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Komunikacijski kabli - 4-2. del: Splošno o uporabi kablov - Vodilo za uporabo

Communication cables - Part 4-2: General considerations for the use of cables - Guide to use

Kommunikationskabel - Teil 4-2: Allgemeine Betrachtungen für die Anwendung der Kabel - Leitfaden für die Verwendung

Câbles de communication - Partie 4-2: Considérations générales pour l'utilisation des câbles - Guide d'utilisation

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ICS:

33.120.10	Koaksialni kabli. Valovodi	Coaxial cables. Waveguides

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EUROPEAN STANDARD
NORME EUROPÉENNE
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EN 50290-4-2

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ICS 33.120.10

English version

Communication cables - Part 4-2: General considerations for the use of cables - Guide to use

Câbles de communication -
Partie 4-2: Considérations générales pour l'utilisation des câbles -
Guide d'utilisation

Kommunikationskabel -
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This European Standard was approved by CENELEC on 2008-02-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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.

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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

Ref. No. EN 50290-4-2:2008 E

Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 46X, Communication cables, with the help of the CENELEC Co-operating Partner EUROPACABLE (ECBL).

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50290-4-2 on 2008-02-01.

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)	2009-02-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2011-02-01

Contents

1 Scope

The scope of this European Standard is to help installers and cabling designers to understand the range of communication metallic cables available. To help this choice the fundamental and practical rules on how to use these cables are established.

The related cables are specified in the documents issued by CLC/TC 46X and its sub-committees.

These cables are:

- telecom cables used in access network,
- data communication twisted pairs cables,
- coaxial cables used in CATV.

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.

EN 50083 series	Cable networks for television signals, sound signals and interactive services
EN 50117 series	Coaxial cables used in cabled distribution networks
EN 50173 series	Information technology - Generic cabling systems
EN 50174 series	Information technology - Cabling installation
EN 50200	Method of test for resistance to fire of unprotected small cables for use in emergency circuits
EN 50288 series	Multi-element metallic cables used in analogue and digital communication and control
EN 50289-3-9	Communication cables - Specifications for test methods - Part 3-9: Mechanical test methods - Bending tests
EN 50289-4-16 [1)]	Communication cables - Specifications for test methods - Part 4-16: Environmental test methods - Circuit integrity under fire conditions
EN 50290 series	Communication cables
EN 50406 series	End user multi-pair cables used in high bit rate telecommunication networks
EN 50407-1	Multi-pair cables used in high bit rate digital access telecommunication networks - Part 1: Outdoor cables
EN 50441 series	Cables for indoor residential telecommunication installations

[1)] At draft stage.

3 Communication cable basics

Communication cables are the highways and arteries that provide a path for telecommunications devices. There is a general tendency to say that one transmission medium is better than another. In fact, each transmission medium has its place in the design of any communication system. Each has characteristics that will make it the ideal medium to use based on a particular set of circumstances. It is important to recognize the advantages of each and develop a system accordingly.

Factors to consider when choosing communication cable include:

- efficiency of transmission,
- cost,
- ease of installation and maintenance,
- availability.

4 Types of cables

When working with communication cables, an installer will deal with two basic types:

- balanced,
- unbalanced.

Balanced cabling involve twisted-pair and/or twinaxial twisted cables that are composed of one or more pairs of copper wires (see Figure 1).

Unbalanced cabling involves coaxial cable, that has only one centre conductor of either solid or stranded inner conductor and an outer concentric conductor. Most data and voice networks use twisted-pair cabling. Coaxial cable is now used primarily for CATV, satellite and video connections (see Figure 2).

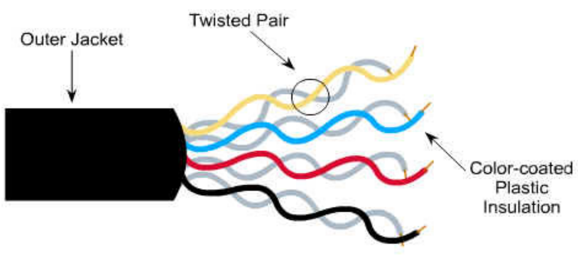

Figure 1 – Balanced cabling

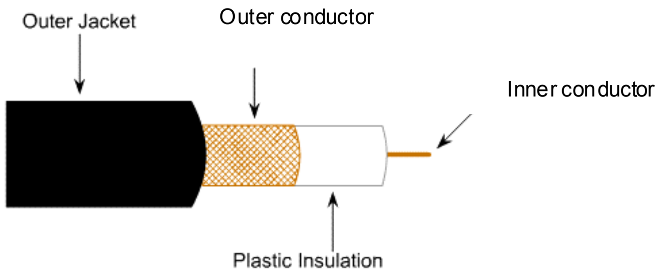

Figure 2 – Unbalanced cabling

4.1 Twisted pairs cables

4.1.1 Pair construction

There are two different pairing constructions:

- a pair made of two insulated wires twisted together (wire A and B in Figure 4);
- a quad made of four insulated wires twisted together, providing two pairs from a star formation (first pair wire A and B and second pair wire D and C in Figure 3);
- a pair made of two insulated wires twisted together;
- a quad made of four insulated wires twisted together, providing two pairs.

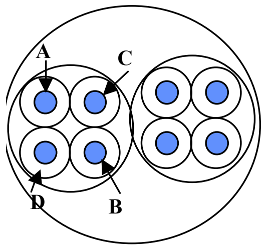

Figure 3 – Starquads

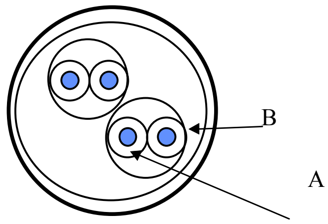

Figure 4 – Pairs

4.1.2 Pair counts

Telecommunications cable comes in many sizes, starting with a single pair of wires, up to and perhaps more than 4 200 pairs of wires. These pairs may be arranged in concentric layers or in bundles. A data communication terminal is fed normally with a maximum of 4 pairs, so the last part of the network is built with cables having 1 to 4 pairs. As the other parts of the network aggregate several terminal cables, they have a larger number of pairs. The highest number of pairs is encountered at the main communication switch. The main communication switch is then connected to global systems by satellite, fibre, radio, waveguide and coaxial (CATV).

The identification of each pair in the cable is made through an appropriate colour code that is given in the relevant standard or may be agreed between customer and manufacturer (see example in Figure 5).

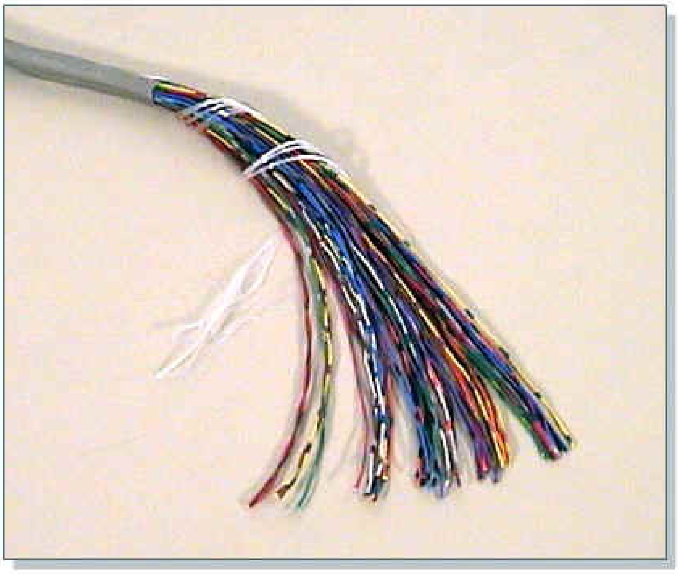

Figure 5 – Example of pair arrangement in a telecommunication cable

4.2 Coaxial cable (unbalanced)

Coaxial cable is called 'coaxial' because it includes one conductor surrounded by a layer of insulation, itself surrounded by a concentric conductor (a metallic foil or braid or a combination of both) and an outer sheath (see Figure 6).

Coaxial cable is the primary type of communication cable used by cable TV companies for signal distribution between the community antenna (CATV, normally 75 Ω) and user's homes and businesses. The WWW is now accessible through such communication mediums making possible all types of connections. It was once the primary medium for Ethernet and other types of local area networks because of its ability to transmit high frequencies. With the development of standards for Ethernet over twisted-pair, new installations of coaxial cable for this purpose have all but disappeared.

Coaxial cable is still used for connecting CCTV cameras to monitors, antenna's and video switches. Cables for radio communication (mobile telephone) antenna's are also coaxial, these are feeder cables and are normally 50 Ω.

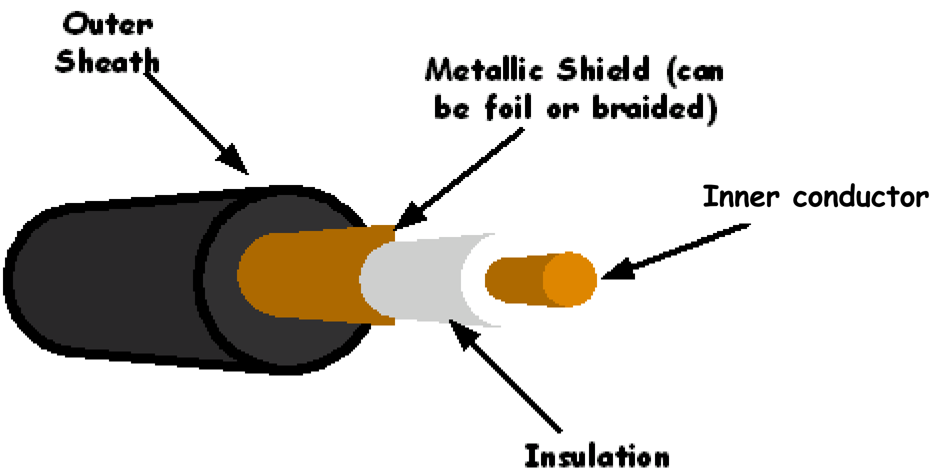

Figure 6 – Coaxial cable illustration

There are several variations. Triaxial (Triax) is a form of cable that uses a single centre conductor with two shields (one could be tape and one braid). This is important when considering EMC (electromagnetic compatibility). This composition affords a greater transmission distance with less loss due to interference from outside electrical signals. Twinaxial (Twinax) is two coaxial systems packaged within a single concentric outer conductor and jacket to form the cable.

4.3 Flexible cables versus rigid cables

Communication infrastructure includes different sections. Some sections are installed, indoor or outdoor, permanently (i.e. fixed) so the cables are static (once installed, do not move) for their lifetime. Some other sections are subjected to continuous movement and different mechanical behaviour is required for the cable (see 7.6).

Copper is inherently rigid and leads to build cables with a certain degree of stiffness suitable for permanent installations. However, copper is one of the most malleable of the rigid metals and so cannot be unsupported. Nonetheless, cable construction includes design to allow appropriate bending radius to be performed without degradation of mechanical and transmission properties.

For some applications there is a need for smaller bending radius, multiple bending, or less stiffness while keeping requested transmission properties (i.e. work area cables or cables used in lift machinery). Specific designs to achieve this target use stranded conductors instead of one-solid-conductor; also with insulation material having specific mechanical properties are used. These cables, named "flexible cables", are often used in cord assemblies and are specified for a given number of mechanical cycles.

In order to provide more flexibility to cables used in cords, stranded conductors are used instead of solid conductors. Not only does this improve flexibility but also allows the cable to be repeatedly flexed many times; this can be useful in robotic systems.

The relevant cable standards identifies whether the cable is either flexible or rigid, depending on how the cable will be used in its life cycle i.e. look for properties such as simulated installation, torsion and twisting or flexing performance tests.

These basic principles, along with avoiding already known stresses and misuses of installations, will ensure the cable does not irreversibly degrade below the performance criteria. There are many situations already known that will change the performance criteria below that of the specified limits.

5 Cables and regulations

In addition to functional requirements cables have to meet the essential requirements of European Directives like the LVD (Low Voltage Directive) and the CPD (Construction Products Directive) and may have to contribute to the compliance of systems versus other directives like the EMCD (Electromagnetic Compatibility Directive).

EN 50290-4-1 gives the relationship between cables and main European Directives by detailing the related cable characteristics and associated tests.

5.1 Low voltage

Cables that are described into the documents issued by CLC/TC 46X and its sub-committees are tested for voltage withstanding.

The test is performed between conductors and between the conductors or screen and the outer surface of the sheath.

When constructed in accordance with EN 50290-2-1 and submitted to spark testing, communication cables may be installed together with low voltage cable.

Moreover the tests are performed after environmental and ageing tests. In addition the raw materials of these cables are defined in the EN 50290 series. This ensures sufficient stability of the cable related to this characteristic for its life cycle.

Thus these cables are considered safe when:

- they are used for their intended purpose and applications;
- they are used under voltages and currents that do not exceed the limits given in the relevant specification.

5.2 Fire reactions and Euroclasses

Cables that are permanently installed in buildings shall meet the local regulation related to the Construction Product Directive classification for fire performances (Euroclasses).

Regulations as well as standards give only the minimum requirement and it is therefore always recommended to choose cable that fulfill or better exceed these requirements. This is particularly true when the requirement is safety related.

The designer/installer is invited to consider the relevant regulation related to safety in case of fire. A choice of cables that strictly comply to the requirements will give greater safety margin (especially in the case where the public or individuals are involved).

The product standards EN 50288, EN 50441 and EN 50117 refer to EN 50290 to describe how a cable behaves in fire. This is achieved through EN 50290-4-1 that gives the relationship between the Euroclasses and the related test methods and limits.

Some local regulations/customer-requirements are stricter than the Euroclassification tables and therefore can and should be designed by discussions between the producer and customer.

During a building fire, a cable that runs in a wall, up an elevator shaft, or through an air-handling plenum could become a wick that carries the flame from one floor, or one part of the building, to the next. The standards, among other things, enable engineers to calculate the time that it will take a cable to become a hazard once it is exposed. Evacuation times and building safety management can now be engineered to ensure complete safety for the occupants.