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Microscopes — Values, tolerances and symbols for magnification

Microscopes — Valeurs, tolérances et symboles de grossissement

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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 committee responsible for this document is ISO/TC 172, *Optics and photonics*, Subcommittee SC 5, *Microscopes and endoscopes*.

This third edition cancels and replaces the second edition (ISO 8039:2012), of which it constitutes a minor revision.

Microscopes — Values, tolerances and symbols for magnification

1 Scope

This International Standard specifies a series of values, tolerances, and symbols for the magnification of imaging components of light microscopes and defines a number of imaging components and magnifying systems to which they apply.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 apply.

4 Symbols for magnification of imaging components

Table 1 gives the symbols that shall be used when referring to the magnification of imaging components and combinations thereof and gives examples of methods of expression.

5 Values and tolerances for magnification

5.1 Values for magnification

Values for the magnification of imaging components or magnifying systems should be one of the values given in Table 2. The products or quotients of any two values in the table are also to be considered as values within the table. The table can be extended by a factor of 10 per row.

5.2 Tolerance of values of magnification for imaging components

Tolerances of values of magnification shall be as given in Table 3.

Table 1 — Symbols for magnification and methods of expression

Component	Symbol	Methods of expression	
		Preferred	Alternative
Objective: a) corrected for finite primary image distance b) corrected for infinite primary image distance	 M_O $M_{O\infty}$	 M_O = 25 : 1 $M_{O\infty}$ = 25 ×	 25 : 1 or 25 25 ×
Eyepiece	M_E	M_E = 10 ×	10 ×
Tube lens	q	q = 1,25 ×	1,25 ×
Projection lens	M_{PHOT}	M_{PHOT} = 2,5 : 1	2,5 : 1
Total (lateral) magnification of microscope: a) for visual observation b) for real image	 $M_{TOT\ VIS}$ $M_{TOT\ PROJ}$	 $M_{TOT\ VIS}$ = 500 × $M_{TOT\ PROJ}$ = 500 : 1	 500 × 500 : 1

Table 2 — Values for magnification

					…0,32	0,4	0,5	0,63	0,8
1	1,25	1,6	2	2,5	3,2	4	5	6,3	8
10	12,5	16	20	25	32	40	50	63	80
100	125	160	200	250	320	400	500	630	800
1 000	1 250	1 600	2 000…						

NOTE 1 The values have been taken from the R10 series in ISO 3:1973.

NOTE 2 The value 0,32 has been rounded from its R10 series value.

NOTE 3 Besides the values in this table, the following values are also in use: 1,5 – 15 – 30 – 60 – 150.

Table 3 — Tolerances on magnification

System/component	Tolerance %
Objective	±5
Tube lens	±2
Projection lens	±2
Eyepiece	±5

Bibliography

[1] ISO 3:1973, *Preferred numbers — Series of preferred numbers*

[2] ISO 10934-2, *Optics and optical instruments — Vocabulary for microscopy — Part 2: Advanced techniques in light microscopy*

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