IS 10980-2 (1984): Aerospace Bolts and Nuts (MJ threads), Part 2: Dimensions for Bolts and Nuts [TED 14: Aircraft and Space Vehicles]

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UDC 621·882·1/·3·082 : 006·78 : 629·13

Indian Standard (Reaffirmed 2005)

SPECIFICATION FOR AEROSPACE BOLTS AND NUTS (MJ THREADS)

PART 2 DIMENSIONS FOR BOLTS AND NUTS

Aircraft and Space Vehicles Sectional Committee, EDC 74; Aircraft Fasteners Subcommittee, EDC 74 : 2 [Ref : Doc : EDC 74 (4207)]

1. Scope — In this part, the dimensions for MJ threads for bolts and nuts of nominal diameter range from 1·6 to 39 mm used in aerospace construction are specified. Part 1 of the specification covers the basic profile of the threads.

2. Dimensions, Tolerances

2.1 The nominal diameter/pitch combinations shall be as given below:

All dimensions in millimetres.

Nominal Diameter *d* or *D*	Pitch *P*	Nominal Diameter *d* or *D*	Pitch *P*
1.6	0.35	14	1.5
2	0.4	16	1.5
2.5	0.45	18	1.5
3	0.5	20	1.5
3.5	0.6	22	1.5
4	0.7	24	2
5	0.8	27	2
6	1	30	2
7	1	33	2
8	1	36	2
10	1.25	39	2
12	1.25		

2.2 The tolerance classes for bolts and nuts shall be in accordance with the following:

Bolt Threads		Nut Threads	
d	6h	D_1	6H for nominal diameter $\leqslant$ 5 mm 5H for nominal diameter $\geqslant$ 6 mm
d_2	4h	D_2	4H

2.3 The maximum and minimum dimensions of finished bolts and nuts (coated or non coated) shall conform to Tables 1 to 4.

Adopted 30 July 1984

Gr 3

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2.4 *Provisions for Coated Threads* — Before coating, the dimensions of the threads shall be compatible with:

a) the thickness of the coating selected, and

b) the maximum and minimum dimensions specified in this standard.

In order to reduce the number of manufacturing and inspection tools, it is recommended that, where possible, standardized tolerance classes for threads (grade and position) be used.

3. Profiles

3.1 The position and forms of the actual profiles indicating maximum, minimum and basic for bolt and nut threads are indicated in Fig. 1 and Fig. 2.

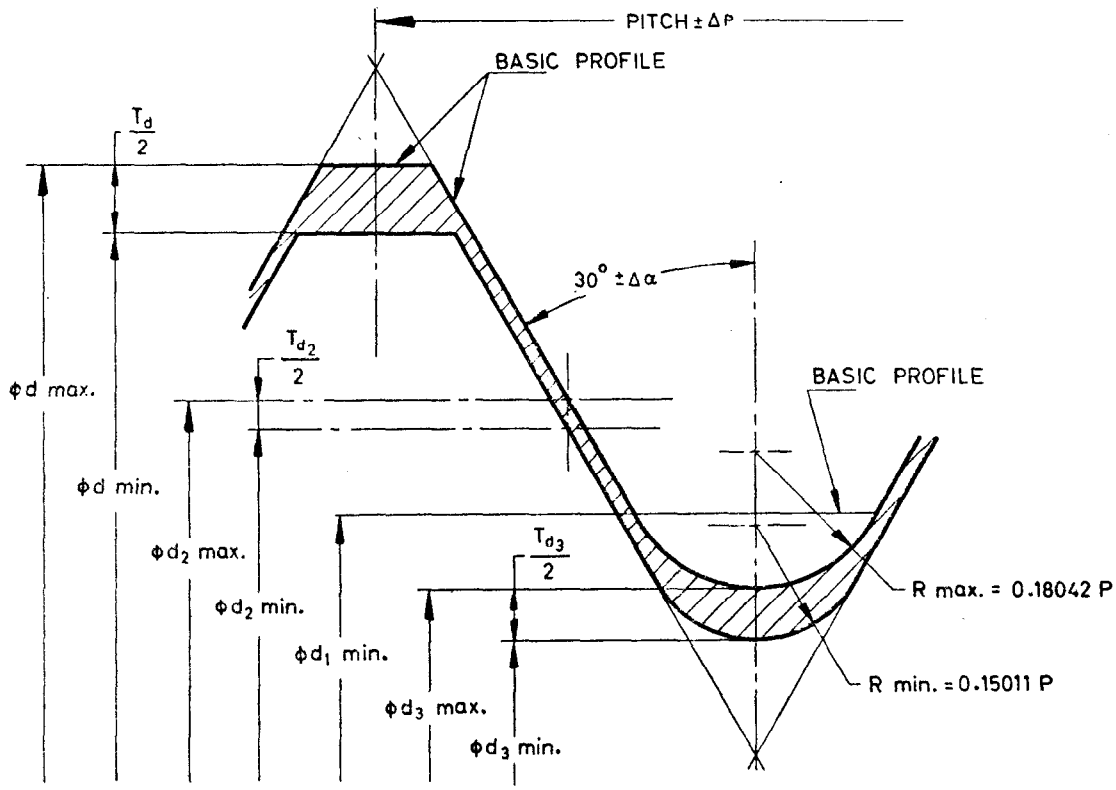

FIG. 1 LIMIT PROFILES FOR BOLT THREADS

4. Threads

4.1 *Bolt Threads* — The connection between the root diameter d_3 and the flanks of the thread is rounded in form. This connection shall lie within the following limits:

a) d_3, *Max* and a width of 0·312 5 *P* (corresponding to the point of tangency between diameter d_1 and the flanks of the thread). This implies a maximum radius equal to 0·180 42 *P*; and

b) d_3, *Min* and a minimum radius equal to 0·150 11 *P*.

Within these limits, any continuous non-reversing blended curve is permitted, provided that it comprises radii not less than 0·150 11 *P*.

4.2 The form of the connection between the root diameter D_3 and the thread flanks is not mandatory. However, in practice, the root is generally rounded beyond the nominal diameter (*d*, *D*). The value of the radius is not specified.

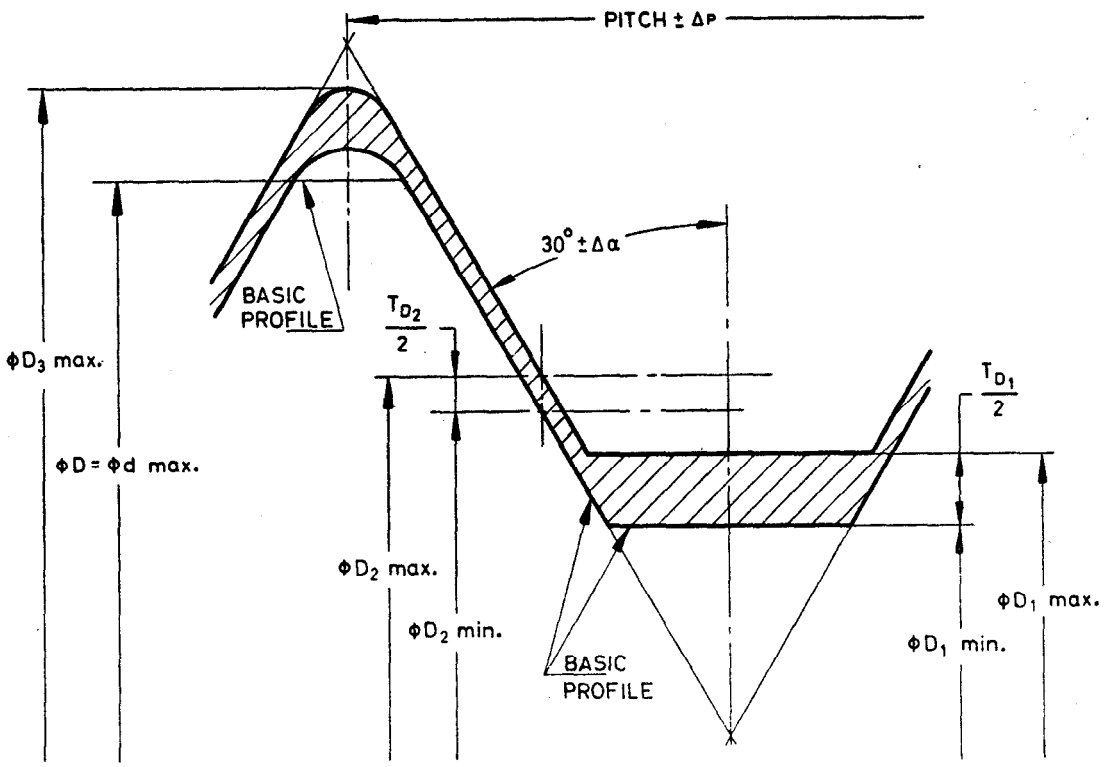

FIG. 2 LIMIT PROFILES FOR NUT THREADS

5. Dimensional Variations

5.1 Within the limits of the pitch diameter, the sum of the variations on the pitch (lead), the flank angle and the helix, as well as variations in taper and circularity, and any other variations affecting the form of the thread, shall not exceed 0·5 times the tolerance on the pitch diameter.

6. Designation

6.1 Threads complying with the requirements of this standard shall be designated by:

a) a letter identifying metric threads: M;

b) a letter symbolizing the thread profile: J;

c) the nominal diameter × the pitch: in millimetres; and

d) the tolerance class on pitch diameter, and the tolerance class on the major diameter for bolts or on the minor diameter for nuts.

Examples:

A bolt with metric thread and J profile, of nominal diameter 6 mm, and pitch 1 mm, and tolerance class 4h6h would be designated MJ 6 × 1 — 4h6h.

A nut with metric thread and J profile, of nominal diameter 6 mm, and pitch 1 mm, and tolerance class 4H5H would be designated MJ 6 × 1 — 4H5H.

Table 1 Maximum and Minimum Dimensions for Bolts of Tolerance Class 4h6h
(*Clause* 2.3)

All dimensions in millimetres.

Thread Designation	Major Diameter d			Pitch Diameter d_2			Root Diameter d_3		
	Max	*Min*	Td (6h)	*Max*	*Min*	Td_2 (4h)	*Max*	*Min*	Td_3
MJ 1.6 × 0.35 — 4h6h	1.600	1.515	0.085	1.373	1.333	0.040	1.196	1.135	0.061
MJ 2 × 0.4 — 4h6h	2.000	1.905	0.095	1.740	1.698	0.042	1.538	1.472	0.066
MJ 2.5 × 0.45 — 4h6h	2.500	2.400	0.100	2.208	2.163	0.045	1.980	1.908	0.072
MJ 3 × 0.5 — 4h6h	3.000	2.894	0.106	2.675	2.627	0.048	2.423	2.345	0.078
MJ 3.5 × 0.6 — 4h6h	3.500	3.375	0.125	3.110	3.057	0.053	2.807	2.718	0.089
MJ 4 × 0.7 — 4h6h	4.000	3.860	0.140	3.545	3.489	0.056	3.192	3.094	0.098
MJ 5 × 0.8 — 4h6h	5.000	4.850	0.150	4.480	4.420	0.060	4.076	3.968	0.108
MJ 6 × 1 — 4h6h	6.000	5.820	0.180	5.350	5.279	0.071	4.845	4.713	0.132
MJ 7 × 1 — 4h6h	7.000	6.820	0.180	6.350	6.279	0.071	5.845	5.713	0.132
MJ 8 × 1 — 4h6h	8.000	7.820	0.180	7.350	7.279	0.071	6.845	6.713	0.132
MJ10 × 1.25 — 4h6h	10.000	9.788	0.212	9.188	9.113	0.075	8.557	8.406	0.151
MJ12 × 1.25 — 4h6h	12.000	11.788	0.212	11.188	11.103	0.085	10.557	10.396	0.161
MJ14 × 1.5 — 4h6h	14.000	13.764	0.236	13.026	12.936	0.090	12.268	12.087	0.181
MJ16 × 1.5 — 4h6h	16.000	15.764	0.236	15.026	14.936	0.090	14.268	14.087	0.181
MJ18 × 1.5 — 4h6h	18.000	17.764	0.236	17.026	16.936	0.090	16.268	16.087	0.181
MJ20 × 1.5 — 4h6h	20.000	19.764	0.236	19.026	18.936	0.090	18.268	18.087	0.181
MJ22 × 1.5 — 4h6h	22.000	21.764	0.236	21.026	20.936	0.090	20.268	20.087	0.181
MJ24 × 2 — 4h6h	24.000	23.720	0.280	22.701	22.595	0.106	21.691	21.464	0.227
MJ27 × 2 — 4h6h	27.000	26.720	0.280	25.701	25.595	0.106	24.691	24.464	0.227
MJ30 × 2 — 4h6h	30.000	29.720	0.280	28.701	28.595	0.106	27.691	27.464	0.227
MJ33 × 2 — 4h6h	33.000	32.720	0.280	31.701	31.595	0.106	30.691	30.464	0.227
MJ36 × 2 — 4h6h	36.000	35.720	0.280	34.701	34.595	0.106	33.691	33.464	0.227
MJ39 × 2 — 4h6h	39.000	38.720	0.280	37.701	37.595	0.106	36.691	36.464	0.227

Table 2 Root Radii for Bolt Threads
(*Clause* 2.3)

All dimensions in millimetres.

Pitch P	Root Radius R	
	Max	*Min*
0.35	0.063	0.053
0.4	0.072	0.060
0.45	0.081	0.068
0.5	0.090	0.075
0.6	0.108	0.090
0.7	0.126	0.105
0.8	0.144	0.120
1	0.180	0.150
1.25	0.226	0.188
1.5	0.271	0.225
2	0.361	0.300

Table 3 Maximum and Minimum Dimensions for Nuts of Tolerance Classes 4H6H Up to and Including MJ5 and 4H5H for MJ6 and Above

All dimensions in millimetres.

Thread Designation	Root Diameter D_3*	Pitch Diameter D_2			Minor Diameter D_1			
	Max	*Max*	*Min*	T_{D_2} (4H)	*Max*	*Min*	T_{D_1} (6H)	(5H)
MJ 1.6 × 0.35 — 4H6H	1.704	1.426	1.373	0.053	1.359	1.259	0.100	
MJ 2 × 0.4 — 4H6H	2.114	1.796	1.740	0.056	1.722	1.610	0.112	
MJ 2.5 × 0.45 — 4H6H	2.625	2.268	2.208	0.060	2.187	2.062	0.125	
MJ 3 × 0.5 — 4H6H	3.135	2.738	2.675	0.063	2.653	2.513	0.140	
MJ 3.5 × 0.6 — 4H6H	3.658	3.181	3.110	0.071	3.075	2.915	0.160	
MJ 4 × 0.7 — 4H6H	4.176	3.620	3.545	0.075	3.498	3.318	0.180	
MJ 5 × 0.8 — 4H6H	5.195	4.560	4.480	0.080	4.421	4.221	0.200	
MJ 6 × 1 — 4H5H	6.239	5.445	5.350	0.095	5.216	5.026		0.190
MJ 7 × 1 — 4H5H	7.239	6.445	6.350	0.095	6.216	6.026		0.190
MJ 8 × 1 — 4H5H	8.239	7.445	7.350	0.095	7.216	7.026		0.190
MJ10 × 1.25 — 4H5H	10.280	9.288	9.188	0.100	8.994	8.782		0.212
MJ12 × 1.25 — 4H5H	12.292	11.300	11.188	0.112	10.994	10.782		0.212
MJ14 × 1.5 — 4H5H	14.334	13.144	13.026	0.118	12.775	12.539		0.236
MJ16 × 1.5 — 4H5H	16.334	15.144	15.026	0.118	14.775	14.539		0.236
MJ18 × 1.5 — 4H5H	18.334	17.144	17.026	0.118	16.775	16.539		0.236
MJ20 × 1.5 — 4H5H	20.334	19.144	19.026	0.118	18.775	18.539		0.236
MJ22 × 1.5 — 4H5H	22.334	21.144	21.026	0.118	20.775	20.539		0.236
MJ24 × 2 — 4H5H	24.429	22.841	22.701	0.140	22.351	22.051		0.300
MJ27 × 2 — 4H5H	27.429	25.841	25.701	0.140	25.351	25.051		0.300
MJ30 × 2 — 4H5H	30.429	28.841	28.701	0.140	28.351	28.051		0.300
MJ33 × 2 — 4H5H	33.429	31.841	31.701	0.140	31.351	31.051		0.300
MJ36 × 2 — 4H5H	36.429	34.841	34.701	0.140	34.351	34.051		0.300
MJ39 × 2 — 4H5H	39.429	37.841	37.701	0.140	37.351	37.051		0.300

*D_3, *Min* is not specified. However, it shall not be less than D (*see* Fig. 2).

Table 4 Tolerances on Pitch (Lead) and Flank Angles

Nominal Diameter *d* or *D* mm	Pitch *P* mm	External Thread		Internal Thread	
		$\pm \triangle P^*$ µm	$\pm \triangle \alpha$	$\pm \triangle P^*$ µm	$\pm \triangle \alpha$
1.6	0.35	9.2	1° 45′	12.2	2° 19′
2	0.4	9.7	1° 37′	12.9	2° 8′
2.5	0.45	10.4	1° 32′	13.9	2° 2′
3	0.5	11.1	1° 28′	14.5	1° 55′
3.5	0.6	12.2	1° 21′	16.4	1° 48′
4	0.7	12.9	1° 13′	17.3	1° 38′
5	0.8	13.9	1° 9′	18.5	1° 32′
6-7-8	1	16.4	1° 5′	21.9	1° 27′
10	1.25	17.3	0° 55′	23.1	1° 13′
12	1.25	19.6	1° 2′	25.9	1° 22′
14-16-18 20-22	1.5	20.8	0° 55′	27.2	1° 12′
24-27-30 33-36-39	2	24.5	0° 49′	32.3	1° 4′

*The pitch (lead) of the thread may vary by $\pm \triangle P$ from the basic profile, but the total variation between any two threads within the length of engagement shall not exceed the value $\triangle P$ specified for each pitch.

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