
**Flexible cellular polymeric materials —
Sponge and expanded cellular rubber
products — Specification —**

**Part 2:
Mouldings and extrusions**

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*Polymères alvéolaires souples — Caoutchoucs alvéolaires mousses et
souples — Spécification*

Partie 2: Moulage et extrusion

ISO 6916-2:2001

<https://standards.iteh.ai/catalog/standards/sist/3e774636-911e-4c93-b349-58ee9795ad4/iso-6916-2-2001>



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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 part of ISO 6916 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 6916-2 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*, Subcommittee SC 4, *Products (other than hoses)*.

ISO 6916 consists of the following parts, under the general title *Flexible cellular polymeric materials — Sponge and expanded cellular rubber products — Specification*:

— *Part 1: Sheetting*

[ISO 6916-2:2001](https://standards.iteh.ai/catalog/standards/sist/3e774636-911e-4c93-b349-58ee9795ad4/iso-6916-2-2001)

— *Part 2: Mouldings and extrusions*

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Annexes A to G form a normative part of this part of ISO 6916.

Flexible cellular polymeric materials — Sponge and expanded cellular rubber products — Specification —

Part 2: Mouldings and extrusions

WARNING — Persons using this part of ISO 6916 should be familiar with normal laboratory practice. This part of ISO 6916 does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

1 Scope

This part of ISO 6916 classifies flexible cellular rubber products known as sponge and expanded rubber. The base material used in their manufacture may be natural rubber, reclaimed rubber, synthetic rubber or rubber-like material, either alone or in combination. Thermoplastic rubbers are not included. This part of ISO 6916 does not apply to latex foam rubbers or shoe soling.

Sheeting materials are covered by ISO 6916-1. This part (part 2) covers vulcanized cellular rubber products that are manufactured by a moulding or continuous vulcanization process, i.e. hot air, microwave, infra-red, liquid curing medium (LCM), shearing-head vulcanization or a combination of two or more of these methods.

In the case of conflict between the provisions of this part of ISO 6916 and those of the detailed specification or test method for a particular product, the latter shall take precedence. Reference to the methods shall specifically state the desired test or tests.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 6916. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 6916 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 188:1998, *Rubber, vulcanized and thermoplastic — Accelerated ageing and heat resistance tests*

ISO 815:1991, *Rubber, vulcanized or thermoplastic — Determination of compression set at ambient, elevated or low temperatures*

ISO 1431-1:1989, *Rubber, vulcanized or thermoplastic — Resistance to ozone cracking — Part 1: Static strain test*

ISO 1817:1999, *Rubber, vulcanized — Determination of the effect of liquids*

ISO 1923:1981, *Cellular plastics and rubbers — Determination of linear dimensions*

ISO 3865:1997, *Rubber, vulcanized or thermoplastic — Methods of test for staining in contact with organic material*

ISO 5893:—¹⁾, *Rubber and plastics test equipment — Tensile, flexural and compression types (constant rate of traverse) — Specification*

NOTE In some of the test methods referenced in this clause, the apparatus but not the procedure is used.

3 Classification (types, classes, grades and suffixes)

3.1 Types

Three types are specified, as follows:

- Type 1:** open-cell rubber
- Type 2:** closed-cell rubber
- Type 3:** self-skinned cellular rubber

3.2 Classes

Each type is divided into four classes designated by the letters A, B, C and D (for example type 1B), as follows:

- Class A:** Cellular rubbers made from natural rubber, where specific resistance to the action of petroleum-based oils is not required
- Class B:** Cellular rubbers having specific requirements for oil resistance with low swell
- Class C:** Cellular rubbers having specific requirements for oil resistance with medium swell
- Class D:** Cellular rubbers made from synthetic rubber or rubber-like materials, either alone or in combination, having specific requirements for both low- and high-temperature resistance (–75 °C to +250 °C), but where specific resistance to the action of petroleum-based oils is not required

3.3 Grades

Each class is divided into six different grades based on a specific range of firmness as expressed by compression deflection determined as described in annex B. Grades are designated by a digit (0 to 6), with the softer grades being identified with the lower numbers and the harder grades with the higher numbers:

- Grade 0:** For type 1 cellular rubbers only, a compression deflection range of 2,5 kPa to 15,0 kPa
- Grade 1:** For type 1 and 2 cellular rubbers, a compression deflection range of 15,1 kPa to 35,0 kPa
- Grade 2:** For type 1 and 2 cellular rubbers, a compression deflection range of 35,1 kPa to 65,0 kPa
- Grade 3:** For type 1 and 2 cellular rubbers, a compression deflection range of 65,1 kPa to 95,0 kPa
- Grade 4:** For type 1 and 2 cellular rubbers, a compression deflection range of 95,1 kPa to 125,0 kPa
- Grade 5:** For type 1 and 2 cellular rubbers, a compression deflection range of 125,1 kPa to 200,0 kPa
- Grade 6:** For type 1 and 2 cellular rubbers, a compression deflection range of 200,1 kPa to 300,0 kPa

1) To be published. (Revision of ISO 5893:1993)

3.4 Suffixes

3.4.1 Suffix letters

Suffix letters may be added singly or in combination after any grade number to indicate additional requirements beyond those specified in Tables 1 to 3 as basic requirements. The significance of the approved suffix letters is shown in Table 4.

3.4.2 Suffix numbers

Each suffix letter should preferably be followed by a suffix number. The suffix number indicates the particular test conditions. The test duration is part of the method and is taken from the listing in Table 5.

NOTE Products meeting requirements defined to the suffix number level should conform with national and supra-national health and safety regulations.

4 Material and workmanship

4.1 Cellular rubbers produced to this part of ISO 6916 shall be manufactured from natural rubber, synthetic rubber, reclaimed rubber or rubber-like material, together with added compounding ingredients of such nature and quality that the product complies with the requirements of this part of ISO 6916.

4.2 In permitting choice in the use of materials, it is not intended to imply that the resulting different rubber materials are equivalent in respect of all physical properties. Any special characteristics other than those specified in this part of ISO 6916 that may be desired for a specific application shall be detailed in the particular product specification. All materials and workmanship shall be in accordance with good commercial practice, and the resulting cellular rubbers shall be free from defects affecting serviceability.

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5 Physical properties

The various types, classes and grades of cellular rubber shall conform to the physical-property requirements given in Tables 1 to 3, together with any additional requirements indicated by any suffix letter as described in Table 4 and any suffix number given in the designation as described in 3.4.

6 Methods of test

6.1 Unless specifically stated otherwise, all tests shall be carried out in accordance with the methods specified in the annexes to this part of ISO 6916.

6.2 Test pieces shall not be tested for at least 72 h after manufacture. Prior to testing, the test pieces shall be stored for at least 16 h at either $(23 \pm 2) ^\circ\text{C}$ and $(50 \pm 5) \%$ relative humidity or $(27 \pm 2) ^\circ\text{C}$ and $(65 \pm 5) \%$ relative humidity. This period may form the latter part of the period following manufacture.

7 Dimensional tolerances

The tolerances allowable on the dimensions of cellular rubber in moulded and extruded form shall be as specified in Table 6.

8 Inspection and rejection

8.1 All tests and inspections shall be made at the place of manufacture prior to shipment, unless otherwise specified. The manufacturer shall afford the inspector all reasonable facilities for tests and inspections.

8.2 The purchaser may carry out the tests and inspections governing acceptance or rejection of the material at his own laboratory or elsewhere. Such tests and inspections shall be made not later than 15 days after receipt of the material.

8.3 All test pieces prepared as specified in clause 11 shall be visually inspected to determine compliance with the material, workmanship and colour requirements.

8.4 Any material that fails one or more of the test requirements may be re-tested. For this purpose, two additional tests shall be made for the requirement for which failure occurred. Failure of either of the re-tests shall be cause for final rejection.

8.5 Rejected material shall be disposed of as directed by the manufacturer.

9 Packaging and marking

The material shall be properly and adequately packaged. Each package or container shall be legibly marked with the name of the material, the name or trademark of the manufacturer, and any required purchaser's designations.

10 Sampling

10.1 When possible, the complete finished product shall be used for the tests specified. Representative samples of the lot being examined shall be selected at random as required.

10.2 When it is necessary or advisable to obtain test pieces from the article, as in those cases where the finished product is not required or suitable for testing, the method of cutting and the exact position from which test pieces are to be taken shall be specified. The apparent density and the state of cure may vary in different parts of the finished product, especially if the article is of complicated shape or of varying thickness, and these factors will affect the physical properties of the test pieces. Also, the apparent density is affected by the number of cut surfaces as opposed to the number of skin-covered surfaces on the test piece.

10.3 When the finished product does not lend itself to testing or to the preparation of test pieces because of its complicated shape, its small size, the presence of metal or fabric inserts, the presence of surface skins, a tendency to adhere to metal, or for other reasons, standard test sheets shall be prepared. When differences in test values arise due to the difficulty in obtaining suitable test pieces from the finished product, manufacturer and purchaser may agree on acceptable deviations. This can be done by comparing results obtained with standard test pieces and those obtained on actual products.

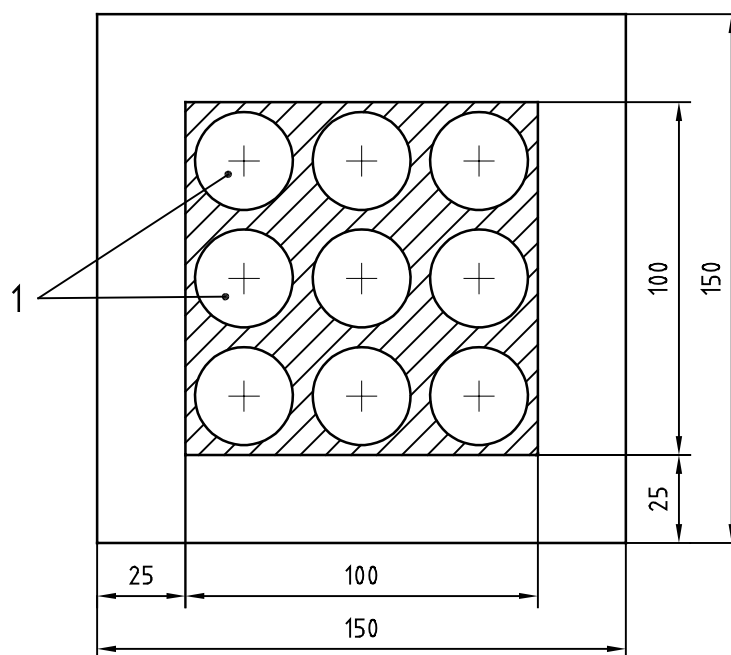
11 Standard test pieces, standard test sheets and specially prepared extruded shapes

11.1 Standard test pieces

Standard test pieces shall be discs, cut out with a die, either $(30^{+0,04})$ mm or $(19^{+0,04})$ mm in diameter and at least $(6^{+0,5})$ mm thick. The test pieces may be cut out with a revolving die using a soap solution as a lubricant. If a lubricant is used, the test pieces shall be thoroughly dried before proceeding with testing. In some cases, it may be necessary to freeze the cellular rubber to obtain parallel cut edges. When cut from standard test sheets, the test pieces shall be cut from the central area as shown in Figure 1. The exact dimensions of the test pieces shall be measured as specified in clause 12. Plyed-up test pieces may be used as indicated in the test methods for compression deflection and compression set.

NOTE Where available material widths are too small to allow standard test pieces to be cut, then smaller-diameter discs may be used. Test results obtained on smaller discs may not be the same as on standard test pieces.

Dimensions in millimetres

**Key**

- 1 Nine holes, diameter 30 mm, with centres spaced 33,3 mm apart

Figure 1 — Locations from which standard test pieces are to be cut when preparing them from standard test sheets or commercial sheets

11.2 Standard test sheets

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11.2.1 Standard test sheets for all types of cellular rubber shall be (150 ± 5) mm square and $(12,5 \pm 0,5)$ mm in thickness, made from the same compound and having the same apparent density and state of cure as the product they represent. In all cases, the surface skin shall be left intact on both top and bottom faces of the test sheet. Standard test sheets shall be prepared either by cutting them from commercial sheets of the specified thickness or as described in 11.2.2 or 11.2.3.

11.2.2 When specially prepared standard test sheets of sponge rubber are required, they shall be made using the frame shown in Figure 2 together with top and bottom plates each approximately 12,5 mm in thickness. The frame and plates shall be made of aluminium or steel. The compound shall be cut into squares slightly smaller than the frame cavities. The thickness shall be such as to give the required apparent density when the material is blown during cure to fill the moulding cavities. The squares of compound shall be dusted with talc and the excess brushed off to avoid pitting. They shall then be placed in the frame, and fabric sheeting shall be applied on the top and bottom between the frame and the plates to allow venting of gases produced during curing. This fabric shall be a commercial sheet with a mass per unit area of approximately 135 g/m^2 and having approximately 2,75 ends/mm and 2,36 picks/mm. The sheets shall be vulcanized in a platen press under conditions of time and temperature chosen to produce the same state of cure in the standard sheets as in the finished products that they represent.

11.2.3 Where specially prepared standard test sheets of expanded rubber are required, such test sheets shall be prepared to have approximately the same density and shall be vulcanized under conditions of time and temperature chosen to produce the same state of cure as in the finished products that they represent.

12 Measurement of test piece dimensions

The dimensions of all test pieces shall be measured in accordance with ISO 1923.

Dimensions in millimetres

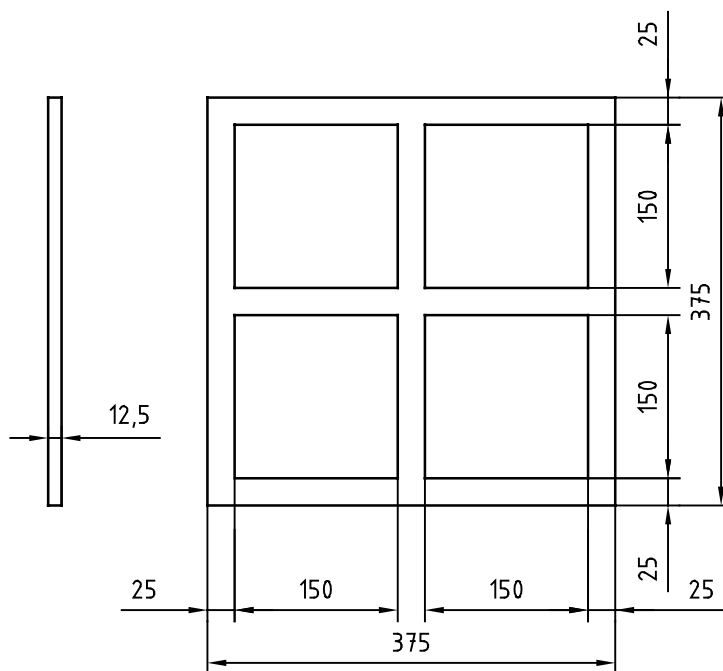


Figure 2 — Four-cavity frame for standard test sheets of cellular rubbers

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Table 1 — Physical requirements for type 1 cellular rubbers [open-cell (sponge) rubbers]

Basic requirements							
Grade No.	Compression deflection at 25 % Deflection at (23 ± 2) °C or (27 ± 2) °C kPa (limits)	Compression deflection after conditioning — Change from original value			Compression set under constant deflection of 50 %		Oil resistance 22 h at (70 ± 1) °C Change in volume in ISO 1817 oil No. 3 % (limits)
		168 h at (70 ± 1) °C	22 h at (150 ± 2) °C	5 h at (-55 ± 2) °C	22 h at (70 ± 1) °C	22 h at (100 ± 1) °C	
Class A, non-oil-resistant							
1A0	2,5 to 15	± 20 ^a	—	25	15	—	—
1A1	15,1 to 35	± 20	—	25	15	—	—
1A2	35,1 to 65	± 20	—	25	15	—	—
1A3	65,1 to 95	± 20	—	25	15	—	—
1A4	95,1 to 125	± 20	—	25	15	—	—
1A5	125,1 to 200	± 20	—	25	15	—	—
1A6	200,1 to 300	± 20	—	25	15	—	—
Class B, oil-resistant, low-swell							
1B0	2,5 to 15	± 20 ^a	—	—	40	—	-25 to +10
1B1	15,1 to 35	± 20	—	—	40	—	-25 to +10
1B2	35,1 to 65	± 20	—	—	40	—	-25 to +10
1B3	65,1 to 95	± 20	—	—	40	—	-25 to +10
1B4	95,1 to 125	± 20	—	—	40	—	-25 to +10
1B5	125,1 to 200	± 20	—	—	40	—	-25 to +10
1B6	200,1 to 300	± 20	—	—	40	—	-25 to +10
Class C, oil-resistant, medium-swell							
1C0	2,5 to 15	± 20 ^a	—	—	50	—	+10 to +60
1C1	15,1 to 35	± 20	—	—	50	—	+10 to +60
1C2	35,1 to 65	± 20	—	—	50	—	+10 to +60
1C3	65,1 to 95	± 20	—	—	50	—	+10 to +60
1C4	95,1 to 125	± 20	—	—	50	—	+10 to +60
1C5	125,1 to 200	± 20	—	—	50	—	+10 to +60
1C6	200,1 to 300	± 20	—	—	50	—	+10 to +60
Class D, high-temperature-resistant							
1D0	2,5 to 15	—	± 5	5	—	50	—
1D1	15,1 to 35	—	± 5	5	—	30	—
1D2	35,1 to 65	—	± 5	5	—	30	—
1D3	65,1 to 95	—	± 5	5	—	30	—
1D4	95,1 to 125	—	± 5	5	—	30	—
1D5	125,1 to 200	—	± 5	5	—	30	—

^a If, after ageing, this grade still falls within the compression-deflection requirement of 2,5 kPa to 15 kPa, it shall be considered acceptable even though the change from the original value is greater than ± 20 %.