



Locking Cylinders with Individual Locking Function

Requirements and Test Methods

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VdS Guidelines for Physical Security Devices

Locking Cylinders with Individual Locking Function

Requirements and Test Methods

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1 General

1.1 Scope

These guidelines contain minimum requirements for locking cylinders with individual locking function and locking cylinders used in ancillary control equipment (ACE) of intruder alarm systems (IAS). The guidelines are valid in connection with the German standards DIN 18 252 and DIN EN 1303.

Deviating from DIN 18 252 these guidelines may also be used for other types of locking cylinders (e.g. round or oval cylinders), when the requirements and test methods are used analogously.

The guidelines are neither valid for locking cylinder in master key systems nor for electronic locking systems. The requirements and test methods for these are described in:

- **VdS 2156-2** Guidelines for Physical Security Devices, Locking Cylinder with Individual Locking Function, Part 2: Electronic Locking Cylinders
- **VdS 2215** Guidelines for Physical Security Devices, Locking Systems
- **VdS 2386** Guidelines for Physical Security Devices, Master Key Systems

1.2 Validity

The guidelines are valid from 2007, September 1st; they replace the guidelines VdS 2156 : 2007-06 (06).

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

2 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 18 252** : 2006-12 Schließzylinder für Türschlösser: Begriffe, Maße, Anforderungen, Kennzeichnung (Locking cylinder for door locks, terms and conditions, measurements, requirements and labelling)
- **DIN EN 1303** : 2005-04 Baubeschlüsse, Schließzylinder für Schlösser; Anforderungen und Prüfverfahren (Hardware, locking cylinder for locks requirements and test methods)
- **VdS 2110** Guidelines for Intruder Alarm Systems, Protection Against Environmental Influences, Requirements and Test Methods
- **VdS 2119** Guidelines for Intruder Alarm Systems; Ancillary Control Equipment (ACE), Requirements
- **VdS 2156-2** Guidelines for Physical Security Devices, Locking Cylinders with Individual Locking Function, Part 2: Electronic Locking Cylinders

- **VdS 2215** Guidelines for Physical Security Devices, Locking Systems, Requirements and Test methods
- **VdS 2344** Procedures for Testing and the Approval of Equipment, Components and Systems Used in Fire Protection and Security Technology
- **VdS 2386** Guidelines for Physical Security Devices, Master Key Systems, Requirements and Test Methods.

3 Terms and definitions

For general terms and definitions refer to DIN 18 252 and DIN EN 1303, clause 3. In addition the following definitions apply:

Attack side: The side of any façade element (e.g. door, window), which needs to be protected against an attack of a trespasser (e.g. the outside front of an apartment door).

Individual locking function: The individual locking of a cylinder, which is not a part of a master key system.

Copy of key: Key which is produced by the manufacturer or a third party on base of the known code or a presented key sample provided independently of the locking cylinder

Original key: Key which is provided together with the locking cylinder by the manufacturer.

Ancillary control equipment (ACE): Operating device for setting/unsetting of intruder alarm systems (IAS), e.g. ACE with physical identification feature.

Ancillary control equipment with physical identification feature: Ancillary control equipment with which setting/unsetting of an IAS is made by identification of physical features (e.g. keys, chip cards).

Pulling protection: Regarding these guidelines pulling protection is known as a part or system of the cylinder, which are intend to prevent extracting the cylinder of the lock or the plug of the cylinder body.

Note: Pulling protection may also be realized by using a burglar-resistant door plate.

Depending and double active detainers: Blocking elements that only open if getting confirmed and sorted accurately. If they are sorted too high or too low the cylinder keeps in blocked position.

4 Classification

Deviating from DIN 18 252 resp. DIN EN 1303 locking cylinders in accordance to their performances are graded into the following classes:

All locking cylinders with **classification A** fulfill in addition to the higher requirements of these guidelines the requirements of DIN 18 252, class 21, 31 or 71.

- **Class A**
basic burglary protection
- **Class AZ**
basic burglary protection *with pulling protection*

All locking cylinders with **classification B** fulfill in addition to the higher requirements of these guidelines the requirements of DIN 18 252, class 42 or 82.

- **Class B**
medium burglary protection
- **Class BZ**
medium burglary protection *with pulling protection*
- **Class B+**
medium burglary protection *with high resistance against attacks with picking tools*
These cylinders are suited for use in ancillary control equipment of intruder alarm systems
- **Class BZ+**
medium burglary protection *with pulling protection and with high resistance against attacks with picking tools*
These cylinders are suited for use in ancillary control equipment of intruder alarm systems

Note: With exclusively mechanical cylinders a high burglary resistance (except a high resistance against attacks with picking tools) cannot be realized. For this purpose cylinders has to meet the requirements of class C. Security techniques using mechanic, electronic and/or biometric features may be combined (see VdS 2156-2).

5 Requirements

The requirements of DIN 18 252 and DIN EN 1303 are valid with the following deviations and/or additions.

5.1 General requirements

5.1.1 Mounting instructions

In addition to DIN 18 252 each delivery of one or more locking cylinders shall be provided with pictorial installation and operating manuals, written in German.

Note: If the products are intended for the non-German speaking market a mounting instruction in English language is adequate.

The mounting instructions shall contain a clear and detailed description of the installation process as well as all security measures and conditions of use (e.g. indication of attack side if only one side of the cylinder is provided with a protection against drilling).

Especially a hint shall be given, that the cylinder is to be protected with a burglar resistant door plate (with or without pulling protection) of the respective class as well as a hint on the projection of the cylinder which is at maximum 3 mm.

5.1.2 Effective varieties

Deviating from DIN EN 1303, clause 3.2, only those moving retainers are considered for the calculation of the effective varieties, that are depending and are double active.

In addition to DIN EN 1303, clause 4.8.2, the locking code may repeat in production for cylinders with individual locking function after 30,000 (**class A, AZ**) resp. 100,000 (**class B, BZ, B+, BZ+**) at the earliest.

5.1.3 Keys

In addition to DIN 18 252 for cylinders with individual locking function key profiles which are used in master key systems shall not be used.

Keys for **class B, BZ, B+ and BZ+** locking cylinders shall have additional features (e.g. protected key profile, trademark protection, special construction features), that increase the difficulty of getting copies of keys.

The copying of keys and/or locking cylinders for **class B and BZ** shall be restricted to the manufacturer or to dealers only which are authorized by the manufacturer, considering the following circumstances:

- The dealer shall be obliged to produce a copy of the key only if a security card is being presented.
- **Every** key blank that a dealer receives from the manufacturer has to be marked, so the dealer can be identified at any time.

If the dealers proceeding with the key blanks does not fulfill the requirements mentioned he shall no longer be supplied with key blanks by the manufacturer.

Keys for profile cylinder for **class B+ and BZ+**, intended for the use in ancillary control equipment (ACE) of intruder alarm systems (IAS) shall only be produced by the manufacturer himself and delivered only against an authorization identification. The manufacturer shall document all deliveries of these key blanks.

The validity period of the protection of the key profile has to be in line with the validity period of the VdS certificate at least.

5.1.4 Declaration of the manufacturer

Additionally to the technical documentation required in DIN 18 252, clause 8.3, a declaration of the manufacturer is to be submitted as shown in Annex A that the requirements concerning quantity and design of the code, the replication of the codes and the requirements for the keys according to clause 5.1.3 are considered.

5.1.5 Marking

Deviating from DIN 18 252, clause 11, every locking cylinder shall be labeled permanently with the name/mark of the manufacturer or the holder of the approval and the type designation and the class. The type designation shall be identical with that in the technical documents and the advertising material and shall only be used for the approved locking cylinders.

In case of a one-sided protection against mechanical attacks the attack side shall be marked permanently.

In the mounted state of the locking cylinder no references to the code, drill protection or class shall be visible.

In the mounted state of the locking cylinder visible marking or a marking of the key concerning the VdS approval is permitted.

A marking at the locking cylinder or at the key referring to the locking variation has to be coded. Without knowing the code it shall not be possible to determine the locking variation.

Note: All VdS markings shall be in accordance with the requirements of VdS 2344.

5.1.6 Dimensions

Deviating from DIN 18 252, clause 4, pins, trips/cams or other devices may be attached on or at the cylinder body in a way, that they support themselves at the door plate in case of a pulling attack.

5.1.7 Protection against picking methods

Locking cylinders in **class A, AZ** shall have a basic and in **class B, BZ** an increased protection against picking methods.

A basic protection in **class A, AZ** may be given if the following features are available:

- Profile cylinder without dimples fulfill the requirements of DIN 18252, clauses 7.1.1 to 7.1.7
- a minimum of two different body pin lengths are used and the difference of the length shall be two steps at the least
- in locking cylinders for keys with dimples, a minimum of two core pins shall be set in the front part (first 2/3) of the locking cylinders, which are long enough to be pushed into the housing in case of a picking attack at the pins behind them.

The cylinder shall not be overcome in case of a picking attack within 10 min.

An increased protection in **classes B, BZ** may be given if the following features are available:

- All features of **class A, AZ** as before mentioned
- in locking cylinders driven with keys with cuts in addition to the aforementioned features the keyway as well as the key profile shall be designed that both profile lines overlap or touch the mid-line of the profile three times at the least and twice of that within the pin reading area of the core pins.

Additional blocking features are permitted, if the picking of the cylinder such way becomes effectively more difficult.

The cylinder shall not be overcome in case of a picking attack within 30 min.

5.1.8 Durability

In addition to DIN EN 1303, clause 4.3, locking cylinders equipped with a cam to operate the lock shall resist the force acting upon the cam during the locking procedure. Therefore deviating from DIN EN 1303, clause 5.3, a test according to clause 6.4.6 of these guidelines shall be performed.

5.1.9 Resistance against attacks with metal cutting tools

Deviating from DIN EN 1303, clause 4.9.1 locking cylinders tested according to clause 6.4.7 of these guidelines shall resist a minimum time as shown in table 5.01 in case of attacks with metal cutting tools.

Class	Minimum resistance time	Total test time
A, AZ	3 min	10 min
B, BZ, B+, BZ+	6 min	15 min

Table 5.01: Resistance to attacks with metal cutting tools

5.1.10 Resistance against attacks with pulling tools

Deviating from DIN EN 1303, clause 4.9.4 locking cylinders tested according to clause 6.4.8 of these guidelines shall resist a minimum time as shown in table 5.02 in case of attacks with pulling tools.

Class	Maximum extraction force	Minimum resistance time
AZ	15 kN	3 min
BZ, BZ+	15 kN	6 min

Table 5.02: Resistance against attacks with pulling tools

For locking cylinders of **class A, B and B+** it is required that the technical documentation of the manufacturer contains the information that the locking cylinder shall be used only in connection with a VdS approved burglar-resistant door plate of the corresponding class with pulling protection.

5.2 Locking cylinders for ancillary control equipment of intruder alarm systems

Locking cylinders of **class A, B and BZ+** intended for the use in ancillary control equipment (ACE) of intruder alarm systems (IAS) (see guidelines for ancillary control equipment, VdS 2119) shall fulfill the requirements of class B as well as the following requirements.

5.2.1 Resistance against picking attacks

The locking cylinder shall have a high resistance against picking attacks. This can be given if one of the following features is existing:

- The pins/levers of the blocking system are arranged in multiple ranks.

- Beside the normal blocking system more depending and double active retainers are existing.
- Blocking systems, which cannot be attacked with manipulation tools (e.g. magnetic retainers).

The cylinder shall not be overcome in case of an attack with opening tools within 90 minutes.

5.2.2 Protection against corrosion

Analogue to the guidelines VdS 2119 locking cylinder for ACE shall have a sufficient resistance against corrosion, corresponding to the test described in clause 6.5.2

5.2.3 Registration of delivered keys

The manufacturer shall operate a documentation system for the delivery of keys for locking cylinders for ACE of IAS.

6 Test methods

6.1 Conditions

6.1.1 Test samples

For the technical test in a laboratory 10 test samples taken of the series production with the corresponding keys and the required construction documentation denoted in DIN 18 252, clause 8.3, shall be provided by the manufacturer.

To test the security against next closest keys the manufacturer has to provide two extra keys that are deviating from the corresponding key with a cut one step higher and a cut one step lower.

If the product is not yet in series production the test can be done on prototypes. In this case a verification with products coming out of the series production is necessary to get the final result.

6.1.2 Tolerances

If not specified otherwise, the tolerance for strength and torque information is $\pm 5\%$.

6.2 Test matrix

The individual tests are carried out according to the sequence as in the following test matrix (table 6.01). If one sample fails or becomes damaged during the test it shall be decided on individual basis, according to consultation with the manufacturer where appropriate, whether and with which step the test program will be continued.

Test No	Test	DIN EN 1303 clause	DIN 18 252 clause	VdS 2156 clause	Test sample										
					1	2	3	4	5	6	7	8	9	10	
1	Completeness			6.3.1	x	x	x	x	x	x	x	x	x	x	x
2	Identity			6.3.2	x	x	x	x	x	x	x	x	x	x	x
3	Mounting instructions			6.4.1	x	x	x	x	x	x	x	x	x	x	x
4	Declaration of the manufacturer			6.4.2	x	x	x	x	x	x	x	x	x	x	x
5	Registration of delivered keys *			6.5.3	x	x	x	x	x	x	x	x	x	x	x
6	Marking	7	11	6.4.3	x	x	x	x	x	x	x	x	x	x	x
7	Dimensions		8.4	6.4.4	x	x	x								
8	Construction	5.8.1-5.8.4	8.5, 8.6		x	x	x								
9	Resistance against picking attacks			6.4.5 6.5.1	x	x	x								
10	Function at extreme temperatures	5.7			x	x	x								
11	Opening with the next closest key	5.8.5			x	x	x								
12	Durability	5.3		6.4.6	x	x	x								
13	Stability of keys	5.2			x	x	x								
14	Stability against twisting	5.9.3			x	x	x								
15	Attack with chisel	5.9.2			x	x	x								
16	Protection against corrosion (salt spray test)	5.7 and Annex B						x	x	x					
17	Protection against corrosion (SO ₂)*			6.5.2				x	x	x					
18	Resistance against attacks with metal cutting tools	5.9.1		6.4.7				x	x	x					
19	Resistance against attacks with pulling tools	5.9.4		6.4.8							x	x	x		
20	Torque resistance of plug and/or cylinder	5.8.6									x	x	x		
21	Additional tests			6.6											x

* Test only for locking cylinders for ACE of IAS

Table 6.01: Test matrix

6.3 Initial tests

6.3.1 Completeness

It is tested whether the test samples including the corresponding keys as well as the required documents and accessories are available completely.

6.3.2 Identity

It is tested by means of visual check and measurements whether the test samples correspond to the information of the manufacturer. Only if no deviations are found at this the subsequent examinations are going to start.

6.4 General tests

6.4.1 Mounting instruction

It is tested whether the mounting instruction is attached according to the requirements (see clause 5.1.1) and if it contains the required notes.

6.4.2 Declaration of the manufacturer

It is tested whether the declaration of the manufacturer was submitted according to the requirements (see clause 5.1.4).

6.4.3 Marking

It is tested whether every locking cylinder is marked with the required information (see clause 5.1.5) and if any references to the locking secret on the cylinder or the keys are coded.

Furthermore it is tested, whether the markings are sufficiently steady, e.g. by peeling, wiping with a moist cloth or by simple scraping.

6.4.4 Dimensions

The dimensional inspection is carried out according to DIN 18 252, clause 8.4 respectively clause 5.1.6 of these guidelines.

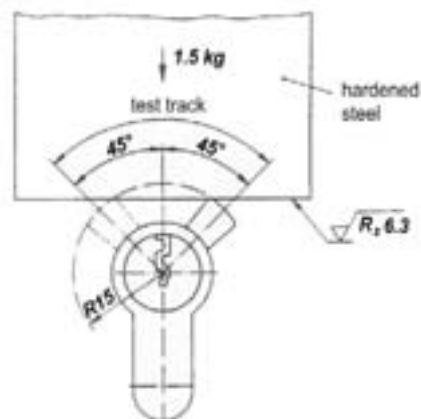
6.4.5 Resistance against picking attacks

It is tested whether an adequate protection against picking attacks is given according to clause 5.1.7

The opening security is determined by manual tests. The test performance has to be recorded.

6.4.6 Durability

The test is described in DIN EN 1303, clause 5.3. For locking cylinders with a cam the cam shall be subjected to a force during the turn of the key in an angle of 315° to 45° with a vertical force of 15 N (for example a weight of 1.5 kg; see picture 6.01).



Picture 6.01: Subjected angle range

6.4.7 Resistance against attacks with metal cutting tools

For testing of the resistance against mechanical attacks the sample will be mounted in a door replication made of steel including a mortise lock and a burglary-resistant door plate.

The attack starts on the front end of the profile cylinder with an electric drill with a nominal capacity of maximum 1000 W and adjustable speed up to 3000 rpm. The drilling will be done with carbide tipped drills of 2 mm to 7 mm diameter or high-speed steel drills of 2 mm to 12 mm diameter which can be edged especially for the intended purpose. The number of drills is not limited.

The drilling machine may dispose of a gauge.

The points of attack will be specified by the tester basing on the construction documents and noted in the test protocol.

Exclusively the working time (net time) will be count. Exchanging of drill bits is counted as 10 s working time. The total test time consists of the resistance time and the time for e.g. cleaning of drilling hole, removal of swarfs or pins, locking attacks and the like. Times for test documentation (recording, photo shooting) are not counted to the total test time.

The profile cylinder fails if within the minimum resistance time according to the security level (class) (see clause 5.1.9) the blocking elements were destroyed or manipulated in a way that the locking cylinder can be operated at least one time.

The test will be executed at 3 test samples. The worst result will be considered for the evaluation.

6.4.8 Resistance against attacks with pulling tools

For testing the extraction prevention the sample will be mounted in a door replication made of steel including a mortise lock and a burglary-resistant door plate.

Within the minimum resistance time for the relevant class (see clause 5.1.10) different screws will be turned into the cylinder (either directly or by use of drilling tools).

By means of a test rig the maximum possible pulling force will be determined.

The locking cylinder fails if at a force of ≤ 15 kN the plug can be pulled out of the cylinder body or the whole cylinder will be pulled out of the lock so that an operating of the lock can be done.

If it is not possible to turn in a screw within the minimum resistance time or the force of the turned screw cannot be transferred to the locking cylinder the requirements are fulfilled.

6.5 Locking cylinders for ancillary control equipment for intruder alarm systems

6.5.1 Resistance against picking attacks

It is tested whether the features described in clause 5.2.1 will provide the adequate resistance against unauthorized opening.

The opening security will be determined by manual tests. The execution of the tests has to be recorded.

6.5.2 Protection against corrosion (SO₂)

A K3-test is performed according to VdS 2110 with 15 cycles and 0.2 l SO₂. After each test cycle it shall be possible to operate the cylinder with a maximum torque of 2.5 Nm.

6.5.3 Registration of delivered keys

It is tested whether the manufacturer disposes of a documentation system for the delivery of keys for locking cylinders for ACE of IAS.

6.6 Additional tests

New constructions or production methods as well as new opening tools or methods may require additional tests.

Changes

Compared with version VdS 2156 : 2001-02 (05) the following changes were made:

- Adoption to DIN EN 1303 : 2005-04 and DIN 18 252 : 2006-12
- Change of the classification (grading)
- Changes of the requirements regarding the ordering of copies of keys
- Fixing of the total test time for the test with metal cutting tools
- Editorial changes

Annex A (Normative)

Declaration of the manufacturer

With this we declare, that for manufacturing of the locking cylinder model _____ in our factory _____ the following organizational measures were made:

Code variations

A permutation table was created, according to which at random _____ code variations can be produced.

The requirements regarding DIN EN 1303, clause 4.8.4 and DIN 18 252, clauses 7.1.1 to 7.1.7 are being considered.

It is guaranteed, that a code is repeated at the earliest after _____ produced variations.

Keys

For locking cylinders with coded individual locking functions only key profiles are being used, that are not in use for master key systems. For cylinders in **class B, B+, BZ and BZ+** only protected profiles are being used. Blank keys will be delivered through authorized dealers only.

The delivery of copies of keys or cylinders with the same code requires the presentation of an identification approval.

Every delivered key and locking cylinder for ancillary control equipment of intruder alarm systems are being registered by us.

The key profile protection is valid for the next _____ years to come.

_____, the _____

Stamp/signature