

Publisher: Gesamtverband der Deutschen Versicherungswirtschaft e.V. (GDV)  
Büro Schadenverhütung  
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## Rules for Intruder Alarm Systems

# Visual warning devices for external alarm

## Requirements

VdS 2301en : 2001-07 (03)

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# 1 General

## 1.1 Scope

These rules contain minimum requirements for visual warning devices (WD) for use in intruder alarm systems. These rules shall be applied in conjunction with the "Rules for intruder alarm systems, general requirements and test methods"; VdS 2227 and the "Rules for intruder alarm systems, protection against environmental influences, requirements and test methods", VdS 2110. The "Rules for alarm systems, software controlled system components, requirements and test methods", VdS 2203, also apply for system components controlled by software.

The rules are also applicable for visual WD where functions are located partly or completely within a control and indicating equipment (CIE).

The test methods for visual WD are described in VdS 2330.

## 1.2 Validity

These rules are valid from 01. July 2001; they replace the edition VdS 2301 02/93 (02).

*Note: This is a translation of the German rules; if there are any discrepancies, the German version shall be binding.*

# 2 Normative references

These rules 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 rules only when announced by a change of these rules. For undated references the latest edition of the publication referred to will be applied.

- **DIN 6163-1** Colours and colour limits for signal lights; general rules
- **DIN EN 60 529** Degrees of protection provided by enclosures (IP-Code) – corresponds with VDE 0470-1
- **DIN EN ISO 6988** Metallic and other non-organic coatings – sulphur dioxide – test with general condensation of moisture
- **DIN IEC 65A/179/CDV** Functional safety – Safety-relevant systems – Part 1: General requirements
- **EN 61 000-4-2** Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 2: Electrostatic discharge immunity test – Basic EMC publication
- **EN 61 000-4-3** Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 3: Radiated, radio-frequency, electromagnetic field immunity test
- **EN 61 000-4-4** Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 4: Electrical fast transient/burst immunity test
- **EN 61 000-4-5** Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 5: Surge immunity test

- **EN 61 000-4-6** Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 6: Immunity to conducted disturbances, induced by radio-frequency fields
- **IEC 60 068-2-1** Environmental testing – Part 2: Tests, Test A: Cold
- **IEC 60 068-2-2** Environmental testing – Part 2: Tests, Test B: Dry heat
- **IEC 60 068-2-3** Environmental testing – Part 2: Tests, Test Ca: Damp heat, steady state
- **IEC 60 068-2-6** Environmental testing – Part 2: Tests, Test Fc: Vibration (sinusoidal)
- **IEC 60 068-2-27** Environmental testing – Part 2: Tests, Test Ea: Shock
- **IEC 60 068-2-30** Environmental testing; Tests; Test Db and guidance: Damp heat, cyclic (12 + 12-hour cycle)
- **IEC 60 068-2-75** Environmental testing – Part 2: Test methods, Test Eh: Hammer test
- **VdS 2110** Rules for intruder alarm systems, protection against environmental influences, requirements and test methods
- **VdS 2195** Rules for intruder alarm systems, class A power supply units, requirements
- **VdS 2203** Rules for alarm systems, software controlled system components, requirements and test methods
- **VdS 2227** Rules for intruder alarm systems, general requirements and test methods
- **VdS 2330** Rules for intruder alarm systems, visual warning devices, test methods

### 3 Terms and definitions

For general terms and definitions refer to the “Rules for intruder alarm systems, general requirements and test methods”, VdS 2227. In addition the following terms and definitions apply:

**Alternative power supply:** Battery which is able to supply an alarm system with energy for a specific period if the main power supply is not available.

**Power supply unit type III (Primary battery or secondary battery not automatically rechargeable):** Power supply not jeopardized by interruptions with limited capacity which cannot be recharged automatically.

## 4 Classification

The **performance criteria** for different classes are defined in the „Rules for intruder alarm systems, general requirements and test methods“, VdS 2227.

The **environmental classes** are set in accordance with the “Rules for intruder alarm systems, protection against environmental influences, requirements and test methods“, VdS 2110.

## 5 Protection against environmental influences

### 5.1 Limits of application

Environmental influences shall not affect the function of visual WD. Environmental influences can have various effects on operating characteristics, depending on the nature of the function applied. The manufacturer shall therefore specify the limits of application (e.g. climate).

### 5.2 Climates

The function of visual WD shall not be adversely affected by the thermic conditions described in table 5.01, appropriate to its environmental class.

Test	Functional test	Endurance test	Degree of severity, abbreviated description of conditions		
			II	III	IV
Dry heat (T1) as spec. in IEC 60 068-2-2	x		+55 °C, 16 h	+70 °C, 16 h	+70 °C, 16 h <sup>1)</sup>
Dry heat (T2) as spec. in IEC 60 068-2-2		x	No test	No test	+70 °C, 21 d <sup>1)</sup>
Cold (T3) as spec. in IEC 60 068-2-1	x		-10 °C, 16 h	-25 °C, 16 h	-25 °C, 16 h
Damp heat, steady (T4) as spec. in IEC 60 068-2-3	x		+40 °C, 4 d 93 % rel. humidity	No test	No test
Damp heat, steady (T5) as spec. in IEC 60 068-2-3		x	+40 °C, 21 d 93 % rel. humidity	+40 °C, 21 d 93 % rel. humidity	+40 °C, 21 d 93 % rel. humidity
Damp heat, cyclic (T6) as spec. in IEC 60 068-2-30	x		+40 °C, 2 cycles	+55 °C, 2 cycles	+55 °C, 2 cycles
Damp heat, cyclic (T7) as spec. in IEC 60 068-2-30		x	No test	+55 °C, 6 cycles	+55 °C, 6 cycles

<sup>1)</sup> The test at 70 °C is made for showing the effect of heating by sun radiation.

**Table 5.01: Climates**

### 5.3 Protection against corrosion

Visual WD shall have adequate resistance to corrosion as specified in table 5.02.

Test	Functional test	Endurance test	Degree of severity, abbreviated description of conditions		
			II	III	IV
SO <sub>2</sub> -corrosion (K3) as spec. in DIN EN ISO 6988		x	0.2 l SO <sub>2</sub> , 5 cycles	2 l SO <sub>2</sub> , 5 cycles	2 l SO <sub>2</sub> , 20 cycles

**Table 5.02:** Protection against corrosion

### 5.4 Mechanical influences

The function of visual WD shall not be adversely affected by mechanical influences as described in table 5.03.

Test	Functional test	Endurance test	Degree of severity, abbreviated description of conditions		
			II	III	IV
Shock (M1) as spec. in IEC 60 068-2-27	x		A(ms <sup>-2</sup> ) = 1000 - (200 x M) 6 x 3 shocks, duration 6 ms each	A(ms <sup>-2</sup> ) = 1000 - (200 x M) 6 x 3 shocks, duration 6 ms each	A(ms <sup>-2</sup> ) = 1000 - (200 x M) 6 x 3 shocks, duration 6 ms each
Impact (M2) as spec. in IEC 60 068-2-63	x		0.5 J, 3 impacts per point	0.5 J, 3 impacts per point	1.0 J, 3 impacts per point
Vibration sinus (M3) as spec. in IEC 60 068-2-6	x		10-150 Hz, 2 ms <sup>-2</sup> , 1 cycle/axes	10-150 Hz, 2 ms <sup>-2</sup> , 1 cycle/axes	10-150 Hz, 2 ms <sup>-2</sup> , 1 cycle/axes
Vibration sinus (M4) as spec. in IEC 60 068-2-6		x	10-150 Hz, 5 ms <sup>-2</sup> , 20 cycles/axes	10-150 Hz, 5 ms <sup>-2</sup> , 20 cycles/axes	10-150 Hz, 5 ms <sup>-2</sup> , 20 cycles/axes

**Table 5.03:** Mechanical influences

## 5.5 Electromagnetic compatibility

The function of visual WD shall not be adversely affected by electromagnetic influences as specified in table 5.04.

Test	Functional test	Endurance test	Degree of severity, abbreviated description of conditions		
			II	III	IV
Electrostatic discharge of low energy (E1b) acc. to EN 61 000-4-2	x		Each 10-times pos. and neg. contact discharge 2, 4 and 6 kV and air discharge 2, 4 and 8 kV	Each 10-times pos. and neg. contact discharge 2, 4 and 6 kV and air discharge 2, 4 and 8 kV	Each 10-times pos. and neg. contact discharge 2, 4 and 6 kV and air discharge 2, 4 and 8 kV
Radiated, radio-frequency, electro-magnetic field (E2a) acc. to EN 61 000-4-3	x		80 – 2000 MHz, 10 V/m as well as 415-466 and 890-960 MHz, 30 V/m Modulation: AM 80 % (modulated with 1 kHz sinus) for at least 3 s and in addition 3-times switching on/off of the carrier with 1 Hz and 1 kHz	80 – 2000 MHz, 10 V/m as well as 415-466 and 890-960 MHz, 30 V/m Modulation: AM 80 % (modulated with 1 kHz sinus) for at least 3 s and in addition 3-times switching on/off of the carrier with 1 Hz and 1 kHz	80 – 2000 MHz, 10 V/m as well as 415-466 and 890-960 MHz, 30 V/m Modulation: AM 80 % (modulated with 1 kHz sinus) for at least 3 s and in addition 3-times switching on/off of the carrier with 1 Hz and 1 kHz
Conducted radio-frequency (E2b) acc. to EN 61 000-4-6	x		150 kHz-100 MHz, 140 dB $\mu$ V Modulation: AM 80 % (modulated with 1 kHz sinus) for at least 3 s and in addition 3-times switching on/off of the carrier with 1 Hz and 1 kHz	150 kHz-100 MHz, 140 dB $\mu$ V Modulation: AM 80 % (modulated with 1 kHz sinus) for at least 3 s and in addition 3-times switching on/off of the carrier with 1 Hz and 1 kHz	150 kHz-100 MHz, 140 dB $\mu$ V Modulation: AM 80 % (modulated with 1 kHz sinus) for at least 3 s and in addition 3-times switching on/off of the carrier with 1 Hz and 1 kHz
Conducted electrical fast transient – burst – (E3a) acc. to EN 61 000-4-4	x		Each for a period of 1 min pos. and neg. 0.25, 0.5 and 1 kV	Each for a period of 1 min pos. and neg. 0.25, 0.5 and 1 kV	Each for a period of 1 min pos. and neg. 0.25, 0.5 and 1 kV
Conducted surge with high energy (E4a) acc. to EN 61 000-4-5	x		5-times pos. and neg. cl. 3: line – line 0.5, 1 kV and line – ground 0.5, 1, 2 kV	5-times pos. and neg. cl. 3: line – line 0.5, 1 kV and line – ground 0.5, 1, 2 kV	5-times pos. and neg. cl. 3: line – line 0.5, 1 kV and line – ground 0.5, 1, 2 kV
Static magnetic fields (E6)	x		150 mT	150 mT	150 mT

**Table 5.04:** Electromagnetic compatibility

## 6 Functional reliability

### 6.1 Technical data

Technical data describing the visual WD shall be provided in German language. This data shall include all information and parameters necessary for the correct and reliable operation of the WD including the necessary information about the required power supply.

### 6.2 Installation instruction

Installation instructions written in the German language shall be provided for visual WD. These instructions shall include a clear illustration of the assembly and installation procedures and a reference of the applications for which the WD are suitable (including a statement of the class according to clause 4 as well as an indication for which installation site the visual WD is suitable). In addition, information regarding adjustment (calibration) and maintenance is required. Adjustments not allowed shall be indicated unambiguously.

### 6.3 Operating voltage behaviour

Nominal voltage, operating voltage range (at least nominal voltage  $U_N \pm 15\%$ ) and maximum permitted ripple of the operating voltage shall be specified by the manufacturer. Visual WD shall be safe in their function within these specified values. Variations in the voltage as specified in table 6.01 shall not adversely affect visual WD.

*Note: This requirement is not valid for WD powered by type III power supply units (see also VdS 2195).*

Test	Functional test	Endurance test	Degree of severity, abbreviated description of conditions		
			II	III	IV
Operating voltage range system-voltage (B1b)	x		$U_N \pm 15\%$ or system dependent	$U_N \pm 15\%$ or system dependent	$U_N \pm 15\%$ or system dependent
Operating voltage surge system voltage (B2b)	x		10 cycles from $U_N + 15\%$ to $U_N - 15\%$ and back or system dependent	10 cycles from $U_N + 15\%$ to $U_N - 15\%$ and back or system dependent	10 cycles from $U_N + 15\%$ to $U_N - 15\%$ and back or system dependent

**Table 6.01:** Changes of operating voltage

## 6.4 Ripple of the operating voltage

As a minimum requirement visual WD shall function safely with a voltage ripple of  $\leq 1,0 V_{SS}$  if a nominal voltage of 12 V is specified. For 24 V nominal voltage the ripple value is  $\leq 2,0 V_{SS}$ . For other nominal voltages the specifications of the manufacturer are definitive.

*Note: This requirement is not valid for WD powered by type III power supply units (see also VdS 2195).*

## 6.5 Reliability

The selection of components for visual WD shall be such that they are suitable for the selected environmental class.

## 6.6 Components

Only components using technology which has proved its reliability in various applications over a period of two years may be used. For components of unproved reliability other means of proof may be considered for evaluation on an individual basis.

All components shall be continuously operated within the limits specified by the manufacturer while taking into consideration the ambient temperature (including inherent warming) (see also DIN IEC 65A/179/CDV).

## 6.7 Relays

Relays shall be protected against the effects of dust at least to the degree of protection specified by DIN EN 60 529 (identical with VDE 0470-1).

Relay contacts shall be designed for at least 10.000 switching cycles at a corresponding connected load.

## 6.8 Switches

Switches shall be fitted with self-cleaning contacts or be enclosed in dust-protected casings complying at least with the degree of protection specified by DIN EN 60 529 (identical with VDE 0470-1) - IP 5x.

## 6.9 Access to assemblies and components

If visual WD contain changeable parts they shall be constructed to ensure easy access to assemblies and components as well as their replacement. Provisions shall be made to reduce handling errors to a minimum.

## 6.10 Connecting and adjustment elements

Connecting and adjustment elements shall be marked and shall be easily accessible to the installer and the maintenance service personnel, however not for the user of the system – except the connecting elements for equi-potential bonding and surge protection measures.

Connection elements for connection to the IAS cabling shall be designed in a way that ensures safe operation and protection against corrosion.

## **7 Operational security**

### **7.1 Degree of protection**

Visual WD shall, if installed, be constructed at least to the degree of protection as specified by EN 60 529 (identical with VDE 0470-1) - IP 3x.

### **7.2 Protection against access**

Parts affecting the function of visual WD as well as connecting elements and adjustment elements shall not be freely accessible; they shall be protected e.g. by covers. Excluded from these requirements are connecting elements for equipotential bonding and surge protection measures.

## **8 Tamper**

### **8.1 Tamper protection**

Housings of visual WD shall have adequate mechanical strength. The covers shall be mechanically stable in their fitting, e.g. by glueing, casting, screwing.

### **8.2 Tamper detection**

No requirements

## **9 Construction**

### **9.1 Stability**

Visual WD shall be of adequate mechanical strength.

### **9.2 Stationary installation**

Visual WD shall be designed to facilitate static installation.

### **9.3 Freedom of potential, isolation resistance**

The casing and all parts of the casing of visual WD shall be free from electrical potential (with the exception of electrical protective measures). The isolation resistance shall be at least 500 k $\Omega$ .

### **9.4 Equi-potential measures**

It shall be possible to connect visual WD which are specified for the use outside of the protected premises to the equi-potential bonding. For this purpose a possibility to clamp wires with a sectional view of 4 mm<sup>2</sup> to 16 mm<sup>2</sup> is to be provided (only if metal housings are used).

## 9.5 Strain relief

Connecting and terminal points of cables and leads shall be relieved of mechanical stress where such stresses can be anticipated.

## 9.6 Connection elements

Connection elements for connection to the IAS cabling shall be designed in a way that ensures safe operation and protection against corrosion.

## 9.7 Fastening

Visual WD shall be constructed to allow proper installation, also under harder conditions (e.g. installation when standing on a ladder) and connection to the wiring of the intruder alarm system.

## 9.8 Colour of the signal

The colour of the signal shall preferably be red according to DIN 6163-1. Except green and blue other colours, e.g. orange are also permitted.

# 10 Function

## 10.1 Alternative power supply

Class C visual WD shall also function when powered by the operational voltage of the alternative power supply of the connected intruder alarm system resp. with the specified type of the power supply unit.

## 10.2 Light intensity

The static light intensity shall be for horizontal reflection angles at least 1000 cd at a frequency of 1 - 3 Hz.

*Note: For flashbulbs this requirement is fulfilled normally by a storage capacitor with a stored energy of  $\geq 1$ Ws.*

## 10.3 Signalling frequency

The signalling frequency of the visible WD respectively the speed of rotation of the reflector shall measure for visible WD which are designed as a turning identity flash light at least 0,5 Hz and maximum 3 Hz resp. at least 0,5 turns/s and maximum 3 turns/s for the whole range of the operation voltage.

## 10.4 Angle of reflection

Visual WD shall be designed such that a signal between the range  $\alpha$  and  $\beta$  (see figure 10.01) is visible without restriction when installed. Angle  $\alpha$  shall be at least  $180^\circ$  and angle  $\beta$  at least  $90^\circ$ .

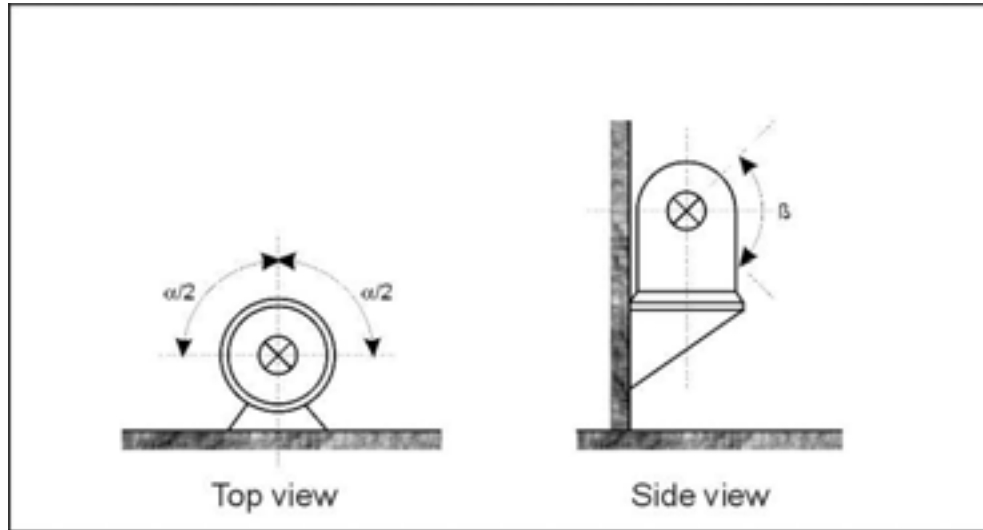


Figure 10.01

## 11 Interface to the Intruder/ Hold-Up Alarm System

Interfaces to other parts of the system, e.g. to the intruder alarm control and indicating equipment (CIE), shall be designed to ensure proper functioning. A combined test may be necessary depending on the design of the visual WD and the other parts of the system.

### 11.1 Inputs for conventional line termination technology

For IAS with a "conventional" line termination technology (end-of-line resistor) the following requirements are valid for the inputs of visual WD.

- Connection possibility for the power supply voltage and control circuit (if necessary)
- Class C: In addition connection possibility for an element for monitoring (e.g. end-of-line resistor)

### 11.2 Other interfaces

The performance shall be specified by the manufacturer.

## 12 Power supply

The necessary power supply for visual WD shall at least meet the requirements of the equivalent class of the IAS. For type III power supply units (see also VdS 2195) proof of a installation possibility shall be given.

## 13 Options

Options shall have no adverse effect on the functions required for visual WD. The performances of the options shall be specified by the manufacturer.

## Changes

Compared with edition VdS 2301 02/93 (02) the following changes have been made:

- Addition of clause 2 (new) "Normative references"
- Amendments for the use of power supply units
- Revision of complete clause 5 "Protection against environmental influences"
- Amendment of clause 7.2 „Protection against access“
- Indication, that cables/wires for the equi-potential bonding and surge protection measures are not security-relevant
- Editorial changes