
**Plastics — Industrial compostable
plastic drinking straws**

*Plastiques — Pailles en plastique compostables en compostage
industriel*

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ISO 5424:2022

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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).

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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.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 14, *Environmental aspects*.

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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.

Introduction

Plastic drinking straws are used worldwide for many years. This caused several environmental problems, such as terrestrial pollution, contamination of soil and water/marine environment pollution. These pose a severe risk to ecosystems, biodiversity and human health. Recently, many countries, regions and cities have enacted legislation to ban or severely reduce the use of plastic drinking straws to help tackle these issues.

This document does not aim to bypass this legislation, but aims to specifically address the following aspects where plastic drinking straws suitable for industrial composting can be used:

- a) offering methods for testing compostability, followed by demonstrating the impact of industrial compostable drinking straws on the ecological environment;
- b) providing a reference for the evaluation of industrial compostable plastic straws.

Development of this document is expected to effectively improve the quality management of industrial compostable drinking straws in countries, regions, and cities where industrial composting is available.

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Plastics — Industrial compostable plastic drinking straws

1 Scope

This document specifies the terms and definitions, basic requirements, technical requirements, test methods, test regulations, and packaging of industrial compostable plastic drinking straws.

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

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

ISO 17088, *Plastics — Organic recycling — Specifications for compostable plastics*

ISO 18188:2016, *Specification of polypropylene drinking straws*

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 <https://www.electropedia.org/>

3.1

compost

organic soil conditioner obtained by biodegradation of a mixture consisting principally of vegetable residues, occasionally with other organic material and having a limited mineral content

[SOURCE: ISO 17088:2021, 3.1]

3.2

compostable plastic

plastic that undergoes degradation by biological processes during composting to yield CO₂, water, inorganic compounds and biomass at a rate consistent with other known compostable materials and leave no visible, distinguishable or toxic residue

Note 1 to entry: “Hazardous” is used synonymously to toxic.

[SOURCE: ISO 17088:2021, 3.2]

3.3

composting

aerobic process designed to produce *compost* (3.1) starting from biodegradable waste

Note 1 to entry: Composting is classified into industrial composting, home composting and worm composting.

[SOURCE: ISO 17088:2021, 3.3]

3.4 industrial composting

composting (3.3) process performed under controlled conditions on industrial scale with the aim of producing compost for the market

Note 1 to entry: In some regions, industrial composting is referred to as professional composting.

[SOURCE: ISO 17088:2021, 3.13]

3.5 drinking straw

hollow tubes for drinking water, beverages and liquid foods

3.6 pointed straw

straw that is machined into a bevel at one end

3.7 spoon-type straw

straw that is processed into a spoon at one end

4 Technical requirements

4.1 Specification and size

Specification and size shall meet the requirements specified in [Table 1](#).

Table 1 — Specifications and size requirements

Index name	Requirements
Length deviation	≤±2 %
Outer diameter deviation	≤±3 %
Maximal wall thickness to minimum wall thickness ratio	≤±1,2
Damage rate after straightening the corrugated pipe	≤2 %
Total mass deviation of 100 straws	≤±5 %

4.2 Industrial compostability

The fitness to industrial compostability of "industrial compostable drinking straws" shall be evaluated in accordance with ISO 17088.

5 Test methods

5.1 Conditioning and testing atmosphere

The standard environment for sample conditioning and testing shall be performed in accordance with procedures specified in ISO 291.

5.2 Specification and size

5.2.1 Length deviation

The length of straw shall be measured using a graduated ruler or other suitable means, capable of reading to 0,5 mm or less.

The value of the length deviation of the straw is calculated by using [Formula \(1\)](#):

$$\Delta l = \frac{l - l_0}{l_0} \times 100 \% \quad (1)$$

where

Δl is the length deviation of the straw, expressed as a percentage (%);

L is the measured length, in millimetres (mm);

l_0 is the nominal length, in millimetres (mm).

5.2.2 Calculation of average deviation of thickness

The average thickness deviation is calculated using [Formula \(2\)](#):

$$\Delta \bar{e} = \frac{\bar{e} - e_0}{e_0} \times 100 \% \quad (2)$$

where

$\Delta \bar{e}$ is the average thickness deviation, expressed as a percentage (%);

\bar{e} is the average thickness, in millimetres (mm);

e_0 is the nominal thickness, in millimetres (mm).

5.2.3 Outer diameter deviation

Measure the outer diameter of a straw at one end, using a vernier calipers or other suitable means, capable of reading to 0,02 mm or less.

The value of the outer diameter deviation of the straw is calculated by using [Formula \(3\)](#):

$$\Delta d = \frac{d - d_0}{d_0} \times 100 \% \quad (3)$$

where

Δd is the outer diameter deviation of the straw, expressed as a percentage (%);

d is the measured diameter, in millimetres (mm);

d_0 is the nominal diameter, in millimetres (mm).

5.2.4 Wall thickness uniformity

The straw wall thickness uniformity shall be tested in accordance with the method specified in ISO 18188:2016, 6.3.4.

5.2.5 Spoon type end development rate

Unfold the spoon-shaped straw section of spoon-type straw. Measure the maximum width, using a graduated ruler or other suitable means, capable of reading to 1 mm or less.

The value of the spoon type end development rate of the straw is calculated by using [Formula \(4\)](#):

$$\Delta k = \frac{k}{\pi d_0} \times 100 \% \quad (4)$$

where

Δk is the outer diameter deviation of the straw, expressed as a percentage (%);

k is the measured maximum width, in millimetres (mm);

d_0 is the nominal diameter, in millimetres (mm).

5.2.6 Damage rate after straightening the corrugated pipe

Randomly select 100 straws from the same batch of products and perform damage rate by visual inspection after straightening the corrugated pipe.

Fracture, breakage and cracking properties shall be evaluated by straightening the corrugated pipe.

5.2.7 Mass deviation

Randomly choose 300 straws from the same batch of products, and divide them into 3 groups, with 100 straws in each group.

Measure the mass of each group (100 straws), using a balance or other suitable means, capable of reading to 0,1 g or less.

The value of mass deviation of the straw is calculated by using [Formula \(5\)](#):

$$\Delta g = \frac{g - g_0}{g_0} \times 100 \% \quad (5)$$

where

Δg is the mass deviation of the straw, expressed as a percentage (%);

g is the measured mass, in gram (g);

g_0 is the nominal mass, in gram (g).

5.3 Industrial compostability

Industrial compostability test shall be in accordance with ISO 17088.

6 Testing regulations

6.1 Group batch

The products shall be inspected and accepted in batches. The straws of the same specification continuously produced from the same raw material and the same process shall be one batch.

6.2 Inspection classification

Inspection is divided into factory inspection and type inspection.