
**Flexible cellular polymeric materials —
Polyurethane foam for load-bearing
applications excluding carpet underlay —
Specification**

*Matériaux polymères alvéolaires souples — Mousse de polyuréthane
pour utilisations soumises à des charges, à l'exclusion des revers de
tapis — Spécifications*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 5999:2007](#)

<https://standards.iteh.ai/catalog/standards/sist/99642bc1-2840-4a2b-9628-308956d7c418/iso-5999-2007>



PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 5999:2007](#)

<https://standards.iteh.ai/catalog/standards/sist/99642bc1-2840-4a2b-9628-308956d7c418/iso-5999-2007>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2007

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing 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 Classification.....	2
3.1 Type.....	2
3.2 Class	2
3.3 Grade.....	6
4 Material	7
5 Construction.....	7
6 Surface condition.....	7
7 Odour	7
8 Colour	7
9 Component mass and density.....	7
10 Dimensions.....	8
11 Physical and chemical requirements.....	8
12 Burning characteristics.....	10
13 Test methods.....	10
13.1 Test conditions.....	10
13.2 Density	10
13.3 Hardness.....	10
13.4 Resilience	10
13.5 Compression set.....	11
13.6 Dynamic fatigue by constant-load pounding.....	11
13.7 Tensile strength and elongation at break	11
13.8 Burning behaviour.....	11
13.9 Heat ageing.....	11
13.10 Humidity ageing	11
14 Marking	11
Annex A (informative) Typical applications for each class of material	12
Annex B (informative) Burning properties of flexible polyurethane foam and recommendations regarding its use	13
Annex C (informative) Main details of revision	15

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 5999 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 5999:1982), which has been technically revised (for the main details, see Annex C).

iTeh STANDARD PREVIEW
(standards.iteh.ai)
<https://standards.iteh.ai/catalog/standards/sist/99642bc1-2840-4a2b-9628-308956d7c418/iso-5999-2007>

Flexible cellular polymeric materials — Polyurethane foam for load-bearing applications excluding carpet underlay — Specification

1 Scope

This International Standard specifies requirements for flexible load-bearing polyurethane foam of the polyether type.

It is applicable to flexible polyurethane cellular materials manufactured in block, sheet and strip form, in moulded and fabricated shapes, and as reconstituted material, used for load-bearing applications in general, but excluding carpet backing and underlay. It thus primarily relates to the quality of polyurethane foam used for comfort cushioning purposes.

The foam is classified according to performance during a fatigue test, indentation hardness index being used as a secondary means of grading the material.

This International Standard is not applicable to polyurethane foams foamed in place or to foams for use in heat-welded systems unless for load-bearing purposes.

Recommended applications for the range of flexible polyurethane foams covered by this International Standard are listed in Annex A.

2 Normative references

The following referenced documents are indispensable for the application 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 845, *Cellular plastics and rubbers — Determination of apparent density*

ISO 1798, *Flexible cellular polymeric materials — Determination of tensile strength and elongation at break*

ISO 1856, *Flexible cellular polymeric materials — Determination of compression set*

ISO 2439:1997, *Flexible cellular polymeric materials — Determination of hardness (indentation technique)*

ISO 2440, *Flexible and rigid cellular polymeric materials — Accelerated ageing tests*

ISO 3385, *Flexible cellular polymeric materials — Determination of fatigue by constant-load pounding*

ISO 3582, *Flexible cellular polymeric materials — Laboratory assessment of horizontal burning characteristics of small specimens subjected to a small flame*

ISO 3795, *Road vehicles, and tractors and machinery for agriculture and forestry — Determination of burning behaviour of interior materials*

ISO 8307, *Flexible cellular polymeric materials — Determination of resilience by ball rebound*

ISO 23529, *Rubber — General procedures for preparing and conditioning test pieces for physical test methods*

3 Classification

3.1 Type

For the purpose of this International Standard, flexible polyurethane foams are classified in accordance with Table 1.

Table 1 — Types of foam

Type		Description of foam
I	LB	Block foam, slabstock or contour cut [low resilience (known as “viscoelastic”)]
	MB	Block foam, slabstock or contour cut (conventional)
	HB	Block foam, slabstock or contour cut (high resilience)
II	LM	Moulded [low resilience (known as “viscoelastic”)]
	MM	Moulded (conventional)
	HM	Moulded (high resilience)
III	RE	Reconstituted or bonded

3.2 Class

3.2.1 Materials of the above types (except type RE) are subdivided into five classes based on performance in the constant-load pounding test described in ISO 3385.

3.2.2 The five classes, their intended types of service and their intended hardness loss ratio are given in Table 2.

<https://standards.iteh.ai/catalog/standards/sist/99642bc1-2840-4a2b-9628-308956d7c418/iso-5999-2007>

Table 2 — Classes and intended types of service

Class	Type of service	Hardness loss ratio %
X	Exceptionally severe	0 to 12
V	Very severe	12 to 22
S	Severe	22 to 32
A	Average	32 to 39
L	Light	39 to 45

NOTE The hardness loss ratio is calculated from the following equation:

$$P = \frac{H - F}{H} \times 100$$

where

- P* is the hardness loss ratio (%);
- H* is the initial hardness index (N);
- F* is the final hardness index (N).

3.2.3 Classes X, V, S, A and L are defined by the indentation hardness loss over the range of hardness index values from 0 N to 650 N, as shown in Figures 1 and 2, provided that the requirements for physical properties specified in Table 7 are met.

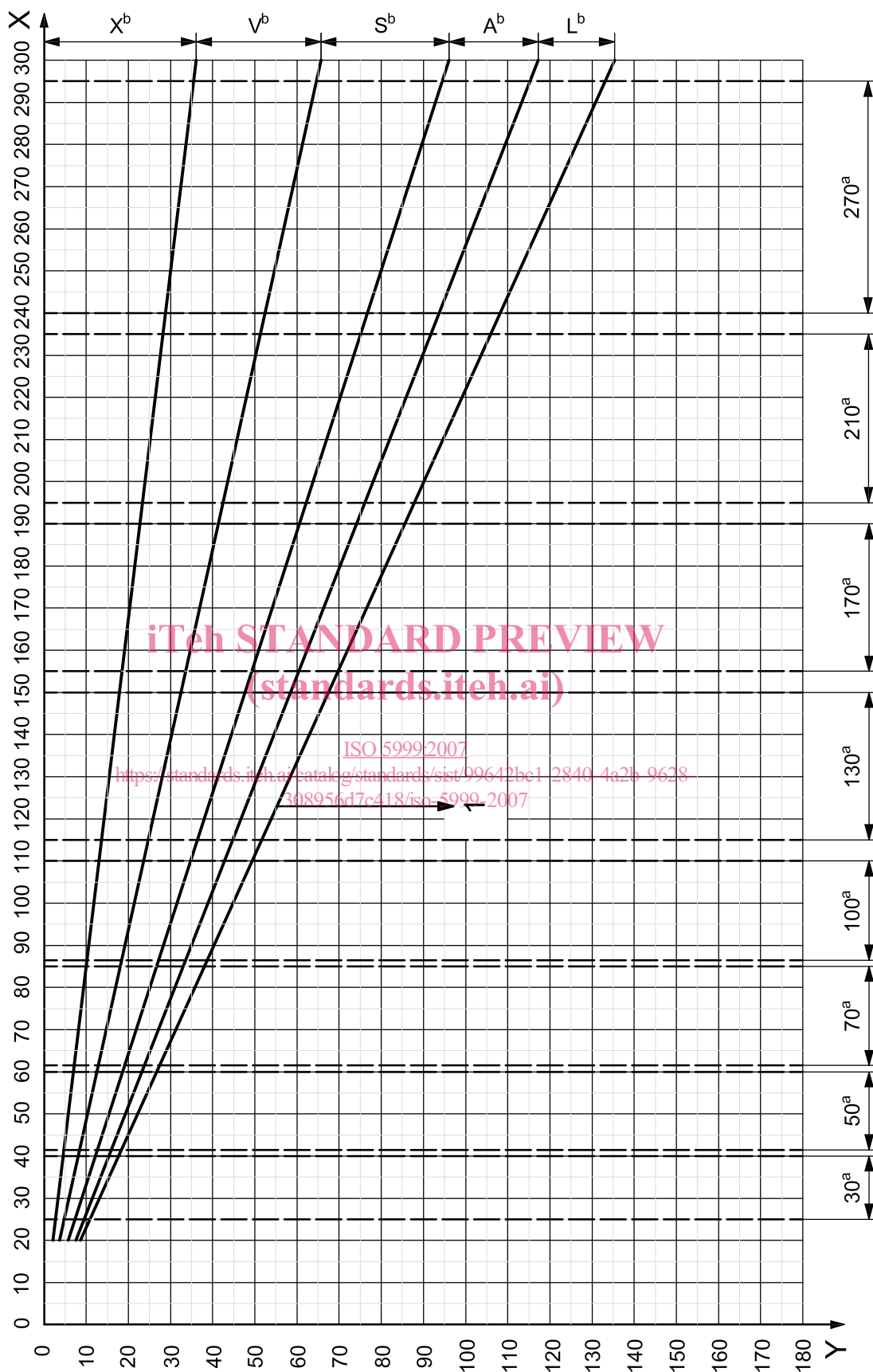


Figure 1 (continued)

Key

X initial indentation hardness index (N)

Y indentation hardness loss (N)

1 below lowest line, material does not comply with this International Standard

^a Hardness index grades.

^b Classes of material.

Figure 1 — Fatigue classes and indentation hardness index grades — Low hardness values

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO 5999:2007](https://standards.iteh.ai/catalog/standards/sist/99642bc1-2840-4a2b-9628-308956d7c418/iso-5999-2007)

<https://standards.iteh.ai/catalog/standards/sist/99642bc1-2840-4a2b-9628-308956d7c418/iso-5999-2007>

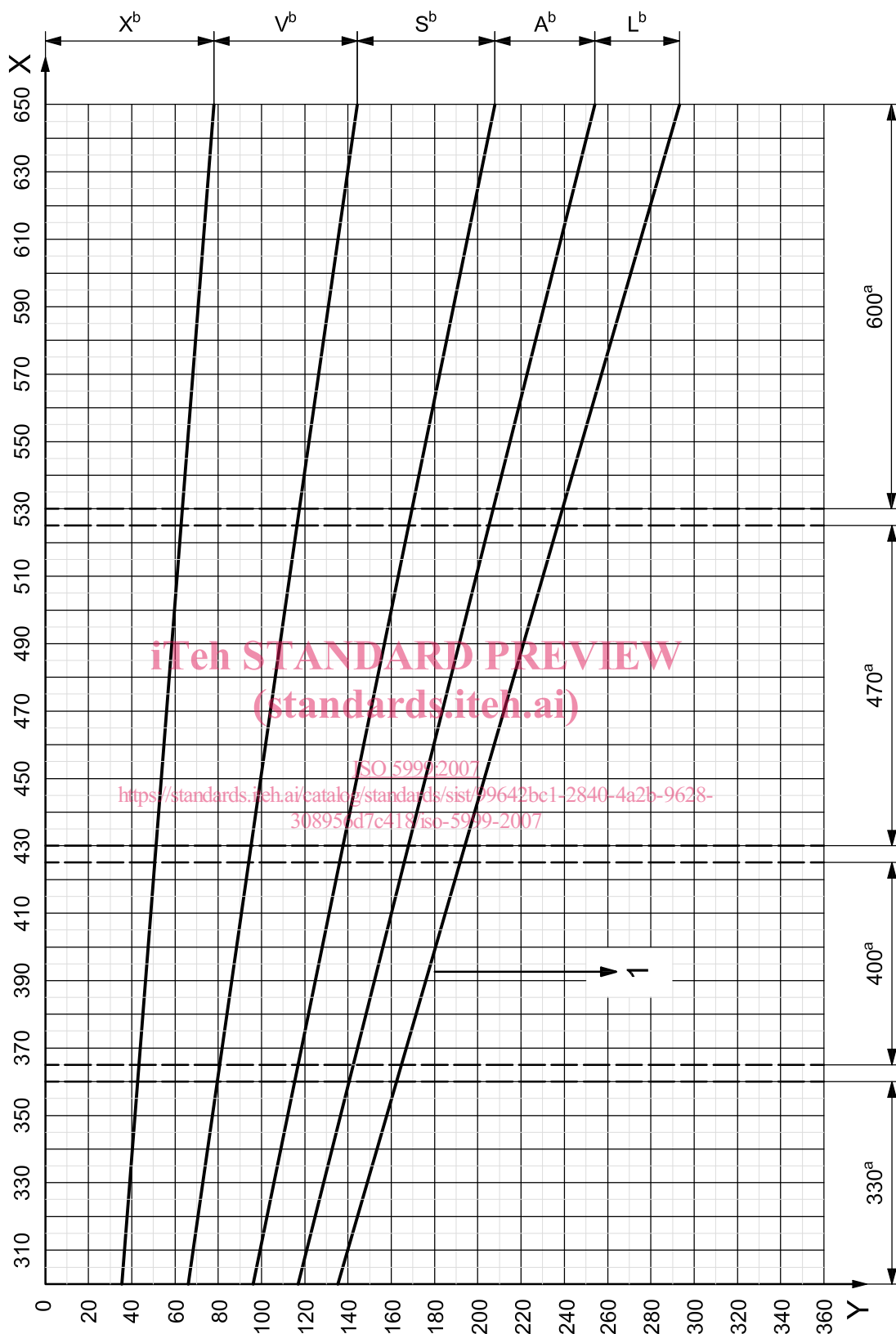


Figure 2 (continued)

Key

- X initial indentation hardness index (N)
- Y indentation hardness loss (N)
- 1 below lowest line, material does not comply with this International Standard
- ^a Hardness index grades.
- ^b Classes of material.

NOTE 1 Class A and class L materials may not be available at all high hardness levels.

NOTE 2 Reconstituted foam (type RE), because of its good fatigue properties combined with poorer compression set, tensile strength and elongation at break properties, is specified separately in Table 8. It is generally used as thin, firm padding or to provide reinforcement for the other foams.

Figure 2 — Fatigue classes and indentation hardness index grades — High hardness values

3.2.4 As an example, a material of initial hardness indentation index 140 N, with an indentation hardness loss between 0 N and 17 N, is a class X material, with a hardness loss between 17 N and 31 N is a class V material, with a hardness loss between 31 N and 45 N is a class S material, with a hardness loss between 45 N and 55 N is a class A material, and with a hardness loss between 55 N and 63 N is a class L material, provided, in all cases, that the other property levels are achieved.

3.2.5 Any material having an indentation hardness index of 140 N and a hardness loss greater than 63 N does not comply with the requirements of this International Standard.

3.3 Grade

Polyurethane foams are further graded by indentation hardness index, as determined by the method described in ISO 2439, in accordance with Table 3.

Table 3 — Grading by indentation hardness index

Grade	Indentation hardness index
	N
30	25 to 40
50	41 to 60
70	61 to 85
100	86 to 110
130	115 to 150
170	155 to 190
210	195 to 235
270	240 to 295
330	300 to 360
400	365 to 425
470	430 to 520
600	525 to 650

NOTE It may not be possible to manufacture foam falling into all these grades in each of the material classes. To control the hardness of foam to within the above grades, selection of material may be necessary, since the typical variation of the hardness of foam within and between production runs can be of the order of ± 16 %.

4 Material

Flexible polyurethane foam shall consist of a network of cells which are essentially open and interconnecting. It shall be free from abnormalities that are likely to adversely affect its performance.

5 Construction

5.1 Flexible polyurethane foams may be supplied in block, sheet or strip form, or in moulded or fabricated shapes, which may be cavities or profiled.

5.2 Depending on the manufacturing conditions, the material may have to be corrected or repaired. Repaired or corrected material shall be considered to comply with this International Standard if the foam used in such repairs or corrections is of the same composition and quality as the original product and provided that such corrections do not adversely affect performance or alter the size and shape beyond the tolerances agreed upon between the purchaser and the supplier.

5.3 When components are repaired, corrected or fabricated, any adhesives used shall be such as to be non-injurious to the foam, and the resulting bonds shall be at least as strong as the foam itself.

5.4 The area of the bond should be sufficient to withstand the service conditions, and a thin overlay should be bonded over a large enough area to prevent rucking or wrinkling in service.

6 Surface condition

There shall be no loose skin on agreed significant surfaces. Mould parting marks and other surface blemishes shall be no worse than those on standard initial samples agreed upon between the purchaser and the supplier.

[ISO 5999:2007](https://standards.iteh.ai/catalog/standards/sist/99642bc1-2840-4a2b-9628-308956d7c418/iso-5999-2007)

<https://standards.iteh.ai/catalog/standards/sist/99642bc1-2840-4a2b-9628-308956d7c418/iso-5999-2007>

7 Odour

The odour of the foam shall not be objectionable.¹⁾

8 Colour

The colour shall be as agreed upon between the purchaser and the supplier.

9 Component mass and density

9.1 The mass of a component, when required, shall be as agreed upon between the purchaser and the supplier, with a tolerance of $\pm 15\%$, unless otherwise stated.

9.2 The density of a component, when required, shall be as agreed upon between the purchaser and the supplier, with a tolerance of $\pm 15\%$, unless otherwise stated. The density shall be determined by the method indicated in 13.2.

1) Tests for odour have been investigated, but none has yet been found to be of practical use in this context.