



Protection against environmental influences

Requirements and test methods

Publishing house: VdS Schadenverhütung GmbH

Amsterdamer Str. 172-174

50735 Köln, Germany

Phone: +49 221 77 66 0; Fax: +49 221 77 66 341

Copyright by VdS Schadenverhütung GmbH. All rights reserved.

VdS Guidelines for Alarm Systems

Protection against environmental influences

Requirements and test methods

Content

1	General	4
1.1	Scope.....	4
1.2	Validity	4
2	Terms and definitions	4
3	Normative references	5
4	Classification	6
4.1	Environmental behaviour	6
4.2	Standard laboratory conditions.....	6
4.3	Groups of tests	7
4.4	Types of tests	8
5	Requirements and test methods	8
5.1	Requirements for system components.....	8
Annex A	19

1 General

1.1 Scope

These guidelines contain requirements on the performance of Alarm Systems (AS) – except system components for fire detection systems, the requirements of which are stipulated in standard series EN 54 – with environmental influences and the respective test methods. They shall be applied in conjunction with the “Guidelines for intruder alarm systems, general requirements and test methods“; VdS 2227.

If AS will be exposed to special environmental influences (e.g. Alarm Systems in radio transmission stations or power plants, in chemical factories), they shall fulfil additional requirements which shall be stipulated for each case beforehand.

These guidelines correspond with the requirements of the standards DIN EN 50130-4 and DIN EN 50130-5.

The differences between these guidelines and the cited standards are unambiguously stated for the individual requirements.

1.2 Validity

These guidelines are valid from 01. January 2011; they replace the edition VdS 2110 : 2003-01 (03).

2 Terms and definitions

For general terms and definitions refer to the “Guidelines for intruder alarm systems, general requirements and test methods“, VdS 2227. In addition the following terms are valid.

Operational test: During the operational test the specimen is subjected to test conditions, which correspond to the service environment.

Movable system components (movable equipment): System components which occasionally change location; proper functioning is **not** expected while the parts are being moved (e.g. transmission equipment of a social alarm system, which normally is located on a table under a telephone).

Endurance test: The intention of an endurance test is to determine the long-term effects of the test condition to the specimen. The specimen is isolated during this test.

Stationary installed system components (fixed equipment): System components mounted stationary or having such a mass that it cannot easily be moved.

Functional test: Test of fundamental functional criteria of a specimen.

Portable System components (portable equipment): System components with alternating operating sites; proper function as specified while being carried is expected (e.g. electronic key).

3 Normative references

These guidelines contain dated and undated references to other publications. The normative references are cited at the appropriate places in the clauses, the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to these guidelines only when announced by a change of these guidelines. For undated references the latest edition of the publication referred will be applied.

- **DIN EN ISO 6988** Metallic and other non-organic coatings – sulphur dioxide – test with general condensation of moisture
- **DIN VDE 0470-1** Degrees of protection provided by enclosures (IP-Code) – corresponds with EN 60 529
- **EN 50130-4** Alarm systems – Part 4: Electromagnetic compatibility; Product family standard: Immunity requirements for components of fire, intruder and social alarm systems (corresponds with VDE 0830 part 1-4)
- **EN 50130-5** Alarm Systems – Part 5: Environmental Test Methods (corresponds with VDE 0830 parts 1-5)
- **EN 60 529** Degrees of protection provided by enclosures (IP-Code) – corresponds with VDE 0470 part 1
- **IEC 60068-1** Environmental testing – Part 1: General principles and guidelines
- **IEC 60068-2-1** Environmental testing, Tests, tests A: Cold
- **IEC 60068-2-2** Environmental testing procedures; Tests; Dry heat
- **IEC 60068-2-3** Environmental testing; Test Ca: Damp heat, steady state
- **IEC 60068-2-5** Environmental testing; Test Sa: simulated solar radiation on earth surface
- **IEC 60068-2-6** Environmental testing, Test Fc: Vibration (sinusoidal)
- **IEC 60068-2-14** Environmental testing – Part 2: Test N: Change of temperature
- **IEC 60068-2-18** Environmental testing – Part 2: Test R and guidance: Water
- **IEC 60068-2-27** Basic environmental testing, tests Ea and guidance: shock
- **IEC 60068-2-30** Environmental testing; part 2: Test Db: Damp heat
- **IEC 60068-2-32** Environmental testing – Part 2: test Ed: Free fall
- **IEC 60068-2-42** Environmental testing – Part 2: Test Kc: Sulphur dioxide test for contacts and connections
- **IEC 60068-2-52** Environmental testing – Part 2: Test Kb: Salt mist
- **IEC 60068-2-56** Environmental testing – Part 2: Test Cb: Damp heat
- **IEC 60068-2-75** Environmental testing; Part 2: Test Eh: Hammer test
- **EN 61 000-4-2** Electromagnetic compatibility (EMC) – Testing and measurement techniques – Electrostatic discharge immunity test
- **IEC 61000-4-3** Electromagnetic compatibility (EMC) – Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test
- **EN 61000-4-4** Electromagnetic compatibility (EMC) – Testing and measurement techniques, Electrical fast transient/burst immunity test

- **EN 61000-4-5** Electromagnetic compatibility (EMC) – Testing and measurement techniques – Surge immunity test
- **EN 61000-4-6** Electromagnetic compatibility (EMC) – Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields
- **EN 61000-4-11** Electromagnetic compatibility (EMC) – Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity test
- **VdS 2227** Guidelines for intruder alarm systems, general requirements and test methods

4 Classification

4.1 Environmental behaviour

Depending on their operation area system components of Alarm Systems (AS) are subject to different environmental influences. Therefore different severe requirements are to be fulfilled by the devices in respect of their environmental behaviour. Difference is made between the following environmental classes:

Environmental class I: conditions in well-kept indoor areas where temperature is well maintained

Environmental class II: conditions in other indoor areas (e.g. stairwells, depot rooms)

Environmental class III: conditions outdoors, but weather-protected (e. g. garage, attics)

Environmental class IV: conditions outdoors, fully exposed to the elements (house wall).

Note: These environmental classes are to be understood independently from the classification as described in VdS 2227 for alarm systems (performance features).

4.2 Standard laboratory conditions

Unless otherwise specified in the specific clauses the atmospheric conditions shall be the standard atmospheric conditions for measurements and tests as specified in IEC 60068-1:

- Temperature: 15-35 °C
- Relative humidity: 25-75 %
- Air pressure: 86-106 kPa

4.3 Groups of tests

Depending on the kind of exposure of a specimen during a test, the tests are grouped according to table 4.01. The following table gives an overview on the requirements contained in these guidelines and compares them with the respective European standards.

Clause of these guidelines	Type of exposure	Group	EN 50130-4	EN 50130-5	Additional or other specifications
5.1.1	Climates	T			
	Dry heat			●	
	Cold			●	
	Damp heat			●	
	Change of temperature			●	
	Sun radiation			●	
5.1.2	Water and debris	F			
	Water ingress			●	
	Dust closeness			●	
	Debris			⌚	EN 60 529
5.1.3	Corrosion	K			
	Corrosion SO ₂			⌚	DIN EN ISO 6988
	Salt mist			●	
	Corrosion window cleanser				VdS
5.1.4	Mechanical influences	M			
	Shock			●	
	Jolt			⌚	VdS
	impact			●	
	Vibration			●	
	Free fall			●	
5.1.5	Influences on operation voltage behaviour	B			
	Changes of operation voltage behaviour/break		●		
5.1.6	Electromagnetic compatibility	E			
	Electrostatic discharge		●		
	Radiated high frequency		⌚		VdS
	Conducted radiated frequency		●		
	Conducted electrical fast transient with low energy (Burst)		●		
	Conducted slow surge with high energy		●		
⌚ VdS-requirements exceeds the respective requirement of EN 50130-4 or EN 50130-5 ● VdS-requirements corresponds with the requirements of EN 50130-4 or EN 50130-5 VdS Additional VdS-requirements without a corresponding requirement in a European standard					
Table 4.01: Groups of tests					

4.4 Types of tests

During the tests distinction is made between operational and endurance tests.

4.4.1 Operational tests

During the operational tests the specimen is exposed to environmental conditions as they can be met under normal use. Purpose of the test is the determination of resistance grades of the specimen against environmental conditions during the operation, i.e. it is ascertained if the specimen is operating properly during the exposure and no inadmissible changes have occurred by the exposure.

4.4.2 Endurance tests

The endurance test shall ascertain the long-term effects of environmental conditions on the specimen.

The exposure is made in the non-functional state of the specimen. A monitoring of the specimen does not occur during the exposure. After the exposure it is ascertained if the specimen still is operating properly and if no inadmissible changes have occurred by the exposure.

4.4.3 Functional tests

For the functional tests the characteristic features of the specimen are tested product by product. The determination of the functional test is made in the respective guidelines for the special system components.

5 Requirements and test methods

A distinction is made between requirements for stationary installed, movable and portable components. Requirements for system components are described in the respective guidelines for the special system components.

5.1 Requirements for system components

5.1.1 Climates (group T)

System components of Alarm systems (AS) shall dispose of sufficient resistance against changes of environmental temperature as described in table 5.01.

5.1.1.1 Purpose of the tests

The tests simulate

- High and low temperatures which may be anticipated temporary at the intended location
- Aging effects of heat by long-term exposures
- High humidity (with and without condensation) which may be anticipated temporary at the intended location
- Long-term effects caused by humidity at the intended location (change of electrical parameters by absorption, chemical reactions caused by humidity, galvanic corrosion etc.)

- Changes of temperature between normal and cold environments and
- Thermal effects of sun radiation

Test	Functional test	Endurance test	Degree of severity, abbreviated description of conditions			
			I	II	III	IV
Dry heat (T1) as spec. in IEC 60068-2-2	x		+40 °C, 16 h	+55 °C, 16 h		+70 °C, 16 h ¹⁾
Dry heat (T2) as spec. in IEC 60068-2-2		x	No test			+70 °C, 21 d ¹⁾
Cold (T3) as spec. in IEC 60068-2-1	x		+5 °C, 16 h	-10 °C, 16 h	-25 °C, 16 h ²⁾	
Damp heat, steady (T4), as spec. in IEC 60068-2-56	x		+40 °C, 4 d 93 % rel. air humidity	No test		
Damp heat, steady (T5) as spec. in IEC 60068-2-3		x	+40 °C, 21 d, 93 % rel. air humidity			
Damp heat, cyclic (T6) as spec. in IEC 60068-2-30	x		No test	+40 °C, 93% rel., 2 cycles	+55 °C, 2 cycles	
Damp heat, cyclic (T7) ³⁾ as spec. In IEC 60068-2-30		x	No test		+55 °C, 6 cycles	
Change of temperature (T8) ³⁾ as spec. in IEC 60068-2-14	x		+ 5 °C/ + 30 °C, 1h, 4 cycles	- 10 °C/ + 30 °C, 1h, 4 cycles	-25 °C ²⁾ / + 30 °C, 1h, 4 cycles	
			Duration of change 2 – 3 min			
Sun radiation (T9) ⁴⁾ as spec. in IEC 60068-2-5		x	No test			+ 40 °C, 10 d

1) The test at 70 °C shall cover the effect of warming by solar radiation and is performed in each case deviating from EN 50130-5 without exception.

2) For especially cold environments (e. g. in the far north of Europe) up to – 40 °C

3) Test for portable system components

4) Test for system components for which a surface degradation by sun radiation is seen as critical.

Table 5.01: Climates

5.1.1.2 Preparation of the specimen for the functional test

The specimen as defined in the test matrix of the guidelines for the system components to be tested is mounted and connected according to the manufacturers instructions (on simulated mounting areas) and is set in functional state to a power supply and processing unit. Before exposure a functional test is performed according to the indications in the respective guidelines of the system component.

5.1.1.3 Preparation of the specimen for endurance testing

The specimen as defined in the test matrix of the guidelines for the system components to be tested is mounted and connected according to the manufacturers instructions (on simulated mounting areas) and is exposed to the influences in non-functional state. Before beginning of the exposure a functional test is performed according to the indications in the respective guidelines of the system component.

5.1.1.4 Performance of the test

The test is performed according to the defined test method. The choice of the severity level is made according to the environmental class that the manufacturers had selected.

5.1.1.5 Monitoring of the specimen during exposure (functional test)

During the exposure no change of status shall occur (e. g. no signal). If a functional test corresponding with the indications of the respective guidelines for the respective system component is performed during the exposure, this shall be effected in the last 30 minutes of the exposure.

For test T8 the following is applicable:

During the exposure no change of status shall occur (e. g. no signal). During the first 10 minutes of the last test cycle for each, the high and the low temperature a functional test is to be performed corresponding with the indications of the respective guidelines for the system component.

5.1.1.6 Assessment of the specimen after exposure

After exposure the specimen is deposited for 1 h at standard laboratory conditions (recovery period). Subsequent a functional test corresponding with the indications of the respective guidelines for the respective system component as well as a visual inspection for ascertaining any mechanical damage (inside and exterior) is performed.

5.1.2 Water and debris (group F)

System components of AS shall – depending of use – have sufficient resistance against the effects of water and the ingress of debris according to table 5.02.

5.1.2.1 Purpose of the tests

The tests are to simulate

- Dropping water
- Spraying water
- Diving in water
- Ingress of debris and
- Ingress of dust

Test	Operational test	Endurance test	Degree of severity, abbreviated description of conditions			
			I	II	III	IV
Water (F1) as specified in IEC 60068-2-18	x		No test		Dropping water (Ra2), 10 min, 200-300 mm/h, corresponds with IPx2 ⁷⁾	Spraying water (Rb2.1 or Rb2.2) 10 min ¹⁾ 15 min ²⁾ Corresponds with IPX4 ⁷⁾
Water ingress (F1a) ³⁾ as specified in IEC 60068-2-18	x		Dropping water (Ra2) 10 min; 200-300 mm/h, corresponds with IPX2 ⁷⁾		Spraying water (Rb2.1 or Rb2.2) 10 min ¹⁾ 15 min ²⁾ Corresponds with IPX 4 ⁷⁾	
Water ingress (F1b) ⁴⁾ as specified in IEC 60068-2-18	x		Total diving into water (Rc1) for 30 min in 0,4 m depth corresponds with IPX7 ⁷⁾			
Dust closeness (F2) ⁵⁾ as specified in IEC 60529		x	IP5X or IP6X ⁷⁾			
VdS additional requirements to DIN EN 50130-5						
Debris/dust (F3) according to EN 60529		x	A straight and inflexible steel wire ⁶⁾ or bar of (2,5 +0,05/-0) mm diameter is pressed against the specimen with a force of (30 ± 3) N. The wire/bar shall not have access to the inside of the specimen and no security-relevant influences shall occur. IP3x ⁷⁾			
<p>1) angle of the spraying nozzle ± 90°; turning angle of the rotatable tube ± 180°; water flow rate per nozzle 0,1 dm³/min; diameter of nozzle outlet port 0,4 mm</p> <p>2) Angle of spraying nozzle ± 180° from all directions with blend removed; 3 min per m² surface for a minimum of 15 min.</p> <p>3) Test of portable system components</p> <p>4) Test of portable system components if the manufacturer has indicated resistance against diving.</p> <p>5) This test is performed only for special devices, for which the ingress of dust is deemed to be critical.</p> <p>6) The end of the wire/bar shall be deburred and rectangular to the direct axis</p> <p>7) According to IEC 60259</p>						

Table 5.02: Water and debris/dust

5.1.2.2 Preparation of the specimen for the functional test

The specimen as defined in the test matrix of the guidelines for the system components to be tested is mounted and connected according to the manufacturers instructions (on simulated mounting areas) and is set in functional state to a power supply and processing unit. Before exposure a functional test is performed according to the indications in the respective guidelines of the system component.

5.1.2.3 Preparation of the specimen for the endurance test

The specimen as defined in the test matrix of the guidelines for the system components to be tested is mounted and connected according to the manufacturers instructions (on simulated mounting areas) and is exposed to the influences in non-functional state. Before beginning of the exposure a functional test is performed according to the indications in the respective guidelines of the system component.

5.1.2.4 Performance of the test

The test is performed according to the defined test method. The choice of the severity level is made according to the environmental class that the manufacturers had selected.

5.1.2.5 Monitoring of the specimen during exposure (functional test)

During the exposure no change of status shall occur (e. g. no signal). If a functional test corresponding with the indications of the respective guidelines for the respective system component is performed during the exposure, this shall be effected in the last 30 minutes of the exposure.

5.1.2.6 Assessment of the specimen after exposure

After exposure, the specimen is deposited for 1 h at standard laboratory conditions (recovery period). Subsequent a functional test corresponding with the indications of the respective guidelines for the respective system component as well as a visual inspection for ascertaining any mechanical damage (inside and exterior) is performed.

For test F1b the following is applicable:

After the exposure the specimen is thoroughly dried either by rubbing with a fabric or by blowing with a slow airflow at room temperature. A functional test is performed corresponding with the indications of the respective guidelines for the system component as well as a visual inspection for ascertaining any mechanical damage (inside and exterior).

5.1.3 Protection against corrosion (group K)

System components of Alarm systems (AS) shall have – depending on the intended use – adequate resistance to corrosion as specified in table 5.03.

5.1.3.1 Purpose of the tests

The tests are to simulate

- Corrosive effects of SO₂ (caused by air pollution)
- Salty atmosphere and
- Corrosive effects of window cleanser

Test	Operational test	Endurance test	Degree of severity, abbreviated description of conditions			
			I	II	III	IV
SO ₂ -corrosion (K1) as specified in IEC 60068-2-42		x	No test	25 ppm ³⁾ , +25 °C, 93 %, rel. air humidity, 4 d	25 ppm ³⁾ , +25 °C, 93 %, rel. air humidity, 10 d	25 ppm ³⁾ , +25 °C, 93 %, rel. air humidity, 21 d
Salt mist (K2) as specified in IEC 60068-2-52		x	No test			4 cycles each 166 h (duration in total 28 d) 5 % salt ⁴⁾ , +40 °C, 93 % rel. air humidity
VdS additional requirements to DIN EN 50130-5						
SO ₂ -corrosion (K3) as specified in DIN EN ISO 6988 ¹⁾		x	No test	0.2 l SO ₂ , 5 cycles	2 l SO ₂ , 5 cycles ⁵⁾	2 l SO ₂ , 20 cycles
Corrosion by window cleanser (K4) ²⁾		x	Diving into 15 % alcohol, 2 % ammonia, 1 % alkyl benzene sulfonate, 20 °C, 5 cycles for 24 h (or comparable available window cleanser on alcohol base) as well as 15 % common salt, 5 % vinegar 1 % alkyl benzene sulfonate, 5 cycles for 24 h,			
<p>1) Test K3 covers also the exposure of test K1. For the test according to EN 50131-x K1 is to be proven independently of this test.</p> <p>2) The test is performed only for certain system components (e.g. glass break detectors, opening contacts).</p> <p>3) From content</p> <p>4) Depending on weight</p> <p>5) 15 cycles for products that are used in special areas (e.g. at doors)</p>						
Table 5.03: Protection against corrosion						

5.1.3.2 Preparation of the specimen for the endurance test

The specimen as defined in the test matrix of the guidelines for the system components to be tested is mounted and connected according to the manufacturers instructions (on simulated mounting areas) and is exposed to the influences in non-functional state. Before beginning of the exposure a functional test is performed according to the indications in the respective guidelines of the system component.

For K2-test the device shall be mounted in accordance with the manufacturer's instructions.

5.1.3.3 Performance of the test

The test is performed according to the defined test method. The choice of the security grade is made according to the environmental class that the manufacturers had selected.

For K4 test (VdS additional requirement) is valid:

The test is made only for certain system components, which are used in the area of doors and windows (e. g. opening contacts). For the test a specimen is dipped in two different solutions, which consist of parts of window cleansers, five cycles each for 24 h (50 mm deep at least) and dried for 24 h at laboratory standard conditions.

5.1.3.4 Assessment of the specimen after exposure

For K1 test:

Immediately after exposure, the specimen is dried for 16 h at + 40 °C and a relative air humidity of ≤ 50 % and then deposited for 1 h at standard laboratory conditions. A functional test is performed afterwards corresponding with the indications of the respective guidelines for the respective system component as well as a visual inspection for ascertaining any mechanical damage (inside and exterior) is performed.

For test K2:

After the exposure the specimen is deposited for 1 – 2 h at standard laboratory conditions (recovery period). A functional test is performed afterwards corresponding with the indications of the respective guidelines for the respective system component as well as a visual inspection for ascertaining any mechanical damage (inside and exterior) is performed.

For tests K3 and K4:

After the exposure the specimen is deposited for 24 h at standard laboratory conditions (recovery period). A functional test is performed afterwards corresponding with the indications of the respective guidelines for the respective system component as well as a visual inspection for ascertaining any mechanical damage (inside and exterior) is performed

5.1.4 Mechanical influences (group M)

The function of system components of Alarm systems (AS) shall not be adversely affected by mechanical influences as described in table 5.04.

5.1.4.1 Purpose of the test

The tests simulate

- Mechanical shocks and impacts
- Mechanical impacts against the surface
- Vibrations and
- Free fall onto a hard underground

Test	Operational test	Endurance test	Degree of severity, abbreviated description of conditions			
			I	II	III	IV
Shock (M1) ¹⁾ as specified in IEC 60068-2-27	x		$\dot{A}(m/s^2) = 1000 - (200 \times M)$ 6 x 3 shocks, duration each 6 ms			
Impact (M2) ²⁾ as specified in IEC 60068-2-75	x		0.5 J, 3 impacts per point (corresponds with EN 50102 class IK 04)		1.0 J, 3 impacts per point (corresponds with EN 50102 class IK 06)	
Vibration sinus (M3) as spec. in IEC 60068-2-6	x		10-150 Hz, 0.2 g resp. 2 ms ⁻² , 1 cycles/axis; 3 axes	10-150 Hz, 0.5 g resp. 5 ms ⁻² , 1 cycle/axis; 3 axes		
Vibration sinus (M4) as spec. in IEC 60068-2-6		x	10-150 Hz, 0.5 g resp. 5 ms ⁻² , 20 cycles/axis; 3 axes	10-150 Hz, 1.0 g resp. 10 ms ⁻² , 20 cycles/axis; 3 axes		
Free fall (M5) ³⁾ as spec. in IEC 60068-2-32	x		Each 1 fall test at 6 different positions from a height of 0,5 m			
Free fall (M5) ⁴⁾ as spec. in IEC 60068-2-32	x		Each 2 fall tests at 6 different positions from a height of 0,5 m			
VdS additional requirements to DIN EN 50130-5						
Impact (M1a) ⁵⁾	x		Mass of 1 kg, which is falling three times from a height of 0,7 m onto the mounting surface of the system component			
<p>\dot{A} = Peak acceleration, M = Value in kg of the specimen mass</p> <p>1) Test only for system components with a mass up to $M < 4,75$ kg</p> <p>2) Test not for areas that are excepted from the product guidelines (z. s. sensor fields of detectors).</p> <p>3) Test for movable system components (e. g. transmission equipment of a social alarm system, which is deposited normally on a table under a telephone).</p> <p>4) Test for portable system components</p> <p>5) Test for respective system components.</p> <p>Table 5.04: Mechanical influences</p>						

5.1.4.2 Preparation of the specimen for the functional test

The specimen as defined in the test matrix of the guidelines for the system components to be tested is mounted and connected according to the manufacturers instructions (on simulated mounting areas) and is set in functional state to a power supply and processing unit. Before exposure a functional test is performed according to the indications in the respective guidelines of the system component.

For test M5 the specimen is not mounted.

5.1.4.3 Preparation of the specimen for the endurance test

The specimen as defined in the test matrix of the guidelines for the system components to be tested is mounted and connected according to the manufacturers instructions (on simulated mounting areas) and is exposed to the influences in non-functional state. Before beginning of the exposure a functional test is performed according to the indications in the respective guidelines of the system component.

5.1.4.4 Performance of the test

The test is performed according to the defined test method. The choice of the severity level is made according to the environmental class that the manufacturers had selected.

For the additional requirements of VdS M1a: The test is performed according to the defined test method. Test and test assembly are described in annex A.

5.1.4.5 Monitoring of the specimen during exposure

During the exposure no change of status shall occur (e. g. no signal).

5.1.4.6 Assessment of the specimen after exposure

After exposure, a functional test corresponding with the indications of the respective guidelines for the respective system component as well as a visual inspection for ascertaining any mechanical damage (inside and exterior) is performed.

5.1.5 Operating voltage behaviour (group B)

Variations in the voltage as specified in table 5.05 shall not adversely affect the function of system components of alarm systems (AS).

5.1.5.1 Purpose of the test

The test simulates

- Changes of the mains supply and
- Failures (lowering) and short-term interruptions of the mains supply

Test	Operational test	Endurance test	Degree of severity, abbreviated description of conditions			
			I	II	III	IV
Operating voltage changes mains supply (B1a)	x		U _N + 10 % and U _N - 15 %			
Operating voltage dips of the mains supply (B2a) acc. to EN 61000-4-11	x		Each 3-times reduction of the voltage for 30 % and 60 % for 0.5, 1, 5 and 10 periods, duration between the reductions ≥ 10 s as well as each 3-times reduction of the voltage for 100 % for 0.5, 1 and 5 periods, duration between the reductions ≥ 10 s			
Table 5.05: Operating voltage behaviour						

5.1.5.2 Preparation of the specimen for the functional test

The specimen as defined in the test matrix of the guidelines for the system components to be tested is mounted and connected according to the manufacturers instructions (on simulated mounting areas) and is set in functional state (incl. batteries) to a power supply and processing unit. Before exposure a functional test is performed according to the indications in the respective guidelines of the system component.

5.1.5.3 Performance of the test

The test is performed according to the defined test method.

5.1.5.4 Monitoring of the specimen during exposure (functional test)

During the exposure no change of status shall occur (e. g. no signal).

5.1.5.5 Assessment of the specimen after exposure

After exposure, a functional test corresponding with the indications of the respective guidelines for the respective system component is performed.

5.1.6 Electromagnetic compatibility (EMC) (group E)

The function of system components of Alarm systems (AS) shall not adversely be affected by electromagnetic influences (EMC) as specified in table 5.06.

5.1.6.1 Purpose of the test

The tests simulate

- Electrostatic discharges
- Electromagnetic fields (high frequency) and
- Conducted electric disturbances

Test	Operational test	Endurance test	Degree of severity, abbreviated description of conditions			
			I	II	III	IV
Electrostatic discharge of low energy (E1b) acc. to EN 61000-4-2	x		Each 10 times pos. and neg. contact discharge 2, 4 and 6 kV resp. air discharge 2, 4 and 8 kV			
Radiated high frequency (radio-frequency) (E2a) acc. to EN 61000-4-3	x		80 – 2000 ¹⁾ MHz, 10 V/m Modulation: AM 80 % (modulated with 1 kHz Sinus) pulse modulation 1 Hz (0,5 s on; 0,5 s off)			
Conducted radio-frequency (E2b) acc. to EN 61000-4-6	x		150 kHz-100 MHz ²⁾ , 140 dB μ V Modulation: AM 80 % (modulated with 1 kHz sinus) pulse modulation 1 Hz (0,5 s on; 0,5 s off)			
Conducted electrical fast transient with low energy – burst – (E3a) acc. to EN 61000-4-4	x		Net voltage 2 kV ³⁾ ; other circuits 1 kV ²⁾⁴⁾ ; each 1 min pos. and neg.			
Conducted slow surge with high energy – (E4a) acc. to EN 61000-4-5	x		Mains 20 times pos. and neg. net voltage 0,5 kV and 1 kV line – line ⁵⁾ ; 0,5 k; 1 kV and 2 kV line – ground ⁶⁾ Other circuits ²⁾⁷⁾ 0,5 kV and 1 kV line – ground; each 5 times pos. and neg.			
VdS additional requirements to DIN EN 50130-4						
Radiated high frequency (radio frequency) acc. to EN 61000-4-3	x		Field strength in frequency range 890 – 960 MHz; 30V/m; Pulse modulation additionally 1 Hz(0,005 s on; 0,005 s off)			
<p>1) Note: Test in frequency range up to 3 GHz are possible.</p> <p>2) A test is not necessary if the manufacturers documentation indicate that the connection of more than 3 m wire is not admitted.</p> <p>3) By direct coupling</p> <p>4) By capacitive coupling</p> <p>5) 5 at each zero crossing point and at the highest and lowest point of net voltage threshold</p> <p>6) By a resistor of 10 Ω connected in series</p> <p>7) By a resistor of 40 Ω connected in series</p>						
Table 5.06: Electromagnetic compatibility (EMC)						

5.1.6.2 Preparation of the specimen for the functional test

The specimen as defined in the test matrix of the guidelines for the system components to be tested is mounted and connected according to the manufacturers instructions (on simulated mounting areas) and is set in functional state to a power supply and processing unit. Before exposure a functional test is performed according to the indications in the respective guidelines of the system component.

5.1.6.3 Performance of the test

The test is performed according to the defined test method.

5.1.6.4 Monitoring of the specimen during exposure

During the exposure no change of status shall occur (e. g. no signal).

For test E2a is valid additionally:

Jittering of displays above 3 V/m is admitted if this is not security relevant. Special criteria are valid for components of video surveillance systems.

For test E2b is valid additionally:

Jittering of displays at voltages of $U_o \geq 130$ dB μ V is admitted if this is not security relevant. Special criteria are valid for components of video surveillance systems.

5.1.6.5 Assessment of the specimen after exposure

After exposure, a test corresponding with the indications of the respective guidelines for the respective system component as well as a visual inspection for ascertaining mechanical damages (inside and exterior) is performed.

Annex A

Test: Impact (M1a)

The system component is affixed with normal means in the middle of the bottom side of a wooden beam (figure A.01). The component is mounted such that it will not be influenced during the test by the movements of the test engineer (e. g. by covering of the detector).

For the test, a cylindrical weight with a mass of 1 kg is dropped from a height of 700 mm onto the middle of the upper side of the wooden beam. The impact area of the weight is $18 \text{ cm}^2 \pm 10 \%$. The weight shall be designed such that it hits the beam with its centre line vertically.

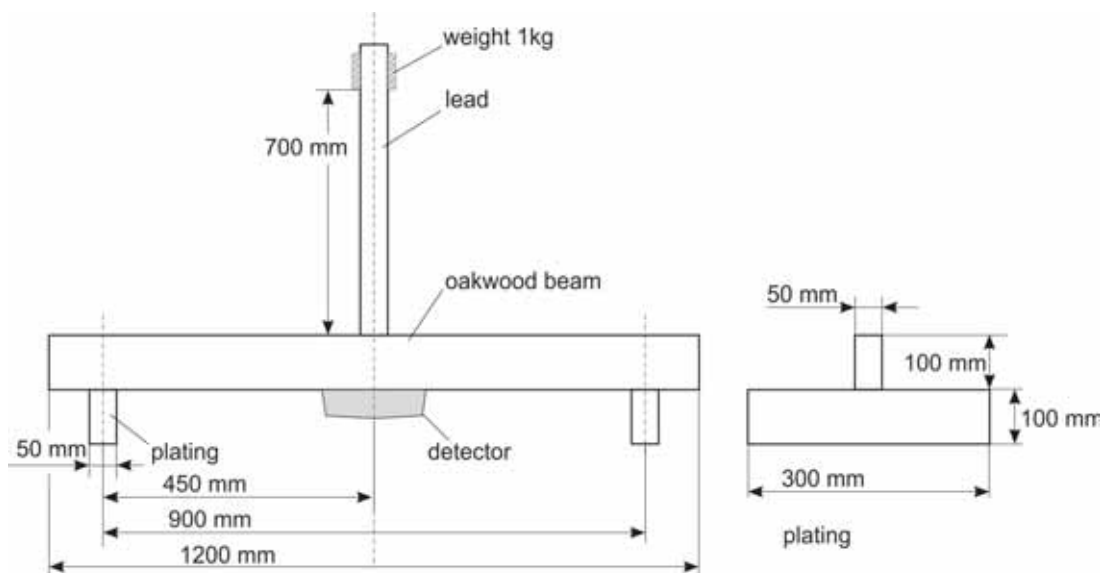


Figure A.01: Assembly of test equipment for the jolt test.