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Plastics — Blow-moulded polypropylene containers for packaging of liquid foodstuffs

Plastiques — Récipients en polypropylène moulés par soufflage pour l'emballage de denrées alimentaires liquides

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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).

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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

Plastics — Blow-moulded polypropylene containers for packaging of liquid foodstuffs

WARNING — This International Standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this International Standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1 Scope

This International Standard provides the requirements of polypropylene resins intended for use in blow-moulded, round containers with capacities up to, and including two litres intended for the packaging of liquids for human consumption. This International Standard also provides tolerances on mass, dimensions, methods of sampling, testing, and performance requirements.

NOTE It is not to be implied that polypropylene resins are the only polymers suitable for these applications, as many other polymers, including PE-HD, PET, etc. are also suitable.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 472:2013, *Plastics — Vocabulary*

ISO 291:2008, *Plastics — Standard atmospheres for conditioning and testing*

ISO 1873-1, *Plastics — Polypropylene (PP) moulding and extrusion materials — Part 1: Designation system and basis for specifications*

ISO 1873-2, *Plastics — Polypropylene (PP) moulding and extrusion materials — Part 2: Preparation of test specimens and determination of properties*

ISO 15270, *Plastics — Guidelines for the recovery and recycling of plastics waste*

ISO 2859-1, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

3 Terms and definitions

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

NOTE For detailed definitions of terms found in this International Standard, refer to ISO 472. Neck height (H) for containers produced using ISBM technology is the perpendicular distance from highest point of the neck face to bottom plane of the support ledge. The brimful capacity can also be measured using special volume testing equipment (Annex B). For bottles and lipped containers, nominal capacity is approximately 90 % of the brimful capacity.

3.1
extrusion blow-moulded container
container formed from an extruded parison of heat-softened thermoplastic, blow-moulded by the application of air pressure which forces it against the inside walls of a blow mould

3.2
injection blow-moulded container
container formed from an injection-moulded parison that is transferred, while hot, to a blow-mould to form the container

3.3
injection stretch blow-moulded container
container formed from an injection-moulded parison or reheated pre-form that is stretched prior to blow-moulding to impart bi-axial orientation

3.4
container body
principal part of a container, usually the largest piece containing the sides

Note 1 to entry: In bottles, the body is the main portion of the bottle without the neck.

3.5
shoulder
sloped area of a container between the neck area and the body of the container

3.6
neck
part of a container where shoulder cross-section area decreases to form the finish

3.7
neck finish
plastic forming the opening of a container and shaped to accommodate a specific closure

Note 1 to entry: Neck finish is a threaded, ribbed, or plain part of the container including sealing surface to accommodate a threaded or press fit closure, lug, and cap, heat sealing gasket or liner and the tamper evidence features.

3.8
seal surface
lip portion of the neck finish that makes contact with the sealing gasket or liner to form a seal

3.9
closure
device used to seal off the opening of the container for product containment and providing a barrier to external contaminants

3.10
overall height
OH
height of a finished empty container at its highest point excluding the closure and fitment

3.11
diameter
D
external diameter of the finished empty container at a specified height, expressed as the mean of the two perpendicular diameters, or as the circumference divided by 3,141 6 at the same specified height

3.12
neck height
H
perpendicular distance from the highest point of the plane including the neck face to the nearest point of the finished container shoulder

3.13
external neck diameter
E
external diameter of the neck, excluding thread, measured as the mean of two perpendicular diameters avoiding the part line

3.14
internal neck diameter
I
minimum internal diameter of the neck, whether it is parallel, tapered, or internally threaded

3.15
thread diameter
T
external diameter of the neck thread measured as the mean of two perpendicular diameters avoiding the parting line

3.16
neck ovality
difference between the maximum and the minimum neck diameters

3.17
fill level
level to which a container shall be filled to achieve designated quantity of the content or nominal capacity

3.18
head space
space between the fill level of a container and the seal surface

3.19
brimful capacity
volume of liquid held by the container when filled to the point of overflowing while standing on a flat horizontal level with all closures removed

Note 1 to entry: The brimful capacity, also called as “overflow capacity”.

3.20
nominal capacity
volume of the liquid foodstuff the container is intended to hold

3.21
conditioning atmosphere and test temperature
atmosphere in which a sample or test specimen is kept before being subjected to a test shall be in accordance with ISO 291, unless otherwise agreed upon by the interested parties, e.g. for testing at high or low temperatures

Note 1 to entry: The preferred set of conditions in ISO 291 is standard atmosphere (23 ± 2) °C and (50 ± 2) % relative humidity. Other set of conditioning atmosphere as mentioned in ISO 291 can also be used, provided such conditioning is reported.

4 Raw material

The grade designation(s) described in ISO 1873-1 and ISO 1873-2 for polypropylene shall be used to describe the raw material.

Since polypropylene is suitable for use in blow-moulded containers, the specification of grades to be used will depend on many factors including the specific application, type of liquid foodstuff intended to be packed and which kind of filling method to be used, filling capacity of container, container design, and conversion process to be used. In all cases, the choice of a specific grade shall be determined by its suitability for the intended application and agreement between the interested parties.

5 Container capacity

When the container is filled to nominal capacity, the liquid level shall correspond to the fill level, but below the bottom of the neck. The purchaser of the container shall specify the minimum brimful capacity, fill level, and the head space according to the filling temperature and filling process used.

6 Container mass

The container mass shall be adequate to meet the overall requirements of the application. The mass of the closure shall not be included in mass of the container. The tolerance for container mass shall be as specified in Table 1.

Table 1 — Container mass tolerance

Mass of the container, g	Tolerance, %
Up to, and including 10	±10,0
Over 10 up to, and including 25	±7,5
Over 25	±5,0

The accuracy of weighing shall be to the nearest 0,1 g for containers with tare weight up to 25 g, and 0,5 g for containers beyond 25 g and up to 100 g.

7 Tolerance on dimensions

7.1 General

The shape and dimensions of the container shall be as specified by the user and in accordance with desired capacity. The tolerance on dimensions is valid for finished empty containers. The dimensions of filled containers might show differences.

7.2 Wall thickness

The minimum wall thickness at any point on the container surface shall be sufficient to meet the requirements of the intended application and this International Standard. The wall thickness shall be measured in accordance with the methods described in Annex C. In many cases, a minimum wall thickness of 0,2 mm has been found reasonable.

7.3 Overall height (OH)

The tolerance on container overall height shall be maximum of ±1,5 %. The height shall be measured in accordance with the methods described in Annex D.

7.4 Diameter (D)

The tolerance on container diameter shall be maximum of ±1,5 %. The diameter shall be measured in accordance with the methods described in Annex E.

7.5 Neck height (H)

The tolerance on neck height shall be maximum of ±1,5 %. The neck height shall be measured in accordance with the methods described in Annex F.

7.6 External neck diameter (E)

The tolerance on external neck diameter shall be maximum of ±1,0 %. The external neck diameter shall be measured in accordance with the methods described in Annex G.

The neck height and external neck diameter shall be designed in accordance with the container filling and handling equipment, and shall be as agreed between the container, the closure manufacturer, and the purchaser.

7.7 Internal neck diameter (I)

The tolerance on internal neck diameter shall be maximum of ±1,0 %. The internal neck diameter shall be measured in accordance with the methods described in Annex G.

7.8 Thread diameter (T)

The tolerance on thread diameter shall be maximum of ±1,0 %. The major and minor thread diameter shall each be measured in accordance with the methods described in Annex G.

7.9 Neck ovality

The tolerance on neck ovality shall be maximum of ±1,0 %. The neck ovality shall be measured in accordance with the methods described in Annex G.

8 Performance requirements

8.1 General

Following are the container performance requirements provided for general guidance. Specific applications can require different or additional requirements agreed upon between the interested parties.

8.2 Closure leakage test

The container filled with water and closed with a closure or a fitment designed to heat seal the specified neck finish according to closure supplier's specification, shall not exhibit any leakage when held vertically upside down for 30 min. The container can be kept on a blotting paper in this position for easy identification of leakage.

8.3 Drop impact resistance test

The container, when subjected to drop impact test as per the method described in Annex H, shall show no sign of rupture or leakage. For containers intended to be stored or used in temperature conditions below 0°C, testing shall be carried out at a temperature appropriate to the condition of use.

8.4 Stack load test

The containers shall not exhibit any cracks, permanent deformation, leakage, or stack instability when tested in accordance with the method described in Annex I.

8.5 Leakage test

The containers, when tested by the methods described in Annex J, shall not exhibit any sign of rupture or leakage from the container.

8.6 Ink adhesion test

The printed containers, when tested by the method described in Annex K, shall show no sign of printed ink or paint removal.

8.7 Compatibility test

Containers intended for use in packaging liquid food shall meet the appropriate regional, national, and international requirements for food packaging. Appropriate testing shall be conducted as specified by the user to ensure the efficacy of the container to be used for its intended purpose.

9 Statutory marking

The blow-moulded containers conforming to this International Standard shall be marked, embossed, or labelled with the following information:

a) the manufacturer's name, identification mark, or trade mark;

b) the reference number of this International Standard, ISO 13106;

c) the recycling identification code or symbol as per ISO 15270.

10 Sampling and criterion for conformity

10.1 Sampling criterion

Each manufacturer shall maintain traceable production records based on their unique lot identification procedure.

For ascertaining the conformity of the containers to this International Standard, testing shall be conducted for each lot. The sampling criteria shall be in accordance with ISO 2859-1 and as given in Table 2.

For drop impact resistance and stack load tests, one set of sample containers as given in the test methods (Annex H and Annex I) shall be drawn from the lot and these shall be subjected to the respective tests. The sample shall pass the tests for the lot in respect of drop impact resistance and stack load requirements.

Ink adhesion testing is applicable only to printed containers. Compatibility testing to confirm conformance to the requirements of the application shall be conducted when changes are made in the raw materials used to produce containers (e.g. material composition, formulation, and functional additive masterbatch, etc.)

Table 2 — Sampling criterion

Lot size	Sample size	Permissible number of defects
501 – 1 200	32	1
1 201 – 3 200	50	2
3 201 – 10 000	80	3
10 001 – 35 000	125	5
35 001 – 150 000	200	7
>150 000	300	10

10.2 Number of tests and criteria for conformity

The number of tests and criteria of conformity shall be determined according to Table 3.

Table 3 — Number of tests and criterion for conformity

Characteristics	Clause/Ref.	No. of tests	Criteria for conformity
Brimful capacity	Clause 5	According to column 2 of Table 2	The number of defective containers should not exceed the corresponding number in column 3 of Table 2
Container mass	Clause 6/ Table 1		
Dimensions	7.3 to 7.9		
Closure leakage test	8.2		
Hydrostatic pressure test	8.5		
Ink adhesion test	8.6		
Wall thickness	7.2	According to column 2 of Table 2	All the containers satisfy the relevant requirements as given in 7.2
Drop impact resistance test	8.3	Two sets of four container samples	All the containers satisfy the relevant requirements as given in 8.3 and 8.4
Stack load	8.4		