Rules for Intruder Alarm Systems

Opening detectors (Magnetic contacts)

Part 1: Requirements

1 General

1.1 Scope

These rules describe requirements for opening detectors OD (e.g. magnetic contacts) of classes A, B and C.

These rules shall be applied in conjunction with the rules for Intruder Alarm Systems VdS 2227, „General Requirements and Test Methods“ and the rules for Intruder Alarm Systems VdS 2110, „Protection against Environmental Influences, Requirements and Test Methods“. The rules VdS 2203, „Software controlled System Components, supplementary Requirements and Test Methods“ also apply for system components controlled by software.

Note: These rules also apply by analogy for OD which are only a sensor (e.g. magnetic contacts used today).

The test methods for OD are described in VdS 2233.

1.2 Validity

These rules are valid from March 01, 1996; they replace the edition VdS 2120 09/93 (02).

Note: This is a translation of the German rules; in case of discrepancies, the German version shall be binding.

2 Terms and definitions

For general terms and definitions refer to the rules for Intruder Alarm Systems VdS 2227, „General Requirements and Test Methods“.

3 Classification

The **performance criteria** of different classes are defined in the rules for Intruder Alarm Systems VdS 2227, „General Requirements and Test Methods“.

The **environmental classes** classification is made in accordance to the rules for Intruder Alarm Systems VdS 2110, „Protection against Environmental Influences, Requirements and Test Methods“.

4 Protection against environmental influences

4.1 Limits of application

OD shall not be adversely affected in their function by environmental influences. Environmental influences can have various effects on operating characteristics depending on the nature of the functional principle applied. The manufacturer shall therefore specify the limits of the application (e.g. climate).

4.2 Climates

OD shall not be adversely affected in their function under the atmospheric conditions as described in table 4.01 according to its environmental class.

Test	Functiontest	Endurance test	Degree of severity, abbreviated description of conditions		
			I	II	III
Dry heat (T1) as spec. in IEC 68-2-2	x		+40°C, 16 h	+55°C, 16 h	+70°C, 16 h
Cold (T3) as spec. in IEC 68-2-1	x		+5°C, 16 h	-10°C, 16 h	-25°C, 16 h
Damp heat, steady (T4) as spec. in IEC 68-2-3	x		+40°C, 4 d 93% rel. air humidity	+40°C, 4 d 93% rel. air humidity	//////////////////////////
Damp heat, steady (T5) as spec. in IEC 68-2-3		x	//////////////////////////	//////////////////////////	+40°C, 21 d 93% rel. air humidity
Damp heat, cyclic (T6) as spec. in IEC 68-2-30	x		//////////////////////////	//////////////////////////	+55°C, 2 cycles
Damp heat, cyclic (T7) as spec. in IEC 68-2-30		x	//////////////////////////	//////////////////////////	+55°C, 6 cycles

Table 4.01: Climates

4.3 Protection against corrosion

OD shall have adequate resistance to corrosion as specified in table 4.02.

Test	Functiontest	Endurance test	Degree of severity, abbreviated description of conditions		
			I	II	III
SO_2-Corrosion (K3) as specified in DIN EN ISO 6988		x	//////////////////////////	0,2 l SO_2 5 cycles	2 l SO_2 5 cycles
Corrosion by window cleanser (K4)		x	15% alcohol 2% ammonia 1% alkylbenzol-sulfanat, 20°C, 24 h as well as 15% common salt, 5% vinegar 1% alkylbenzol-sulfanat, 20°C, 24 h, per solvent 5 cycles	15% alcohol 2% ammonia 1% alkylbenzol-sulfanat, 20°C, 24 h as well as 15% common salt, 5% vinegar 1% alkylbenzol-sulfanat, 20°C, 24 h, per solvent 5 cycles	15% alcohol 2% ammonia 1% alkylbenzol-sulfanat, 20°C, 24 h as well as 15% common salt, 5% vinegar 1% alkylbenzol-sulfanat, 20°C, 24 h, per solvent 5 cycles

Table 4.02: Protection against corrosion

4.4 Mechanical influences

OD shall not be adversely affected in their function by mechanical influences as described in table 4.03.

Test	Functiontest	Endurance test	Degree of severity, abbreviated description of conditions		
			I	II	III
Shock (M1) as spec. in IEC 68-2-27	x		a=100-20 M, 6 x 3 shocks, duration 6 ms	a=100-20 M, 6 x 3 shocks, duration 6 ms	a=100-20 M, 6 x 3 shocks, duration 6 ms
Impact (M2) as spec. in IEC 68-2-63	x		//////////////////////////	0,5 J, 3 impacts per point	0,5 J, 3 impacts per point
Vibration sinus (M3) as spec. in IEC 68-2-6	x		10-150 Hz, 0,1 g, 1 cycle	10-150 Hz, 0,5 g, 1 cycle	10-150 Hz, 0,5 g, 1 cycle
Vibration sinus (M4) as spec. in IEC 68-2-6		x	10-150 Hz, 0,5 g, 20 cycles	10-150 Hz, 1,0 g, 20 cycles	10-150 Hz, 1,0 g, 20 cycles

Table 4.03: Mechanical influences

4.5 Electromagnetic compatibility

OD shall not be adversely affected in their function by electromagnetic influences as specified in table 4.04.

Test	Functiontest	Endurance test	Degree of severity, abbreviated description of conditions		
			I	II	III
Low energy static discharge (E1b) as spec. in IEC 1000-4-2 (1995)	x		Contact discharge 6 kV/ Air discharge 8 kV	Contact discharge 6 kV/ Air discharge 8 kV	Contact discharge 6 kV/ Air discharge 8 kV
Electromagnetic fields (radio frequency) (E2) as spec. in IEC 1000-4-3 (1995)	x		1-1000 MHz, 10 V/m, 1 kHz pulsed modulation	1-1000 MHz, 10 V/m, 1 kHz pulsed modulation	1-1000 MHz, 10 V/m, 1 kHz pulsed modulation
Line-conducted burst (E3a) as spec. in IEC 1000-4-4 (1995)	x		1 kV	1 kV	1 kV
Line-conducted surge (E4a) as spec. in IEC 1000-4-5 (1995)	x		Cl. 3: Diff.: 0,5, 1 kV and Common 0,5, 1, 2 kV	Cl. 3: Diff.: 0,5, 1 kV and Common 0,5, 1, 2 kV	Cl. 3: Diff.: 0,5, 1 kV and Common 0,5, 1, 2 kV
Medium energy static discharge in the vicinity of the device (E5b)	x		10 kV/2 µs	10 kV/2 µs	10 kV/2 µs
Static magnetic fields (E6) [1)]	x		150 mT	150 mT	150 mT

[1)] Test will be only performed to class C OD

Table 4.04: Electromagnetic compatibility

5 Functional reliability

5.1 Provision of functions

5.1.1 Technical data

Technical data shall be provided in the German language for the parts of an IAS. This data shall include all information and parameters necessary for the safe operation of the system element.

5.1.2 Installation instructions

Installation instructions written in the German language shall be provided for the elements of an IAS. These instructions shall include a clear illustration of the assembly and installation procedures and a reference to the applications for which the parts are suitable (including a statement of the classes according to clause 3). In addition, information regarding adjustment (calibration) and maintenance is required. Adjustments not allowed shall be indicated unambiguously.

5.1.3 Operating voltage behaviour

Nominal voltage, operating voltage range (at least nominal voltage U_N ±25%) and maximum permitted ripple of the operating voltage shall be specified by the manufacturer. OD shall be safe in their function within these specified values. Variations in the voltage as specified in table 5.01 shall not adversely affect the function of OD.

Test	Functiontest	Endurance test	Degree of severity, abbreviated description of conditions		
			I	II	III
Operating voltage range system voltage (B1b)	x		$U_N \pm$ 25% or system dependent	$U_N \pm$ 25% or system dependent	$U_N \pm$ 25% or system dependent
Operating voltage surge system voltage (B2b)	x		10 cycles from U_N +25% to U_N -25% and back	10 cycles from U_N +25% to U_N -25% and back	10 cycles from U_N +25% to U_N -25% and back

Table 5.01: Operating voltage behaviour

5.1.4 Ripple of the operating voltage

As a minimum requirement OD shall function safely with a voltage ripple of ≤ 1,0 Vss if a nominal voltage of 12 V is specified. For 24 V nominal voltage the ripple value is ≤ 2,0 Vss. For other nominal voltages the specifications of the manufacturer are definitive.

5.1.5 Reliability

The selection of components for OD shall provide a MTBF-value of at least 45.000 h for the devices.

5.1.6 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 VDE 0801).

5.1.7 Relays

Relays shall be protected against the effects of dust at least to the degree of protection specified by EN 60 529 - IP 5x. Relay contacts shall be designed for at least 10.000 switching cycles at a corresponding connected load. Relays that are operated each time the detector response shall be designed for at least 10^7 switching cycles.

5.1.8 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 EN 60 529 - IP 5x.

5.1.9 Access to assemblies and components

If OD enclose exchangeable parts these parts shall be constructed to ensure easy access to assemblies and components as well as their easy replacement. Provisions shall be made to reduce handling errors to a minimum.

5.1.10 Connecting and adjustment elements

Connecting and adjustment elements shall be marked and shall be easily accessible to the installer and the maintenance service personnel. Connecting elements for connection to the IAS cabling shall be designed in a way that ensures safe operation and protection against corrosion.

Note: Connecting elements of detectors (sensors) with fixed connected cable need not be marked.

5.1.11 Operational readiness of the detector after application of the operation voltage

The time between the application of the operation voltage and the safe functioning of the OD shall be specified by the manufacturer and shall not exceed 120 s.

5.2 Function monitoring

A failure of or a fault in central processing units (e.g. microprocessors) shall be signalled. Faults detected by the functional monitoring system shall be signalled (see also clause 10).

5.3 Function tests

5.3.1 Function test by the installer

It shall be possible to test the function of OD by the installer and maintenance service. The test functions shall allow recognition of the actual functions of the detector.

5.3.2 Function testing by the operator

It shall be possible to test the function of OD by the operator in a simple and easy way.

For classes B and C OD it shall be possible for the operator to switch the indications on/off if the indicators are located at the OD.

Note: See clause 8.8 for the design of the indicators.

6 Operational security

6.1 Operation

Actions to be executed by the operator shall be simple. Indicators shall be designed in a clear and easy understanding manner.

6.2 Operating instructions

Operating instructions written in the German language shall be available for the operator of the IAS. The instructions shall include a clear illustration and description of all control and display elements of importance to the operator and shall incorporate clear instructions for all operating states of the installation.

Note: This requirement for operating instructions is not valid for OD which are only a sensor.

6.3 Degree of protection

System parts of an IAS shall, if installed, be constructed at least to the degree of protection as specified by EN 60 529 - IP 3x. Sensors of OD shall be according at least to the degree of protection as specified by EN 60 529 - IP 67.

Note: For OD containing electronic parts in critical locations (e.g. in the area of windows) the degree of protection necessary shall be defined on a case to case basis.

6.4 Protection against access

Housings of OD shall be of adequate mechanical strength. The covers shall be mechanically stable in their fitting to the housing. Function relevant parts of OD as well as connecting elements and adjustment elements shall not be freely accessible; they shall be protected e.g. by covers.

6.5 Sealing capability

Classes B and C OD with parts which can be removed or opened shall be designed to allow the attachment of a seal.

6.6 Error tolerance

OD shall be constructed such that they cannot be adversely affected by incorrect operations executed by the operator.

6.7 Setting of parameters

Facilities for the setting of the parameters of OD shall be designed to allow parameter settings by the installer only with the actual consent of the user.

7 Tamper security

7.1 Tamper protection

Housings of OD shall be of adequate mechanical strength. The covers shall be mechanically stable in their fitting to the housing.

The indicating and operating elements of classes B and C OD shall be designed such that they do not weaken the stability of the casing and inhibit the access to the inside of the device. The fastening screws for assemblies shall not be visible externally once the device is properly fitted. It shall only be possible to open these devices by using tools. Furthermore, it shall not be possible to see into the inside of the devices.

Significant reduction of the proper function of class C OD (e.g. because of covering, replication of monitoring criteria) shall be prevented; alternatively monitoring in accordance with clause 7.2 shall be provided.

7.2 Tamper detection

Openings of classes B and C OD with removable parts shall be detected and signalled if, because of it, security relevant functions become accessible. The inside of the device and the monitoring of the opening shall be protected against access until the monitoring system has responded.

Only micro-“snap“-switches complying with DIN 46 636 or equivalent parts shall be used for cover contacts. The contact area of the switches shall be gold-plated or of equivalent finish. Alternatively, reed contacts may be used as long as they cannot be influenced from the outside.

The minimum response time (holding time) of the opening monitoring system shall be specified by the manufacturer if the device has an interface complying with clause 10.1.2.3.

A significant reduction of the proper functioning of class C OD (e.g. because of covering, replication of monitoring criteria) shall be detected and signalled if this reduction is not prevented as specified in clause 7.1.

8 Construction

8.1 Stability

Housings of OD shall be of adequate mechanical strength.

8.2 Stationary installation

OD shall be designed to allow stationary installation.

8.3 Freedom of potential, isolation resistance

The casing and all parts of the casing for OD shall be free from electrical potential (with the exception of electrical protective measures). The isolation resistance shall be at least 10 MΩ.

8.4 Shielded cables

OD shall be constructed so that the shielded cables can be connected together in a reliable manner.

8.5 Strain relief

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

8.6 Fastening and calibration

OD shall be constructed to allow proper installation and so far as necessary calibration. Any special tools required shall be supplied by the manufacturer of the device.

Where the installer is required to calibrate the detectors, the manufacturer shall provide the appropriate calibration auxiliaries.

8.7 Setting elements

The manufacturer shall supply the detection characteristics of the OD for all extreme values of the setting elements. The functions and effects of setting elements shall be described if several setting elements are provided.

Where OD have only one electrical setting element (e.g. sensitivity), a setting of „nil“ (e.g. no function) shall not be possible.

Note: The requirements for the environmental behaviour in accordance with clause 4 shall comply with all possible settings; requirements for the immunity to false alarms shall be met in all settings specified by the manufacturer for the relevant application.

8.8 Indicators

Any available indicators of the operational status of OD (e.g. fault condition) shall be unambiguous to the operator of the IAS. Optical indicators shall be clearly visible to the operator and have an average lifetime of at least 30.000 h.

8.9 Mounting materials

If the mounting surface or the use of the standard mounting material can negatively influence the function of the detector (e.g. by mounting of OD using reed contacts on ferromagnetic materials) special mounting material and appropriate distance elements shall be supplied and used with the OD (e.g. washers made of non-ferromagnetic material, $\mu r \leq 10$).

8.10 Connecting cable

OD consisting of one sensor only may be supplied with a fixed connecting cable. The manufacturer shall offer detectors with a cable length of at least 2 m. If the cross-section area of the cores is less than 0,28 mm^2 (diameter less than 0,6 mm), the cable shall not be longer than 6 m (cross-section $\geq$ 0,14 mm^2 per core).

For classes B and C OD the following is valid in addition: If the OD is not supplied with a part or end-of-line element (e.g. resistor), the cable shall be provided with at least four wires in a way that corresponding wires can´t be assigned to each other (e.g. by using the same colour for wire and isolation of the wire).

9 Function

9.1 Detection characteristics

The OD shall respond if the item monitored (e.g. door panel, window frame) is moved within a range of 10 - 30 mm (in the case of OD for shutters etc. 10 - 50 mm) from the closed state. When re-approaching the item monitored the detector shall leave in the idle state until 50% of the distance of the response distance is reached.

Note: Depending on the performance and specified use of the OD (e.g. for a combined detection for opening and the locked state of a door/window) lower ranges may be used.

9.2 Quiet operation

OD shall function quietly (e.g. triggering of an alarm).

9.3 Switching cycles

The operating elements of OD (e.g. contacts) shall be designed to ensure at least 10^7 operating cycles. Transition resistance and switching hystereses shall be in the limits of the specifications of the manufacturer.

9.4 Long term behaviour

OD shall signal an operation according to clause 9.1 with a high probability even if they have been in the idle state for months.

9.5 Triggering indication

OD containing electronic components shall allow connection to the IAS such that the operator is able to determine which OD have triggered.

Once these detectors have triggered, it shall be ensured that the information concerning the triggering of the detectors is not falsified in the unset state of the IAS.

It shall be possible for the operator to delete this information. Undeleted information concerning detectors triggering shall be included in the mandatory action of the IAS during setting (shall block a set procedure); alternatively, this information shall be deleted automatically during setting of the IAS.

9.6 State of the device beyond the limits of the operating voltage

If the OD is outside the operating voltage range (loss of voltage) and if the features specified are not longer fully available an alarm signal shall be emitted for classes B and C detectors. A fault signal may be issued in addition.

9.7 Renewed readiness of the system

The detector shall be ready to signal again within 10 s of a signal being issued by the detector and the end of the criterion triggering this signal.

10 Interface to IAS/Hold-Up Alarm System

Interfaces to other parts of the system, e.g. to the Intruder Alarm Control and Indicating Equipment, shall be designed to ensure proper functioning. A combined test may be necessary depending on the design of the OD and the other parts of the system.

All interfaces shall be specified in detail by the manufacturer. Alternatively, the interfaces described in clause 10.1 can be used.

Note: Detailed specifications for the interfaces may only be dropped if all requirements of clause 10.1 are fulfilled.

10.1 Interface for conventional line technologies

The following requirements shall apply for the input and output of OD with external power supply in accordance to clause 5.1.3 and a „conventional“ line technology (end-of-line resistor).

10.1.1 Inputs

10.1.1.1 Operating voltage

OD shall have terminals for the supply voltage if necessary.

10.1.1.2 Additional inputs

The relevant values shall be given by the manufacturer.

10.1.2 Outputs

10.1.2.1 Interface for intruder alarms

The interface shall meet the following requirements:

- potential-free output, loading capability at least 50 mA at 30 V DC, series resistance ≤ 47 Ω
- closed in the idle state (low resistance), opens in the event of a signal (high resistance)
- response time ≥ 1 s to ≤ 10 s; classes B and C: at latest 10 s after the end of the criteria triggering the alarm the contact shall close/the output shall be high resistant

  Class B and C
- Capability of connecting a monitoring element (e.g. end-of-line resistor)

10.1.2.2 Additional electronic output for intruder alarms (Option)

The additional electronic output shall be designed as an open-collector output with the following specifications.

Idle state

	Minimum	Maximum
- output voltage	-	depends on U_B
- output current	-	depends on U_B
- stray current	-	≤ 50 µA

Alarm state

	Minimum	Maximum
- output voltage at minimum output current	-	1,5 V
- output current	1 mA	-

10.1.2.3 Interface for tamper alarm according clause 7.2

There are no requirements for class A OD.

For classes B and C OD the interface shall meet the following requirements:

- potential-free output, loading capability at least 50 mA at 30 V DC, series resistance $\leq 47\ \Omega$
- closed in the idle condition (low resistance), opens in the event of a signal (high resistance)
- response time corresponding with the duration of the tamper detector response

10.1.2.4 Additional outputs

The relevant values shall be given by the manufacturer.

10.2 Interfaces for other techniques

The performances shall be specified by the manufacturer.

11 Options

Options shall not have a negative effect on the mandatory functions of OD. The performances of the options shall be specified by the manufacturer.