



BSI Standards Publication

Optics and photonics — Test method for temperature coefficient of refractive index of optical glasses

Part 1: Minimum deviation method

National foreword

This British Standard is the UK implementation of ISO 6760-1:2025. It supersedes BS ISO 6760-1:2024, which is withdrawn.

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A list of organizations represented on this committee can be obtained on request to its committee manager.

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International
Standard

ISO 6760-1

**Optics and photonics — Test
method for temperature coefficient
of refractive index of optical
glasses —**

**Part 1:
Minimum deviation method**

*Optique et photonique — Méthode d'essai pour déterminer le
coefficient de température de l'indice de réfraction des verres
optiques —*

Partie 1: Méthode de la déviation minimale

**Second edition
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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 document 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 172, *Optics and photonics*, Subcommittee SC 3, *Optical materials and components*.

This second edition cancels and replaces the first edition (ISO 6760-1:2024), which has been technically revised.

The main changes are as follows:

- The status of [Annex C](#) and [Annex D](#) was changed from “informative” to “normative”.

A list of all parts in the ISO 6760 series can be found on the ISO website.

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

Optical glass is widely used in optical devices such as cameras, telescopes, and microscopes, and its refractive index is measured by the minimum deviation method (see ISO 21395-1) and the V-block refractometer method (see ISO 21395-2^[4]). Here, when designing an optical apparatus that requires high resolution, it is necessary to consider the temperature change of the refractive index of the optical glass in the usage environment, however up until now, there is no International Standard. In view of the above situation, this document proposes a method for measuring the temperature coefficient of refractive index of optical glass with high accuracy, aiming to help mutual understanding of measured value users and contribute to efficiency and fairness.

Optics and photonics — Test method for temperature coefficient of refractive index of optical glasses —

Part 1: Minimum deviation method

1 Scope

This document specifies the measurement method used for calculating the temperature coefficient of the refractive index by measuring the refractive index, which changes with the temperature of the optical glass using the minimum deviation method.

The intended temperature range for the specified measurement method is $-40\text{ }^{\circ}\text{C}$ to $+80\text{ }^{\circ}\text{C}$.

The intended wavelength range for the specified measurement method is 365 nm to 1 014 nm.

The intended accuracy for the specified measurement method is $1 \times 10^{-6}\text{ K}^{-1}$.

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 21395-1:2020, *Optics and photonics — Test method for refractive index of optical glasses — Part 1: Minimum deviation method*

3 Terms and definitions

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

ISO and IEC maintain terminology 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

temperature coefficient of refractive index

ratio of refractive index change to temperature change at a selected wavelength

Note 1 to entry: Similar to ISO 9802[2].

3.2

temperature coefficient of absolute refractive index

$\Delta n_{\text{abs}}/\Delta T$

ratio of refractive index change in vacuum to temperature change at a selected wavelength

[SOURCE: ISO 9802:2022[2], 3.4.2.3, modified — The word "absolute" was moved in the term.

3.3

temperature coefficient of relative refractive index

$$\Delta n_{\text{rel}}/\Delta T$$

ratio of refractive index change at an air pressure of $1,013\,3 \times 10^5$ Pa and a relative humidity of 0 % to temperature change at a selected wavelength

[SOURCE: ISO 9802:2022[2], 3.4.2.4, modified — $1,013\,3 \times 10^5$ Pa and a relative humidity of 0 % were added.]

Note 1 to entry: This definition of $\Delta n_{\text{rel}}/\Delta T$ is for a specific pressure and humidity. $\Delta n_{\text{rel}}/\Delta T$ can be calculated for any other pressure and humidity by understanding the index of air in those conditions.

3.4

thermal chamber

chamber where the temperature of the specimen can be changed and maintained to a preset temperature

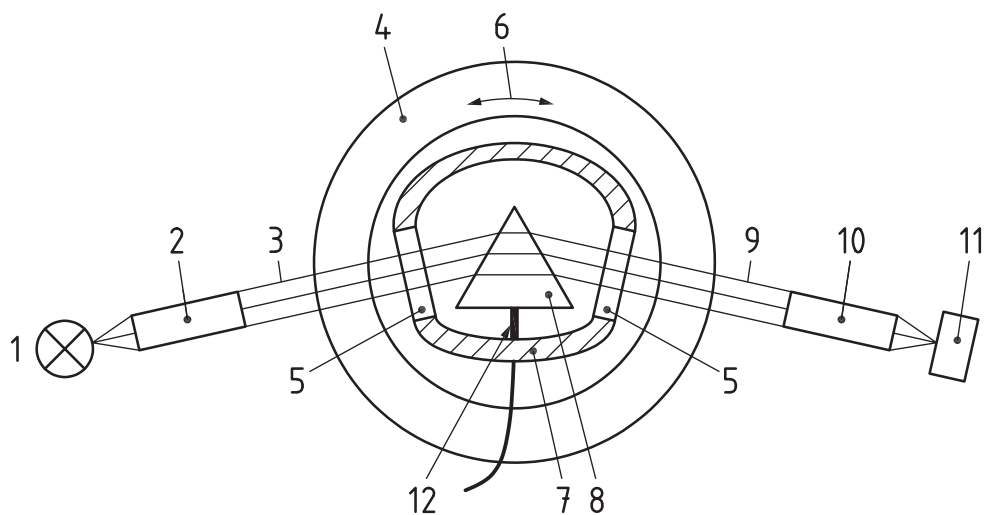
4 Principle

As shown in [Figure 1](#), a specimen prism is placed in a thermal chamber. The temperature of the specimen prism is changed from T_1 to T_2 or from T_2 to T_1 , and the refractive index of the specimen prism is measured (see also [Annex A](#)) at the temperatures of T_1 and T_2 respectively, in accordance with the method described in ISO 21395-1 to find the temperature coefficient of refractive index. [Figure 2](#) shows the concept of calculating this temperature coefficient of refractive index.

Alternatively, the measurement principle accordance with [Annex C](#) shall be applied.

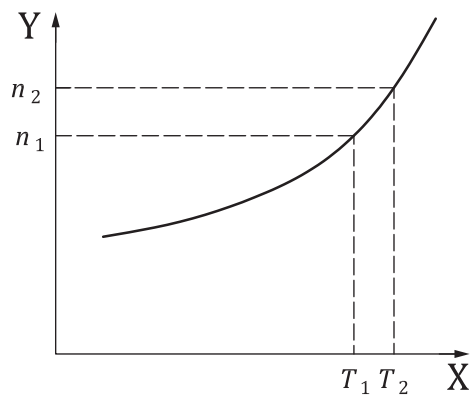
NOTE 1 In this document the term “light” is used to describe not only optical radiation visible to the human eye but also radiation in the infrared and ultraviolet spectrum.

NOTE 2 In this document, all temperature symbols are represented by “ T ”. The original symbol for temperature in ISO 80000-5 is “ t ” or “ ϑ ” for temperature in Celsius degrees, and “ T ” for absolute temperature.



- Key**
- 1 light source
 - 2 collimator
 - 3 incident light
 - 4 goniometer containing the telescope and detector
 - 5 window
 - 6 rotating stage containing the thermal chamber
 - 7 thermal chamber containing the specimen prism
 - 8 specimen prism
 - 9 transmitted light
 - 10 telescope
 - 11 detector
 - 12 thermometer

Figure 1 — Measurement set-up with thermal chamber



$$\frac{\Delta n}{\Delta T} = \frac{n_2 - n_1}{T_2 - T_1}$$

- Key**
- X temperature
 - Y refractive index
 - T_1, T_2 temperature of specimen prism
 - n_1 refractive index of specimen prism at temperature T_1
 - n_2 refractive index of specimen prism at temperature T_2

Figure 2 — Conceptual diagram for calculation of temperature coefficient of refractive index