TECHNICAL SPECIFICATION

ISO/TS 22762-4

Second edition
2019-01

Elastomeric seismic-protection isolators —

Part 4: Guidance on the application of ISO 22762-3

Appareils d'appuis structuraux en élastomère pour protection sismique —

Partie 4: Lignes directrices pour l'application de l'ISO 22762-3

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

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This document was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 4, *Products (other than hoses)*.

This second edition cancels and replaces the first edition (ISO/TS 22762-4:2014), which has been technically revised.

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The main changes compared to the previous edition are as follows:

— the number of the pieces in Clause 6 has been amended;

— the temperature has been changed from 20 °C to 23 °C.

A list of all parts in the ISO 22762 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Elastomeric seismic-protection isolators —

Part 4:
Guidance on the application of ISO 22762-3

1 Scope

This document provides guidance on ISO 22762-3:2018. It includes examples of design calculations, and provides data on the characteristics obtained from all types of elastomeric isolators.

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.

ISO 22762-1:2018, *Elastomeric seismic-protection isolators — Part 1: Test methods*

ISO 22762-3:2018, *Elastomeric seismic-protection isolators — Part 3: Applications for buildings — Specifications*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22762-3:2018 apply.

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

ISO/TS 22762-4:2019

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Guidance on the use of Clause 4 of ISO 22762-3:2018

No guidance is given.

5 Guidance on the use of Clause 5 of ISO 22762-3:2018

No guidance is given.

6 Guidance on the use of Clause 6 of ISO 22762-3:2018

6.1 General

Guidance is given for 6.2, 6.4, and 6.5.

6.2 Type tests and routine tests

An example of the scaled test pieces (scales A and B) for the type testing of the specific isolator size is given as follows.

Dimensions and properties of target isolator (isolator-X) are shown in Table 1.

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Table 1 — Dimensions and properties of isolator-X

Outer diameter, d_o (mm)	1 000
Inner diameter, d_i (mm)	25
Thickness of one rubber layer, t_r (mm)	6,7
Thickness of reinforcing steel plate, t_s (mm)	4,4
Number of rubber layer, n	30
First shape factor, S_1	36,4
Second shape factor, S_2	5,0
Shear stiffness, K_h (N/mm × 10^3)	2,44
Equivalent damping ratio, h_{eq}	0,225
Compressive stiffness, K_v (N/mm × 10^3)	5 450

K_h and h_{eq} values are under shear strain of 100 %.

In this case, requirement for scales A and B test piece are shown in Table 4 of ISO 22762-3:2018.

Examples of dimensions and properties of scales A and B are shown in Table 2.

Table 2 — Examples of Scales A and B for Isolator-X

Characteristics	Scale A	Scale B
Scale	0,25	0,6
Outer diameter, d_o (mm)	250	600
Inner diameter, d_i (mm)	0 (6,3)	15
Thickness of one rubber layer, t_r (mm)	1,7	4,0
Thickness of reinforcing steel plate, t_s (mm)	1,2	2,2
Number of rubber layer, n	30	30
First shape factor, S_1	36,4	36,4
Second shape factor, S_2	5,0	5,0
Shear stiffness, K_h (N/mm × 10^3)	0,61	1,46
Equivalent damping ratio, h_{eq}	0,225	0,225
Compressive stiffness, K_v (N/mm × 10^3)	1 360	3 270

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For any dimension, variation of ± 5 % from exact scale-downed dimensions can be allowed.

The scaling of reinforcing plate for scale A can be adjusted if the effect on characteristics of isolator is not significant. In the case of scale A in Table 2, the thickness of the plate is computed as 1,1 mm and 1,2 mm is adopted for the test piece.

Number of the test pieces required is not specified in the text. The recommended number of the test pieces is shown in Table 3 when each test piece is tested individually. Table 3 is number of the test pieces for single-shear testing arrangement. In the case that double-shear testing arrangement is used for determining the shear properties, it is recommended that three tests are performed and the number of test pieces doubled.

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Table 3 — Recommended number of test pieces for each test item

Properties		Number of test pieces
Compressive properties		3
Shear properties		3
Dependency of shear properties	Shear strain dependence	3
	Compressive stress dependence	3
	Others	3
Dependency of compressive properties		3
Ultimate properties		3
Durability		2

In the case shown in Table 4, the available previous test results can be used for substitution of the test required for the newly designed isolator.

Table 4 — An example of available previous type test results: Comparison of characteristics between newly designed and previously tested isolator

Characteristics	Previously tested isolator	Newly designed isolator (–)	Newly designed isolator (+)	Remarks
Outer diameter, d_o (mm)	1 100	1 000	1 200	within ± 10 %
Inner diameter, d_i (mm)	25	25	27	within ± 10 %
Thickness of one rubber layer, t_r (mm)	7,0	6,7	7,5	within ± 10 %
Thickness of reinforcing plate, t_s (mm)	4,4	4,4	4,8	within ± 10 %
Number of rubber layer, n	30	30	30	same
First shape factor, S_1	38,4	36,4	42,0	within ± 10 %
Second shape factor, S_2	5,2	5,0	5,3	within ± 10 %
Maximum comp. stress for test, σ_{max} (MPa)	30	25	30	less than or equal to previous test
Minimum comp. stress for test, σ_{min} (MPa)	−0,5	0,5	5,0	more than previous test
Maximum shear strain for test, γ_{max}	3,5	3,0	3,2	less than previous test

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6.3 Functional requirements

No guidance is given.

6.4 Design compressive force and design shear displacement

Design compressive force refers to the force under non-seismic conditions.

Any specification or guidance is not given regarding nominal stress, σ_{nom}. Recommended process to specify σ_{nom} is given as follows:

a) σ_{nom} is determined in the range less than 30 % of critical stress, σ_{cr}. Maximum σ_{nom} is less than or equal to 15 MPa;

b) Adequacy of σ_{nom} is verified so that compressive stress dependency (change of shear property under 0,5 σ_{nom} and 2,0 σ_{nom}) is acceptable. Maximum σ_{nom} is less than or equal to 15 MPa.

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6.5 Performance requirements

6.5.1 General

No guidance is given.

6.5.2 Compressive properties

An example of HDR for 6.5.2 of ISO 22762-3:2018 on compressive properties is given.

a) Test piece and test conditions

Test piece is shown in Table 5.

Table 5 — Test piece

Type	Outer diameter mm	Inner diameter mm	First shape factor	Second shape factor	Compressive stress N/mm^2	Number of test isolator
HDR	700	15	36,4	5,0	12,0	1

Test conditions are given below:

— compressive stress amplitude: 12 MPa ± 30 %;

— number of cycles: 3 cycles;

— compressive stiffness, K_v, is computed from 3rd cycle.

b) Test results

The result for one type of HDR is shown in Figure 1 and Table 6.

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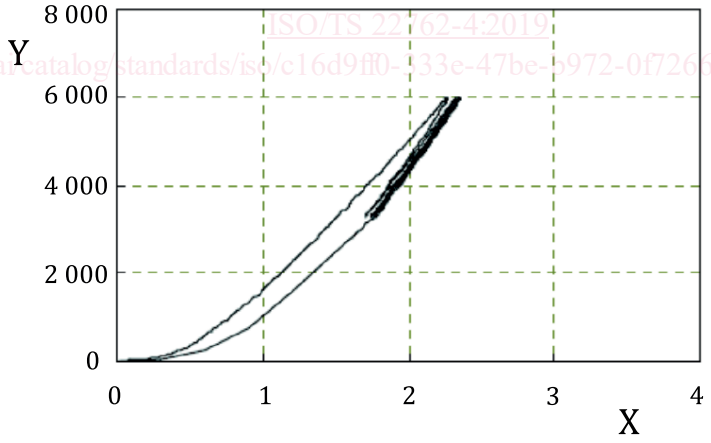

Key

X vertical disp. (mm)

Y vertical load (kN)

Figure 1 — Compressive property test of HDR

Table 6 — Test results

Characteristics	Test result
Compressive stiffness, K_v	4 592,0 kN/mm

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6.5.3 Shear properties

An example of HDR for 6.2.2 of ISO 22762-3:2018 on shear properties is given.

a) Test piece and test conditions

Test piece is shown in Table 7.

Table 7 — Test piece

Type	Outer diameter mm	Inner diameter mm	First shape factor	Second shape factor	Compressive stress N/mm^2	Number of test isolator
HDR	700	15	36,4	5,0	12,0	1

Test conditions are given below:

— test vibration frequency: 0,023 Hz, triangular wave;

— compressive stress: 12 MPa;

— shear strain amplitude: ± 100 % (141 mm);

— number of cycles: 3 cycles;

— shear stiffness, K_h, and damping ratio, h_{eq}, are computed from 3rd cycle;

— test results were corrected to their counterpart with 0,33 Hz by the specified method in ISO 22762-3:2018, 6.5.5.3;

— test results were corrected to the corresponding value of the property at 23 °C by the specified method in ISO 22762-3:2018, 6.5.5.5.

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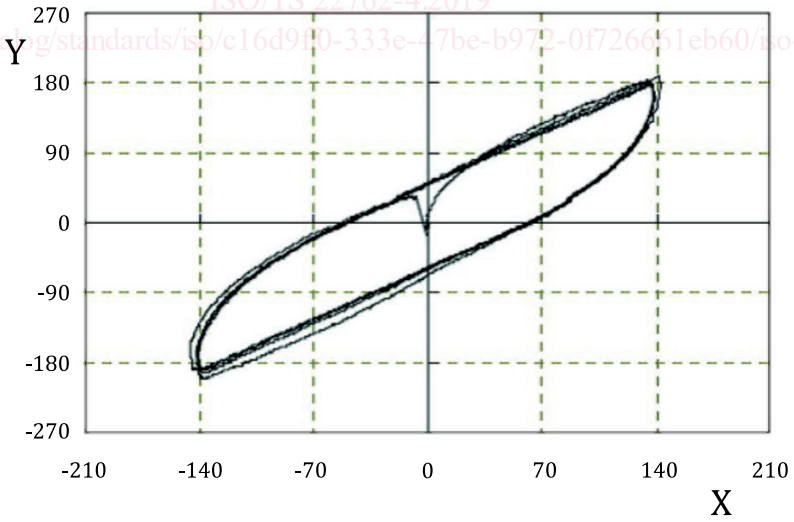
The results for one type of HDR are shown in Figure 2 and Table 8.



Key

X horizontal disp. (mm)

Y horizontal load (kN)

Figure 2 — Shear property test of HDR

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Table 8 — Test results

Characteristics	Test results
Shear stiffness, K_h	4 592,0 kN/mm
Equivalent damping ration, h_{eq}	0,21

6.5.4 Tensile properties

6.5.4.1 In case of LNR

Examples of LNR for 6.5.4 of ISO 22762-3:2018 on shear properties are given.

a) Test pieces and test conditions

Test pieces are shown in Table 9.

Table 9 — Test pieces

Type	Outer diameter mm	S_1	S_2
LNR	500	32,0	5,1
	800	31,7	5,1

b) Test results

Test results are shown in Figures 3 a) and b) and Table 10.

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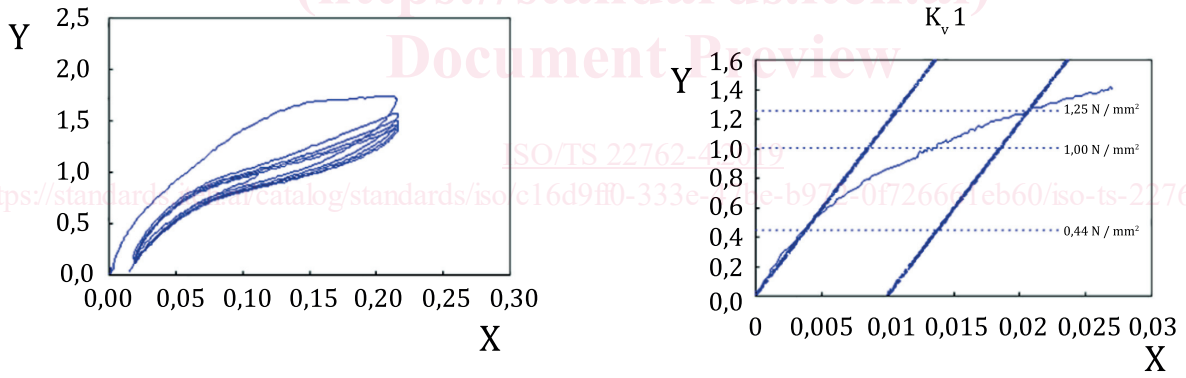

a) Relationship of tensile stress and tensile strain of LNR under shear-strain offset of 100 %

b) Measurement of tensile yield stress

Key

X tensile strain ε

Y tensile stress (N/mm^2)

Figure 3 — Tensile performance at γ = 100 % (sample: LNR-D500)

Table 10 — Test results

Outer diameter mm	Tensile yield stress under shear strain of 100 % MPa
500	1,25
800	1,19

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6.5.4.2 In case of HDR

Examples of HDR for 6.5.4 of ISO 22762-3:2018 on shear properties are given.

a) Test pieces and test conditions

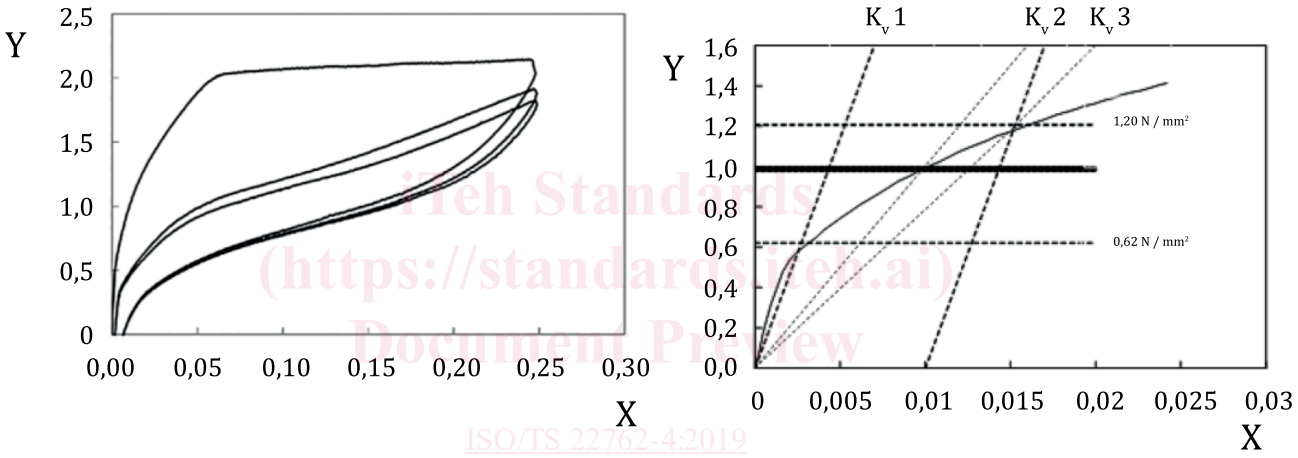
Test pieces are shown in Table 11.

Table 11 — Test pieces

Type	Outer diameter mm	S_1	S_2
HDR	800	36,1	4,0
	600	36,6	3,0

b) Test results

Test results are shown in Figures 4 a) and b) and Table 12.



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a) Relationship of tensile stress and tensile strain of HDR under shear-strain offset of 100 %

b) Measurement of tensile yield stress

Key

X tensile strain ε

Y tensile stress (N/mm^2)

Figure 4 — Tensile performance at γ = 100 % (sample: HDR-D500)

Table 12 — Test results

Outer diameter mm	Tensile yield stress under shear strain of 100 % MPa
800	1,2
600	1,4

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