
**Plastics — Determination of
yellowness index and change in
yellowness index**

*Plastiques — Détermination de l'indice de jaunissement et du
changement de l'indice de jaunissement*

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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 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 5, *Physical-chemical properties*.

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Plastics — Determination of yellowness index and change in yellowness index

1 Scope

This International Standard specifies an instrumental method for determining the yellowness index and change in yellowness index on clear, translucent, or opaque plastics.

NOTE 1 Specimen shapes can include moulded plaques or discs, films, sheets, powders, and pellets. Plaque, disc, film, and sheet specimens can have smooth, matt, or patterned surfaces. Fluorescent plastics are not permitted.

NOTE 2 Change in yellowness index is often used to evaluate the effect of environment, e.g. heat, UV exposure, etc., on colour stability.

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

ISO 1043-1, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics*

ISO 5725-2, *Accuracy (trueness and precision) of measurement methods and results — Part 2: Basic method for the determination of repeatability and reproducibility of a standard measurement method*

ASTM E313, *Standard Practice for Calculating Yellowness and Whiteness Indices from Instrumentally Measured Color Coordinates*

CIE 15, *Colorimetry*

3 Terms and definitions

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

3.1

yellowness index

YI

deviation in chroma from colourless or whiteness toward yellow

3.2

change of yellowness index

ΔYI

difference between yellowness index of specimen before additional test and yellowness index of specimen after additional test

Note 1 to entry: For example, before and after exposure to specified conditions.

4 Preparation and conditioning of samples and test specimens

4.1 Sample and preparation of test specimen

Samples shall be gathered by a statistical method from the batch to be evaluated. In all cases, the sample shall be used as received unless the purpose is to evaluate pellets or powders converted into a final shape, i.e. moulded plaques or discs, films, or sheets.

4.2 Environment of measurement and standard condition

The standard condition of the environment of measurement shall be set as 23 °C/50 % RH condition as described in ISO 291.

5 Procedure

5.1 General

Colourimetry is derived from calculating tristimulus values by spectral or tristimulus measurements. In the case of the specimen with the diffusibility of the light, the measuring apparatus shall have an integrating sphere or other system that can detect diffusion light. Optical geometries, requirements, and solution for different measurement methods are given in [Table 1](#).

Table 1 — Optical geometries, requirements, and solution for different measurement methods

Measurement method using integrating sphere	Optical geometries in accordance with CIE 15	Requirements	Solution
Transmission measurements	di:0, de:0	A part of the incident light on the integrating sphere shall not irradiate a specimen directly.	Arrange a baffle plate that is the same quality as the integrating sphere.
Reflection measurement	di:8, de:8		
Transmission measurements	0:di, 0:de	A part of a reflected or transmitted light from a specimen shall not be introduced into a detector directly.	
Reflection measurement	8:di, 8:de		
Measurement method without integrating sphere	Optical geometries in accordance with CIE 15		
Transmission measurements	0:0	These optical geometries don't use an integrating sphere.	
Reflection measurement	45a:0, 0:45a, 45x:0, 0:45a		

NOTE 1 In the case of measuring a diffusing specimen, satisfying the above-mentioned condition is important.

NOTE 2 In the case of measuring a translucent specimen, the colour or thickness of the specimen might make an influence.

NOTE 3 Optical geometries are described in CIE 15.

Tristimulus values are represented in the XYZ colour system (2° visual field) or the $X_{10}Y_{10}Z_{10}$ colour system (10° visual field) using CIE standard illuminant D65 or supporting illuminant C.

One of the following three measurement methods specified in [5.2](#) to [5.4](#) shall be used.

5.2 Transmission measurement method for sheet, film, moulded plaque, or disc specimens

Adjust the centre of the specimen and the centre of the opening for measurement, and measure the tristimulus value (see [Figure 1](#)).