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International Standard



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**Polymeric materials, cellular flexible — Polyurethane foam
for laminate use — Specification**

Matériaux polymères alvéolaires souples — Mousse de polyuréthane pour utilisation dans les stratifiés — Spécifications

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

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Polymeric materials, cellular flexible — Polyurethane foam for laminate use — Specification

1 Scope and field of application

This International Standard specifies the minimum requirements for flexible polyurethane foams up to and including 20 mm thick intended for combination with suitable substrates such as non-woven, woven or knitted fabrics, to form a laminate.

Three types of flexible polyurethane foam are specified as follows :

type 1 : polyether;

type 2 : polyester with minimum elongation at break of 200 %;

type 3 : polyester with minimum elongation at break of 300 %.

2 References

ISO 845, *Cellular rubbers and plastics — Determination of apparent density.*

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

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

ISO 2440, *Flexible cellular materials — Accelerated ageing tests.*

3 Appearance

3.1 The material shall consist of a uniform network of cells and shall be free from any flaws, stains and other defects which might detrimentally affect the serviceability.

3.2 Material of thickness up to and including 6 mm thickness shall lie flat when laid on a flat surface.

3.3 The material shall have no holes more than 3 mm in diameter through the full thickness of the foam. The maximum number of holes of diameter between 1,5 and 3 mm in any 60 m² of material shall be not more than four for material of thickness 2 mm or less, and not more than eight for thicker material.

3.4 The colour shall be reasonably uniform and shall be as agreed between the supplier and the purchaser, having regard to the tendency for polyurethane foam to change colour on exposure to light.

4 Joints

Where it is necessary to join lengths of material together, the joint shall be as strong as the foam itself, and the adhesive or method of joining used shall not be injurious to the foam or to the material to which it is to be laminated. The construction and minimum spacing of joints shall be as agreed between the purchaser and the supplier.

5 Odour

The material shall be free from objectionable odour.

6 Dimensions

6.1 Thickness

The nominal thickness shall be agreed between the purchaser and the supplier.

Tolerances on thickness shall be as given in table 1.

Table 1 — Thickness tolerances

Values in millimetres

Thickness	Tolerance	
	+	-
Less than 4	0,3	0,2
4 and over	0,5	0,3

Thickness measurement shall be carried out in accordance with ISO 1923, sub-clause 4.3.

6.2 Width

The width of the material shall be agreed between the purchaser and the supplier.

Tolerances on width shall be as given in table 2.

Table 2 — Width tolerances

Values in millimetres

Width	Tolerance
Less than 1 200	+40 0
1 200 and over	+55 0

6.3 Length

The minimum length of a roll shall be agreed between the purchaser and the supplier.

The length of a roll shall be determined by winding the roll on a slack winding machine.

7 Apparent density

The apparent density of the material, when determined by the method given in ISO 845, shall be within $\pm 10\%$ of the nominal value agreed between the purchaser and the supplier.

8 Cell count

The cell count shall be as agreed between the purchaser and the supplier subject to a tolerance of $\pm 10\%$. It shall be ex-

pressed in cells per linear 100 mm, and shall be determined by the method described in annex A.

NOTE — The cell count method described produces a result representative of the count at a single position. Variations may occur within a sheet of foam and, if necessary, these can be established by agreement between the purchaser and the supplier.

9 Performance requirements

The performance requirements, determined in accordance with the appropriate methods indicated in table 3, shall be in accordance with the limits stated in the table.

10 Packaging and marking

The product shall be packaged in such a manner as to be protected against possible contamination and deformation. Each product or package shall be marked with the following information :

- the name and/or distinctive mark of the manufacturer;
- the batch number or other reference to identify the individual rolls with manufacturing batches;
- the nominal thickness;
- the nominal width;
- the length;
- the number of this International Standard and type of sheeting.

Table 3 — Performance requirements of flexible polyurethane foams

Property	Type 1	Type 2	Type 3	Method of test
Tensile strength, kPa, min.	100	120	160	ISO 1798
Elongation at break, %, min.	200	200	300	ISO 1798
After humidity ageing in accordance with ISO 2440 (3 h at 105 °C and 100 % relative humidity)				
Tensile strength, % of initial value, min.	80	80	80	ISO 1798
Elongation at break, % of initial value, min.	80	80	80	ISO 1798
After heat ageing in accordance with ISO 2440 (16 h at 140 °C)				
Tensile strength, % of initial value, min.	80	80	80	ISO 1798
Elongation at break, % of initial value, min.	80	80	80	ISO 1798
Solvent swelling				
Temporary swelling, %, max.	80	15	15	Annex B
Permanent swelling, %, max.	6,5	2,5	2,5	Annex B

Annex A

Measurement of cell count

(Forms an integral part of the Standard.)

A.1 Scope

This annex describes a method for measuring the cell count of cellular material. It is a method of comparing the cell structure of foam materials.

Due to the variation in individual cell size even in uniform cell structures, it is more convenient to report the number of cells per unit length rather than the actual cell size.

A.2 Definition

For the purposes of this annex the following definition applies :

cell count : the number of cells per 100 mm in the cellular material under specified conditions.

A.3 Apparatus

A 25 mm cloth counting glass shall be used.

A.4 Test pieces

Test pieces may consist of any sample of foam material which is free of skin and has a plane surface large enough to accommodate the counting glass.

Surfaces revealing a marked elongation of the cellular structure or striations shall not be measured unless specifically required.

A.5 Conditioning

Test pieces shall not be measured less than 72 h after manufacture. Prior to measurement, the test pieces shall be stored for at least 16 h in one of the following standard atmospheres :

- a) 23 ± 2 °C, 50 ± 5 % relative humidity; or
- b) 27 ± 2 °C, 65 ± 5 % relative humidity.

A.6 Procedure

After conditioning as described in clause A.5, lay the test piece on a flat, horizontal surface without strain and count the actual number of cells against the counting edge of the glass. Carry out three counts at a given position. Multiply the median value of the three counts by four to provide the count per 100 mm.

Where cell counts along and across the test piece are important, a set of counts shall be made in each direction.

NOTE — The process of counting may be eased by lightly marking the surface of the foam with ink in the counting area, to indicate the uppermost layer of cells.

Annex B

Measurement of solvent swelling

(Forms an integral part of the Standard.)

B.1 Scope

This annex describes a method for measuring the volume swelling of urethane foam after immersion in perchloroethylene under specified conditions. Other solvents may be used by agreement between the parties concerned.

B.2 Test piece

The test piece shall be a die-cut 100 mm diameter disc, the thickness of which shall be measured in accordance with ISO 1923, sub-clause 4.3.

B.3 Solvent

The solvent shall be of recognized analytical reagent quality. When using perchloroethylene, fresh solvent shall be used for each test piece.

WARNING — Precautions governing the use of toxic solvents should be observed throughout the test.

B.4 Conditioning

Samples and test pieces shall be tested not less than 72 h after manufacture. They shall be conditioned immediately before testing for a period of not less than 16 h in one of the following standard atmospheres :

- a) 23 ± 2 °C, 50 ± 5 % relative humidity; or
- b) 27 ± 2 °C, 65 ± 5 % relative humidity.

B.5 Test temperature

Unless otherwise specified, the test shall be carried out at a temperature of 23 ± 2 °C.

B.6 Procedure

B.6.1 Measurement of temporary swelling

Place the test piece in a dish of dimensions approximately 300 mm × 200 mm containing perchloroethylene to a depth of 25 to 30 mm. After 5 min submerge the test piece by covering it with a 200 mm square of wire gauze with a nominal aperture size of 250 μm ('legs' may be formed by bending a 12,5 mm strip on two opposite sides to 90°). After the foam has been in contact with the solvent for a total period of 30 min, remove the wire gauze and lift the test piece from the solvent by means of a flat wire gauze scoop consisting of a 175 mm square of wire gauze with a nominal aperture size of 250 μm and fitted with a wire frame and handle. Secure the scoop at an angle of

45° and allow the test piece to drain for 5 min. Cover the test piece with a 150 mm square glass plate, 6,5 mm thick. Invert the glass, test piece and scoop and, after the scoop has been removed, measure the diameter of the test piece and the thickness of the test piece with glass plate in accordance with ISO 1923.

B.6.2 Measurement of permanent swelling

Allow the test piece to stand at room temperature for a period of not less than 24 h or until such time as it is completely free from solvent. Check by weighing to constant mass. If possible, dry the test piece in a fume cupboard without forced extraction.

Measure the diameter and thickness in accordance with ISO 1923.

B.7 Expression of results

B.7.1 Temporary swelling

The temporary swelling, expressed as a percentage, is given by the formula

$$\frac{d_2^2(t_2 - t_4) - d_1^2 t_1}{d_1^2 t_1} \times 100$$

where

d_1 is the original diameter of the test piece;

d_2 is the diameter of the test piece soaked in solvent;

t_1 is the original thickness of the test piece;

t_2 is the thickness of the test piece soaked in solvent, plus that of the glass plate;

t_4 is the thickness of the glass plate.

B.7.2 Permanent swelling

The permanent swelling, expressed as a percentage, is given by the formula

$$\frac{d_3^2 t_3 - d_1^2 t_1}{d_1^2 t_1} \times 100$$

where

d_3 is the final diameter of the test piece;

t_3 is the final thickness of the test piece;

d_1 and t_1 have the same meanings as in B.7.1.