

Knuckle Threads

Thread Profiles, Nominal Dimensions, Thread Series

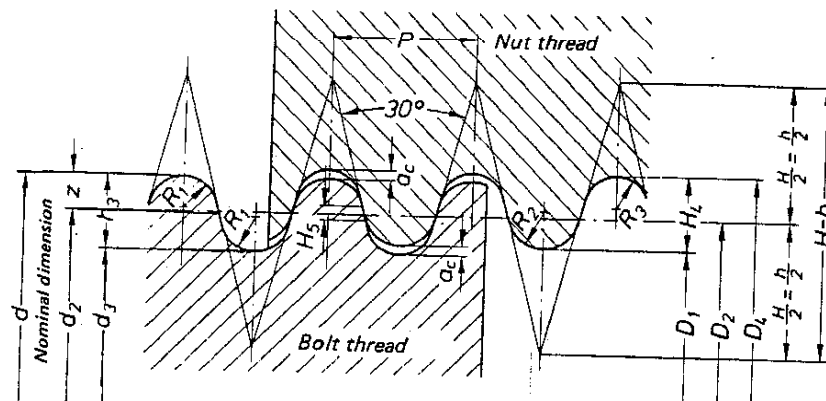
DIN
405
Part 1

Rundgewinde; Gewindeprofile, Nennmasse, Gewindereihen

Dimensions in mm

1 Basic profiles, nominal profiles

The basic profile is the theoretical profile to which the basic dimensions of the outside, pitch and minor diameters are related. A knuckle thread according to this Standard does not, however, have the same basic profile for the bolt and nut threads, because the rounding radii vary in size. The basic profiles for bolt and nut threads are identical with the corresponding nominal profiles.



- $D_4; d$ - Outside diameter of thread
 $D_2 = d_2$ - Pitch diameter of thread
 $D_1; d_3$ - Minor diameter of thread
 P - Lead of single thread and pitch of multiple thread
 $H = h$ - Height of the basic triangle
 $H_4 = h_3$ - Depth of thread = $0.5 \cdot P$
 H_5 - Flank overlap $0.08350 \cdot P$

$$z = 0.25 P = \frac{h_3}{2}$$

$$D_4 = d + 2 a_c = d + 0.1 P$$

$$D_1 = D_4 - 2 H_4 = D_4 - P = d - 0.9 P$$

$$d_3 = d - 2 h_3 = d - P$$

$$d_2 = D_2 = d - 2 z = d - 0.5 P$$

$$a_c = \text{Clearance} = 0.05 P$$

$$R_1 = 0.23851 P$$

$$R_2 = 0.25597 P$$

$$R_3 = 0.22105 P$$

Figure 1. Basic profiles and profiles for bolt and nut threads with clearance on the outside and minor diameters and without backlash (nominal dimensions)

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Table 1. Dimensions for the nominal profiles

Threads per inch	inch	P		h 1,866 P	$h/2$ 0,933 P	$h_3 - H_4$	H_5	R_1	R_2	R_3
		m								
10	1/10	2,540		4,740	2,370	1,270	0,212	0,606	0,650	0,561
8	1/8	3,175		5,925	2,962	1,588	0,265	0,757	0,813	0,702
6	1/6	4,233		7,899	3,949	2,117	0,353	1,010	1,084	0,936
4	1/4	6,350		11,849	5,925	3,175	0,530	1,515	1,625	1,404

2 Profiles for threads with backlash

These profiles result from the nominal profiles and the basic allowance on the pitch diameter.

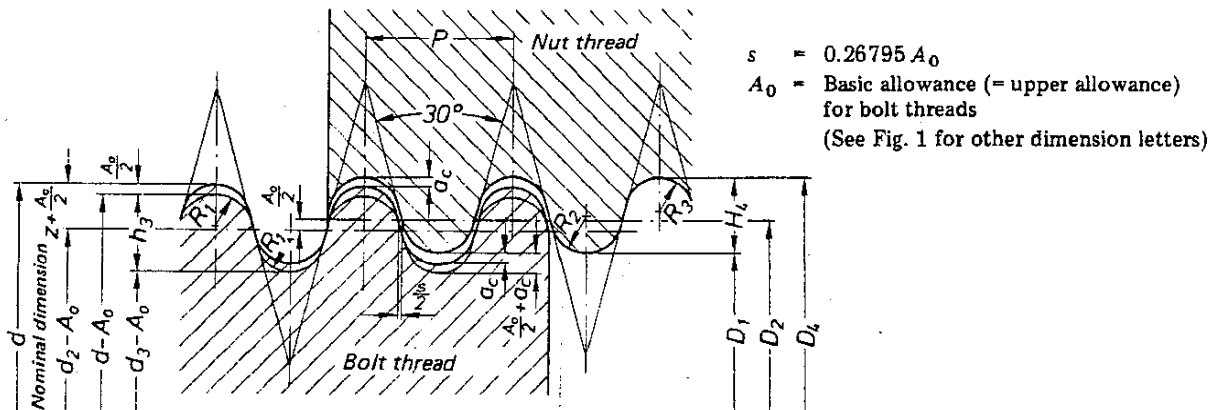


Figure 2. Profiles for bolt and nut threads with clearance on the outside and minor diameters and with backlash resulting from basic allowance in the bolt (nut basis system)

3 Profiles for multiple threads

(The illustration shows the profile of a double bolt thread)

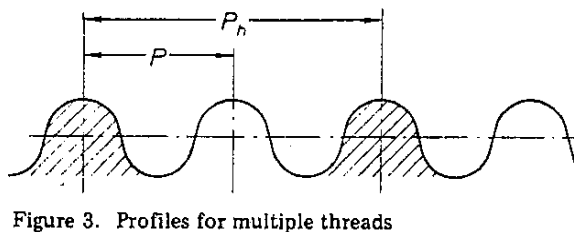


Figure 3. Profiles for multiple threads

P_h Lead (axial displacement for one turn)

P Pitch (axial distance between two adjacent equidirectional flanks)

Multiple threads (n -threads) have the same profile as single threads of lead $P_h = \text{pitch } P$.

For the pitch P of multiple threads, only those values permissible for the lead P (equal to pitch P) of single threads may be selected. However, multiples of the pitch P of multiple threads do not need to correspond to a value permissible for the lead of single threads.

4 Designation

Single knuckle threads according to this Standard are designated by the letters Rd, followed by the nominal thread diameter and the lead P of the single thread (in this case, lead P equals pitch P) in inches, separated by the symbol \times .
 Example: Rd 40 \times 1/6 (1/6 inch = 6 threads per inch)

Multiple knuckle threads according to this Standard are designated by the letters Rd, followed by the nominal thread diameter and the lead P_h of the multiple thread in inches, the letter P (pitch) and the pitch in inches.

Example: Rd 40 \times 1/3 P 1/6

In the example, number of threads = $\frac{\text{lead } P_h}{\text{pitch } P} = \frac{1/3}{1/6}$. It follows that it is a double thread.

Note: A standard dealing with tolerances for knuckle threads according to this Standard is in course of preparation. Details of the tolerance grade can then be added to the designation.

5 Nominal thread dimensions, thread series

Table 2. Nominal thread dimensions

Nominal thread diameter 1)		Threads per inch	Lead P	Pitch diameter $d_2 = D_2$	Outside diameter D_4	Minor diameter	
Series 1	Series 2					d_3	D_1
8		10	2,540	6,730	8,254	5,460	5,714
9		10	2,540	7,730	9,254	6,460	6,714
10		10	2,540	8,730	10,254	7,460	7,714
11		10	2,540	9,730	11,254	8,460	8,714
12		10	2,540	10,730	12,254	9,460	9,714
14		8	3,175	12,412	14,318	10,825	11,142
16		8	3,175	14,412	16,318	12,825	13,142
18		8	3,175	16,412	18,318	14,825	15,142
20		8	3,175	18,412	20,318	16,825	17,142
22		8	3,175	20,412	22,318	18,825	19,142
24		8	3,175	22,412	24,318	20,825	21,142
26		8	3,175	24,412	26,318	22,825	23,142
28		8	3,175	26,412	28,318	24,825	25,142
30		8	3,175	28,412	30,318	26,825	27,142
32		8	3,175	30,412	32,318	28,825	29,142
36	34	8	3,175	32,412	34,318	30,825	31,142
	38	8	3,175	34,412	36,318	32,825	33,142
		8	3,175	36,412	38,318	34,825	35,142
40		6	4,233	37,883	40,423	35,767	36,190
44	42	6	4,233	39,883	42,423	37,767	38,190
		6	4,233	41,883	44,423	39,767	40,190
48	46	6	4,233	43,883	46,423	41,767	42,190
	50	6	4,233	45,883	48,423	43,767	44,190
		6	4,233	47,883	50,423	45,767	46,190
52		6	4,233	49,883	52,423	47,767	48,190
55		6	4,233	52,883	55,423	50,767	51,190
	58	6	4,233	55,883	58,423	53,767	54,190
60		6	4,233	57,883	60,423	55,767	56,190
65	62	6	4,233	59,883	62,423	57,767	58,190
		6	4,233	62,883	65,423	60,767	61,190
70	68	6	4,233	65,883	68,423	63,767	64,190
	72	6	4,233	67,883	70,423	65,767	66,190
		6	4,233	69,883	72,423	67,767	68,190
75		6	4,233	72,883	75,423	70,767	71,190
80	78	6	4,233	75,883	78,423	73,767	74,190
		6	4,233	77,883	80,423	75,767	76,190
85	82	6	4,233	79,883	82,423	77,767	78,190
	88	6	4,233	82,883	85,423	80,767	81,190
		6	4,233	85,883	88,423	83,767	84,190
90		6	4,233	87,883	90,423	85,767	86,190
95	92	6	4,233	89,883	92,423	87,767	88,190
		6	4,233	92,883	95,423	90,767	91,190
100	98	6	4,233	95,883	98,423	93,767	94,190
	105	6	4,233	97,883	100,423	95,767	96,190
		4	6,350	101,825	105,635	98,650	99,285
110		4	6,350	106,825	110,635	103,650	104,285
120	115	4	6,350	111,825	115,635	108,650	109,285
		4	6,350	116,825	120,635	113,650	114,285

1) The diameters are preferably to be taken from Series 1.

Table 2. Nominal thread dimensions (continued)

Nominal thread diameter 1) d		Threads per inch	Lead P	Pitch diameter $d_2 - D_2$	Outside diameter D_4	Minor diameter	
Series 1	Series 2					d_3	D_1
130	125	4	6,350	121,825	125,635	118,650	119,285
	135	4	6,350	126,825	130,635	123,650	124,285
		4	6,350	131,825	135,635	128,650	129,285
140	145	4	6,350	136,825	140,635	133,650	134,285
150		4	6,350	141,825	145,635	138,650	139,285
		4	6,350	146,825	150,635	143,650	144,285
160	155	4	6,350	151,825	155,635	148,650	149,285
	165	4	6,350	156,825	160,635	153,650	154,285
		4	6,350	161,825	165,635	158,650	159,285
170	175	4	6,350	166,825	170,635	163,650	164,285
180		4	6,350	171,825	175,635	168,650	169,285
		4	6,350	176,825	180,635	173,650	174,285
190	185	4	6,350	181,825	185,635	178,650	179,285
	195	4	6,350	186,825	190,635	183,650	184,285
		4	6,350	191,825	195,635	188,650	189,285
200		4	6,350	196,825	200,635	193,650	194,285

Explanations

During preparation of the new version of standards DIN 103 dealing with trapezoidal threads and DIN 380 Flat trapezoidal threads, consideration was also given to the possibility of modifying knuckle threads according to DIN 405 and of converting them to knuckle threads with metric leads. It would then have been relatively simple to take the trapezoidal thread according to DIN 103 as a basis by adopting the diameters and leads unchanged and by considerable rounding of the trapezoidal shape of the profile. This would have resulted in a new knuckle thread or a rounded trapezoidal thread. At the same time, DIN 405 would have been able to remain in its existing form because, even today, certain specialized fields are unable to do without it. The Committee on Threads therefore resolved to retain the knuckle thread unchanged according to DIN 405 and to effect only a editorial revision of the standard on the lines of the current layout of other thread standards.

The knuckle thread according to this Standard does not have an identical basic profile for the bolt and nut thread because the radii R_1 for the bolt and R_2 and R_3 for the nut are different. A separate representation of the basic profiles has therefore been omitted, because they are identical with the nominal profiles without backlash. The representation of the nominal profiles has been supplemented by the missing dimensions of the basic profile.

This Standard has been issued as DIN 405 Part 1 to permit possible extension of this series of standards on the lines of DIN 103 or DIN 513.