

INTERNATIONAL STANDARD

IEC 60189-3

Fourth edition
2007-05

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

**Part 3:
Equipment wires with solid or stranded
conductor wires, PVC insulated, in singles,
pairs and triples**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**LOW-FREQUENCY CABLES AND WIRES
WITH PVC INSULATION AND PVC SHEATH –****Part 3: Equipment wires with solid or stranded conductor wires,
PVC insulated, in singles, pairs and triples**

FOREWORD

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International Standard IEC 60189-3 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 1988 and amendment 1 (1989). 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/822/FDIS	46C/830/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- withdrawn;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 3: Equipment wires with solid or stranded conductor wires, PVC insulated, in singles, pairs and triples

1 Scope

This part of IEC 60189 is applicable to equipment wires with solid or stranded conductor, polyvinyl chloride (PVC) insulated, in singles, pairs and triples to be used for internal wiring of telecommunication equipment, industrial and consumer electronic equipment.

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. 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.

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*

<https://standards.iteh.ai/catalog/standards/sist/11d8e7c4-070c-4c50-a4eb-bf701d65b4c6/iec-60189-3-2007>

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 60344, *Guide to the calculation of resistance of plain and coated copper conductors of low-frequency cables and wires*

IEC 60649, *Calculation of maximum external diameter of cables for indoor installations*

ISO 105 (all parts), *A and B textiles – Tests for colour fastness*

3 Terms and definitions

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

4 Wire 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.

The three smallest conductors (0,12 mm and 0,15 mm diameter and 0,035 mm² cross-sectional area) shall consist of copper alloy, uniform in quality and free from defects. Copper alloy may also be used for other small conductor gauges.

4.1.2 Type of conductor

The conductor may be either solid or stranded.

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

This stranded conductor shall consist of several strands of circular cross-section assembled either by concentric layer stranding or by bunching, and without insulation between them.

4.1.3 Conductor finish

The conductor may be either plain or tinned.

4.1.4 Conductor dimensions

The solid conductor is designated by its nominal diameter.

This stranded conductor is designated by its nominal cross-sectional area, the number of strands, and maximum diameter of strands.

Dimensions are given in Annexes A and B.

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. Joints in a complete stranded conductor are not permitted.

4.2 Insulation

4.2.1 insulation material

The insulation shall consist of PVC.

NOTE The initials "PVC" denote 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 and not less than the value specified in Annex A.

The maximum diameter of the wire shall be calculated in accordance with the method given in Annex C.

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.

Colour fastness to daylight, checked according to ISO 105, shall be rated at not less than standard 4, prolonging the exposure until the contrast is equivalent to grade 4 on the grey scale. 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 shall be not less than 1,5 mm, measured parallel to the axis, the widths shall be approximately constant along the insulated conductor;
- 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.

The choice of colours or combinations of colours shall be made in the following order of preference:

- the 12 standard colours shown in IEC 60304;
- the following 19 easily identifiable combinations of two standard colours:

RED-black	YELLOW-violet
RED-blue	GREEN-black
ORANGE-green	GREEN-red
ORANGE-blue	BLUE-black
ORANGE-violet	GREY-red
YELLOW-black	GREY-blue
YELLOW-red	WHITE-black
YELLOW-green	WHITE-red
YELLOW-blue	WHITE-green
	WHITE-blue