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**Plastics — Poly(methyl methacrylate)  
double- and triple-skin sheets — Test  
methods**

*Plastiques — Plaques de poly(méthacrylate de méthyle) à double et  
triple paroi — Méthodes d'essai*

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CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
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Published in Switzerland

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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](http://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](http://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 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](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 249, *Plastics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 12017:1995), of which it constitutes a minor revision.

The changes compared to the previous edition are as follows:

- the normative reference clause ([Clause 2](#)) has been updated.

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](http://www.iso.org/members.html).

# Plastics — Poly(methyl methacrylate) double- and triple-skin sheets — Test methods

## 1 Scope

This document specifies the test methods for quality control of poly(methyl methacrylate) (PMMA) extruded double- and triple-skin flat sheets, obtained from colourless and coloured transparent, translucent and opaque grades of materials.

The minimum sheet width is 600 mm.

The main applications of these sheets are in building and agriculture (greenhouses).

## 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 2818, *Plastics — Preparation of test specimens by machining*

ISO 4892-2, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc sources*

ISO 7823-2:2003, *Plastics — Poly(methyl methacrylate) sheets — Types, dimensions and characteristics — Part 2: Melt-calendered extruded sheets*

ISO 8302, *Thermal insulation — Determination of steady-state thermal resistance and related properties — Guarded hot plate apparatus*

ISO 10140-2, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 2: Measurement of airborne sound insulation*

ISO 10140-5, *Acoustics — Laboratory measurement of sound insulation of building elements — Part 5: Requirements for test facilities and equipment*

ISO 12999-1, *Acoustics — Determination and application of measurement uncertainties in building acoustics — Part 1: Sound insulation*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

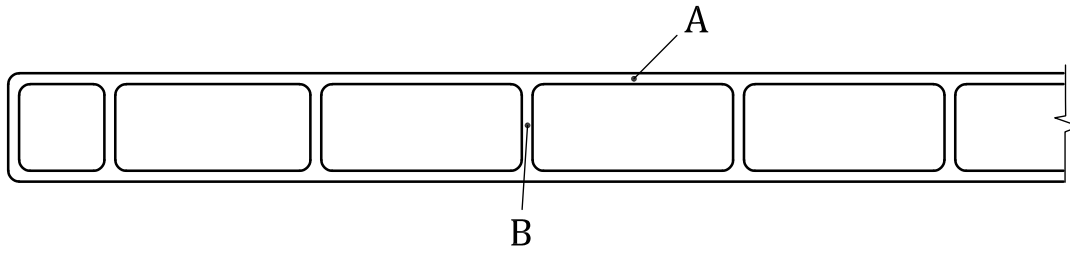
### 3.1

#### double-skin sheet

#### DSS

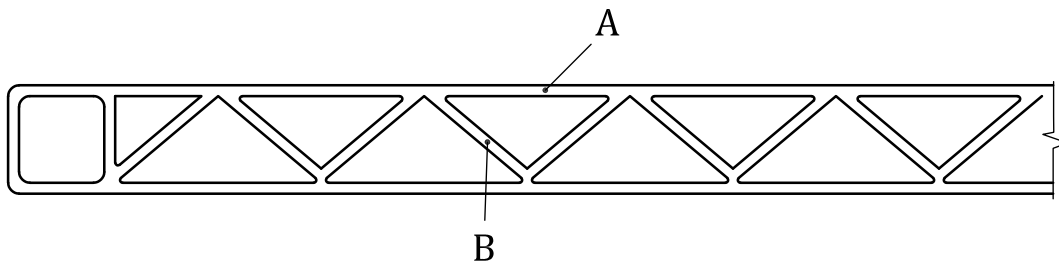
sheet having two parallel external skins, differently spaced and jointed by ribs of different shapes

Note 1 to entry: See [Figures 1](#) and [2](#).



**Key**  
A skin  
B rib

**Figure 1 — Example of a double-skin sheet**



**Key**  
A skin  
B rib

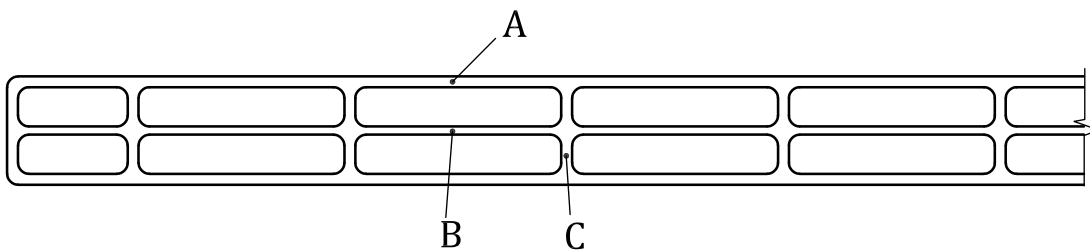
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**Figure 2 — Example of a double-skin sheet**  
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**3.2**  
**triple-skin sheet**  
**TSS**

sheet having two external and an internal skin which is parallel and properly spaced by ribs from the external one

Note 1 to entry: See [Figure 3](#).



**Key**  
A skin  
B internal skin  
C rib

**Figure 3 — Example of a triple-skin sheet**

## 4 Composition of materials

This document applies to PMMA homopolymers and to copolymers of methyl methacrylate containing at least a mass fraction of 80 % of MMA and not more than a mass fraction of 20 % of acrylic ester or other suitable monomers.

Such materials may be unmodified or may contain lubricants, processing aids, UV absorbers, pigments and colorants.

## 5 Characteristics

### 5.1 Main characteristics of DSS and TSS

5.1.1 Total thickness.

5.1.2 Total width.

5.1.3 Skin thickness.

5.1.4 Mass per unit area.

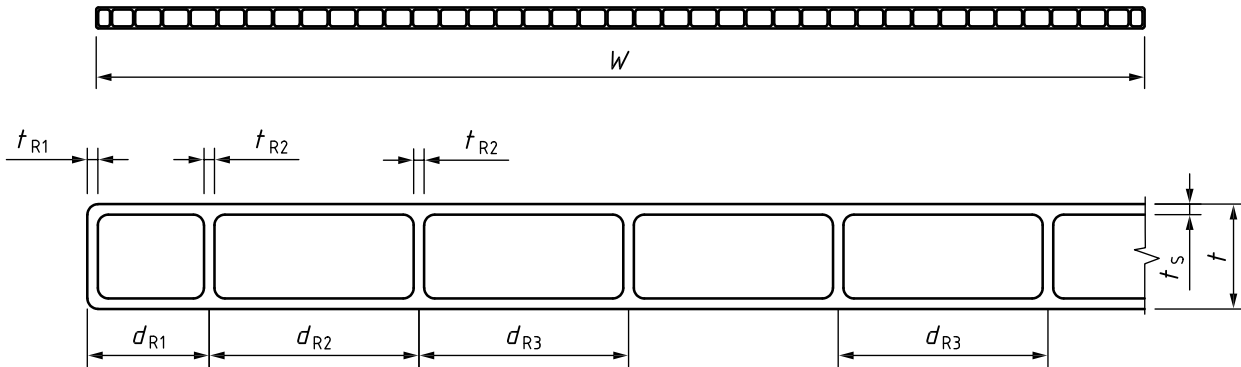
5.1.5 Rib thickness.

5.1.6 Rib geometry (spacing, angle).

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## 5.2 Profile

The profile of a sheet is defined collectively by the characteristics specified in 5.1. Examples are shown in Figures 4 and 5.



Total thickness	$T = 16 \text{ mm}$
Total width	$W = 700 \text{ mm}$
Mass per unit area	$\rho_A = 5 \text{ kg/m}^2$
Skin thickness	$t_s = 1,8 \text{ mm}$
Rib thickness	$t_{R1} = 1,7 \text{ mm}$
	$t_{R2} = 1,8 \text{ mm}$
Rib spacing	$d_{R1} = 20 \text{ mm}$
	$d_{R2} = 24 \text{ mm}$
	$d_{R3} = 30 \text{ mm (main rib spacing)}$

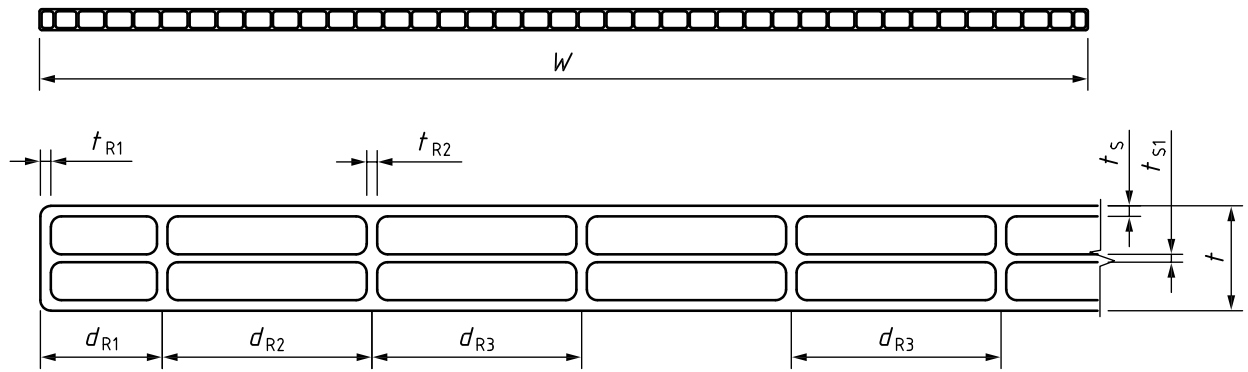
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**Figure 4 — Examples of typical dimensions and mass per unit area of DSS**





Total thickness	$T = 16 \text{ mm}$
Total width	$W = 980 \text{ mm}$
Mass per unit area	$\rho_A = 5 \text{ kg/m}^2$
Skin thickness	$t_S = 1,5 \text{ mm}$
Internal skin thickness	$t_{S1} = 1,2 \text{ mm}$
Rib thickness	$t_{R1} = 1,6 \text{ mm}$ $t_{R2} = 1,5 \text{ mm}$
Rib spacing	$d_{R1} = 20 \text{ mm}$ $d_{R2} = 24 \text{ mm}$ $d_{R3} = 32 \text{ mm}$ (main rib spacing)

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Figure 5 — Examples of typical dimensions and mass per unit area of TSS

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### 5.3 Other characteristics of DSS and TSS

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#### 5.3.1 Curvature.

#### 5.3.2 Curvature of edge in extrusion direction.

#### 5.3.3 Optical properties.

#### 5.3.4 Thermal resistance.

#### 5.3.5 Bending properties.

#### 5.3.6 Sound insulation.

#### 5.3.7 Fire resistance.

#### 5.3.8 Weatherability.

#### 5.3.9 Chemical resistance to gaskets and sealants.

#### 5.3.10 Internal stress.

#### 5.3.11 Condensate formation.

## 6 Test methods

### 6.1 General

#### 6.1.1 Test conditions

Make all measurements under the standard conditions of  $23\text{ °C} \pm 2\text{ °C}$  and  $(50 \pm 5)\%$  relative humidity (refer to ISO 291). For measurements made under local ambient conditions, due allowance shall be made for dimensional changes due to the differences in temperature and relative humidity.

#### 6.1.2 Sampling

The sampling procedure shall be agreed upon between the interested parties. The procedures described in ISO 28590 and ISO 2859-1 are widely accepted and frequently used. Hence these are recommended for sampling.

The test report shall include the following information:

- a) a reference to this document, i.e. ISO 12017:2021;
- b) all details necessary to identify the sample used for the tests.

#### 6.1.3 Preparation of test specimens

Specimens shall be prepared in accordance with the procedures described in ISO 2818, wherever applicable.

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### 6.2 Thickness measurements

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#### 6.2.1 Total thickness

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Measure the total thickness, to the nearest 0,1 mm, at 200 mm intervals over the whole extrusion width, beginning at the central point of the edge cell. Calculate the average of the measurements.

#### 6.2.2 Minimum skin thickness

Measure the thickness of the outer skins, to the nearest 0,1 mm, at the point of minimum thickness.

Do not report the thickness of the inner skin of a TSS; however, check to ensure that the inner skin is intact.

#### 6.2.3 Minimum rib thickness

Measure the rib thickness, to the nearest 0,1 mm, at the thinnest point of the thinnest rib.

#### 6.2.4 Test report

The test report shall include the following measurements, accurate to 0,1 mm:

- a) the average total thickness, minimum thickness and maximum thickness;
- b) the minimum outer-skin thickness;
- c) the minimum rib thickness.

### 6.3 Width and length measurements

Measure the extrusion width, the cut width (if necessary) and the sheet length in the extrusion direction to the nearest 0,1 mm.

Report the width and the length measured.

### 6.4 Rib geometry

Report the nominal values of the rib spacing, the rib angles and any other relevant rib-geometry parameters.

### 6.5 Mass per unit area

Weigh, to the nearest 1 g, strips with a width corresponding to the extrusion width and 100 mm in length.

Calculate the mass per unit area,  $\rho_A$ , in kilograms per square metre, using [Formula \(1\)](#):

$$\rho_A = \frac{m}{W \times 100} \times 10^3 \quad (1)$$

where

$m$  is the mass, in grams, of the specimen;

$W$  is the width, in millimetres, of the specimen.

Report the value of  $\rho_A$  calculated from [Formula \(1\)](#) to the nearest 0,01 kg/m<sup>2</sup>.

### 6.6 Curvature of sheet surface

Measure the curvature on a full-size sheet, using a 1 000-mm-long straight edge (see [Figure 6](#)).