

DIN EN 15129



ICS 91.120.25

Supersedes
DIN EN 15129:2010-06
See start of application

**Anti-seismic devices;
English version EN 15129:2018,
English translation of DIN EN 15129:2018-07**

Erdbebenvorrichtungen;
Englische Fassung EN 15129:2018,
Englische Übersetzung von DIN EN 15129:2018-07

Dispositifs anti-sismiques;
Version anglaise EN 15129:2018,
Traduction anglaise de DIN EN 15129:2018-07

Document comprises 181 pages

Translation by DIN-Sprachendienst.

In case of doubt, the German-language original shall be considered authoritative.

A comma is used as the decimal marker.

Start of application

The start of application of this standard is 2018-07-01.

It should be noted that, in Germany, CE conformity marking of construction products will be permitted once this standard has been listed in the Official Journal of the European Union and/or the *Bundesanzeiger* (German Federal Gazette) and from the date given therein.

For further information, users of this standard should refer to the websites of the European Commission or of the relevant building authority.

National foreword

This document (EN 15129:2018) has been prepared by Technical Committee CEN/TC 340 “Anti-seismic devices” (Secretariat: UNI, Italy).

The responsible German body involved in its preparation was *DIN-Normenausschuss Bauwesen* (DIN Standards Committee Building and Civil Engineering), Working Committee NA 005-57-02 AA “Structural bearings (DIN 4141) (national mirror committee for CEN/TC 167 “Structural bearings”)”.

The DIN documents corresponding to the international documents referred to in this document are as follows:

ISO 34 (all parts)	DIN ISO 34 (all parts)
ISO 48	DIN ISO 48
ISO 815 (all parts)	DIN ISO 815 (all parts)
ISO 1431-1	DIN ISO 1431-1

Amendments

This standard differs from DIN EN 15129:2010-06 as follows:

- a) Clause 3 “Terms and definitions” has been revised;
- b) a new Clause 10 “Assessment and verification of constancy of performance” has been added;
- c) Annex ZA has been adapted to the EU Construction Products Directive;
- d) the standard has been editorially revised in preparation for the next technical revision.

Previous editions

DIN EN 15129: 2010-06

National Annex NA
(informative)

Bibliography

DIN ISO 34 (all parts), *Rubber, vulcanized or thermoplastic — Determination of tear strength*

DIN ISO 48, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

DIN ISO 815 (all parts), *Rubber, vulcanized or thermoplastic — Determination of compression stress-strain properties*

DIN ISO 1431-1, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static and dynamic strain testing*

— This page is intentionally blank —

English Version

Anti-seismic devices

Dispositifs anti-sismiques

Erdbebenvorrichtungen

This European Standard was approved by CEN on 8 February 2018.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

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

Contents

Page

European foreword.....	7
1 Scope	8
2 Normative references.....	8
3 Terms, definitions, symbols and abbreviations.....	10
3.1 Terms and definitions	10
3.2 Symbols.....	19
3.2.1 Latin upper case letters	19
3.2.2 Latin lower case letters.....	19
3.2.3 Greek letters	20
3.2.4 Subscripts.....	20
3.3 Abbreviations	21
3.4 List of devices	22
4 General design rules	24
4.1 General.....	24
4.2 Performance of anti-seismic devices	24
4.2.1 General.....	24
4.2.2 Increased reliability of structural system.....	24
4.2.3 Functional requirements.....	25
4.2.4 Structural and mechanical requirements	25
4.2.5 Compliance criteria	26
4.3 Action effects on devices.....	26
4.3.1 Seismic design situations and seismic combinations of actions	26
4.3.2 Effects of actions.....	26
4.4 Conceptual design of the devices.....	26
4.4.1 Reliability of the devices behaviour	26
4.4.2 Capacity design	26
4.4.3 Maintenance.....	27
4.4.4 Modification and replacement of devices	27
4.4.5 Device documentation.....	27
4.5 General properties.....	27
4.5.1 Material properties	27
4.5.2 Device properties to be used in the analysis.....	28
4.5.3 Re-centring capability	29
4.6 Constitutive laws	29
4.7 Validation of anti-seismic devices.....	29
4.8 Dangerous substances.....	30
5 Rigid connection devices	30
5.1 General.....	30
5.2 Permanent Connection Devices	30
5.3 Fuse Restraints.....	30
5.3.1 Performance requirements.....	30
5.3.2 Material properties	31
5.3.3 Design requirements	31
5.3.4 Type Testing.....	31
5.3.5 Factory Production Control tests	32

5.4	Temporary (dynamic) Connection Devices.....	32
5.4.1	Functional requirements	32
5.4.2	Material properties.....	33
5.4.3	Design Requirements	34
5.4.4	Type Testing	34
5.4.5	Factory Production Control Tests.....	36
6	Displacement Dependent Devices	37
6.1	General	37
6.2	Performance Requirements	37
6.3	Materials	39
6.3.1	General	39
6.3.2	Elastomer.....	40
6.3.3	Steel	40
6.3.4	Other materials (special steel, stainless steel, SMA, visco-elastic polymeric materials)	40
6.4	Testing.....	40
6.4.1	General	40
6.4.2	Type Tests of materials	41
6.4.3	Factory Production Control tests of materials.....	42
6.4.4	Type Tests of devices.....	43
6.4.5	Factory Production Control testing of devices.....	44
7	Velocity Dependent Devices	44
7.1	Functional requirements	44
7.2	Material properties.....	45
7.2.1	General	45
7.2.2	Materials	45
7.2.3	Active Surfaces.....	45
7.2.4	Viscous Fluid.....	45
7.3	Design requirements.....	46
7.3.1	General	46
7.3.2	Overvelocity.....	47
7.3.3	Buckling	48
7.4	Testing.....	48
7.4.1	General	48
7.4.2	Type Testing	48
7.4.3	Factory Production Control	51
8	Isolators	52
8.1	General Requirements.....	52
8.2	Elastomeric Isolators	53
8.2.1	Requirements.....	53
8.2.2	Materials	60
8.2.3	Design	68
8.2.4	Testing.....	73
8.2.5	Manufacturing Tolerances	83
8.2.6	Marking and Labelling	83
8.3	Curved Surface Sliders	83
8.3.1	Requirements.....	83
8.3.2	Materials	89
8.3.3	Design	90
8.3.4	Testing.....	92
8.3.5	Manufacturing, Assembly and Tolerances.....	99
8.4	Flat Surface Sliders.....	100

8.4.1	Requirements	100
8.4.2	Materials.....	101
8.4.3	Design	101
8.4.4	Testing.....	101
8.4.5	Manufacturing, Assembly and Tolerances	101
9	Combinations of Devices	101
9.1	Requirements	101
9.1.1	General.....	101
9.1.2	Particular requirements.....	101
9.2	Materials.....	102
9.3	Design	102
9.4	Testing.....	102
9.4.1	General.....	102
9.4.2	Type Testing.....	102
9.4.3	Factory Production Control testing	102
10	Assessment and verification of constancy of performance - AVCP	103
10.1	General.....	103
10.2	Type testing.....	103
10.2.1	General.....	103
10.2.2	Test samples, testing and compliance criteria	104
10.2.3	Test reports.....	109
10.2.4	Shared other party results.....	109
10.2.5	Cascading determination of the product type results	110
10.2.6	Combined devices	111
10.3	Factory Production Control (FPC).....	111
10.3.1	General.....	111
10.3.2	Requirements.....	111
10.3.3	Product specific requirements.....	117
10.3.4	Initial inspection of factory and of FPC	118
10.3.5	Continuous surveillance of FPC.....	118
10.3.6	Procedure for modifications	118
10.3.7	One-off products, pre-production products (e.g. prototypes)	119
11	Installation	119
12	In-service inspection.....	120
12.1	General requirements	120
12.2	Regular inspection.....	120
12.3	Principal inspection	120
Annex A (informative) Commentary to Clause 1: Scope.....		121
Annex B (informative) Commentary to Clause 4: General design rules		122
B.1	Service life of a device	122
B.2	Characteristics	122
B.3	Reliability differentiation	122
B.4	Increased reliability.....	122
B.5	Requirements at the ULS	122
B.6	Requirements at the SLS.....	123
B.7	Structural analysis.....	123
B.8	Material properties	123
B.9	Re-centring capability	124
Annex C (informative) Commentary to Clause 5: Rigid connection devices		126
C.1	Functional requirements.....	126

C.2	Material properties.....	126
C.3	Design Requirements	127
C.4	Testing.....	127
C.4.1	General	127
C.4.2	Low velocity test.....	128
C.4.3	Seal Wear Test	129
C.4.4	Impulsive Load Test.....	129
C.4.5	Overload Test.....	130
C.4.6	Cyclic Load Test.....	130
Annex D	(informative) Commentary to Clause 6: Displacement Dependent Devices.....	131
D.1	Categories of Non Linear Devices (NLD).....	131
D.2	Examples of linear devices — Elastomeric shear-strained devices	133
D.3	Examples of nonlinear devices	133
D.3.1	Buffer.....	133
D.3.2	Steel hysteretic energy dissipating devices	133
D.3.3	Buckling Restrained Braces.....	134
D.3.4	SMA Re-centring Devices	134
Annex E	(informative) Commentary to Clause 7: Velocity Dependent Devices.....	135
E.1	Functional requirements	135
E.2	Design Requirements	137
E.2.1	General	137
E.3	Testing.....	139
E.3.1	General	139
E.3.2	Low velocity test for Fluid Viscous Dampers.....	139
E.3.3	Low velocity test for Fluid Spring Dampers	140
E.3.4	Constitutive law test for Fluid Viscous Dampers.....	141
E.3.5	Constitutive law test for Fluid Spring Dampers.....	141
E.3.6	Damping efficiency test	142
Annex F	(informative) Commentary to Clause 8: Isolators.....	144
F.1	Ageing conditions for elastomeric isolators	144
F.2	Low temperature crystallization	144
F.3	Commentary on Basis of design.....	145
F.3.1	Shape Factor	145
F.3.2	Design shear strain due to compression by vertical loads	145
F.3.3	Isolator stiffnesses	146
F.4	Curved Surface Slider force.....	147
F.5	Determination of the Restoring Stiffness by tests for Curved Surface Sliders	149
F.6	Simultaneous application of a sinusoidal displacement input waveforms in two perpendicular in plane directions.....	150
Annex G	(normative) Equipment for combined compression and shear test and data analysis.....	151
G.1	General requirements.....	151
G.2	Data Acquisition	151
G.3	Combined compression and shear equipment	151
G.4	Load Platens	152
G.5	Data analysis	152
Annex H	(informative) Design of Connections for Devices.....	154
H.1	Elastomeric Isolators	154
H.2	Sliders	154

Annex I (informative) Method for calculating pressure distributions on curved sliding surfaces	156
I.1 General	156
I.2 Modelling assumptions	156
I.3 Cylindrical surfaces	156
I.3.1 General	156
I.3.2 Vertical loads	157
I.3.3 Horizontal loads	159
I.3.4 Combined loads	159
I.4 Spherical surfaces	160
I.4.1 General	160
I.4.2 Effects of vertical loads	161
I.4.3 Effects of horizontal loads	162
I.5 Combined loads	162
Annex J (informative) λ-Factors for common isolator types	164
J.1 $\lambda_{\max}$- values for elastomeric isolators	164
J.2 $\lambda_{\max}$- values for sliding isolator units	165
Annex ZA (informative) Relationship of this European Standard with Regulation (EU) No.305/2011	167
Bibliography	177

European foreword

This document (EN 15129:2018) has been prepared by Technical Committee CEN/TC 340 “Anti-seismic devices”, the secretariat of which is held by UNI.

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 November 2018, and conflicting national standards shall be withdrawn at the latest by November 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.

This document supersedes EN 15129:2009.

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 Regulation 305/2011.

For relationship with EU Regulation 305/2011, see informative Annex ZA, which is an integral part of this document.

The main changes with respect to the previous edition are listed below:

- editorial revision;
- new subclause 10.1 AVCP;
- new Annex ZA.

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, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.