SLOVENSKI STANDARD
oSIST prEN 15129-6:2022

01-januar-2022

Naprave za zagotavljanje potresne varnosti konstrukcij - 6. del: Drsni izolatorji

Anti-seismic devices - Part 6: Sliding isolators

Erdbebenvorrichtungen - Teil 6: Gleitisolatoren

Dispositifs anti-sismiques - Partie 6 : Isolateurs coulissants

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ICS:

91.120.25	Zaščita pred potresi in vibracijami	Seismic and vibration protection

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English Version

Anti-seismic devices - Part 6: Sliding isolators

Dispositifs anti-sismiques - Partie 6 : Isolateurs coulissants

Erdbebenvorrichtungen - Teil 6: Gleitisolatoren

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 340.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (prEN 15129-6:2021) has been prepared by Technical Committee CEN/TC 340 “Anti-seismic devices”, the secretariat of which is held by UNI.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 15129:2018, which is split into 6 parts:

— Part 1: *General Design Rules*

— Part 2: *Rigid Connection Devices*

— Part 3: *Displacement Dependent Devices*

— Part 4: *Velocity Dependent Devices*

— Part 5: *Elastomeric Isolators*

— Part 6: *Sliding Isolators*

This part 6 supersedes 8.3 and 8.4 of EN 15129:2018.

The following technical modifications have been made:

— updating the scope with definition of material aspects;

— tests O (integrity of overlay), P2 (Property Verification) and S (Service) removed;

— test P1 (Benchmark) is now called Test C (Comparison);

— the sliding tests D1 and D2 are now performed at 0,33· d_0 and 0,67· $d0$ (before it was 0,25· d_{bd} and 0,50· d_{bd}; d_{bd} is replaced by d_0);

— the sliding tests assess the dynamic coefficient of friction and effective radius, both averaged over the 3 test cycles (the dynamic coefficient of friction of cycle 1 is not assessed anymore and the stiffness due to the effective radius is replaced by the effective radius);

— the tolerance limits of the assessed ECs are removed (defined only for D3);

— the static coefficient of friction (2018) is now named as maximum coefficient of friction;

— removal of clauses related to design aspects;

— removal of informative annexes.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

1 Scope

This document specifies procedures for assessments and verification of constancy of performance (AVCP) of **sliding isolators** in relation to their characteristics. Sliding isolators with main functions in accordance with 3.1.2 are intended to be used **for building and civil engineering construction works**.

This document comprises the following types of sliding isolators:

1. curved surface sliders (CSS, 3.1.1) (spherical and cylindrical) of the following types:

   a) single curved surface slider,

   b) double curved surface slider with rigid slider,

   c) double curved surface slider with articulated slider,

   d) multiple curved surface slider with rigid slider,

   e) multiple curved surface slider with articulated slider, and

2. flat surface slider (FSS, 3.1.3).

This document comprises sliding isolators with some or all of the following parts:

a) backing plates without lightening hollows and without ribs,

b) slider without or with hinge,

c) mating elements,

d) sliding sheets, undimpled or dimpled, without or with lubricant (being in contact with mating element),

e) containment rings (for controlling the sliding isolator kinematics but not limiting the sliding isolator displacement capacity).

This document comprises sliding isolators with the following materials:

a) for backing plates without hard chromium plating and for sliders:

   — steel in accordance with EN 10025:2019 (all parts),

   — cast iron in accordance with ISO 1083:2018,

   — cast carbon steel in accordance with ISO 14737:2015, or

   — stainless steel in accordance with EN 10088:2014 (all parts);

b) for backing plates with hard chromium plating:

   — steel grade S 355 J2+N, or

   — fine grain steel of the same or higher grade in accordance with the EN 10025:2019 (all parts);

c) for mating elements:

— austenitic steel with thickness of at least 2,5 mm in accordance with EN 10088-2:2014, 1.4401 + 2B or 1.4404 +2B,

— backing plates with at least 100 µm hard chromium plating in accordance with EN ISO 6158:2018;

d) for sliding sheets with and without lubrication:

— UHMWPE (Ultra High Molecular Weight Polyethylene),

— PTFE in accordance with EN 1337-7:2004 (Clause 5),

— fluorpolymer made of claimed PTFE (polytetrafluoroethylene), or

— PTFE filled with solid lubricant and reinforcing fibres;

e) lubricants in accordance with EN 1337-2:2004 (5.8).

This document does not comprise:

a) vertical seismic isolation systems,

b) sliding isolators with restrainers limiting their displacement capacity, and

c) sliding isolators with accumulated sliding path less than 1 000 m.

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 1337-2:2004, *Structural bearings — Part 2: Sliding elements*

EN 1337-7:2004, *Structural bearings — Part 7: Spherical and cylindrical PTFE bearings*

EN 10025 (all parts):2019, *Hot rolled products of structural steels*

EN 10088 (all parts):2014, *Stainless steels*

EN ISO 6158:2018, *Metallic and other inorganic coatings — Electrodeposited coatings of chromium for engineering purposes (ISO 6158:2018)*

ISO 1083:2018, *Spheroidal graphite cast irons — Classification*

ISO 14737:2015, *Carbon and low alloy cast steels for general applications*

3 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

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

Note 1 to entry: In this European Standard compressive forces, stresses and strains have a positive sign.

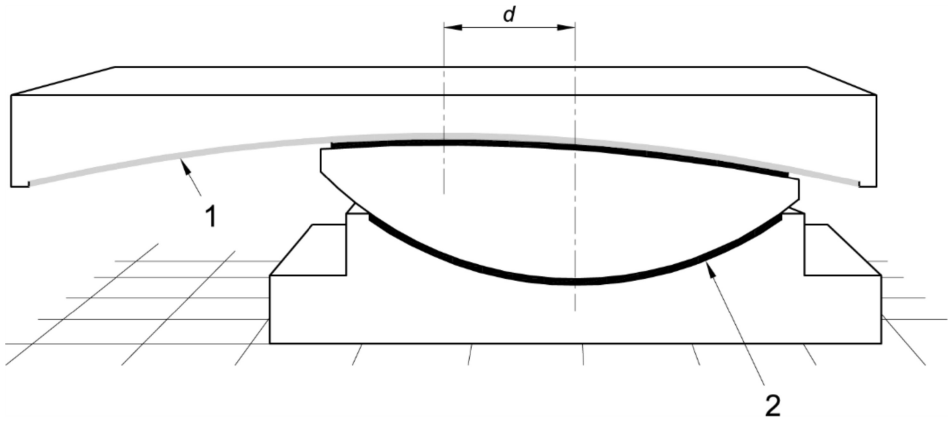
3.1.1
curved surface slider
CSS
sliding isolator with one primary sliding surface and one secondary sliding surface denoted as Single CSS (Figure 1); sliding isolator with two primary sliding surfaces denoted as Double CSS (Figure 2 showing Double CSS with rigid slider, Figure 3 showing Double CSS with articulated slider); sliding isolator with more than two primary sliding surfaces (with rigid or articulated slider) denoted as Multiple CSS (Figure 4 showing an example of various types of Multiple CSS)

Note 1 to entry: For Single CSS the effective radius of the primary sliding surface determines the stiffness force of the Single CSS and the dynamic coefficient of friction of the primary sliding surface determines mainly the energy dissipation of the Single CSS. The rotation capability is given by the secondary sliding surface.

Note 2 to entry: For Double CSS with rigid slider the sum of the effective radii of both primary sliding surfaces mainly determines the stiffness force of the Double CSS and the average dynamic coefficient of friction of both primary sliding surfaces determines the energy dissipation of the Double CSS with rigid slider. The rotation capability is based on the relative motions on both primary sliding surfaces.

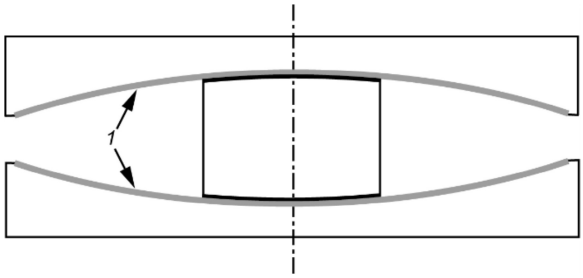
Note 3 to entry: For Double CSS with articulated slider the effective radii and the dynamic coefficients of friction of the primary sliding surfaces determine the stiffness force and the energy dissipation of the Double CSS with articulated slider. The rotation capability is given by the hinge of the articulated slider.

Note 4 to entry: For Multiple CSS the stiffness force due to the effective radii and the energy dissipation due to the dynamic coefficients of friction depend on the relative motion amplitudes on all sliding surfaces. For Multiple CSS with rigid slider the rotation capability is given by the relative motions on the primary sliding surfaces. For Multiple CSS with articulated slider the rotation capability is given by hinge of the articulated slider.



Key
1 primary sliding surface
2 secondary sliding surface

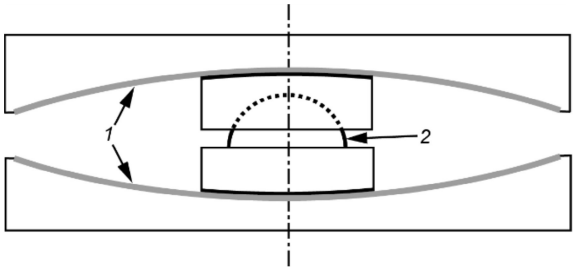
Figure 1 — Schematic of Single CSS



Key

1 primary sliding surfaces

Figure 2 — Schematic of Double CSS with rigid slider

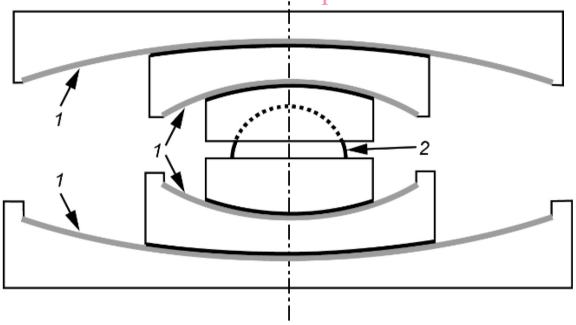


Key

1 primary sliding surfaces

2 secondary sliding surface of articulated slider

Figure 3 — Schematic of Double CSS with articulated slider



Key

1 primary sliding surfaces

2 secondary sliding surface of articulated slider

Figure 4 — Schematic of an example of a Multiple CSS

3.1.2
sliding isolator

seismic isolator such as CSS and FSS protecting the structure from the shaking ground; the four main functions of sliding isolators are:

— support the vertical force of the structure both in the non-seismic and seismic situation,

— reduce structural accelerations / structural shear forces by the low stiffness due to the large curvature (effective radius) of the curved sliding surface,

— adding damping to the structure by friction damping, and

— re-centre the structure by the appropriate combination of stiffness and friction forces (the FSS needs to be combined with a re-centring device to ensure this function);

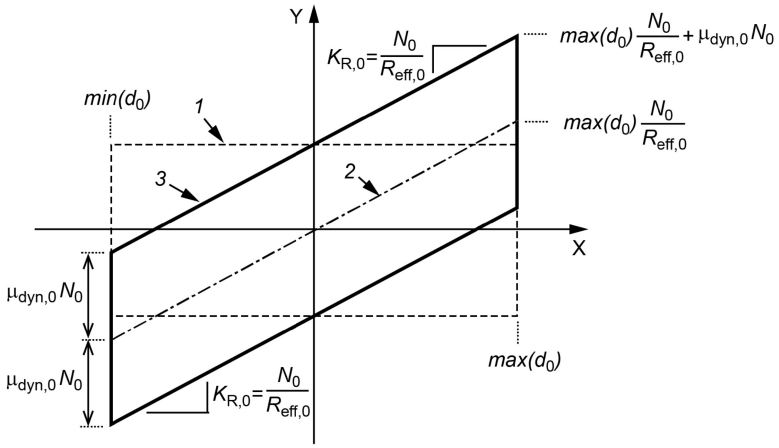
Note 1 to entry: In the non-seismic situation sliding isolators are structural bearings.

3.1.3
flat surface slider
FSS
sliding isolator with flat sliding surface providing horizontal displacement capacity, rotation capability, energy dissipation by relative motion at the sliding surface, transmitting vertical forces but not providing any re-centring stiffness force

3.1.4
claimed isolator displacement amplitude
$\boldsymbol{d_0}$
claimed sliding isolator displacement amplitude (Figure 5)

3.1.5
claimed isolator vertical force
$\boldsymbol{N_0}$
claimed sliding isolator vertical force (Figure 5)

3.1.6
claimed effective radius
$\boldsymbol{R_{eff,0}}$
claimed radius of simple pendulum with natural frequency being equal to the natural frequency of the CSS (Figure 5)



Key

X	horizontal displacement of sliding isolator
Y	horizontal force of sliding isolator
d_0	claimed horizontal displacement of sliding isolator
N_0	vertical force on isolator
$R_{eff,0}$	claimed effective radius
$K_{R,0}$	claimed stiffness resulting from $R_{eff,0}$ and N_0
$\mu_{dyn,0}$	claimed dynamic coefficient of friction
1	frictional force of sliding isolator
2	stiffness force due to $K_{R,0}$
3	horizontal force of sliding isolator

Figure 5 — Schematic force displacement characteristics of sliding isolator

3.1.7
claimed stiffness due to effective radius
$K_{R,0}$
claimed stiffness of CSS resulting from $R_{eff,0}$ and N_0 (Figure 5)

3.1.8
claimed isolator load bearing capacity
$N_{BC,0}$
claimed sliding isolator load bearing capacity

3.1.9
claimed isolator maximum seismic vertical force
$N_{E1,0}$
claimed sliding isolator maximum seismic vertical force

3.1.10
claimed isolator minimum seismic vertical force
$N_{E2,0}$
claimed sliding isolator minimum seismic vertical force