

PD ISO/TS 22762-4:2014



BSI Standards Publication

Elastomeric seismic-protection isolators

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

bsi.

...making excellence a habit.
AVA Documents™
Document Sharing Hub

National foreword

This Published Document is the UK implementation of ISO/TS 22762-4:2014.

The UK participation in its preparation was entrusted to Technical Committee PRI/73, Industrial rubber products.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2014.
Published by BSI Standards Limited 2014

ISBN 978 0 580 80828 9
ICS 83.140.99; 91.120.25

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 July 2014.

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

TECHNICAL SPECIFICATION

ISO/TS 22762-4

First edition
2014-07-15

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



Reference number
ISO/TS 22762-4:2014(E)

AVA Documents
Document Sharing Hub
© ISO 2014



COPYRIGHT PROTECTED DOCUMENT

© ISO 2014

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Guidance on the use of Clause 4 of ISO 22762-3	1
5 Guidance on the use of Clause 5 of ISO 22762-3	1
6 Guidance on the use of Clause 6 of ISO 22762-3	1
6.1 General	1
6.2 Type tests and routine tests	1
6.3 Functional requirements	3
6.4 Design compressive force and design shear displacement	3
6.5 Performance requirements	4
7 Guidance on the use of Clause 7 of ISO 22762-3	24
7.1 General	24
7.2 Compressive stiffness	24
8 Guidance on the use of Clause 8 of ISO 22762-3	31
9 Guidance on the use of Clause 9 of ISO 22762-3	31
10 Guidance on the use of Clause 10 of ISO 22762-3	31
11 Guidance on the use of Clause 11 of ISO 22762-3	31

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 4, *Products (other than hoses)*.

ISO 22762 consists of the following parts, under the general title *Elastomeric seismic-protection isolators*:

- *Part 1: Test methods*
- *Part 2: Applications for bridges — Specifications*
- *Part 3: Applications for buildings — Specifications*
- *Part 4: Guidance on the application of ISO 22762-3 [Technical Specification]*

Elastomeric seismic-protection isolators —

Part 4:

Guidance on the application of ISO 22762-3

1 Scope

This Technical Specification provides guidance on the use of ISO 22762-3:2010. It includes example design calculations and provides data on the characteristics obtained from all types of elastomeric isolators.

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.

ISO 22762-1:2010, *Elastomeric seismic-protection isolators — Part 1: Test methods*

ISO 22762-3:2010, *Elastomeric seismic-protection isolators — Part 3: Applications for buildings — Specifications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 22762-3:2010 apply.

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

No guidance is given.

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

No guidance is given.

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

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](#).

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 $\times 10^3$)	2,44
Equivalent damping ratio, h_{eq}	0,225
Compressive stiffness, K_v (N/mm $\times 10^3$)	5 450

In this case, requirement for scales A and B test piece are shown in Table 4 of ISO 22762-3:2010.

An example of dimensions and properties of scales A and B is 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 $\times 10^3$)	0,61	1,46
Equivalent damping ratio, h_{eq}	0,225	0,225
Compressive stiffness, K_v (N/mm $\times 10^3$)	1 360	3 270

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. In the case that double-shear testing arrangement is used for determining the shear properties, it is recommended that two tests are performed and the number of test pieces doubled.

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

Properties		Number of test pieces
Compressive properties		2
Shear properties		2
Dependency of shear properties	Shear strain dep.	2
	Compressive stress dep.	2
	Others	1
Dependency of compressive properties		1
Ultimate properties		1
Durability		1

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, $\sigma_{\max}$ (MPa)	30	25	30	Previous test more severe condition
Minimum comp. stress for test, $\sigma_{\min}$ (MPa)	-0,5	5,0	0,5	Previous test more severe condition
Maximum shear strain for test, $\gamma_{\max}$	3,5	3,0	3,2	Previous test more severe condition

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:

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

6.5 Performance requirements

Examples of tests for each requirement are introduced.

6.5.1 General

No guidance is given.

6.5.2 Compressive properties

Example for 6.5.2 of ISO 22762-3 on compressive properties is given.

6.5.2.1 In case of HDR

a) Test piece and test conditions

Test piece is shown in [Table 5](#).

Table 5 — Test isolators (scaled isolator)

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 $\pm$ 30 %;
- number of cycles: 3 cycles;
- compressive stiffness, K_v , is computed from 3rd cycle.

b) Test result

The result for one type of HDR is plotted in [Figure 1](#) and [Table 6](#).

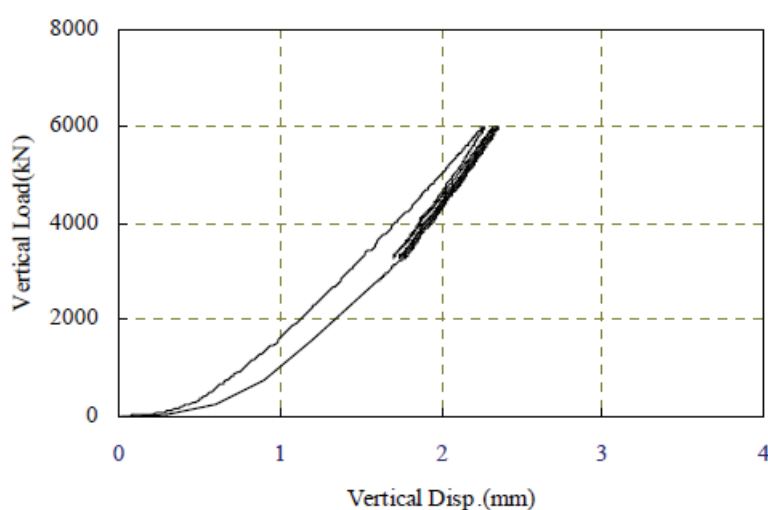


Figure 1 — Compressive property test of HDR

Table 6 — Test results

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

6.5.3 Shear properties

Example for 6.2.2 of ISO 22762-3 on shear properties is given.

6.5.3.1 In case of HDR

a) Test piece and test conditions

Test piece is shown in [Table 7](#).

Table 7 — Test isolators (scaled isolator)

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: 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.

b) Test results

The result for one type of HDR is shown in [Figure 2](#) and [Table 8](#).

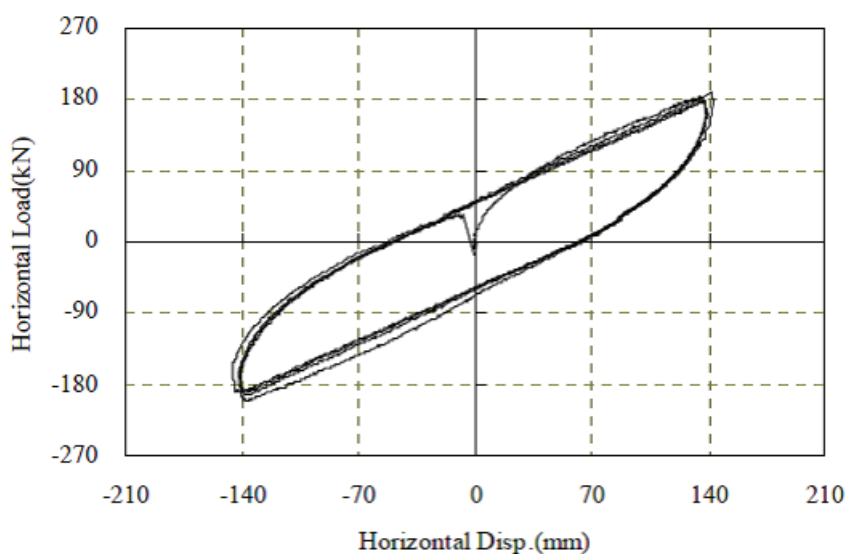


Figure 2 — Shear property test of HDR

Table 8 — Test piece

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

6.5.4 Tensile properties

Example for 6.5.4 of ISO 22762-3 on shear properties is given.

6.5.4.1 In case of LNR

a) Test piece and test conditions

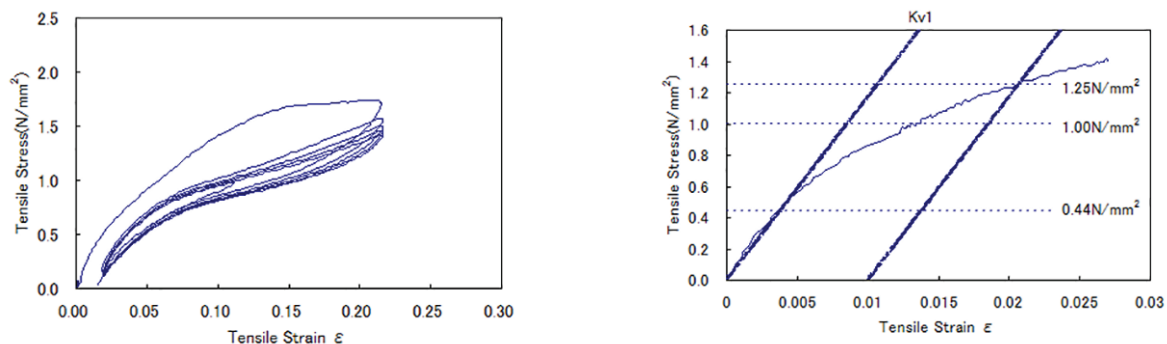
Test pieces are shown in [Table 9](#).

Table 9 — Test piece

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](#).



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

b) measurement of tensile yield stress

Figure 3 — Tensile performance at $\gamma = 100 \%$

Table 10 — Test results

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

6.5.4.2 In case of HDR

a) Test piece and test conditions