DRAFT INTERNATIONAL STANDARD ISO/DIS 19012-2

ISO/TC **172**/SC **5** Secretariat: **DIN**

Voting begins on: **2008-11-03**

Voting terminates on: **2009-04-03**

Optics and photonics — Designation of microscope objectives —

Part 2: Chromatic correction

Optique et photonique — Désignation des objectifs de microscope —

Partie 2: Correction chromatique

ICS 37.020

In accordance with the provisions of Council Resolution 15/1993 this document is circulated in the English language only.

Conformément aux dispositions de la Résolution du Conseil 15/1993, ce document est distribué en version anglaise seulement.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Pour accélérer la distribution, le présent document est distribué tel qu'il est parvenu du secrétariat du comité. Le travail de rédaction et de composition de texte sera effectué au Secrétariat central de l'ISO au stade de publication.

Contents

Page

Foreword iv

1 Scope 1

2 Normative references 1

3 Terms and Definitions 1

4 Requirements 2
4.1 Basic criterion for the depth of field 2
4.2 Markings 2
4.2.2 Achromat 2
4.2.3 Semiapochromat 2
4.2.4 Apochromat 2
4.3 Specifications 2
4.3.1 General 2
4.3.2 Achromat 3
4.3.3 Semiapochromat 3
4.3.4 Apochromat 3

Annex A (informative) Depth of field, δ_{ob} 4

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 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: Designation of microscope objectives – Part 1: Flatness of field/Plan*

— *Part 2:Designation of microscope objectives – Part 2: Chromatic correction*

Optics and photonics — Designation of microscope objectives —

Part 2: Chromatic correction

1 Scope

This International standard specifies classes of chromatic correction and defines minimum requirements regarding chromatic correction. The defined marking on the component shall enable 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 8578: 1997, *Optics and optical instruments — Microscopes — Marking of objectives and eyepieces*

ISO 10934-1: 2002, *Optics and optical instruments — Vocabulary for microscopy — Part 1: Light microscopy*

3 Terms and Definitions

For the purpose of this part of ISO 19012, the following terms and definitions apply.

Some terms and definitions are taken from ISO 10934-1.

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

The following equation 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 standard does not apply to the objectives exclusively used on stereo microscopes.

Mixture of a capital letter and a small 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:

1) SEMIAPO or

2) FL or

3) 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 equal or less than twice the value of δ_{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 equal or less than 2.5 times the value of δ_{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 equal or less than the value of δ_{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