
**Tableware, giftware, jewellery and
luminaries, made of glass — Glass
clarity — Classification and test
method**

*Vaisselle, objets de décoration, bijouterie et luminaires, faits de
verre — Clarté du verre — Classification et méthode d'essai*

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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 Project Committee ISO/PC 320, *Tableware, giftware, jewellery and luminaries made of glass — Glass clarity — Classification and test method*.

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

This document intends to provide a generic definition and classification of glass clarity to permit a global understanding of consumer quality requirements, with a corresponding method to measure glass clarity.

For glass clarity, spectrophotometric measurement is performed in accordance with CIE 15 with a predefined choice of illuminate and observer. Measurement on the sample at two different thicknesses permits calculation of internal transmission for a defined intermediate thickness and indicates glass clarity irrespective of the refractive index value. The same methodology applies for all mineral glasses.

This method has been verified in accordance with visual inspection with a light cabinet. In addition, preliminary collaborative studies have confirmed the results of these measurements as being coherent with both consumer perception and quality recognition.

As it is well known that iron is by far the main contaminant of glass raw materials affecting the transparency and colorimetric purity of the glass, the iron content has been considered as an additional criterion.

This document does not concern lead crystal categories as defined in EU Council Directive 69/493/EEC, which has its own characteristics with respect to density and refraction index.

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Tableware, giftware, jewellery and luminaries, made of glass — Glass clarity — Classification and test method

1 Scope

This document establishes requirements for the use of the glass designations “clear glass” and “ultra-clear glass” for non-coloured glass items according to their clarity and iron content. It specifies a procedure for measuring the clarity of glass items by means of a spectrophotometer.

This document is applicable to

- mineral glasses, and
- glass items where a part is not covered by coating or decoration, and is therefore available for sampling.

This document is applicable to the use of glass as tableware, giftware, jewellery and luminaries.

It is not applicable to the use of glass in the context of building, watches, containers, medicine and laboratories, and to other technical uses of glass.

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2 Normative references

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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.

CIE 15, *Colorimetry*

3 Terms and definitions

No terms and definitions are listed in this document.

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/>

4 Specifications

4.1 General

The classification of the samples of glass in terms of clarity is based on three criteria:

- lightness, L^* ;
- chroma, C^* ;
- iron content of the material.

The iron content is a main contaminant influencing the transparency and colour of the glass; the value is expressed in iron oxide (Fe_2O_3) in mg/kg.

NOTE The best classification of clarity is obtained for the maximum value of lightness L^* at 100 and the minimum value of chroma C^* at zero.

4.2 Specifications for ultra-clear glass

Ultra-clear glass shall have:

- lightness $L^* \geq 98,8$;
- chroma $C^* \leq 0,5$;
- iron oxide content ≤ 140 mg/kg.

If one or more of these criteria are not reached, the glass cannot be classified as ultra-clear glass.

4.3 Specifications for clear glass

Clear glass shall have:

- lightness $L^* \geq 98,0$;
- chroma $C^* \leq 0,5$;
- iron oxide content ≤ 200 mg/kg.

If one or more of these criteria are not reached, the glass cannot be classified as clear glass.

5 Test methods

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5.1 General

The sample shall be prepared in accordance with 5.3 and 5.4. The same sample shall be used to characterize the three criteria, in accordance with the following two determination methods:

- Annex A shall apply for the determination of lightness L^* and chroma C^* ;
- Annex B shall apply for the determination of the iron oxide content.

5.2 Apparatus

5.2.1 **Double-beam spectrophotometer**, preferably with integrating sphere.

5.2.2 **X-ray fluorescence spectrometer**, with wavelength dispersion.

5.2.3 **Non-metallic hammer**.

5.2.4 **Non-metallic plate**.

5.2.5 **Platinum crucible**, compatible with the final dimensions of the sample(s).

5.2.6 **Electric oven**, capable of maintaining a temperature of 1 300 °C for a duration of 16 h.

5.2.7 **Polishing device**.

5.2.8 Manual grinding device, with silicium carbide (SiC) abrasive.

5.2.9 Automatic grinding machine.

5.2.10 Automatic polishing device.

5.3 Sampling

5.3.1 General

The sampling is carried out to select one or two pieces of glass with:

- a minimum dimension of 30 mm between two parallel faces;
- a minimum dimension of 10 mm between two parallel faces.

The two other dimensions shall be greater than the slide dimensions of the spectrophotometer ([5.2.1](#)) for the one or two pieces.

5.3.2 Cutting

Cut a glass block from the glass item (such as tumblers with a thick bottom).

For glass items covered with coating or decoration, or for glass items of which the minimum dimensions of the sample cannot be reached:

- a) melt a sufficient quantity of glass not covered with coating or decoration, approximately 200 g;
- b) crush with a non-metallic hammer ([5.2.3](#)) on a non-metallic plate ([5.2.4](#));
- c) melt in a platinum crucible ([5.2.5](#)) in an electric oven ([5.2.6](#)) for a duration of at least 8 h at 1 300 °C, in order to obtain a good quality of glass;
- d) check for the absence of seeds or bubbles;
- e) after solidification of the glass, put the crucible outside the furnace in a cold-water stream to separate the glass from the crucible. The resulting sample is annealed to avoid residual stresses. Alternatively, the crucible and glass can be annealed and drilled with the core drill and core removed for cutting and polishing.

5.4 Sample preparation

5.4.1 General

For the internal transmission measurements, prepare one or two samples with at least one dimension of 10 mm and another one of 30 mm thickness for measurement between two parallel faces (see [5.3.1](#)). The sample thicknesses where the light travels are (10 ± 0,05) mm and (30 ± 0,05) mm respectively.

The dimensions of the samples should fit the sample holder of the spectrophotometer that is used.

The preparation of the glass samples is carried out in accordance with the usual procedures of the laboratories, applying a polishing device ([5.2.7](#)) on the two faces in the optical way of transmission (light path).