UDC 621.882.082.4

April 1977

ISO Metric Trapezoidal Screw Thread

Profiles

DIN 103 Part 1

Metrisches ISO-Trapezgewinde; Gewindeprofile

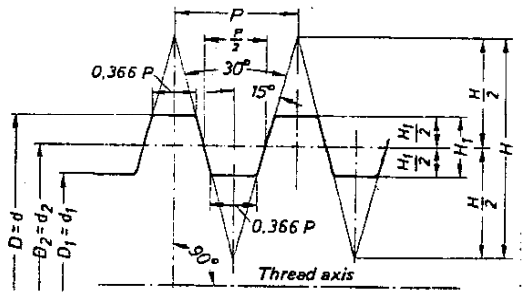
For connection with ISO Standard 2901-1977 issued by the International Organization for Standardization (ISO), see Explanations.

Dimensions in mm

1 Basic profile

The basic profile is the theoretical profile to which the basic dimensions of the outside, pitch and minor diameters are related.

The clearances on the outside and minor diameters (see Section 2) and the basic allowances for the pitch diameter (see Section 3) are referred to these basic dimensions.



$D = d$ Outside diameter of thread
$D_2 = d_2$ Pitch diameter of thread
$D_1 = d_1$ Minor diameter of thread
P Pitch of single-start and multiple-start thread
H Height of fundamental triangle
H_1 Thread depth of basic profile

Figure 1. Basic profile

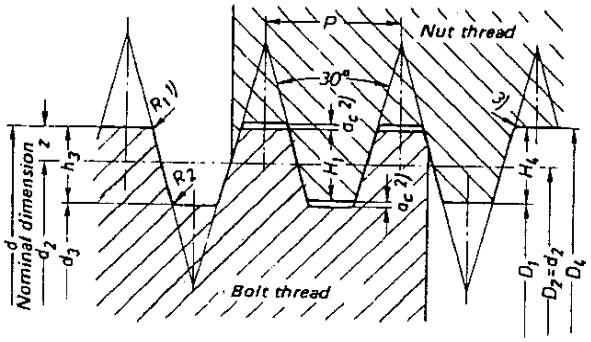
Table 1. **Basic profile dimensions**

Pitch P	H 1,866 P	$H/2$ 0,933 P	H_1 0,5 P	0,366 P
1,5	2,799	1,400	0,75	0,549
2	3,732	1,866	1	0,732
3	5,598	2,799	1,5	1,098
4	7,464	3,732	2	1,464
5	9,330	4,665	2,5	1,830
6	11,196	5,598	3	2,196
7	13,062	6,531	3,5	2,562
8	14,928	7,464	4	2,928
9	16,794	8,397	4,5	3,294
10	18,660	9,330	5	3,660
12	22,392	11,196	6	4,392
14	26,124	13,062	7	5,124
16	29,856	14,928	8	5,856
18	33,588	16,794	9	6,588
20	37,320	18,660	10	7,320
22	41,052	20,526	11	8,052
24	44,784	22,392	12	8,784
28	52,248	26,124	14	10,248
32	59,712	29,856	16	11,712
36	67,176	33,588	18	13,176
40	74,640	37,320	20	14,640
44	82,104	41,052	22	16,104

Continued on pages 2 to 4
Explanations on pages 4 and 5

2 Nominal profiles

These profiles, to which the allowances and tolerances are referred, have prescribed clearances on the outside and pitch diameters which are referred to the basic profile (see Fig. 1).



$D_1 = d - 2H_1 = d - P$
$H_1 = 0{,}5P$
$H_4 = H_1 + a_c = 0{,}5P + a_c$
$h_3 = H_1 + a_c = 0{,}5P + a_c$
$z = 0{,}25P = \frac{H_1}{2}$
$D_4 = d + 2a_c$
$d_3 = d - 2h_3$
$d_2 = D_2 = d - 2z = d - 0{,}5P$
a_c Clearance 2)
R_1 = max. $0{,}5a_c$
R_2 = max. a_c

Figure 2. Profiles for bolt and nut thread with clearance on the outside and minor diameter and without flank clearance (nominal dimensions)

Table 2. **Nominal profile dimensions**

P	a_c	$H_4 = h_3$	R_1 max.	R_2 max.
1,5	0,15	0,9	0,075	0,15
2	0,25	1,25	0,125	0,25
3	0,25	1,75	0,125	0,25
4	0,25	2,25	0,125	0,25
5	0,25	2,75	0,125	0,25
6	0,5	3,5	0,25	0,5
7	0,5	4	0,25	0,5
8	0,5	4,5	0,25	0,5
9	0,5	5	0,25	0,5
10	0,5	5,5	0,25	0,5
12	0,5	6,5	0,25	0,5
14	1	8	0,5	1
16	1	9	0,5	1
18	1	10	0,5	1
20	1	11	0,5	1
22	1	12	0,5	1
24	1	13	0,5	1
28	1	15	0,5	1
32	1	17	0,5	1
36	1	19	0,5	1
40	1	21	0,5	1
44	1	23	0,5	1

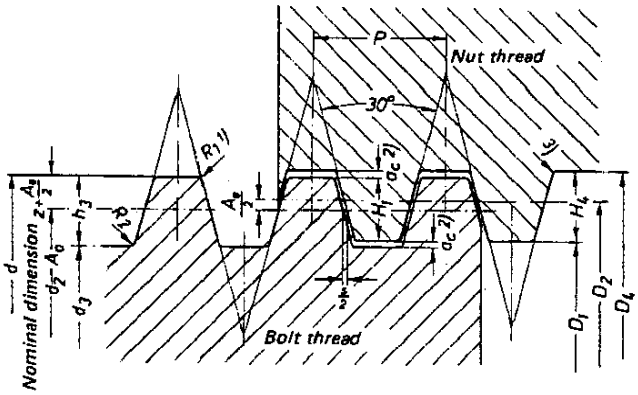
1) The provision of radiusing R_1 or a chamfer on the outside diameter of the bolt thread is recommended.

2) The subscript c signifies crest.

3) The maximum permissible edge radiusing on the outside diameter of the nut thread resulting from wear of the new sharp-edged tool at this point shall not exceed dimension a_c.

3 Profiles for threads with flank clearance

These profiles derive from the nominal profiles and the basic allowance for the pitch diameter.



$s = 0.26795\, A_o$

A_o = Basic allowance (= upper allowance) for bolt thread on pitch diameter.

For other dimension letters (see Fig. 2)

Figure 3. Profiles for bolt and nut thread with clearance on outside and minor diameter and with flank clearance (nut basis system)

4 Profiles for multiple-start threads

(The profile shown is that of a two-start bolt thread)

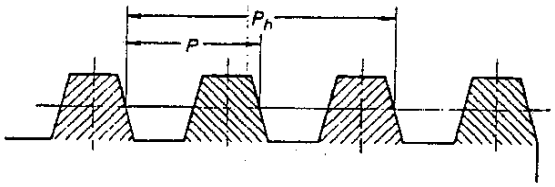


Figure 4. Profiles for multiple-start threads

P_h Lead — Distance along the pitch diameter line between adjacent equal-directed flanks of the same thread.

P Pitch — Distance along the pitch diameter line between adjacent equal-directed flanks.

Multiple-start (n-start) threads have the same profile as single-start threads having lead P_h = Pitch P.

Only those values which are accepted for the lead P (equal to pitch P) of single-start threads may be chosen for the pitch P of multiple-start threads. The multiple of the pitch P of multiple-start threads need not however correspond with a lead value accepted for single-start threads.

5 Profile variations

In the case of rolled bolt threads, the profile at the minor diameter may be modified in order to obtain the increased radiusing at the root of the thread which this process requires. The minor diameter of the bolt thread may in this case be made smaller than the nominal diameter d_3 by $0.15 \cdot P$.

When trapezoidal screw threads are cut by means of straight-flank tools it is possible for variations from the flank form dictated by the nominal profile to occur. Such variations are generally permissible. In special cases (involving steep lead angles; increased precision) it is recommended that agreement should be reached on the manufacturing method (position of the generating lines on the tool) and hence the flank form of the bolt and nut threads and the corresponding gauges uniformly defined. In these cases the rules of worm geometry according to DIN 3975 (October 1976 issue, Section 3.6) apply, i.e. tools and gauges must be manufactured by the same method.

It is not possible to specify the value of the lead angle for these special cases because it is dependent on a number of different factors. As a guide, the lower limit of 8° can be assumed for milled trapezoidal threads and 6° for ground trapezoidal threads.

1), 2) and 3) See page 2

Further standards

DIN 103 Part 2	ISO metric trapezoidal screw thread; general plan
DIN 103 Part 3	ISO metric trapezoidal screw thread; allowances and tolerances for trapezoidal screw threads of general purpose
DIN 103 Part 4	ISO metric trapezoidal screw thread; nominal dimensions
DIN 103 Part 5	ISO metric trapezoidal screw thread; limiting sizes for nut threads from 8 to 100 mm nominal diameter
DIN 103 Part 6	ISO metric trapezoidal screw thread; limiting sizes for nut threads from 105 to 300 mm nominal diameter
DIN 103 Part 7	ISO metric trapezoidal screw thread; limiting sizes for bolt threads from 8 to 100 mm nominal diameter
DIN 103 Part 8	ISO metric trapezoidal screw thread; limiting sizes for bolt threads from 105 to 300 mm nominal diameter
DIN 103 Part 9	(Preliminary Standard) ISO metric trapezoidal screw thread; gauges for bolt and nut threads, gauge dimensions and construction features

Explanations

In Sections 1 and 2 this Standard is in complete agreement factually with the ISO Standard 2901-1977 issued by the International Organization for Standardization (ISO).

ISO metric trapezoidal screw threads; Basic profile and maximum-material-profile.

Sections 3 and 4 of this Standard dealing with profiles for threads with flank clearance and profiles for multiple-start threads are not contained in the ISO standard. For profiles for threads with flank clearance the basic nut system has been adopted. To keep the flank overlap the same with all classes of fit, the outside diameter of the bolt thread has been made equal to the nominal dimension d for all tolerance positions. Therefore for all tolerance positions the same gauges can be used for the outside diameter of the bolt thread. Similarly, the nominal dimension of the minor diameter of the bolt thread has been fixed uniformly by d_3 for all tolerance positions. The basic allowance A_c has been included in the tolerance on the minor diameter.

A note relating specifically to the manufacture of trapezoidal screw threads by rolling has been included. There is no objection to the reduction in the minor diameter of the bolt thread permitted in this way, since the better surface imparted to the core area and the crystalline structure of the bolt mean that the bolt strength is not impaired.

Section 5 of this Standard has been enlarged compared with the ISO standard, since the same conditions apply to the production of trapezoidal screw threads with large lead angles as to worm manufacture (see DIN 3975, October 1976 issue, Section 3.6).

Alterations compared with DIN 103 (August 1924 issue), DIN 378 Part 1 and Part 2 (October 1925 issues), DIN 379 (August 1937 issue):

The following alterations had already been indicated in DIN 103 Part 1 (August 1970 issue) in the Explanations and are now repeated for a better understanding of earlier documentation.

In conformity with ISO 2901 the crest clearances a_c have been altered compared with the previous finish of trapezoidal screw thread, because it had been decided during the preparation of the ISO standard to lay down a uniform value for the crest clearance a_c on the outside and minor diameters of the thread in conformity with the standards of the USSR and of the countries using the Anglo-American units. The Table below presents a comparison of the previous values according to DIN 103, DIN 378 and DIN 379 with the new values.

Lead	previous		new
	a	b	a_c
2	0,25	0,5	0,25
3	0,25	0,5	0,25
4	0,25	0,5	0,25
5	0,25	0,75	0,25
6	0,25	0,75	0,5
7	0,25	0,75	0,5
8	0,25	0,75	0,5
9	0,25	0,75	0,5
10	0,25	0,75	0,5
12	0,25	0,75	0,5
16	0,5	1,5	1
20	0,5	1,5	1
24	0,5	1,5	1
32	0,5	1,5	1
40	0,5	1,5	1

The depth of bolt thread h_3 has been fixed at $0.5 \times P + a_c$ and the flank overlap at $H_1 \times 0.5 \times P$. The Table below compares the thread depth h_3 of the bolt thread and H_4 of the nut thread as well as the flank overlap H_1 according to this Standard with the values laid down in the earlier standards DIN 103, DIN 378 and DIN 379.

Lead	Flank overlap		Thread depth		
	previous	new	previous values for bolt thread	new values for bolt and nut threads	previous values for nut threads
P	t_2	H_1	t_1	$h_3 = H_4$	T
2	0,75	1	1,25	1,25	1
3	1,25	1,5	1,75	1,75	1,5
4	1,75	2	2,25	2,25	2
5	2	2,5	2,75	2,75	2,25
6	2,5	3	3,25	3,5	2,75
7	3	3,5	3,75	4	3,25
8	3,5	4	4,25	4,5	3,75
9	4	4,5	4,75	5	4,25
10	4,5	5	5,25	5,5	4,75
12	5,5	6	6,25	6,5	5,75
16	7	8	8,5	9	7,5
20	9	10	10,5	11	9,5
24	11	12	12,5	13	11,5
32	15	16	16,5	17	15,5
40	19	20	20,5	21	19,5