

---

---

**Microscopes — Cover glasses —**

Part 1:

**Dimensional tolerances, thickness and  
optical properties**

*Microscopes — Lamelles couvre-objet —*

*Partie 1: Tolérances dimensionnelles, épaisseur et propriétés optiques*

STANDARDSISO.COM : Click to view the full PDF of ISO 8255-1:2011



STANDARDSISO.COM : Click to view the full PDF of ISO 8255-1:2011



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2011

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

## 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

STANDARDSISO.COM : Click to view the full PDF of ISO 8255-1:2011

# 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,  $\nu_e$ .

### 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<br><i>t</i> | Tolerance        |
|-------------|------------------------------|------------------|
| Type 11/2   | 0,17                         | +0,02<br>-0,01   |
| Type 11/2 H | 0,17                         | +0,005<br>-0,005 |
| Type 1      | 0,17                         | +0,00<br>-0,04   |

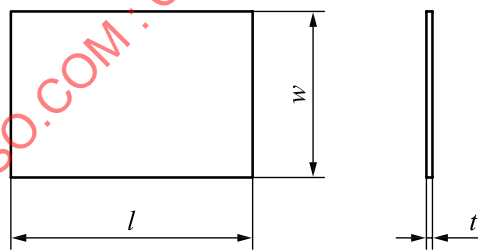
In addition to the thicknesses given in Table 1, cover glasses are available in other thicknesses. These can be used for certain applications or in combination with objectives specifically designed for such non-standard cover glasses. However, it shall be pointed out that the highest optical quality 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 11/2 and 11/2 H with objective numerical aperture values in combination with common immersion media.

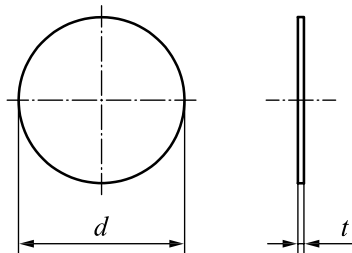
### 3.3 Dimensional tolerances for length, width and diameter

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  $\pm 0,5$  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<sup>[1]</sup>).

The Abbe number,  $\nu_e$ , 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 11/2, type 11/2 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                    | 11/2                |
| Air              | 0,70                    | —                       | 11/2 H              |
| Water            | 0,60                    | 0,90                    | 11/2                |
| Water            | 0,90                    | —                       | 11/2 H              |
| Glycerol         | 0,80                    | 1,10                    | 11/2                |
| Glycerol         | 1,10                    | —                       | 11/2 H              |
| Immersion oil    | 0,90                    | 1,30                    | 11/2                |
| Immersion oil    | 1,30                    | —                       | 11/2 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<br><i>l</i><br>± 0,5 | Width<br><i>w</i><br>± 0,5 | Diameter<br><i>d</i><br>± 0,5 |
|------|-----------------------------|----------------------------|-------------------------------|
| A    | 18                          | 18                         | —                             |
|      | 22                          | 22                         | —                             |
|      | 24                          | 24                         | —                             |
|      | 32                          |                            |                               |
|      | 40                          |                            |                               |
|      | 50                          |                            |                               |
| 60   | —                           |                            |                               |
| B    | —                           | —                          | 18                            |
|      | —                           | —                          | 22                            |