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ISO general purpose metric screw threads — Tolerances —

Part 1: Principles and basic data

Filetages métriques ISO pour usages généraux — Tolérances —

Partie 1: Principes et données fondamentales

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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. www.iso.org/directives

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The committee responsible for this document is ISO/TC ISO 965-1 was prepared by Technical Committee ISO/TC 1, *Screw Threads*.

This fourth edition cancels and replaces the third edition (ISO 965-1:1998), which has been technically revised. It also incorporates the Technical Corrigendum ISO 965-1:1998/Cor.1:2009.

ISO 965 consists of the following parts, under the general title *ISO general purpose metric screw threads — Tolerances*:

— *Part 1: Principles and basic data*

— *Part 2: Limits of sizes for general purpose external and internal screw threads — Medium quality*

— *Part 3: Deviations for constructional screw threads*

— *Part 4: Limits of sizes for hot-dip galvanized external threads to mate with internal screw threads tapped with tolerance position H or G after galvanizing*

— *Part 5: Limits of sizes for internal screw threads to mate with hot-dip galvanized external screw threads with maximum size of tolerance position h before galvanizing*

ISO general purpose metric screw threads — Tolerances —

Part 1: Principles and basic data

1 Scope

This part of ISO 965 specifies a tolerance system for ISO general purpose metric screw threads (M) according to ISO 261.

The tolerance system refers to the basic profile according to ISO 68-1.

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 68-1, *ISO general purpose screw threads — Basic profile — Part 1: Metric screw threads*

ISO 261, *ISO general purpose metric screw threads — General plan*

ISO 1502, *ISO general-purpose metric screw threads — Gauges and gauging*

ISO 5408, *Screw threads — Vocabulary*

3 Terms, definitions and symbols

3.1 Terms and definitions

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

3.2 Symbols

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

Symbol	Meaning
D	basic major diameter of internal thread
D_1	basic minor diameter of internal thread
D_2	basic pitch diameter of internal thread
d	basic major diameter of external thread
d_1	basic minor diameter of external thread
d_2	basic pitch diameter of external thread
d_3	minor diameter of external thread (see Figure 6)
P	pitch

Ph	lead
H	height of fundamental triangle
S	designation for “short” thread engagement group
N	designation for “normal” thread engagement group
L	designation for “long” thread engagement group
T	tolerance
T_{D1}, T_{D2}, T_d, T_{d2}	tolerances for D_1, D_2, d and d_2
ei, EI	lower limit deviations (see Figure 1)
es, ES	upper limit deviations (see Figure 1)
R	root radius of external thread (see Figure 6)
C	root truncation of external thread (see Figure 6)

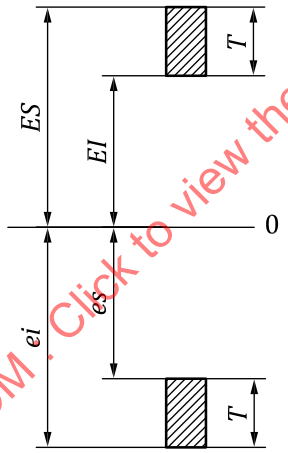


Figure 1 — Position of tolerances with respect to zero line (basic size)

4 Tolerance system

The tolerance system consists of tolerance grades and tolerance positions. The tolerance grades are expressed by number, such as 4, 6 and 8. The tolerance positions are expressed by letter, such as H, G, h and g. The tolerance class designation shall be the combination of the number and the letter, for example 6H and 6g.

5 Tolerance positions

The following tolerance positions are standardized:

— for internal threads:

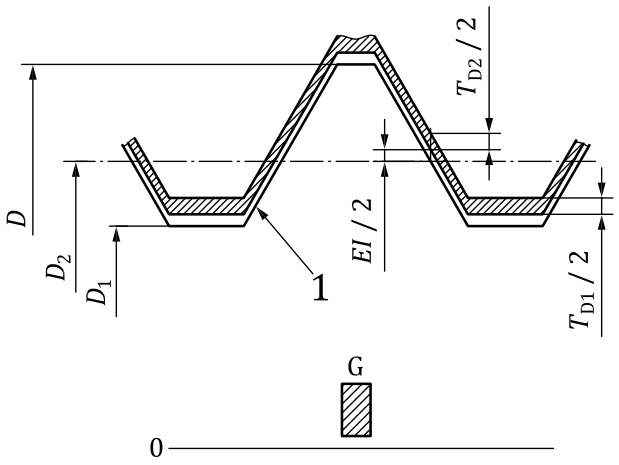
  — G with positive fundamental deviation (EI), shown in Figure 2;

  - H with zero fundamental deviation (*EI*), shown in Figure 3.

- for external threads:
  - a, b, c, d, e, f and g with negative fundamental deviation (*es*), shown in Figure 4;
  - h with zero fundamental deviation (*es*), shown in Figure 5.

The established tolerance positions comply with the needs of coating thickness and with the demands of easy assembly.

The fundamental deviations for internal threads and external threads are given in Table 1.



Key

1 basic profile

Figure 2 — Internal threads with tolerance position G

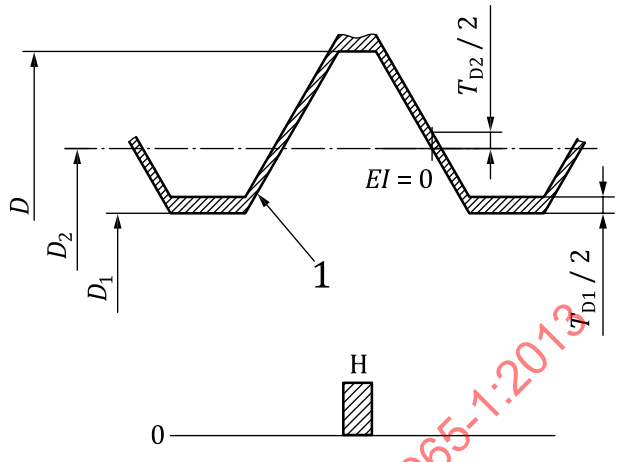


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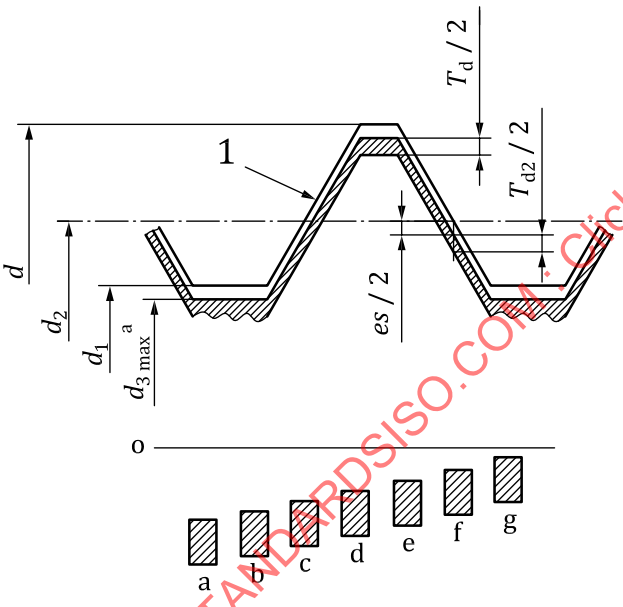
Figure 3 — Internal threads with tolerance position H

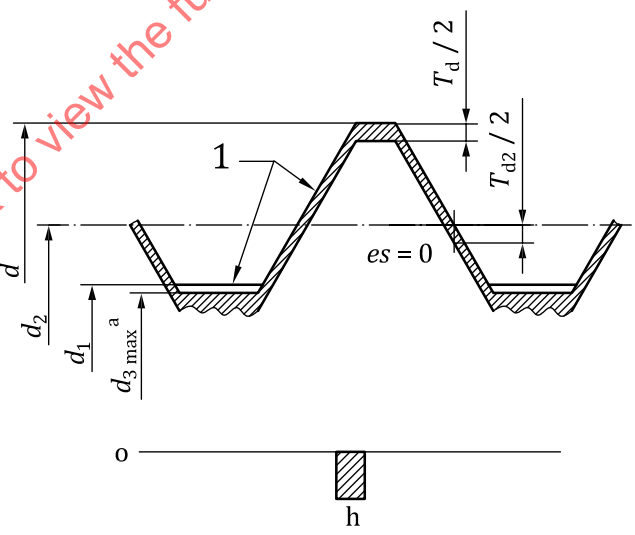


Key

1 basic profile

a Application only in connection with minimum material limits ($d_{2\,min}$); see Clause 11, Figure 6.

Figure 4 — External threads with tolerance positions a, b, c, d, e, f and g



Key

1 basic profile

a Application only in connection with minimum material limits ($d_{2\,min}$); see Clause 11, Figure 6.

Figure 5 — External threads with tolerance position h

Table 1 — Fundamental deviations for internal threads and external threads

Pitch P mm	Fundamental deviation									
	Internal thread		External thread							
	G EI µm	H EI µm	a es µm	b es µm	c es µm	d es µm	e es µm	f es µm	g es µm	h es µm
0,2	+17	0	–	–	–	–	–	–	–17	0
0,25	+18	0	–	–	–	–	–	–	–18	0
0,3	+18	0	–	–	–	–	–	–	–18	0
0,35	+19	0	–	–	–	–	–	–34	–19	0
0,4	+19	0	–	–	–	–	–	–34	–19	0
0,45	+20	0	–	–	–	–	–	–35	–20	0
0,5	+20	0	–	–	–	–	–50	–36	–20	0
0,6	+21	0	–	–	–	–	–53	–36	–21	0
0,7	+22	0	–	–	–	–	–56	–38	–22	0
0,75	+22	0	–	–	–	–	–56	–38	–22	0
0,8	+24	0	–	–	–	–	–60	–38	–24	0
1	+26	0	–290	–200	–130	–85	–60	–40	–26	0
1,25	+28	0	–295	–205	–135	–90	–63	–42	–28	0
1,5	+32	0	–300	–212	–140	–95	–67	–45	–32	0
1,75	+34	0	–310	–220	–145	–100	–71	–48	–34	0
2	+38	0	–315	–225	–150	–105	–71	–52	–38	0
2,5	+42	0	–325	–235	–160	–110	–80	–58	–42	0
3	+48	0	–335	–245	–170	–115	–85	–63	–48	0
3,5	+53	0	–345	–255	–180	–125	–90	–70	–53	0
4	+60	0	–355	–265	–190	–130	–95	–75	–60	0
4,5	+63	0	–365	–280	–200	–135	–100	–80	–63	0
5	+71	0	–375	–290	–212	–140	–106	–85	–71	0
5,5	+75	0	-385	–300	–224	–150	–112	–90	–75	0
6	+80	0	–395	–310	–236	–155	–118	–95	–80	0
8	+100	0	–425	–340	–265	–180	–140	–118	–100	0

6 Tolerance grades

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

	Tolerance grade
D_1	4, 5, 6, 7, 8
d	4, 6, 8
D_2	4, 5, 6, 7, 8
d_2	3, 4, 5, 6, 7, 8, 9

Clause 8 shows details of tolerance grades and combinations of tolerance grades for pitch and crest diameters according to the tolerance quality and length of engagement group required, with the order of preference.

In some grades, certain tolerance values for small pitches are not shown in tolerance tables because of insufficient thread overlap or the requirement that the pitch diameter tolerance not exceed the crest diameter tolerance.

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

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

Pitch	Tolerance grade				
P	4	5	6	7	8
mm	µm	µm	µm	µm	µm
0,2	38	–	–	–	–
0,25	45	56	–	–	–
0,3	53	67	85	–	–
0,35	63	80	100	–	–
0,4	71	90	112	–	–
0,45	80	100	125	–	–
0,5	90	112	140	180	–
0,6	100	125	160	200	–
0,7	112	140	180	224	–
0,75	118	150	190	236	–
0,8	125	160	200	250	315
1	150	190	236	300	375
1,25	170	212	265	335	425
1,5	190	236	300	375	475
1,75	212	265	335	425	530
2	236	300	375	475	600
2,5	280	355	450	560	710
3	315	400	500	630	800
3,5	355	450	560	710	900
4	375	475	600	750	950
4,5	425	530	670	850	1 060
5	450	560	710	900	1 120
5,5	475	600	750	950	1 180
6	500	630	800	1 000	1 250
8	630	800	1 000	1 250	1 600

The major diameter tolerances of external thread, T_d, are given in Table 3. The tolerance grades 5 and 7 do not exist for them.

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

Pitch	Tolerance grade		
P	4	6	8
mm	µm	µm	µm
0,2	36	56	–
0,25	42	67	–
0,3	48	75	–
0,35	53	85	–
0,4	60	95	–
0,45	63	100	–
0,5	67	106	–
0,6	80	125	–
0,7	90	140	–
0,75	90	140	–
0,8	95	150	236
1	112	180	280
1,25	132	212	335
1,5	150	236	375
1,75	170	265	425
2	180	280	450
2,5	212	335	530
3	236	375	600
3,5	265	425	670
4	300	475	750
4,5	315	500	800
5	335	530	850
5,5	355	560	900
6	375	600	950
8	450	710	1 180

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 including	mm	4	5	6	7	8
mm	mm		µm	µm	µm	µm	µm
0,99	1,4	0,2	40	–	–	–	–
		0,25	45	56	–	–	–
		0,3	48	60	75	–	–
1,4	2,8	0,2	42	–	–	–	–
		0,25	48	60	–	–	–
		0,35	53	67	85	–	–
		0,4	56	71	90	–	–
		0,45	60	75	95	–	–

Table 4 *(continued)*

Basic major diameter D		Pitch P mm	Tolerance grade				
over mm	up to and including mm		4 µm	5 µm	6 µm	7 µm	8 µm
2,8	5,6	0,35 0,5 0,6 0,7 0,75 0,8	56 63 71 75 75 80	71 80 90 95 95 100	90 100 112 118 118 125	– 125 140 150 150 160	– – – – – 200
5,6	11,2	0,75 1 1,25 1,5	85 95 100 112	106 118 125 140	132 150 160 180	170 190 200 224	– 236 250 280
11,2	22,4	1 1,25 1,5 1,75 2 2,5	100 112 118 125 132 140	125 140 150 160 170 180	160 180 190 200 212 224	200 224 236 250 265 280	250 280 300 315 335 355
22,4	45	1 1,5 2 3 3,5 4 4,5	106 125 140 170 180 190 200	132 160 180 212 224 236 250	170 200 224 265 280 300 315	212 250 280 335 355 375 400	– 315 355 425 450 475 500
45	90	1,5 2 3 4 5 5,5 6	132 150 180 200 212 224 236	170 190 224 250 265 280 300	212 236 280 315 335 355 375	265 300 355 400 425 450 475	335 375 450 500 530 560 600
90	180	2 3 4 6 8	160 190 212 250 280	200 236 265 315 355	250 300 335 400 450	315 375 425 500 560	400 475 530 630 710
180	355	3 4 6 8	212 236 265 300	265 300 335 375	335 375 425 475	425 475 530 600	530 600 670 750

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

Basic major diameter d		Pitch P mm	Tolerance grade						
over mm	up to and including mm		3 µm	4 µm	5 µm	6 µm	7 µm	8 µm	9 µm
0,99	1,4	0,2 0,25 0,3	24 26 28	30 34 36	38 42 45	48 53 56	– – –	– – –	– – –
1,4	2,8	0,2 0,25 0,35 0,4 0,45	25 28 32 34 36	32 36 40 42 45	40 45 50 53 56	50 56 63 67 71	– – 80 85 90	– – – – –	– – – – –
2,8	5,6	0,35 0,5 0,6 0,7 0,75 0,8	34 38 42 45 45 48	42 48 53 56 56 60	53 60 67 71 71 75	67 75 85 90 90 95	85 95 106 112 112 118	– – – – – 150	– – – – – 190

Table 5 *(continued)*

Basic major diameter *d*		Pitch *P*	Tolerance grade						
over mm	up to and including mm	mm	3 µm	4 µm	5 µm	6 µm	7 µm	8 µm	9 µm
5,6	11,2	0,75 1 1,25 1,5	50 56 60 67	63 71 75 85	80 90 95 106	100 112 118 132	125 140 150 170	– 180 190 212	– 224 236 265
11,2	22,4	1 1,25 1,5 1,75 2 2,5	60 67 71 75 80 85	75 85 90 95 100 106	95 106 112 118 125 132	118 132 140 150 160 170	150 170 180 190 200 212	190 212 224 236 250 265	236 265 280 300 315 335
22,4	45	1 1,5 2 3 3,5 4 4,5	63 75 85 100 106 112 118	80 95 106 125 132 140 150	100 118 132 160 170 180 190	125 150 170 200 212 224 236	160 190 212 250 265 280 300	200 236 265 315 335 355 375	250 300 335 400 425 450 475
45	90	1,5 2 3 4 5 5,5 6	80 90 106 118 125 132 140	100 112 132 150 160 170 180	125 140 170 190 200 212 224	160 180 212 236 250 265 280	200 224 265 300 315 335 355	250 280 335 375 400 425 450	315 355 425 475 500 530 560
90	180	2 3 4 6 8	95 112 125 150 170	118 140 160 190 212	150 180 200 236 265	190 224 250 300 335	236 280 315 375 425	300 355 400 475 530	375 450 500 600 670
180	355	3 4 6 8	125 140 160 180	160 180 200 224	200 224 250 280	250 280 315 355	315 355 400 450	400 450 500 560	500 560 630 710

7 Lengths of thread engagement

The lengths of thread engagement are classified into one of three groups: short (S), normal (N) or long (L), in accordance with Table 6.

Table 6 — Length groups of thread engagement

Dimensions in millimetres

Basic major diameter *D, d*		Pitch *P*	Length group of thread engagement			
			S	N		L
over	up to and including		up to and including	over	up to and including	over
0,99	1,4	0,2 0,25 0,3	0,5 0,6 0,7	0,5 0,6 0,7	1,4 1,7 2	1,4 1,7 2
1,4	2,8	0,2 0,25 0,35 0,4 0,45	0,5 0,6 0,8 1 1,3	0,5 0,6 0,8 1 1,3	1,5 1,9 2,6 3 3,8	1,5 1,9 2,6 3 3,8

Table 6 *(continued)*

Basic major diameter *D, d*		Pitch *P*	Length group of thread engagement			
			S	N		L
over	up to and including		up to and including	over	up to and including	over
2,8	5,6	0,35 0,5 0,6 0,7 0,75 0,8	1 1,5 1,7 2 2,2 2,5	1 1,5 1,7 2 2,2 2,5	3 4,5 5 6 6,7 7,5	3 4,5 5 6 6,7 7,5
5,6	11,2	0,75 1 1,25 1,5	2,4 3 4 5	2,4 3 4 5	7,1 9 12 15	7,1 9 12 15
11,2	22,4	1 1,25 1,5 1,75 2 2,5	3,8 4,5 5,6 6 8 10	3,8 4,5 5,6 6 8 10	11 13 16 18 24 30	11 13 16 18 24 30
22,4	45	1 1,5 2 3 3,5 4 4,5	4 6,3 8,5 12 15 18 21	4 6,3 8,5 12 15 18 21	12 19 25 36 45 53 63	12 19 25 36 45 53 63
45	90	1,5 2 3 4 5 5,5 6	7,5 9,5 15 19 24 28 32	7,5 9,5 15 19 24 28 32	22 28 45 56 71 85 95	22 28 45 56 71 85 95
90	180	2 3 4 6 8	12 18 24 36 45	12 18 24 36 45	36 53 71 106 132	36 53 71 106 132
180	355	3 4 6 8	20 26 40 50	20 26 40 50	60 80 118 150	60 80 118 150

8 Recommended tolerance classes

8.1 General

In order to reduce the number of gauges and tools, the tolerance classes should preferably be chosen from Tables 7 and 8.

The tolerance class should be selected according to the tolerance quality (fine, medium and coarse) and the length group of thread engagement (S, N and L).

If the actual length of thread engagement is unknown (as in the manufacturing of standard bolts), group N is recommended.

8.2 Tolerance quality

The following general rules can be formulated for the choice of tolerance quality:

— fine: for precision threads, where little variation of fit character is needed;

— medium: for general use;

— coarse: for cases where manufacturing difficulties can arise, for example when threading hot-rolled bars and long blind holes.

8.3 Preference order

Tolerance classes within broad frames shall be selected for commercial internal and external threads.

The tolerance classes given in Tables 7 and 8 in bold typeface, nomal typeface and parentheses shall be the first, second and third choices, respectively.

Table 7 — Recommended tolerance classes for internal threads

Tolerance quality	Tolerance position G			Tolerance position H		
	S	N	L	S	N	L
Fine	–	–	–	4H	5H	6H
Medium	(5G)	**6G**	(7G)	**5H**	**6H**	**7H**
Coarse	–	(7G)	(8G)	–	7H	8H

Table 8 — Recommended tolerance classes for external threads

Tolerance quality	Tolerance position e			Tolerance position f			Tolerance position g			Tolerance position h		
	S	N	L	S	N	L	S	N	L	S	N	L
Fine	–	–	–	–	–	–	–	(4g)	(5g4g)	(3h4h)	**4h**	(5h4h)
Medium	–	**6e**	(7e6e)	–	**6f**	–	(5g6g)	**6g**	(7g6g)	(5h6h)	6h	(7h6h)
Coarse	–	(8e)	(9e8e)	–	–	–	–	8g	(9g8g)	–	–	–

8.4 Combination of internal threads and external threads

Any of the recommended tolerance classes for internal threads may be combined with any of the recommended tolerance classes for external threads. However, in order to guarantee sufficient overlap, the finished components should preferably be made to form the H/g, H/h or G/h fits. For thread sizes M1,4 and smaller, the combinations 5H/6h, 4H/6h or finer shall be chosen.

8.5 Coated threads

For coated threads, the tolerances apply to the parts before coating, unless otherwise stated. After coating, the actual thread profile shall not at any point transgress the maximum material limits for positions H or h.

9 Multiple-start threads

With the same pitch, the tolerances for multiple-start threads are the same as for single-start threads, with the exception of the pitch diameter tolerances which are enlarged.

For multiple-start threads, the tolerance values for pitch diameter (T_{D2} and T_{d2}), specified in Tables 4 and 5, shall be multiplied by a factor according to Table 9.

Table 9 — Factors for multiple-start threads

Number of starts	2	3	4	5 and larger
Factor	1,12	1,25	1,4	1,6

10 Formulae

10.1 General

The tolerance values given in this part of ISO 965 are based on experience. In order to obtain a consistent system, mathematical formulae have been developed.

The values for pitch and crest diameter tolerances and for fundamental deviations have been calculated from the formulae and then rounded off to the nearest value in the R40 series of preferred numbers. However, when decimals appear, the value has been further rounded off to the nearest whole number.

In order to reproduce a smooth progression, the rules of rounding off are not always used.

When the tolerance values calculated from the formulae are different from the values specified by the tolerance tables, the values in the tolerance tables shall be used.

10.2 Fundamental deviations

The fundamental deviations for threads are calculated as given by Formulae (1) to (10):

$$EI_G = +(15 + 11P) \quad (1)$$

$$EI_H = 0 \quad (2)$$

$$es_a = -(270 + 19P) \quad (3)$$

NOTE 1 This is not applicable to threads with $P \leq 0{,}8$ mm.

$$es_b = -(185 + 19P) \quad (4)$$

NOTE 2 This is not applicable to threads with $P \leq 0{,}8$ mm.

$$es_c = -(115 + 19P) \quad (5)$$

NOTE 3 This is not applicable to threads with $P \leq 0{,}8$ mm.

$$es_d = -(65 + 19P) \quad (6)$$

NOTE 4 This is not applicable to threads with $P \leq 0{,}8$ mm.

$$es_e = -(50 + 11P) \quad (7)$$

NOTE 5 This is not applicable to threads with $P \leq 0{,}45$ mm.

$$es_f = -(30 + 11P) \tag{8}$$

NOTE 6 This is not applicable to threads with $P \leq 0{,}3$ mm.

$$es_g = -(15 + 11P) \tag{9}$$

$$es_h = 0 \tag{10}$$

where

EI and es are expressed in micrometres;

P is expressed in millimetres.

10.3 Crest diameter tolerances

10.3.1 Tolerances for major diameter of external thread (T_d)

The tolerances for grade 6 are calculated as given by Formula (11):

$$T_d(6) = 180\sqrt[3]{P^2} - \frac{3{,}15}{\sqrt{P}} \tag{11}$$

where

T_d is expressed in micrometres;

P is expressed in millimetres.

The tolerances for the other grades shall be obtained from the $T_d(6)$ values given in Table 10.

Table 10 — T_d tolerances for the other grades

Tolerance grade		
4	6	8
0,63 $T_d(6)$	$T_d(6)$	1,6 $T_d(6)$

10.3.2 Tolerances for minor diameter of internal thread (T_{D1})

The tolerances for grade 6 are calculated as given by Formulae (12) and (13):

a) Pitches 0,2 mm to 0,8 mm:

$$T_{D1}(6) = 433P - 190P^{1,22} \tag{12}$$

b) Pitches 1 mm and coarser:

$$T_{D1}(6) = 230P^{0,7} \quad (13)$$

where

T_{D1} is expressed in micrometres;

P is expressed in millimetres.

The tolerances for the other grades shall be obtained from the $T_{D1}(6)$ values given in Table 11.

Table 11 — T_{D1} tolerances for the other grades

Tolerance grade				
4	5	6	7	8
0,63 $T_{D1}(6)$	0,8 $T_{D1}(6)$	$T_{D1}(6)$	1,25 $T_{D1}(6)$	1,6 $T_{D1}(6)$

10.4 Pitch diameter tolerances

10.4.1 Tolerances for pitch diameter of external thread (T_{d2})

The tolerances for grade 6 are calculated as given by Formula (14):

$$T_{d2}(6) = 90P^{0,4}\ d^{0,1} \quad (14)$$

where

T_{d2} is expressed in micrometres;

P and d are expressed in millimetres;

d is equal to the geometrical mean value of the diameter range limits.

The tolerances for the other grades shall be obtained from the $T_{d2}(6)$ values given in Table 12.

Table 12 — T_{d2} tolerances for the other grades

Tolerance grade						
3	4	5	6	7	8	9
0,5 $T_{d2}(6)$	0,63 $T_{d2}(6)$	0,8 $T_{d2}(6)$	$T_{d2}(6)$	1,25 $T_{d2}(6)$	1,6 $T_{d2}(6)$	2 $T_{d2}(6)$

No T_{d2} values are given when values calculated according to the given formulae exceed the T_d values in the tolerance grades which are combined for recommended tolerance classes; see the dashes in Table 5.

10.4.2 Tolerances for pitch diameter of internal thread (T_{D2})

T_{D2} values shall be obtained from the $T_{d2}(6)$ values given in Table 13.

Table 13 — T_{D2} tolerances

Tolerance grade				
4	5	6	7	8
0,85 $T_{d2}(6)$	1,06 $T_{d2}(6)$	1,32 $T_{d2}(6)$	1,7 $T_{d2}(6)$	2,12 $T_{d2}(6)$

No T_{D2} values are given when values calculated according to the given formulae exceed 0,25P; see the dashes in Table 4.

10.5 Length of thread engagement

For the calculation of the limits of the normal length of thread engagement, l_N, the following rule is applied.

For each pitch within a certain diameter range, d is set equal to the smallest diameter (within the range) which appears in the general plan (conforming to ISO 261).

$$l_{N,min} \approx 2{,}24Pd^{0,2} \tag{15}$$

$$l_{N,max} \approx 6{,}7Pd^{0,2} \tag{16}$$

where l_N, P and d are expressed in millimetres.

11 Root contours

For internal threads as well as external threads, the actual root contours shall not at any point transgress the maximum material limit which is decided by the basic profile and the tolerance position. For the root of external threads, see Figure 6.

For external threads on fasteners of property class 8.8 and higher (see ISO 898-1), the root profile shall have a non-reversing curvature, no portion of which shall have a radius of less than 0,125P. The minimum radius, R_{min}, is given in Table 14.

In the maximum minor diameter position, d_{3max}, the two radii R_{min} = 0,125 P will go through the points of intersection between the maximum material flanks and the minor diameter cylinder of the Go-gauges in accordance with ISO 1502 and blend tangentially into the minimum material flanks.

The maximum truncation, C_{max}, is calculated as given by Formula (17):

$$C_{max} = \frac{H}{4} - R_{min}\left\{1 - \cos\left[\frac{\pi}{3} - \arccos\left(1 - \frac{T_{d2}}{4R_{min}}\right)\right]\right\} + \frac{T_{d2}}{2} \tag{17}$$

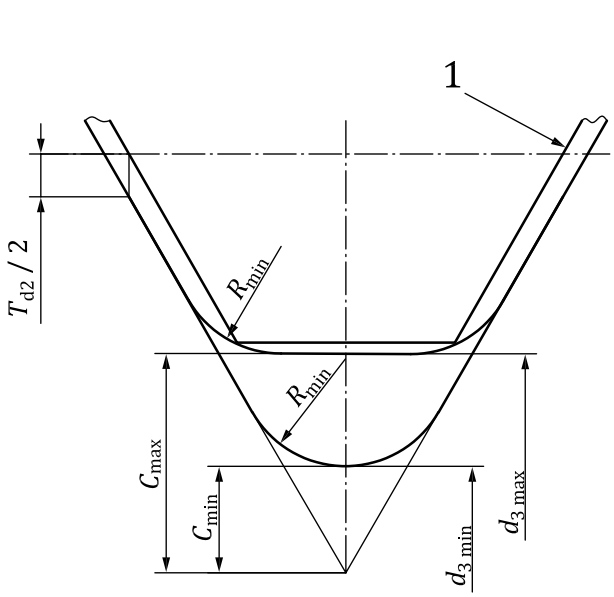
It is, however, advisable to aspire to a truncation of $H/6$ (R = 0,144 34P) and to take $H/6$ as the basis for stress calculation of the minor diameter, d_3, of external threads (for corresponding values, see ISO 965-3).

The minimum truncation, C_{min}, is calculated as given by Formula (18):

$$C_{min} = 0{,}125P \approx \frac{H}{7} \tag{18}$$

External threads on the fasteners of property classes below 8.8 should preferably conform to the requirements stated above. This is particularly important for fasteners or other screwed connections which are subjected to fatigue or impact. However, there are in principle no restrictions other than

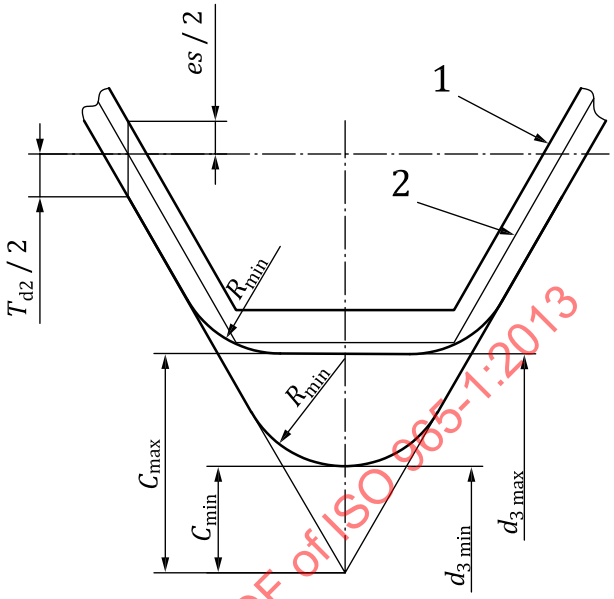
that the maximum minor diameter, d_{3max}, of the external thread shall be less than the minimum minor diameter of the Go-gauges in accordance with ISO 1502.



Key

1 basic profile and Go-gauge profile

a) Position h



Key

1 basic profile

2 Go-gauge profile

b) Positions a, b, c, d, e, f, g

Figure 6 — External thread root profile

Table 14 — Minimum root radii

Pitch P mm	R_{min} µm	**Pitch** P mm	R_{min} µm
0,2	25	1,5	188
0,25	31	1,75	219
0,3	38	2	250
0,35	44	2,5	313
0,4	50	3	375
0,45	56	3,5	438
0,5	63	4	500
0,6	75	4,5	563
0,7	88	5	625
0,75	94	5,5	688
0,8	100	6	750
1	125	8	1 000
1,25	156	–	–