INTERNATIONAL STANDARD

ISO 2903

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ISO metric trapezoidal screw threads — Tolerances

Filetages métriques trapézoïdaux ISO — Tolérances

Reference number
ISO 2903:1993(E)

Contents

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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.

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.

International Standard ISO 2903 was prepared by Technical Committee ISO/TC 1, *Screw threads*, Sub-Committee SC 2, *Tolerances*.

This second edition cancels and replaces the first edition (ISO 2903:1977), tables 1 and 7 of which have been technically revised.

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ISO metric trapezoidal screw threads — Tolerances

1 Scope

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

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

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 965-1:1980, *ISO general purpose metric screw threads — Tolerances — Part 1: Principles and basic data.*

ISO 2901:1993, *ISO metric trapezoidal screw threads — Basic profile and maximum material profiles.*

ISO 2902:1977, *ISO metric trapezoidal screw threads — General plan.*

ISO 5408:1983, *Cylindrical screw threads — Vocabulary.*

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 5408 apply.

4 Symbols

(See figures 1 to 4)

D_4	basic major diameter of nut thread, in millimetres
D_1	basic minor diameter of nut thread, in millimetres
D_2	basic pitch diameter of nut thread, in millimetres
d	basic major diameter of bolt thread, in millimetres
d_3	basic minor diameter of bolt thread, in millimetres
d_2	basic pitch diameter of bolt thread, in millimetres
P	pitch, in millimetres
P_h	lead, in millimetres
N	designation for thread engagement group "Normal"
L	designation for thread engagement group "Long"
l_N	thread engagement, in millimetres
T	tolerance, in micrometres
T_{D1}, T_{D2}, T_d, T_{d3}, T_{d2}	tolerances for D_1, D_2, d, d_3, d_2 (for D_4 no tolerances are specified), in micrometres
ei, EI	lower deviations (EI for nut threads is equal to zero), in micrometres
es, ES	upper deviations, in micrometres

5 Structure of the tolerance system

The system is based on the tolerance system for ISO general-purpose metric screw threads of ISO 965-1, completed with tolerance positions c and e, and with values for pitches above 6 mm.

The recommended tolerance classes are, however, not the same as those for ISO metric screw threads in ISO 965-1.

6 Tolerance grades

The following tolerance grades are established:

	Tolerance grades			
Minor diameter of nut threads D_1 :		4		
Major diameter of bolt threads d :		4		
Pitch diameter of nut threads D_2 :		7	8	9
Pitch diameter of bolt threads d_2 :	(6)	7	8	9
Minor diameter of bolt threads d_3 :		7	8	9

Tolerance grade 6 for the pitch diameter (d_2) of the bolt thread has been included only as a means to establish the pitch diameter tolerances of grades 7, 8 and 9. See 13.4.2.

The tolerance grade for the minor diameter (d_3) of the bolt 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 because $T_{d3} = 1{,}25 T_{d2} + |es|$.

7 Tolerance positions

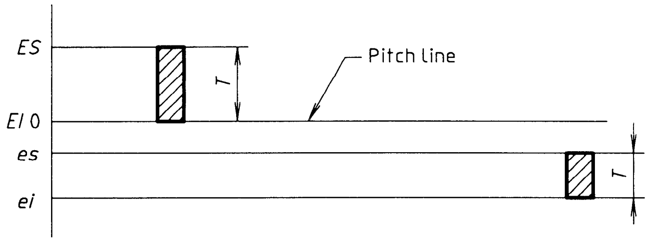

Figure 1 — Tolerance positions with respect to zero line (basic size)

The following tolerance positions are standardized for the pitch diameter.

a) For nut threads: H with zero fundamental deviation (see figure 2 and table 1).

b) For both threads: c and e with negative fundamental deviation (see figure 3 and table 1).

The tolerance position for the minor diameter D_1 and the major diameter D_4 of the nut threads is always H, i.e. with zero fundamental deviation. The tolerance position for the major diameter d and minor diameter d_3 of the bolt threads is in all cases h, i.e. with zero fundamental deviation, and it is independent of the tolerance position of the pitch diameter.

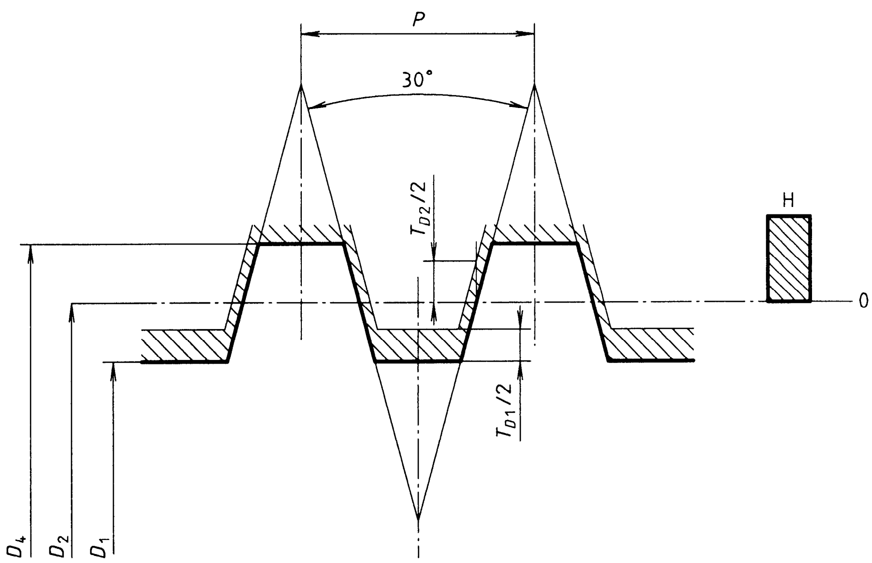

Figure 2 — Nut threads with tolerance position H for the pitch diameter

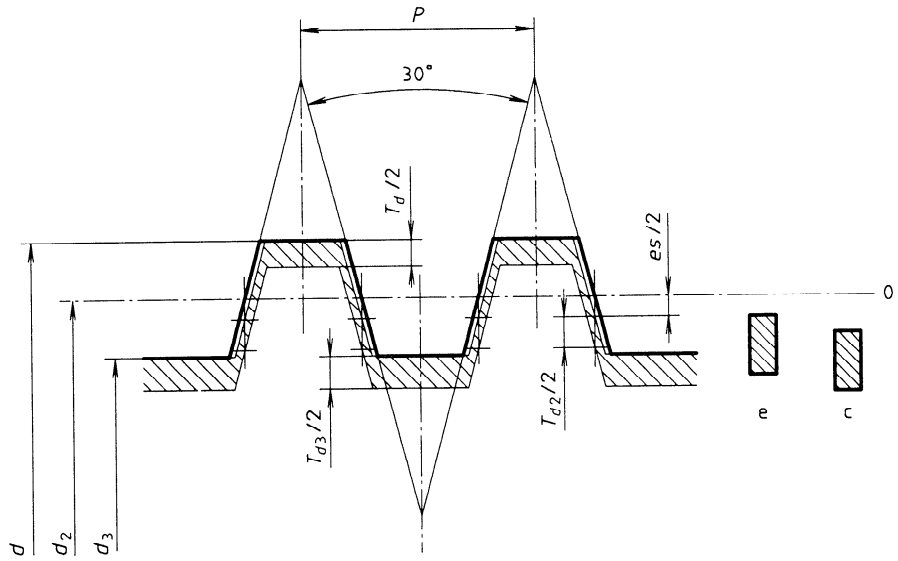

Figure 3 — Bolt threads with tolerance positions c and e for the pitch diameter

Table 1 — Fundamental deviations for the pitch diameter of nut threads and bolt threads

Pitch P	Fundamental deviation		
	Nut thread	Bolt thread	
	D_2	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

8 Lengths of thread engagement

The length of thread engagement is classified into the groups N or L, in accordance with table 2.

9 Crest and root diameter tolerances

9.1 Minor diameter tolerances of nut thread (T_{D1})

For the minor diameter tolerance of the nut thread, T_{D1}, there is only one tolerance grade, 4 (see table 3).

9.2 Major diameter tolerances of bolt thread (T_d)

For the major diameter tolerance of the bolt thread, T_d, there is only one tolerance grade, 4 (see table 4).

9.3 Minor diameter tolerances of bolt thread (T_{d3})

For the minor diameter tolerance of the bolt thread, T_{d3}, there are three tolerance grades, 7, 8, and 9, in accordance with table 5.

10 Pitch diameter tolerances

For the pitch diameter tolerances there are three tolerance grades, 7, 8 and 9 for nut threads, in accordance with table 6, and four tolerance grades, 6, 7, 8 and 9 for bolt threads, in accordance with table 7.

Table 2 — Lengths of thread engagement

Dimensions in millimetres

Basic major diameter d		Pitch P	Groups of lengths of thread engagement, l		
			N		L
over	up to and incl.		over	up to and incl.	over
5,6	11,2	1,5 2 3	5 6 10	15 19 28	15 19 28
11,2	22,4	2 3 4 5 8	8 11 15 18 30	24 32 43 53 85	24 32 43 53 85
22,4	45	3 5 6	12 21 25	36 63 75	36 63 75
		7 8 10 12	30 34 42 50	85 100 125 150	85 100 125 150
45	90	3 4 8	15 19 38	45 56 118	45 56 118
		9 10 12	43 50 60	132 140 170	132 140 170
		14 16 18	67 75 85	200 236 265	200 236 265
90	180	4 6 8 12	24 36 45 67	71 106 132 200	71 106 132 200
		14 16 18	75 90 100	236 265 300	236 265 300
		20 22 24 28	112 118 132 150	335 355 400 450	335 355 400 450
180	355	8 12 18	50 75 112	150 224 335	150 224 335
		20 22 24	125 140 150	375 425 450	375 425 450
		32 36 40 44	200 224 250 280	600 670 750 850	600 670 750 850

Table 3 — Minor diameter tolerances of nut 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 4 — Major diameter tolerances of bolt 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

Table 5 — Minor diameter tolerances of bolt thread (T_{d3})

Basic major diameter d		Pitch P	Tolerance position c of the pitch diameter tolerance			Tolerance position e of the pitch diameter tolerance		
over	up to		Tolerance grades			Tolerance grades		
			7	8	9	7	8	9
mm	mm	mm	µm	µm	µm	µm	µm	µm
5,6	11,2	1,5	352	405	471	279	332	398
		2	388	445	525	309	366	446
		3	435	501	589	350	416	504
11,2	22,4	2	400	462	544	321	383	465
		3	450	520	614	365	435	529
		4	521	609	690	426	514	595
		5	562	656	775	456	550	669
		8	709	828	965	576	695	832
22,4	45	3	482	564	670	397	479	585
		5	587	681	806	481	575	700
		6	655	767	899	537	649	781
		7	694	813	950	569	688	825
		8	734	859	1 015	601	726	882
		10	800	925	1 087	650	775	937
		12	866	998	1 223	691	823	1 048