AS 1193—1989
ISO 1183:1987

Australian Standard®

Plastics—Methods for determining the density and relative density of non-cellular plastics

This Australian Standard was prepared by Committee PL/10, Methods of Testing Plastics. It was approved on behalf of the Council of Standards Australia on 16 January 1989 and published 11 August 1989.

The following interests are represented on Committee PL/10:

CSIRO, Division of Building, Construction and Engineering
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PREFACE

This Standard was prepared for Committee PL/10, Methods of Testing Plastics, under the authority of the Plastics Standards Board to supersede AS 1193—1974, *Methods for the determination of the density and relative density of plastics excluding cellular plastics.* This Standard is identical with and has been reproduced from ISO 1183—1987, *Plastics—Methods for determining the density and relative density of non-cellular plastics.*

Statements in the following Notes within this Standard are deemed to be requirements of this Standard: Clause 3.2, Note 1; Clause 5.1.4.4, Note; Clause 5.4.4.2.2, Note 1; Clause 5.4.4.3, Note 2.

For the purposes of this Australian Standard, the text of ISO 1183 should be modified as follows:

(a) Substitute a point (.) for a comma (,) wherever it appears as a decimal marker.

(b) Replace the cross-references to other publications with references to Australian Standards:

Reference to International Standard		*Australian Standard*	
ISO		AS	
31/3	Quantities and units of mechanics	2900	Quantities, units, and symbols
	—	2900.1	Part 3: Quantities and units of mechanics
291	Plastics—Standard atmospheres for conditioning and testing	1327	Standard environments for conditioning and testing plastics materials

Plastics—Methods for determining the density and relative density of non-cellular plastics

1 Scope and field of application

1.1 This International Standard specifies four methods for the determination of the density and relative density of non-cellular plastics in the form of sheet, film, tube, moulded objects, and moulding powders, granules and pellets.

— Method A

Immersion method for plastics in a finished condition, whether machined or otherwise formed (see 5.1.3), but not powders.

— Method B

Pyknometer method for plastics in the form of powder, granules, pellets, flake or moulded articles reduced to small particles.

— Method C

Titration method for plastics in forms similar to those required for method A, including pellets.

— Method D

Density gradient column method for plastics in forms similar to those required for method A, and including pellets. Density gradient columns are columns of liquid, the densities of which increase uniformly from top to bottom. They are particularly suited to measurement of small samples of products and to comparison of densities.

1.2 Density and relative density are used frequently, both to follow the variations in the physical structures of specimens and in calculation of the amount of material necessary to fill a given volume. Density is the preferred property relating the mass and volume of an object, specimen or material. These properties may also be useful in assessinguniformity among samples or specimens. These methods are designed to yield results accurate to at least 0,2 % without applying corrections for weighings in air, and to 0,05 % with such corrections.

1.3 Often the density of plastics will depend upon the methods employed in the preparation of tests specimens. When this is the case, precise details of the methods of preparation shall be given; these are ordinarily included in the specifications for the material.

2 References

ISO 31-3, *Quantities and units of mechanics.*

ISO 291, *Plastics — Standard atmospheres for conditioning and testing.*

3 Definitions

3.1 density, ϱ_t: The ratio of the mass of the sample to its volume V_t (at the temperature t), expressed in kilograms per cubic metre, grams per cubic centimetre or grams per millilitre.

Ordinarily, t will be one of the standard laboratory temperatures specified in ISO 291 (23 or 27°C).

3.2 relative density: The ratio of the mass of a given volume of material at the temperature t_1 to that of an equal volume of a reference material at the temperature t_2; it is expressed as relative density, at t_1 and t_2 (symbol $d_{t_2}^{t_1}$) where t is the temperature, in degrees Celsius.

Ordinarily, t will be one of the standard laboratory temperatures specified in ISO 291 (23 or 27°C).

Relative density may also be defined as the ratio of the density of a substance to the density of a reference substance under conditions that are specified for both substances.

NOTES

1 When the reference substance is water, the English term “specific gravity” is often used instead of “relative density”, and the French term “densité” instead of “densité relative”.

Density at t_1 °C may be converted to specific gravity, using the equation

$$d_{t_2}^{t_1} = \frac{\varrho_{s,t_1}}{\varrho_{w,t_2}}$$

where

$d_{t_2}^{t_1}$ is the specific gravity of the sample;

ϱ_{s,t_1} is the density, in grams per cubic centimetre, of the specimen, at temperature t_1;

ϱ_{w,t_2} is the density, in grams per cubic centimetre, of water, at temperature t_2; values at some laboratory temperatures are as follows: