



Locking Cylinders with Individual Locking Function

Requirements and test methods

Part 2: Electronic locking cylinder

Publisher: VdS Schadenverhütung GmbH
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 Physical Security Devices

Locking Cylinders with Individual Locking Function

Requirements and test methods

Part 2: Electronic locking cylinders

These product guidelines are binding only if their application has been agreed between VdS and the applicant on an individual basis. Otherwise, an application of these product guidelines is non-binding; an agreement on the application of these product guidelines is purely optional. In individual cases, third parties may also accept other safety precautions or installation or maintenance companies under conditions that are defined at their sole discretion and that do not comply with these technical specifications.

CONTENT

1	General	4
1.1	Scope.....	4
1.2	Validity	4
2	Normative references	4
3	Terms and definitions	5
4	Classification	6
5	Requirements	8
5.1	General requirements	8
5.2	Design requirements.....	11
5.3	Electromagnetic interference	12
5.4	Physical influences	13
5.5	Reliability.....	14
5.6	Picking security.....	14
5.7	Resistance to violent attacks	15
5.8	Options.....	15
6	Test methods	16
6.1	Conditions for the tests	16
6.2	Receiving inspection	20
6.3	General tests.....	20
6.4	Test of the structural requirements	20
6.5	Electromagnetic influences.....	21
6.6	Physical influences	22
6.7	Reliability.....	22
6.8	Picking security.....	22
6.9	Resistance against violent attacks.....	23
6.10	Additional tests.....	23
	Changes	24
	Annex A Manufacturer's declaration (normative)	25

1 General

1.1 Scope

This second part of the Guidelines for Physical Security Devices, Locking Cylinders with Individual Locking Function contains minimum requirements and test methods for electronic locking cylinders and is considered in conjunction with DIN 18252 and DIN EN 15684.

The operation of electronic locking cylinders can be carried out using mechanical code media or by using biometric features and mnemonic codes or other techniques. Entering the code can occur, depending on the design, with or without physical contact between code medium and input device.

Are electronic locking cylinders used for setting or unsetting of an intruder alarm system or is it intended to trigger a hold-up alarm using the input device, additional guidelines apply in addition to the above mentioned regulations (e.g. Richtlinien für Einbruchmeldeanlagen, Schalteinrichtungen, VdS 2119, Richtlinien für Einbruchmeldeanlagen, Überfallmelder, VdS 2271 as well as VdS 2314).

For software controlled system parts Richtlinien für Brandschutz und Sicherungstechnik, Software, VdS 2203 are valid in addition.

1.2 Validity

These guidelines are valid from 01.06.2013. They replace the version VdS 2156-2 : 2007-09 (03).

Note: This is a translation of the German guidelines. In case of doubt, 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 chapters, 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 18252** : 2006-12 Profilzylinder für Türschlösser – Begriffe, Maße, Anforderungen, Kennzeichnung
- **DIN EN 15684** : 2013-01 Schlösser und Baubeschläge, Mechatronische Schließzylinder, Anforderungen und Prüfverfahren
- **DIN EN 1303** : 2005-04 Baubeschläge – Schließzylinder für Schlösser – Anforderungen und Prüfverfahren
- **DIN EN ISO 6988** : 1997-03 Metallische und andere anorganische Überzüge – Prüfung mit Schwefeldioxid unter allgemeiner Feuchtigkeitskondensation
- **EN 61000-4-2** Elektromagnetische Verträglichkeit (EMV) – Teil 4-2: Prüf- und Messverfahren – Hauptabschnitt 2: Störfestigkeit gegen die Entladung statischer Elektrizität
- **EN 61000-4-3** Elektromagnetische Verträglichkeit (EMV) – Teil 4-3: Prüf- und Messverfahren – Prüfung der Störfestigkeit gegen hochfrequente elektromagnetische Felder
- **EN 61000-4-4** : 1995 Elektromagnetische Verträglichkeit (EMV) – Teil 4: Prüf- und Messverfahren – Hauptabschnitt 4: Störfestigkeit gegen schnelle transiente elektrische Störgrößen/Burst
- **EN 61000-4-5** : 1995 Elektromagnetische Verträglichkeit (EMV) – Teil 4: Prüf- und Messverfahren – Hauptabschnitt 5: Störfestigkeit gegen Stoßspannungen

- **EN 61000-4-6** Elektromagnetische Verträglichkeit (EMV) – Teil 4-6: Prüf- und Messverfahren – Störfestigkeit gegen leitungsgeführte Störgrößen, induziert durch hochfrequente Felder
- **IEC 60068-2-1** Umgebungseinflüsse – Teil 2-1: Prüfverfahren – Prüfung A: Kälte
- **IEC 60068-2-2** Umgebungseinflüsse – Teil 2-2: Prüfverfahren – Prüfung B: Trockene Wärme
- **IEC 60068-2-3** Umweltprüfungen – Teil 3: Leitfäden; Hauptabschnitt 2: Kombinierte Prüfungen, Temperatur/niedriger Luftdruck
- **IEC 60068-2-6** Umgebungseinflüsse – Teil 2-6: Prüfverfahren – Prüfung Fc: Schwingen (sinusförmig)
- **IEC 60068-2-27** Umgebungseinflüsse – Teil 2-27: Prüfverfahren – Prüfung Ea und Leitfäden: Schocken
- **IEC 60068-2-30** Umgebungseinflüsse – Teil 2-30: Prüfverfahren – Prüfung Db: Feuchte Wärme, zyklisch (12 + 12 Stunden)
- **IEC 60068-2-75** Umweltprüfungen – Teil 2: Prüfungen; Prüfung Eh: Hammerprüfungen
- **VdS 2110** Richtlinien für Gefahrenmeldeanlagen, Schutz gegen Umwelteinflüsse, Anforderungen und Prüfmethoden
- **VdS 2119** Richtlinien für Einbruchmeldeanlagen, Schalteinrichtungen, Anforderungen
- **VdS 2156-1** Richtlinien für mechanische Sicherungseinrichtungen, Schließzylinder mit Einzelsperrschließung, Anforderungen und Prüfmethoden
- **VdS 2203** Richtlinien für die Brandschutz- und Sicherungstechnik, Software, Anforderungen und Prüfmethoden
- **VdS 2271** Richtlinien für Einbruchmeldeanlagen, Überfallmelder, Anforderungen
- **VdS 2314** Richtlinien für Einbruchmeldeanlagen, Überfallmelder, Teil 2: Prüfmethoden
- **VdS 2344** Verfahren für die Prüfung und Anerkennung, Zertifizierung und Konformitätsbewertung von Produkten und Systemen der Brandschutz- und Sicherungstechnik
- **VdS 3112** Richtlinien für Sicherungstechnik, Biometrische Erkennungsverfahren, Entwurf

3 Terms and definitions

The general terms are listed in DIN 18252, DIN EN 15684 and DIN EN 1303, chapter 3. In addition, the following definitions apply.

Attack, smart: Attack with the aim, if possible non-destructive or with little evidence, to overcome a locking cylinder by using technical know-how and possibly also technical information on the specific component.

Biometrics: Automated recognition of individuals based on their physical characteristics.

Code: Information that is transferred to the cylinder by means of a suitable interface. A distinction is made between the opening code and the authorisation code.

- An opening code must be entered to operate the locking cylinder.
- An authorisation code must be entered to make changes at the opening code or at the programming.

Code, biometric: Information that is compiled by physical characteristics of a person (the code medium).

Code, physical: Information that is stored by physical characteristics (on a code medium such as keys).

Code medium: Object (or person) that is used as storage for a code by means of its physical features.

Input device: Component that receives or reads a code from the code medium and passes it to the processing unit.

Electronic locking cylinder: Component of a locking system for actuating a cylinder lock. Elektronik locking cylinder basically consist of the components:

- input unit,
- processing unit,
- blocking unit.

Blocking unit: Element in the locking cylinder, which is controlled by the processing unit and disables or enables the activation of the elektronik locking cylinder.

Processing unit: Element of the cylinder, which checks the access authorisation and triggers the locking element if a positive result given.

Locked: State in which the otherwise (in the unlocked state) possible movement of an element is blocked.

4 Classification

Electronic locking cylinders are divided into the following classes A, AZ, B, BZ, B+ BZ+, C, CZ, C+, CZ+ described in the following.

Characteristics of electronic locking cylinder locks of class A

– Class A

Basic security against burglary.

– Class AZ

Basic security against burglary with *integrated pulling protection*.

All locking cylinders with **classification A** satisfy beside the higher requirements of these guidelines the security-related requirements against unauthorised opening meeting DIN EN 15684, table 4-1.

character of the rating code	1	2	3	4	5	6	7	8
description of the performance feature	app- lication class	dura- bility	restis- tance against fire/ smoke	environ- mental stability	physical locking certainty	elec- tronic locking certainty	system manage- ment	attack resis- tance
rating	1	6	0	2	A	D	0	1

Table 4-1: Rating of electronic locking cylinders of class A meeting the standard

Characteristics of locking cylinders of class B

– Class B

Medium security against burglary.

– Class BZ

Medium security against burglary with *integrated pulling protection*.

– **Class B+**

Medium security against burglary
with *high resistance against smart attacks*.

These cylinders are adapted for use in ancillary control equipment of intruder alarm systems.

– **Class BZ+**

Medium security against burglary with *integrated pulling protection*
and *high resistance against smart attacks*.

These cylinders are adapted for use in ancillary control equipment of intruder alarm systems.

All locking cylinders with **classification B** satisfy beside the higher requirements of these guidelines on the security-related requirements against unauthorised opening meeting DIN EN 15684, table 4-2.

character of the rating code	1	2	3	4	5	6	7	8
description of the performance feature	app- lication class	dura- bility	restis- tance against fire/ smoke	environ- mental stability	physical locking certainty	elec- tronic locking certainty	system manage- ment	attack resis- tance
rating	1	6	0	2	A	E	2	2

Table 4-2: Rating of electronic locking cylinders of class B meeting the standard

Characteristics of locking cylinders of class C

– **Class C**

High security against burglary
with *high resistance against smart attacks*.

– **Class CZ**

High security against burglary with *integrated pulling protection*
with *high resistance against smart attacks*.

– **Class C+**

High security against burglary
with *high resistance against smart attacks*.

These cylinders are adapted for use in ancillary control equipment of intruder alarm systems.

– **Class CZ+**

Medium security against burglary with *integrated pulling protection*
and *high resistance against smart attacks*.

These cylinders are adapted for use in ancillary control equipment of intruder alarm systems.

All locking cylinders with **classification C** satisfy beside the higher requirements of these guidelines on the security-related requirements against unauthorised opening meeting DIN EN 15684, table 4-3.

character of the rating code	1	2	3	4	5	6	7	8
description of the performance feature	app- lication class	dura- bility	restis- tance against fire/ smoke	environ- mental stability	physical locking certainty	elec- tronic locking certainty	system manage- ment	attack resis- tance
rating	1	6	0	2	A	F	2	2

Table 4-3: Rating of electronic locking cylinders of class C meeting the standard

As far as not specifically mentioned below, with reference to any classification level in accordance with VdS (e.g. "class B") all versions (B, B+, BZ, BZ+) are addressed.

Note: If for electronic locking cylinders approvals in class C and CZ, but not in class C+ or CZ+ are given (i.e. the products are not suitable for use in ancillary control equipment (ACE of IAS), this is due solely to the design of the cylinder. For example, double-knob cylinders of class C or CZ can not be installed in an ACE despite high security against burglary and high resistance against picking. For a classification in class C+ or CZ+ the series must include a half-cylinder.

5 Requirements

The requirements according to DIN EN 15684 are valid with the following exceptions and additions.

5.1 General requirements

5.1.1 Installation instructions

In addition to DIN EN 15684 each supply of one or more locking cylinders shall enclose written and illustrated installation instructions and if needed a maintenance instruction as well as handling details. The instructions shall be written in German.

Note: If the products are sold in not German-speaking areas only, it is sufficient to include the instructions in English.

The installation instructions must be a clear representation of the assembly process and contain all security measures and operational conditions (e.g. specifying the attack side, if only one side of the locking cylinder is equipped with a drilling protection).

In particular, a statement must be included that the locking cylinder must be protected by a burglary resistant door plate (including drilling protection or not) of the appropriate class as well as the reference to the maximum permissible projection of the cylinder of 3 mm.

5.1.2 Manual

For the user a manual written in German language shall be attached.

Note: If the products are sold in not German-speaking areas only, it is sufficient to include the manual in English.

The manual must contain all the important issues for the user in a clear and understandable form. In particular, the following references on electronic locking cylinders must be included:

- The key is always to be stored securely so that it is accessible only to the authorised person.

- If a key gets lost, the electronic cylinder is to be replaced immediately or, by changing of the codification put to a new coding respectively to block/delete the coding of the lost key.

5.1.3 Manufacturer's declaration

The approval of electronic cylinders requires a completed manufacturer's declaration according to annex A.

The manufacturer's declaration is part of the documentation to be tested.

5.1.4 Identification

Each electronic cylinder must be durably marked with the name/mark of the manufacturer or holder of the approval, with the approval number, the type description and the class. The type designation must be identical with the one contained in the technical documentation and the sales documents and may be used only for the approved locking cylinder.

If only one side of the cylinder is protected against attacks, the attack side to be marked permanently.

When installed, no information regarding the encoding, protection measures or the class shall be visible.



















A on the electronic cylinder or the code medium attached labelling may not allow any direct conclusions on the codification.

A labelling of the electronic cylinder visible in mounted condition or a labelling of the code medium as VdS approved is permitted.

Note: The labelling as VdS-approved product must comply with the requirements of VdS 2344.

5.1.5 VdS consumer labelling

Sales packages of VdS-approved locking cylinders have to and the approved products themselves should be provided with labels according to table 5-1 for a simplified communication towards consumers.

class	labels for sales packages	labels for products
A	  with note ¹⁾	
AZ	 	
B	  with note ¹⁾	
BZ	 	
B+	  with note ¹⁾	
BZ+	 	
<p>¹⁾ When the cylinder is of class A and B next to the VdS consumer labelling clearly is to be stated that the locking cylinder shall only to be used with an approved burglar resistant door plate with pulling protection. Therefore the following phrase is recommended:</p> <p>„Door plate with cylinder cover required“</p> <p>For using the VdS consumer labelling, the provisions of 2344 for using the VdS logo are valid analogue.</p> <p>The logos may be purchased by the approval holder as file templates (pixel or vector graphics) from VdS.</p>		
<p>Table 5-1: Recommended consumer labelling for VdS approved electronic locking cylinders</p>		

A consumer labelling of class C products with 4 stars is permitted.

5.1.6 Dimensions

The dimensions of electronic locking cylinders, which are intended for use in locks according to DIN 18251, must comply to DIN 18252, chapter 4. Notwithstanding these pins, cams or thelike may be attached to the cylinder body in a way that they stabilise themselves against the door plate.

5.2 Design requirements

5.2.1 Code for material code media

Code media must be designed in a way they can not be copied by simple means.

Unchangeable code media for material codes must be selected at random.

On the code media no unencrypted information regarding the code shall be made.

5.2.2 Contactless transmission of codes

Is no direct contact of code medium and input device required for entering the code (e.g. when using a transponder) and exceeds the potential distance between code medium and the electronic locking cylinder the distance of 5 cm, the transmission must be encrypted.

Additionally for electronic locking cylinders of class C applies:

The code shall be transferred only after a deliberate action by the user (e.g. operating the transponder). After the operation, the code can be transferred once each. The reading of the transponder and determine actionable information by third parties may not be possible.

5.2.3 Superposed codes

The use of a superposed, non-documented codes, with the aid of such the electronic locking cylinder can be unlocked after a blockage due to a malfunction, is not permitted. Features for unlocking the electronic locking cylinder in case of a malfunction without entering an unlocking code first, are not permitted as well.

5.2.4 Change of the code

It must be possible to delete or block opening codes for operating electronic locking cylinders or to change them. The code change may be possible only after entering an authorisation code.

5.2.5 Requirements electronic codes

Both opening code and authorisation code must at least comply with the requirements of table 5-2.

class of the electronic locking cylinder	class meeting DIN EN 15684, chapter 4.6.7, table 7
A	D
B	E
C	F

Table 5-2: Code requirements

5.2.6 History memory

With electronic locking cylinders at least the number of operations as listed in table 5-3 must be saved in a non-transient memory. It must be stored at least particulars on the order in which the electronic locking cylinders was operated, with which code and by which user this was done.

The manufacturer remains free to decide whether – although this is not required – time allocations (date, time of day) of operations shall be done.

class of the electronic locking cylinder	minimum number of operations to be stored	time and date of operations to be stored	class meeting DIN EN 15684, chapter 4.7, table 8
A, AZ	no requirements	no requirements	no requirements
B, BZ, B+, BZ+	30	no requirements	≥ 2
C, CZ, C+, CZ+	100	yes	≥ 3

Table 5-3: History memory

5.2.7 Blocking situations

Blocking situations, for example being activated after repeatedly entering an incorrect code, must be displayed to the user.

5.2.8 Energy supply

For battery-operated electronic locking cylinders the battery capacity must be monitored. When the battery is almost discharged, an acoustic or optical warning must occur during or immediately after the operating process. After the first warning it still must be possible to complete at least 50 locking procedures.

With electronic locking cylinders supplied with mains voltage, even after a mains power failure at least 50 complete locking procedures must be possible.

The above mentioned requirement may be waived if the exchange of discharged batteries is possible without a locking procedure being necessary respectively no opening of the locking cylinders is required or when opportunities are provided for coupling a source of energy.

5.3 Electromagnetic interference

5.3.1 Failure of the power supply

With electronic locking cylinders a failure of the power supply must not lead to deactivation of the locking function (i.e. the system may neither open automatically nor should an opening without the necessary permission be possible).

5.3.2 Resistance to static discharges

The electronic locking cylinder must withstand static discharges corresponding to table 5-4.

class of the electronic locking cylinder	attack resistance meeting DIN EN 15684, chapter 4.8.10, table 9
A, AZ	class 1
B, BZ, B+, BZ+, C, CZ, C+, CZ+	class 2

Table 5-4: Static discharge

5.3.3 Resistance to mains-born disturbance – burst

Electronic locking cylinders connected to external devices with cables longer than 10 meters in length need to withstand fast, transient electrical disturbances (burst) according to EN 61000-4-4, test level 4.

5.3.4 Resistance to mains-born disturbances – surge

Electronic locking cylinders connected to external devices with cables longer than 10 meters in length need to withstand voltages impulses (surge) according to EN 61000-4-3, test level 4.

5.3.5 Resistance to radiated high-frequency electromagnetic fields

Electronic locking cylinders must resist high-frequency interferences, according to table 5-5.

frequency field	strength	increment	exposure time	modulation
80 – 3000 MHz	10 V/m	1 %	3 s	AM 80 % mit 1 kHz, 1 kHz PM, 1 Hz PM
415 - 466 MHz	30 V/m	1 MHz	3 s	AM 80 % mit 1 kHz, 1 kHz PM, 1 Hz PM
890 - 960 MHz	30 V/m	3 MHz	3 s	AM 80 % mit 1 kHz, 1 kHz PM, 1 Hz PM

Table 5-5: High-frequency radiation

5.3.6 Resistance to induced high-frequency electromagnetic fields

Electronic locking cylinders connected to external devices with cables longer than 10 meters in length need to withstand induced high-frequency electromagnetic fields according to EN 61000-4-6, test level 3.

5.4 Physical influences

5.4.1 Climates

Electronic locking cylinders and their electronic keys must resist influences of temperature and exposure to water according to DIN EN 15684, chapter 4.2 to 4.5.6 and tables 2 and 3, class 3.

5.4.2 Corrosion protection

Electronic locking cylinders must meet the requirements according to DIN EN 15684, chapter 4.5.1 and the requirements named in table 5-6 without being negatively affected in their function.

class of the electronic locking cylinder	corrosion resistance according to DIN EN 15684, chapter 4.5.1, table 2	SO ₂ -corrosion (grade K3) according to DIN EN ISO 6988
A, AZ, B, BZ	≥ 2	0.2 l SO ₂ 5 cycles
B+, BZ+, C, CZ, C+, CZ+	≥ 2	0.2 l SO ₂ 15 cycles

Table 5-6: Corrosion

5.4.3 Impact

Electronic locking cylinders must resist blows according to EN 60068-2-75 with an energy of 0.5 J.

5.4.4 Shock

Electronic locking cylinders and their electronic keys must resist influences by shock according to DIN EN 15684, chapter 4.2.4 and table 1.

5.4.5 Vibration

Electronic locking cylinders and their electronic keys must resist influences by vibration according to DIN EN 15684, chapter 4.2.5 and table 1.

5.5 Reliability

5.5.1 Durability

In addition to EN 15684, chapter 5.5 electronic locking cylinders, equipped with a cam for driving the lock, have to withstand the loads imposed to the cam during a locking operation. Deviating from DIN EN 15648, chapter 5.5 this is to be tested according to chapter 6.7.1 and table 5-7.

class of the locking cylinder	number of locking cycles
A, AZ	100,000
B, BZ, B+, BZ+, C, CZ, C+, CZ+	200,000

Table 5-7: Durability

5.6 Picking security

5.6.1 Resistance against smart attacks

Electronic locking cylinders must meet the requirements according to DIN EN 15684, chapter 4.8.9 and 4.8.11, table 9.

5.6.2 Manual picking attacks

Electronic locking cylinders must not be overcome by picking attacks within the times fixed in table 5-8.

class	minimum resistance time
A, AZ	10 min
B, BZ	30 min
B+, BZ+, C, CZ, C+, CZ+	90 min

Table 5-8: Resistance to attacks

The resistance against picking attacks is to be proven even when not mounted correctly (e.g. without installing a steel door plate).

5.7 Resistance to violent attacks

Electronic locking cylinders must meet the requirements according to DIN EN 15684, chapter 4.8.2 to 4.8.8 and table 5-9.

class	attack resistance according to DIN EN 15684, chapter 4.8.10, table 9
A, AZ	class 1
B, BZ, B+, BZ+, C, CZ, C+, CZ+	class 2

Table 5-9: Attack resistance

5.7.1 Resistance against drilling

Deviating from DIN EN 15684, chapter 4.8.2, electronic locking cylinders need at least to possess a resistance to drilling attacks according to table 5-10 during a test meeting chapter 6.9.1 of these guidelines.

class	minimum resistance time
A, AZ	3 min
B, BZ, B+, BZ+	6 min
C, CZ, C+, CZ+	10 min

Table 5-10: Resistance against drilling

5.7.2 Resistance against attacks with pulling tools

Deviating from DIN EN 15684, section 4.8.5, electronic locking cylinders shall prove a resistance against attacks with drawing tools according to the test described in chapter 6.9.2 at least as shown in table 5-11.

class	maximum pulling force	minimum resistance time
A, AZ	15 kN	3 min
B, BZ, B+, BZ+	15 kN	6 min
C, CZ, C+, CZ+	20 kN	10 min

Table 5-11: Resistance against pulling tools

As far as the technical documentation provided by the manufacturer demand the locking cylinder is to be used exclusively with a VdS approved burglary resistant door plate with pulling protection, the requirements shown in table 5-11 are considered to be fulfilled.

5.8 Options

Options, new construction or production processes must not adversely affect the required properties of electronic locking cylinders. Options must be specified by the manufacturer.

6 Test methods

6.1 Conditions for the tests

6.1.1 Test samples

For the technical laboratory test the manufacturer shall provide at least 10 test samples taken of the series production with the corresponding keys respectively code information to VdS Schadenverhütung.

Furthermore, all relevant design documentation must be provided.

If the product is not manufactured in series, the test can be performed on prototypes.

6.1.2 Tolerances

Unless otherwise specified, the tolerance on force and torque information is $\pm 5\%$.

6.1.3 Control plan

Tests scheduled for one and the same specimen shall be carried out according to the order shown in table 6-1. If during the test a sample fails it has to be decided individually, if necessary after conferring with the manufacturers, if the test shall be carried out addressing which test step.

test module	test	requirements regarding chapters of VdS or EN	test procedure regarding chapters of VdS or EN	test samples										
				1	2	3	4	5	6	7	8	9	10 ¹⁾	
receiving controls														
1	completeness		VdS 6.2.1	X	X	X	X	X	X	X	X	X	X	X
2	technical documentation	EN 4.9	VdS 6.2.3	X										
3	identity		VdS 6.2.2	X	X	X	X	X	X	X	X	X	X	X
general tests														
4	installation instructions	VdS 5.1.1 EN 4.9	VdS 6.3.1	X										
5	manual	VdS 5.1.2 EN 4.9	VdS 6.3.2	X										
6	manufacturer's declaration	VdS 5.1.3	VdS 6.3.3	X										
7	identification	VdS 5.1.4 EN 7	VdS 6.3.4	X										
8	VdS consumer labelling	VdS 5.1.5	VdS 6.3.5	X										
9	dimensions	VdS 5.1.6	VdS 6.3.6	X										

test module	test	requirements regarding chapters of VdS or EN	test procedure regarding chapters of VdS or EN	test samples																
				1	2	3	4	5	6	7	8	9	10 ¹⁾							
design requirements																				
10	code media for material codes	VdS 5.2.1	VdS 6.4.1	X																
11	contactless transmission of codes	VdS 5.2.2	VdS 6.4.2	X																
12	superposed codes	VdS 5.2.3	VdS 6.4.3	X																
13	change of codes	VdS 5.2.4	VdS 6.4.4	X																
14	minimum number electronic codes	VdS 5.2.5 EN 4.6.7	VdS 6.4.5 EN 5.8.4	X																
15	history memory	VdS 5.2.6 EN 4.7	VdS 6.4.6 EN 5.9	X																
16	blocking situations	VdS 5.2.7	VdS 6.4.7	X																
17	energy supply	VdS 5.2.8	VdS 6.4.8	X																
18	failure of the power supply	VdS 5.3.1	VdS 6.5.1	X																
electromagnetic influences																				
19	resistance to static discharges	VdS 5.3.2 EN 4.2.6	VdS 6.5.2 EN 5.10.9		X															
20	resistance to mains-born disturbances – burst	VdS 5.3.3	VdS 6.5.3		X															
21	resistance to mains-born disturbances – surge	VdS 5.3.4	VdS 6.5.4		X															
22	resistance to radiated high-frequency electromagnetic fields	VdS 5.3.5	VdS 6.5.5		X															
23	resistance to induced high-frequency electromagnetic fields	VdS 5.3.6	VdS 6.5.6		X															

test module	test	requirements regarding chapters of VdS or EN	test procedure regarding chapters of VdS or EN	test samples										
				1	2	3	4	5	6	7	8	9	10 ¹⁾	
physical influences														
24	resistance of the cylinder against water	EN 4.5.2	EN 5.7.2			X								
25	resistance of the key against water	EN 4.5.6	EN 5.7.6			X								
25	impact	VdS 5.4.3	VdS 6.6.2				X							
26	climates, dry heat	VdS 5.4.1 EN 4.5.3	EN 5.7.3				X							
27	climates, coldness	VdS 5.4.1 EN 4.5.4	EN 5.7.4				X							
28	periodic damp heat	EN 4.5.5	EN 5.7.5				X							
29	corrosion (SO ₂)	VdS 5.4.2	VdS 6.6.1				X							
30	corrosion (salt spray test)	VdS 5.4.2 EN 4.5.1	EN 5.7.1				X							
31	shock	EN 4.2.4	EN 5.4.3					X						
32	vibration	EN 4.2.5	EN 5.4.4					X						
reliability														
33	durability	VdS 5.5.1 EN 4.3	VdS 6.7.1 EN 5.2						X					
stability														
34	key stability	EN 4.2.1	EN 5.4.1							X				
35	key stability (drop test)	EN 4.2.2	EN 5.4.2							X				
36	false electronic code	EN 4.2.3	EN 5.10.5.3	X										
security against smart attacks														
37	attack with higher voltage	VdS 5.6.1 EN 4.8.9	EN 5.10.8							X				
38	attack with static discharge	VdS 5.6.1 EN 4.8.10	EN 5.10.9							X				

test module	test	requirements regarding chapters of VdS or EN	test procedure regarding chapters of VdS or EN	test samples																
				1	2	3	4	5	6	7	8	9	10 ¹⁾							
39	attack with magnetic field	VdS 5.6.1 EN 4.8.11	EN 5.10.10	X																
40	manual picking attacks	VdS 5.6.2	VdS 6.8.1	X																
resistance against violent attacks																				
41	resistance against oscillation	EN 4.8.8	EN 5.10.7										X							
42	resistance against hits	EN 4.8.7	EN 5.10.6												X					
43	resistance against drilling	VdS 5.7.1 EN 4.8.2	VdS 6.9.1 EN 5.10.1										X	X	X					
44	torsion stability (locking stability)	EN 4.6.6	EN 5.8.3	X																
45	torsion stability (core)	EN 4.8.6	EN 5.10.5	X																
46	resistance against chiseling ²⁾	EN 4.8.3	EN 5.10.2																	
47	resistance against attack by turning the cylinder ²⁾	EN 4.8.4	EN 5.10.3																	
48	resistance against pulling tools ³⁾	VdS 5.7.2 EN 4.8.5	VdS 6.9.2 EN 5.10.4																	
miscellaneous tests																				
49	options	VdS 5.8	VdS 6.10																	
¹⁾ storage sample ²⁾ As far as according to the installation instruction the electronic locking cylinder is not protected against such attacks (e.g. by the use of a burglar resistant door plate), for these tests 6 further samples are needed. ³⁾ As far as it is not required according to the installation instruction to protect the electronic locking cylinder by a burglar resisting door plate, for these tests 3 further samples are needed.																				
Table 6-1: Test matrix																				

6.2 Receiving inspection

6.2.1 Completeness

It is checked whether the test samples were submitted completely and with the associated keys/code media and information.

6.2.2 Technical documentation

A visual check is done whether the required technical documentation in accordance with DIN EN 15684, chapter 4.9 and VdS 2344, annex B, is complete.

6.2.3 Identity

A visual check as well as a dimensional check is done whether the test samples meet the manufacturer's data and comply with the technical documentation. The following tests will only be started if no deviations are discovered.

6.3 General tests

6.3.1 Installation instructions

By means of visual inspection it is checked whether each locking cylinder is supplied with installation instructions in accordance with the requirements of chapter 5.1.1.

6.3.2 Manual

By means of visual inspection it is checked whether each locking cylinder is supplied with a manual in accordance with the requirements of chapter 5.1.2.

6.3.3 Manufacturer's declaration

By means of visual inspection it is checked whether the manufacturer's declaration was completed and if the entries comply with the technical documentation of the samples according to chapter 5.1.

6.3.4 Identification

By means of visual inspection it is checked whether the locking cylinder is labelled in accordance with the requirements of chapter 5.1.4.

Next, it is checked whether all labels are attached sufficiently stable, as by stripping-tests, wiping with water and alcohol soaked cloth or by simple scraping.

6.3.5 VdS consumer labelling

All (varities of) sales package(s) providing the VdS consumer label according to 5.1.5 are checked in respect of the correctness of the identification.

6.3.6 Dimensions

The examination of the dimensions occurs in accordance with DIN 18252, chapter 8.4 and chapter 5.1.6 of the present guidelines respectively.

6.4 Test of the structural requirements

6.4.1 Code media for material codes

By visual inspection of the samples and the manufacturer's documentation it is checked whether the requirements referred to in chapter 5.2.1 are met.

6.4.2 Contactless transmission of codes

By visual inspection of the manufacturer's documentation it is checked whether the requirements referred to in chapter 5.2.2 are met.

6.4.3 Superposed codes

By visual inspection of the manufacturer's documentation it is checked whether the requirements referred to in chapter 5.2.3 are met.

6.4.4 Change of the code

By visual inspection of the manufacturer's documentation it is checked whether the requirements referred to in chapter 5.2.4 are met.

6.4.5 Code features

By visual inspection of the manufacturer's documentation it is checked whether the design features referred to in chapter 5.2.5 are met.

6.4.6 History memory

By visual inspection of the manufacturer's documentation it is checked whether the requirements referred to in chapter 5.2.6 are met.

6.4.7 Blocking situations

By practical tests it is determined whether the requirements referred to in chapter 5.2.7 are met.

6.4.8 Energy supply

By visual inspection of the manufacturer's documentation it is checked whether the requirements referred to in chapter 5.2.8 are met.

6.5 Electromagnetic influences

6.5.1 Failure of the power supply

By practical tests it is determined whether the electronic locking cylinders remain in accordance with the requirements of section 5.3.1 securely locked during a failure of the power supply. Electronic locking cylinders must neither unlock automatically after a power interruption nor may it be possible to release them without entering the correct code.

6.5.2 Static discharge

The samples are subjected to the requirements of chapter 5.3.2 with static discharges. The test is performed following EN 61000-4-2.

6.5.3 Mains-born disturbances (burst)

The samples are subjected to the requirements of chapter 5.3.3 with fast transient electrical disturbances. The test is performed following EN 61000-4-4.

6.5.4 Mains-born disturbances (surge)

The samples are subjected in accordance with the requirements of chapter 5.3.4 with impulse voltages. The test is performed following EN 61000-4-5.

6.5.5 Radiated high-frequency

The samples are subjected in accordance with the requirements of chapter 5.3.5 to radiated high-frequency electromagnetic fields. The test is performed following EN 61000-4-3.

6.5.6 Induced high-frequency

In the wiring of samples in accordance with chapter 5.3.6 high-frequency fields are induced. The test is performed following EN 61000-4-6.

6.6 Physical influences

6.6.1 Corrosion protection (SO₂)

The samples are in accordance with the requirements of chapter 5.4.2 applied with SO₂. The test is performed following EN ISO 6988.

A functional check carried out after each cycle must give no reason for complaint.

6.6.2 Impact

The samples are in accordance with the requirements of chapter 5.4.3 stressed with a hammer. The test is performed following EN 60068-2-75.

Neither during the load nor during a performed functional check after the load a reason for complaint must be given.

6.7 Reliability

6.7.1 Durability

The test is described in DIN EN 15684, chapter 5.5. Locking cylinder with a cam given the cam is to be loaded with a force of 15 N at right angle (e.g. weight of a mass of 1.5 kg) in an angle range of 315° to 45° while turning the key (cf. figure 6-1).

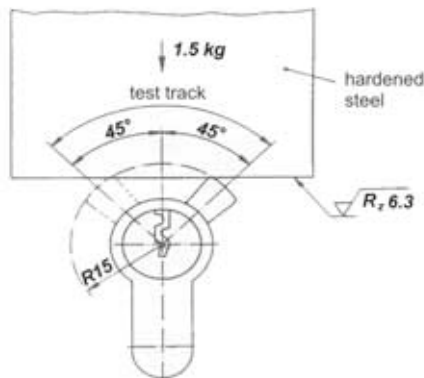


Figure 6-1: Loaded angular range

6.8 Picking security

6.8.1 Manual picking attacks

By practical tests it is determined whether the samples are according to the requirements of chapter 5.6.2 adequately protected against smart attacks.

Smart attacks must not lead to overcoming the sample within the specified resistance times despite increased expertise with respect to the sample.

Note: The tools permitted for these attacks are determined by the examiner prior to the test taking into account the class of the electronic cylinder and its construction.

6.9 Resistance against violent attacks

6.9.1 Resistance against drilling

For checking the resistance against physical attacks the electronic locking cylinder is installed in a door replica made of steel equipped with a mortise lock and a burglar resistant door plate.

The attack is performed with an electric hand drill with a maximum output of 1000 W and a variable revolution speed up to max. 3000 rpm. During the drilling process carbide tipped drills or high speed drills from 2 mm to 7 mm in diameter, which can be particularly sharpened for the intended purpose are used.

The drilling machine can be equipped with a depth stop.

The points of attack are defined by the examiner based on the design documents and documented in the test report.

The electronic locking cylinder is considered overcome if within the specified minimum resistance time for the respective class (cf. chapter 5.7.1) the blocking function removed or weakened in a way that a functioning locking process can be performed.

The test time is summed up from the net working time. Changes of drills are evaluated with 10 s as net working time.

The test is carried out on three electronic locking cylinder and for evaluating the worst result is used.

6.9.2 Resistance against attacks with drawing tools

For checking the resistance against pulling attacks the electronic locking cylinder is installed in a door replica made of steel.

Within the specified minimum resistance time for the respected class (cf. chapter 5.7.2) it is tried to screw different pulling screws into the samples (either directly or by use of drilling tools). The positioning of the screws is defined by the test engineer in each individual case.

With a drawing gear the maximum applicable force is determined.

The electronic locking cylinder is considered overcome if within the specified minimum resistance time for the respective class (cf. chapter 5.7.1) the blocking function removed or weakened in a way that a functioning locking process can be performed.

The locking cylinder is considered overcome if at a maximum force in accordance to table 5-11 one component of the system can be removed, so that a functioning locking process can be performed.

The requirements are considered fulfilled as far as the screwing in of the pulling screw fails.

6.10 Additional tests

New designs or manufacturing processes or new opening tools or methods may require additional tests.

Changes

Compared with the previous version of these guidelines, the following changes were made:

- taking into account the requirements of DIN EN 15684
- addition of the VdS consumer labelling
- editorial changes

Former changes

- change of the classification (analogous to VdS 2156)
- enable the implementation of innovative handling methods (e.g. biometrics)
- deletion of the choice regarding the environmental classes
- editorial changes

Annex A

Manufacturer's declaration (normative)

We hereby declare that, for the production of electronic locking cylinder

Type _____

in our factory _____

the following organisational measures were taken:

Superposed Codes

In a.m. electronic locking cylinder are available no superimposed or undocumented codes that allow an operation or a change of the code of the cylinder without entering an opening or authorisation codes prior to the operation.

Code medium

The delivery of copied code media or further electronic locking cylinders with the same code occurs only on presentation of the legitimization card.

Installation and operating instructions

Each delivery of a.m. electronic locking cylinders is accompanied by an installation instruction.

Each of the a.m. locking cylinders is accompanied by a use's manual.

_____, the _____

Stamp/signature

