INTERNATIONAL STANDARD

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Microscopes — Marking of objectives and eyepieces

Microscopes — Marquage des objectifs et des oculaires

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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
Web www.iso.org

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Foreword

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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 8578 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 8578:1997) which has been technically revised. It also incorporates the Technical Corrigendum ISO 8578:1997/Cor. 1:2002.

Introduction

This International Standard has been prepared in order to define clearly the data relating to optical characteristics with which microscope objectives and eyepieces have to be marked and the positioning of such marking on the component to enable correct use of the microscope. In addition to data which have been marked, recommendations for the marking of additional information relating to several other optical characteristics are given.

Microscopes — Marking of objectives and eyepieces

1 Scope

This International Standard specifies the format for the marking of data or symbols for optical characteristics on microscope objectives and eyepieces and the positioning of the data. It makes recommendations for the marking of additional information, particularly colour coding of rings designating the magnification of objectives and the immersion media with which they are used.

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*

ISO 19012-1, *Microscopes — Designation of microscope objectives — Part 1: Flatness of field/Plan*

ISO 19012-2, *Optics and photonics — Designation of microscope objectives — Part 2: Chromatic correction*

3 Objectives

3.1 Mandatory markings on objectives

The markings on objectives shall be as given in Table 1.

Tube length and cover glass thickness shall be marked in this sequence and shall be separated by oblique strokes and be in one line, e.g. ∞/0.17, 160/-, ∞/0. This marking shall be in a smaller font than markings according to Table 3. The objective field number (OFN) shall be marked according to the following example:

OFN25

3.2 Recommended additional markings on objectives

The marking of additional data is optional. If features as listed in Table 2 are marked, they shall be marked as given in Table 2.

3.3 Recommendation for arrangement of the marking

It is recommended that the markings in Table 3, column A should be placed above or before the markings of column B, which in turn should be placed above or before those of column C.

4 Eyepieces

4.1 Mandatory markings on eyepieces

The markings on eyepieces shall be as specified in Table 4.

4.2 Recommended additional markings on eyepieces

The marking of additional data is optional. If features as listed in Table 5 are marked, they shall be marked as given in Table 5.

Table 1 — Mandatory markings on objectives

Optical property	Feature to be marked	Example of marking[a]	Remarks
Magnification	Lateral magnification of objectives for a finite image distance.	100	Magnification and numerical aperture shall be separated by an oblique stroke, e.g. 100/1.30.
	Lateral magnification of objectives for an infinite image distance.	100×	The marked value of the magnification of infinity corrected objectives is only valid in combination with the related tube lens. The marking of the symbol "×" has been introduced as an additional designation of magnification on infinity-corrected objectives.
Aperture	Numerical aperture.	/1.30	The numerical aperture shall be stated to at least two decimal places.
Adjustable iris diaphragm	Limiting values of numerical aperture.	/1.30-0.80	The upper and lower limits of the numerical aperture range controlled by the iris diaphragm shall be marked at the position where the value for the numerical aperture is usually marked.
Immersion liquid	Oil according to ISO 8036.	OIL	For additional marking, colour-coded rings can be used (see Table 2).
	Water.	W	
	Glycerol according to ISO 8036.	GLYC	
	Other.		The requirement to use any other immersion medium shall be indicated unambiguously.
Tube length	Length in mm for objective of finite primary image distance.	160	See 3.1.
	Symbol ∞ for objective of primary image distance ∞.	∞	
Cover glass thickness	Thickness, in mm	/0	For objectives that are corrected for use with uncovered specimens only, the figure "0" shall be indicated after the first oblique stroke.
		/0.17	For objectives that are corrected for use only with a specified cover glass, the value of the cover glass thickness to be used shall be indicated, in mm, after the first oblique stroke, e.g. /0.17.
		/-	For objectives that can be used without a cover glass or with a cover glass up to 0,17 mm thickness, the symbol "-" shall be positioned after the first oblique stroke.
		/0.14-0.20	For objectives with a correction collar, the range of usable cover glass thicknesses shall be given.
Objective field number	Diameter of intermediate image, in mm, according to ISO 19012-1.	/OFN20	
Flatness of field	Field flatness properties according to ISO 19012-1.	PLAN	
Chromatic correction	Chromatic correction properties according to ISO 19012-2.	FL	Example for semi-apochromat.
		APO	Example for apochromat.
Phase contrast	Symbol PH.	PH 2	A figure after the symbol indicates the associated annular diaphragm.

[a] Capital or lower case letters optional.

Table 1 *(continued)*

Optical property	Feature to be marked	Example of marking[a]	Remarks
Polarizing microscopy	Symbol POL, P or PO.	POL PO P	
Manufacturer	Name or symbol of identification.		

[a] Capital or lower case letters optional.

Table 2 — Recommended additional markings on objectives

Optical property	Feature to be marked		Example of marking[a]	Remarks
Magnification	**Value**	**Colour of ring**		
	1/1.25	Black		
	1.6/2	Grey		
	2.5/3.2	Brown		
	4/5	Red		
	6.3/8	Orange		
	10/12.5	Yellow		
	16/20	Light green		
	25/32	Dark green		
	40/50	Light blue		
	63/80	Dark blue		
	100 125 160	White		
Immersion medium	**Medium**	**Colour of ring**		To avoid confusion, it is recommended that a coloured ring indicating the immersion medium only be used in conjunction with a second ring indicating the magnification.
	Air	None		
	Oil	Black		
	Water	White		
	Glycerol	Orange		
	Others	Red		
Phase contrast	The entire marking, apart from the coloured rings and the manufacturer's name, shall be in green.			The marking of the manufacturer's name may be in any colour.
Polarizing microscopy	The entire marking, apart from the coloured rings and the manufacturer's name, shall be in red.			The marking of the manufacturer's name may be in any colour.
Differential interference contrast	Symbol DIC.		DIC	
Epi illumination	Symbol EPI or M.		EPI M	

[a] Capital or lower case letters optional.

Table 2 *(continued)*

Optical property	Feature to be marked	Example of marking[a]	Remarks
Epi illumination, brightfield and darkfield	Symbol D or BD or HD.	D BD HD	The symbol EPI can be marked in addition.
Correction collar	Symbol CORR or KORR.	CORR	
Long working distance	Symbol L, LD or LWD.	L LD LWD	
Country of manufacture			The marking of the country of origin is mandatory in several countries.

[a] Capital or lower case letters optional.

Table 3 — Recommendation of arrangement of markings on objectives

A	B	C
Flatness of field Chromatic correction Long working distance	Magnification Numerical aperture	Immersion liquid Phase contrast Polarizing microscopy system Differential interference contrast Objectives for brightfield and darkfield Epi illumination Objectives with correction collar
NOTE 1 If an additional coloured ring is used in accordance with Table 2 to identify the immersion medium, this ring should be placed closer to the front lens than the coloured ring used to indicate the magnification.		
NOTE 2 A to precede B, B to precede C (see 3.3).		

Table 4 — Mandatory markings on eyepieces

Optical property	Feature to be marked	Example of marking	Remarks
Magnification	Visual magnification	10×	Visual magnification and field-of-view number shall be separated by an oblique stroke, e.g. 10×/18.
Field-of-view	Diameter in mm	/18	
Manufacturer	Name or symbol of identification		

Table 5 — Recommended additional markings on eyepieces

Optical property	Feature to be marked	Example of marking	Remarks
Suitable for spectacle wearers	Symbol		Marking in conjunction with the magnification and field-of-view number, for example 10×/18 .
Centred and aligned cross lines	Symbol ⊕	⊕	Only for eyepieces with centred cross lines aligned with an orienting pin.