



# SLOVENSKI STANDARD

## SIST EN 16864:2017

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### Stavbno okovje - Mehatronske obešanke - Zahteve in preskusne metode

Building hardware - Mechatronic padlocks - Requirements and test methods

Schlösser und Baubeschläge - Mechatronische Hängschlösser - Anforderungen und Prüfverfahren

Quincaillerie du bâtiment - Cadenas mécatroniques - Exigences et méthodes d'essai

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
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**Building hardware - Mechatronic padlocks - Requirements  
and test methods**

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

Schlösser und Baubeschläge - Mechatronische  
Hangschlösser - Anforderungen und Prüfverfahren

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

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## European foreword

This document (EN 16864:2017) 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of an identical text or by endorsement, at the latest by March 2018, and conflicting national standards shall be withdrawn at the latest by March 2018.

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.

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## Introduction

Mechanical padlocks have been used to provide security and control of external doors, cabinets and movable items. Increasing demand for the flexibility of master key systems, audit trail, copy control of keys, etc. has made it desirable to incorporate additional functions into such mechanical padlocks, and new technologies have made it possible to develop mechatronic padlocks. A mechatronic padlock uses either pure electrically operated means or combination of electrically operated and mechanical means to achieve security.

The test methods are specified in detail to ensure reproducibility at any testing establishment within Europe, and the acceptance criteria are defined objectively to ensure consistency of assessment.

Mechanical performance of the mechatronic padlock is based on EN 12320:2012.

It is assumed that mechatronic padlocks (MPs) will conform to the legal regulations i.e. of the Electromagnetic Compatibility (EMC) Directive 2014/30/EU, The Low Voltage (LV) Directive 2014/35/EU, Radio and Telecommunications Terminal Equipment (RTTED) - Directive 1999/5/EC and other relevant directives concerning electronic apparatus.

On occasions there may be a need for additional functions within the design of the padlock. 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 European Standard includes assessment of such features when they are included in the padlock design.

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## 1 Scope

This European Standard specifies requirements for performance and testing of mechatronic padlocks (MPs) and their keys and/or electronic keys.

It establishes categories of use based on performance tests and grades of security based on design requirements and on performance tests that simulate attack. If the design incorporates mechanical security means in addition to the mechatronic means, these are also tested.

This European Standard does not cover any other element of a security system, other than those directly involved in the control of a padlock.

This European Standard does not cover the physical testing of multi-function devices such as Smartphones that may be used as part of the control system.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12320:2012, *Building hardware - Padlocks and padlock fittings - Requirements and test methods*

EN 1670:2007, *Building hardware - Corrosion resistance - Requirements and test methods*

EN 60068-2-1, *Environmental testing - Part 2-1: Tests - Test A: Cold*

EN 60068-2-2, *Environmental testing - Part 2-2: Tests - Test B: Dry heat*

EN 60068-2-6:2008, *Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)*

EN 60068-2-27:2009, *Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock*

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

EN 60529:1991, *Degrees of protection provided by enclosures (IP Code)*

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

EN ISO 10666:1999, *Drilling screws with tapping screw thread - Mechanical and functional properties (ISO 10666:1999)*

EN ISO 15480, *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 10899, *High-speed steel two-flute twist drills — Technical specifications*



### 3 Terms, definitions and symbols

#### 3.1 Terms and definitions

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

##### 3.1.1

##### **audit trail capability**

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

##### 3.1.2

##### **attack**

unauthorised attempt to open a mechatronic padlock (MP) by various techniques (destructive and/or non-destructive techniques)

##### 3.1.3

##### **cryptographic attack**

use of codes and credentials that are randomly or algorithmically generated to defeat the electronic security of the MP

##### 3.1.4

##### **spoofing**

presentation of a forged credential

Note 1 to entry      Spoofing includes the use of devices to capture an unencrypted code.

##### 3.1.5

##### **brute force attack**

the use of a high speed code generator to try and enter a valid code or credential

##### 3.1.6

##### **dictionary attack**

the use of a list of common words or number sequences to try and shorten the duration of a code-guessing attack

##### 3.1.7

##### **cam**

component of the mechatronic padlock (MP) to provide the movement necessary to effect locking or to move a locking part that retains the shackle, such as a pawl or ball

##### 3.1.8

##### **cylinder**

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

##### 3.1.9

##### **detaining elements**

parts of the padlock, which should be moved by the authorisation of the electronic key and key (if available) into a pre-determined position before the locking mechanism can move

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**3.1.10****code mechanism**

any combination of mechanical and/or electronic elements that may be given various values in order to restrict the opening of the padlock to the correct keys

**3.1.11****effective mechanical code variation**

difference between locking mechanisms of padlocks of similar design achieved only by the movable detainer, which enables each padlock to be operated only by the correct key or keys

**3.1.12****electronic code variation**

difference between locking mechanisms of padlocks of similar design achieved only by the electronic code which enables each padlock to be operated only by the correct key or keys

**3.1.13****electronic dummy key**

electronic key which cannot electronically operate the mechatronic padlock (MP)

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

**3.1.14****electronic key**

discrete device containing the information necessary to authorise operation of the mechatronic padlock

**3.1.15****key**

separate device corresponding to the operating means of the mechatronic padlock, which can mechanically operate the padlock

**3.1.16****knob**

element of the mechatronic padlock for mechanical hand operation of the padlock

**3.1.17****mechatronic padlock****MP**

independent locking device comprising a body, a code mechanism, a locking mechanism and a shackle. The code mechanism includes an electronic component that interfaces with mechatronic detaining elements after verification

**3.1.18****plug**

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

**3.1.19****steps**

cuts in the surface of a bit or blade which operate the mechanical code elements

**3.1.20****time zone**

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

**3.1.21****manufacturer**

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

**3.1.22****credential**

portion of data that serves to identify the user as valid

**3.1.23****staple**

part of the padlock fitting through which the padlock shackle is passed

**3.1.24****mean time to compromise****MTC**

average estimated time for a cryptographic attack to defeat the electronic security of the MP

**3.1.25****whitelist**

database of authorised users

**3.2 Symbols**

For the purposes of this document, the following symbols apply.

Symbol	Unit	Definition
$d$	mm	Diameter of shackle
$F1$	kN	Push/pull force on cylinder plug/locking mechanism
$F2$	kN	Pull force on shackle or staple
$F3$	kN	Cutting force on shackle or staple
$F4$	kN	Maximum possible push/pull force on cylinder plug/locking mechanism
$h$	mm	Height through which weight is dropped (impact test)
$M1$	Nm	Torque on key to test for inter-passing
$M2$	Nm	Torque on cylinder plug/locking mechanism
$M3$	Nm	Twisting torque on shackle or staple
$n$	-	Minimum number of effective key differs
$N$	-	Number of electronic codes available
$W$	-	Maximum number of users in the Whitelist
$A$	-	Number of code attempts possible within one hour
$t$	min	Drilling/sawing resistance time
$T$	°C	Temperature of product for impact testing
$m$	g	Drop mass for impact test

## 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

NOTE If all requirements 4.2.1 to 4.2.8 of this section are met, the MP is classed as Grade 1 Category of use.

#### 4.2.1 Key strength

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

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

#### 4.2.2 Operation of release mechanism

The operating torque of the MP shall not exceed 1,5 Nm.

#### 4.2.3 Stability of electronic key and MP

The electronic key and the MP shall be able to withstand a free-fall from 1,5 m height, with the electronic key not inserted without loss of function and without the need for reassembly.

Compliance is checked by the test method given in 5.4.2.

#### 4.2.4 Wrong electronic code

When using an electronic dummy key with the right mechanical code the MP 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 manufacturer's key if less than 3,5 Nm) without loss of function.

Compliance is checked by the test method given in 5.4.1 however with a torque of 3,5 Nm.

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

#### 4.2.5 Bump requirements

The MP and its electronic keys shall be able to withstand bumps typical of daily usage.

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

Compliance is checked by the test methods given in 5.4.3.

#### 4.2.6 Vibration requirements

The MP and its electronic keys shall be able to withstand vibrations typical of daily usage.

The MP and its electronic key shall conform to the requirements given in Table 1.

Compliance is checked by the test methods given in 5.4.4

The MP shall remain secured during the test and shall operate normally afterwards.5.4.4.

**Table 1 — Bump and vibration requirements**

Requirements	Test method
<p><i>40 G</i></p> <p>(100 bumps / 3 directions) duration per bump 6 ms</p>	<p>1. Bump test</p> <p>EN 60068-2-27:2009</p>
<p>-Frequency range: 10 to 150 Hz</p> <p>-Displacement amplitude: 0,35 mm</p> <p>-Acceleration amplitude: 5 G</p> <p>-Number of sweep cycles for each axis: 5</p> <p>-Crossover frequency : 58 Hz to 62 Hz</p> <p>-Sweep rate: 1 octave per minute</p>	<p>3.a Vibrations</p> <p>EN 60068-2-6:2008</p>

#### 4.2.7 Electrostatic discharge requirement

The MP and its electronic keys shall be able to withstand and function after an accidental electro-static discharge. It shall conform to the requirements given in EN 61000-4-2 and conform to the specification in Table 7 for Grade 1.

The MP and the electronic keys may have temporary degradation or loss of function and/or data, but the electric blocking of the MP shall remain in the secured condition. Verification after the test shall be done after a rest of 10 s and within one minute.

Compliance is checked by the test method given in 5.11.14.

#### 4.2.8 Minimum knob transmission

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Where a MP is equipped with a knob protected by a clutch in order to prevent damage if an excessive torque is applied, 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 5.2.3

### 4.3 Durability requirements

Grade 0: no requirements

Grade 1: 10 000 cycles

When tested in accordance with 5.5 it shall be possible to operate the padlock using a maximum torque on the authorized electronic key or knob of 1,5 Nm, applying the relevant sequence of 5.2

### 4.4 Corrosion resistance requirements

After the corrosion test of 5.6 the MP shall operate, using the maximum torque on the authorized electronic key or knob specified in 4.2.2.

Compliance is checked by the relevant test method in 5.2.

Corrosion resistance is applicable for environmental resistance, grades 1, 2, 3, 4 and 5 in compliance with EN 1670:2007 as below. This corrosion test shall apply to functionality only.