
**Večelementni kovinski kabli za analogne in digitalne komunikacije in
krmiljenje – 7. del: Področna specifikacija za instrumentne in krmilne kable**

Multi-element metallic cables used in analogue and digital communication and
control - Part 7: Sectional specification for instrumentation and control cables

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**Multi-element metallic cables used
in analogue and digital communication and control
Part 7: Sectional specification
for instrumentation and control cables**

Câbles métalliques à éléments multiples
utilisés pour les transmissions et les
commandes analogiques et numériques
Partie 7: Spécification intermédiaire
pour les câbles d'instrumentation
et de contrôle

Mehradrige metallische Daten-
und Kontrollkabel für analoge
und digitale Übertragung
Teil 7: Rahmenspezifikation
für Instrumenten- und Kontrollkabel

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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.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

This European Standard was prepared by SC 46XC, Multicore, Multipair and Quad Data communication cables, of Technical Committee CENELEC TC 46X, Communication cables.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50288-7 on 2005-04-01.

This Part 7 is to be used in conjunction with EN 50288-1.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2006-04-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2008-04-01

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1 Scope

This sectional specification covers multi-element cables suitable for connecting instruments and control systems for analogue or digital signal transmission. They may or may not be screened and optionally may incorporate armouring and/or moisture or environmental protection layers.

The cables shall have a mechanically robust construction and electrical transmission handling properties. The electrical, mechanical, transmission and environmental performance characteristics of the cables, related to their reference test methods are detailed.

This sectional specification is to be read in conjunction with EN 50288-1, which contains the essential provisions for its application.

Cables covered by this specification have maximum rated voltages of 90 V, 300 V and 500 V a.c.

These cables shall not be connected directly to mains electricity supply or other low impedance sources. Multi-element cables for use in analogue, digital and control circuits are not designed to be used for power supply.

These cables should be installed in accordance with the applicable local and national regulations.

Cables intended to have limited circuit integrity in a fire are not covered by this specification, but they are however under consideration for future editions.

There may be occasions when cables are required to have higher operating temperature ratings than those provided by using materials specified by the EN 50290 series. Suitable alternative materials are under consideration.

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.

| <u>Publication</u> | <u>Year</u> | <u>Title</u> |
|--------------------|-------------|---|
| EN 10218-1 | - | Steel wire and wire products – General – Part 1: Test methods |
| EN 10244-2 | - | Steel wire and wire products – Non-ferrous metallic coatings on steel wire – Part 2: Zinc or zinc alloy coatings |
| EN 10257-1 | - | Zinc or zinc alloy coated non-alloy steel wire for armouring either power cables or telecommunications cables – Part 1: Land cables |
| EN 50289 | Series | Communication cables - Specifications for test methods |
| EN 50290 | Series | Communication cables |
| EN 50307 | - | Lead and lead alloy sheath and sleeves of electric cables |

| | | |
|--------------|---|---|
| EN 60708 | - | Low-frequency cables with polyolefin insulation and moisture barrier polyolefin sheath (IEC 60708) |
| EN 60811-1-1 | - | Insulating and sheathing materials of electric and optical cables – Common test methods – Part 1-1: General application – Measurement of thickness and overall dimensions – Tests for determining the mechanical properties (IEC 60811-1-1) |
| HD 383 S2 | - | Conductors of insulated cables First supplement: Guide to the dimensional limits of circular conductors (IEC 60228 + IEC 60228A, mod.) |
| HD 446.3 S1 | - | Thermocouples - Part 3: Extension and compensating cables – tolerances and identification system (IEC 60584-3, mod.) |
| IEC 60189-2 | - | Low-frequency cables and wires with PVC insulation and PVC sheath - Part 2: Cables in pairs, triples, quads and quintuples for inside installations |

3 Definitions, symbols and abbreviations

For the purposes of this European Standard the definitions of EN 50288-1 apply in addition to the following:

3.1 foil

a metal tape laminated to a plastic tape

4 Cable construction

4.1 Conductor

Except for thermocouple extension and compensating cables, with conductors as described in Annex D, conductors shall be solid, stranded or flexible plain or metal coated copper in accordance with Class 1, 2 or 5 of HD 383 in the range of 0,5 mm² to 2,5 mm². For multi-core cables the maximum conductor resistance shall be as HD 383, and for finished multi-pair, multi-triple and multi-quad cables the maximum resistance of HD 383 shall be increased by 2 %.

Conductor joints shall be as EN 50288-1.

Stranded and flexible conductors shall consist of wires circular in cross section assembled, without insulation between them, by concentric stranding or by bunching.

When the installed length of cable results in a high conductor resistance, larger conductor sizes can be used.

4.2 Insulation

The insulating material shall be selected from those listed below. It shall be applied to comply with the requirements of EN 50288-1.

- a) PVC EN 50290-2-21
- b) Polyethylene EN 50290-2-23
- c) Polypropylene EN 50290-2-25
- d) Halogen free flame retardant compound EN 50290-2-26
- e) Cross-linked polyethylen EN 50290-2-29

The minimum thickness at any point of the insulation shall not be less than the value given in Table 1, for the specified voltage rating, and the concentricity shall not fall below 75 % when measured using the procedure in Annex A.

There may be occasions when cables are required to have higher operating temperature ratings than those provided by using materials specified by the EN 50290 series. Suitable alternative materials are under consideration.

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Table 1 – Minimum insulation thickness

| Conductor size mm ² | Minimum thickness mm | | |
|-----------------------------------|-------------------------|-------|-------|
| | Voltage rating | | |
| | 90 V | 300 V | 500 V |
| 0,5 | 0,20 | 0,26 | 0,44 |
| 0,75 | 0,20 | 0,26 | 0,44 |
| 1,0 | 0,26 | 0,26 | 0,44 |
| 1,5 | 0,30 | 0,35 | 0,44 |
| 2,5 | - | - | 0,53 |

4.3 Cable elements

Cable elements shall be in accordance with 4.3 of EN 50288-1.

The lay length of a pair, triple or quad shall not exceed 100 mm for cables with conductor cross-section ≤ 1,5 mm², nor 150 mm for cables with conductor cross-section 2,5 mm².

4.4 Identification of cabling elements

Unless otherwise specified e.g. by means of numbered cores or tapes, the coding for identification shall be as given in IEC 60189-2 or EN 60708, as appropriate. The colours shall meet the requirements of 4.4 of EN 50288-1.

Coloured or numbered non-hygroscopic binder tapes may be applied over screened cabling elements as identification.

4.5 Screening of cabling elements

When screening of individual cable elements is specified, it shall be selected from those listed below and applied in accordance with 4.5 of EN 50288-1:

- a) a plain or coated metal braid with a minimum filling factor of 0,6 when calculated in accordance with Annex B;
- b) a combination of a foil, and a plain or coated metal braid with a minimum filling factor of 0,3 when calculated in accordance with Annex B. The use of a drain wire is optional when this type of screen is applied;
- c) a foil applied with a minimum overlap of 20 % and with a drain wire in direct contact with the metallic side of the foil.

Metal braid wire diameters are given in Table B.1.

4.6 Cable make-up

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The cable elements shall be assembled together in concentric layers or in unit construction to form the cable core.

The cable core assembly shall be protected by wrappings of non-hygroscopic tape.

Successive layers may be separated from each other by interlayer binders of non-hygroscopic tape.

4.7 Filling compound

When a filling compound is specified, it shall be selected from the compounds given in EN 50290-2-28 and shall meet the requirements of 4.7 of EN 50288-1.

4.8 Interstitial fillers

When fillers are used they shall meet the requirements of 4.8 of EN 50288-1.

4.9 Screening of the cable core

The cable core shall be protected with a protective layer as described in 4.11 or 4.13 when it is covered with a screen.

When screening of the cable core is specified, it shall be selected from those listed below, and applied in accordance with 4.9 of EN 50288-1:

- a) a plain or coated metal braid with a minimum filling factor of 0,6 when calculated in accordance with Annex B;
- b) a combination of a foil, and a plain or coated metal braid with a minimum filling factor of 0,3 when calculated in accordance with Annex B. The use of a drain wire is optional when this type of screen is applied;
- c) a foil applied with a minimum overlap of 20 % and with a drain wire in direct contact with the metallic side of the foil.

Metal braid wire diameters are given in Table B.1.

Screening over the cable core may also be in the form of a laminated sheath (moisture barrier as 4.10 or multi layer sheath as 4.18.2).

4.10 Moisture barriers

When a moisture barrier is specified it shall be selected from those listed below. It shall be applied to meet the requirements of 4.10 of EN 50288-1:

- a) water swellable tapes; **(standards.iteh.ai)**
- b) water swellable non-toxic powder; [SIST EN 50288-7:2006](https://standards.iteh.ai/catalog/standards/sist/5239ba3-a90b-444f-b4f6-ffc80bfbdc3/sist-en-50288-7-2006)
- c) filling compound; <https://standards.iteh.ai/catalog/standards/sist/5239ba3-a90b-444f-b4f6-ffc80bfbdc3/sist-en-50288-7-2006>
- d) laminated sheath, consisting of a longitudinal overlapped metallic foil, bonded within the overlapping and to the inner surface of an extruded sheath. The foil shall be one or both sides plastic coated, but in the case of only one side being coated a tinned copper drain wire shall be applied in direct contact with the metallic surface of the foil. The thickness of the metallic part of the foil shall be at least 0,15 mm;
- e) combinations of these four methods.

4.11 Protective wrappings

A wrapping layer may be applied under a sheath.

A wrapping layer may be applied under a metallic protection layer.

The wrapping layer shall be of a material compatible with the cable components with which it is in contact.