

# INTERNATIONAL STANDARD

**IEC**  
**60708**

First edition  
2005-06

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**Low-frequency cables with polyolefin insulation  
and moisture barrier polyolefin sheath**

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Reference number  
IEC 60708:2005(E)

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PRICE CODE

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**LOW-FREQUENCY CABLES WITH POLYOLEFIN INSULATION  
AND MOISTURE BARRIER POLYOLEFIN SHEATH**

## FOREWORD

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International Standard IEC 60708 has been prepared by subcommittee 46C: Wires and symmetric cables, of IEC technical committee 46: Cables, wires, waveguides, r.f. connectors, r.f. and microwave passive components and accessories.

IEC 60708 cancels and replaces IEC 60708-1 published in 1981 and amendment 3(1988). This edition constitutes a technical revision.

IEC 60708 has been completely revised technically and structurally. IEC 60708 now comprises only one single standard dealing with general design details and requirements. The old IEC 60708-2(1981), IEC 60708-3(1981) and IEC 60708-4(1983) have already been withdrawn because they are not used anymore. Although IEC 60708 addresses low frequency cables, these cables are often used for digital communications up to 2 Mbit/s or 1 MHz. Therefore a Subclause 7.8 has been added, which provides transmission characteristics for the cable when used for digital communication. Furthermore, Annex H of IEC 60708-1(1981) was deleted: The requirements for filling compounds are not needed anymore since they are covered by the cable performance requirements.

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

FDIS	Report on voting
46C/713/FDIS	46C/728/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 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- withdrawn;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 standard may be issued at a later date.

The contents of the corrigendum of August 2016 have been included in this copy.

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# LOW-FREQUENCY CABLES WITH POLYOLEFIN INSULATION AND MOISTURE BARRIER POLYOLEFIN SHEATH

## 1 Scope

This standard is intended to define polyolefin-insulated cables for insertion into local outdoor networks.

This standard is applicable to polyolefin insulated and moisture barrier polyolefin sheathed telephone cables, filled or unfilled with copper conductors, and used as:

- a) Cables suitable for installation in ducts.
- b) Cables suitable for direct burial in the ground.
- c) Cables with integral suspension strand for aerial installations.

This standard is in accordance with ITU-T Recommendations.

This standard includes general design details and requirements for dimensions and other constructional details as well as mechanical, electrical and environmental characteristics for all types of low-frequency cables with polyolefin insulation (solid or cellular), filled or unfilled, and moisture barrier polyolefin sheath (with integral suspension strand).

## 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, *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 60794-1-2, *Optical fibre cables – Part 1-2: Generic specification – Basic optical cable test procedures*

IEC 60811-1-1, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section 1: Measurement of thickness and overall dimensions – Tests for determining the mechanical properties*

IEC 60811-1-2, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section Two: Thermal ageing methods*

IEC 60811-1-3, *Insulating and sheathing materials of electric cables – Part 1: General application – Section 3: Methods for determining the density – Water absorption tests – Shrinkage test*

IEC 60811-1-4, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section Four – Test at low temperature*



IEC 60811-4-1, *Insulating and sheathing materials of electric and optical cables – Common test methods – Part 4-1: Methods specific to polyethylene and polypropylene compounds – Resistance to environmental stress cracking – Measurement of the melt flow index – Carbon black and/or mineral filler content measurement in polyethylene by direct combustion – Measurement of carbon black content by thermogravimetric analysis (TGA) – Assessment of carbon black dispersion in polyethylene using a microscope*

IEC 60811-4-2, *Insulating and sheathing materials of electric and optical cables – Common test methods – Part 4-2: Methods specific to polyethylene and polypropylene compounds – Tensile strength and elongation at break after conditioning at elevated temperature – Wrapping test after conditioning at elevated temperature – Wrapping test after thermal ageing in air – Measurement of mass increase – Long-term stability test – Test method for copper-catalyzed oxidative degradation*

IEC 60811-5-1, *Common test methods for insulating and sheathing materials of electric cables – Part 5-1: Methods specific to filling compounds – Drop point – Separation of oil – Lower temperature brittleness – Total acid number – Absence of corrosive components – Permittivity at 23 °C – DC resistivity at 23 °C and 100 °C*

IEC 61156-1, *Multicore and symmetrical pair/quad cables for digital communications – Part 1: Generic specification*

ITU-T L.3, *Armouring of cables*

### **3 Quality assurance**

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 shall 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.

## **4 Cable construction**

### **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. The nominal diameter shall be at least 0,4 mm.

#### **4.1.3 Conductor-finish**

The conductor shall be plain.

#### **4.1.4 Continuity of conductor**

Joints in the conductor are permitted provided that the tensile strength of a joint is not less than 90 % of the tensile strength of the unjointed conductor.

## 4.2 Insulation

### 4.2.1 Insulation material

The conductor shall be covered with solid or cellular polyolefin insulation or any combination thereof.

For cellular insulation, the cells produced by the expanding process shall be uniformly distributed circumferentially and should be substantially non-intercommunicating.

The material for the insulation shall be a virgin thermoplastic compound suitably stabilized. Examples of suitable materials are:

- Polyethylene.
- Polypropylene.

### 4.2.2 Insulation thickness

The insulation shall be continuous and shall have a thickness such that the completed cable will meet the electrical requirements specified.

### 4.2.3 Colour of insulated conductor

The insulated conductors shall be coloured. Colours shall be readily identifiable and shall correspond reasonably with the standard colours shown in IEC 60304.

## 4.3 Cabling element

A cabling element (Figure 1) shall be:

- a pair of two insulated conductors twisted together and designated wire a and b respectively,

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or

- a quad of four insulated conductors twisted together and designated wire a, wire c, wire b, and wire d respectively.

The maximum length of lay in the finished cable shall not exceed 150 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.

## 4.4 Stranding

The cable elements shall be formed into a number of sub-units or units which can be stranded into a regular make up to produce the required number of pairs.

## 4.5 Colour code

### 4.5.1 General

Three different colour schemes for identifying pair or quad counts are defined. One with 10 pair or 5 quad sub-units, one for 25 pair colour groups and a third for 25 quad colour groups.

#### **4.5.2 Sub-units, units and cables up to and including 100 pairs or 100 quads**

##### **4.5.2.1 10 pair or 5 quad count**

The pairs or quads shall be identified by each insulated conductor having a single colour in accordance with the colour scheme given in Annex A.

Sub-units of 10 pairs or 5 quads shall be identified by coloured bindings of tape or threads according to the colour scheme given in Annex B for assembly into units of 50 pairs (25 quads) or 100 pairs (50 quads).

##### **4.5.2.2 25 pair count**

The pairs shall be identified by each insulated conductor having a single colour in accordance with the colour scheme given in Annex C.

Sub-units shall be identified by coloured bindings of tape or threads. Each group of sub-units making up a 25 pair count shall be identified by a common colour of bindings. For 50 and 100 pair cables the colours of the bindings are given in Annex D.

##### **4.5.2.3 25 quad count**

The quads shall be identified by each insulated conductor having a single colour in accordance with the colour scheme given in Annex E.

Sub-units shall be identified by coloured bindings of tape or threads. Each group of sub-units making up a 25 quad count shall be identified by a common colour of bindings. For 50 quad (100 pair) and 100 quad (200 pair) cables the colours of the bindings are given in Annex D.

#### **4.5.3 Cables of more than 100 pairs or 100 quads**

Cables shall be assembled in concentric layers of units. The units shall be identified by coloured bindings of tape or threads. [IEC 60708:2005](https://standards.iteh.ai/catalog/standards/iec/3d40308e-2f44-408d-b19c-9dd6af7c57e1/iec-60708-2005)

##### **4.5.3.1 Marker / reference identification system**

In each layer, the marker unit shall be identified by red coloured bindings, the reference unit shall be identified by green coloured bindings and the other units shall be identified by bindings of a contrasting or natural colour.

The marker and reference units shall be adjacent and the counting of units in each layer of the cable shall be in the same direction.

##### **4.5.3.2 Marker identification system**

In each layer, the marker unit shall be identified by red coloured bindings and the other units shall be identified by bindings of a contrasting or natural colour.

##### **4.5.3.3 Full colour code system for 25 pair count**

Each 25 pair count group shall be identified by bindings coloured in accordance with Annex F.

##### **4.5.3.4 Full colour code system for 10 pair or 5 quad count or 25 quad count**

Each group of sub-units making up a 100 pair (50 quad) count group shall be identified by a common colour of bindings in accordance with Annex G.