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**Stanovanjski in stavbni elektronski sistemi (HBES) – 9-1. del: Inštalacijske zahteve – Upravljalni proces – Splošno pokabljenje za HBES razreda 1, zviti par**

Home and Building Electronic Systems (HBES) – Part 9-1: Installation requirements – Generic cabling for HBES Class 1 Twisted Pair

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EUROPEAN STANDARD

**EN 50090-9-1**

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EUROPÄISCHE NORM

May 2004

ICS 97.120

English version

**Home and Building Electronic Systems (HBES)  
Part 9-1: Installation requirements -  
Generic cabling for HBES Class 1 Twisted Pair**

Systèmes électroniques pour les foyers  
domestiques et les bâtiments (HBES)  
Partie 9-1: Spécifications d'installation -  
Câblage générique pour paire torsadée  
Classe 1

Elektrische Systemtechnik für Heim  
und Gebäude (ESHG)  
Teil 9-1: Installationsanforderungen -  
Verkabelung von Zweidrahtleitungen  
ESHG Klasse 1

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This European Standard was approved by CENELEC on 2003-12-01. 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**

## Foreword

This European Standard was prepared by Technical Committee CENELEC TC 205, Home and Building Electronic Systems (HBES).

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50090-9-1 on 2003-12-01.

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) 2004-12-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2006-12-01

EN 50090-9-1 is part of the EN 50090 series of European Standards, which will comprise the following parts:

Part 1: Standardization structure

Part 2: System overview

Part 3: Aspects of application

Part 4: Media independent layers

Part 5: Media and media dependent layers

Part 6: Interfaces

Part 7: System management

Part 8: Conformity assessment of products

Part 9: Installation requirements

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## Introduction

Home and Building Electronic Systems (HBES) are intended to control devices on networks supporting HBES Class 1 applications (simple control and command) according to CENELEC R205-004.

HBES may be installed in homes and buildings together with other networks. In the past the different networks have been installed independently, usually by different installers. Such separated systems are only widely accepted by the user when the implementation is simple and the cost of installation is low.

One of the primary functions of HBES is to control mains powered devices and therefore in particular the cabling for HBES needs to coexist with the mains distribution network and needs to follow the mains installation rules. Consequently, this document contains description of coexistence of HBES Class 1 Twisted Pair and other networks concerning electrical safety and EMC matters.

## 1 Scope

This standard provides common rules for the planning and engineering as well as installation of HBES cabling systems taking into account the layout of the cable support, cables and connectors, and the commissioning of HBES.

It applies to HBES networks installed according to the legal boundaries of the electrical utilities additionally.

The assessment of an installation shall be based on this standard and CLC/TS 50090-9-2.

Rules for co-existence of HBES Class 1 cabling with mains power, and other networks (i.e. those covered by EN 50173 series, EN 50174 series, EN 50083 series) are also specified.

This part of EN 50090 recommends one specific implementation but allows any solution which supports the required HBES functionality without disturbing, or being disturbed by, other application systems or networks.

This part of EN 50090 is also intended as a predisposition and pre-cabling guide-line for Twisted Pair Class 1.

This document concerns only HBES Class 1 application supported by Twisted Pair (TP) media, and coexistence with HBES Class 2 (Class 1 plus simple voice and stable picture transmission), HBES Class 3 (Class 2 plus complex video transfers, e.g. CAT V, and IT) and power networks. Network coexistence is ensured by infrastructure (see 5.2) and installation requirements.

This document applies specifically to the installation of copper cables.

Power line carrier, and optical fibre communication are outside the scope of this document.

The environmental conditions of EN 50090-2-2 apply to enclosure, connectors and generally to all Twisted Pair HBES devices of the installation.

## 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	<i>Cable networks for television signals, sound signals and interactive services</i>
EN 50090-2-2	<i>Home and Building Electronic Systems (HBES) - Part 2-2: System overview - General technical requirements</i>
EN 50090-2-3 <sup>1)</sup>	<i>Home and Building Electronic Systems (HBES) - Part 2-2: System overview - General functional safety requirements for products intended to be integrated in HBES</i>

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<sup>1)</sup> At draft stage.

- CLC/TS 50090-9-2 <sup>2)</sup> *Home and Building Electronic Systems (HBES) - Part 9-2: Installation requirements - Inspection and testing of HBES installation*
- EN 50173-1:2002 *Information technology – Generic cabling systems – Part 1: General requirements and office areas*
- EN 50174-1:2000 *Information technology – Cabling installation - Part 1: Specification and quality assurance*
- EN 50174-2:2000 *Information technology – Cabling installation - Part 2: Installation planning and practices inside buildings*
- EN 50290 series *Communication cables*
- EN 55022 + A1 *Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement (CISPR 22:1997, modified)*
- EN 55024 *Information technology equipment – Immunity characteristics - Limits and methods of measurement (CISPR 22:1997, modified)*
- EN 60603-7 *Connectors for frequencies below 3 MHz for use with printed boards - Part 7: Detail specification for connectors, 8-way, including fixed and free connectors with common mating features, with assessed quality (IEC 60603-7:1996)*
- EN 60603-8 *Connectors for frequencies below 3 MHz for use with printed boards - Part 8: Two-part connectors for printed boards, for basic grid of 2,54 mm (0,1 in), with square male contacts of 0,63 mm x 0,63 mm (IEC 60603-8:1990)*
- EN 60715 *Dimensions of low-voltage switchgear and controlgear - Standardized mounting on rails for mechanical support of electrical devices in switchgear and controlgear installations (IEC 60715:1981 + A1:1995)*
- ENV 61024-1 *Protection of structures against lightning - Part 1 General Principles (IEC 61024-1:1990, modified)*
- EN 61140 *Protection against electric shock - Common aspects for installation and equipment (IEC 61140:2001)*
- EN 61508 series *Functional safety of electrical/electronic/programmable electronic safety-related systems (IEC 61508 series)*
- HD 384.5.54 *Electrical installations of buildings - Part 5: Selection and erection of electrical equipment - Chapter 54: Earthing arrangements and protective conductors (IEC 60364-5-54:1980, modified)*
- HD 625.1 *Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests (IEC 60664-1:1992, modified)*
- 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*
- IEC 60364-4-44 *Electrical installations of buildings - Part 4-44: Protection for safety - Protection against voltage disturbance and electromagnetic disturbances*
- IEC 60670-1:2002 *Boxes and enclosures for electrical accessories for household and similar fixed electrical installations - Part 1: General requirements*
- IEC 60807-2 *Rectangular connectors for frequencies below 3 MHz - Part 2: Detail specification for a range of connectors, with assessed quality, with trapezoidal shaped metal shells and round contacts - Fixed solder contact types*
- IEC 60807-3 *Rectangular connectors for frequencies below 3 MHz - Part 3: Detail specification for a range of connectors with trapezoidal shaped metal shells and round contacts - Removable crimp contact types with closed crimp barrels, rear insertion/rear extraction*

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<sup>2)</sup> Under consideration



ISO/IEC 15018 <sup>3)</sup> *Information technology - Integrated cabling system for homes*  
EN ISO 16484-2 *Building automation and control systems (BACS) - Part 2: Hardware*

### 3 Definitions and abbreviations

#### 3.1 Definitions

For the purposes of this document the following definitions apply.

##### 3.1.1

##### **application (in the sense of network application)**

a system with its associated transmission method which is supported by telecommunications/ HBES cabling

[EN 50173-1:2002, definition 3.1.2, with /HBES modified]

##### 3.1.2

##### **bridge**

device that connects two or more segments of a network at the physical and data link layers of layers the ISO-OSI basic reference model.

NOTE This device can also perform message filtering based upon MAC layer addresses.

[EN ISO 16484-2, definition 3.28]

##### 3.1.3

##### **broadband**

signals requiring a wide bandwidth for their transmission, e.g. video

##### 3.1.4

##### **building**

an individual fixed structure. This may contain commercial residential, or light industrial premises

##### 3.1.5

##### **bus**

a common path within an apparatus or station over which signals from a number of channels pass with separation achieved by time division multiplexing

[IEC 60050, Part 704]

##### 3.1.6

##### **cable**

assembly of one or more cable units of the same type and category in an overall sheath. It may include an overall screen

[EN 50173-1:2002, definition 3.1.7]

##### 3.1.7

##### **cable element**

the smallest construction unit in a cable. A cable element may have a screen

[EN 50173-1:2002, definition 3.1.8]

##### 3.1.8

##### **cable type**

description of a cable according to its construction e.g. coaxial, TP, etc.

##### 3.1.9

##### **cable unit**

single assembly of one or more cable elements usually of the same type or category. A cable unit may have a screen

[EN 50173-1:2002, definition 3.1.9]

##### 3.1.10

##### **cabling**

system of telecommunication/HBES cables, cords and connecting hardware that support the operation of information technology respectively HBES equipment

[EN 50173-1:2002, definition 3.1.10, with /HBES modified]

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<sup>3)</sup> At draft stage.

**3.1.11****campus**

a premises containing one or more buildings

[EN 50173-1:2002, definition 3.1.11]

**3.1.12****canalisation**

ducting, trunking, conduits, etc.

**3.1.13****channel**

end to end transmission path connecting any two pieces of application specific equipment. Equipment cables and work area cables are included in the channel

[EN 50173-1:2002, definition 3.1.14]

**3.1.14****circuit breaker**

mechanical switching device, capable of making, carrying and breaking currents under normal circuit conditions and also making, carrying for a specified time, and automatically breaking currents under specified abnormal circuit conditions such as those of short-circuit

**3.1.15****comfort class**

level of service options provided by the HBES system

**3.1.16****cross-connect**

a facility enabling the termination of cable elements and their connection, primarily by means of patch cords or jumpers

**3.1.17****distribution board**

an assembly containing switching or protective devices (e.g. fuses or miniature circuit-breakers) associated with one or more outgoing circuits fed by one or more incoming circuits, together with terminals for the neutral and protective circuit conductors. It may also include signalling and other control devices

**3.1.18****double pole mains switch**

device designed to make and break the current in a single phase or in a double phase circuit

**3.1.19****feeding zone**

space in which the mains power supply cables are installed

**3.1.20****functional insulation**

insulation between conductive parts which is necessary for the proper functioning of the equipment

**3.1.21****fuse**

switching device that, by the melting of one or more of its specially designed and proportioned components, opens the circuit in which it is inserted and breaks the current when this exceeds a given value for a sufficient time

**3.1.22****gateway**

unit connecting different networks or parts of one network and performing any necessary protocol translations

**3.1.23****Handover Box**

box containing an interface between networks within a building and networks of external service suppliers (generally located in IS1). In certain cases this Handover Box is a legally required boundary

### 3.1.24

#### **Home and Building Electronic Systems (HBES)**

a multi-application data bus system where the functions are decentrally distributed and linked through a common communication process

NOTE HBES is used in homes and buildings plus their surroundings. Functions of the system are e.g. switching, open loop controlling, closed loop controlling, monitoring and supervising

[EN 50090-2-3, definition 3.10]

### 3.1.25

#### **HBES Class 1**

HBES with capabilities for telecontrol applications such as:

- control
- monitoring
- measurement
- alarm
- low speed data transfer

NOTE These capabilities are typically provided for by:  
- single packet-mode low bandwidth channel,  
- digital transmission.

### 3.1.26

#### **HBES Class 2**

HBES with Class 1 capabilities plus:

- Switched voice or other information transfer with similar bandwidth

NOTE These capabilities are typically provided for by a Class 1 system enhanced with:  
- multiple switched medium bandwidth channels,  
- analogue or digital transmission or both.

In principle all Class 2 capabilities can be supported on a single Class 2 channel. For practical reasons, however, HBES Class 2 may contain a separate channel or use a separate medium to support Class 1 capabilities

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### 3.1.27

#### **HBES Class 3**

HBES with Class 2 capabilities plus:

- Switched high quality sound and video transfer and high speed data transfer

NOTE These capabilities are typically provided for by a Class 2 system enhanced with:  
- multiple switched high bandwidth channels,  
- analogue or digital transmission or both.

In principle all Class 3 capabilities can be supported on a single Class 3 channel. For practical reasons, however, HBES Class 3 may contain a separate channel or use a separate medium to support Class 1 and Class 2 capabilities

### 3.1.28

#### **home**

fixed residential premises for use by a single family or household as a dwelling place. This may be an individual building or a part of a larger building e.g. an apartment

### 3.1.29

#### **house**

single building used as a home villa or as a small office

### 3.1.30

#### **Installation Spaces (IS)**

void part or wall surface of the building specifically intended to host boxes, cabinets, enclosure, mounted-in-wallbox containing themselves active and/or passive devices, and their cables

### 3.1.31

#### **interface**

the point at which application specific equipment is connected to the cabling

### 3.1.32

#### **line coupler**

device for connecting two different lines in the logical topology of a network

**3.1.33****link**

transmission path between any two interfaces of generic cabling. It excludes equipment cords and work area cords

[EN 50173-1:2002, definition 3.1.36]

**3.1.34****link segment**

the part of a link

**3.1.35****multimedia**

the use of a number of different media e.g. sound, vision etc.

**3.1.36****protective separation**

double insulation or reinforced insulation for rated insulation voltages in mains

NOTE In the context of installation the following definition applies: separation of live parts to provide protection against electric shock.

**3.1.37****separation**

routing of cables that maintain a minimum distance for EMC purposes, or for insulation

**3.1.38****screened cable**

assembly of two or more balanced Twisted Pair cable elements or one or more quad cable elements where each element is individually screened and/or the elements are contained within an overall screen

[EN 50173-1:2002, definition 3.1.45]

**3.1.39****screen**

screen used to minimize interference between cable elements and to protect cables and attached equipment from extraneous electric and/or magnetic fields and to reduce the emission of electromagnetic radiation generated by applications connected to the cabling

**3.1.40****terminal block**

an insulating part carrying one or more mutually insulated terminal assemblies and intended to be fixed to a support

**3.1.41****Twisted Pair**

cable element that consists of two insulated conductors twisted together in a determined fashion to form a balanced transmission line

[EN 50173-1:2002, definition 3.1.55]

**3.1.42****Twisted Pair Class 1 bus outlet**

connection point between Twisted Pair Class 1 network and flexibly connected HBES devices

**3.1.43****passive tap**

connection point for short cable link for extension

### 3.2 Abbreviations

AC	Alternating Current	
AM	Application Module	
BAU	Bus Access Unit	
CATV	Cable TV	
HBES Class 1	refers to simple control and command	
HBES Class 2	refers to Class 1 plus simple voice and stable picture transmission	
HBES Class 3	refers to Class 2 plus complex video transfers	
TP Type 0	HBES Class 1, Twisted Pair Type 0	
TP Type 1	HBES Class 1, Twisted Pair Type 1	
DC	Direct Current	
EMC	Electromagnetic Compatibility	
HVAC	Heating, Ventilation & Air Conditioning	
HBES	Home and Building Electronic Systems	
IS	Installation Space	
	in this standard	ISO/IEC 15018)
IS1	Space for campus entrance facility	
IS2	Space for building distributor	BEF Building Entrance Facility
IS3	Space for floor distributor	HD Home Distributor
IS4	Space for home distributor	HD Home Distributor
		SHD Secondary HD
IS5	Room connection point	Primary ACP
IS6	Application connection point	ACP Application Connection Point
IT	Information Technology	
LV	Low Voltage	
PC	Personal Computer	
PE	Protective Earth (conductor)	
TNV	Telecommunication Network Voltage	
TO	Telecommunication Outlet	
TP	Twisted Pair	

### 4 Aspects of system and cabling

An HBES cabling system can be installed on residential premises as well as in other buildings. It is designed to support the new construction, extension or retrofitting of buildings.

An appropriate design of a HBES network shall pay attention to the following factors: size, infrastructure and purpose of the building (home, commercial or light industrial environment), whether it is a new or an existing building and the type of occupancy of the building.

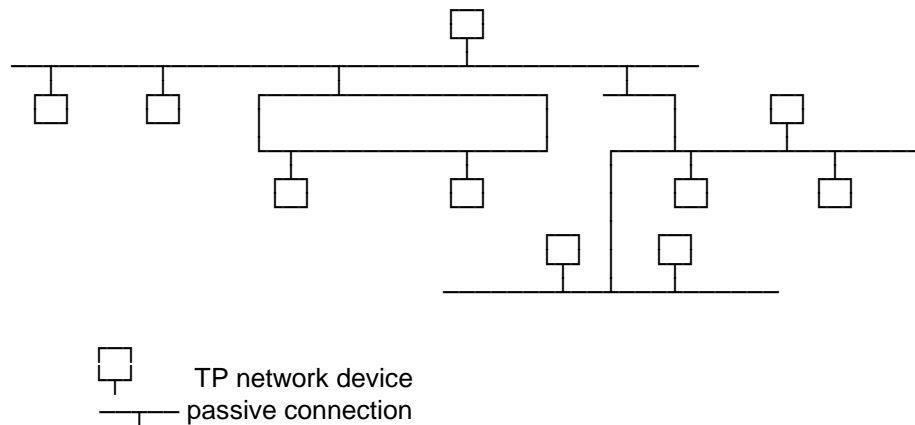
Depending on the application specification, the cabling for TP may be configured as bus tree, star and loop or/and their combinations (see Figure 1). TP may be cut everywhere for providing branches.

For example: In retrofitting, a new actuator for HVAC control could be simply installed with a new branch and a passive tap.

In any building, both indoor and outdoor installations have to be taken into account. Outdoor installation includes front doors, garages, shafts, etc.

In a HBES system, the devices are usually fixed, a lighting point in the ceiling will stay in place, as will a window-shutter or HVAC fixture. Nevertheless moveable appliances can be connected. Many modifications, however, will occur during the building life (e.g. change of devices, the addition or removal of walls...). Therefore flexibility is required which can be achieved by aligning the HBES installation with that of the mains network as far as possible. Twisted Pair can be branched off for the installation of an extension at each point one chooses.

HBES itself contains several wired media. An overview of these is given in Table B.1.



**Figure 1 – Example of possible topology**

## 5 Cabling model and general requirements

### Introduction

Cabling solutions offer flexibility for many applications. These applications may be linked with one other or may be independent sharing only the same wiring.

### 5.1 Connection of segments, general requirements

The cabling system specified in this standard consists of interfaces, where application specific equipment may be connected, and the links between such interfaces. A link may consist of more than one segment. At every point in a segment where other link segments are to be connected and at the interfaces of links Installation Spaces shall be provided. The type of Installation Spaces needed is shown in the hierarchy in Figure 2.

Installation Spaces IS1 to IS6 are spaces intended for fixing cabinets, enclosures and/or boxes, e.g. according to IEC 60670 and containing active and/or passive devices as well as connecting hardware.

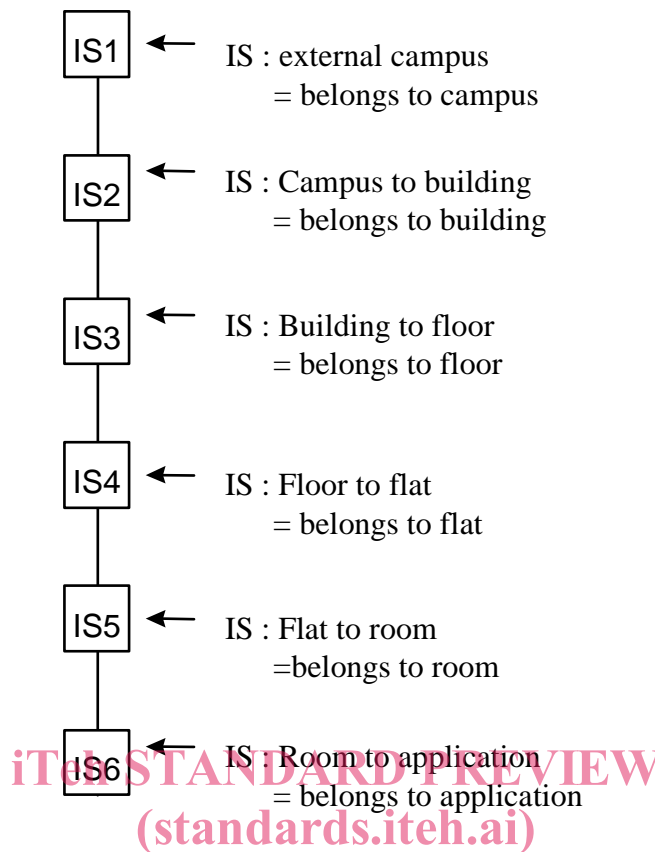
The requirements for Installation Space and related equipment are specified in Clause 8.

The Installation Space shall:

- make apparent the change in level in the hierarchy,
- offer appropriate standardized connection hardware for fixing the equipment in an Installation Space,
- enable location of active and passive (modular) devices, including any insulation and separation required,
- facilitate access to the media and related equipment,
- allow management and extension of the network.

An Installation Space may also be used for the Handover Box to all external services. All IS shall be provided according to the building structure, as a minimum IS4 shall be provided.

The Installation Spaces also allow the cable network to be divided into distinct physical segments so that any failure or disturbance may be limited to a single segment and not affect the entire network. For electrical safety requirements see 9.1 and 9.2.



NOTE 1 IS6 is to be provided for each termination. IS6 can be moved into IS5 according to the application.

NOTE 2 See 3.2 for abbreviations compared to ISO/IEC 15018.

**Figure 2 – HBES Installation Spaces (IS) principle**

## 5.2 Coexistence between HBES control bus, broadband multimedia and mains

The intention of this standard is to allow the cables for different media and for mains to use the same canalisation and ducts etc., so far as is appropriate, in order to simplify installation and, where possible, to allow all wired media to be combined in one canalisation. Table 1 lists examples of applications the cabling of which may be desired to use the same canalisation.

The coexistence of different media and mains can also be provided within the Installation Spaces, within enclosures and boxes as well as within the interfaces/components.

In some areas of the cabling hierarchy relevant characteristics e.g. for lightning protection, EMC and availability, see Clauses 9 and 10, have to comply with respective requirements.

In any case the national regulations, if any, prevail on these requirements.