

Svenska Elektriska Kommissionen, SEK

Fastställt	Utgåva	Sida	Ingår i
2005-06-15	1	1 (1+45)	SEK Område 205

© Copyright SEK. Reproduction in any form without permission is prohibited.

Installationsbussar – Del 5-1: Media och medieberoende skikt – Signalöverföring på elnät, HBES klass 1

*Home and Building Electronic System, HBES –
Part 5-1: Media and media dependent layers –
Power line for HBES Class 1*

Som svensk standard gäller europastandarden EN 50090-5-1:2005. Den svenska standarden innehåller den officiella engelska språkversionen av EN 50090-5-1:2005.

ICS 97.120

Denna standard är fastställd av Svenska Elektriska Kommissionen, SEK, som också kan lämna upplysningar om **sakinnehållet** i standarden.
Postadress: SEK, Box 1284, 164 29 KISTA
Telefon: 08 - 444 14 00. Telefax: 08 - 444 14 30
E-post: sek@sekom.se. Internet: www.sekom.se

Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a säkerhet, prestanda, dokumentation, utförande och skötsel av elprodukter, elanläggningar och metoder. Genom att utforma sådana standarder blir säkerhetskraven tydliga och utvecklingskostnaderna rimliga samtidigt som marknads acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

SEK är Sveriges röst i standardiseringsarbetet inom elområdet

Svenska Elektriska Kommissionen, SEK, svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

SEK

Box 1284
164 29 Kista
Tel 08-444 14 00
www.sekom.se

English version

**Home and Building Electronic Systems (HBES)
Part 5-1: Media and media dependent layers -
Power line for HBES Class 1**

Systèmes électroniques pour les foyers
domestiques et les bâtiments (HBES)
Partie 5-1: Médias et couches
dépendantes des médias -
Courants porteurs pour HBES Classe 1

Elektrische Systemtechnik für Heim
und Gebäude (ESHG)
Teil 5-1: Medien und medienabhängige
Schichten -
Signalübertragung auf elektrischen
Niederspannungsnetzen
für ESHG Klasse 1

This European Standard was approved by CENELEC on 2004-09-01. 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 one official version (English). 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 the Technical Committee CENELEC TC 205, Home and Building Electronic Systems (HBES) with the help of CENELEC co-operation partner Konnex Association, Neerveldstraat 105, B-1200 Brussels, (former EHBESA).

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50090-5-1 on 2004-09-01.

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) 2005-09-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2007-09-01

CENELEC takes no position concerning the evidence, validity and scope of patent rights.

Konnex Association as Cooperating Partner to CENELEC confirms that to the extent that the standard contains patents and like rights, the Konnex Association's members are willing to negotiate licenses thereof with applicants throughout the world on fair, reasonable and non-discriminatory terms and conditions.

Attention is drawn to the possibility that some of the elements of this standard may be the subject of patent rights other than those identified above. CENELEC shall not be held responsible for identifying any or all such patent rights.

EN 50090-5-1 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

Contents

1	Scope.....	5
2	Normative references	5
3	Definitions and abbreviations.....	6
3.1	Definitions	6
3.2	Abbreviations	6
4	Requirements for HBES Class 1, power line PL110	7
4.1	Physical layer PL110.....	7
4.1.1	General	7
4.1.2	Transmission medium.....	8
4.1.3	Medium attachment unit (MAU).....	9
4.1.4	Installation topology	12
4.1.5	Installation requirements	12
4.1.6	Surge protection	13
4.1.7	Services at the data link layer / physical layer interface	13
4.1.8	Features of PL110 physical layer.....	14
4.2	Data link layer type PL110.....	18
4.2.1	Domain Address/Individual Address/Group Address	19
4.2.2	Frame formats	20
4.2.3	Medium access control	24
4.2.4	Data link layer services	28
4.2.5	Parameters of layer-2	30
4.2.6	Data link layer protocol.....	30
4.2.7	The layer-2 of a repeater	31
5	Requirements for HBES Class 1, power line PL132	32
5.1	General	32
5.2	Physical layer PL132	32
5.2.1	Medium definition	32
5.2.2	Datagram service	33
5.3	Data link layer type power line 132.....	36
5.3.1	Frame format.....	36
5.3.2	Medium access control	41
5.3.3	L_Data service and protocol	41
5.3.4	L_PollData service	44
5.3.5	L_Busmon service	44
5.3.6	L_Service_Information service	44
	Bibliography.....	45
	Figure 1 - Structure of the MAU (example)	8
	Figure 2 - Signal encoding.....	10
	Figure 3 - Idealized overlapping of 105,6 kHz and 115,2 kHz	11
	Figure 4 - Example of a PL inductive coupling circuit	12
	Figure 5 - Example of a typical PL topology.....	12
	Figure 6 - Character	14
	Figure 7 - Structure of a datagram	15
	Figure 8 - Structure of an acknowledgement frame	15
	Figure 9 - Generation matrix of PL110	16

Figure 10 - Operations of Galois-Field GF2	17
Figure 11 - Three phase system	18
Figure 12 - Domain Address	19
Figure 13 - Individual Address.....	19
Figure 14 - Group Address	19
Figure 15 - Format 1s, frame fields with standard fieldname abbreviations	20
Figure 16 - Format 1s, L_Data_standard request frame format.....	20
Figure 17 - Control field.....	21
Figure 18 - Check octet	22
Figure 19 - Frame fields with standard fieldname abbreviations	22
Figure 20 - Format 1e, L_Data_extended request frame format.....	22
Figure 21 - Extended control field.....	23
Figure 22 - Format 2, short acknowledgement frame format	24
Figure 23 - Timing diagram of an L_Data-request frame	27
Figure 24 - Complete frame encapsulation (datagram)	34
Figure 25 - Overview of primitives.....	35
Figure 26 - Frame fields with standard fieldname abbreviations	36
Figure 27 - L_Data request standard frame format.....	37
Figure 28 - Control field	37
Figure 29 - NPCI Field.....	38
Figure 30 - Frame fields with standard fieldname abbreviations	39
Figure 31 - L_Data_extended request frame format.....	39
Figure 32 - Extended control field	39
Figure 34 - Complete acknowledgement frame encapsulation (ACK)	40
Table 1 - General requirements for physical layer PL110.....	7
Table 2 - Example of typical cable characteristics	9
Table 3 - Power supply of the MAU.....	9
Table 4 - Requirements for the impedance of the MAU	11
Table 5 - Table of syndromes related to errors	16
Table 6 - L_Data-request priorities	26
Table 7 - Parameters for Ph-Data service.....	35
Table 8 - Ph-Service class parameters	35
Table 9 - Ph-Result values	36

1 Scope

This European Standard defines the mandatory and optional requirements for the medium specific physical and data link layer of power line Class 1 in its two variations PL110 and PL132.

Data link layer interface and general definitions, which are medium independent, are given in EN 50090-4-1.

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 50090-1	- ¹⁾	<i>Home and Building Electronic Systems (HBES) Part 1: Standardization structure</i>
EN 50090-2-2	1996	<i>Home and Building Electronic Systems (HBES) Part 2-2: System overview - General technical requirements</i>
EN 50090-4-1	2004	<i>Home and Building Electronic Systems (HBES) Part 4-1: Media independent layers - Application layer for HBES Class 1</i>
EN 50090-4-2	2004	<i>Home and Building Electronic Systems (HBES) Part 4-2: Media independent layers - Transport layer, network layer and general parts of data link layer for HBES Class 1</i>
EN 50090-5-2	2004	<i>Home and Building Electronic Systems (HBES) - Part 5-2: Media and media dependent layers - Network based on HBES Class 1, Twisted Pair</i>
EN 50065-1	2001	<i>Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148,5 kHz Part 1: General requirements, frequency bands and electromagnetic disturbances</i>
EN 50065-4-6	2004	<i>Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148,5 kHz Part 4-6: Low voltage decoupling filters - Phase coupler</i>
EN 50065-7	2001	<i>Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148,5 kHz Part 7: Equipment impedance</i>
EN 50160	1999	<i>Voltage characteristics of electricity supplied by public distribution systems</i>
EN 55016-1-2	2004	<i>Specification for radio disturbance and immunity measuring apparatus and methods Part 1-2: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Conducted disturbances (CISPR 16-1-2:2003)</i>
EN 61643-11	2002	<i>Low-voltage surge protective devices – Part 11: Surge protective devices connected to low-voltage power systems - Requirements and tests (IEC 61643-1:1998 + corrigendum Dec. 1998, modified)</i>

¹⁾ At draft stage.