INTERNATIONAL STANDARD

ISO 19012-2

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Optics and photonics — Designation of microscope objectives —

Part 2: Chromatic correction

Optique et photonique — Désignation des objectifs de microscope —

Partie 2: Correction chromatique

Reference number
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Foreword

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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 19012-2 was prepared by Technical Committee ISO/TC 172, *Optics and photonics*, Subcommittee SC 5, *Microscopes and endoscopes*.

ISO 19012 consists of the following parts, under the general title *Optics and photonics — Designation of microscope objectives*:

— *Part 1: Flatness of field/Plan*

— *Part 2: Chromatic correction*

In this corrected version of ISO 19012-2:2009, on page 3, subclause 4.2.3 has been re-worded and mention of the reference wavelength removed.

Optics and photonics — Designation of microscope objectives —

Part 2: Chromatic correction

1 Scope

This part of ISO 19012 specifies classes of chromatic correction and defines minimum requirements regarding chromatic correction. The defined marking on the component enables the operator to correctly use the microscope.

The standard application for visual observation refers to the combination of objective and tube lens as specified by the manufacturer. The specifications regarding chromatic correction only refer to axial chromatic aberration.

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 10934-1, *Optics and optical instruments — Vocabulary for microscopy — Part 1: Light microscopy*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 10934-1 and the following apply.

3.1
reference wavelength
wavelength of 546,07 nm (e-line)

3.2
blue wavelength
wavelength of 479,99 nm (F'-line)

3.3
red wavelength
wavelength of 643,85 nm (C'-line)

3.4
focus
best focusing point for each wavelength

3.5
focus difference
axial separation of foci for different wavelengths

4 Requirements

4.1 Basic criterion for the depth of field

Equation (1) applies as the basic criterion for the depth of field:

$$\delta_{ob} = \frac{n\lambda}{2NA^2} \quad (1)$$

where

n is the refractive index of medium in object space;

NA is the numerical aperture of objective;

λ is the wavelength of the reference wave e-line in micrometers.

A table of δ_{ob} depending on NA can be found in Annex A.

4.2 Markings

4.2.1 General

The following markings may be used if the requirements according to 4.3 are met.

The indication of this marking does not apply to objective lenses sold before the year 2011.

This part of ISO 19012 does not apply to the objectives exclusively used on stereo microscopes.

A mixture of a capital letter and a lowercase letter is allowed in marking.

4.2.2 Achromat

Marking is not necessary but possible.

ACH, ACHRO, ACHROMAT

4.2.3 Semiapochromat

Objective lenses shall be marked with one of the following three options:

a) SEMIAPO, or

b) FL, or

c) a naming containing the letter sequence FLU.

4.2.4 Apochromat

APO

4.3 Specifications

4.3.1 General

The specifications of the “Semiapochromat” and “Apochromat” include the criterion of “Achromat”.

4.3.2 Achromat

The absolute value of the focus difference between the red wavelength and the blue wavelength is $\leqslant 2 \times \delta_{ob}$.

4.3.3 Semiapochromat

The absolute values of the focus differences for the red wavelength and the blue wavelength to the reference wavelength are $\leqslant 2{,}5 \times \delta_{ob}$.

4.3.4 Apochromat

The absolute values of the focus differences for the red wavelength and the blue wavelength to the reference wavelength are $\leqslant \delta_{ob}$.

Annex A
(informative)

Depth of field, δ_{ob}

Dry	
n	1
λ (µm)	0,546
NA	δ_{ob} (µm)
0,04	170,63
0,07	55,71
0,10	27,30
0,13	16,15
0,15	12,13
0,16	10,66
0,20	6,83
0,22	5,64
0,25	4,37
0,30	3,03
0,35	2,23
0,40	1,71
0,45	1,35
0,50	1,09
0,55	0,90
0,60	0,76
0,65	0,65
0,70	0,56
0,75	0,49
0,80	0,43
0,85	0,38
0,90	0,34
0,95	0,30

Immersion	
n	1,518
λ (µm)	0,546
NA	δ_{ob} (µm)
0,40	2,59
0,70	0,85
0,90	0,51
1,00	0,41
1,25	0,27
1,30	0,25
1,35	0,23
1,40	0,21