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**Večparni kabli do končnega uporabnika, uporabljeni v telekomunikacijskih omrežjih z visokimi bitnimi hitrostmi prenosa - 1. del: Nadzemni kabli**

End user multi-pair cables used in high bit rate telecommunication networks – Part 1: Aerial cables

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EUROPEAN STANDARD

**EN 50406-1**

NORME EUROPÉENNE

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**End user multi-pair cables used in  
high bit rate telecommunication networks  
Part 1: Aerial cables**

Câbles multi-paires de l'utilisateur final  
utilisés dans les réseaux  
de télécommunication à haut-débits  
Partie 1: Câbles aériens

Vielpaarige Kabel für Endanwender  
für Telekommunikationsnetzwerke  
mit hoher Bitrate  
Teil 1: Luftkabel

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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**

### Foreword

This European Standard was prepared by the 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 50406-1 on 2004-02-01.

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) 2005-02-01
  - latest date by which the national standards conflicting  
with the EN have to be withdrawn (dow) 2007-02-01
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## 1 Scope

This European Standard defines outdoor multi-pair/quad cables for use in high bit rate telecommunication networks with their relative definitions and requirements.

It covers radially water blocked cables, with an overall screen, with performances up to 60 MHz, to be used in outdoor networks intended to connect the broadband outside plant to the individual customer premises with a maximum recommended length of connection of 1 km.

The electrical, environmental, mechanical and transmission performance characteristics of the cables, related to their reference test methods, are detailed.

## 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 50289	series	Communication cables - Specifications for test methods ( <i>Basic reference standards</i> )
EN 50290	series	Communication cables ( <i>Basic reference standards</i> )
EN 60811-1-1	1993	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)
EN 60811-1-2	1995	Insulating and sheathing materials of electric cables - Common test methods - Part 1-2: General application - Thermal ageing methods (IEC 60811-1-2:1985 + corrigendum May 1986 + A1:1989)
HD 402 S2	1984	Standard colours for insulation for low-frequency cables and wires (IEC 60304:1982)
IEC 60028	1925	International standard of resistance for copper

## 3 Terminology and abbreviations

### 3.1 Terminology

For the purpose of this European Standard, the definitions of EN 50290-1-2 apply.

### 3.2 Abbreviations

ADSL	Asymmetric Digital Subscriber Lines
ATM	Asynchronous Transfer Mode
DSL	Digital Subscriber Line
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
FSAN	Full Service Access Network
HDSL	High-bit-rate Digital Subscriber Lines

ISDN	Integrated Digital Services Network
ISDN-BRA	ISDN-Basic Rate Access
ISDN-PRA	ISDN-Primary Rate Access
Mbps	Mega-bits per second
TBD	To be determined
VDSL	Very-high-bit-rate Digital Subscriber Lines
XDSL	Generic term referring to all DSLs, ISDN, HDSL, ADSL, VDSL, etc.

## 4 General information

### 4.1 General cable description

These cables are designed for outdoor high bit rate telecommunication networks. They are water-blocked cables with an overall screen.

High bit rate applications targeted in this specification involve frequencies up to 60 MHz. To restrict emission and to ensure satisfactory electromagnetic immunity, these cables include an overall screen.

These cables contain from one pair up to 200 pairs (ffs) that can be either in pairs or quads.

### 4.2 Environment and product safety requirement.

Safety local and regional regulation (e.g. relevant European directives) is assumed to be met by these cables.

### 4.3 Testing

For all test procedures described in this subclause, the test conditions shall be the standard atmospheric conditions ( $23 \pm 5$ )°C and 20 % - 70 % Relative Humidity, unless otherwise stated. All measured and computed values are to be rounded to the number of decimal places given in the corresponding requirement or objective.

The parameters specified in this standard may be affected by measurement uncertainty arising either from measurement errors or calibration errors due to a lack of suitable standards. Acceptance criteria shall be interpreted with respect to this consideration.

## 5 Requirements for conductor

### 5.1 Construction and dimensions

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 conductor shall be solid, circular in section. Normally the conductor should be drawn in one piece. Joints in the conductor are permitted, provided that the tensile strength of a joint is not less than 85 % of the un-jointed solid conductor.

The diameter of the conductor shall be between 0,4 mm to 0,8 mm.

### 5.2 Mechanical requirements

The conductor elongation at break shall be tested according to EN 50289-3-2 and shall be minimum 10 % for 0,4 mm wires and better than 15 % for wires with diameters superior to 0,4 mm.



### 5.3 Electrical requirements

#### 5.3.1 Conductor resistance

While measured in accordance with EN 50289-1-2, the conductor resistance shall meet the computed values when using EN 50290-2-1, Subclause 12.1.

#### 5.3.2 Conductor resistance unbalance

While measured in accordance with EN 50289-1-2, the conductor resistance unbalance shall be maximum 2 %.

## 6 Requirements for insulation

### 6.1 Construction material and dimensions

#### 6.1.1 Construction

Conductor insulation shall be composed of solid, cellular or composite (e.g. foam skin) polyolefin.

The insulation shall be continuous, having a thickness as uniform as possible. The minimum thickness of the insulation shall be measured in accordance with the method specified in EN 60811-1-1, Subclause 8.2.

The insulation shall be applied to fit closely to the conductor. The stripping properties of the insulation shall be checked in accordance with the method specified in EN 60811-1-1, Subclause 8.1. It shall be possible to strip the insulation from the conductor easily and without damage to the insulation or the conductor.

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When required the insulated conductors shall be coloured for identification. Colours shall correspond reasonably with the standard colours shown in HD 402.

#### 6.1.2 Colour code

The colour code shall be agreed between the customer and the manufacturer.

### 6.2 Mechanical requirements

Shrinkage of insulation shall be checked against EN 50290-2-23. The shrinkage shall be less than 5 %.

### 6.3 Electrical requirements

#### 6.3.1 Insulation resistance

When tested according to EN 50289-1-4, the insulation resistance shall be at least 5 000 Mohm.km under 500 V d.c.

#### 6.3.2 Dielectric strength

Dielectric strength shall be tested according to EN 50289-1-3. The test shall be conducted with 1 kV d.c. or 700 V a.c. for 2 s.