BS EN 50491-6-1:2014

BSI Standards Publication

General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) -

Part 6-1: HBES installations — Installation and planning

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee IST/6/-/12, Home Electronic Systems.

A list of organizations represented on this committee can be obtained on request to its secretary.

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General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) - Part 6-1: HBES installations - Installation and planning

Exigences générales pour systèmes électroniques pour les foyers domestiques et les bâtiments (HBES) et pour systèmes de gestion technique du bâtiment (SGTB) - Partie 6-1 : Installations des HBES - Planification et installation

Allgemeine Anforderungen an die Elektrische Systemtechnik für Heim und Gebäude (ESHG) und an Systeme der Gebäudeautomation (GA) - Teil 6-1: ESHG-Installationen - Installation und Planung

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B - 1000 Brussels

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Foreword

This document (EN 50491-6-1:2014) has been prepared by CLC/TC 205 "Home and Building Electronic Systems (HBES)".

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2014-11-25
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2016-11-25

This European Standard covers the Principle Elements of the Safety Objectives for Electrical Equipment Designed for Use within Certain Voltage Limits (LVD - 2006/95/EC).

This European Standard is complementary to EN 50174-2, “Information technology – Cabling installation – Part 2: Installation planning and practices inside buildings” – Clause 10 “Homes”. The couple of standards constitute the reference for the installation requirements of the home network which includes the telecommunications service distribution and the HBES.

This European Standard specifies the specific HBES installation requirements. EN 50174-2 gives the specific ICT and BCT cabling installation and planning requirements.

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1 Scope

This European Standard specifies the additional specific HBES requirements for the common rules for the planning and the installation of HBES home cabling systems. The structure is in accordance with EN 50174-2.

This European Standard focuses on requirements for HBES cabling systems in homes. Requirements for backbones cabling in buildings are also considered.

HBES radio frequency (RF) systems are considered as extensions or as alternative to cabled systems.

RF connections may have an impact on the infrastructure. Different infrastructure models are presented for the use of RF connections instead of wired ones (e.g. fewer installation spaces IS6).

Optical fibre HBES installation guidelines may be considered in future.

Power line systems are outside the scope of this European Standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 50090 (all parts), *Home and Building Electronic Systems (HBES)*

EN 50090-5-3, *Home and Building Electronic Systems (HBES) – Part 5-3: Media and media dependent layers – Radio frequency*

CLC/TR 50090-9-2, *Home and Building Electronic Systems (HBES) – Part 9-2: Installation requirements – Inspection and testing of HBES installation*

EN 50131-5-3 *Alarm systems – Intrusion systems – Part 5-3: Requirements for interconnections equipment using radio frequency techniques*

EN 50173-4, *Information technology – Generic cabling systems – Part 4: Homes*

EN 50174 (all parts), *Information technology – Cabling installation*

EN 50174-2:2009, *Information technology – Cabling installation – Part 2: Installation planning and practices inside buildings*

EN 50491-2, *General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) – Part 2: Environmental conditions*

EN 50491-3, *General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) – Part 3: Electrical safety requirements*

EN 50491-4-1, *General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) – Part 4-1: General functional safety requirements for products intended to be integrated in Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS)*

EN 50491-5-1, *General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) – Part 5-1: EMC requirements, conditions and test set-up*

EN 50491-5-2, *General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) – Part 5-2: EMC requirements for HBES/BACS used in residential, commercial and light industry environment*

EN 50491-5-3, *General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) – Part 5-3: EMC requirements for HBES/BACS used in industry environment*

CLC/TR 50491-6-3, *General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) – Part 6-3: HBES installations – Assessment and definition of levels*

EN 60670 series, *Boxes and enclosures for electrical accessories for household and similar fixed electrical installations* (IEC 60670 series)

ETSI EN 300 220, *Electromagnetic compatibility and Radio spectrum Matters (ERM); Short Range Devices (SRD); Radio equipment to be used in the 25 MHz to 1 000 MHz frequency range with power levels ranging up to 500 mW*

ETSI EN 301 489, *Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services*

ETSI EN 302 208-1, *Electromagnetic compatibility and Radio spectrum Matters (ERM); Radio Frequency Identification Equipment operating in the band 865 MHz to 868 MHz with power levels up to 2 W; Part 1: Technical requirements and methods of measurement*

ETSI EN 302 208-2, *Electromagnetic compatibility and Radio spectrum Matters (ERM); Radio Frequency Identification Equipment operating in the band 865 MHz to 868 MHz with power levels up to 2 W; Part 2: Harmonized EN covering essential requirements of article 3.2 of the R&TTE Directive*

HD 60364 (all parts), *Low-voltage electrical installations* (IEC 60364)

HD 60364-4-41, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock* (IEC 60364-4-41)

HD 60364-4-444 *Low-voltage electrical installations – Part 4-444: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances* (IEC 60364-4-44)

HD 60364-5-52, *Low-voltage electrical installations – Part 5-52: Selection and erection of electrical equipment – Wiring systems* (IEC 60364-5-52)

HD 60364-5-54, *Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements, protective conductors* (IEC 60364-5-54)

IEEE 802.15.4, *IEEE Standard for Information technology – Telecommunications and information exchange between systems-Local and metropolitan area networks – Specific requirements – Part 15.4: Wireless Medium Access Control (MAC) and Physical Layer (PHY) Specifications for Low-Rate Wireless Personal Area Networks (WPANs)*

IEEE 802.11, *IEEE Standard for Information Technology – Telecommunications and information exchange between systems-Local and Metropolitan networks – Specific requirements – Part II: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1.1
Broadcast and Communication Technologies (BCT) cabling
cabling system designed to support applications using the HF band (3 MHz … 30 MHz), the VHF band (30 MHz … 300 MHz) and the UHF band (300 MHz … 3 000 MHz) for transmission of sound radio, TV and two-way data services, as well as fro in-home inter-networking

3.1.2
Control, Commands and Communication in Buildings (CCCB) cabling
cabling system designed to support applications related to commands, controls and communications in buildings

3.1.3
HBES application
single automated action performed by the systems

Note 1 to entry: Applications are normally integrated to perform higher-level actions.

3.1.4
HBES/BACS
any combinations of HBES/BACS products (including their separate connected/detachable devices) linked together via one or more HBES/BACS networks

Note 1 to entry: Other names to describe types of HBES/BACS systems:

– home control network;
– home control systems;
– home and building electronics systems;
– building systems;
– building automation systems;
– home automation system.

3.1.5
HBES cluster
group of HBES applications operated to release a common scope desired by the user (automation, security)

3.1.6
home network
network for digital and analogue information transport for a home or a business premises of similar complexity, providing defined access points and using one or more media in any topology

3.1.7
Information and Communication Technologies (ICT) cabling
cabling system designed to support applications using information and communication technologies

3.1.8
service
user need released by HBES functions (single or integrated)

3.2 Abbreviations

For the purposes of this document, the following abbreviations apply.

ACP Area Connection Point

BE Building Entrance

BO Broadcasting Outlet

CO Control Outlet

HD Home Distributor

MATO Multi-Application Telecommunication Outlet.

SHD Secondary Home Distributor

TO Telecommunications Outlet

4 Aspect of system and cabling

The home cabling system ensures the distribution of telecommunication services and HBES functions in accordance with EN 50491 and/or EN 50090 either as a specific HBES or in conjunction with generic cabling designed in accordance with EN 50173-4.

The set up of the home network goes through the following steps:

– design;

– planning;

– installation.

Planning and installation of a general telecommunication cabling are given in EN 50174. Additional requirements for HBES are given in this European Standard.

HBES services may be distributed across all three cabling subsystem (ICT, BCT and CCCB, see 5.1).

Wireless extension to a cabled system may be considered when the infrastructure cannot be entirely planned and/or to give the user mobility.

5 Home network model and general requirements

5.1 Home cabling

The proper design of home cabling shall take into account factors like size, infrastructure, telecommunication services and HBES functions required by the user, whether the home is placed in a new or existing building (see Annex A).

Cabling subsystems may have different topologies (see Figure 1). Star topology is commonly used for ICT, BCT cabling subsystems, even if some “non-star” topologies may also be required to implement some HBES functions. CCCB cabling has normally free topology (bus, tree, loop, star and/or combinations thereof).

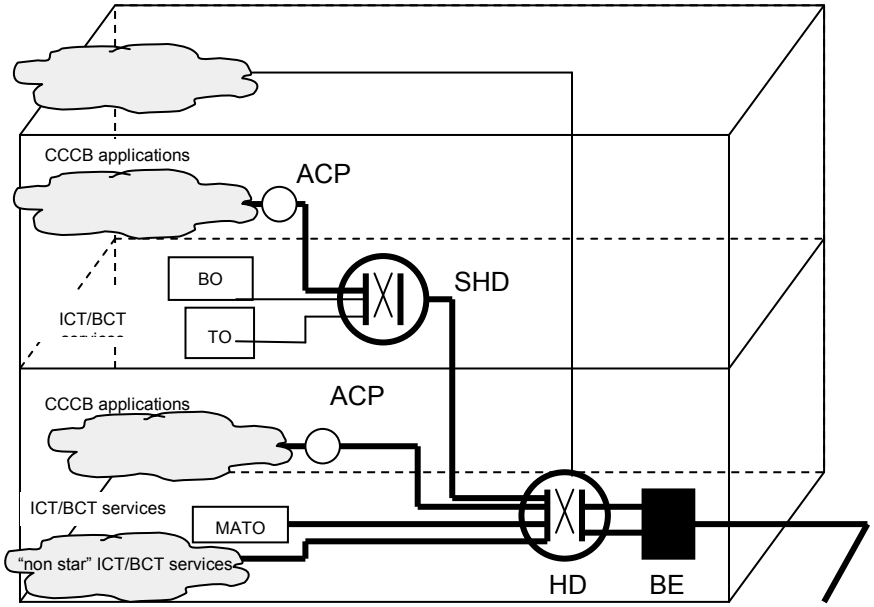


**Figure 1 – General topology of home cabling –
ICT, BCT, CCCB cabling subsystems are indicated**

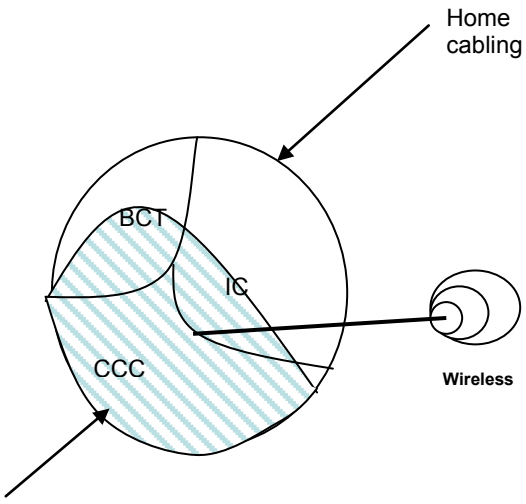
According to EN 50173, IC or BCT cabling subsystems are conceived mainly to distribute telecommunication services. CCCB cabling subsystems are reserved for control, command and wide band HBES functions such as video door phony and surveillance, audio distribution, etc.

NOTE 1 CCCB channel performances are under revision in CLC/TC 215 to support HBES wide band functions.

To support all the HBES functions, ICT, BCT, CCCB cabling subsystems are needed (see Table 1).

HBES cabling may be extended by wireless.

Figure 2 shows the cabling needed to deliver HBES functions as a part of the complete home cabling.



Cabling needed to deliver HBES functions

HBES cabling systems are part of the home cabling system thereby making use of all four subsystems and a possible wireless extension.

Figure 2 – Cabling needed to deliver HBES function

An HBES cabling system covers both indoor and outdoor locations.

EXAMPLES Outdoor locations are e.g. front doors, garages, shafts, etc.

NOTE 2 Requirements for outdoor HBES installation, foreseen to be included in 6.4, are for further study.

HBES devices are usually fixed to the home cabling system (e.g. ceiling lighting point, a window shutter or HVAC fixture) and have thus a fixed position. Nevertheless, it may be necessary to connect moveable appliances.

Many modifications may however occur during the building life (e.g. change of devices, the addition or removal of walls). Flexibility is therefore required for both the home cabling system and for the mains network.

Table 1 lists telecommunication services and HBES functions and states the physical medium normally used.

Table 1 – Non exhaustive list of telecommunications services, HBES clusters/applications, corresponding cabling subsystem and reference standards

Cluster	Applications covered by HBES / BACS / telecommunications services	Cabling subsystem	Bandwidth / transmission rate requirements
Automation	Lighting control	CCCB	Up to 80 kbs
	Shutters control	CCCB	Up to 80 kbs
	Portal and door control	CCCB	Up to 80 kbs
HVAC	Heating control	CCCB	Up to 80 kbs
	Air conditioning control	CCCB	Up to 80 kbs
	Ventilation	CCCB	Up to 80 kbs
	Smart energy metering	CCCB	Up to 80 kbs
Security	Gas detection	CCCB	Up to 80 kbs
	Smoke detection	CCCB	Up to 80 kbs
	Fire detection and alarm	CCCB	Up to 80 kbs
	Flood detection	CCCB	Up to 80 kbs
	Intrusion detection	CCCB	
	Video surveillance	CCCB	40 MHz
	Access control	CCCB	40 MHz
Communications	Audio/video door systems	CCCB	40 MHz
	Social alarm	CCCB	Up to 20 kbs
	Indoor voice communication	CCCB	40 MHz
	Outdoor voice communication	CCCB, ICT	4-8 MHz
AV	Music distribution	CCCB	40 MHz
	Video distribution	CCCB	40 MHz
	TV broadcast distribution	BCT	47 MHz – 2 150 MHz
IT	PC and other peripheral device sharing	ICT	10 Mbs – 10 000 Mbs / 10 MHz … 1 000 MHz
	Internet access	ICT	10 Mbs – 10 000 Mbs / 10 MHz … 1 000 MHz
	Network storage	ICT	10 Mbs – 10 000 Mbs / 10 MHz … 1 000 MHz
General	Home supervision	ICT	10 Mbs – 10 000 Mbs / 10 MHz … 1 000 MHz
NOTE ICT and BCT applications are listed in EN 50173.			

HBES installations are classified according to their complexity in CLC/TR 50491-6-3.

5.2 Wireless telecommunication services and HBES applications

HBES functions may alternatively be supplied via radio links.

References to relevant ETSI and IEEE standards to which an RF system shall comply are listed in Table 2.

Table 2 – Telecommunication services and HBES applications alternatively supplied via radio

Cluster	Applications covered by HBES / BACS / telecommunications services	Bandwidth / transmission rate requirements	Reference standard
Automation	Lighting control	434 MHz 865 MHz … 868 MHz; max. 2 W 2,4 GHz / 250 kbs	EN 301 489 EN 302 208 EN 300 220 IEEE 802.15.4 EN 50090-5-3
	Shutters control	434 MHz 865 MHz … 868 MHz; max. 2 W 2,4 GHz / 250 kbs	EN 301 489 EN 302 208 EN 300 220 IEEE 802.15.4 EN 50090-5-3
	Portal and door control	434 MHz 865 MHz … 868 MHz; max. 2 W 2,4 GHz / 250 kbs	EN 301 489 EN 302 208 EN 300 220 IEEE 802.15.4 EN 50090-5-3
HVAC	Heating control	434 MHz 865 MHz … 868 MHz; max. 2 W 2,4 GHz / 250 kbs	EN 301 489 EN 302 208 EN 300 220 IEEE 802.15.4 EN 50090-5-3
	Air conditioning control	434 MHz 865 MHz … 868 MHz; max. 2 W 2,4 GHz / 250 kbs	EN 301 489 EN 302 208 EN 300 220 IEEE 802.15.4 EN 50090-5-3
	Ventilation	434 MHz 865 MHz … 868 MHz; max. 2 W 2,4 GHz / 250 kbs	EN 301 489 EN 302 208 EN 300 220 IEEE 802.15.4 EN 50090-5-3
	Smart energy metering	434 MHz 865 MHz … 868 MHz; max. 2 W 2,4 GHz / 250 kbs	EN 301 489 EN 302 208 EN 300 220 IEEE 802.15.4 EN 50090-5-3

Table 2 – Telecommunication services and HBES applications alternatively supplied via radio
(continued)

Cluster	Applications covered by HBES / BACS / telecommunications services	Bandwidth / transmission rate requirements	Reference standard
Security	Gas detection	434 MHz 865 MHz … 868 MHz; max. 2 W 2,4 GHz / 250 kbs	EN 301 489 EN 302 208 EN 300 220 IEEE 802.15.4 EN 50090-5-3
	Smoke detection	434 MHz 865 MHz … 868 MHz; max. 2 W 2,4 GHz / 250 kbs	EN 301 489 EN 302 208 EN 300 220 IEEE 802.15.4 EN 50090-5-3
	Fire detection and alarm	434 MHz 865 MHz … 868 MHz; max. 2 W 2,4 GHz / 250 kbs	EN 301 489 EN 302 208 EN 300 220 IEEE 802.15.4 EN 50090-5-3 EN 50131-5-3
	Flood detection	434 MHz 865 MHz … 868 MHz; max. 2 W 2,4 GHz / 250 kbs	EN 301 489 EN 302 208 EN 300 220 IEEE 802.15.4 EN 50090-5-3
	Intrusion detection	434 MHz 865 MHz … 868 MHz; max. 2 W 2,4 GHz / 250 kbs	EN 301 489 EN 302 208 EN 300 220 IEEE 802.15.4 EN 50090-5-3
	Access control	Not implemented	==
	Video surveillance	Not implemented	==
Communications	Social alarm	434 MHz 865 MHz … 868 MHz; max. 2 W 2,4 GHz / 250 kbs	EN 301 489 EN 302 208 EN 300 220 IEEE 802.15.4 EN 50090-5-3
	Audio/Video door systems	Not implemented	==
	Indoor voice communication	Not implemented	==
	Outdoor voice communication	Not implemented	==

Table 2 – Telecommunication services and HBES applications alternatively supplied via radio
(continued)

Cluster	Applications covered by HBES / BACS / telecommunications services	Bandwidth / transmission rate requirements	Reference standard
AV	Music distribution	Not implemented	==
	Video distribution	Not implemented	==
	TV broadcast distribution	Not implemented	
IT	PC and other peripheral devices sharing	2,4 GHz ... 2,48 GHz 10 Mbs ... 300 Mbs 5,15 GHz…5,33 GHz 5,49 GHz…5,71 GHz 600 Mbs	IEEE 802-11
	Internet access	2,4 GHz ... 2,48 GHz 10 Mbs ... 300 Mbs 5,15 GHz…5,33 GHz 5,49 GHz…5,71 GHz 600 Mbs	IEEE 802-11
	Network storage	2,4 GHz ... 2,48 GHz 10 Mbs ... 300 Mbs 5,15 GHz…5,33 GHz 5,49 GHz…5,71 GHz 600 Mbs	IEEE 802-11
General	Home supervision	2,4 GHz ... 2,48 GHz 10 Mbs ... 300 Mbs 5,15 GHz…5,33 GHz 5,49 GHz…5,71 GHz 600 Mbs	IEEE 802-11

6 Infrastructure requirements

6.1 Installation spaces for home cabling

According to the cabling model of Clause 5, a corresponding infrastructure shall be defined to allow the installation of cables within a home.

The following installation spaces are defined as shown in Figure 3.

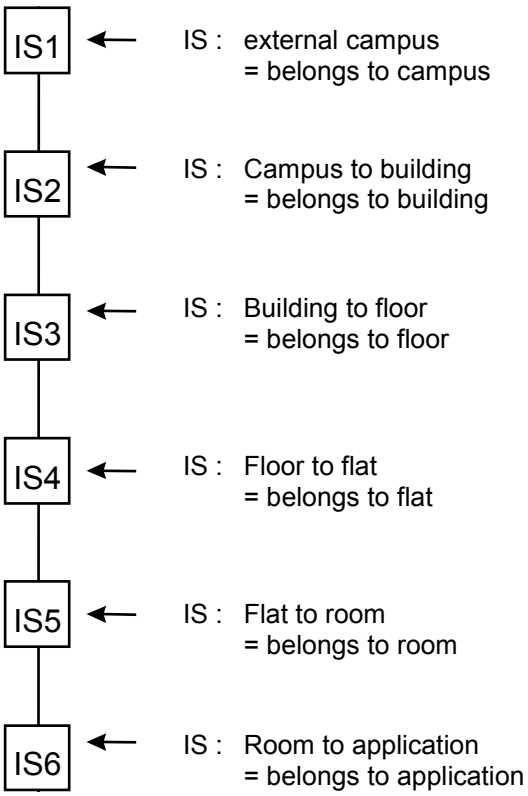


Figure 3 – Installation spaces

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

The installation space shall include boxes which

– make apparent the change in level in the hierarchy,

– offer appropriate fixture 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 (including gateways to external services),

– allow management and extension of the network.

The home cabling infrastructure also allows the 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 EN 50491-3.

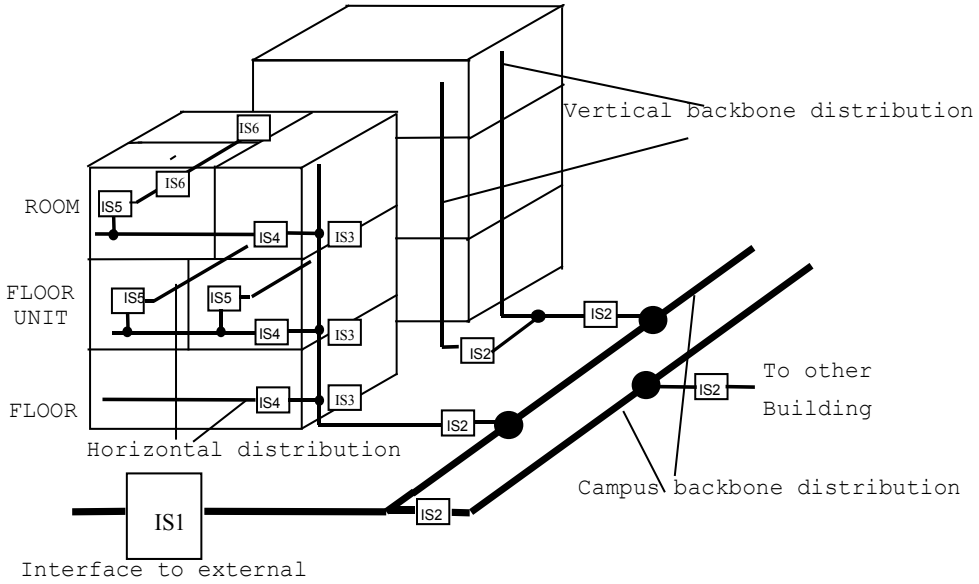


Figure 4 – Infrastructure for buildings

In Figure 4, the building in the foreground shows one single vertical backbone distribution, the building in the background shows two vertical ways of distribution connected with each other.

The gateways to external services connecting the campus with a public network may be located in an extra enclosure (IS1), which can be mandatory in certain cases, e.g. public telephone network.

A maximum cable length between devices maybe imposed for HBES functions. Infrastructure planning shall consider such aspects for distances between IS.

The general infrastructure may consist of campus, building, floors, flat, rooms, distribution systems and shall be adapted to the needs by taking into account different types of buildings.

The infrastructure shall easily allow future extension/modification of the home cabling system.

Figure 5 shows an example of a horizontal cabling floor infrastructure.

Horizontal cabling connects the floor installation space IS3 to the flat installation space IS4.

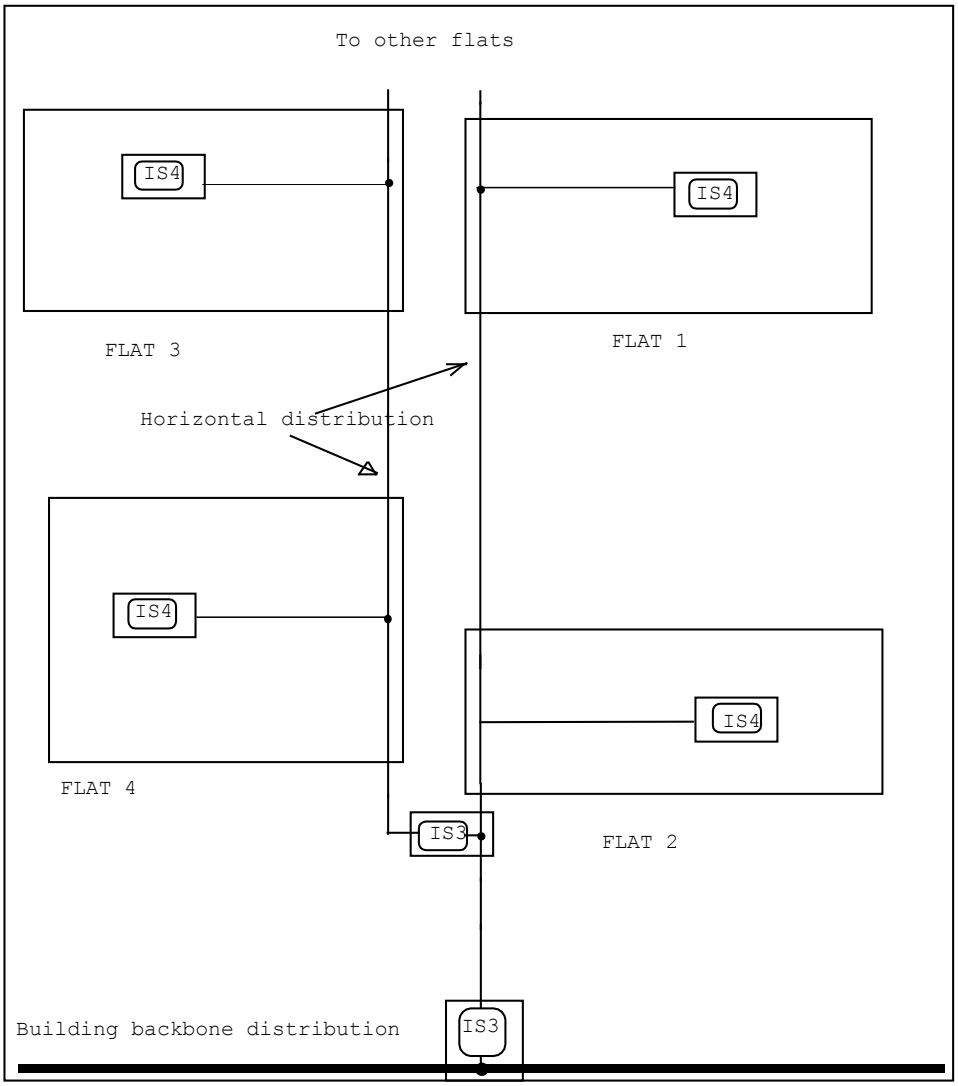


Figure 5 – Horizontal infrastructure (floor distribution)

The following Figure 6 and Figure 7 show examples of the topology of installation spaces inside a home.

IS4 provides the space for equipment for distribution of services in the home as well as home gateway to the building network.

IS5 is an intermediate space between IS4 and IS6 (terminal outlets).

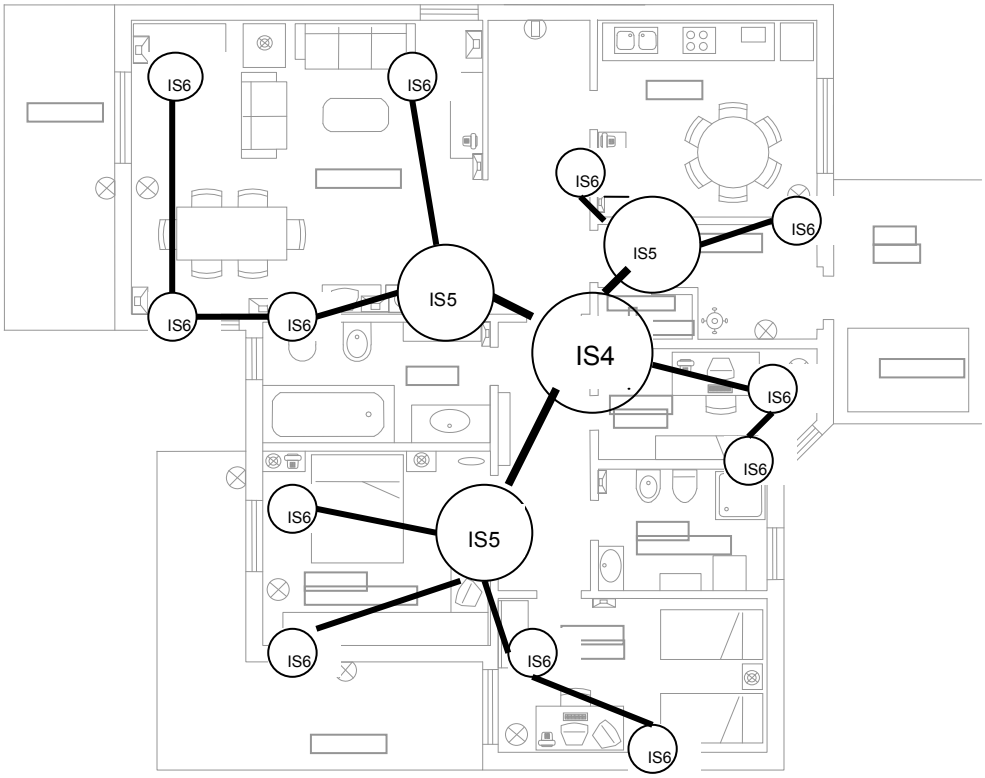


Figure 6 – Example of infrastructure for ICT, BCT cabling for an apartment

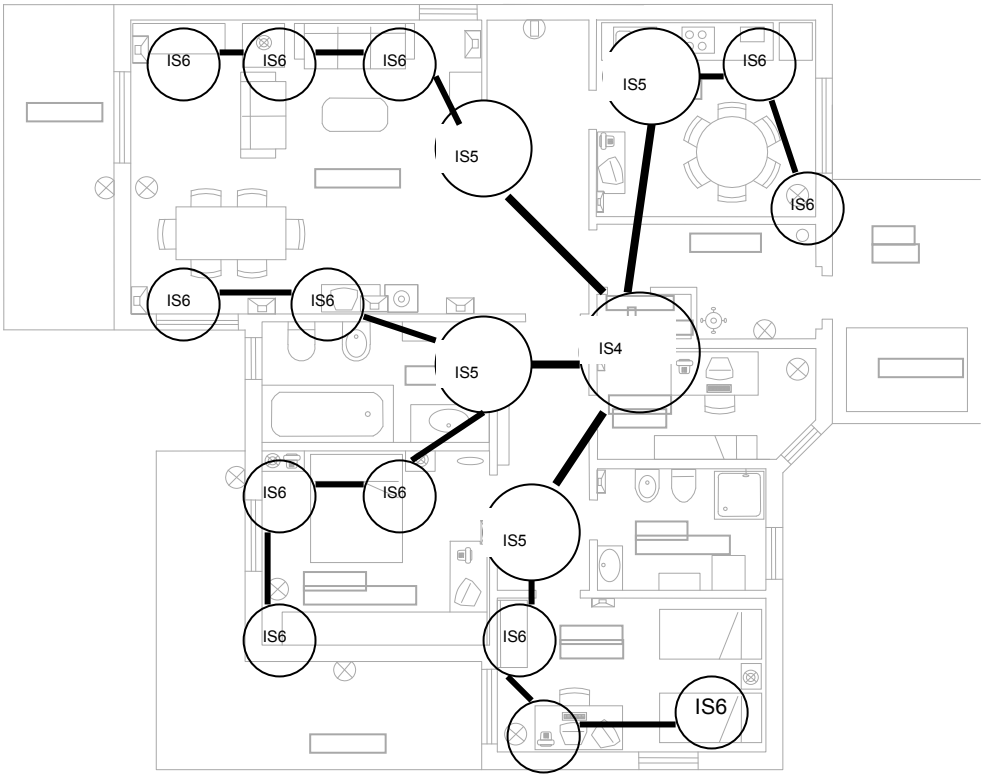


Figure 7 – Example of infrastructure for CCCB cabling for an apartment

Figure 8 shows an example of the physical allocation of the installation spaces IS6, terminal outlets, inside a home.

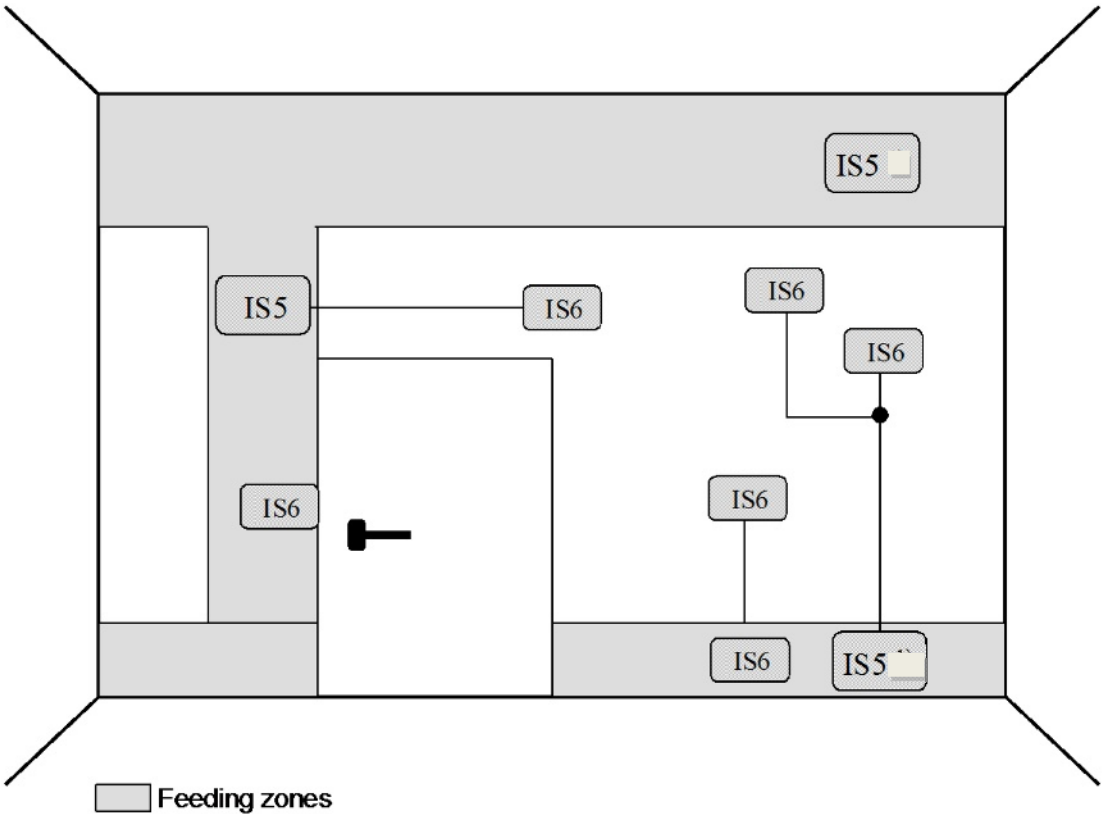


Figure 8 – Example of allocation of installation spaces (IS5, IS6)

The height of the IS6 depends on the device to be installed. In Figure 9, the heights for IS6 of the most common HBES devices are given.

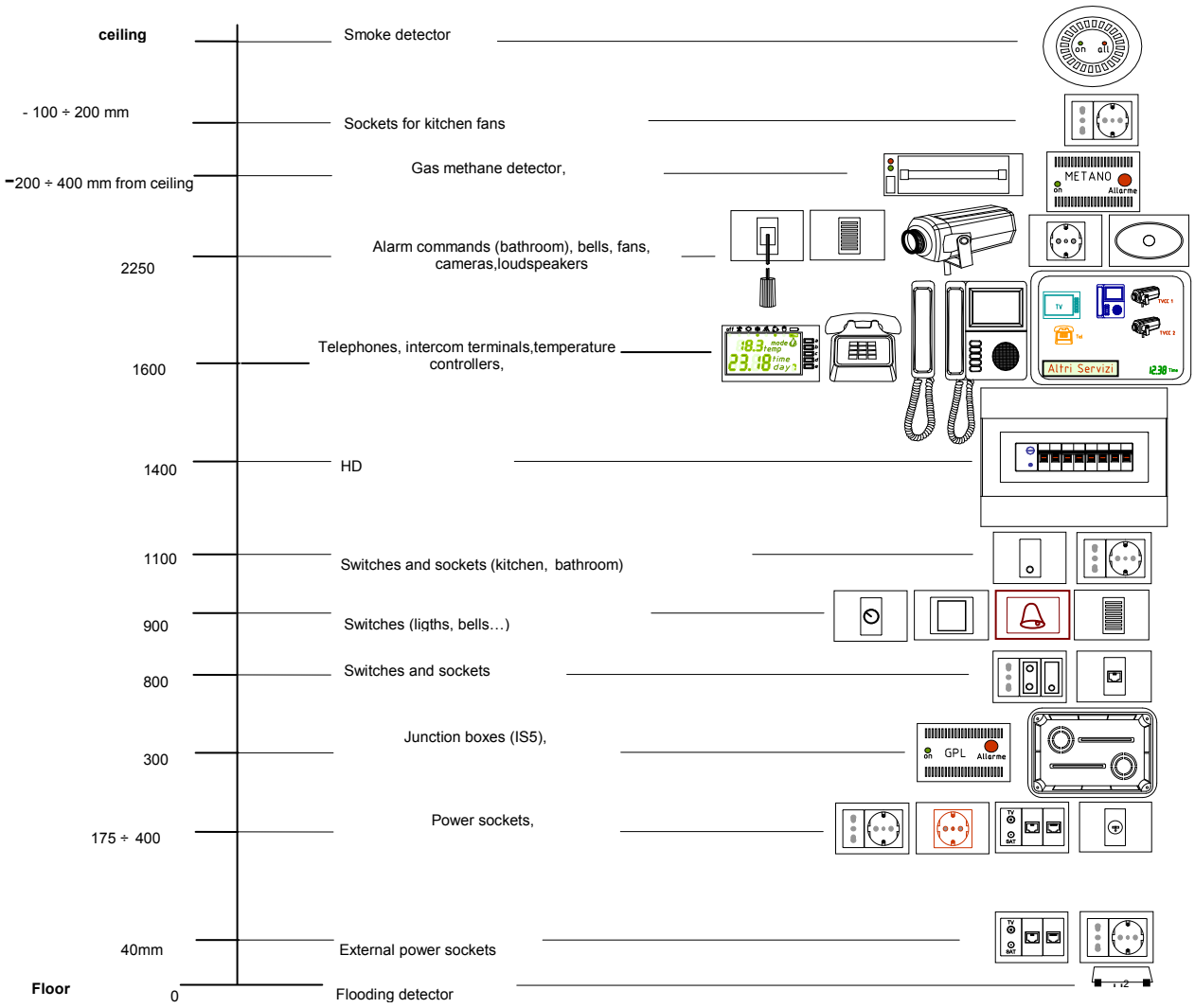


Figure 9 – Indicative installation height for the most common HBES devices

NOTE 1 If national regulations require different values, these take precedence.

NOTE 2 Installation height to allow the use of equipment for special needs (e.g. disabled) may be different and are outside the scope of this European Standard.

The number of enclosures/boxes in an IS, their volume and organisation depend on the volume of cables going in and out of the installation space. Table 3 shows the distribution of cables under safety and EMC aspects, bearing in mind that national regulations, if any, prevail over those requirements and that HD 60364-5-52 and HD 60364-4-41 apply concerning wiring systems and protection against electric shock.

Dimensional, mechanical, and electrical aspects depend on requirements relevant to the building and functions needed: they shall be taken into account in boxes and enclosures, in design and installation according to national/local practices and/or regulations.

Enclosures (for IS1 … IS4) should be designed in such a way that DIN rail 35 mm according to EN 60715 may be used.

EN 60670 is referred to for flush-mounting boxes used for switches in the household and similar fixed electrical installations for installation in IS6.

It is recommended to consider the infrastructures at an early stage of the building design, even if some functions are not initially requested by the customer. This allows to install the cables with minimum impact and to extend home cabling in future.

The cable ways cross section shall be designed for present and additional cables installation. Consequently, the minimum total diameter of conduits between IS5 and IS6 shall be not less than 20 mm or the equivalent section for other shapes of conduits (taking into account the fact, among others, that a mains cable may be required later on).

The main parameters to be taken into account in the design of the installation are the following:

– bending radius of cables;

– dimensioning of cabling systems according to the nature and variety of cables in the different segments.

The cables for mains, CCCB, ICT, BCT, shall be distributed in single or multiple conduits connecting different installation spaces, according to coexistence requirements listed in Table 3.

Attention is drawn to the fact that cables in general and especially between IS1 and IS2 should have a sufficient mechanical resistance regarding pulling forces needed for installation.

NOTE 3 Additional insulation requirements may apply in case all cables are installed in the same canalisation.

6.2 Coexistence between home cabling and mains

The coexistence between home cabling and mains is subject to safety and EMC requirements (see Table 3).

Assuming that safety conditions are fulfilled, EMC may impose additional requirements.

The latter depends on the cable type and the application group (CCCB, BCT, ICT).

Table 3 – EMC requirements for the coexistence between home cabling and mains *(continued)*

Cluster	Applications covered by HBES / BACS / telecommunications services	Coexistence with mains	Cabling subsystem
Automation	Lighting control	Allowed [a]	CCCB
	Shutters control	Allowed [a]	CCCB
	Portal and door control	Allowed [a]	CCCB
HVAC	Heating control	Allowed [a]	CCCB
	Air conditioning control	Allowed [a]	CCCB
	Ventilation	Allowed [a]	CCCB
	Smart energy metering	Allowed [a]	CCCB
Security	Gas detection	Allowed [a]	CCCB
	Smoke detection	Allowed [a]	CCCB
	Fire detection and alarm	Allowed [a]	CCCB
	Flood detection	Allowed [a]	CCCB
	Intrusion detection	Allowed [a]	CCCB
	Access control	Not recommended	CCCB
	Video surveillance	Not recommended	CCCB
Communications	Social alarm	Allowed [a]	CCCB
	Audio/video door systems	Not recommended	CCCB
	Indoor voice communication	Not recommended	CCCB
	Outdoor voice communication	Not recommended	CCCB
AV	Music distribution	Not recommended	CCCB
	Video distribution	Not recommended	CCCB, BCT, ICT
	TV broadcast distribution	Not recommended	BCT
IT	PC and other peripheral devices sharing	Allowed: see EN 50174-2, HD 60364-4-444 for details	ICT
	Internet access	Allowed: see EN 50174, HD 60364-4-444 for details	ICT
	Network storage	Allowed: see EN 50174, HD 60364-4-444 for details	ICT
General	Home supervision	Allowed: see EN 50174, HD 60364-4-444 for details	ICT

[a] Providing safety separation rules according 60364 are fulfilled.

6.3 Infrastructure for home cabling including wireless links

Wireless connections may be used as an alternative to cabled connections. This approach simplifies the infrastructures presented in 6.1 and may be considered in light refurbishments.

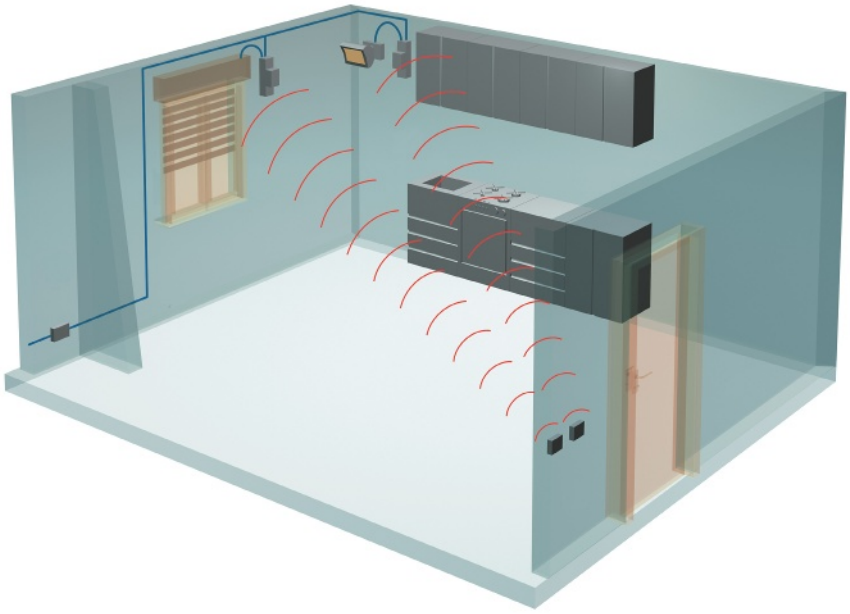


Figure 10 – Addition of control points simplified by using wireless connections

A radio connection may be created inside a room, but also across different rooms. The distance covered is normally 10 m to 100 m, depending on the technology/frequency, the position of radio components and/or obstacles that may be present along the communication path.

Table 4 gives attenuation values of the typical materials present in a home.

Table 4 – RF attenuation of the most common materials used in homes

Material	Thickness, typical cm	Attenuation %
Wood	0 … 30	0 … 10
Plaster, plasterboard panels	0 … 10	0 … 10
Glass (without metal coating or wire inlays)	0 … 5	0 … 10
Stone, pressboard panels	0 … 30	0 … 30
Pumice stone	0 … 30	0 … 10
Gas concrete block	0 … 30	0 … 20
Brick	0 … 30	0 … 35
Iron reinforced concrete	0 … 30	30 … 90
Ceiling	0 … 30	0 … 70
Outside wall	0 … 30	0 … 60
Inside wall	0 … 30	0 … 40
Metal grille	0,1	90
Metals, aluminium lamination	0,1	100

The presence of an obstacle between the transmitter and the receiver may be difficult to plan, due to changes in furniture during the life of the home. For this reason, radio connections shall be planned in such a way that they have sufficient margin of field strength at the receiver side. Repeaters may be used to improve signal strength and coverage area.

Radio connections may also be affected by electromagnetic interferences.

EXAMPLES interference sources in a home are

– computers,
– microwave ovens,
– electronic transformers,
– home theatre systems and television sets,
– ballast units for fluorescent lamps.

Generally, a distance of 50 cm between the RF devices and the aforesaid equipment is deemed to be sufficient to avoid interference.

Interference with other radio connections shall also be considered: cordless phones, wireless audio headset, microphones, etc.

For such equipment, a distance of at least 3 m is advised.

Defective electronic devices may provide additional electromagnetic interference sources, which may temporally affect negatively the HBES wireless connections.

6.4 Infrastructure additional requirements for outdoor installations

Under consideration

7 Connectors for HBES twisted pairs

Connectors for HBES are not specified.

8 Cable and installation accessories requirements

8.1 Channel and link performances

According to CCCB channel and permanent link defined in EN 50173-4.

8.2 TP cable characteristics

The planner shall refer, in the case of

– HBES applications complying to EN 50090, to the relevant standard part for cable characteristics;
– other HBES applications, to the cable specifications supplied by the systems manufacturer.

It is noted that all the above systems have cables with specific characteristics for

– frequency range,
– attenuation,
– operation voltage,
– capacitance,

– current carrying capacity,

– mechanical characteristics (e.g. external dimensions …),

– availability of screen,

– temperature range.

The choice of the type of cable has a direct influence on the installation planning and design (e.g. maximum cable run).

8.3 Installation requirements for typical HBES applications

8.3.1 General

In the following sub-clauses, requirements for the installation of specific components are given. These requirements are applicable both for cabled and wireless systems.

8.3.2 Lighting and shutters control

An HBES lighting system is based on a logical connection between switches and controlled actuating devices (actuators) physically connected by a cable or a wireless link (see 6.3).

The actuators shall match with the connected load. Manufacturers typically provide devices specifically designed for any type of load (e.g. incandescent lamps, fluorescent lamp, inductive loads, transformers, electronic transformer). Actuators are normally “ON/OFF” or dimming devices. The logical connection between switches and actuators may be assigned via hardware, software or a combination of both.

HBES lighting function may be activated through macro-commands releasing combinations of lighting and shutters positions (scenarios). Scenarios shall be programmed either in sensors/actuators or in specific memory devices according to manufacturer’s instructions.

8.3.3 Temperature control

Temperature control helps increase energy efficiency in the home by using a feedback system acting on a local heat source. Temperature control may be realised for each room or a “zone” in a home. See Figure 11.

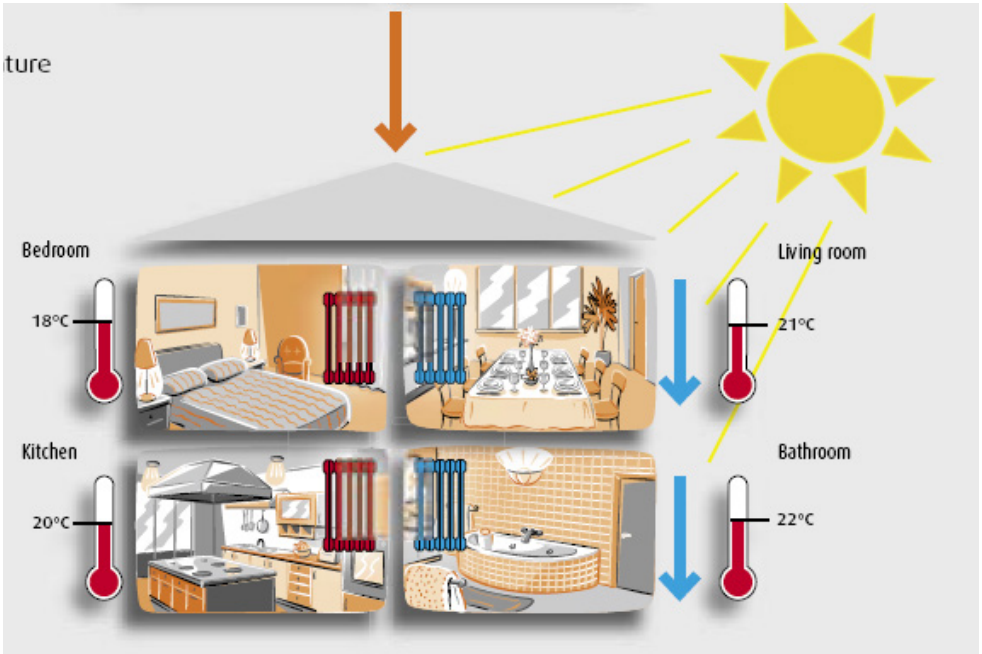


Figure 11 – The zone temperature control concept

Zoned temperature control requires a local flow control valve for the heating fluid. Local valves are either located in a single cabinet or directly at heat source. See Figure 12.

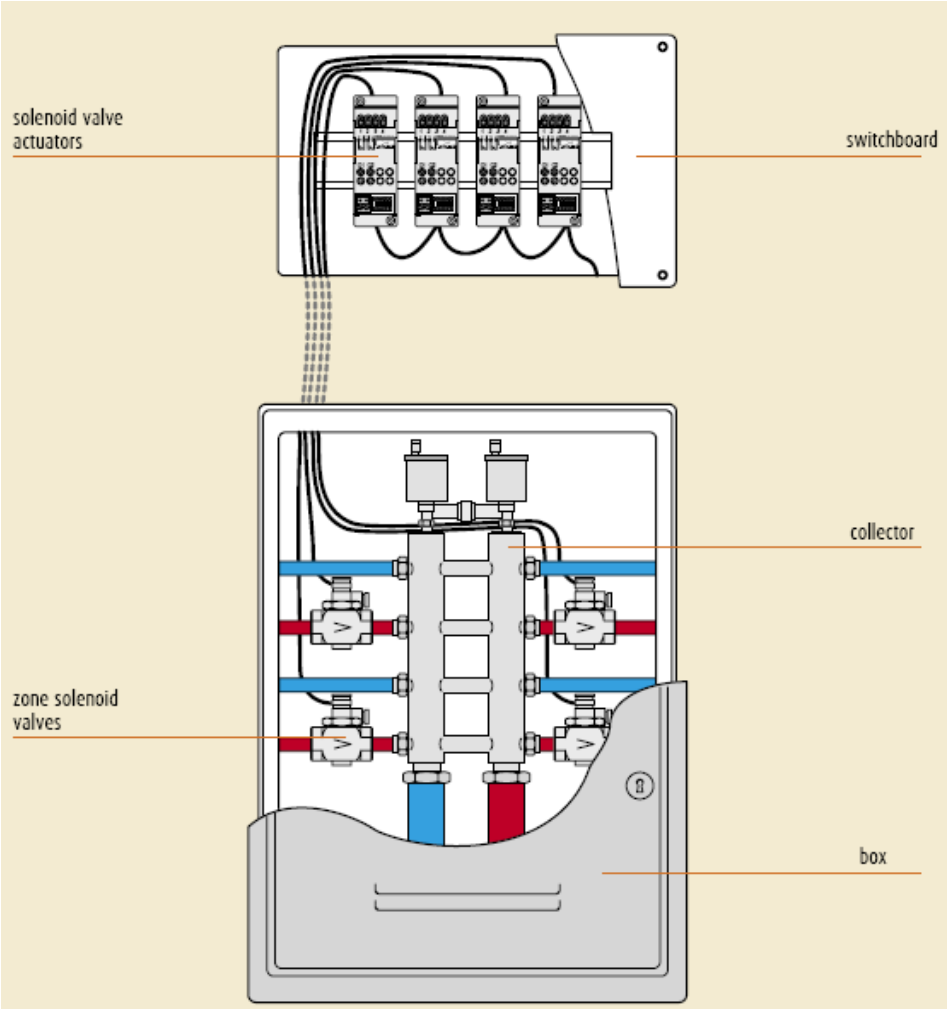


Figure 12 – Example of home cabinet for heating flow control valves

At least one temperature sensor shall be located in each zone at a location where it can correctly sense the local temperature, i.e. at medium height, far from windows and heat sources, fans etc. (see Figure 13).

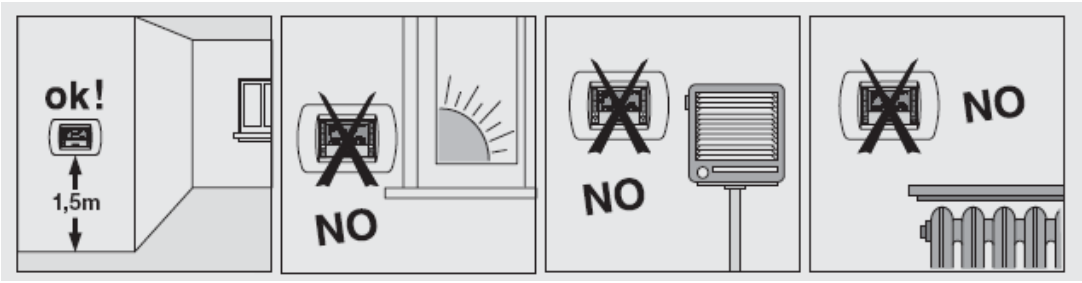
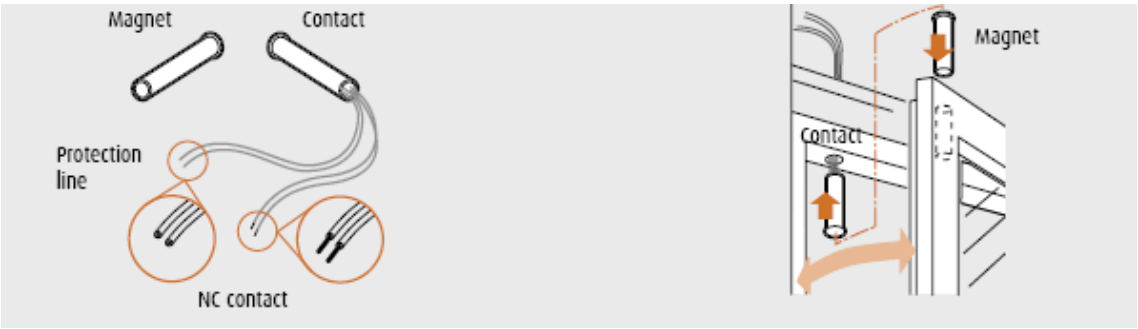


Figure 13 – Recommendations on temperature sensor positioning

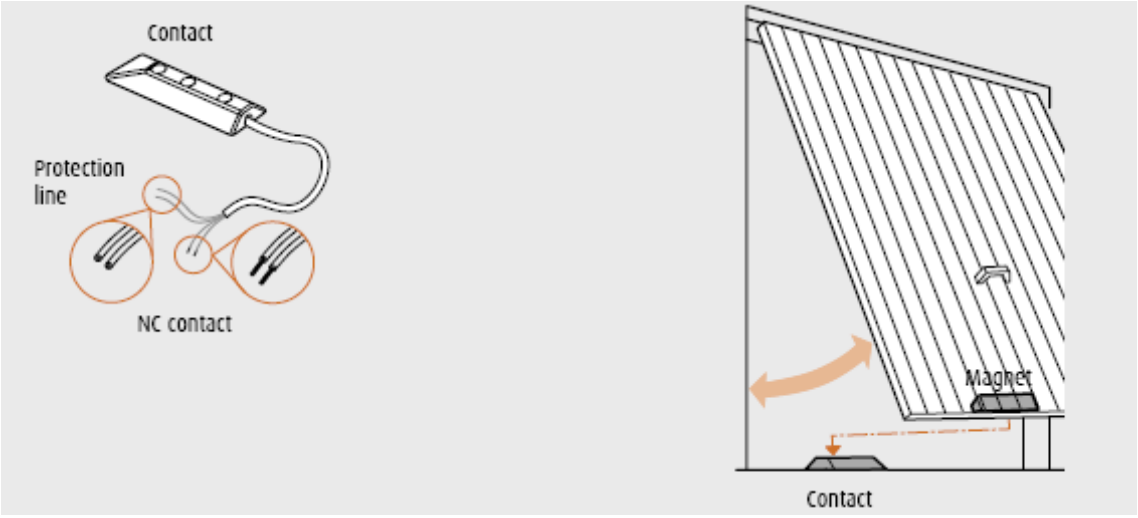
8.3.4 Intrusion detection

Intrusion detection function may be achieved through a network of detecting sensor communicating with a central unit able to send local or remote alarm signals. Sensors may be realised with different technologies (infrared, RF, etc.) and are specific for the type of detection: external (windows/doors opening, glass break) or internal (room monitoring). According to the sensor type, manufacturers provide specific installation instructions (see some examples in Figure 14).



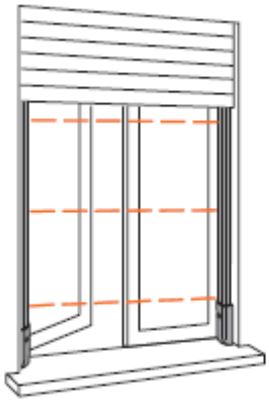
a) Windows opening detection

b) Windows opening detection

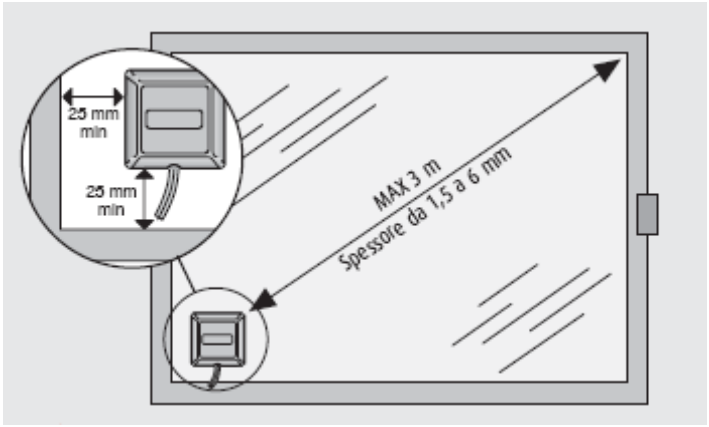


c) Garage door protection

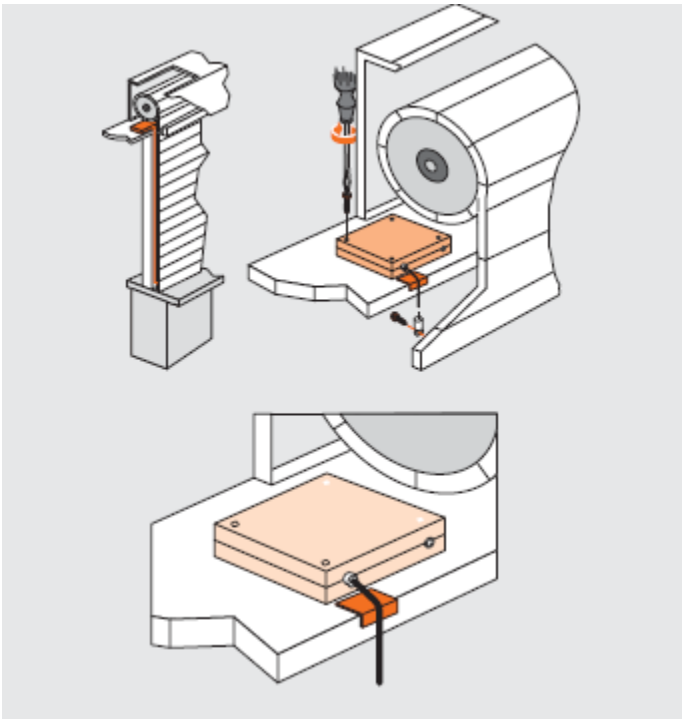
Figure 14 – Examples of external detecting sensors



d) Windows entry detection



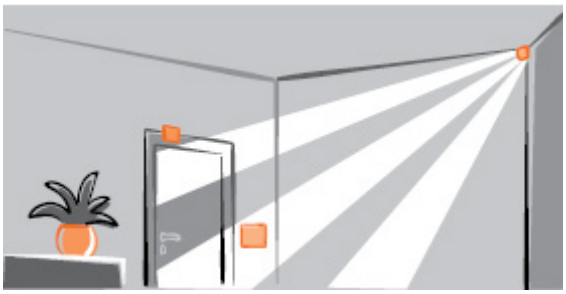
e) Glass breaking detection



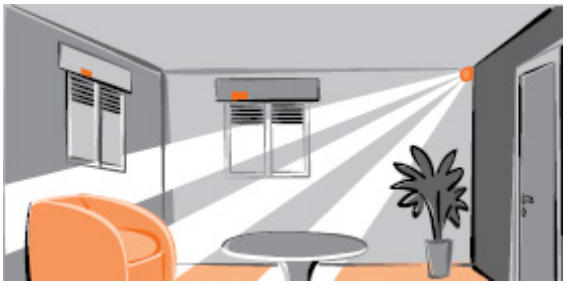
f) Shutters forcing detection

Figure 14 – Examples of external detecting sensors *(continued)*

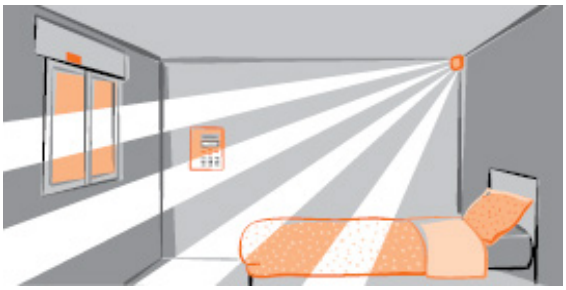
Intruder sensors shall be placed to cover most of the volume of the controlled zone and in particular doors and windows (see Figure 15).



a)



b)



c)

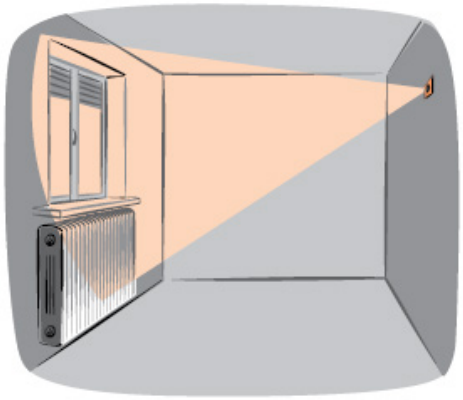
Figure 15 – Examples of internal detecting sensors and basic installation rules

Correct positioning of internal sensor: door and windows space shall be entirely monitored. The presence of obstacles and interference sources may reduce the effective controlled volume (see Figure 16):

a) heat sources may interfere with IR sensors;

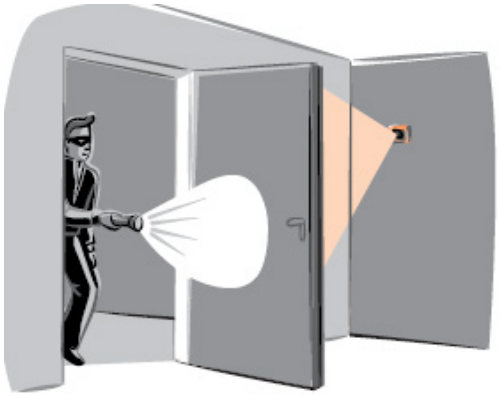
b) physical objects may reduce sensor-controlled volume;

c) sensor positioning shall consider opening of doors.



a) Heat sources interfering with IR sensors

b) Physical objects reducing sensor controlled volume



c) Sensor positioning considering opening of doors

Figure 16 – Examples of common mistakes in positioning internal sensors

Gas sensors may be added to the intrusion detection function. These sensors shall be placed near the ceiling (20 cm - 40 cm) in the case of CH4 or the floor (about 20 cm) for LPG. Both types shall be placed in the kitchen or near the gas heater at a distance between 1 m and 8 m from the equipment.

Smoke detectors shall be placed on the ceiling.

Flooding detectors shall be placed at ground level, considering the slope of the floor in order to sense water as soon as it covers the floor. See also Figure 17.

The alarm messages generated by these sensors may be fed into the intrusion detection system resources, which can then act accordingly (e.g. activate siren, send messages via telephone interface …).

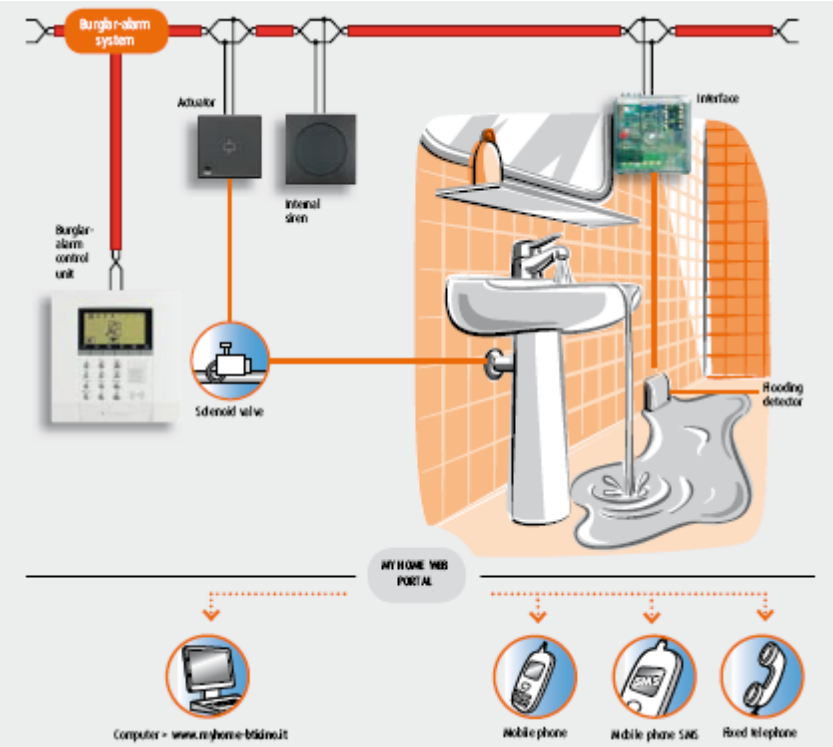


Figure 17 – Example of flooding detection

9 Electrical safety and functional safety

9.1 Electrical safety

Safety requirements for HBES are in accordance with EN 50491-3.

9.2 Functional safety

Functional safety requirements are in accordance with EN 50491-4-1.

10 EMC

The HBES devices shall comply with the requirements of EN 50491-5 and the coexistence requirements of 6.2 are fulfilled.

11 Earthing and bounding for lightning protection

Connections requirements for the screen of the bus cable (when present) shall comply with HD 60364-5-54.

12 Fire reaction and resistance requirements

The performance of HBES cables shall also be checked according to national regulations and relevant standards considering those cables which are running along with them. In case of error or malfunction, they will follow those of mains cables. Components and installation shall also follow national regulations.

13 Environmental aspects

Requirements are in accordance with EN 50491-2.

14 Administration and documentation

14.1 Installation documentation

HBES shall be installed on the basis of a technical documentation, with a unique reference number allocated to each installation.

The technical documentation shall be handed to the user of the installation and a copy of it shall be available for maintenance.

This documentation may be provided electronically.

Under special circumstances, the user is allowed to modify himself the documentation, subject to national or local regulations.

The technical documentation shall at least include the instructions for use and the installer manual, with the minimum contents established according to 14.2 and 14.3.

14.2 Instructions for use

The instructions for use shall contain the following:

a) instructions for the correct use and basic maintenance of the installation, including

- single line diagram of the control and command installation,
- list of devices installed and their main data sheets,
- logical links,
- installation diagrams;

b) parameters and operational specifications according to 14.3, c) and d);

c) simple explanations to allow the final user to change those parameters that can be modified by the user, established by the manufacturer;

NOTE The level of complexity of these explanations will depend on the type of HBES installed.

d) possibilities to extend the installation;

e) address and telephone number of the installer and/or maintenance company;

f) handover declaration (according to Annex B) signed by the installer.

14.3 Installer manual

The installer manual shall contain the following:

a) identification of the installation:

- data of the location,
- basic characteristics of the installation,
- particular characteristics of the installation, if necessary;

b) installation diagrams:

- house/building layout,
- layout of the cable management systems, both for mains and data cables,
- location of the devices,
- single line diagram of the installation, indicating control circuits and mains circuits and cable sections for mains circuits;

c) list of devices installed, data sheets and manufacturer instructions;

d) input/output/address schedule including those that have not been assigned, in case they are needed for future enlargements;

e) system parameters set according to the functional specifications of the manufacturer of each device;

f) alarm signalling setting in dedicated devices;

g) instructions, from the manufacturer to the installer for the inspection, with indication of the appropriate steps to ensure that the parts, components, cabling, etc are according to the installation rules;

h) commissioning and testing plan. instructions from the manufacturer to the installer to test the correct operation of the installation;

i) list of regulations and standards the installation complies with;

j) indication of the function of 6.2 regarding EMC requirements, if required.

15 Inspection and tests

15.1 General

Inspection and test, when required, shall be carried out according to CLC/TR 50090-9-2.

15.2 Carry out of the installation

In order to confirm that the installation has been carried out correctly, the following checks will be performed.

a) The installation has been carried out according to the approved drawings and specifications.

b) The installation wiring and terminations are both adequately labelled.

c) The installation cabling does not have any short circuits and continuity is assured and all cabling within the installation has passed the required insulation resistance test (where required).

d) The HBES meets the manufacturer's installation requirements.

e) EMC conformance: The documentation shall report that all devices are EMC compliant and the installation is carried out according to the relevant standards and manufacturer instructions and the equipment is attached to cabling for which has been proven to be EMC compliant.

15.3 HBES operation

In order to confirm the correct operation of the installation, the correct operation of the following shall be checked:

a) sensors;

b) input signals;

c) output signals;

d) actuators;

e) user interface units;

f) safety related items;

g) annunciation and alarm schedule;

h) control loop setting according to the installation specifications;

i) successful instant restart of the system after a power cut-off;

j) correct setting of the real time clock.

15.4 Checks record

The checks required to comply with 15.2 and 15.3 shall be recorded in a document containing at least the sections of Annex B.

Annex A
(informative)

Guidelines on HBES installation in existing buildings

Installation spaces described in 6.1 may not be present in existing buildings. In these cases, installing HBES according to the guidelines given in this European Standard should require refurbishing.

However, HBES may be installed at reasonable costs, according to the following guidelines.

a) External boxes are easier to be placed respect to flush mounted.

b) Cohabitation rules reported in Table 3 allow share conduits and save installation space accordingly.

c) The integration of a cabled network with wireless links may reduce size and total lengths of conduits.

d) Optical fibre systems may share infrastructures with non-electrical services.

e) Manufacturer’s installation guidelines may give additional suggestions to share installation spaces.

Annex B
(informative)

Documentation

This annex shows an example of possible conformity declaration for an HBES installation.

HDR/1

Serial No: .....

This Certificate is not valid if the number has been defaced or altered

PROJECT DETAILS

Project Details: (tick as appropriate) New ☐ Addition ☐ Modification ☐

Description: .....

Project Ref. No: .....

Specification Ref. No: .....

DECLARATION

I being the person with overall responsibility (as indicated by my signature below) for the following:

	Y	N		Y	N		Y	N
1. Design	☐	☐	2. Installation	☐	☐	3. Inspection and Testing	☐	☐

(Tick appropriate box against items 1-3)

of the above referenced project, certify that the said work has been carried out in accordance with the current relevant parts, sections and clauses of Standards highlighted in the matrix overleaf under the cross reference codes and is safe to use:

(insert codes) …… …… …… …… …… …… …… …… ……

Signature: ..... Name (In Block Capitals): .....

Position: ..... Date: .....

For and on Behalf of: .....

Address: …….. .....

DETAILS OF DEPARTURES

(Enter here any departures from relevant standards or statutory requirements that either have become obvious during contract execution, or which form part of the Client's specification)

HBES Installation Inspection Schedule

Document No: **Sheet:** **HBES No.**

.... of..... .....

The following documents were available and have been examined:			
	YES	**NO**	**N/A**
Client or System Designer’s Specification	☐	☐	☐
Manufacturer’s Instructions	☐	☐	☐
Installation Specification	☐	☐	☐
Installation Drawings	☐	☐	☐
Relevant Data Sheets	☐	☐	☐
Input/Output/Address Schedule	☐	☐	☐
Annunciation and Alarm Schedule	☐	☐	☐
EMC Requirements for the Installation	☐	☐	☐
Commissioning and Testing Plan	☐	☐	☐
Hardware Schedule	☐	☐	☐
Operational Specification	☐	☐	☐
Other (please list)	☐	☐	☐

The following checks were carried out:			
	YES	**NO**	**N/A**
The installation meets the Client's and System Designer's specification	☐	☐	☐
All documents relating to HBES have a unique reference number	☐	☐	☐
The HBES electrical installation safety systems and devices	☐	☐	☐
The HBES meets the manufacturers installation requirements	☐	☐	☐
All EMC requirements for the installation have been met	☐	☐	☐
Installed equipment is suitable for both its location and function	☐	☐	☐
Cabling and equipment identified is in accordance with the system drawings and schedules	☐	☐	☐

	YES	**NO**	**N/A**

Cable supports and cable integrity of the installation are adequate	☐	☐	☐
Power supply correct voltage and frequency	☐	☐	☐
Number, type, location and hardware configuration of devices is correct	☐	☐	☐
Power supply and interconnecting cables are adequate for the function	☐	☐	☐
All cabling within the installation has passed the required insulation resistance test (where required)	☐	☐	☐
The installation wiring does not have any short circuits and continuity is assured	☐	☐	☐
The installation wiring and terminations are both adequately identified	☐	☐	☐
All control loops have been tuned in accordance with the Client's specification and for the intended operation of the HBES	☐	☐	☐
All control loop settings have been recorded	☐	☐	☐
The central control unit accepts commands and gives reports correctly	☐	☐	☐
The real time clock is set correctly	☐	☐	☐
The HBES responds to incoming and outgoing communications	☐	☐	☐
The annunciation of alarms is correct	☐	☐	☐
All interface units have been commissioned	☐	☐	☐
Power cut-off and not restored test successful	☐	☐	☐
Power cut-off and instant restart test successful	☐	☐	☐
All necessary documents associated with inspection, testing and commissioning of the HBES have been adequately completed ready for handover to the client	☐	☐	☐

HANDOVER DECLARATION AND REPORT SERIAL NO: .....

Comments: .....
.....
.....

SIGNATURE INSPECTOR/CLIENT DATE

INSPECTED BY: .....

ACCEPTED BY: .....

This test schedule shall be accompanied by the Handover Declaration and Report for the installation.

Bibliography

CLC/TS 50131-7, *Alarm systems – Intrusion and hold-up systems – Part 7: Application guidelines*

EN 50173 (all parts), *Information technology – Generic cabling systems*

prEN 50491-1, *General requirements for Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) – Part 1: General requirements*

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)*

EN 61082-1, *Preparation of documents used in electrotechnology. Part 1 : Rules (IEC 61082-1)*

EN 81346-1, *Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations- Part 1 : Basic rules.*

EN 81346-2, *Industrial systems, installations and equipment and industrial products – Structuring principles and reference designations- Part 2: Classifications of objects and codes for classes.*

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