
Specification for
UNJ threads, with controlled root radius,
for aerospace: inch series

Spécification des filetages UNJ, avec rayon à fond de filet contrôlé, pour applications
aérospatiales : série en inches

Spezifikation für UNJ – Gewinde mit kontrollierter Fußabrundung zur Verwendung
in der Luft- und Raumfahrt : Inch-Reihe

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National foreword

This revised British Standard, which is identical with ISO 3161 'UNJ threads, with controlled root radius, for aerospace — Inch series' and which incorporates the corrections in ISO 3161-1977 (E) Erratum, published 15 April, 1977, has been prepared under the direction of the Mechanical Engineering Standards Committee. The United Kingdom has taken an active part in the work of Technical Committee ISO/TC 20, Aircraft and space vehicles, as a member of subcommittee ISO/TC 20/SC 4.

BS 4084 : 1966 specified unified screw threads of UNJ basic profile for general use in applications requiring a high fatigue strength, reference only being made to its use for aerospace. This edition of BS 4084 is intended primarily for aerospace use.

Terminology and conventions. The text of the international standard has been approved as suitable for publication, without deviation, as a British Standard. Some terminology and certain conventions are not identical with those used in British Standards; attention is especially drawn to the following.

The comma has been used in some places as a decimal marker. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

Wherever the words 'International Standard' appear, referring to this standard, they should be interpreted as 'British Standard'.

Additional information. Pending publication of the international standard referred to in the footnote to clause 7, reference may be made to BS 919 : Part 1. However, special attention is drawn to the fact that the limits of size specified in BS 4084 have to be adhered to.

NOTE. *Textual error.* When adopting the text of the international standard, the printing error listed below was noticed. It has been corrected in this British Standard and has been reported to ISO in a proposal to amend the text of the international standard.

Subclause 6.3.2.2 *External threads*. In line 6, 'tengential' is deleted and replaced by 'tangential'.

Amendment No. 1
published and effective from 31 July 1986
to BS 4084 : 1978

Specification for UNJ threads, with controlled
root radius, for aerospace: inch series

Revised text

AMD 5093
July 1986

Front and back cover

Delete 'ISO 3161-1977' where it appears as a heading on the front cover, and as a heading and a side-heading on the back cover.

AMD 5093
July 1986

Contents

After the entries for the tables, insert the following new entry.

'Appendix

A. 20 UNJ constant pitch series for diameters
up to and including 3 inches'

AMD 5093
July 1986

National foreword

Delete the national foreword, including the note, and substitute the following.

'Foreword

This British Standard, which, with the exception of appendix A, is technically equivalent to ISO 3161 'UNJ threads, with controlled root radius, for aerospace — Inch series', has been prepared under the direction of the Mechanical Engineering Standards Committee. It is a revision of BS 4084 : 1966.

BS 4084 : 1966 specified unified screw threads of UNJ basic profile for general use in applications requiring a high fatigue strength, reference only being made to its use for aerospace. This edition of BS 4084 is intended primarily for aerospace use.

Appendix A provides the information for a 20 UNJ constant pitch series for diameters up to and including 3 inches.

A request has been made by the United Kingdom to ISO on the need to include this additional thread series in a revision of ISO 3161-1977, but as this will be a low priority item in the ISO programme of work the BSI Technical Committee has decided to supplement the requirements of this standard by appendix A, until such time as a revision is possible based on a revised ISO 3161.

For convenience the text of the international standard has been used in the production of this British Standard. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

The comma has been used in some places as a decimal marker. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

Wherever the words 'International Standard' appear, referring to this standard, they should be interpreted as 'British Standard'.

Additional information. Pending publication of the international standard referred to in the footnote to clause 7, reference may be made to BS 919 : Part 1. However, special attention is drawn to the fact that the limits of size specified in BS 4084 have to be adhered to.

Compliance with a British Standard does not of itself confer immunity from legal obligations.'

AMD 5093
July 1986

Clause 6.3.1 Calculation formulae

Delete the formula for D_2 max. and substitute the following.

$$'D_2 \text{ max.} = D_2 \text{ min.} + 0.975 (0.0015 \sqrt[3]{d} + 0.0015 \sqrt{L_e} + 0.015 \sqrt[3]{P^2})'$$

Clause 7.2 Gauging of external threads

In line 2, delete 'of' and substitute 'or'.

New appendix A

Insert a new appendix with tables A1, A2, A3 and A4 as follows.

Appendix

A. 20 UNJ constant pitch series for diameters up to and including 3 inches

The following information is given in tables A1 to A4.

Table A1 Basic dimensions (inches)

Table A2 Thread series

Table A3 Values of tolerances for profile dimensions (inch dimensions)

Table A4 Maximum permissible deviation in the lead error and half-angle (inch dimensions)

For all other information refer to clauses 1 to 8.

TABLE A1. Basic dimensions (inches)

(1)	(2)	(3)	(4)	(5)
Nominal sizes	Number of threads per inch n	Major diameter D, d	Pitch diameter D_2, d_2	Minor diameter D_1, d_1
in		in	in	in
0.312 5	20	0.312 5	0.280 0	0.263 8
0.375 0	20	0.375 0	0.342 5	0.326 3
0.562 5	20	0.562 5	0.530 0	0.513 8
0.625 0	20	0.625 0	0.592 5	0.576 3
0.687 5	20	0.687 5	0.655 0	0.638 8
1.062 5	20	1.062 5	1.030 0	1.013 8
1.125 0	20	1.125 0	1.092 5	1.076 3
1.187 5	20	1.187 5	1.155 0	1.138 8
1.250 0	20	1.250 0	1.217 5	1.201 3
1.312 5	20	1.312 5	1.280 0	1.263 8
1.375 0	20	1.375 0	1.342 5	1.326 3
1.437 5	20	1.437 5	1.405 0	1.388 8
1.500 0	20	1.500 0	1.467 5	1.451 3
1.562 5	20	1.562 5	1.530 0	1.513 8
1.625 0	20	1.625 0	1.592 5	1.576 3
1.687 5	20	1.687 5	1.655 0	1.638 8
1.750 0	20	1.750 0	1.717 5	1.701 3
1.812 5	20	1.812 5	1.780 0	1.763 8
1.875 0	20	1.875 0	1.842 5	1.826 3
1.937 5	20	1.937 5	1.905 0	1.888 8
2.000 0	20	2.000 0	1.967 5	1.951 3
2.125 0	20	2.125 0	2.092 5	2.076 3
2.250 0	20	2.250 0	2.217 5	2.201 3
2.375 0	20	2.375 0	2.342 5	2.326 3
2.500 0	20	2.500 0	2.467 5	2.451 3
2.625 0	20	2.625 0	2.592 5	2.576 3
2.750 0	20	2.750 0	2.717 5	2.701 3
2.875 0	20	2.875 0	2.842 5	2.826 3
3.000 0	20	3.000 0	2.967 5	2.951 3

TABLE A2. Thread series

(1)	(2)	(3)
Nominal sizes		Constant pitch series
primary	secondary	20 UNJ
in	in	
0.312 5		20
0.375 0		20
0.437 5		UNJF*
0.500 0		UNJF*
0.562 5		20
0.625 0		20
	0.687 5	20
0.750 0		UNJEF*
	0.812 5	UNJEF*
0.875 0		UNJEF*
	0.937 5	UNJEF*
1.000 0		UNJEF*
	1.062 5	20
1.125 0		20
	1.187 5	20
1.250 0		20
	1.312 5	20
1.375 0		20
	1.437 5	20
1.500 0		20
	1.562 5	20
1.625 0		20
	1.687 5	20
1.750 0		20
	1.812 5	20
1.875 0		20
	1.937 5	20
2.000 0		20
	2.125 0	20
2.250 0		20
	2.375 0	20
2.500 0		20
	2.625 0	20
2.750 0		20
	2.875 0	20
3.000 0		20
* For dimensions see tables 2, 5 and 7.		

TABLE A3. Values of tolerances for profile dimensions (inch dimensions)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Nominal sizes	<i>n</i>	Series symbol	EXTERNAL THREAD									INTERNAL THREAD						
			Major diameter <i>d</i>			Pitch diameter <i>d</i> ₂			Minor diameter <i>d</i> ₃			Minor diameter <i>D</i> ₁			Pitch diameter <i>D</i> ₂			Major diameter <i>D</i>
			max.	<i>T_d</i>	min.	max.	<i>T_{d2}</i>	min.	max.	<i>T_{d3}</i>	min.	max.	<i>T_{D1}</i>	min.	max.	<i>T_{D2}</i>	min.	min.
0.312 5	20	UNJ	0.312 5	0.008 1	0.304 4	0.280 0	0.003 0	0.277 0	0.254 7	0.006 0	0.248 7	0.273 4	0.009 6	0.263 8	0.283 9	0.003 9	0.280 0	0.312 5
0.375 0	20	UNJ	0.375 0	0.008 1	0.366 9	0.342 5	0.003 1	0.339 4	0.317 2	0.006 1	0.311 1	0.414 3	0.008 8	0.326 3	0.346 5	0.004 0	0.342 5	0.375 0
0.562 5	20	UNJ	0.562 5	0.008 1	0.554 4	0.530 0	0.003 2	0.526 8	0.504 7	0.006 2	0.498 5	0.521 3	0.007 5	0.513 8	0.534 1	0.004 1	0.530 0	0.562 5
0.625 0	20	UNJ	0.625 0	0.008 1	0.616 9	0.592 5	0.003 2	0.589 3	0.567 2	0.006 2	0.561 0	0.583 5	0.007 2	0.576 3	0.596 7	0.004 2	0.592 5	0.625 0
0.687 5	20	UNJ	0.687 5	0.008 1	0.679 4	0.655 0	0.003 2	0.651 8	0.629 7	0.006 2	0.623 5	0.645 8	0.007 0	0.638 8	0.659 2	0.004 2	0.655 0	0.687 5
1.062 5	20	UNJ	1.062 5	0.008 1	1.054 4	1.030 0	0.003 4	1.026 6	1.004 7	0.006 4	0.998 3	1.020 6	0.006 8	1.013 8	1.034 4	0.004 4	1.030 0	1.062 5
1.125 0	20	UNJ	1.125 0	0.008 1	1.116 9	1.092 5	0.003 4	1.089 1	1.067 2	0.006 4	1.060 8	1.083 1	0.006 8	1.076 3	1.096 9	0.004 4	1.092 5	1.125 0
1.187 5	20	UNJ	1.187 5	0.008 1	1.179 4	1.155 0	0.003 5	1.151 5	1.129 7	0.006 5	1.123 2	1.145 6	0.006 8	1.138 8	1.159 5	0.004 5	1.155 0	1.187 5
1.250 0	20	UNJ	1.250 0	0.008 1	1.241 9	1.217 5	0.003 5	1.214 0	1.192 2	0.006 5	1.185 7	1.208 1	0.006 8	1.201 3	1.222 0	0.004 5	1.217 5	1.250 0
1.312 5	20	UNJ	1.312 5	0.008 1	1.304 4	1.280 0	0.003 5	1.276 5	1.254 7	0.006 5	1.248 2	1.270 6	0.006 8	1.263 8	1.284 5	0.004 5	1.280 0	1.312 5
1.375 0	20	UNJ	1.375 0	0.008 1	1.366 9	1.342 5	0.003 5	1.339 0	1.317 2	0.006 5	1.310 7	1.333 1	0.006 8	1.326 3	1.347 0	0.004 5	1.342 5	1.375 0
1.437 5	20	UNJ	1.437 5	0.008 1	1.429 4	1.405 0	0.003 6	1.401 4	1.379 7	0.006 6	1.373 1	1.395 6	0.006 8	1.388 8	1.409 6	0.004 6	1.405 0	1.437 5
1.500 0	20	UNJ	1.500 0	0.008 1	1.491 9	1.467 5	0.003 6	1.463 9	1.442 2	0.006 6	1.435 6	1.458 1	0.006 8	1.451 3	1.472 1	0.004 6	1.467 5	1.500 0
1.562 5	20	UNJ	1.562 5	0.008 1	1.554 4	1.530 0	0.003 6	1.526 4	1.504 7	0.006 6	1.498 1	1.520 6	0.006 8	1.513 8	1.534 6	0.004 6	1.530 0	1.562 5
1.625 0	20	UNJ	1.625 0	0.008 1	1.616 9	1.592 5	0.003 6	1.588 9	1.567 2	0.006 6	1.560 6	1.583 1	0.006 8	1.576 3	1.597 1	0.004 6	1.592 5	1.625 0
1.687 5	20	UNJ	1.687 5	0.008 1	1.679 4	1.655 0	0.003 6	1.651 4	1.629 7	0.006 6	1.623 1	1.645 6	0.006 8	1.638 8	1.659 7	0.004 7	1.655 0	1.687 5
1.750 0	20	UNJ	1.750 0	0.008 1	1.741 9	1.717 5	0.003 6	1.713 9	1.692 2	0.006 6	1.685 6	1.708 1	0.006 8	1.701 3	1.722 2	0.004 7	1.717 5	1.750 0
1.812 5	20	UNJ	1.812 5	0.008 1	1.804 4	1.780 0	0.003 6	1.776 4	1.754 7	0.006 6	1.748 1	1.770 6	0.006 8	1.763 8	1.784 7	0.004 7	1.780 0	1.812 5
1.875 0	20	UNJ	1.875 0	0.008 1	1.866 9	1.842 5	0.003 6	1.838 9	1.817 2	0.006 6	1.810 6	1.833 1	0.006 8	1.826 3	1.847 2	0.004 7	1.842 5	1.875 0
1.937 5	20	UNJ	1.937 5	0.008 1	1.929 4	1.905 0	0.003 7	1.901 3	1.879 7	0.006 7	1.873 0	1.895 6	0.006 8	1.888 8	1.909 8	0.004 8	1.905 0	1.937 5
2.000 0	20	UNJ	2.000 0	0.008 1	1.991 9	1.967 5	0.003 7	1.963 8	1.942 2	0.006 7	1.935 5	1.958 1	0.006 8	1.951 3	1.972 3	0.004 8	1.967 5	2.000 0
2.125 0	20	UNJ	2.125 0	0.008 1	2.116 9	2.092 5	0.003 7	2.088 8	2.067 2	0.006 7	2.060 5	2.083 1	0.006 8	2.076 3	2.097 3	0.004 8	2.092 5	2.125 0
2.250 0	20	UNJ	2.250 0	0.008 1	2.241 9	2.217 5	0.003 7	2.213 8	2.192 2	0.006 7	2.185 5	2.208 1	0.006 8	2.201 3	2.222 3	0.004 8	2.217 5	2.250 0
2.375 0	20	UNJ	2.375 0	0.008 1	2.366 9	2.342 5	0.003 8	2.338 7	2.317 2	0.006 8	2.310 4	2.333 1	0.006 8	2.326 3	2.342 5	0.005 0	2.342 5	2.375 0
2.500 0	20	UNJ	2.500 0	0.008 1	2.491 9	2.467 5	0.003 8	2.463 7	2.442 2	0.006 8	2.435 4	2.458 1	0.006 8	2.451 3	2.472 5	0.005 0	2.467 5	2.500 0
2.625 0	20	UNJ	2.625 0	0.008 1	2.616 9	2.592 5	0.003 8	2.588 7	2.567 2	0.006 8	2.560 4	2.583 1	0.006 8	2.576 3	2.597 5	0.005 0	2.592 5	2.625 0
2.750 0	20	UNJ	2.750 0	0.008 1	2.741 9	2.717 5	0.003 8	2.713 7	2.692 2	0.006 8	2.685 4	2.708 1	0.006 8	2.701 3	2.722 5	0.005 0	2.717 5	2.750 0
2.875 0	20	UNJ	2.875 0	0.008 1	2.866 9	2.842 5	0.003 9	2.838 6	2.817 2	0.006 9	2.810 3	2.833 1	0.006 8	2.826 3	2.847 6	0.005 1	2.842 5	2.875 0
3.000 0	20	UNJ	3.000 0	0.008 1	2.991 9	2.967 5	0.003 9	2.963 6	2.942 2	0.006 9	2.935 3	2.958 1	0.006 8	2.951 3	2.972 6	0.005 1	2.967 5	3.000 0

TABLE A4. Maximum permissible deviation in the lead error and half-angle (inch dimensions)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Nominal sizes	<i>n</i>	Series symbol	EXTERNAL THREAD				INTERNAL THREAD			
			0.4 <i>T_{d2}</i>	δP	$\delta \alpha$		0.4 <i>T_{D2}</i>	δP	$\delta \alpha$	
					o	i			o	i
0.312 5	20	UNJ	0.001 20	0.000 69	0	55	0.001 56	0.000 90	1	11
0.375 0	20	UNJ	0.001 24	0.000 72	0	57	0.001 60	0.000 92	1	13
0.562 5	20	UNJ	0.001 28	0.000 74	0	59	0.001 64	0.000 95	1	15
0.625 0	20	UNJ	0.001 28	0.000 74	0	59	0.001 68	0.000 97	1	17
0.687 5	20	UNJ	0.001 28	0.000 74	0	59	0.001 68	0.000 97	1	17
1.062 5	20	UNJ	0.001 36	0.000 79	1	02	0.001 76	0.001 02	1	21
1.125 0	20	UNJ	0.001 36	0.000 79	1	02	0.001 76	0.001 02	1	21
1.187 5	20	UNJ	0.001 40	0.000 81	1	04	0.001 80	0.001 04	1	22
1.250 0	20	UNJ	0.001 40	0.000 81	1	04	0.001 80	0.001 04	1	22
1.312 5	20	UNJ	0.001 40	0.000 81	1	04	0.001 80	0.001 04	1	22
1.375 0	20	UNJ	0.001 40	0.000 81	1	04	0.001 80	0.001 04	1	22
1.437 5	20	UNJ	0.001 44	0.000 83	1	06	0.001 84	0.001 06	1	24
1.500 0	20	UNJ	0.001 44	0.000 83	1	06	0.001 84	0.001 06	1	24
1.562 5	20	UNJ	0.001 44	0.000 83	1	06	0.001 84	0.001 06	1	24
1.625 0	20	UNJ	0.001 44	0.000 83	1	06	0.001 84	0.001 06	1	24
1.687 5	20	UNJ	0.001 44	0.000 83	1	06	0.001 88	0.001 09	1	26
1.750 0	20	UNJ	0.001 44	0.000 83	1	06	0.001 88	0.001 09	1	26
1.812 5	20	UNJ	0.001 44	0.000 83	1	06	0.001 88	0.001 09	1	26
1.875 0	20	UNJ	0.001 44	0.000 83	1	06	0.001 88	0.001 09	1	26
1.937 5	20	UNJ	0.001 48	0.000 85	1	08	0.001 92	0.001 11	1	28
2.000 0	20	UNJ	0.001 48	0.000 85	1	08	0.001 92	0.001 11	1	28
2.125 0	20	UNJ	0.001 48	0.000 85	1	08	0.001 92	0.001 11	1	28
2.250 0	20	UNJ	0.001 48	0.000 85	1	08	0.001 92	0.001 11	1	28
2.375 0	20	UNJ	0.001 52	0.000 88	1	10	0.002 00	0.001 15	1	32
2.500 0	20	UNJ	0.001 52	0.000 88	1	10	0.002 00	0.001 15	1	32
2.625 0	20	UNJ	0.001 52	0.000 88	1	10	0.002 00	0.001 15	1	32
2.750 0	20	UNJ	0.001 52	0.000 88	1	10	0.002 00	0.001 15	1	32
2.875 0	20	UNJ	0.001 56	0.000 90	1	11	0.002 04	0.001 18	1	33
3.000 0	20	UNJ	0.001 56	0.000 90	1	11	0.002 04	0.001 18	1	33

British Standard Specification for

UNJ threads, with controlled root radius, for aerospace : inch series

1 SCOPE

This International Standard specifies the characteristics of inch series UNJ threads with controlled root radius.¹⁾

It determines the basic triangular profile for this type of thread, gives a system of designating and also, for diameters from 0.060 to 6 in, series of diameter/pitch combinations, basic dimensions and tolerances, and finally specifies the inspection procedures to be used.

2 FIELD OF APPLICATION

This International Standard applies primarily to the threads of inch series aerospace fasteners.

3 BASIC PROFILE OF THREAD

3.1 Definition of basic profile

basic profile : The theoretical profile corresponding to the basic dimensions, i.e. : the major diameter, the pitch diameter and the minor diameter. The tolerances are applied to the basic profile. See figure 1.

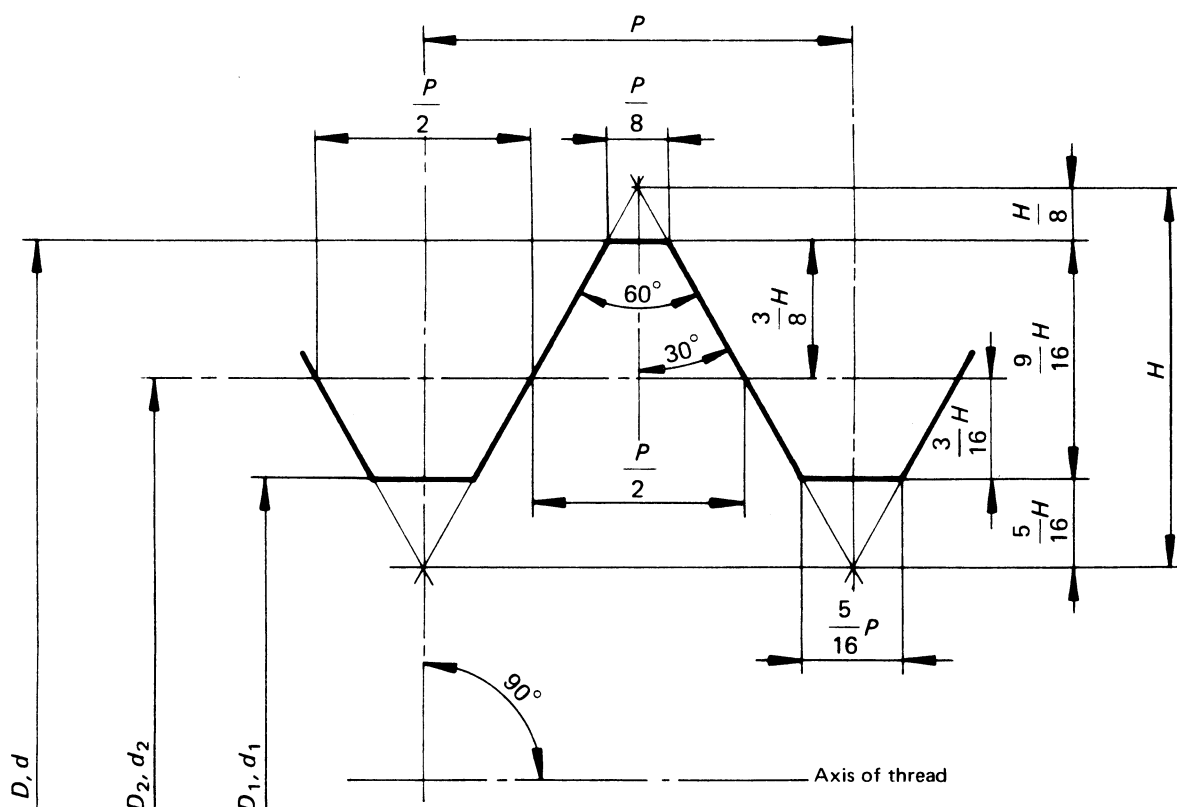


FIGURE 1 – Basic profile

1) Metric units shown in this International Standard are conversions of inch units.

3.2 Basic profile dimensions

In the following formulae :

P = pitch

H = height of fundamental triangle

n = number of threads per inch

$$H = \frac{\sqrt{3}}{2} \times P = 0.866\ 025\ P = \frac{0.866\ 025}{n}$$

$$\frac{9}{16}H = 0.487\ 14\ P = \frac{0.487\ 14}{n}$$

$$\frac{3}{8}H = 0.324\ 759\ P = \frac{0.324\ 759}{n}$$

$$\frac{5}{16}H = 0.270\ 63\ P = \frac{0.270\ 63}{n}$$

$$\frac{H}{8} = 0.108\ 25\ P = \frac{0.108\ 25}{n}$$

All these values are shown in table 1.

3.3 Basic dimensions of thread

3.3.1 Symbols

D = basic major diameter of internal thread

D_2 = basic pitch diameter of internal thread

D_1 = basic minor diameter of internal thread

d = basic major diameter of external thread

d_2 = basic pitch diameter of external thread

d_1 = basic minor diameter of external thread

H = height of fundamental triangle

$$P = \text{pitch} = \frac{1}{n}$$

n = number of threads per inch ($n = \frac{1}{P}$)

3.3.2 Values

Values shown in table 2 have been calculated according to the following formulae :

$$D_2 = D - (2 \times \frac{3}{8}H) = D - 0.649\ 519\ P = D - \frac{0.649\ 519}{n}$$

$$d_2 = d - (2 \times \frac{3}{8}H) = d - 0.649\ 519\ P = d - \frac{0.649\ 519}{n}$$

$$D_1 = D - (2 \times \frac{9}{16}H) = D - 0.974\ 28\ P = D - \frac{0.974\ 28}{n}$$

$$d_1 = d - (2 \times \frac{9}{16}H) = d - 0.974\ 28\ P = d - \frac{0.974\ 28}{n}$$

4 SERIES OF THREADS

This International Standard includes various series of threads; i.e. groups of diameter/pitch combinations distinguished from each other by the number of threads per inch associated with any given thread diameter. These series of threads are given in table 3.

4.1 Diameters

Columns 1 and 2 of table 3 give the primary and secondary series nominal sizes which satisfy current requirements.

4.2 Number of threads per inch

Columns 3 to 8 inclusive of table 3 give the numbers of threads per inch which are recommended to be associated with the diameters in columns 1 and 2. These columns of the numbers of threads per inch are divided into two groups :

- Series with increasing pitches : columns 3, 4 and 5
- Constant (uniform) pitch series : columns 6, 7 and 8

4.2.1 Series with increasing pitches

There are three series of increasing pitches. They are headed "Coarse pitch", "Fine pitch" and "Extra fine pitch" in accordance with current practice.

These terms indicate the relative pitches of the three series for each given thread diameter and do not imply a difference in quality between the series.

4.2.2 Constant (uniform) pitch series

In addition to these three series of increasing pitches, the table includes details of constant pitch series which have been selected from the range of 8 to 16 threads per inch. Each of these series is limited to an appropriate range of diameters.

5 DESIGNATION OF THREADS

Threads shall be designated as shown in 5.1 and 5.2 by indicating, in sequence, the nominal size, the number of threads per inch, the thread-series symbol and the thread class symbol.

The thread designation is indicated at the head of each column in table 3, with the addition of the thread class (3A : external thread, 3B : internal thread).

5.1 Thread designation with increasing pitches

Designation

Coarse pitch series — External thread : UNJC — 3A

Fine pitch series — External thread : UNJF — 3A

Extra fine pitch series — External thread : UNJEF — 3A

Coarse pitch series — Internal thread : UNJC — 3B

Fine pitch series — Internal thread : UNJF — 3B

Extra fine pitch series — Internal thread : **UNJEF — 3B**

Example : **0.2500 — 28 UNJF — 3A** : External thread, basic diameter 0.250 0 in, 28 threads per inch, UNJF — 3A thread.

5.2 Constant pitch series

The diameter/pitch combinations of threads of the constant pitch series are all designated by the three letters UNJ followed by the class of thread (3A : external thread; 3B : internal thread).

Examples :

3.500 — 12 UNJ — 3B : Internal thread, basic diameter 3.500 in, constant series, 12 threads per inch, UNJ — 3B thread class.

3.500 — 12 UNJ — 3B — LH : Internal thread, basic diameter 3.500 in, constant series, 12 threads per inch, UNJ — 3B thread class, left-hand thread.

6 TOLERANCES

6.1 Length of thread engagement used in computing tolerances

The length of thread engagement (L_e) when engaged is equal to :

- the basic major diameter for the series UNJC, UNJF and 8 UNJ;

- 9 P for the series UNJEF, 12 UNJ and 16 UNJ.

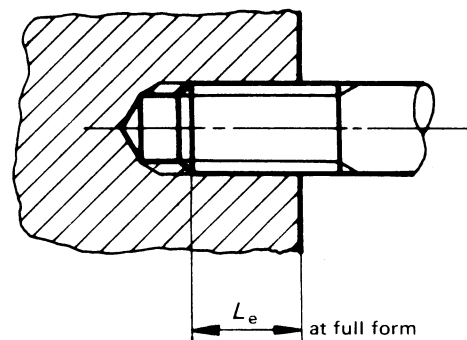


FIGURE 2 — Length of engagement

6.2 Position of tolerances

The tolerances are positive (+) for the internal threads and negative (–) for the external threads (that is, the tolerances are applied in the direction of minimum material).

6.2.1 Internal thread

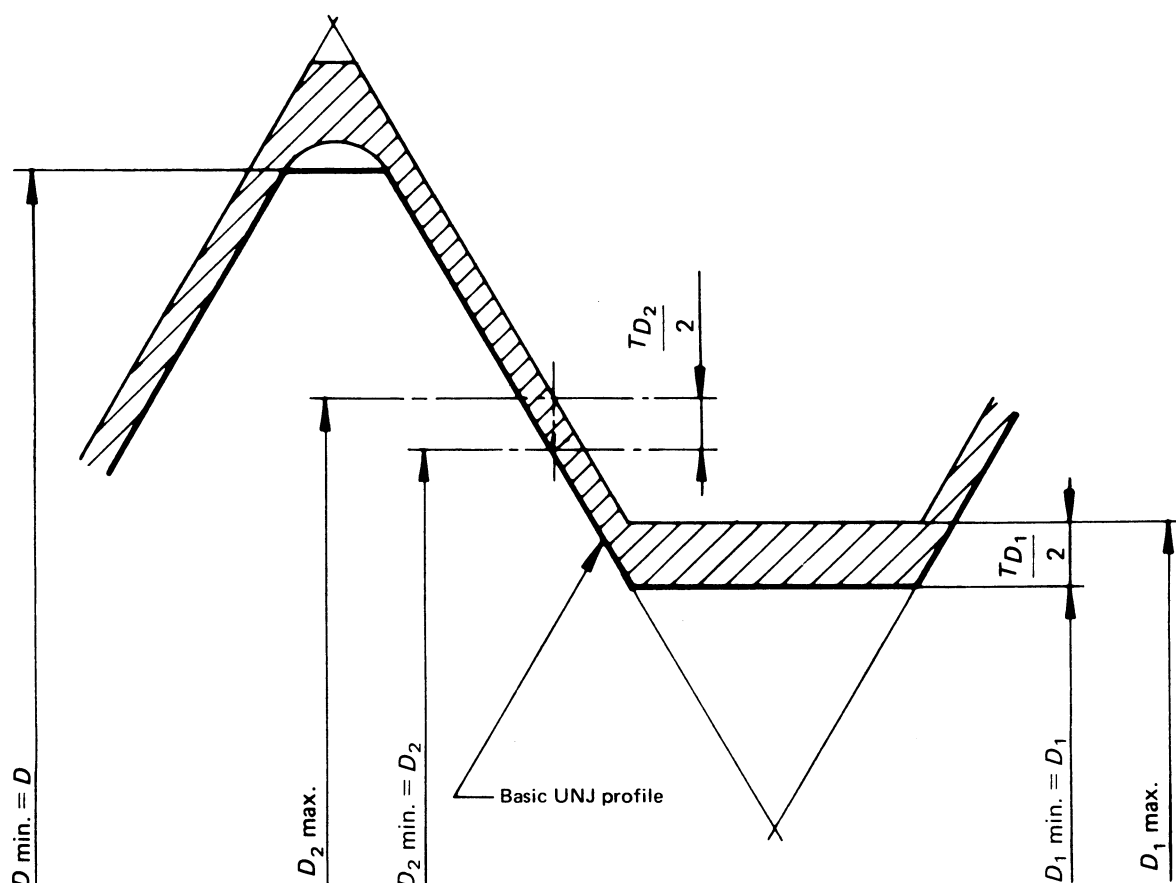


FIGURE 3 — Internal thread tolerances

6.2.2 External thread

6.3 Values of tolerances for profile dimensions and tolerances of the profile form

Values indicated in tables 4, 5, 6, 7 and 8 have been calculated according to the formulae given in 6.3.1, and are based on the length of engagement equal to that shown in clause 6, where

α is the basic half-angle of the thread;

$\delta\alpha$ is the maximum permissible deviation of the half-angle;

T_{D_2} and T_{d_2} are the pitch diameter tolerances;

δP is the maximum permissible pitch deviation between any two of the threads engaged;

δD_2 is the pitch diameter increment due to lead deviation for the internal threads;

$\delta D_2'$ is the pitch diameter increment due to deviations in the half-angles for the internal threads;

R is the root radius of the external thread;

δd_2 is the pitch diameter increment due to lead deviation for the external threads;

$\delta d_2'$ is the pitch diameter increment due to deviations in the half-angles for the external threads;

6.3.1 Calculation formulae

$$d_{\text{max.}} = d$$

$$d_{\text{min.}} = d_{\text{max.}} - 0.060 \sqrt[3]{P^2}$$

$$d_2_{\text{max.}} = d_{\text{max.}} - 0.649 519 P = d_2$$

$$d_2_{\text{min.}} = d_2_{\text{max.}} - 0.750 (0.001 5 \sqrt[3]{d} + 0.001 5 \sqrt{L_e} + 0.015 \sqrt[3]{P^2})$$

$$d_3_{\text{max.}} = d_2_{\text{max.}} - 0.505 18 P = d_3$$

$$d_3_{\text{min.}} = d_2_{\text{min.}} - 0.565 80 P$$

$$R_{\text{max.}} = 0.180 42 P$$

$$R_{\text{min.}} = 0.150 11 P$$

$$D_{\text{max.}} = D_2_{\text{max.}} + 0.793 86 P$$

$$D_{\text{min.}} = D$$

$$D_2_{\text{max.}} = D_2_{\text{min.}} + 0.975 (0.001 5 \sqrt[3]{d} + 0.001 5 \sqrt{L_e} + 0.001 5 \sqrt[3]{P^2})$$

$$D_2_{\text{min.}} = D_{\text{min.}} - 0.649 519 P = D_2$$

$$D_1_{\text{max.}} = D_1_{\text{min.}} + T_{D_1}$$

$$T_{D_1} = (0.05 \sqrt[3]{P^2} + 0.03 P/d) - 0.002$$

with $0.135 315 P < T_{D_1} < 0.259 809 P$ for threads with more than 12 threads per inch

and $T_{D_1} = 0.120 P$ for threads with 12 threads per inch or less.

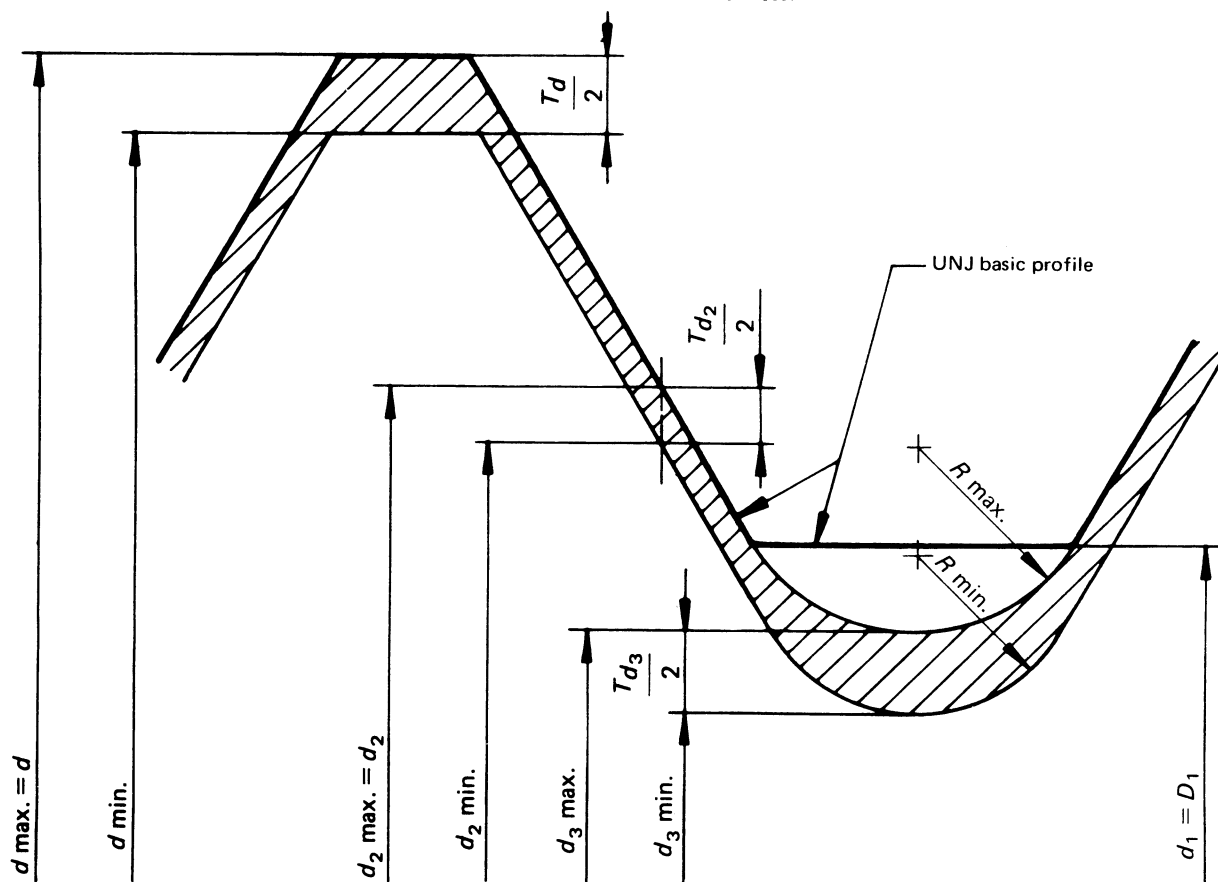


FIGURE 4 – External thread tolerances

$D_1 \text{ min.} = D - 0.974\,28\,P$ rounded upwards to the fourth decimal place, unless the fifth figure is zero.

$$\delta P = \frac{\delta D_2}{\cot \alpha} = \frac{\delta D_2}{1.732\,1} = \frac{0.4\,T_{D_2}}{1.732\,1} \text{ for internal threads}$$

$$\delta P = \frac{\delta d_2}{\cot \alpha} = \frac{\delta d_2}{1.732\,1} = \frac{0.4\,T_{d_2}}{1.732\,1} \text{ for external threads}$$

$$\tan \delta \alpha = \frac{\delta D_2'}{1.5\,P} = \frac{0.4\,T_{D_2}}{1.5\,P} \text{ for internal threads}$$

$$\tan \delta \alpha = \frac{\delta d_2'}{1.5\,P} = \frac{0.4\,T_{d_2}}{1.5\,P} \text{ for external threads}$$

6.3.2 Root radius of the thread

6.3.2.1 INTERNAL THREADS

For internal threads, the profile of the actual root of the thread shall at no point be below the basic profile given in figure 3. No particular radius is specified.

6.3.2.2 EXTERNAL THREADS

For external threads, the profile of the actual root of the thread shall lie within the root radius tolerance zone shown in figure 5. The limit values of the root radius R are specified in table 4. The profile shall be a continuous blended curve, no part of which shall have a radius of less than $0.150\,11\,P$ and which is tangential to the thread flanks at

not less than $0.562\,5\,H$ thread depth. The profile may comprise tangent flank radii that are joined by a tangential flat at the root.

6.4 Special case for coated threads

The thread is, when required, protected by applying a metal coating or a layer of solid lubricant.

6.4.1 External threads

Where the external threads are intended to be coated, the minimum value of the pitch diameter of the thread may be reduced by 0.001 in maximum for threads with a tolerance for the pitch diameter of the thread of less than $0.003\,5$ in in table 5.

For threads with a tolerance for the minimum pitch diameter of the thread of more than $0.003\,5$ in, the value of the pitch diameter of the thread may be reduced by 0.3 times the tolerance of the pitch diameter of the thread, but this reduction shall not exceed $0.001\,5$ in. The maximum limits for the dimensions of the threads of coated screws shall be in accordance with the values given in this International Standard.

6.4.2 Internal threads

Where the internal threads are intended to be coated, the maximum value of the pitch diameter of the thread may be increased in the same way as specified in 6.4.1 for the reduction of the minimum pitch diameter of the external thread. The minimum limits of the dimensions of the coated internal threads shall be in accordance with the values given in this International Standard.

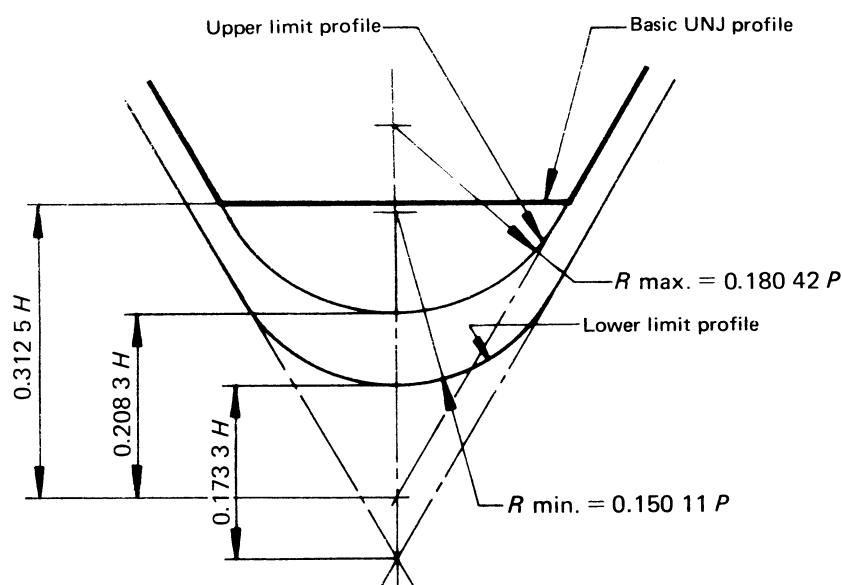


FIGURE 5 — Radius at the root of the screw thread

7 GAUGING BY LIMIT GAUGES¹⁾

7.1 Gauging of internal threads

For checking the internal threads, threaded gauges of the GO and NOT-GO type shall be used.

To check the minor diameter of the internal threads, plug gauges of the GO and NOT-GO type shall be used.

7.2 Gauging of external threads

For checking the maximum limits of the material, a thread GO ring gauge of a properly calibrated dial gauge shall be used.

Thread dial gauges or reference gauges (with shortened flanks and properly calibrated) shall be used to check the minimum limits of the material of the pitch diameter.

Measuring instruments or reference gauges, properly calibrated, shall be used to check the deviations in the pitch diameter due both to the lead error and to errors of the half-angles, also the uniformity of the distribution of these errors, the lead errors and concentricity defects.

Snap gauges, indicating gauges, or a measuring instrument shall be used to check the major diameter.

7.3 Root radius

The radius of the thread root shall be checked by an optical method.

The minor diameter of the thread shall be checked using flange gauges or dial gauges (properly calibrated), by measuring instruments or by optical procedures.

8 TABLES

Tables are provided which specify inch dimensions and corresponding metric equivalents. All thread designations are specified in inch units. The conversion procedure adopted for obtaining the metric values in the tables was to multiply the inch values by 25,4. The resultant values were rounded to be within the inch product limits.

Table 1 gives the inch dimensions of basic profile.

Table 2 specifies the basic dimensions in inches (with metric conversions).

Table 3 gives the preferred selection of diameter/pitch combinations. It is recommended that usage be restricted to the primary sizes indicated.

Table 4 gives the limit values of the root radius in inches (with metric conversions).

Table 5 and 6 specify the values of tolerances for profile dimensions in inches (with metric conversions).

Tables 7 and 8 specify the maximum permissible deviations in the half-angle and the lead error in inches (with metric conversions).

¹⁾ The gauges used shall be in accordance with the appropriate International Standard (to be prepared).