wires of circular cross-section before compaction. Requirements b) and c) do not apply to conductors made with pre-shaped wires.