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मानक

IS 2186 (1985): ISO Metric external screw threads for interference fit applications [PGD 20: Engineering Standards]









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Indian Standard

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ISO METRIC EXTERNAL SCREW THREADS FOR INTERFERENCE FIT APPLICATIONS

(First Revision)

1. Scope — Covers the limits of sizes for ISO metric external screw threads for interference fit applications with the basic profile in accordance with IS: 4218 (Part 1)-1976 'ISO metric screw threads: Part 1 Basic and design profiles (*first revision*)'.

2. Application — External threads covered in this standard shall be used with internal screw threads conforming to IS: 4218 (Part 6)-1978 'ISO metric screw threads: Part 6 Limits of sizes for commercial bolts and nuts (diameter range 1 to 52 mm) (*first revision*)' for the following applications:

- a) For general interference fit applications, with internal threads of tolerance class 6H.
- b) For closer interference fit applications, with internal threads of tolerance class 5H.

3. Form of External Screw Threads — The design profile of external threads shall be as given in Fig. 1.



- d = Major diameter of external threadsH = 0'866 025 P d_2 = Pitch diameter of external threads h_3 = 0'613 43 P d_3 = Minor diameter of external threads d_2 = d 0'649 52 P
- h_3 = Basic depth of external threads
- H = Height of fundamental triangle
- R =Root radius of external threads
- P = Pitch

FIG. 1 DESIGN PROFILE OF EXTERNAL THREADS

 $d_3 = d - 1226 87 P$

R = 0.14434 P = H/6

4. Fundamental Deviations - Shall be as given in Table 1.

5. Designation — ISO metric external threads conforming to this standard shall be designated as follows:

Example:

An external thread of nominal size M12 shall be designated as: M12-IS : 2186

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(Values of deviations in micrometres)

Thread Nominal	Pitch	Deviations								
Diameter	nım	Major Diameter			Pitch Diameter			Minor Diameter		
		+		Td	+		TJ.	+		Td ₃
1, (1·1), 1·2 (1·4) 1·6, (1·8)	0 [.] 25 0 [.] 3 0 [.] 35	0	42 48 53	42 48 53	36	0	36	19	37	56
2, (2·2) 2·5 3 (3·5) 4 (4·5) 5	0.4 0.45 0.5 0.6 0.7 0.75 0.8	0	60 63 67 80 90 90 95	60 63 67 80 90 90 95	50	0	50	27	53	80
6, (7) 8, 10	1 1·25 1·5	0	112 132 150	112 132 150	71	0	71	37	75	112
12 (14), 16 (18), 20 (22) 24, (27) 30, (33)	1 ·75 2 2 ·5 3 3 ·5	0	170 180 212 236 265	170 180 212 236 265	100	0	100	55	105	160
36. (39) 42, (45) 48, (52) 56, (60) 64 to 80	4 4·5 5 5·5 6	0	300 315 335 355 375	300 315 335 355 375	140	0	140	72	152	224
(85) to 150	6	0	375	375	200	0	200	105	210	315

Note - Sizes shown within brackets are non-preferred.

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TABLE 2 LIMITS OF DIMENSIONS FOR EXTERNAL SCREW THREADS (COARSE SERIES) (Clause 6.2)

Thread Nominal	Pitch P	Major Diameter d		Pitch D	iameter d _a	Minor Diameter d _a		
Diameter		Max	Min	Max	Min	Max	Min	
1 (1·1) 1·2 (1·4) 1·6	0'25 0'25 0'25 0'25 0'3 0'35	1.000 1.100 1.200 1.400 1.600	0:958 1:058 1:158 1:158 1:352 1:547	0.874 0.974 1.074 1.241 1.409	0'838 0'938 1'038 1'205 1'375	0.712 0.812 0.912 1.051 1.189	0.656 0.756 0.856 0.995 1.133	
(1·8) 2 (2.2) 2·5 3	0·35 0·4 0·45 0·45 0·45 0·5	1.800 2.000 2.200 2.500 3.000	1.747 1.940 2.137 2.437 2.933	1.609 1.790 1.958 2.258 2.725	1.573 1.740 1.908 2.208 2.675	1 389 1 536 1 675 1 975 2 414	1.333 1.456 1.595 1.895 2.334	
(3·5) 4 (4·5) 5 6	0.6 0.7 0.7 5 0.8 1	3 500 4 000 4 500 5 000 6 000	3:420 3:910 4:410 4:905 5:888	3·160 3·595 4·063 4·530 5·421	3·110 3·545 4·013 4·480 5·350	2·791 3·168 3·607 4·046 4·810	2.711 3.088 3.527 3.966 4.698	
(7) 8 10 12 (14)	1 1·25 1·50 1·75 2	7.000 8.000 10.000 12.000 14.000	6 [.] 888 7 [.] 868 9 [.] 850 11 [.] 830 13 [.] 820	6:421 7:259 9:097 10:963 12:801	6 ⁻³⁵⁰ 7 ⁻¹⁸⁸ 9 ⁻⁰²⁶ 10 ⁻⁸⁶³ 12 ⁻⁷⁰¹	5 [.] 810 6 [.] 503 8 [.] 197 9.908 11.601	5.698 6.391 8.085 9.748 11.441	
16 (18) 20 (22) 24	2 2·5 2·5 2·5 2·5 3	16.000 18.000 20.000 22.000 24.000	15:820 17:738 19:788 21:788 23:764	14 [.] 801 16 [.] 476 18 [.] 476 20 476 22 [.] 151	14 [.] 701 16 [.] 376 18 [.] 376 20 [.] 376 22 [.] 051	13.601 14.988 16.988 18.988 20.374	13.441 14.828 16.828 18.828 20.214	
(27) 30 (33) 36 (39)	3 3·5 3·5 4 4	27'000 30'000 33'000 36'000 39'000	26 [.] 764 29 [.] 735 29 [.] 735 35 [.] 700 38 [.] 700	25.151 27 [.] 827 30 [.] 827 33 [.] 542 36 [.] 542	25 [.] 051 27 [.] 727 30 [.] 727 33 [.] 402 36 [.] 402	23 [.] 374 25.761 28.761 31.165 34.165	23.214 25.601 28.601 30.941 33.941	
42 (45) 48 (52) 56	4`5 4`5 5 5`5	42.000 45.000 48.000 52.000 56.000	41.685 44.685 47.665 51.665 55.645	39·217 42·217 44·892 48·892 52·568	39.077 42.077 44.752 48.752 52.428	36.551 39.551 41.938 45.938 49.324	36.327 39.327 41.714 45.714 49.100	
(60) 64 (68)	5'5 6 6	60 [.] 000 64 [.] 000 68 [.] 000	59 [.] 645 63 [.] 625 67 [.] 625	56 [.] 568 60 [.] 243 64 [.] 243	56 [.] 428 60 [.] 103 64 [.] 103	53.324 56.711 60.711	53 100 56,487 60.487	

All dimensions in millimetres.

Note 1 — Sizes shown within brackets are non-preferred.

Note 2 - For thread sizes not covered in the above Table, limits of dimensions may be calculated from the fundamental deviations given in Table 1.

TABLE 3 LIMITS OF DIMENSIONS FOR EXTERNAL THREADS (FINE SERIES) (Clause 6.2)

All dimensions in millimetres.

Thread Size	Major D	iameter d	Pitch Di	ameter d _s	Minor Diameter d ₃		
	Max	Min	Max	Min	Max	Min	
M8×1	8'000	7.888	7 [.] 421	7·350	6 [.] 810	6 [.] 698	
M10×1 25	10'000	9.868	9 [.] 259	9·188	8 [.] 503	8 [.] 391	
M12×1 25	12'000	11.868	11 [.] 259	11·188	10 [.] 503	10 [.] 391	
M12×1'5	12 [.] 000	11 [.] 850	11 [.] 097	11'026	10 [.] 197	10 [.] 085	
(M14×1'5)	14 [.] 000	13 [.] 850	13 [.] 097	13'026	12 [.] 197	12 [.] 086	
M16×1'5	16 [.] 000	15 [.] 850	15 [.] 097	15'026	14 [.] 197	14 [.] 085	
M18×1 ^{.5}	18 [.] 000	17:850	17'097	17:026	16'197	16 [.] 085	
M20×1 ^{.5}	20 [.] 000	19:850	19'097	19:026	18'197	18.08 5	
M22×1 ^{.5}	22 [.] 000	21:850	21'097	21:026	20' 19 7	20 [.] 085	
M24×1 [.] 5	24.000	23 [.] 850	23 [.] 097	23 [.] 026	22 [.] 197	22 [.] 085	
M24×2	24.000	23 [.] 820	22 [.] 801	22 [.] 701	21 [.] 601	21 [.] 441	
M27×2	27.000	26 [.] 820	25 [.] 801	25 [.] 701	24 [.] 601	24 [.] 441	
(M28×1'5)	28 [.] 000	27 [.] 850	27:097	27 [.] 026	26 [.] 197	26·085	
M30×1'5	30 [.] 000	29 [.] 850	29:097	29 [.] 026	28 [.] 197	28·085	
M20×2	30 [.] 000	29 [.] 820	28:801	28 [.] 701	27 [.] 601	27·441	
M33×2	33.000	32·820	31 [.] 801	31·701	30 [.] 601	30 [.] 441	
M36×3	36.000	35·764	34 [.] 151	34·051	32 [.] 374	32 [.] 214	
(M38×1∙5)	38.000	37·850	37 [.] 097	37·026	36 [.] 197	36 [.] 085	
M39× 3	39.000	38.764	37.151	37.021 -	35.374	35.214	

Note 1 - Sizes shown within brackets are non-preferred.

Note 2 — For thread sizes not covered in the above Table, limits of dimensions may be calculated from the fundamental deviations given in Table 1.

6. Dimensions

6.1 The basic dimensions for the external screw threads of coarse and fine series shall be in accordance with IS : 4218 (Part 3)-1976 'ISO metric screw threads: Part 3 Basic dimensions for design profiles (*first revision*)'.

6.2 The limits of dimensions for external screw threads of coarse and fine series shall be as given in Tables 2 and 3 respectively.

6.3 When the threads are required to be coated, minimum material limits would be maintained before coating and to control the maximum limit coating thickness shall be agreed between the purchaser and the supplier.

EXPLANATORY NOTE

This standard was first published in 1967, covering the eternal threads of basic profile as per ISO metric threads and the limits corresponding to Sk6 class of DIN 13 and 14, Supplement 14. Internal ISO metric threads of 6H class were recommended for mating with these threads for interference fit.

From the experience gained it was observed that the fit obtained by the above combination needed improvement for satisfactory interference applications. Further some of the industries were using a still closer interference fit threads (corresponding to Sn4 class of DIN 13 and 14, supplement 14) which were also to be taken care of in this standard.

Considering the above points, following modifications have been made in this revision:

- a) The maximum clearance between the mating threads has been reduced by shifting the position of tolerance zone slightly such that the entire tolerance on pitch diameter is on positive side. Accordingly the tolerance zone of minor diameter has also been shifted upwards. However, the amount of tolerance has been retained same in both cases. No change is made in either the value or position of major diameter. These changes also increase the maximum interference between the mating threads.
- b) Two classes of internal threads that is 6H and 5H have been recommended for mating threads, so that general as well as closer interference fit can be achieved.

In preparation of this standard, assistance has been derived from DIN 13 and 14, Supplement 14-1944 Metric screw threads, screw threads for interference fit fastenings without sealing action (for inserted ends of studs), issued by the Deutsches Institut für Normung.