



## EN54-Certified solutions explained



**BOSCH**  
Invented for life

## Preface

With one of the largest installed bases of security solutions in the world, the name Bosch has become synonymous with quality and innovation in public address & voice evacuation, fire-alarm systems, CCTV, conference systems, and integrated building and alarm management. The company is committed to developing and producing systems and components that are fully compliant with the latest and most demanding quality and safety standards. It provides solutions for applications in a wide range of locations, from small commercial premises to large-scale public buildings.

Bosch's goal is to comply with more than just minimum quality and safety requirements, and to remain at the forefront of this field. The development and manufacture of compliant equipment is however just one part of true compliance. Bosch takes its commitment much further by participating in multi-disciplinary standardization commissions and actively supporting a global network of dealers via training courses, knowledge sharing, and design tools.



**EN54**

EVAC Certified  
Emergency  
Voice Alarm

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## Introduction

A public address & voice alarm system is used for public announcements, scheduled events, background music and, most importantly, for directing people to safety in the event of an emergency. A public address & voice alarm system is expected to function at all times, throughout an entire premises and in conjunction with other control and indicating equipment.

The guarantee of correct operation begins with the inclusion of relevant and required elements during a product's development and production processes. During these processes, compliance with the international standard EN54 has recently become very important for voice alarm equipment.

**EN54**

EVAC Certified  
Emergency  
Voice Alarm





Over recent years, there has been a lot of discussion around the inclusion of the latest EN54 parts for voice alarm equipment. Manufacturers of voice alarm equipment, including Bosch Security Systems, have been racing to achieve EN54 certification of their voice alarm products within the required timeframe. However, confusion still exists, specifically around the added value of the EN54 product standard for voice alarm applications, about when to use EN54-certified voice alarm products, and with regards to how to realize a safe voice alarm system using certified products.

Bosch Security Systems believes that EN54 offers support in the creation of a safer environment for staff and the general public in premises where these systems are used, competitive advantage for value added resellers (VARs) and integrators, as well as greater clarity for those involved in specification. This document should be regarded as a general introduction to standardization, voice evacuation product certification, and the implementation of the standards. The document is an overview and is not intended to cover every detail of standardization and/or the standards it mentions.

## 2. History of product standards

Standards have existed for thousands of years and are either in place because of the desire to harmonize activities or in response to the needs of an increasingly complex society. Basically, standardization is the agreed way of doing something; one of the earliest examples of standardization is the creation of the calendar.

Ancient calendar as an example of standardization



In the 18th and 19th Centuries, it became clear that poor building construction had a significant impact on the spread of fire. This was of particular relevance in the United Kingdom and Germany where insurance companies were already in existence, legislation was being considered, and laws had been introduced aimed specifically at fire prevention.

Regulations helped to ensure (or assure) that buildings were built safely and made a contribution to the prevention of fire, as well as allowing people to escape safely from a building if it were to catch fire. It has been a long journey from there to the present day where we have international, regional and national organizations that work on standards, certification and testing on a daily basis.



The scope of today's standardization organizations is to "promote safety, quality and technological compatibility in order to create a basic infrastructure to underpin society while promoting sustainability and good regulatory practice." In other words, standards provide the minimum requirements that manufacturers and engineering companies in this sector have to meet in their offerings.

Formal standards, such as European Norms (EN), vary according to what they provide. For example, they may:

- ▶ Specify requirements for the features or characteristics of a product, such as the components for air-conditioning equipment, or
- ▶ Recommend the best way of doing something, such as how a company manages information security.

A country's National Standards Organization (NSO) is usually its biggest developer of formal standards. An NSO brings together representatives from relevant sections of business, government and society in national committees that develop local standards. NSOs, like BSI (Britain), AFNOR (France), and DIN (Germany), are in turn members of the CEN (European Committee for Standardization).

### 3. Voice Alarm and the Fire Business

In general, voice evacuation is used alongside, or instead of, the coded warnings sounded by fire alarm systems in order to improve communication to people who need to be warned of a hazardous situation. Clear and understandable messaging reduces the time taken for those at risk to recognize that an emergency exists. It also enables emergency services, such as the fire brigade, to give clear directions, carry out step-by-step evacuation per area, and communicate the end of an evacuation process.

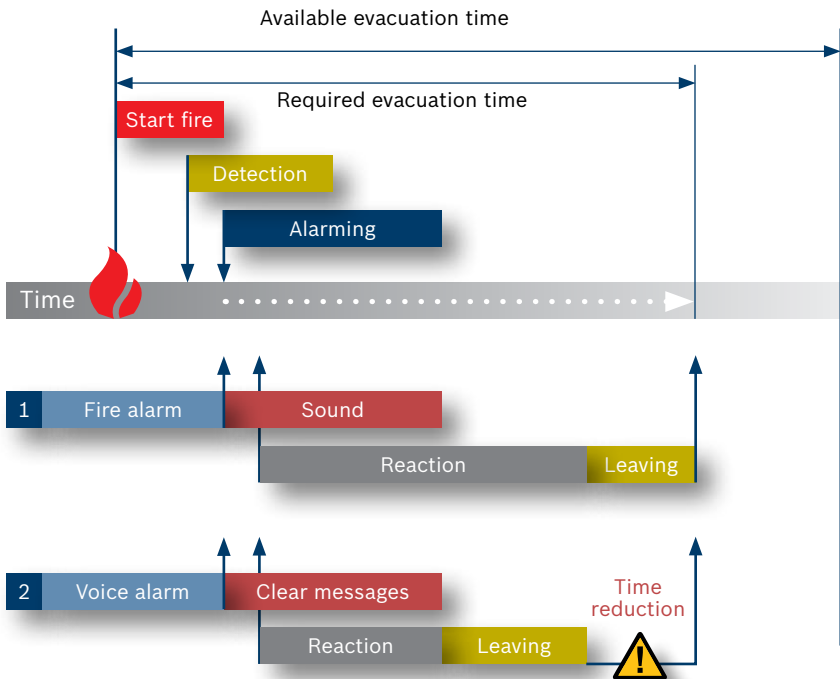
The alarm tones that are generally used with fire alarm systems create awareness, but do not offer any additional information, causing people to potentially misunderstand a warning signal or even not react to it at all.

The use of a public address system for voice evacuation has become more common over the past decades. A schematic created by Prof. Klingsch (see figure page 11) is often used to show the realizable reduction in evacuation time when using voice alarm.



The integration of more audio functionality into fire alarm systems is an obvious next step, as is the inclusion of product requirements for voice evacuation components into fire alarm product standards.

The current situation is that products used in a voice evacuation system that is part of, or connected to, a fire alarm system, are subject to the European Construction Products Directive and have to be certified according to the EN54 fire alarm product standard.



## 4. Voice Alarm, Construction Product Directive and Certification

### 4.1 The Construction Product Directive (CPD)

The aim of the Construction Products Directive (CPD) is to ensure the free movement of all construction products within the European Union by harmonizing national laws with respect to the essential requirements applicable to construction products in terms of health and safety.

In other words, its main goal is to ensure that construction products are only introduced to the European market if they are fit for their intended use. The products must enable the applications in which they are implemented to satisfy, for an economically reasonable working life, the essential requirements with regard to:

- ▶ Mechanical strength and stability
- ▶ Safety in the event of fire
- ▶ Hygiene, health and the environment
- ▶ Safety in use
- ▶ Protection against noise and energy economy
- ▶ Heat retention



The essential requirements are defined in the first instance in interpretative documents drawn up by technical committees and are then elaborated further in the form of technical specifications.

## 4.2 EN54 Standard

In relation to the CPD, CEN / CENELEC act on a mandate of the European Commission to publish harmonized standards that define the essential requirements and test methods of, amongst lots of other, Fire detection and fire alarm systems.

CEN / CENELEC have as members the National standardization organizations of 31 EC member states as well as several candidate states, which have in this cooperation the task to establish European harmonized standards. In practice the responsibility for standards development is mostly delegated to national committees or workgroups within these committees. National committees comprise of field specialists from organizations, like:

- ▶ Training institutes
- ▶ Research institutes
- ▶ Federations
- ▶ Associations

In relation to European Fire detection and Fire alarm standards, the CEN (Technical Committee CEN/TC72) underlines the importance of setting the standard requirements and test methods for fire alarm products; the minimum requirements and testing of fire alarm products will provide a means of ensuring acceptable safety levels, which will be of major benefit to all European countries and which will contribute in the reduction of societies' cost related to fires.



#### **4.2.1 European standardization in relation to worldwide standardization**

The International Electrotechnical Commission (IEC), is an international organization that develops general international standards regarding safety of electronic components and products. These standards form the bases for 82% of the European standards.

Besides the IEC, ISO is an important international organization for standardization. ISO's main goal is to promote standardization and related activities in all working areas except electro techniques.

The difference between international standards and European standards basically lies in the fact that European standards will be copied nationally, where with IEC standards the national implementation is voluntary.

### 4.3 EN54 Voice Alarm Parts as Harmonized Standards

After the process of standards development, more than 70% of the European National Standardization Organizations voted for EN54-4, EN54-16 and EN54-24, which meant that the standards received the official status of harmonized standards.

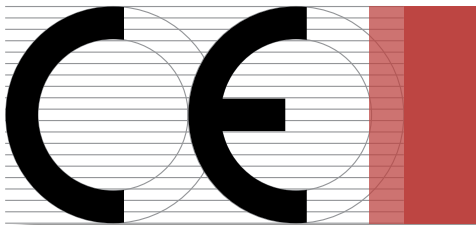
For harmonized standards, a transition period is granted after which conflicting local standards must no longer exist. In Europe in relation to voice alarm, EN54 conflicting local standards:

- ▶ As from April 2011 for EN54-16
- ▶ As from April 2011 for EN54-24
- ▶ As from August 2009 for EN54-4



## 4.4 EN54 Certification and CE Marking

In the case of EN54-4, EN54-16 and EN54-24, only voice alarm products that comply with these harmonized standards are eligible to bear the CE marking. This ensures that new installed voice alarm systems satisfy essential requirements as part of a fire alarm system.



### 4.4.1 The EN54 Certification Procedure

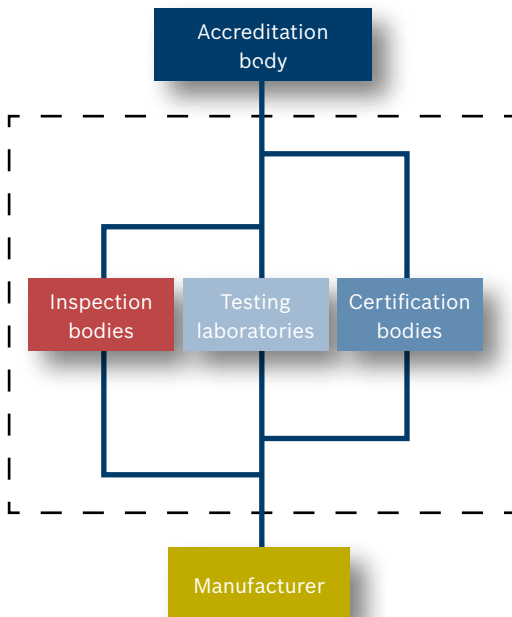
It is up to the manufacturers or their representatives to prove via an approved certification body that their products comply with the harmonized standards and therefore may carry a CE marking mentioning EN54-16, EN54-24 or EN54-4.

There are several steps to the process of gaining approval and being allowed to use CE marking according to CPD. The products have to undergo environmental and safety tests as specified in the standards and a certification bureau will verify amongst other the products' functionality with the standards requirements. Besides the production process at the manufacturers' facility(ies) must be regularly audited by a certification body to ensure Factory Production Control.



As from January 2010, the bodies that test, audit and certify have to be accredited by European accreditation bodies. This is to ensure that product testing and certification follow international standards as to how testing and evaluation are carried out. The accreditation of certification bureaus covers:

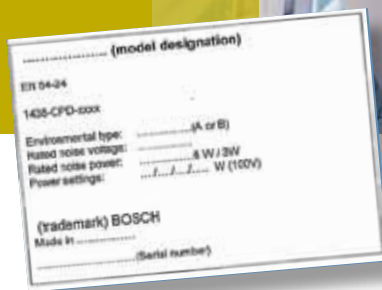
1. Testing laboratories
2. Inspection bodies
3. Certification bodies



Testing, certification and inspection by accredited bodies

Testing (left):  
Products undergo environmental and safety tests to comply with the harmonized standards and carry a CE mark mentioning EN54-16, EN54-24 or EN54-4.

Production (right):  
The production process at the manufacturers' facility(ies) are regularly audited by the certification body to ensure Factory Production Control.





**CE**  
0560

**CCA**

**Bosch Security Systems B.V.**  
Kapittelweg 10  
4827 HS Breda  
The Netherlands

Year in which the marking has been affixed

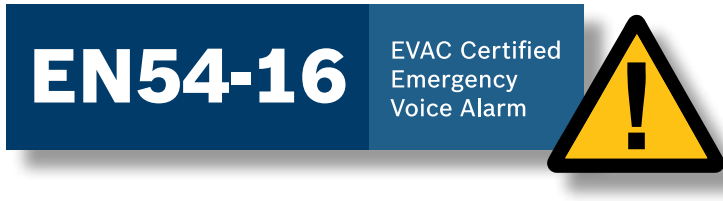
2011	2012	2013	2014	2015	2016	2017	2018	2019	2020

0560 - CPO - 10219002/AA/00

EN 54-16:2006  
ISO 7243-16:2007  
Digital Public Address and Emergency Sound System  
Part 16: 3.5

Provided options and other product information is available in the  
Installation and User Instructions  
of Part 16: 3.5, 2011-02

## 5. Voice Evacuation Standard EN54-16 for Voice Alarm and Indicating Equipment



Part 16 of the EN54 (EN54-16) standard specifies requirements, methods of testing and performance criteria for voice alarm systems used in fire detection and fire alarm systems providing audible fire alarm signals within a building.

EN54-16 was originally based on part 2 of the EN54 standard (EN54-2), which comprises the requirements for fire alarm control and indicating equipment (CIE). Just like EN54-2, EN54-16 defines functions that are mandatory, as well as optional functions which the products may provide in addition to mandatory functions.

The mandatory functionality to be provided by all voice alarm control and indicating equipment (VACIE) concerns the following (EN54-16 chapters between brackets):

Mandatory functions	An interpretation and/or examples
General requirements for indications (5)	The indication and display requirements of the system's state (quiescent-, voice alarm- and/or fault warning) and power supply.
Quiescent condition (6)	Indications in the quiescent condition may not be confused with other condition indicators.
Voice alarm condition (7)	Receiving and processing alarm signals from the CIE and manual VACIE control, safeguarding the CIE - VACIE transmission path, visible alarm indication on the VACIE and the silencing/resetting of the VACIE alarm condition when it was triggered by the CIE (silencing and resetting of the voice alarm condition from the CIE only when the CIE is reset and the message has been fully broadcasted).
Fault warning condition (8)	<p>Enter the fault warning condition when fault information is received and report faults within 100 seconds (and re-report within 20 seconds when not resolved).</p> <p>Examples are:</p> <ul style="list-style-type: none"> <li>- Transmission path faults (CIE-VACIE/VACIE-loudspeakers/VACIE parts in different cabinets)</li> <li>- Power supply</li> <li>- Emergency microphone capsule</li> <li>- VACIE to fire alarm devices</li> </ul>

Mandatory functions	An interpretation and/or examples
Design requirements (13-14)	<p>Describes the design requirements that the VACIE shall comply with, like good installation instructions and complete user documentation provided by the manufacturer.</p> <p>It also describes requirements with regard to the design of the VACIE. The definition of access levels and indication colors are important here.</p> <p>Four access levels must be provided on the VACIE, from access level 1 (most accessible, normal operation of all mandatory functions) to access level 4 (i.e. least accessible, access restricted by special means. This can mean programming of the VACIE's core)</p> <p>Indication colors of light emitting indicators must be:</p> <ul style="list-style-type: none"> <li>a) Red for indications of voice alarms</li> <li>b) Yellow for indications of fault warnings and disablements</li> <li>c) Green for the indication that the VACIE is supplied with power</li> </ul>
Functional tests (16)	<p>Functional tests to demonstrate the good performance of the VACIE, frequency response test of the VACIE and operational and endurance tests with regard to cold/damp/heat/steady state, impact, vibration, supply voltage variation, Electromagnetic Compatibility (EMC) Immunity.</p>

While the mandatory requirements are most important for safeguarding the good quality and proper functioning of voice evacuation products, optional functions may be included for specific applications. Optional requirements can be included, for example, in national or local application guidelines and project-specific tender specifications.



Relevant optional functions in EN 54-16

- ▶ audible warning (7.3)
- ▶ delay(s) to entering the voice alarm condition (7.4)
- ▶ phased evacuation (7.5)
- ▶ manual silencing of the voice alarm condition (7.6.2)
- ▶ manual reset of the voice alarm condition (7.7.2)
- ▶ output to fire alarm devices (7.8)
- ▶ voice alarm condition output (7.9)
- ▶ indication of faults related to the transmission path to the CIE (8.3)
- ▶ indication of fault related to voice alarm zones (8.4)
- ▶ disabled condition (9)
- ▶ voice alarm manual control (10)
- ▶ interface to external control device(s) (11)
- ▶ emergency microphone(s) (12)
- ▶ redundant power amplifiers (13.14)





As explained in earlier chapters, EN54-16 is a product standard and EN54-16 complying products may carry a CE mark. However, the requirements and performance criteria that the EN54-16 contains should be regarded as pertaining to the voice alarm system as a whole and not just separate system components. EN54-16 certification is only granted when a complete system setup is tested and approved, including the 19" rack in which the system is fitted. Therefore the CE marking should be fitted on the rack including the certified Voice alarm central equipment products.

Generally, the certificate mentions the generic system name with the more important information - the list of certified products and racks - detailed in the certificate's 'Annex'.

Note: This European standard does not cover emergency alarm systems for non-fire applications. In other words, it does not cover voice alarm systems that are not connected to fire indicating and control equipment. It may however be used for such systems.



## 6. Voice Evacuation Standard EN54-24 for Voice Alarm Loudspeakers



Part 24 of the EN54 standard specifies requirements, testing methods and performance criteria for loudspeakers used in fire detection and alarm systems that broadcast a warning of a fire to the occupants of a building. The loudspeaker is assumed to be part of the alarm condition in the event of fire, before the fire is so large it affects the functioning of the loudspeaker, meaning that the standard has no requirement for loudspeakers to function when exposed directly to the fire.

EN54-24 gives common requirements for the construction and robustness of voice alarm loudspeakers, as well as their performance under climatic and mechanical conditions, but does not take into account the acoustical surroundings that the designer and installers are confronted with.

In other words, the standard helps designers to make objective decisions about which loudspeaker to use in a specific application, but it doesn't guarantee intelligibility in the premises.



EN 54-24-specified loudspeakers are classified in two types:

**Type A, generally for indoor use**

**Type B, generally for outdoor use.**

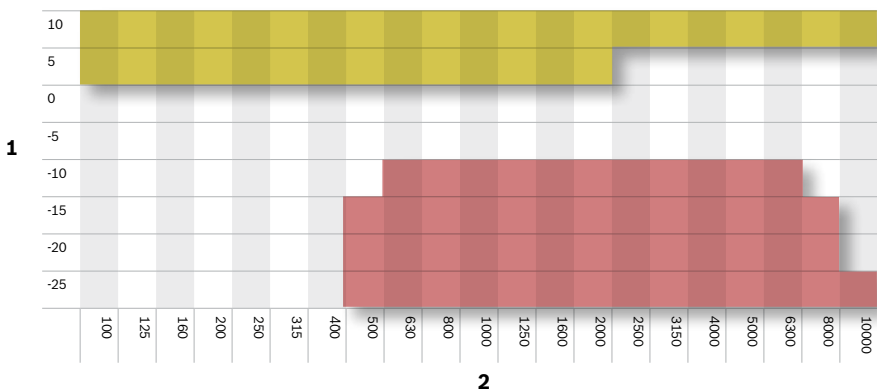
More specific differences between type A and type B loudspeakers are given in the table below.

Requirement	Type A (indoor)	Type B (outdoor)
Temperature resistant dry heat	$55 \pm 2^{\circ}\text{C}$	$70 \pm 2^{\circ}\text{C}$
Temperature resistant cold	$-10 \pm 3^{\circ}\text{C}$	$-25 \pm 3^{\circ}\text{C}$
Temperature resistant damp heat (at $\geq 95\%$ rel. humidity)	$40 \pm 2^{\circ}\text{C}$	$55 \pm 2^{\circ}\text{C}$
Enclosure protection (EN 60529:1991/A1:2000)	IP21 (2 = protected against solid objects over 12mm, 1 = protected against vertically falling drops of water)	IP33 (3 = protected against solid objects over 2.5mm, 3 = protected against direct sprays of water up to 60 degrees from vertical)

An important step in granting EN54-24 certification is the testing and review of the loudspeaker manufacturer by a notified certification body based on specifications in terms of performance.

**Important specifications to consider are:**

- Frequency response – the response has to fit into a range of minimum/maximum relative levels of dB per octave band [Hz] as shown in the below figure.



**Key**

- 1 Relative level (dB)
- 2 1/3 octave band centre frequency (HZ)

- Durability – the loudspeaker has to be able to operate for 100 hours at the rated noise power specified by the manufacturer. Previously, this was only done by few manufacturers as a Power Handling Capacity (PHC) test.

- ▶ Construction - suitable connectors for external cables are to be provided, materials used must withstand certain levels of heat and cold, corrosion, shock, impact, and vibration. Plastic enclosures have to conform to flammability standards EN 60695-11-10 (<15W) or EN60695-11-20 (>15W). Access for removal of parts should be limited and adjustment to the mode of operation should only be possible by means of hidden screws, tools, etc.

EN54-24 is not to be mistaken with EN54-3 which is primarily intended for fire alarm signal sounders, but also covers voice alarm sounders; the difference is that the EN54-3 is not applicable when the loudspeakers are primarily used for voice alarm messaging.

It is also important to realize that this European standard is not intended to cover addressable/active loudspeakers and that the standard does not cover loudspeakers used in hazardous applications (for example EX horns). Loudspeakers used in these applications require additional tests to those laid out by this European standard.



## 7. Voice Evacuation Standard EN54-4 for Voice Alarm Power Supply Equipment



A system's power supply plays the most important role in guaranteeing reliable operation. Part 16 of the EN54 standard states that all power supply equipment, external or included in the voice alarm control and indicating equipment (VACIE), shall comply with the requirements of EN 54-4. The latter specifies requirements, testing methods, and performance criteria for power supply equipment.

To guarantee correct operation of the voice alarm system, the most important requirement, as written in EN54-4, is that power for the VACIE be provided by at least two power sources;

- ▶ mains power source and,
- ▶ standby power source.

EN54-4 further prescribes that at least one standby power source is a rechargeable battery and that the power supply equipment include charging equipment to charge the batteries and maintain them in a fully charged state.



Whereas the power supply equipment itself is subject to EN54-4 certification, the batteries are not. The batteries must be rechargeable, able to be maintained in a fully charged state, constructed for stationary use, and marked with type number and production date.

This means that basically any battery can be used. However, to guarantee that the requirements for charging (which are part of the EN54-4 requirements) are met, it is advisable to follow the manufacturer's advice on battery selection. The charger must be designed and rated so that:

- ▶ A battery discharged to its final voltage can be recharged to at least 80% of its rated capacity within 24 hours
- ▶ A battery discharged to its final voltage can be recharged to its rated capacity within another 48 hours
- ▶ The charging characteristics are within the battery manufacturer's specifications with regard to the ambient temperature range of the battery

Power supply equipment can either be housed in the same rack or housing as the voice alarm control and indicating equipment or in a separate rack.

1. When placed in the same housing, which is common with, for example, power amplifiers, it will be regarded as part of the central equipment and certified under EN54-16. There is no separate EN 54-4 certificate for these internal power supplies.
2. When placed in the same rack, but not in the same housing, it will be certified for EN54-4 compliancy and must also be part of the EN54-16 certification.
3. When the power supply equipment is placed in a separate rack, it will be certified for EN54-4 compliancy and is not part of EN54-16 certification.

In any case, all manual controls, fuses, calibration elements, etc. for disconnection and adjustment of the power sources must be accessible only at access level 3, meaning that the equipment is placed in a closed rack only accessible with a tool or key.





<b>Batteries, charger and VACIE in the same rack</b>	<b>Batteries, charger and VACIE in separate racks</b>
charger part of EN54-16 certificate for VACIE	EN54-4 certificate for charger
	EN54-16 certificate for VACIE
power supplies placed in closed/locked rack	power supplies placed in closed/locked rack

The power supply equipment referred to in bullets 2 and 3 shall be clearly marked 'EN 54-4', and show the manufacturer's name, the type number and the production period. If the power supply equipment is housed in its own rack, the marking should be found on the outside of the cabinet.



## 8. EN54 Voice Alarm and other Voice Alarm Standards



### 8.1 EN 60849 and EN54

The overall requirements of a voice alarm system, especially concerning audibility and intelligibility, are not covered in the new parts of the EN54 standard, whereas EN 60849 did address these topics.\*\*

In other words, the EN54 standard was primarily written for applications where voice evacuation is part of, or connected to a fire alarm system. For applications, such as stadiums, where the voice alarm system often has no direct connection with a fire alarm system, some parts of the EN54 fire alarm-voice alarm standard would be irrelevant. It is therefore expected that EN 60849 will be revised or replaced by a new standard that will bring it in line with EN 54-16.

### 8.2 ISO 7240-16 + ISO7240-19 + ISO 7240-24 and EN54

The International Standardization Committee (ISO) provides global product, design, and installation standards and as such also provides the following:

EN54	ISO 7240 counterpart
Part 16	Part 16, fire detection and alarm systems – sound system control and indicating equipment.
Part 24	Part 24, fire detection and alarm systems – sound system loudspeakers.
Part 4	Part 4, fire detection and alarm systems – power supply equipment.
-	Part 19, design, installation, commissioning, and servicing of sound systems for emergency purposes.

EN54 does not provide any guideline with regard to the realization of a voice alarm installation, however the International Standardization Organization covers the following topics in Part 19 of ISO 7240:

- ▶ Design
- ▶ Planning (of the installation and related [what?]),
- ▶ Equipment & material requirements
- ▶ System compatibility (and components)
- ▶ Approval of the system and components
- ▶ Installation of the system
- ▶ Commissioning the system
- ▶ Usage of the system
- ▶ Service/after care of the installed system
- ▶ Troubleshooting

\*\* When, with the introduction of EN54-16, it was suggested to withdraw EN 60849, the German National Committee drew attention to the fact that the withdrawal of EN 60849:1998 would result in a gap concerning 'sound systems for emergency purposes which are not part of fire detection and alarm systems'.

## 9. Bosch Security Systems EN54-certified Voice Alarm products

Both of Bosch's Voice Alarm Systems – the mid-end Plena System and the high-end fully digital Praesideo System – have been granted EN 54 certification by an accredited notified body. Certification includes not only the central Voice Alarm Equipment, but also peripheral equipment, such as loudspeakers and charging equipment. The central equipment of Praesideo 3.5 and Plena VAS 2.16 have been granted EN 54-16 certification, the Bosch Chargers carry EN54-4 certification, and Bosch has also been granted EN 54-24 certification for a broad range of loudspeakers covering a host of different application areas associated with Voice Alarm.



## 9.1 EN54-16-certified Praesideo 3.5 Voice Alarm Products

The Praesideo product range is certified not only for the mandatory requirements of EN54-16 for voice alarm and indicating equipment, but also includes the following options:

Optional function	EN54-16 Clause	Certified
Audible warning	7.3	•
Phased evacuation	7.5	•
Manual silencing of the voice alarm condition	7.6.2	•
Manual reset of the voice alarm condition	7.7.2	•
Output to fire alarm devices	7.8	•
Voice alarm condition output	7.9	•
Indication of faults related to the transmission path to the CIE	8.3	•
Indication of fault related to voice alarm zones	8.4	•
Disabled condition	9	•
Voice alarm manual control	10	•
Interface to external control device(s)	11	•
Emergency microphone(s)	12	•
Redundant power amplifiers	13.14	•

The following Praesideo products are certified according to EN54-16:

Product	Commercial type number	Short description
A	PRS-NCO-B	Network Controller (Incl. Prs-Sw)
B	LBB4402/00	Audio Expander
C	PRS-16MCI	Multi Channel Interface
	PRS-CRF	Call Stacker
D	PRS-1B500	Basic Amplifier, 1X500w
	PRS-2B250	Basic Amplifier, 2X250w
	PRS-4B125	Basic Amplifier, 4X 125W
	PRS-8B060	Basic Amplifier, 8X 60W
E	PRS-1P500	Power Amplifier 1 X 500 W
	PRS-2P250	Power Amplifier 2 X 250 W
	PRS-4P125	Power Amplifier 4 X 125 W
	LBB4428/00	Power Amplifier 8X60w



Additional Praesideo products certified according to EN54-16:

Product	Commercial type number	Short description
F	LBB4430/00	Call Station Basic
G	LBB4432/00	Callstation Keypad
H	PRS-CSNKP	Numeric Keypad
I	PRS-CSR	Remote Call Station
	PRS-SW	Praesideo Software (For Prs-Nco-B)
	PRS-CSI	Call Station Interface
	PRS-FIN	Fiber Interface
	PRS-FINNA	Fiber Interface Non-Addressable
	PRS-FINS	Fiber Interface Single-Mode
	PRS-NSP	Network Splitter
	LBB4440/00	Supervision Control Board
	LBB4441/00	Loudspeaker Supervision Board
	LBB4442/00	Line Supervision Set
LBB4443/00	End Of Line Supervision Board	
LBB4446/00	Set Of Supervision Brackets (10 Pcs)	

## 9.2 EN54-16-certified Plena 2.16 Voice Alarm Products

The Plena Voice Alarm product range is certified not only for the mandatory requirements of EN54-16 for voice alarm and indicating equipment, but also includes the following options:

Optional function	EN54-16 Clause	Certified
Clause	Certified	
Audible warning	7.3	•
Manual silencing of the voice alarm condition	7.6.2	•
Manual reset of the voice alarm condition	7.7.2	•
Voice alarm condition output	7.9	•
Indication of faults related to the transmission path to the CIE	8.3	•
Indication of fault related to voice alarm zones	8.4	•
Emergency microphone(s)	12	•
Redundant power amplifiers	13.14	•

**EN54-24** EVAC Certified  
Emergency  
Voice Alarm





The following Plena Voice Alarm products are certified according to EN54-16:

NR	Commercial type number	Short description
A	LBB1990/00	Controller
	LBB1981/00	Handheld Microphone
B	LBB1992/00	Router
C	LBB1995/00	Fireman's Panel
D	LBB1996/00	Remote Control
E	LBB1997/00	Remote Control Extension
F	LBB1935/20	Plena Power Amplifier 360/240W
	LBB1938/20	Plena Power Amplifier 720/480W
	PLN-1P1000	Plena Power Amplifier 1000W,
H	PLN-1EOL	Set Of 6 End Of Line Boards
	PLN-DMY60	Set Of 12 Dummy Load 60W
	TA-110	Lanex Fiber Interface



### 9.3 EN54-24-certified Bosch Loudspeaker Voice Alarm Products

Bosch provides EN54-24-certified products for the full range of audio applications, including voice alarm, speech and background music, as well as foreground music and professional audio. The Bosch range includes indoor and outdoor loudspeakers, as well as flush wall- and ceiling-mounted loudspeakers. The following types are certified:



NR	Commercial type number	Commercial classification	ST CL
A	LBC 3086/41	Ceiling Loudspeaker	A
B	LC1-WM06E8	Modular Ceiling Loudspeaker	A
B	LC1-UM06E8	Modular Ceiling Loudspeaker	A
B	LC1-UM12E8	Modular Ceiling Loudspeaker	A
B	LC1-UM24E8	Modular Ceiling Loudspeaker	A
C	LB1-UM06E	Cabinet Loudspeaker	A
D	LBC 3018/00	Cabinet Loudspeaker	A
E	LBC3432/02	Sound Projector	B
F	LB3-PC250	Premium Sound Cabinet Loudspeaker	B
F	LB3-PC350	Premium Sound Cabinet Loudspeaker	B
G	LA1-UM20E	Line Array	B
G	LA1-UM40E	Line Array	B
H	LBC 3482/00,	Horn Loudspeaker	B
I	LBC 3483/00	Horn Loudspeaker	B


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 EVAC Certified  
 Emergency  
 Voice Alarm

As an extra operational benefit, every Bosch Voice Alarm Loudspeaker is equipped with a ceramic block and thermal fuse (in accordance with BS5839:8) to prevent the failure of a total loudspeaker line in the case where a short is caused by one loudspeaker. The measure is not described in EN54-24, but will have significant positive impact on the correct operation of the loudspeaker.

Each Bosch Loudspeaker is equipped with a ceramic connector and fuse



The following products are currently under certification:

Commercial type number	Commercial classification
LS1-OC100E-1	Hemi-directional Loudspeaker 100 W
LH1-UC30E	Music Horn Loudspeaker 30 W
LH1-10M10E	Horn Loudspeaker 10 W
LBC3430/02	Bi-directional Sound Projector 12 W
LB1-UM20E-D/L	Cabinet Loudspeaker 20 W
LB1-UM50E-D/L	Cabinet Loudspeaker 50 W
LC2-PC30G6-4	Premium Sound Ceiling Speaker 30 W
LC2-PC30G6-8	Premium Sound Ceiling Speaker 30 W
LC2-PC30G6-8L	Premium Sound Ceiling Speaker 30 W
LBC3200/00 XLA	Line Array Loudspeaker 30 W
LBC3201/00 XLA	Line Array Loudspeaker 30 W
LBC3210/00 XLA	Line Array, Loudspeaker 30 W
LP1-UC10E-1	Uni-directional Sound Projector 10 W
LP1-BC10E-1	Bi-directional Sound Projector 10 W
LP1-UC20E-1	Uni-directional Sound Projector 20 W
LS1-UC20E-1	Uni-directional Sound Projector 20 W

## **9.4 EN54-4-certified Bosch Battery Chargers**

Bosch provides EN54-4 certified products for both 24VDC and 48VDC backup power. These battery chargers come with full documentation that offers advice on the best-in-class batteries that Bosch recommends for use with 48VDC Praesideo equipment and 24VDC Plena Voice Alarm equipment. The following power supply equipment is certified:

Battery brands to be used with the Bosch Chargers are:

- ▶ Yuasa NPL series
- ▶ Powersonic GB series
- ▶ ABT TM series
- ▶ Enersys VE series
- ▶ Effecta BTL series
- ▶ Long GB series

PLN-24CH12 and PRS-48CH12 charge lead-acid batteries and simultaneously provide 24 or 48 volts for system components that use 24 or 48 volts. These Battery Chargers are fully compliant and certified to the EN 54-4 standard. These Battery Chargers have been designed to work with a Praesideo or Plena Voice Alarm System, but can be used in any system.



PLN-24CH12 24 V Battery Charger

**EN54-4**

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Voice Alarm



PRS-48CH12 48 V Battery Charger

**EN54-4**

EVAC Certified  
Emergency  
Voice Alarm

## 10. Implementation of Voice Alarm Product Standards



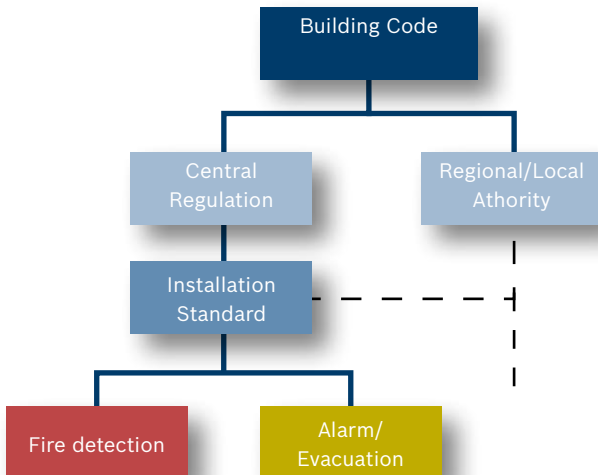
The overall safety of a system in an alarm and emergency application in accordance with EN54-16, EN54-24 and EN54-4 not only depends on the safety of each component, but also to a great extent on the design, installation, and correct operation of the complete system. For example, the sound pressure level of the system depends on the products chosen to do the job, as well as their design and installation. It is important that systems are always designed, installed, and operated by qualified personnel in order to ensure a correctly functioning system.

In addition, the fact that product standards EN54-16, EN54-24 and EN54-4 exist does not automatically mean a voice evacuation system is installed alongside a fire system where it could be required. In Europe, every Member State is responsible for making the harmonized product standards the national standard, however whether a voice evacuation system is required in locations where fire systems have been installed is subject to local regulation.



## 10.1 Country Implementation and Codes

How EN54-16, EN54-24 and EN54-4 product standards are introduced in each country can be completely different. The main differences pertain to when an alarm and or voice alarm system is deemed necessary and in what detail the system requirements are described to the installer and owner. In some countries, building codes are developed by government agencies or quasi-governmental standards organizations and then enforced across the country by the central government. These codes are known as the national building codes (and in a sense, they have mandatory nationwide application). In other countries, where the power for regulating construction and fire safety is vested in local authorities, a system of model building codes is used. Model building codes have an advisory status and give a rough outline of safety requirements.



### European regulations and codes

Two countries where codes specifically mention fire alarm and voice evacuation and regulate correct design, installation, etc. and/or when voice evacuation should be used are Germany and the Netherlands.

## 10.2 Regulations in Germany and the Netherlands

### 10.2.1 When to use Voice Evacuation; a Dutch Example.

In the Netherlands, regional/local regulations are about “Making sure that voice evacuation solutions are installed additionally to fire systems when needed.”

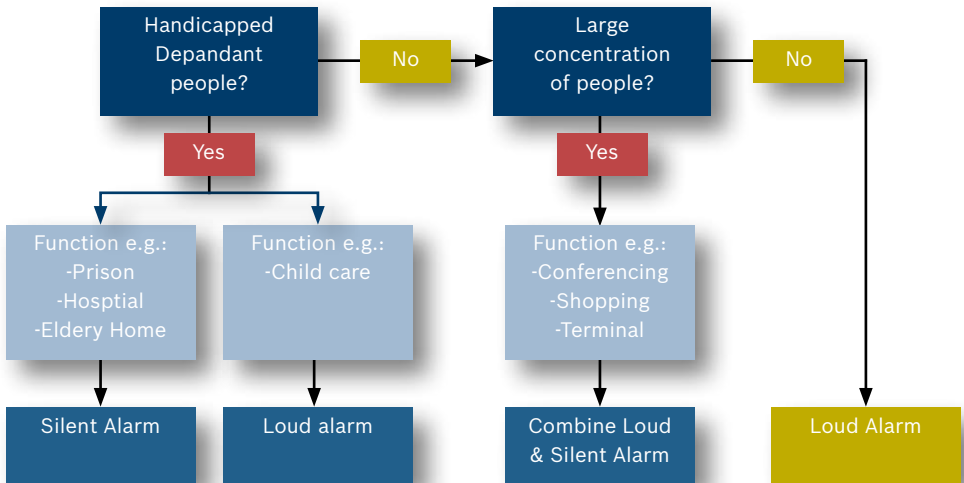


Regulations therefore refer to the NEN2575 standard for system, quality and design of voice alarm systems in buildings. Especially interesting in this standard is the description of the ‘choice of alarm type per application and application scale’.

The choice of alarm type or combination of alarm types is:

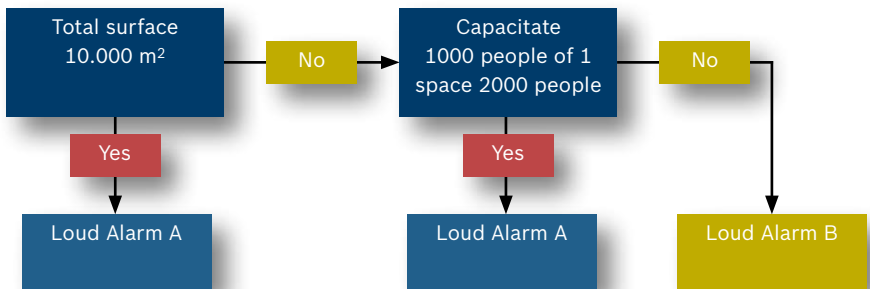
- ▶ **Loud Alarm**
  - type A, for voice evacuation
  - type B, for evacuation by sounders
- ▶ **Silent alarm** (attention panels, code messages, paging)

Which alarm type or combination of alarm types is used depends on the type and size of the application. The decision about the alarm system is made by means of flow charts.



**Flow chart example NEN2575.**

Restrictions to the usage of a specific solution for each application are also given. For example, for public buildings the following decision model is applied.



**Flow chart example NEN2575.**

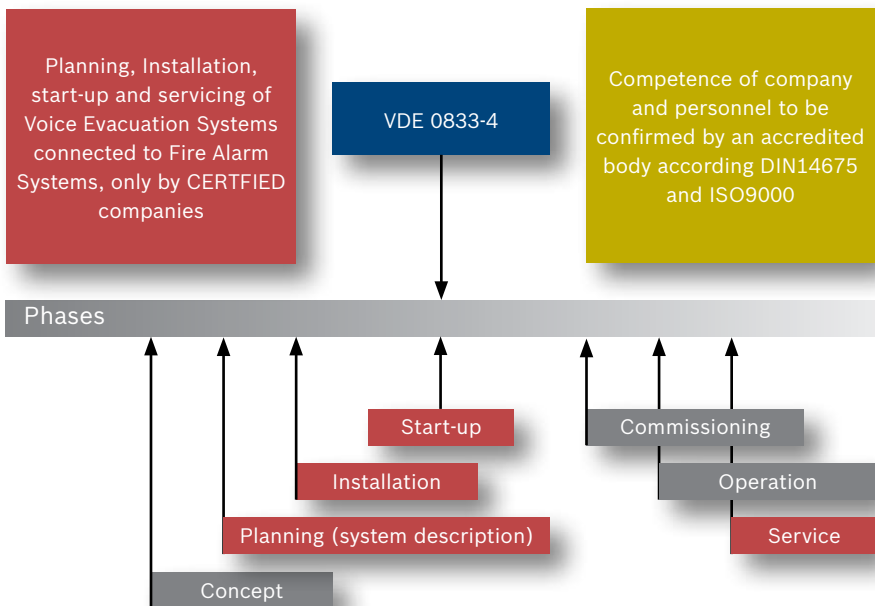
### 10.2.2 Correct Design, Realization and Service; a German Example.

In Germany, a voice alarm system controlled by a fire alarm system is subject to DIN VDE 0833-4. This national standard must be followed during the six phases of installation of the voice alarm system. These phases are:

Conception	A description of the purpose of the building, fire brigade intervention time, user responsibilities, alarm procedures, and risk analyses taking into account surface/escape routes/building structure and building parts where voice EVAC is required and where it is not.
Planning	A solution description and installation plan with detailed information about zoning, BOM [?], and block schemes, and including remarks and a test plan. Its development is the responsibility of the engineering bureau. It should include: determination of user interfaces, power management, prioritizing messages, EVAC zones and zone groups, automatic and/or phased evacuation, loudspeaker planning and intelligibility, alarm signals and normal signaling.
Installation	Physical installation by the installer.
Initial start-up	The pre-commissioning by the installer is overseen by the owner/investor. Checking the configuration, measuring intelligibility, and measuring the power consumption in normal and evacuation situations are included in this pre-test.
Commissioning	Final test by a responsible person appointed by a government authority.
Operation and service	Servicing has to be documented and may only to be done by the installer (operation and check are documented for the end user).

The German standard adds particular value with regard to ensuring that “voice evacuation solutions are designed and installed properly and have the desired result.” For this purpose, the companies and personnel taking care of the planning, installation, start-up, and service phases are respectively subjected to:

- ▶ Mandatory company ISO9000 certification and competence requirements as described in DIN14675
- ▶ Mandatory competence certification for the personnel responsible for planning, installing, and servicing the system in accordance with the requirements of DIN14675 by an accredited bureau



VDE 0833-4, Realization phases subject to certification

# 11. Certificates Praesideo, Plena Voice Alarm and Loudspeakers



ification



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## Addendum

### Tests

This addendum relates to the EN54-24 chapter on page 26 that explains the certification criteria for loudspeakers.

The list below describes the tests performed and that must be passed in order for certification to be granted.

#### The tests cover:

- ▶ **Reproducibility:** To verify that the acoustical performance of the loudspeaker does not vary unduly from specimen to specimen.
- ▶ **Rated impedance:** To check that the rated impedance specified by the manufacturer is achieved.
- ▶ **Horizontal and vertical coverage angles:** To check that the horizontal and vertical coverage angles specified by the manufacturer (see 4.5.2 c) are achieved.
- ▶ **Maximum sound pressure level:** To check that the maximum sound pressure level specified by the manufacturer is achieved.
- ▶ **Rated noise power (durability):** To check that the rated noise power specified by the manufacturer is achieved.
- ▶ **Dry heat (operational):** To demonstrate the ability of the loudspeaker to function correctly at high ambient temperatures that may occur for short periods in the service environment.
- ▶ **Dry heat (endurance):** To demonstrate the ability of the loudspeaker to withstand long-term ageing effects.
- ▶ **Cold (operational):** To demonstrate the ability of the loudspeaker to function correctly at low ambient temperatures as appropriate to the anticipated service environment.
- ▶ **Damp heat, cyclic (operational):** To demonstrate the immunity of the loudspeaker to an environment with high relative humidity, where the device may be subject to condensation.

- ▶ **Damp heat, steady state (endurance):** To demonstrate the ability of the loudspeaker to withstand the long-term effects of humidity in the service environment (e.g. changes in electrical properties due to absorption, chemical reactions involving moisture, galvanic corrosion).
- ▶ **Damp heat cyclic (endurance):** To demonstrate the ability of the type B loudspeaker to withstand the long-term effects of high humidity and condensation.
- ▶ **SO2 corrosion (endurance):** To demonstrate the ability of the loudspeaker to withstand the corrosive effect of sulfur dioxide as an atmospheric pollutant.
- ▶ **Shock (operational):** To demonstrate the immunity of the loudspeaker to mechanical shocks that may occur in the anticipated service environment.
- ▶ **Impact (operational):** To demonstrate the immunity of the loudspeaker to mechanical impacts upon its surface, which it may sustain in the normal service environment, and which it can reasonably be expected to withstand.
- ▶ **Vibration, sinusoidal (operational):** To demonstrate the immunity of the loudspeaker to vibration at levels considered appropriate to the normal service environment.
- ▶ **Vibration, sinusoidal (endurance):** To demonstrate the ability of the loudspeaker to withstand the long-term effects of vibration at levels appropriate to the service environment.
- ▶ **Enclosure protection:** To demonstrate that the degree of protection provided by the loudspeaker's enclosure with regard to the presence of solid foreign objects and the harmful effects due to the entrance of water, meets the minimum requirements of European Standard EN 60529:1991.



In 2011, the Bosch Group is celebrating a double anniversary: the 125th anniversary of the company's establishment, and the company founder's 150th birthday. This is cause for more than mere retrospection – it prompts us to show how the company's past fuels its future. The history of the company has had its ups and downs, but at the same time has always been vibrant. We see this history as one that drives us forward to new – and above all beneficial – achievements.

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