



# SLOVENSKI STANDARD SIST EN 15684:2021

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## Stavbno okovje - Mehatronski valji - Zahteve in preskusne metode

Building hardware - Mechatronic cylinders - Requirements and test methods

Schlösser und Baubeschläge - Mechatronische Schließzylinder - Anforderungen und Prüfverfahren

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Quincaillerie pour le bâtiment - Cylindres mécatroniques - Exigences et méthodes d'essai

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## Building hardware - Mechatronic cylinders - Requirements and test methods

Quincaillerie pour le bâtiment - Cylindres  
mécatroniques - Exigences et méthodes d'essai

Schlösser und Baubeschläge - Mechatronische  
Schließzylinder - Anforderungen und Prüfverfahren

This European Standard was approved by CEN on 25 October 2020.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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**EN 15684:2020 (E)****European foreword**

This document (EN 15684:2020) has been prepared by Technical Committee CEN/TC 33 “Doors, windows, shutters, building hardware and curtain walling”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2021, and conflicting national standards shall be withdrawn at the latest by May 2021.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 15684:2012.

In comparison with EN 15684:2012, the following significant changes have been made:

- Classification - minimum number of codes changed to credential security;
- Classification - attack resistance refers to EN 1303;
- Credential security introduced, with the same principle as in EN 16867.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## Introduction

Mechanical cylinders have been used to provide security and control of locks. Increasing demand for higher security, flexibility of master key systems, flow control, copy control of keys, etc. have made it desirable to incorporate additional functions to such mechanical cylinders, and new technologies have made it possible to develop electronically controlled cylinders.

Mechanical performance of the mechatronic cylinder is based on EN 1303.

Mechatronic Cylinder can technically be described in three main designs:

- a cylinder with electrical actuator and mechanical operated detaining elements;
- a cylinder with electrically operated locking part and a key for mechanically rotating the plug;
- a cylinder with electrically operated locking part and with manual operated opening/closing function.

NOTE Motor driven cylinders where the cam is rotated by a motor are not covered by this document.

Increasingly, such Mechatronic Cylinders (MCs) form a part of the security system of a building and may involve the use of electrical locking and controlling elements.

The performance tests incorporated in this document are considered to be reproducible and as such will provide a consistent and objective assessment of the performance of these devices throughout CEN Member States.

It is assumed that MC will conform to the legal regulations, e.g. RED – Radio Equipment Directive 2014/53/EU.

On occasions there may be a need for additional functions within the design of the cylinder. Purchasers should satisfy themselves that the products are suitable for their intended use. This is particularly important when the operation of such additional functions is safety-related. Accordingly, this document includes assessment of such features when they are included in the cylinder design.

**EN 15684:2020 (E)****1 Scope**

This document specifies requirements for performance and testing of Mechatronic Cylinders and their keys and/or electronic keys.

It applies to cylinders for such locks designed to be normally used in buildings. It also applies to cylinders for use with other hardware products such as exit devices, door operators, etc. or monitoring facilities and alarm systems.

It establishes categories of use based on performance tests and grades of security based on design requirements and on performance tests that simulate attack.

This document includes assessment of additional features when they are included in the cylinder design.

This document does not cover any other element of a system, other than those directly involved in the control of a cylinder.

The suitability of cylinders for use on fire or smoke-door assemblies is determined by fire performance tests conducted in addition to the performance testing specified by this document; see Annex A.

**2 Normative references**

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 636:2012+A1:2015, *Plywood — Specifications* (standards.iteh.ai)

EN 1634-1, *Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware — Part 1: Fire resistance test for door and shutter assemblies and openable windows* (standards.iteh.ai)

EN 1634-2, *Fire resistance and smoke control tests for door, shutter and openable window assemblies and elements of building hardware — Part 2: Fire resistance characterisation test for elements of building hardware* (standards.iteh.ai)

EN 1634-3, *Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware — Part 3: Smoke control test for door and shutter assemblies* (standards.iteh.ai)

EN 1670:2007, *Building hardware — Corrosion resistance — Requirements and test methods* (standards.iteh.ai)

EN 1906, *Building hardware — Lever handles and knob furniture — Requirements and test methods* (standards.iteh.ai)

EN 60068-2-1, *Environmental testing — Part 2-1: Tests — Test A: Cold (IEC 60068-2-1)* (standards.iteh.ai)

EN 60068-2-2, *Environmental testing — Part 2-2: Tests — Test B: Dry heat (IEC 60068-2-2)* (standards.iteh.ai)

EN 60068-2-6, *Environmental testing — Part 2-6: Tests — Test Fc: Vibration (sinusoidal) (IEC 60068-2-6)* (standards.iteh.ai)

EN 60068-2-27, *Environmental testing — Part 2-27: Tests — Test Ea and guidance: Shock (IEC 60068-2-27)* (standards.iteh.ai)

EN 60068-2-30:2005, *Environmental testing — Part 2-30: Tests — Test Db: Damp heat, cyclic (12 h + 12 h cycle) (IEC 60068-2-30:2005)* (standards.iteh.ai)



EN 60529:1991<sup>1)</sup>, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN 61000-4-2, *Electromagnetic compatibility (EMC) — Part 4-2: Testing and measurement techniques — Electrostatic discharge immunity test (IEC 61000-4-2)*

EN ISO 10666, *Drilling screws with tapping screw thread — Mechanical and functional properties (ISO 10666)*

EN ISO 15480, *Fasteners — Hexagon washer head drilling screws with tapping screw thread (ISO 15480)*

EN ISO 15481, *Cross recessed pan head drilling screws with tapping screw thread (ISO 15481)*

EN ISO 15482, *Cross recessed countersunk head drilling screws with tapping screw thread (ISO 15482)*

EN ISO 15483, *Cross recessed raised countersunk head drilling screws with tapping screw thread (ISO 15483)*

ISO/IEC 18033-3:2010, *Information technology — Security techniques — Encryption algorithms — Part 3: Block ciphers*

ISO 10899, *High-speed steel two-flute twist drills — Technical specifications*

### 3 Terms and definitions

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For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

#### 3.1

##### access card

Card or Tag, read only or read write, without integrated circuit, does not provide encryption and which can be used with contact or contactless

EXAMPLES     Magnetic stripe, Wigand, barcode.

#### 3.2

##### actuator

electrically operated means to effect or enable operation of the MC “at rest” position unforced condition of the lever handle or knob

#### 3.3

##### AES

Advanced Encryption Standard

#### 3.4

##### audit trail capability

degree of functionality intended to provide a record of mechatronic cylinder and/or its electronic key events that will identify the individual credential used to operate the mechatronic cylinder

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1) As impacted by EN 60529:1991/A1:2000 and EN 60529:1991/A2:2013.

**EN 15684:2020 (E)****3.5****attack**

unauthorized attempt to open a mechatronic cylinder by various techniques (destructive and or non-destructive techniques)

**3.6****cam**

component of the cylinder to provide the movement necessary to effect locking

**3.7****credential**

identification means containing information necessary to authorize operation of the MC

**3.8****cylinder**

device, usually distinct from its associated lock or latch, operated by a key

**3.9****direct coding**

marking on in the key where the mechanical and/or electronic coding can be determined without reference to another data source

**3.10****effective differ**

difference between cylinders of similar design, achieved only by the movable detainer, which enables each cylinder to be operated only by its own key

Note 1 to entry: The number of effective differs is equal to the number of theoretical differs after deduction of the differs excluded by the manufacturer due to technical constraints and those differs excluded in accordance with the restraints of 4.6.2.

**3.11****electronic dummy key**

electronic key which cannot electronically operate the mechatronic cylinder

Note 1 to entry: If applicable the electronic dummy key has the right mechanical code.

**3.12****electronic key**

device containing credential(s) necessary to authorize operation of the (mechatronic) cylinder

**3.13****False Acceptance Rate****FAR**

probability that the system incorrectly authorizes a non-authorized person, due to incorrectly matching the biometric input with a template

Note 1 to entry: The FAR is normally expressed as a percentage, following the FAR definition this is the percentage of invalid inputs which are incorrectly accepted.

**3.14****FAR-1**

FAR-1 (1/FAR) is the inverse of FAR

**3.15****Integrated Circuit Card****ICC**

Card, Tag or device with an integrated circuit which can be used with contact or contactless (RFID), Active or passive

EXAMPLES Radio-Frequency Identification (RFID), Smartcard.

**3.16****key**

separate device corresponding to the cylinder, which can mechanically operate the cylinder

**3.17****key way**

aperture extending along the whole or part of the length of the plug into which the key is inserted

**3.18****knob**

element of the cylinder for mechanical hand operation of the cylinder

**3.19****mechatronic cylinder****MC**

device with an integrated or a remote electronic system, which is to be used with a lock for the purpose of operating the lock and/or detaining elements after verifying the authorization of an electronic key

Note 1 to entry: It can be replaced by a mechanical cylinder conforming to EN 1303 without replacing any door furniture.

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<https://standards.iteh.ai/catalog/standards/sist/f80ec0c0-647d-4a1c-8e9a-71ddbcd927b2/sist-en-15684-2021>

**3.20****moveable detainer**

part of the mechanism of a cylinder, which should first be moved by the key into a pre-determined position before the key and/or plug can move

**3.21****outside**

side of the door that is facing the uncontrolled area

**3.22****plug**

part of a cylinder that can be moved when the proper key is used

**3.23****steps**

cuts in the surface of a bit or blade which operates movable detainers

**3.24****thumb turn**

element of the cylinder for mechanical finger operation of the cylinder

**EN 15684:2020 (E)****3.25****time zone**

degree of functionality intended to provide security by limiting the time that a valid credential will operate the MC

**3.26****manufacturer**

entity or organization that is legally responsible for putting the product on the market

**3.27****3DES**

Triple Data Encryption Standard

**4 Requirements****4.1 General**

The structure of the following requirements and test procedures reflects the classification in accordance with Clause 6.

**4.2 Category of use****4.2.1 Key strength**

When tested in accordance with 5.4.1 the electronic key shall not break under the applied torque of 2,5 Nm.

After the test, the electronic key shall be capable of being removed from the MC and re-used to operate the same MC with a torque not exceeding 1,5 Nm.

Compliance is checked by the test method given in 5.4.1.

**4.2.2 Stability of electronic key**

The electronic key shall be able to withstand a freefall from 1,5 m height, without loss of function and without the need to reassemble it.

Compliance is checked by the test method given in 5.4.2.

**4.2.3 Wrong electronic code**

When using an electronic dummy key with the right mechanical code the MC shall be capable of resisting a torque on the key of 3,5 Nm (or the maximum torque that can be transmitted with the normal manufacturers key if less than 3,5 Nm) without loss of function.

Compliance is checked by the test method given in 5.10.5.3, however with a torque of 3,5 Nm.

If a MC is equipped with a knob or thumb turn on the outside (replacing the key function) and this MC is not protected by a clutch to prevent damage in case of excessive torque being applied to the knob or thumb turn, the MC shall be capable of resisting a torque of 5 Nm +0,25 Nm -0 Nm, without loss of function.

**4.2.4 Bump requirements**

The MC and its electronic keys shall be able to withstand bumps.

The MC shall conform to the requirements given in Table 1.

The MC and the electronic key may have temporary degradation or loss of function and/or data, but the MC shall remain in secured position. The loss of function and/or data shall be self-recoverable within 5 s.

Compliance is checked by the test method given in 5.4.3.

#### 4.2.5 Vibration requirements

The MC and its electronic keys shall be able to withstand vibrations.

The MC shall conform to the requirements given in Table 1.

The MC and the electronic keys may have temporary degradation or loss of function and/or data, but the MC shall remain in secured position. The loss of function and/or data shall be self-recoverable within 5 s after the vibration test.

Compliance is checked by the test methods given in 5.4.4.

**Table 1 — Bump and Vibration requirements**

Test method	Grade 1
Bump test EN 60068-2-27	40 g (100 bumps / 3 directions) duration per bump 6 ms
Vibrations EN 60068-2-6	<ul style="list-style-type: none"> <li>- Frequency range: 10 Hz to 150 Hz</li> <li>- Displacement amplitude: 0,35 mm</li> <li>- Acceleration amplitude: 5 g</li> <li>- Duration of endurance in sweep cycles for each axis: 5</li> <li>- Cross-over frequency : 58 Hz to 62 Hz</li> <li>- Sweep rate: 1 octave per minute</li> </ul>

#### 4.2.6 Electrostatic discharge requirement

The MC and its electronic keys shall be able to withstand high voltage and static electricity. It shall conform to 4.8.10 grade 0.

The MC and the electronic keys may have temporary degradation or loss of function and/or data, but the electric blocking of the MC shall remain in secured position. The loss of function and/or data shall be self-recoverable within 5 s.

Compliance is checked by the test method given in 5.4.5.

#### 4.2.7 Minimum knob transmission

If a MC is equipped with a blocked knob on the outside and this MC is protected by a clutch to prevent damage in case of excessive torque being applied to the knob, the clutch shall be able to transmit a minimum torque of 1,5 Nm having been released 100 times within 20 min.

Compliance is checked by the test method given in 5.10.11.

### 4.3 Durability requirements

When tested in accordance with 5.5, it shall be possible to operate the MC with a new original authorized electronic key with a torque not exceeding 1,5 Nm after the number of completed test cycles specified in 6.3.

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Compliance is checked by the test method given in 5.2.

**4.4 Fire/smoke resistance**

The MC shall conform to the requirements of Annex A.

**4.5 Environmental resistance****4.5.1 Corrosion resistance requirements**

After the corrosion test of 5.7.1, The MC shall operate with authorization not exceeding a torque of 1,5 Nm.

Compliance is checked by the test method in 5.2.

Corrosion resistance is applicable for environmental resistance, grades 2, 3 and 4 (see Table 2). This corrosion test shall apply to functionality only.

No distinction is made between the inside and the outside of cylinder and/or door.

**4.5.2 Resistance of MC against water**

The MCs shall have protection, against water.

After being tested as in 5.7.2 for grades 2, 3 and 4 in Table 2 the MC shall operate with its authorized electronic key.

**4.5.3 Dry heat**

The MC and its electronic key shall be able to function correctly at different temperatures. It shall also be able to function correctly after being exposed to thermal shocks. See Tables 2 and 3 for environmental resistance MC and electronic keys.

Compliance is checked by the test methods of 5.7.3.

**4.5.4 Cold**

The MC and its electronic key shall be able to function correctly at different low temperatures. It shall also be able to function correctly after being exposed to thermal shocks. See Tables 2 and 3 for environmental resistance MC and electronic keys.

Compliance is checked by the test methods of 5.7.4.

**4.5.5 Damp heat cyclic**

The MC and its electronic keys shall be able to function correctly in an environment of high relative humidity. See Tables 2 and 3 for environmental resistance MC and electronic keys.

Compliance is checked by the test method of 5.7.5.

**4.5.6 Resistance of electronic key against water**

The electronic keys shall be able to operate its MC after they have been exposed to water in accordance with the test described in 5.7.6.

Table 2 — Environmental resistance MC

Requirement	Test clause	Grade				
		0	1	2	3	4
4.5.1 Corrosion resistance	5.7.1	-	-	Yes	Yes	Yes
4.5.2 Protection of MC against water	5.7.2	-	-	Yes	Yes	Yes
4.5.3 Dry heat	5.7.3	-	+55 °C, 16 h	+55 °C, 16 h	+55 °C, 16 h	+65 °C, 16 h
4.5.4 Cold	5.7.4	-	+5 °C, 16h	+5 °C, 16 h	-10 °C, 16 h	-25 °C, 16 h
4.5.5 Damp Heat (cyclic)	5.7.5	-	-	-	-	+55 °C, 6 cycles

Table 3 — Environmental resistance MC Key

Requirement	Test clause	Grade				
		0	1	2	3	4
4.5.6 Resistance of electronic key against water	5.7.6	-	-	Yes	Yes	Yes
4.5.3 Dry heat	5.7.3	-	+55 °C, 16 h	+55 °C, 16 h	+55 °C, 16 h	+65 °C, 16 h
4.5.4 Cold	5.7.4	-	+5 °C, 16 h	+5 °C, 16 h	-10 °C, 16 h	-25 °C, 16 h
4.5.5 Damp Heat (cyclic)	5.7.5	-	-	-	-	+55 °C, 6 cycles

## 4.6 Key related security

### 4.6.1 General

For classification of mechanical code variation (5<sup>th</sup> character), the following requirements shall be fulfilled:

- 4.6.2; Minimum number of effective mechanical code variations
- 4.6.3; Minimum numbers of movable retainers
- 4.6.4; Maximum number of identical steps
- 4.6.5; Direct coding on key
- 4.6.6; Torque resistance of plug/cylinder relevant to key related security