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Home and building electronic systems (HBES) - Part 2-2: System overview - General technical requirements

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Elektrische Systemtechnik für Heim und Gebäude (ESHG) -- Teil 2-2: Systemübersicht - Allgemeine technische Anforderungen

Systèmes électroniques pour les foyers domestiques et les bâtiments (HBES) -- Partie 2-2: Vue d'ensemble du système - Exigences techniques générales

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English version

Home and building electronic systems (HBES)
Part 2-2: System overview - General technical requirements

Systèmes électroniques pour les foyers domestiques et les bâtiments (HBES)
Partie 2-2: Vue d'ensemble du système
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This European Standard was approved by CENELEC on 1996-10-01. 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.

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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 has been prepared by Technical Committee CENELEC TC 205, Home and Building Electronic Systems (HBES).

This European Standard has been prepared under a mandate given to CENELEC by the European Commission and covers the essential requirements of the following EC Directives.

- Low Voltage Directive 73/23/EEC;
- EMC Directive 89/336/EEC and its amendments 92/31/EEC and 93/68/EEC.

This European Standard should also be used as family standard; it is also addressed to product committees, which are free to adopt it for their needs.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50090-2-2 on 1996-10-01.

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) 1997-06-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) -

EN 50090-2-2 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: Transport layer and network layer

Part 5: Media and media dependent layers

Part 6: Interfaces

Part 7: System Management

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1 Scope

This European standard defines the general technical requirements of a Home and Building Electronic System (HBES) based on SELV or PELV. It concerns cabling and topology, electrical and functional safety, environmental conditions and behaviour in case of failures as well as specific HBES installation rules.

The HBES includes also the interfaces of devices and equipment providing connection to the HBES. Parts of devices and equipment not providing HBES functionality are not included. For such parts the relevant product standards apply.

NOTE: Reference is made also to CENELEC Technical Report R205-002.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 29646-1	Information technology - Open Systems Interconnection - Conformance testing methodology and framework -- Part 1: General concepts (ISO/IEC 9646-1:1994)
EN 45001	General criteria for the operation of testing laboratories
EN 45011	General criteria for certification bodies operating product certification
EN 50081-1	Electromagnetic compatibility - Generic emission standard -- Part 1: Residential, commercial and light industry
EN 50082-1	Electromagnetic compatibility - Generic immunity standard -- Part 1: Residential, commercial and light industry
EN 50090-2-1	Home and Building Electronic Systems (HBES) -- Part 2-1: System overview - Architecture
EN 55022	Limits and methods of measurement of radio disturbance characteristics of information technology equipment (IEC/CISPR 22:1993)
EN 60068-2-1	Environmental testing -- Part 2: Tests - Tests A: Cold (IEC 68-2-1:1990)
EN 60068-2-2	Basic environmental testing procedures -- Part 2: Tests - Tests B: Dry heat (IEC 68-2-2:1974 + IEC 68-2-2A:1976)
EN 60068-2-6	Environmental testing -- Part 2: Tests - Test Fc: Vibration (sinusoidal) (IEC 68-2-6:1995 + corrigendum March 1995)
EN 60068-2-27	Basic environmental testing procedures -- Part 2: Tests - Test Ea and guidance: Shock (IEC 68-2-27:1987)
EN 60721-3-3	Classification of environmental conditions -- Part 3: Classification of groups of environmental parameters and their severities -- Section 3: Stationary use at weatherprotected locations (IEC 721-3-3:1994)
ENV 61000-2-2	Electromagnetic compatibility (EMC) -- Part 2: Environment -- Section 2: Compatibility levels for low-frequency conducted disturbances and signalling in public low-voltage power supply systems (IEC 1000-2-2:1990, modified)
EN 61000-3-2	Electromagnetic compatibility (EMC) -- Part 3: Limits -- Section 2: Limits for harmonic current emissions (equipment input current up to and including 16 A per phase) (IEC 1000-3-2:1995)
EN 61000-3-3	Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to and including 16 A (IEC 1000-3-3:1994)

EN 61000-4-2	Electromagnetic compatibility (EMC) -- Part 4: Testing and measurement techniques -- Section 2: Electrostatic discharge immunity test (IEC 1000-4-2:1995)
EN 61000-4-3	Section 3: Radiated, radiofrequency, electromagnetic field immunity test (IEC 1000-4-3:1995, modified)
EN 61000-4-4	Section 4: Electrical fast transient/burst immunity test (IEC 1000-4-4:1995)
EN 61000-4-5	Section 5: Surge immunity test (IEC 1000-4-5:1995)
EN 61000-4-6	Section 6: Immunity to conducted disturbances, induced by radio- frequency fields (IEC 1000-4-6:1996)
EN 61000-4-11	Section 11: Voltage dips, short interruptions and voltage variations immunity tests (IEC 1000-4-11:1994)
HD 21.1 S2	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V Part 1: General requirements (IEC 227-1:1979, modified)
HD 21.2 S2	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V Part 2: Test methods (IEC 227-2:1979, modified)
HD 323.2.3 S2	Basic environmental testing procedures -- Part 2: Tests - Test Ca: Damp heat, steady state (IEC 68-2-3:1969 + A1:1984)
HD 323.2.14 S2	Basic environmental testing procedures -- Part 2: Tests - Test N: Change of temperature (IEC 68-2-14:1984 + A1:1986)
HD 323.2.30 S3	Basic environmental testing procedures -- Part 2: Tests - Test Db and guidance: Damp heat, cyclic (12+12-hour cycle) (IEC 68-2-30:1980 + A1:1985)
HD 384.4.41 S2	Electrical installations of buildings -- Part 4: Protection for safety -- Chapter 41: Protection against electric shock (IEC 364-4-41:1996, modified)
HD 384.4.43 S1	Electrical installations of buildings -- Part 4: Protection for safety -- Chapter 43: Protection against overcurrent (IEC 364-4-43:1977)
HD 384.5.523 S1	Electrical installations of buildings -- Part 5: Selection and erection of electrical equipment -- Chapter 52: Wiring systems - Section 523: Current-carrying capacities (IEC 364-5-523:1983, modified)
R205-002	Home and Building Electronic Systems - Technical Report 2: Guidelines for the professional installation of twisted pair cables - Class 1
IEC 50(191)	International Eelectrotechnical Vocabulary -- Chapter 191: Dependability and quality of service
IEC 189-2	Low-frequency cables and wire with p.v.c. insulation and p.v.c sheath -- Part 2: Cables in pairs, triples, quads and quintuples for inside installations
IEC 536-2	Classification of electrical and electronic equipment with regard to protection against electric shock - Part 2: Guidelines to requirements for protection against electrical shock
IEC 664-1	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests
IEC 1140	Protection against electric shock- Common aspects for installation and equipment
IEC 1196-1	Radio-frequency cables - Part 1: Generic specification - General definitions, requirements and testing methods
CCITT K.20	Resistibility of telecommunication switching equipment to overvoltages and overcurrents

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this standard the following definitions apply:

3.1.1 physical medium: The physical carrier, such as cable, infra-red, radio, that forms the topology..

NOTE 1: If the context is clear, "medium" instead of "physical medium" may be used.

NOTE 2: Examples of topologies are bus, tree or star.

3.1.2 conformity: Fulfilment by a product, process or service of all requirements specified.

3.1.3 product interworking: Capability of a product, conformant to a set of standards, to communicate with other products and to properly operate their intended functions or properly respond to their stimuli according to the application specifications.

3.2 Abbreviations

A	Attenuation
AC	Alternating current
AM	Amplitude modulation
AT	Antenna
BI	Basic insulation for rated insulation voltage
C	Coupling network
CC	Capacity clamp
CDN	Coupling-decoupling network
Ctr/Eval	Control and evaluation equipment
CU	Communication unit
CX	Coaxial
D	Device needed for functional test of the EUT
DC	Direct current
DF	Decoupling filter
DI	Double insulation
ESD	Electro-static discharge
EUT	Equipment under test
F	Filter
G	Test generator
HBES	Home and Building Electronic System
HF	High frequency
I/O	Input/output
I/O-Adpt	Input-/output adaptation of the EUT
M/C-Adpt	Measurement/control adaptation
MEQU	Measurement equipment
MI	Medium Interface
NAU	Network access unit
PELV	Protective extra low voltage
PF	Passing filter
PI	Process Interface
PSU	Power supply unit
RF	Radio frequency
RI	Reinforced insulation for rated insulation voltage in mains environment
SELV	Safety extra low voltage
T	Termination
T/R	Transmitter/receiver
TP	Twisted pair
UI	Universal Interface
U_{N+S}	Mains voltage with added test signals
V_N	Artificial mains V-network
Z	load impedance

4 Topology, cabling and power supply

4.1 Topology

4.1.1 Topology of control cables

For control purposes in principle different types of physical media may be used. Among these physical media twisted pair (TP) cables are mostly used. As this HBES medium (TP) is dedicated for a wide range of home

and building applications, it allows several types of wiring topologies. In particular tree, star, loop, and bus topologies are supported for this medium. Also combinations of these topologies are possible. For a network consisting of several HBES TP media connected by bridges or routers, restrictions to the overall topology may apply (e.g. loops will normally not be supported).

See also R205-002 for figures and recommendations regarding multiple networks or HBES TP media.

4.1.2 Topology of information cables

Under consideration

4.2 Cabling

4.2.1 Planning

The network shall be planned before the beginning of any construction or renovating of a building. All aspects of installation and connections to the mains power supply network or communication networks have to comply with the relevant European standards (or national standards, when European standards are not available), especially where safety and electromagnetic compatibility aspects are concerned.

See also R205-002.

4.2.2 Control cables

Several cables may be used, (see also R205-002).

For insulation requirements see 5.2.3.

Other types of cables may be used to optimize cost or transmission or to use an existing prewiring. For installation of such cables 5.2.3.3 applies (see also R205-002).

4.2.3 Information cables

Under consideration

4.3 Power supply

In addition to the control and information transfer functions, the HBES shall have a DC SELV or PELV power supply function. A power supply function is provided by a power supply unit (PSU) which may be a stand alone device or which may be integrated into another device. This allows a remote power supply for several connected devices. The power supply can be either provided through the same two wires used for communication or through a second pair of the cable. According to the characteristics of the power supply current, only electronic devices with limited power consumption (some tens of milliwatts), such as sensors, or actuators, can be powered. To make sure, that a cable is not thermally overloaded, the power supply shall have a short circuit and/or overload current limitation.

An example of a possible combination of HBES devices with different power supply units connected to a bus is shown in figure 1.

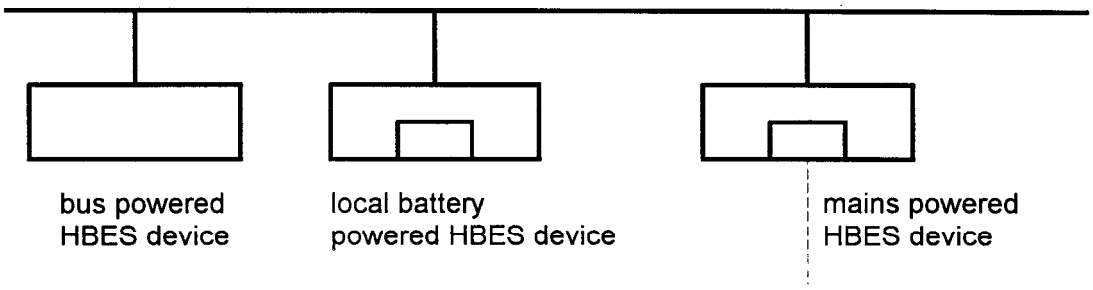

Figure 1: Power supply units of HBES devices

5 Safety

5.1 General

The entire HBES System, i.e. media and devices as well as their installation, shall ensure safe operation and protection against electric shock and fire during normal service as well as under specified abnormal conditions.

This is achieved by compliance with the electrical safety requirements in 5.2 and the functional safety requirements in 5.3.

NOTE: In this clause the term "device" means "devices and equipment"

5.2 Electrical safety requirements

5.2.1 Compliance

The electrical safety is ensured by compliance with

a) the general requirements in accordance with 5.2.2;

b) the requirements for media, i.e. cables with conductors in accordance with 5.2.3;

c) the requirements for devices in accordance with 5.2.4;

d) the requirements for the installation in accordance with 5.2.5.

5.2.2 General

To achieve the required protection against electric shock SELV or PELV as defined in HD 384.4.41 S2 shall be used as the protective measure for the HBES circuits of twisted pair and coaxial media.

If for functional reasons a connection between SELV circuits and earth is required this connection shall comply with the requirements for protective impedances as described in IEC 1140 or in IEC 536-2.

5.2.3 Cables

5.2.3.1 Types of cables

Cables for HBES shall be of the sheathed cable type. Twisted pair (TP) cables shall be in accordance with IEC 189-2. Coaxial (CX) cables shall be in accordance with IEC 1196-1.

5.2.3.2 Protection against overheating and overcurrent

The temperature limits and current-carrying capacities specified in HD 384.5.523 S1 shall not be exceeded.

NOTE: The current limitation may be provided by the power supply unit (clause 436 in HD 384.4.43 S1:1980).

5.2.3.3 Electric strength and installation requirements

Cables complying with the test described in 5.2.3.4 for 2,5 kV AC may be installed without distance between mains and HBES cables (cables may come into touch).

NOTE: Mains means a nominal voltage of the supply system of max. 230/400 V.

Cables according to 5.2.3.1 as well as mains cables not complying with the test described in 5.2.3.4 shall be installed with a minimum distance of 10 mm between the outer surfaces of cables or the separation shall be ensured by one of the measures described in 411.1.3.2 of HD 384.4.41 S2:1996.

5.2.3.4 Electric strength test

The high voltage test is a withstand test between the wire and the outer surface of the cable.

The test follows HD 21.1 S2 and HD 21.2 S2 with the following modifications:

Test voltage and test time:	2,5 kV AC 50 Hz / 5 min or in addition 4 kV AC 50 Hz / 1 min
Set-up:	The test voltage is applied to all cores and screen connected together and the outer surface of the sheath. The cable is immersed in water.

5.2.4 HBES devices

5.2.4.1 General

HBES devices shall provide protective separation for the rated insulation voltage of the device externally to any adjacent equipment and internally to parts, devices and equipment of other circuits, if any (see also 4.3 in IEC 536-2:1992).

HBES devices shall comply with the standards as outlined in table 1.

Table 1: Applicable standards for HBES devices

Situation for device standard		Applicable standards	
Device standard exists	Device standard includes HBES interface requirements explicitly	Device standard	5.2.4 of EN 50090-2-2:1996 (this standard)
YES	YES	applies	---
YES	NO	applies	applies
NO	NO	---	applies

NOTE: Subclause 5.2.4 does not cover basic safety of the device.

5.2.4.2 Specification of insulation

In order to achieve the required protective separation the rated insulation voltage shall be specified according to IEC 664-1 with the following parameters:

a)	Overvoltage category:	III
	Rated impulse withstand voltage	in accordance with Table 1 in IEC 664-1:1992
b)	Pollution degree:	2 or 3
c)	Material class:	min IIIa

5.2.4.3 Protective separation

Arrangements shall ensure electrical separation between mains (and other hazardous voltages) and SELV/PELV in accordance with 411.1.3.1 of HD 384.4.41 S2:1996. The required insulation for protective separation can be achieved by one of the methods given in table 2.

Table 2: Methods used to provide the required insulation for protection separation

Environment	insulation
mains 230/400 V e.g. HBES devices for use in mains distribution boards or in combinations with mains devices	- Basic insulation for RIV[1)] and supplementary insulation for RIV - Basic insulation for RIV applied two times - Basic insulation for RIV and screen connected to protective earth - Basic insulation for RIV and an additional external insulation - Basic insulation for RIV and a barrier of basic insulation quality - Basic insulation for RIV and supplementary basic separation (e.g. distance) - Reinforced insulation for RIV
other non-SELV/PELV circuits with voltages less than mains supply voltage	Double or reinforced insulation for RIV according to the methods under mains environment
SELV/PELV e.g. HBES devices containing only SELV or PELV circuits which are in the same enclosure together with other equipment also with SELV/ PELV only or are mounted far away from other than SELV/PELV circuits	Basic insulation for RIV
1) RIV Rated insulation voltage (see 1.3.9.1 in IEC 664-1:1992) RIV for mains devices e.g. 250 V or for mains cable e. g. 300/400V RIV for SELV depends on the highest SELV voltage RIV for PELV corresponds to PELV + 50 V	

HBES devices containing 230 V and SELV/PELV circuits shall provide an insulation for protective separation for mains 230/400 V environment according to Table 2, externally (between HBES equipment and other circuits outside the HBES device) and internally (between HBES circuits and other circuits inside the HBES device)(see figure 2a), 2b)).

NOTE 1: Figure 2a) addresses the SELV/PELV part within single mains operated devices, which are intended to be used either in SELV/PELV installations or in mains installations, where basic insulation of mains live parts can be expected. Figure 2b) addresses the SELV/PELV part within single mains operated devices, which are intended to be used in installations, where hazardous voltages appear (including mains installations).

Double or reinforced insulation for the rated insulation voltage shall be provided between any accessible surface/part (e.g. operating handles, toggles, push buttons, front plates) of the HBES device and live parts of internal non-SELV/PELV circuits.

HBES devices containing only SELV/PELV circuits shall provide an insulation (externally between HBES equipment and other circuits outside the HBES device) according to mains 230/400 V environment (see figure 2c)) unless the usage in an other environment is made clearly visible either by marking, an instruction sheet or similar means (see figure 2d)).

NOTE 2: Figure 2c) addresses SELV/PELV devices, which are intended to be used in installations, where hazardous voltages appear (including mains installations). Figure 2d) addresses SELV/PELV devices, which are intended to be used in SELV/PELV installations.

For combinations of HBES devices, e.g. mounting in distribution boards or in common wall boxes, the same rules apply. In addition the protective separation is considered to be provided if each of the devices combined provides "Basic Insulation for the rated insulation voltage" (see figure 3).

Terminals of devices used in such combinations shall at least provide "Basic Insulation for the rated insulation voltage" to the surface of the device.