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ISO metric trapezoidal screw threads — Tolerances

Filetages métriques trapézoïdaux ISO — Tolérances

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 1, *Screw threads*.

This third edition cancels and replaces the second edition (ISO 2903:1993), Clauses 1, 13 and 14, and Table 7 of which have been technically revised (now Clauses 1, 11 and 12, and Table 5).

ISO metric trapezoidal screw threads — Tolerances

1 Scope

This document specifies a tolerance system for metric trapezoidal screw threads in accordance with ISO 2902. The tolerances refer to the design profile in accordance with ISO 2901.

The tolerance system does not apply to trapezoidal screw threads with special requirements on axial displacement, for example, machine tool lead and feed screws and nuts.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 965-1, *ISO general purpose metric screw threads — Tolerances — Part 1: Principles and basic data*

ISO 2901, *ISO metric trapezoidal screw threads — Basic and design profiles*

ISO 2902, *ISO metric trapezoidal screw threads — General plan*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5408 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

4 Symbols

For the purposes of this document, the following symbols apply.

D_4	basic major diameter of internal thread
D	nominal diameter (internal thread)
D_2	basic pitch diameter of internal thread
D_1	basic minor diameter of internal thread
d	basic major diameter of external thread (nominal diameter)
d_2	basic pitch diameter of external thread
d_3	basic minor diameter of external thread
P	pitch
Ph	lead

N	designation for normal group of thread engagement
L	designation for long group of thread engagement
T	tolerance
T_{D2}, T_{D1}, T_d, T_{d2}, T_{d3}	tolerances for D_2, D_1, d, d_2 and d_3, respectively (no tolerance for D_4)
EI, ei	lower limit deviations
ES, es	upper limit deviations

5 Tolerance system

The system is based on the tolerance system for ISO general-purpose metric screw threads of ISO 965-1.

6 Tolerance positions

The following tolerance positions are standardized for the pitch diameters.

— For internal threads: H with zero fundamental deviation (*EI*). See Figure 1.

— For external threads: c and e with negative fundamental deviation (*es*). See Figure 2.

The tolerance position for the minor diameter (D_1) and the major diameter (D_4) of the internal threads is always H, i.e. with zero fundamental deviation (*EI*).

The tolerance position for the major diameter (d) and minor diameter (d_3) of the external threads is in all cases h, i.e. with zero fundamental deviation (*es*), and it is independent of the tolerance positions of the pitch diameter.

The fundamental deviations for the pitch diameters of internal and external threads are given in Table 1.

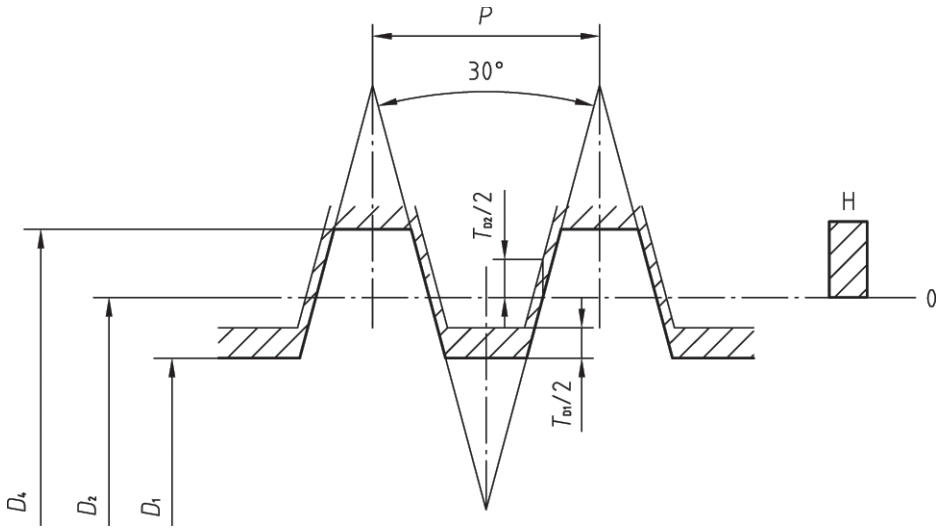

Figure 1 — Internal threads with tolerance position H

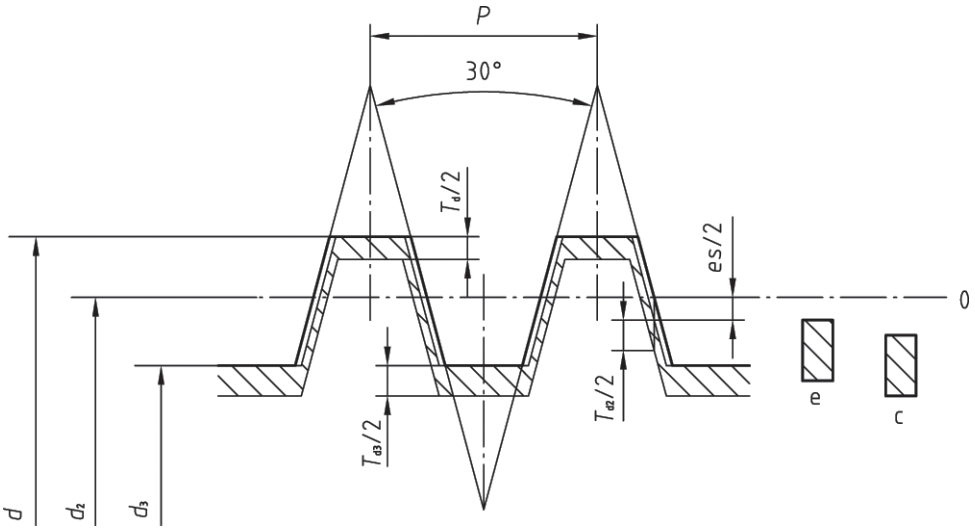

Figure 2 — External threads with tolerance positions c and e for the pitch diameter

Table 1 — Fundamental deviations for the pitch diameters of internal and external threads

Pitch P	Fundamental deviations		
	Internal threads D_2	External threads d_2	
	H EI	c es	e es
mm	µm	µm	µm
1,5	0	−140	−67
2	0	−150	−71
3	0	−170	−85
4	0	−190	−95
5	0	−212	−106
6	0	−236	−118
7	0	−250	−125
8	0	−265	−132
9	0	−280	−140
10	0	−300	−150
12	0	−335	−160
14	0	−355	−180
16	0	−375	−190
18	0	−400	−200
20	0	−425	−212
22	0	−450	−224
24	0	−475	−236
28	0	−500	−250
32	0	−530	−265
36	0	−560	−280
40	0	−600	−300
44	0	−630	−315

7 Tolerance grades

The tolerance grades for the following screw thread diameters are standardized.

	Tolerance grades		
Minor diameter of internal threads, D_1		4	
Major diameter of external threads, d		4	
Pitch diameter of internal threads, D_2	7	8	9
Pitch diameter of external threads, d_2	7	8	9
Minor diameter of external threads, d_3	7	8	9

The tolerance grade for the minor diameter (d_3) of the external thread is always the same as for the pitch diameter (d_2). However, the values for T_{d3} and T_{d2} are not the same for a same grade.

The minor diameter tolerances of internal thread (T_{D1}) are given in Table 2.

The major diameter tolerances of external thread (T_d) are given in Table 3.

Table 2 — Minor diameter tolerances of internal threads (T_{D1})

Pitch P	Tolerance grade 4
mm	µm
1,5	190
2	236
3	315
4	375
5	450
6	500
7	560
8	630
9	670
10	710
12	800
14	900
16	1 000
18	1 120
20	1 180
22	1 250
24	1 320
28	1 500
32	1 600
36	1 800
40	1 900
44	2 000

Table 3 — Major diameter tolerances of external threads (T_d)

Pitch P	Tolerance grade 4
mm	µm
1,5	150
2	180
3	236
4	300
5	335
6	375
7	425
8	450
9	500
10	530
12	600
14	670
16	710
18	800
20	850
22	900
24	950
28	1 060
32	1 120
36	1 250
40	1 320
44	1 400

The pitch diameter tolerances of internal thread (T_{D2}) are given in Table 4.

The pitch diameter tolerances of external thread (T_{d2}) are given in Table 5.

Table 4 — Pitch diameter tolerances of internal thread (T_{D2})

Basic major diameter D		Pitch P	Tolerance grade		
over	up to and incl.		7	8	9
mm	mm	mm	µm	µm	µm
5,6	11,2	1,5	224	280	355
		2	250	315	400
		3	280	355	450
11,2	22,4	2	265	335	425
		3	300	375	475
		4	355	450	560
		5	375	475	600
		8	475	600	750

Table 4 *(continued)*

Basic major diameter *D*		Pitch *P*	Tolerance grade		
over	up to and incl.		7	8	9
mm	mm	mm	µm	µm	µm
22,4	45	3	335	425	530
		5	400	500	630
		6	450	560	710
		7	475	600	750
		8	500	630	800
		10	530	670	850
		12	560	710	900
45	90	3	355	450	560
		4	400	500	630
		8	530	670	850
		9	560	710	900
		10	560	710	900
		12	630	800	1 000
		14	670	850	1 060
		16	710	900	1 120
		18	750	950	1 180
90	180	4	425	530	670
		6	500	630	800
		8	560	710	900
		12	670	850	1 060
		14	710	900	1 120
		16	750	950	1 180
		18	800	1 000	1 250
		20	800	1 000	1 250
		22	850	1 060	1 320
		24	900	1 120	1 400
		28	950	1 180	1 500
180	355	8	600	750	950
		12	710	900	1 120
		18	850	1 060	1 320
		20	900	1 120	1 400
		22	900	1 120	1 400
		24	950	1 180	1 500
		32	1 060	1 320	1 700
		36	1 120	1 400	1 800
		40	1 120	1 400	1 800
		44	1 250	1 500	1 900

Table 5 — Pitch diameter tolerances of external thread (T_{d2})

Basic major diameter d		Pitch P	Tolerance grade		
over	up to and incl.		7	8	9
mm	mm	mm	µm	µm	µm
5,6	11,2	1,5	170	212	265
		2	190	236	300
		3	212	265	335
11,2	22,4	2	200	250	315
		3	224	280	355
		4	265	335	425
		5	280	355	450
		8	355	450	560
22,4	45	3	250	315	400
		5	300	375	475
		6	335	425	530
		7	355	450	560
		8	375	475	600
		10	400	500	630
		12	425	530	670
45	90	3	265	335	425
		4	300	375	475
		8	400	500	630
		9	425	530	670
		10	425	530	670
		12	475	600	750
		14	500	630	800
		16	530	670	850
		18	560	710	900
90	180	4	315	400	500
		6	375	475	600
		8	425	530	670
		12	500	630	800
		14	530	670	850
		16	560	710	900
		18	600	750	950
		20	600	750	950
		22	630	800	1 000
		24	670	850	1 060
		28	710	900	1 120