BS ISO 8255-1:2011

BSI Standards Publication

Microscopes — Cover glasses

Part 1: Dimensional tolerances, thickness and optical properties

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National foreword

This British Standard is the UK implementation of ISO 8255-1:2011. It supersedes BS 7011-3.1:1989, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee CPW/172/5, Optics and Photonics - Microscopes.

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

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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INTERNATIONAL STANDARD

ISO 8255-1

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Microscopes — Cover glasses —

Part 1: Dimensional tolerances, thickness and optical properties

Microscopes — Lamelles couvre-objet —

Partie 1: Tolérances dimensionnelles, épaisseur et propriétés optiques

Reference number
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Foreword

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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.

ISO 8255-1 was prepared by Technical Committee ISO/TC 172, *Optics and photonics*, Subcommittee SC 5, *Microscopes and endoscopes*.

This second edition cancels and replaces the first edition (ISO 8255-1:1986), which has been technically revised.

ISO 8255 consists of the following parts, under the general title *Microscopes — Cover glasses*:

— *Part 1: Dimensional tolerances, thickness and optical properties*

— *Part 2: Quality of materials, standards of finish and mode of packaging*

Introduction

This part of ISO 8255 defines dimensions and specifies optical quality requirements in order to guarantee the quality of observation.

The data given in this part of ISO 8255 are applicable to most products in use and have been adapted to take into account the relevant national standards in vigour.

This part of ISO 8255 contains requirements for dimensional tolerances, thickness and optical properties, whereas quality requirements and test methods related to the material are dealt with in ISO 8255-2.

INTERNATIONAL STANDARD **ISO 8255-1:2011(E)**

Microscopes — Cover glasses —

Part 1: Dimensional tolerances, thickness and optical properties

1 Scope

This part of ISO 8255 specifies requirements for dimensional tolerances, thickness and optical properties for microscope cover glasses used for transmitted light microscopy in the visible spectral range (400 nm to 760 nm).

2 Normative references

The following referenced documents are indispensable for the application 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 8036, *Optics and photonics — Microscopes — Immersion liquids for light microscopy*

3 Requirements

3.1 General

All media that are located between the specimen and the microscope objective are in their optical effect part of the objective. Such media are usually cover glasses and immersion media. Immersion media are defined in ISO 8036; their refractive index shall be taken into account for the selection of the cover glass.

Microscope objectives, unless equipped with correction collars, are designed for a specific immersion medium (e.g. air, oil or water) and cover glass thickness. The design thickness is $t = 0{,}17$ mm, unless otherwise marked on the objective.

When using microscope objectives with high numerical aperture, deviations from the nominal cover glass thickness leads to severe optical aberrations, mainly spherical aberration.

The refractive index of the cover glass material needs to be specified for a broad spectral range to maintain good chromatic correction. This is achieved by specification of the refractive index, n_e, for a reference wavelength ($\lambda_e = 546{,}07$ nm) near the maximum of the eye's spectral sensitivity and the corresponding Abbe number, ν_e.

3.2 Dimensional tolerances for thickness

The thickness tolerances of cover glasses shall be in accordance with Table 1.

Table 1 — Dimensional tolerances of types of cover glasses

Dimensions in millimetres

Designation	Design thickness t	Tolerance
Type 1 1/2	0,17	$^{+0,02}_{-0,01}$
Type 1 1/2 H	0,17	$^{+0,005}_{-0,005}$
Type 1	0,17	$^{+0,00}_{-0,04}$

In addition to the thicknesses given in Table 1, cover glasses are available in other thicknesses. These can be used for certain applications or in combination with objectives specifically designed for such non-standard cover glasses. However, it shall be pointed out that the highest optical quality may not necessarily be obtained with such cover glasses, when using objectives of high numerical aperture.

Annex A provides guidelines for the selection of cover glass types 1 1/2 and 1 1/2 H with objective numerical aperture values in combination with common immersion media.

3.3 Dimensional tolerances for length, width and diameter

The limiting tolerances for nominal length (l) and width (w) for rectangular cover glasses (Form A) as shown in Figure 1 or diameter (d) for round cover glasses (Form B) as shown in Figure 2 are ± 0,5 mm.

Typical dimensions for rectangular and round cover glasses are given in Annex B.

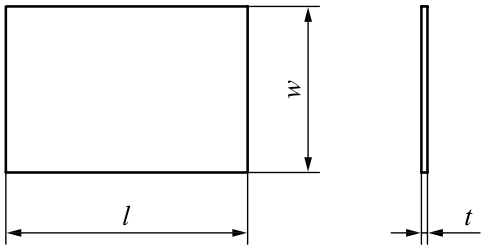

Figure 1 — Form A: Rectangular cover glass

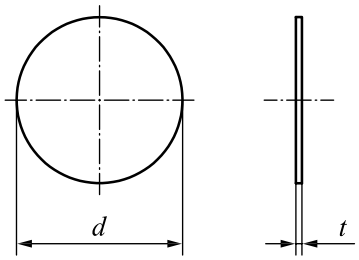

Figure 2 — Form B: Round cover glass

3.4 Optical properties

Cover glasses shall have the following optical properties:

Principal refractive index: $n_e = 1{,}525\ 5 \pm 0{,}001\ 5$

Abbe number: $\nu_e = 56 \pm 2$

NOTE The principal refractive index, n_e, is the index of refraction for light of wavelength $\lambda_e = 546{,}07$ nm (green Mercury e-line). This wavelength is located close to the maximum spectral sensitivity of the human eye and is commonly used as a reference wavelength for optical computations (see ISO 7944[1]).

The Abbe number, ν_e, is computed according to the following formula:

$$\nu_e = \frac{n_e - 1}{n_{F'} - n_{C'}}$$

where

n_e is the principal refractive index;

$n_{F'}$ is the refractive index for light of wavelength $\lambda_{F'} = 479{,}99$ nm (blue Cadmium F′-line);

$n_{C'}$ is the refractive index for light of wavelength $\lambda_{C'} = 643{,}85$ nm (red Cadmium C′-line).

4 Marking and labelling

The packaging of microscope cover glasses that comply with this part of ISO 8255 shall display the following information:

a) the thickness, type 1 1/2, type 1 1/2 H, or type 1;

b) the dimensions for length and width, or diameter;

c) the average number of cover glasses per package or mass;

d) the name of the manufacturer or supplier and country of origin;

e) a marking to show that the cover glasses comply with the requirements of this part of ISO 8255.

Annex A
(informative)

Guidelines for selection of cover glass type

To achieve optimum results, using the cover glass types shown in Table A.1 is recommended. The proper selection of the cover glass type depends on the application and individual properties of the objective as shown in Table A.1. Users, including those with objectives with mechanisms to correct for cover glass thickness, should always use cover glass that conforms with the other optical properties specified in this part of ISO 8255.

Table A.1 — Guidelines for selection of cover glass type

Immersion medium	Min. numerical aperture	Max. numerical aperture	Type of cover glass
Air	0,35	0,70	1 1/2
Air	0,70	—	1 1/2 H
Water	0,60	0,90	1 1/2
Water	0,90	—	1 1/2 H
Glycerol	0,80	1,10	1 1/2
Glycerol	1,10	—	1 1/2 H
Immersion oil	0,90	1,30	1 1/2
Immersion oil	1,30	—	1 1/2 H

Annex B
(informative)

Typical dimensions for rectangular and round cover glasses

Table B.1 — Typical dimensions for rectangular and round cover glasses

Dimensions in millimetres

Form	**Length** l ± 0,5	**Width** w ± 0,5	**Diameter** d ± 0,5
A	18	18	—
	22	22	—
	24 32 40 50 60	24	—
B	—	—	18
	—	—	22

Bibliography

[1] ISO 7944, *Optics and optical instruments — Reference wavelengths*

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