ZVEI:
Safety and Security Systems

Nurse Call Systems according to DIN VDE 0834

Safely into the future

Imprint:

Planning Brochure Nurse Call Systems According to DIN VDE 0834

Publisher:

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November 2008

Notes on Planning, Installation, Operation and Maintenance of Nurse Call Systems According to DIN VDE 0834 e.g. in Hospitals, Residential Homes for the Elderly and Senior Citizens, Care Institutions, Forensic Clinics and Prisons

Compiled by Members of the Committee of Experts for Nurse Call of the ZVEI Trade Group Security Systems

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Call Systems –
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1. Introduction

This is the third and revised edition of this brochure. The first editions (in German only) originated immediately after the appearance of the new version of the standard DIN VDE 0834 and met with an exceptional amount of interest. This brochure should assist all those interested in the application of this standard, as well as achieving a manufacturer-wide standardisation of the procedures and terminology.

This goal has been achieved. Unfortunately, it has been discovered that not all companies that deal with the subject matter take account of this standard. Through ambiguous arguments and clearly false interpretations, sometimes conceptual deficiencies in their own technology are covered up and expensive investment is avoided. The companies organised in the committee of experts for nurse call have, by contrast, carried out higher investment in function and operational safety. No company in the market can exclude itself if it wants to live up to this state.

Non-compliance and/or "liberal interpretation" of the standard carelessly endangers patients, those requiring protection and, in particular, the elderly. As a result of these dangers it would appear to be necessary to address the points that are vital for safeguarding affected persons more clearly and plainly.

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1.1 General

The Committee of Experts for Nurse Call in the ZVEI represents active manufacturers of call and communication systems for hospitals, senior citizens' residences and care institutions, forensic clinics and prisons in Germany. Its member companies and their representatives possess a wealth of experience and expertise, gained over many decades, in all questions that arise, from the planning to the operation of such systems. Their products reflect the results of continuous innovation processes, in which the desires and the safety of the user, the requirements of the planner and installer, the constant target of cost reduction and the latest state of technology are incorporated.

The current publication in its third edition aims to give a summarised overview of the Application Area and is directed at interested planning offices, installation companies and operators.

The notes are valid for the planning, installation, extension, modification, operation and maintenance of call and communication systems, traditionally known under the term "nurse call systems".

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These systems range from simple call functionality through to complex systems, which orient themselves on the requirements of modern care services and which are subject to DIN VDE 0834. This standard has been brought into force by the Deutschen Elektrotechnischen Kommission (DKE) (German Electrical and Electronics Commission) in DIN and VDE in agreement with the European Standards Organisations.

1.2 Application areas

"Typical for these systems is a variable degree of danger that can occur for the caller or other party if calls are not indicated as the result of a malfunction or malfunctions are not recognised in time…""

Nurse call systems within the meaning of this publication are call systems with the help of which persons can be summoned or sought or information can be forwarded. Typical for these systems is a variable degree of danger that can occur for the caller or other party if calls are not indicated as the result of a malfunction or malfunctions are not recognised in time, for example in

- hospitals
- homes for the elderly and senior citizens
- care institutions
- forensic clinics
- prisons

DIN VDE 0834 describes a human environment, in which a person seeking help summons assistance. The standard is valid universally; application areas such as hospitals, prisons and homes for the elderly are only listed as possible examples. The standard sets the framework conditions for technical boundary limits, for timing and function procedures and for the interface between humans and the system.

"Call systems are independent systems."

Call systems are independent systems. They possess their own supply and transmission network, independently of third-party systems, that must be controlled and monitored by the devices of the call system itself. Call system devices may carry out telecommunications, media technology and information technology functions, in order to be able to offer the user (e.g. the patient) a full and perfectly matched service package. These functions are, for instance, light control, radio reception, remote control of TV equipment, telephone connection and debt collection functions.

"According to DIN VDE 0834, call functions must always have unlimited priority over all other services…"

According to DIN VDE 0834, call functions must always have unlimited priority over all other services; emergency operation must be guaranteed.

"The system must be (…) functionally completely independent of third-party systems…"

The system must be protected by means of secure cut-off points against the transmission of impermissible higher voltages and must be functionally completely independent of third-party systems that are attached to the call system. The exchange of data with other security and communications systems may only take place via interfaces that are certified by the manufacturer.

So, for example, the switching off of the auxiliary telephone system, the failure of a TV or short-circuiting of a bed light must under no circumstances have an effect either on the functional capability of the call system or on its functional characteristics.

When using medical equipment or other intensive care devices, the use of the call system does not replace the rules and regulations for the personnel and the duty of care when operating such devices. The system can however additionally transmit messages to accelerate observance of calls and alarms.

1.3 Standards

DIN VDE 0834	Call systems in hospitals, nursing homes and similar institutions
DIN EN 793	Special requirements for the safety of medical supply units
DIN EN 60601-1	Medical electrical equipment Part 1: General requirements for basic safety and essential performance
DIN EN 60601-1-1	Medical electrical equipment Part 1-1: General requirements for safety; Collateral standard: Safety requirements for medical electrical systems
EN 61000-6-2	Electromagnetic compatibility (EMC) Generic standards - Immunity for residential, commercial and light-industrial environments
EN 61000-6-3	Electromagnetic compatibility (EMC) Generic standards – Emission standards for residential, commercial and light-industrial environments
DIN VDE 0100	Low-voltage electrical installations with up to 1000 V nominal voltage
DIN VDE 0107	Low-voltage electrical installations in hospitals and rooms used for medical purposes outside hospitals
EN 60950	Information technology equipment – Safety
DIN EN 50134	Alarm systems – Social alarm systems
DIN 77800	Quality requirements for providers of "Assisted living for the elderly"

Furthermore, the rules and regulations of each of the individual German states, e.g. hospital building regulations, must be observed.

HeimMindBauV (Minimum requirements for installation and operation for retirement homes, homes for elderly citizens and care institutions)
As a result of this regulation, the installation of a call system is mandatory. The planning, installation and the operation of call systems for homes in which persons in need of care are housed, fall without exception within the scope of DIN VDE 0834.

Standards are normally not necessarily binding for planners and installers, insofar as their use is not required by law. The specification of a standard lies initially at the discre-

"Standards are normally not necessarily binding for planners and installers, insofar as their use is not required by law. The specification of a standard lies initially at the discretion of those responsible. However, if there is a standard, in which the protection of safety, health and life are regulated in advance, it is normally regarded as a binding, generally acknowledged rule of technology (BGHAz. (German Federal Supreme Court File No.): I ZR 234/89 from 06.06.1991). It is used as the basis for the clarification of claims and for the assessment of the question of guilt."

"The standard is not fulfilled only in that technically the correct devices are assembled. If the system is not installed and used organisationally according to the standard, and if this was intentional or foreseeable, then ultimately the standard has not been complied with and this also raises the question here of liability."

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1.4 Prisons, forensic clinics

Detainees in prisons or patients in forensic clinics are restricted in their freedom of movement and are confined to small areas for long periods of time in the daily routine. Naturally under these conditions living closely together with people with different educational backgrounds and personality structures often leads to social tensions with the danger of the use of physical and psychological violence against others, against themselves and against installations. This danger confronts the prisoners themselves, as well as the officers and carers supervising and looking after them.

The recreation area of the prisoners and the areas where prisoners and supervisory staff meet must therefore also be so equipped, because of the particular duty of care, that every possible hazard can be recognised early or can be reported by each of those affected and help can be requested.

1.5 Short overview of minimum requirements according to DIN VDE 0834

"DIN VDE 0834 takes into account rapid technological advances, in that it does not specify which technologies should be used."

DIN VDE 0834 takes into account rapid technological advances, in that it does not specify which technologies should be used. However, it sets the framework conditions for technical boundary limits, for timing and function procedures and for the human and system interface.

For a fast initial orientation, the most important design parameters are summarised here. Functions and terminology from the area of hospitals/care institutions are used for this. They can be used analogously for all call situations and all persons, who are exposed to danger, e.g. also for staff in a prison:

- Every bed must have a call release assigned to it, which can be easily reached by bed-ridden patients.
- Call buttons are always red, have a clear call symbol and must be easily recognisable in darkness.
- The call release must be indicated optically in close proximity to the call element (reassurance lamp).
- In all rooms in which the personnel to be contacted can be found, manual or automatic presence buttons and acoustic noise generators for call forwarding must be present.
- An emergency call by a person providing assistance to fetch further persons providing assistance must be released automatically by means of pressing the available call button. This release must be prepared through the marking of presence for this location.
- Outside every room it is essential to provide a corridor indicator lamp, which indicates the call (red) and the presence (green) as a minimum. These indicators must still be clearly recognisable with an ambient luminous intensity of 500 lux. A call release must be indicated within one second.
- Additional text displays in the corridors should still be clearly readable between 5 lux and 500 lux at a distance of 20 m.
- Optical and acoustic signals must be unambiguously specified so that mobile response personnel can operate the call systems of different manufacturers without instruction. Only permanent lights, slowly flashing lights and fast flashing lights are permissible in a system. Likewise, for call forwarding a maximum of three acoustic signals are defined for normal calls, emergency calls and alarm calls. For further applications a maximum of one more acoustic signal is permissible, which must be clearly distinguishable from the tone sequences of the call forwarding.
- The time period between the call release and reaching the personnel responsible must not be longer than five seconds.
- The marking of the presence of personnel in the call area may be used for deleting the call.
- Rooms, which cannot be looked into from the installation location of the presence recognition, such as bathrooms, must be provided with a separate call cancellation.
- Call and operational equipment must not be mounted under a common cover plate together with devices belonging to high voltage units and must be clearly distinguishable from these on the outside.
- For call systems with speech communication, remote cancellation of the call can only take place if a speech connection has actually been established. For calls without speech possibility, remote cancellation must not be possible. These calls may, however, be acknowledged in order to suppress acoustic call forwarding as long as an optical indication still occurs.

"Every bed must have a call release assigned to it, which can be easily reached by bed-ridden patients."

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"The power supply of the system must not exceed 30 V effective value or 60 V direct current. This low voltage must not be used for other systems as well."

"All call systems must be supplied with emergency power, which takes over within 15 seconds of the failure of the normal current supply and maintains the operation for a minimum of one hour."

"…transmission paths of the call system may be used by other systems if all input and output signals via their own interfaces or those approved by the manufacturer of the call system are used…"

- The power supply of the system must not exceed 30 V effective value or 60 V direct current. This low voltage must not be used for other systems or devices as well. Exceptions are electronic latching relays for light control and call system interfaces to other products. They must be securely connected and must be provided with their own overload protection. On the installer side suitable protective measures against impermissible voltage peaks must be provided!
- All call systems must be supplied with emergency power, which takes over within 15 seconds of the failure of the normal current supply and maintains the operation for a minimum of one hour. With a power failure, existing calls must remain stored as an interim measure for at least 30 seconds.
- Transmission paths of other systems must not be used for the call system.
- Conversely, transmission paths of the call system may be used by other systems if all input and output signals via their own interfaces or those approved by the manufacturer of the call system are used and malfunctions of the third-party system do not affect the call system.
- All earth wires connected to the call system must be connected to the same main potential equalisation. If this is not possible, then the individual areas must be electrically isolated from each other.
- Cables that interconnect buildings must be provided with overvoltage protection or be electrically isolated.

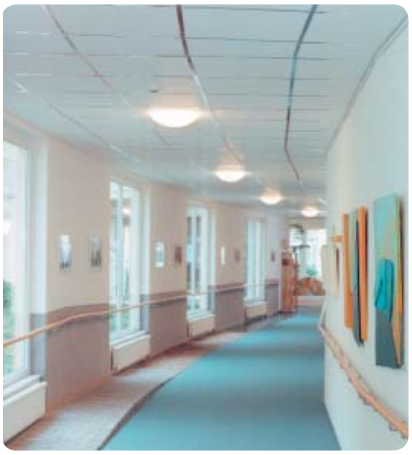
2. Terminology, Basic Functions, Characteristics, Requirements

Someterms,devicesandbasicfunctionsareexplainedbelowandtheircharacteristics/requirementsarecommentedupon,inordertofacilitateacommonlanguageforthemultiplicityofsystemtypesandtoavoidmisunderstandings.Thetermsarenotarrangedalphabetically,butinthesequenceinwhichtheyoccurwhenplanningsystemsandrequiringdecisions.Theinformationreferstohospitalsandoldpeople'shomes;thesameapplies analogously to prisons.

2.1 Organisation

Use	Description	Project notes
Application Area	Application Area is the area for which a call system is conventionally used. The deciding factor therefor is the behaviour in the event of a malfunction.	The call system should be planned as a stand-alone system; VDE 0834 should be taken as a binding basis. The Application Area should be specified together with the operator. Where applicable, hospital building regulations of German States should also be taken into account.
Application Area A	With the call system help is summoned, with a malfunction there is danger for the caller.	The call system must be capable of recognising and reporting malfunctions. The call system must monitor itself constantly.
Application Area B	With the call system special emergency calls, e.g. for a reanimation team, are also released or technical medical devices are attached for monitoring patients. Malfunctions pose a particular danger for the caller. Call systems in prisons always fall within the scope of Application Area B.	The transmission paths, call lines and those parts of the system important for the call release must be included in the monitoring. The current supply of the system must be guaranteed through suitable measures. The storage of calls during short-term interruptions of the current supply (e.g. power failure) must be ensured.
Protection Area A	There are no electrically conductive connections of persons to earth potential or other systems and devices.	Mostly, the manufacturer has already specified the applicable Protection Area for each group of devices. In Protection Area A no specific protection measures are required.

Use	Description	Project notes
Protection Area B	In this area an increased risk to patients can occur, if they are connected to earth potential or technical medical devices.	In Protection Area B additional measures are required. The selection of devices is important. Call switches, for instance in bathrooms, belong to Protection Area B.
Systems without speech	Calls are indicated optically and acoustically and can only be cancelled by going to the call location.	The call types to be recorded and forwarded should be specified at the planning stage.
Systems with speech	Calls are indicated optically and acoustically; specific calls may be cancelled remotely after a conversation with the caller.	It should also be specified which rooms of the call system should be fitted with or without speech connection.
Centralised operation	Type of organisation by which all calls from all wards are exclusively directed to a higher ranking central location (→ central switchboard), are answered and evaluated there and from where all further measures are put into operation.	It should be specified whether wards should also be operated locally as a temporary measure. The integration of fur ther function areas, (administration, X-rays, dispensary etc.), would be sensible for an efficient complete system.
De-centralised operation	Type of organisation by which all calls within the ward or the duty area reach the care personnel responsible directly on an answering unit in the duty room or at the respective current location of the personnel (→ call forwarding).	In addition to the patient rooms and function rooms, all rooms in which the care personnel and patients could pass time, must be included in the system.
Centralised / de-centralised operation	Type of organisation by which, depending on the time of day and frequency of calls, the centralised or de-centralised mode of operation can be activated separately ward-by-ward.	The call system must be capable of being switched automatically ward-by-ward to the other mode of operation, e.g. by pressing a button.
Group care	Type of organisation by which the ward-by-ward organisation is overlaid by the forming of care groups. Thereby, specific rooms or beds are linked to an individual duty area. This can also take place across wards.	It should be ensured that all rooms and beds are assigned; rooms and beds that have not been taken into account remain in their respective wards.



Use	Description	Project notes
Call forwarding mode	Mode of operation by which the calls are not only reported in the duty room but also in every other changeable location where the personnel can be found.	Mode of operation that is part of the de-centralised operation.
Ward / zone linking	Temporary extension of the call forwarding operation over several wards (groups) in quieter times or in emergencies.	The scope and the location of the zone linking should be specified; optical indicators should be planned in.
Ward / groups	Smallest self-contained organisational and care area with the same responsibilities, whose messages can be centralised and which should also be reflected in the technological realisation, e.g. supply area of a power supply, closed loop system.	This area results from the structure of the institution. It should be planned so that it can be operated independently and can be integrated into the organisational areas.
Duty area	Periodic organisationally required linking of wards, whose calls should reach the same personnel → zone linking.	The wards should also be close to each other, in order to be linked sensibly.
Duty room	Location where the care personnel can regularly be found.	The duty room normally has a main answering unit installed in it.
Patient room	Room in which one or more patients are cared for.	Equipment for calls, call cancellation and the marking of presence (call forwarding) should be planned.
Function room	Room in which personnel are temporarily and during which time they must be contactable, in which however no patients are found.	As a minimum call forwarding must be provided for each room; where appropriate, displays can offer important additional information.

2.2 Functions

Use	Description	Project notes
Call	Call from person requiring assistance, with the aim of being visited or spoken to by a carer.	Each bed must have a device for call release assigned to it, which can be easily and safely reached by the patients. The call button must be red and lit up when dark. This applies correspondingly to all other rooms in which patients could be found. The call release must be indicated optically in the call button or in the immediate vicinity by means of a reassurance lamp. Call buttons in bathrooms must be specially designed for this environment.
Presence	Marking of the presence of care personnel by means of → presence button when entering a room connected to the call system.	In all rooms in which the personnel should be contactable by calls the presence marking must be switched on through operation of the presence button or through automatic logging. The presence button must be green; the state of the switch should be indicated optically within the button or next to it. It should be positioned near the door. The presence button for a second group of personnel may be yellow.
Emergency call	Call by a carer, with which assistance from another carer is summoned.	The emergency call release is prepared through switching on of presence. The call in the room becomes an emergency call.
Answerable calls	Call from a device with speech possibility by the bed or in the room.	In systems with speech communication, calls with speech that have been answered may be remotely cancelled at the place where they were answered.
Non-answerable calls	Call from a device without speech possibility. The call location must be visited.	Calls without speech communication may not be cancelled remotely, only call acknowledgement is permissible if the call response is monitored by the system.
Bed call	Call by a patient from the call equipment by the bed that can be selectively recognised.	Malfunctions that can affect the release, transmission and indication of calls must be reported. The relevant Application Area should be taken into account.
Bathroom / WC call	Call from a bathroom or toilet that cannot be answered.	The Protection Area should be taken into account!
Monitoring/diagnostic call	Emergency call released from a monitored device.	The number of sockets per bed should be specified with the operator.

Use	Description	Project notes
Telephone call	Receive a call released from a telephone extension in the case of absence.	Normally, a call to the duty room telephone is forwarded via the call system in the case of absence.
Call forwarding	Forwarding of a call to the location where presence has been marked by the care personnel. The call is acoustically indicated as a minimum. In addition, the call location and the call type can be indicated. Answerable calls may be cancelled after a speech connection (→ auxiliary answering).	Call forwarding is required when the call system is used in de-centralised mode.
Call cancellation	Termination of the call state by setting of marked presence by means of a cancel button or by remote answering within the framework of the permissible possibilities.	The installation locations of the equipment with presence button and the cancel button (WC) should be specified.
Call answering	Reaction to a call through the setting up of speech communication to the caller.	
Auxiliary answering	Call answering within the framework of call forwarding from locations with set presence marking in patient rooms or function rooms.	It should be planned whether and where auxiliary answering is sensible, taking into account the possible forming of care groups.
Room-by-room speech	The patient room has a central speech device for general announcements and call answering.	When planning, the relevant equipment and devices should be selected with the operator.
Bed-by-bed speech	Each bed is supplied with a speech device and can be addressed individually.	

2.3 Devices

Use	Description	Project notes
Room terminal	Operating and communications unit in patient rooms and function rooms.	Room terminals are usually provided for all sick rooms and function rooms. They can contain the operational elements and indicator displays as well as the auxiliary call answering for systems with speech. In many cases, they also form the installation centre with connections for the beds, en-suite bathrooms and the optical indicator elements (→ corridor indicator lamps).
Call button	Device for releasing a call, with reassurance lamp for control of call release. Types: call button, call switch, pneumatic call transmitter.	The call button must be red and must be illuminated when dark. The Protection Area and the Application Area must be taken into account.
Presence push-button	Device for marking presence, preparation of emergency calls, call forwarding and call cancellation in the rooms in which the calls were released. Call locations in WC's or other auxiliary rooms, which cannot be seen into must have their own → cancel button allocated to them.	The presence push-button can be planned as a separate device or as an operational element in the room terminal.
Cancel button	Device for cancelling calls.	The cancel button, where required for the WC, only cancels the call. It does not carry out any other functions.
Patient terminal / patient handset	Device meant for the patient, with call button, reassurance lamp, light buttons, where applicable all operational elements required for reception of radio and TV programmes and all elements for speech connection to care personnel as integrated unit or handset.	For handsets a bracket (cradle) should be planned for the wall and/or bedside table.
Pear push-button	Simple type of patient terminal with simple call release and light buttons.	When planning, account must be taken of a suitable plug connection.
Plug connection	Multipin socket by the patient bed for attachment of mobile call devices.	The plug connection or bed connection unit can be designed for wall mounting or installation in the medical supply unit (bed service rail).

Use	Description	Project notes
Bed connection unit	Comprehensive operating and installation unit by the patient bed for attachment of mobile call and monitoring devices.	
Corridor indicator lamp	An indispensable light with call lamp (red) and presence indicator (green) allocated to and in close proximity to the respective room (entrance door).	In the corridor area by each room with call facilities, a corridor indicator lamp with a red luminous field (calls) and green luminous field (presence) should be provided above or next to the entrance to the room. Additional illuminated fields (white, yellow) for further presences and for additional information are permissible.
Direction lamp	Lamp, which combines the displays of several corridor indicator lamps, in order to direct personnel to parts of the building that are not immediately visible.	The call information of several rooms can additionally be indicated collectively in zone, care group and direction lamps.
Zone indicator lamp	Lamp allocated to a ward for collective indication of calls from this ward.	The indication occurs thereby taking into account the call priorities in the same way as with the corridor indicator lamps. Instead of zone, care group and direction lamps, numerical or alpha-numerical displays can be used.
Display	Indicator board with textually or numerically displayed call indication, usable as a rule instead of zone indicator lamps.	All optical displays must conform to the standard DIN VDE 0834. The acoustic signal forms for calls, emergency calls and alarm calls must conform to the standard VDE 0834.
Main answering unit	Device in the staff duty room for showing each call location and for differentiating between call types within a ward. As a rule, every room and every bed can be spoken to and answered calls can be cancelled from an answering unit. General announcements, zone linking and other operational procedures are mostly organised from here.	For each ward unit a main answering unit should be provided in the duty room. Usually calls to the telephone in the duty room are forwarded in the call system.
Area answering unit	Device similar to main answering unit, however, higher-ranking and responsible for several wards.	Area answering units can be necessary with the appropriate type of organisation.

Use	Description	Project notes
Centralansweringunit	Centralworkplacefor→centralisedoperation.	Whenplanningthefactthatthecentralansweringunitmay have to be manned 24 hours a day should be taken into account.Thenumberofoperatorpositionsshouldbespecified. It also makes sense to connect in function areas.
Power supply	Voltage supply according to EN 60950 for creation of a safe extra-low voltage with a maximum output voltage of 30 V_{eff} (60 V DC) in Protection Area A, 25 V_{eff} (60 V DC) in Protection Area B, for the exclusive supply of devices in the call system from the low-voltage network with alternative current supply.	Powersuppliesmustonlybeinstalledincorridorsorfunction rooms that are dry. They must be easily accessible. Adequateheatdissipationmustbeprovidedfor.Wheninstallinginaswitchgearcabinetforcedventilationshould be provided where required. Ifthevoltagesupplyconformsto DIN EN 60601-1, therequirementsofProtectionAreaBhavealreadybeenfulfilled toalargeextent.Thepowersupplyshouldbesecurelyconnected to the general current supply without a plug.

2.4 Technical

Use	Description	Project notes
Voltage supply	Equipmentforsafeandfailure-protected supply of all call system devices.	Power supply units of the call system that are supplied from the low-voltage network must have their own ring circuits with their own protection measures. An auxiliary current supply is mandatory. This auxiliary current supply must take over the supply of the call system not later than 15 seconds after failure of the general current supply. The connection of resources alien to the system is not permitted.
Replacement current supply	Equipmentformaintainingtheinternal low-voltagenetworkorbufferingthepower supply.	Ifnoreplacementpowersupplysystemisavailable,comparable provisions must be made (batteries).

Use	Description	Project notes
Fault and failure monitoring	Equipment for logging of line faults and device failures, which can result in danger for the caller. It must be ensured that faults in the call lines and device failures can be immediately recognised by care personnel or other qualified positions and the appropriate measures triggered.	Automatic forwarding of faults and failures directly to the technical department is sensible and should be provided for.
Ward circuit	Cable connection within a ward, which combines all connections necessary for operation of a call system and, for example, connects all room terminals of a ward.	The structure of the line network is currently manufacturer-specific. The configuration of the call system must also be taken into account in the concept.
Zone circuit	Cable connection, which combines several wards with all connections necessary for → zone forming.	For the line network the standard DIN VDE 0834 applies. The possibility of a mix-up with lines of the low-voltage network or interference should be excluded through predefined measures.
Central circuit	a) Cable connection, which combines several wards with all connections necessary for → centralised operation. b) Cable connection, which connects all wards with central control electronics (→ central control unit).	
Control unit	Manufacturer-specific central control device that administers and controls the processes of a call system and in which, as a rule, control programs are stored.	As with power supplies, control units may only be placed in rooms or function rooms that are dry. They must be easily accessible. Adequate heat dissipation must be provided for. If necessary forced ventilation should be provided. Functions should be maintained in emergency mode. (In practice a mix-up with the central answering unit often occurs, since there are also systems by which the control unit is integrated into the central answering unit.)

Use	Description	Project notes
Communication interface	Manufacturer-specific interface between call system, pager, DECT or telecommunications systems.	Messages released in the call system (calls, emergency calls, alarm calls, diagnostic calls, faults) can be forwarded additionally to external communication systems, in order to fulfil organisational requirements, taking into account DIN VDE 0834. From experience, timely clarification of the responsibilities with mutual agreement about the type and scope of the forwarding is needed. Warning: With technical faults of these third-party systems there is an unacceptable significant danger to the caller when such faults are not intercepted organisationally and technically.
Protocol interface	Manufacturer-specific interface between call system, pager, DECT or telecommunications systems.	Logging of events for external evaluation, e.g. accounting, statistics etc. Use should be agreed with the operator.

3. Installation

Modern call systems conforming to DIN VDE 0834 have a higher safety standard and form organisational units with other security systems. The technical advances and the merging of different systems to form complex functional units demand trained experts and extensive specialist knowledge, in order to install call systems.

"Modern call systems conforming to DIN VDE 0834 have a higher safety standard and form organisational units with other security systems."

The extent of activities today ranges from the traditional nurse call system to radio and television transmission to complex computer networks.

The technology in this Application Area has reached a standard today which causes almost no problems in operation.

Problems occur however if:

- Call systems are incorrectly planned
- Call systems are badly installed
- Call systems are badly or never maintained
- Call systems are not accepted or are ignored by the operator and/or the personnel

Call systems within the meaning of this brochure serve primarily to protect human life and retain integrity. For this reason there is a particular duty to use specialist companies and personnel, who have proved their competency, for planning, installation, commissioning and maintenance. Due to having the same objectives, the same standards must also be used as for the installation of fire alarm systems.

"Call systems within the meaning of this brochure serve primarily to protect human life and retain integrity."

3.1 General safety rules / directives

As well as the general regulations of VDE 0100 / IEC 364-1, other directives should also be observed. The basis for the structure and the function of a call system is DIN VDE 0834. In addition, special conditions apply to rooms used for medical purposes (VDE 0107) and general regulations for telecommunications. Within the framework of installation, depending on the installation and/or location, the observance of other directives may be required.

"The basis for the structure and the function of a call system is DIN VDE 0834."

For protection against dangerous leakage currents, in rooms of the Application Groups 1 and 2 – according to VDE 0107 - the protective measures required for these rooms must be put in place.

3.2 Installing the system

Before starting the installation as such, the installation location of the individual devices and the installation paths of the wiring must be determined.

3.2.1 Mounting height, mounting location and conditions

According to DIN VDE 0834 the devices of the call system must be mounted at the following heights above the floor:

"Operational devices (with or without indicator lamps) 0.7 m to 1.5 m…"

- Operational devices (with or without indicator lamps)
  0.7 m to 1.5 m (e.g. call or cancel push-buttons)
  For call switches in bathrooms the special requirements of "barrier-free living" should be taken into account. Pull cords must also be reachable here, for instance, by persons lying on the floor.

"Operational devices with text displays 1.5 m to 1.8 m…"

- Operational devices with text displays
  1.5 m to 1.8 m (e.g. terminals with displays)
  The mounting locations should be chosen so that they do not receive any direct sunlight.

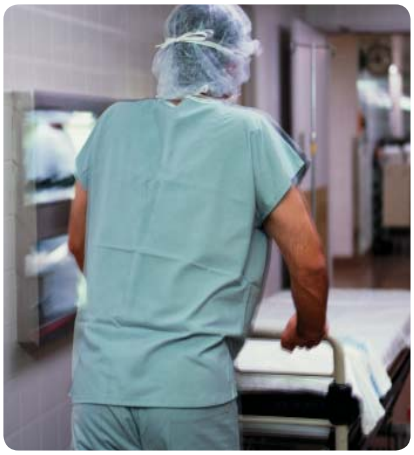
"Devices in installation units 1.6 m to 1.8 m…"

- Devices in installation units
  1.6 m to 1.8 m (e.g. medical supply units)

"Indicator lamps and large text displays 1.5 m to 2.2 m…"

- Indicator lamps and large text displays
  1.5 m to 2.2 m

- Control units, power supply devices
  Central control devices, power supply devices and other parts without operational or indicator functions must only be placed in dry rooms (max. humidity 75 % at approx. 18 °C), but not in patient rooms. They must always be accessible (maintenance access 60 cm minimum). The heat dissipation must not be impeded. When installed in a switch cabinet or similar the lost heat must be dissipated if necessary through forced ventilation.



The central control unit may only be operated within an environmental temperature range of 0°C to 40°C. Here an air-conditioned room must be given preference in individual cases.

On account of voltage drops, the power supply should be installed near the largest user where possible.

- Others
  Presence buttons and call devices must be mounted where they are easy to reach and where confusion with devices from other systems is not possible.

  Devices of the call system (presence buttons or call buttons) and devices of the low-voltage network (e.g. switches, sockets) must not be covered with a common cover plate and must be unmistakeably different.

  In WC's and bathrooms the special provisions of VDE 0100 must be observed. In these rooms only those devices suitable for these rooms must be installed. For this the manufacturers' own notes must be taken into account which particularly characterise the devices for installation in WC's and bathrooms. Call switches or similar in shower cubicles must be fitted a minimum of 20 cm above the highest possible position of the shower head and the pull cord should not be more than 20 cm from the top edge of the floor, so that persons lying on the floor can reach the pull cord.

  "In WC's and bathrooms the special provisions of VDE 0100 must be observed."

  Terminals with displays must be placed well within the field of vision.

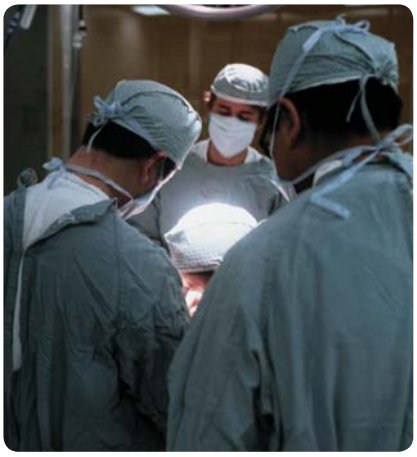
  Corridor indicator lamps are mandatory and must be clearly identifiable with the rooms (as near as possible to the door) and also clearly recognisable from a long distance. All optical indicator equipment must be mounted so that their detectability is not influenced by extraneous light. It is left up to the user whether to also place these corridor indicator lamps in design-oriented modules (e.g. door or name plates), if the prescribed parameters are adhered to.

  "Corridor indicator lamps are mandatory and must be clearly identifiable with the rooms…"

  Corridor indicator lamps that are not fitted with light-emitting diodes can become warm. Therefore care should be taken that they are far enough away from highly inflammable materials. If too much warmth develops, the lifespan of the lamps is shortened and the electronics destroyed. Therefore it must be ensured that any ventilation slots that may have been installed are not closed (e.g. through being painted).

  Corridor indicator lamps represent the last safety level and contribute to the recognition of emergencies always then when through technical or human failure or through organisational error of judgement calls are lost. The latter occurs increasingly in senior residences, in which the entire organisation is based on DECT systems without any other form of backup. The dispensing with corridor indicator lamps represents gross negligence and leads to liability for unlimited compensation for damage.

  "Corridor indicator lamps represent the last safety level…"



- Wiring

  Wires of the call system must not be carried in the same cable as those of the high-voltage system or other systems with dangerous voltage.

  Wires of the call system must not be carried in the same pipes or installation channels as those of the high-voltage system or other systems with dangerous voltage.

  The wires of the call system and the high-voltage system must be laid at least 30 cm apart, for shorter stretches under 10 m a distance of 10 cm apart is considered to be adequate. This must be clearly recorded in the revision documents of the installer company and must be verified with the appropriate control proof (e.g. through the specialist electrical planer)!

"The wires of the call system and the high-voltage system must be laid at least 30 cm apart…"

  If it is not possible to conform to these requirements for constructional reasons, for nominal currents less than 250 V effective value the groups of wires can be separated by means of a conductive screen. This must be included in the protection measures of the high-voltage system and must have a cross section typical of a protective earth conductor.

  As an alternative, separate cables can be carried in pipes or installation channels with double or increased insulation according to DIN EN 60950. Thereby the insulation must be capable of withstanding a testing voltage of 4000 V effective value for one minute, the complex leakage current must not exceed 0.5 mA.

"Wires of the call system that leave the building must be provided with an overvoltage protection according to DIN VDE 0845 at the point of exit."

  Wires of the call system that leave the building must be provided with an overvoltage protection according to DIN VDE 0845 at the point of exit. This can be dispensed with if a galvanic separation point safely prevents the transfer of dangerous voltages.

  With regard to the electromagnetic compatibility (EMC), wiring should generally be avoided in the immediate vicinity of possible sources of interference. This applies in particular also for transmitting antenna (e.g. pagers) and therapy devices. Despite conforming to all standards and directives regarding EMC, in individual cases mutual interference can occur, without it being possible to allocate blame.

"The screen or the uncoated screen wire should be laid isolated directly to the connection point…"

  The screen or the uncoated screen wire should be laid isolated directly to the connection point, otherwise short-circuits could occur.

  All screened wires for the transmission of music or speech should be stripped of insulation as little as possible, so that the screen function remains intact.

  The installation of the supply mains requires particular care. Here attention should especially be paid to short wiring routes, adequate wire cross-section and suitable protection where the wire cross-section is reduced, in order to prevent damage in the case of short-circuits.

  Through the suitable choice of colour and the appropriate method of laying the wires, it must be impossible to mistake the wires for those of the high-voltage system.

3.2.2 Handling

All devices must be protected from direct moisture.

The system components of electronic devices are fitted with electrostatically endangered components as a rule. The components can be destroyed through electrostatic charge. Every direct contact with the electro-statically endangered components is therefore to be avoided.

Devices and resources of the call system must not be installed in rooms with damaging effects on telecommunications equipment.

Devices that are, for instance, installed in medical bathrooms or chemical laboratories must be suitable for these environmental conditions.

When exchanging fuses, only original fuses according to the specification of the manufacturer must be used. The cause of the trigger must be ascertained.

When connecting the devices, the tool recommended by the manufacturer must be used, in order to avoid damage to the connection terminals.

Further notes on the structure and on function checking can be found in the manufacturers' documentation and in DIN VDE 0834.

3.3 Recommended installation steps

Depending on the hospital/prison and on the requirements, call systems for centralised, de-centralised or combined operation are used.

Installation sequence:

When a central control unit (central distributor) is installed, this should be done at the beginning of the installation work.

"When a central control unit (central distributor) is installed, this should be done at the beginning of the installation work."

After that, the installation of the call system takes place ward-by-ward. That is, each ward is installed and commissioned individually and successively.

The installation steps for a ward in overview:

1. Decide on the installation site
2. Position the flush-mounting boxes
3. Lay the cables
4. Connect up the plug and terminal connectors
5. Install power supply unit and check the current supply
6. Connect up the room terminals
7. Check the room installation
8. Connect up the control unit
9. Commission the main answering unit
10. Check the ward installation

3.4 Commissioning

"Before commissioning of the call system a final inspection according to the directives of DIN VDE 0834, Section Inspection, should be carried out by an expert for call systems."

Before commissioning of the call system a final inspection according to the directives of DIN VDE 0834, Section Inspection, should be carried out by an expert for call systems. Acceptance inspections of sections of the call system may also be carried out in the course of the construction process. An expert is a person who has trained specialist knowledge in order to set up and test a call system according to the valid standard and to certify its operational capability.

3.5 Connection

"The call system forms a self-contained and independent system and must not be routed over the transmission paths of other systems."

The call system forms a self-contained and independent system and must not be routed over the transmission paths of other systems. Conversely, external signals may be routed via the transmission paths. The coupling and decoupling may only occur thereby via system interfaces of the call system. These can be simple potential-free contacts, but also complex data interfaces. These interfaces must be delivered or specified by the manufacturer of the call system. Malfunctions of the third-party system must not be able to have any effect on the call system.

3.6 Medical supply units

Medical supply units are pieces of equipment that, as a rule, are assigned to a patient bed and that contain all devices and cable paths, from the reading lights to the connection of medical gases, which serve for the care as well as the comfort of the patient. Call system devices are also installed there. These supply units, in contrast to the call systems, are subject to the rules and standards for medical electrical devices and their own established DIN EN 793 (Special requirements for the safety of medical supply units).

Since call systems are usually contracted out and installed independently of the supply units, the manufacturers of the supply units receive the components of the call system from the installer or the operator of the system for installation, without however being able to take over the responsibility for these supplies. DIN VDE 0834 thus contains the obligation that DIN EN 793 must also be observed for the parts of the call system that are installed in the medical supply units.

In practice, there are occasionally problems about the question of responsibility when functional faults occur. Thus, as a result of the particular responsibility only appropriately trained personnel should be used at the front-end for connecting up the devices and the cabling network and later for supervision and assessment.

3.7 Documentation

The installer must compile detailed documentation for the system, with the help of the manufacturer's documentation. Thereby all parameter setups must also be recorded. These documents must be kept by the operator for later maintenance and repairs and must be available at all times. Also the compilation of the log book described below should be supplied by the installer.

"The installer must compile detailed documentation for the system, with the help of the manufacturers' documentation."

"These documents must be kept by the operator for later maintenance and repairs and must be available at all times."

"Also the compilation of the log book described below should be supplied by the installer."

4. System Operation

4.1 Preliminary notes on operation

The operator of a call system in hospitals, care homes, care wards and similar institutions or prisons must be "a trained person" within the meaning of DIN VDE 0834 or must delegate a trained person.

"The operator of a call system (…) must be "a trained person" within the meaning of DIN VDE 0834…"

The operator or the delegated person must autonomously take responsibility for ensuring that the personnel, in particular the care personnel, have sufficient knowledge – as far as the tasks, functions and the operation of the call system are concerned. Appropriate training should be carried out regularly and should be repeated.

The operator must also ensure that indications of interference with the permanent state of readiness or functional irregularities are reported by the personnel and inspections are carried out.

The connection of devices and operating resources foreign to the system (e.g. electrical medical devices) may only be carried out by personnel specially trained for this. Pluggable devices for call release, e.g. patient handsets, must be checked for correct functioning of the call release every time they are plugged in.

4.2 Fault reporting

The personnel (in particular the care personnel) must report functional irregularities as well as failures and malfunctions of individual components of the call system to the operator or the person delegated by the operator, in order that maintenance and modification measures can be initiated immediately. All incidents arising must be recorded successively by the operator or the person delegated by the operator in one of the log books available by the call system.

"All incidents arising must be recorded successively by the operator or the person delegated by the operator in one of the log books available by the call system."

4.3 Rectification of faults

"When malfunctions occur in a call system, these must be investigated and repaired without delay by the call system specialists."

When faults occur in a call system, these must be investigated and repaired without delay by the call system specialists. The repair work must start within 24 hours of reporting of the fault. The repair work must be carried out in such a way that the down time for the functioning of the devices and system parts is kept as short as possible.

After completion of the repair work, a function test of the device or system part whose function was faulty must be carried out by a specialist.

All repair measures must be recorded in the log book of the call system by the specialist delegated to rectify the fault.

The professionally carried out and on schedule maintenance should be guaranteed through a service and maintenance contract between the operator of the call system and the maintenance contractor, in order to guarantee the fastest possible effective fault clearance.

4.4 Log book

"A log book that can always be found by the call system must be kept…"

A log book that can always be found next to the call system must be kept, in which all cases of faults with details of the cause, the author and all necessary and carried out maintenance and modification measures are written down.

A sample log book can be found at the end of this document. This log book provides the operator and the delegated person with proof that they have carried out their obligation of care when operating the call system. Furthermore, it is an important pre-requisite for the proper maintenance of the system as well as for the prompt and efficient repair work when faults occur.

4.5 Changes

If changes to the call system are necessary, these may only be carried out by specialist electricians with proven expertise. In particular with the integration of non-system parts, the compatibility of the modification measures with the existing call system must be confirmed by the manufacturer of the call system and the liability for possibly resulting system defects must be responsibly checked by the operator or an expert delegated by the operator. With every change, an extensive function check of the actual state of the call system must follow.

All changes must be recorded in the log book. This must be done by the expert delegated to carry out the changes.

"All changes must be recorded in the log book."

4.6 Shutdown, partial shutdown

The operator or the person trained and delegated by the operator must provide an alternative control of the affected rooms until the function of the call system has been restored to all system units, in all cases in which the system or system parts are shutdown.

All (partial) shutdowns must be recorded in the log book of the call system with the reason, extent and length of time. This must be carried out by the personnel, the operator, the "trained person" or the specialist delegated to carry out the shutdown.

"All (partial) shutdowns must be recorded in the log book of the call system with the reason, extent and length of time."

5. Maintenance

5.1 Preliminary notes on maintenance

Call systems within the meaning of this document support the effective and comprehensive care of the sick, residents in homes and prisoners. The distinctive indicator for the application is that the reason for calling could be a greater or lesser degree of danger to the caller or a third party. These particular operating conditions require full availability of the call systems at all times of the day and night. Modern call systems form a widely branched network of microcomputers. For this reason, the proper maintenance of the system by specially trained experts must be guaranteed under all circumstances.

The three components for maintenance: inspection – maintenance – repair guarantee the availability in an excellent way, since wear and tear, errors and faults in the system can be recognised early and suitable counter-measures can be undertaken immediately.

The three components for maintenance:

- Inspection
- Servicing
- Repair

5.2 Responsibility for maintenance

The responsibility for maintenance lies with the operator of a call system. The operator should guarantee the proper maintenance of the call system according to DIN VDE 0834 with respect to the time and expert fulfilment. The operator can transfer the responsibility to a specialist company. Here by the necessary replacement part logistics and the availability must be taken into account.

5.3 Inspection of the system

The inspection of the system consists first of the inspection of the log book of the system to establish existing defects. Then the functioning of the installed devices is checked and a visual inspection for mechanical damage is carried out.

Inspections should be carried out at least four times a year at approximately regular intervals.

"Inspections should be carried out at least four times a year at approximately regular intervals."

The following should be checked for the intended functionality:

- Call buttons and mobile devices for call release, which are provided for use by patients or prisoners

"At least once a year the following should (…) for the intended functionality: all (…) devices for call release, call cancellation and presence indication, all (…) indicator installations, all installations for call answering including possible speech paths, volume, speech clarity."

- Indicator lamps and acoustic noise generators
- Power supplies, adherence to parameters

At least once a year the following should also be checked for the intended functionality:

- All other devices for call release, call cancellation and presence indication
- All other indicator installations
- All installations for call answering including possible speech paths, volume, speech clarity

Attention should be paid to undocumented changes to the system.

The inspections carried out as well as their results should be documented in the log book of the system by the expert delegated to carry out the inspections. They form the basis for possible necessary repairs.

5.4 Servicing of the system

"The servicing of the system should be carried out according to the manufacturers' instructions, but at least once a year."

The servicing of the system should be carried out according to the manufacturers' instructions, but at least once a year. This includes where applicable:

- Maintenance and cleaning of system parts, cleaning of ventilation slots
- Exchange of components with limited lifespan (e.g. batteries)
- Resetting and adjustment of components and devices

Deviations from the nominal condition should be corrected. The serviced parts of the system should be tested at the end; any remaining errors should be rectified. For software controlled systems, it is recommended that an update of the software is carried out as part of the servicing.

"The servicing carried out as well as its results should be documented in detail in the log book by the expert delegated to carry out the servicing."

The servicing carried out as well as its results should be documented in detail in the log book by the expert delegated to carry out the servicing.

5.5 Repairs to the system

Repairs to the system include the repair or the exchange of the defective system parts with subsequent functionality check of the repaired/exchanged system parts including their interaction with the entire call system.

Appendix: Sample of a Log book for Call Systems According to VDE 0834

Master Data Call System

System location

Name:

Address:

Telephone:

Call number service modem:

Operator

Name:

Address:

Telephone:

Trained person*

Name:

Address:

Telephone:

* if other persons have been trained, please add a new sheet

Maintenance engineer

Name:

Address:

Telephone:

Basic Data

Manufacturer:

Contact address:

Fax:

Contact:

Telephone:

Hotline / Switchboard

Name:

Address:

Telephone:

Installed system

System:

Year of manufacture:

Call system type according to DIN / VDE 0834:

Maintenance of call system according to DIN / VDE 0834:

Deviations:

Type of service contract:

No.:

Number of wards:

Number of rooms:

Number of beds:

Extension

System:

Year of manufacture:

Additions:

Number of wards:

Number of rooms:

Number of beds:

Commissioning log of the call system

1. The following system parts have been checked according to the service documentation of the manufacturer:

- ☐ Call buttons and mobile devices for call release
- ☐ All other operational devices such as presence buttons, cancel buttons etc.
- ☐ Indicator lamps and acoustic noise generators
- ☐ All other display units
- ☐ All installations for call answering including possible speech paths, volume, speech clarity
- ☐ Interfaces to systems that are not part of the call system
- ☐ Power supplies

2. The following system documentation has been given to the operator:

Location of documentation:

- ☐ System documentation with cable plan, distributor wiring, device list etc.
- ☐ Installation and commissioning instructions
- ☐ User manuals
- ☐ Service instructions
- ☐ Configuration of the system

3. Training of the operator in the operation of the call system:

Date: **Repeated:**

4. Acceptance carried out on:

Date:

	Company	Name	Signature
Planer:			
Installer:			
Operator:			

Fault reports

Date	Time	What are the symptoms? Type of fault	System part	Forwarded on	Dealt with on	Entered by

Report plan

Event – System	Report organised	When Yes, who is dealing with it?	What needs doing	Replacement devices	Repair arranged	Service partner
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Service work carried out – inspection – service – repairs

Date	Time	Work carried out – determined cause	System part	Which fault was rectified?	Entered by

Notes:

Information material of the ZVEI group of Experts Safety Systems:

TheFVsafetysystemsholdsaselectionofbrochuresandleaflets forsafetytechnologyavailable,whichcanbedownloadedfrom theInternet(www.zvei.org/sicherheitssysteme)ororderedper fax (+49(0)69 6302-288):

English brochures

- The German Electrical and Electronics Industry – Global Growth Driver
- RWA today (download only)
- Alarm Announcements in German/English/French Alarmsignals on Memory Stick, Price 79.- € + postage/packing + VAT

General

- Aktiv für die Elektroindustrie
- Elektronik für die Sicherheit
- Musterwartungsverträge (download only)

Fire alarm systems

- Das Brandrettungskonzept des ZVEI, mit technischen Anlagen
- Sicherheit durch Brandmeldesysteme
- Hinweise zur Planung von Brandmeldeanlagen in Krankenhäusern, Alten- und Pflegeheimen (download only)
- Hinweise zur Planung von Brandmeldeanlagen in Beherbergungsbetrieben (download only)
- Strategischer Erfolgsfaktor Normung Zertifizierter Planer nach DIN 14675
- Kompetenz und Qualität DIN 14675 – Vorteile für die Planung
- Offene Schnittstellen für Sicherheitssysteme
- Rauchmelder retten Leben
- Duman Detektörleri Hayat Kurtarıcıdır (download only)

Intercom systems

- EVA Com

Smoke and heat control systems

- RWA heute (nominal charge 5.- € + shipping + VAT)
- RWA today (download only)
- RWA aktuell 1 Instandhaltung von Rauch- und Wärmeabzugsanlagen (nominal charge 5.- € + shipping + VAT)
- RWA aktuell 3 Kraftbetätigte Fenster (nominal charge 5.- € + shipping + VAT)
- RWA aktuell 4 Entrauchung über Fassaden (nominal charge 5.- € + shipping + VAT)
- RWA aktuell 5 Entrauchung von Treppenräumen (from Jan. 08) (nominal charge 5.- € + shipping + VAT)
- RWA aktuell 6 Individuelle Gebäudeentrauchung und die Zustimmung im Einzelfall (ZiE) (nominal charge 5.- € + shipping + VAT)

Video systems

- Videoüberwachung Hardenberg / Breitscheidplatz Berlin – Ein Konzept des ZVEI
- Videoüberwachung im öffentlichen Raum – Argumente für Entscheider
- Mit Videotechnik für Sicherheit sorgen und Vertrauen schaffen
- Hinweise zur Einführung von Videoüberwachung in Unternehmen und Behörden (download only)

Intrusion systems

- Alarmanlagen – Kein Raum für ungebetene Gäste
- Die sichere Gemeinde – Eine ZVEI-Initiative
- Die sichere Innenstadt – Eine ZVEI-Initiative
- Nicht bei mir! Initiative für aktiven Einbruchschutz

Nurse call systems

- Rufanlagen nach VDE 0834 (nominal charge 5.- € + shipping + VAT)
- Induktive Höranlagen (download only)

Sound engineering

- ELA Infos Infos (download only)
- Hinweise zur Planung, Erstellung und Wartung von professionellen Beschallungsanlagen (Members 5.- € / non-members 8.- € + shipping + VAT)
- Betriebshandbuch für elektroakustische Anlagen (Nominal charge: Members 3.- € / non-members 4.50 € + shipping + VAT)
- MerkblattElektroakustischeAlarmierungseinrichtungen (from Nov. 07) (Nominal charge 5.- € + postage/packing + VAT)
- PrüfprotokollfürelektroakustischeNotfallwarnsysteme (from Nov. 07) (Nominal charge 5.- € + postage/packing + VAT)
- Alarmierungstexte in deutsch/englisch/französisch/ Alarmierungssignale auf USB-Stick Price: 79.- € + postage/packing + VAT

Zutrittskontrolle

- Zutrittsmanagement – das Konzept des ZVEI
- Zutrittsmanagement – das Konzept des ZVEI -
- Allgemeine Planungsgrundsätze (download only)

ZVEI:

Safety and Security Systems

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