

INTERNATIONAL STANDARD

IEC
60189-2

Fourth edition
2007-05

**Low-frequency cables and wires
with PVC insulation and PVC sheath –**

**Part 2:
Cables in pairs, triples, quads and quintuples
for inside installations**

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**LOW-FREQUENCY CABLES AND WIRES
WITH PVC INSULATION AND PVC SHEATH –**
**Part 2: Cables in pairs, triples, quads and quintuples
for inside installations**

FOREWORD

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International Standard IEC 60189-2 has been prepared by subcommittee 46C: Wires and symmetrical cables, of IEC technical committee 46: Cables, wires, waveguides, r.f. connectors, r.f. and microwave passive components and accessories.

This fourth edition cancels and replaces the third edition published in 1981, amendment 1 (1989) and amendment 2 (1996). This edition constitutes a technical revision.

This edition includes an update of the technical characteristics.

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

FDIS	Report on voting
46C/821/FDIS	46C829/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 list of all the parts of the IEC 60189 series, under the general title *Low-frequency cables and wires with PVC insulation and PVC sheath*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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- withdrawn,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.

A bilingual version of this publication may be issued at a later date.

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LOW-FREQUENCY CABLES AND WIRES WITH PVC INSULATION AND PVC SHEATH –

Part 2: Cables in pairs, triples, quads and quintuples for inside installations

1 Scope

This part of IEC 60189 is applicable to cables for inside installations, intended for the interconnection of the following:

- transmission equipment;
- telecommunications equipment;
- equipment for data processing.

NOTE It is the responsibility of the manufacturer to establish quality assurance by quality control procedures which will ensure that the product will meet the requirements of this standard. It is not intended that a complete testing programme must be carried out on every length of conductor and cable. When the purchaser wishes to specify acceptance tests or other quality procedures, it is essential that agreement be reached between the purchaser and the manufacturer by the time of ordering.

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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 60028, *International standard of resistance for copper*

IEC 60189-1:2007, *Low-frequency cables and wires with PVC insulation and PVC sheath – Part 1: General test and measuring methods*

IEC 60304, *Standard colours for insulation for low-frequency cables and wires*

IEC 60332-3 (all parts): *Tests on electric cables under fire conditions – Part 3: Test for vertical flame spread*

IEC 60344, *Calculation method of resistance of plain and coated copper conductors of low-frequency cables and wires – Application guide*

3 Terms and definitions

For the purposes of this document, the terms and definitions are given in IEC 60189-1 apply.

4 Cable construction and dimensions

4.1 Conductor

4.1.1 Conductor material

The conductor shall consist of annealed copper, uniform in quality and free from defects. The properties of the copper shall be in accordance with IEC 60028.

4.1.2 Type of conductor

The conductor shall consist of a single strand, circular in section.

4.1.3 Conductor finish

The conductor may be either plain or tinned.

4.1.4 Conductor dimensions

The conductor is designated by its nominal diameter.

Dimensions are given in Annex C.

4.1.5 Continuity of conductor

Normally the conductor shall be drawn in one piece. In cases of necessity, joints in the conductor are permitted provided that the breaking strength of a joint is not less than 85 % of the breaking strength of the unjointed conductor.

4.2 Insulation

4.2.1 Insulation material

The insulation shall consist of polyvinyl chloride (PVC).

NOTE The term "polyvinyl chloride" denotes a plasticized compound of polyvinyl chloride or vinylchloride vinylacetate copolymers.

4.2.2 Insulation thickness

The insulation shall be continuous having a thickness as uniform as possible, not less than 0,15 mm for a nominal conductor diameter up to and including 0,6 mm, and not less than 0,25 mm for a nominal conductor diameter of 0,8 mm.

The minimum thickness of the insulation shall be measured in accordance with the method specified in 5.2.1.1 of IEC 60189-1.

4.2.3 Application of the insulation

The insulation shall be applied to fit closely to the conductor without adhering to it.

The stripping properties of the insulation shall be checked in accordance with the method specified in 6.4.2 of IEC 60189-1.

It shall be possible to strip the insulation from the conductor easily and without damage to the insulation, to the conductor, or to the tinning, if any.

4.2.4 Colour of insulation

The insulated conductors shall be coloured by one colour or by two different colours.

Colours shall correspond reasonably with the standard colours shown in IEC 60304. When two colours are used, the following conditions shall be fulfilled:

- markings shall be rings or helices: if helices, single helices are preferred, double helices however are allowed;
- markings may be made by helical bicolour extrusion;

- markings printed or painted on the insulation shall adhere satisfactorily;
- markings shall be easily identifiable within any 15 mm length of the insulated conductor;
- the distance of repetition of the markings shall be not less than 4 mm, measured from centre to centre parallel to the axis;
- the width of the rings or helices and the width of their spacing measured parallel to the axis, shall be approximately constant and shall be not less than 1,5 mm;
- the width of the rings or helices need not be the same as that of the spacing.

NOTE For wires identified by ring marking, neither the registration of the two half-bands nor the complete encirclement of the wire is critical.

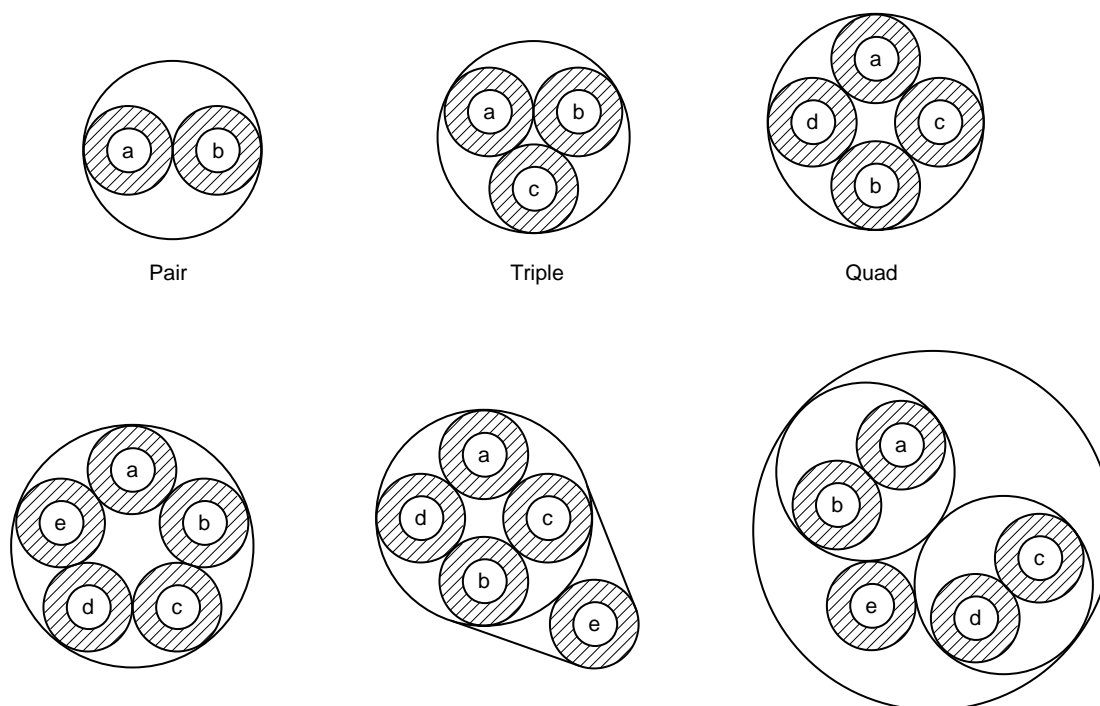
4.3 Cabling element

A cabling element (Figure 1) shall be

- a pair of two insulated conductors twisted together and designated wire a and wire b respectively, or
- a triple of three insulated conductors twisted together and designated wire a, wire b and wire c respectively, or
- a quad (star quad) of four insulated conductors twisted together and designated wire a, wire b, wire c and wire d respectively, or
- a quintuple of five insulated conductors made up in one of the following ways:
 - a) five insulated conductors, twisted together and designated wire a, wire b, wire c, wire d and wire e;
 - b) four insulated conductors, twisted together and designated wire a, wire b, wire c and wire d and one designated wire e not twisted;
 - c) two insulated conductors, twisted together and designated wire a and wire b, combined with two insulated conductors, twisted together and designated wire c and wire d, and one wire designated e.

The maximum length of lay in the finished cable shall be 120 mm.

NOTE Forming the element with a variable lay can lead to the infrequent, but acceptable, occurrence of the maximum lay being longer than specified.



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IEC 595/07

Figure 1 – Cabling elements

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4.4 Binding of elements

If a thread or tape is used to bind the cabling elements, it shall consist of non-hygroscopic and non-wicking material.

4.5 Assembling of elements

4.5.1 Concentric layer cables

All the cabling elements shall be stranded in concentric layers.

One single insulated conductor may be added for metering purposes: its diameter shall preferably be the same as that of other conductors and its insulation shall be coloured WHITE-red.

NOTE 1 When necessary, fillers, of non-hygroscopic and non-wicking material, can be used to obtain a round cable core.

NOTE 2 The successive layers of cabling elements may be separated from each other by interlayer binders, of non-hygroscopic and non-wicking material.