ASME B1.30-2024
[Revision of ASME B1.30-2002 (R2022)]

Screw Threads: Standard Practice for Calculating and Rounding Dimensions

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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150 Clove Road • Little Falls, NJ • 07424 USA

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FOREWORD

The Committee B1 for standardization of screw threads was organized in 1920 under the sponsorship of the American Society of Mechanical Engineers (ASME), the Society of Automotive Engineers, and the American Engineering Standards Committee [now known as the American National Standards Institute (ANSI)]. The efforts of this committee through the years resulted in the development of several screw thread standards.

The ASME B1 Standards Committee recognized the need to standardize the method of rounding decimal values in the calculation of screw thread dimensions. It charged Subcommittee 30 with the responsibility for producing such a standard. ASME B1.30 was developed only to serve as the basis for rounding of decimal values associated with the computation of screw thread dimensions.

The examples and formulas depicted within this Standard are for reference only and are presented only to clarify the rounding procedures described. When calculating the different thread characteristics for a particular thread form, see the appropriate ASME B1 standard for the formulas and methodology of calculation for that thread.

ASME B1.30 was originally approved as an American National Standard on June 29, 1992. It was revised in 2002 and reaffirmed in 2012 and reaffirmed again in 2017.

The 2002 revisions included a clarification of the use of this Standard for metric applications; an exception to the number of decimal places for the allowance 2A when used in intermediate calculations as Td_2; and the addition of the maximum external UN minor diameter, maximum and minimum internal pitch diameters, and the minimum internal major diameter to the examples cited in para. 3.2. The 2002 update also removed Appendix A because the values for 60-deg thread elements were either listed or could be calculated by formulas in other existing B1 standards. It was replaced with a new Nonmandatory Appendix A containing a table listing the number of decimal places for each of the thread characteristics used in the examples in ASME B1.30. Examples of a standard metric size listed in ASME B1.13M and ISO 261 and a special inch size showing how to round numbers with an infinite number of digits after the decimal point were also added.

This 2024 edition of ASME B1.30 includes the following updates:

(a) General rules for trigonometric functions have been added.

(b) Examples for the calculation of 3A and 3B threads have been added.

(c) The wording in various paragraphs has been clarified.

(d) A small number of values has been corrected.

(e) Symbols r and Td_2 have been added to Table A-1.

(f) Tables 3.2-1, 3.2-5, and 4-1 (formerly Tables 2, 4, and 10) have been revised as follows for consistency with changes in ASME B1.1-2024:

(1) In Characteristic Description (5) of Tables 3.2-1 and 3.2-5, the UNR $2h_s$ constant has been corrected from 1.19078493P to 1.22686932P.

(2) In Table 4-1, the UNR $2h_s$ constant 1.19078493P was replaced with the corrected value 1.22686932P and the h_s constant 0.59539247 P was replaced with the corrected value 0.61343466P.

(g) Tables have been redesignated.

ASME B1.30-2024 was approved as an American National Standard on May 7, 2024.

ASME B1 COMMITTEE
Standardization and Unification of Screw Threads

(The following is the roster of the committee at the time of approval of this Standard.)

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In addition, the committee may post errata on the committee web page. Errata become effective on the date posted. Users can register on the committee web page to receive email notifications of posted errata.

This Standard is always open for comment, and the committee welcomes proposals for revisions. Such proposals should be as specific as possible, citing the paragraph number, the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent background information and supporting documentation.

Cases. The committee does not issue cases for this Standard.

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SCREW THREADS: STANDARD PRACTICE FOR CALCULATING AND ROUNDING DIMENSIONS

1 GENERAL

1.1 Purpose

The purpose of this Standard is to establish uniform and specific practices for calculating and rounding the numeric values used for inch and metric screw thread design data dimensions and for gages where appropriate. No attempt is made to establish a policy of rounding actual thread characteristics measured by the manufacturer or user of thread gages. The standard rounding practice regarding the last figure or decimal place to be retained by a numeric value and the number of decimal places to be retained by values used in intermediate calculations of thread design data dimensions is covered. Values calculated to this Standard for inch and metric screw thread design data dimensions may vary slightly from values shown in existing ASME B1 standards and shall take precedence, unless a specific standard states otherwise, in all new or future revisions of ASME B1 standards as applicable (see para. 1.2 for exceptions).

1.2 Metric Application

Allowances (fundamental deviations) and tolerances for metric M and MJ screw threads are based on formulas in applicable standards. Values of allowances for standard tolerance positions and values of tolerances for standard tolerance grades are tabulated in these standards for a selection of pitches. The rounding rules specified herein have not been applied to these values but have followed practices of the International Organization for Standardization (ISO). For pitches, which are not included in the tables, standard formulas and the rounding rules specified herein are applicable.

NOTE: ISO rounding practices for screw thread tolerances and allowances use rounding to the nearest values in the ISO R40 series of numbers in accordance with ISO 3. In some cases, the rounded values have been adjusted to produce a smooth progression. Since the ISO rounded values have been standardized internationally for metric screw threads, recalculating tolerances and allowances using ASME B1.30 rules in the United States would lead to confusion. ASME B1.30 rounding rules are, therefore, only applicable to special threads where tabulated values do not exist in ISO standards. Values calculated using the ISO R40 series values may differ from those calculated using ASME B1.30. In such a case, the special thread values generated using ASME B1.30 take precedence.

1.3 References

The following is a list of publications referenced in this Standard. Unless otherwise specified, the latest edition shall apply.

ASME B1.1. Unified Inch Screw Threads (UN, UNR, and UNJ Thread Forms). The American Society of Mechanical Engineers.
ASME B1.13M. Metric Screw Threads: M Profile. The American Society of Mechanical Engineers.
ASME SI-1. ASME Orientation and Guide for Use of SI (Metric) Units (9th ed.). The American Society of Mechanical Engineers.
IEEE/ASTM SI 10. American National Standard for Metric Practice. IEEE/ASTM International.
ISO 3. Preferred numbers — Series of preferred numbers. International Organization for Standardization.
ISO 261. ISO general purpose metric screw threads — General plan. International Organization for Standardization.
ISO 965-1. ISO general-purpose metric screw threads — Tolerances — Part 1: Principles and basic data. International Organization for Standardization.

2 ROUNDING OF DECIMAL VALUES

The following rounding practice, inch or metric, represents the method to be used in all new or future revisions of ASME B1 thread standards.

NOTE: This Standard is not in agreement with other published standards, e.g., ASME SI-1 and IEEE/ASTM SI 10. The rounding practices used in the forenamed standards are designed to produce even distribution of numerical values. The purpose of this Standard is to define the most practical and commonly used method of rounding numerical thread form values considering today's technology.

(a) When the next figure beyond the last figure or place to be retained is less than 5, the figure in the last place retained is kept unchanged.

EXAMPLE:

To Be Rounded	Rounded
1.012342	1.01234
1.012342	1.0123
1.012342	1.012

(b) When the next figure beyond the last figure or place to be retained is equal to or greater than 5, the figure in the last place retained is increased by 1.

EXAMPLE:

To Be Rounded	Rounded
1.01235	1.0124
1.0123500	1.0124
1.012345	1.01235
1.01234500	1.01235
1.56789	1.5679
1.56789	1.568
1.56789	1.57

(c) The final rounded value is obtained from the most precise value available and not from a series of successive rounding. For example, 0.5499 should be rounded to 0.550, 0.55 and 0.5 (not 0.6), since the most precise value available (0.5499) is less than 0.55. Similarly, 0.5501 should be rounded to 0.550, 0.55 and 0.6, since the most precise value available (0.5501) is more than 0.55. In the case of 0.5500, rounding should be to 0.550, 0.55 and 0.6, since the most precise value available is 0.5500.

3 CALCULATIONS FROM FORMULAS

3.1 General Rules

3.1.1 Pitch Values and Constants. Values for pitch, *P,* and constants of *P* are used out to eight decimal places for inch series. The eight place values are obtained by rounding their truncated ten place values. Seven decimal place values for metric series constants are derived by rounding their truncated nine place values. See para. 4 for thread form constants of *P*. Values used in intermediate calculations are rounded to two places beyond the number of decimal places retained for the final value (see Table 3.1.1-1).

Table 3.1.1-1
Number of Decimal Places Used in Calculations

Units	Pitch	Constants of *P*	Intermediate	Final
Inch	8	8	6	4 (except as outlined in para. 3.1.3)
Metric	As designated	7	5	3

EXAMPLE:

$$
\begin{aligned}
n &= 28 \text{ threads per inch} \\
P &= 1/n \\
&= 1/28 \\
&= 0.0357142857142857 \\
&= 0.0357142857 \text{ (truncated to ten decimal places)} \\
&= 0.03571429 \text{ (rounded to eight decimal places)}
\end{aligned}
$$

3.1.2 Trigonometric Functions. Values for the trigonometric functions pi (π), cosine, sine, etc., are used in formulas out to eight decimal places. The eight place values are obtained by rounding their truncated ten place values. The difference using the unrounded cosine of 30 deg times the P value versus rounding the cosine of 30 deg to eight places times the P value will never exceed 0.0000000009. With 0.0000000009 inch being the largest difference, it would never impact an intermediate calculation to six places.

EXAMPLE:

$$
\begin{aligned}
\cos\ 30\ \text{Deg} &= 0.866025403784438 \\
&= 0.8660254037 \quad \text{truncated ten decimal place value} \\
&= 0.86602540 \quad \text{rounded to eight decimal places}
\end{aligned}
$$

3.1.3 Final Values. Rounding to the final value is the last step in the calculation.

(a) ASME B1.1 requires four decimal places for the final values of pitch diameter, major diameter, and minor diameter, except for Classes 1B and 2B internal thread minor diameters for thread sizes 0.138 and larger. These minor diameter exceptions for internal threads are as follows:

(1) Minimum Minor Diameter. All classes are calculated and then rounded off to the nearest 0.001 in. and expressed in three decimal places for sizes 0.138 in. and larger. For Class 3B, a zero is added to yield four decimal places.

(2) Maximum Minor Diameter. All classes are calculated before rounding, using the six decimal place intermediate value of the minimum minor diameter, then rounded for Classes 1B and 2B to the nearest 0.001 in. for sizes 0.138 in. and larger. Class 3B values are rounded to four decimal places.

(b) Per ASME B1.1, the final values for Class 1A/2A allowances and for 1A/1B, 2A/2B, and 3A/3B tolerances for inch screw thread dimensions are four decimal places. The four decimal place values are calculated using the six decimal place 2A pitch diameter tolerance, Td_2, rounded to four decimal places.

(c) Per ASME B1.13M, metric screw threads are dimensioned in millimeters. The final values of pitch diameter, major diameter, minor diameter, allowance, and thread element tolerances are expressed to three decimal places.

3.1.4 Multiple Zeros. Values containing multiple trailing zeros out to the required number of decimal places can be expressed by displaying only two zeros beyond the last significant digit.

EXAMPLE: 20 threads per inch has a pitch equal to 0.05000000 and can be expressed as 0.0500.

3.2 Examples

The formulas in the examples for inch screw threads in Tables 3.2-1 through 3.2-6 are based on formulas in ASME B1.1. Tables 3.2-1 through 3.2-4 are based on a size that when converted from a fraction to a decimal will result in a number that has no value beyond the fourth decimal place. Tables 3.2-5 and 3.2-6 are based on a size that when converted will result in a number with infinite numbers of digits following the decimal point.

The formulas in the examples for metric screw threads in Tables 3.2-7 through 3.2-10 are based on formulas in ASME B1.13M. Tables 3.2-7 and 3.2-8 show the use of the tabulated values for allowances and tolerances (in accordance with ISO 965-1) for the calculation of size limits for standard diameter and pitch combinations listed in both ISO 261 and ASME B1.13M. The constant values differ from those used for inch screw threads, in accordance with the policy of rounding of this Standard, because metric limits of size are expressed to only three decimal places rather than four.

For an example of size limit calculations using formulas for sizes not listed, see Tables 3.2-9 (external) and 3.2-10 (internal).

4 THREAD FORM CONSTANTS OF *P*

For 60-deg thread form data tables, see Table 4-1. The number of decimal places and the way they are listed should be consistent. Thread form constants printed in older thread standards are based on a function of thread height, H, or pitch, P. The equivalent of the corresponding function is also listed. There are some constants that would require some of these

values to extend to seven or eight decimal places before they would round to equivalent values. For standardization, the tabulated listing of thread values based on a function of *P* has been established, with *H* used as a reference only. All thread calculations shall be performed using a function of *P*, rounded to eight decimal places for inch series and as designated for metric series, not a function of *H*. *H* is to be used for reference only.

Table 3.2-1
Example of External Inch Screw Threads, $^{1}/_{2}$-28 UNEF-2A

Thread Size = $^{1}/_{2}$ -28 or 0.5000-28 UNEF-2A		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(1) Maximum external major diameter, d max. = Basic major diameter, d bsc − allowance, es	d max. = d bsc − es	...
	d bsc = 0.5000	This is the final value of the d bsc, which is rounded to four decimal places.
	es = 0.300 (Td_2 for class 2A)	For Class 2A pitch diameter tolerance, Td_2, see Characteristic Description (4).
	es = 0.300(0.003668)	The six decimal place value for Class 2A Td_2 is used in this calculation.
	es = 0.001100	This figure is rounded to four decimal places to obtain the final value of es.
	es = 0.0011	...
	d max. = 0.5000 − 0.0011	...
	d max. = 0.4989	...
(2) Minimum external major diameter, d min. = Maximum external major diameter, d max. − major diameter tolerance, Td	d min. = d max. − Td	...
	$Td = 0.060\sqrt[3]{P^2}$	...
	$Td = 0.060\sqrt[3]{(0.03571429)^2}$	All thread calculations should be performed using the ten decimal place truncated value of P rounded to eight decimal places.
	$Td = 0.060\sqrt[3]{0.001276}$	...
	Td = 0.060(0.108463)	...
	Td = 0.006508	This figure is rounded to four decimal places to obtain the final value of Td.
	Td = 0.0065	...
	d min. = 0.4989 − 0.0065	...
	d min. = 0.4924	...
(3) Maximum external pitch diameter, d_2 max. = Maximum external major diameter, d max. − twice the external thread addendum, h_b	d_2 max. = d max. − h_b	...
	h_b = 0.64951905P	...
	h_b = 0.64951905(0.03571429)	All thread calculations should be performed using the ten decimal place truncated value of P rounded to eight decimal places.
	h_b = 0.023197	...
	d_2 max. = 0.4989 − 0.023197	...
	d_2 max. = 0.475703	This figure is rounded to four decimal places to obtain the final value of d_2 max.
	d_2 max. = 0.4757	...

Table 3.2-1
Example of External Inch Screw Threads, $^1/_2$-28 UNEF-2A (Cont'd)

Thread Size = $^1/_2$ -28 or 0.5000-28 UNEF-2A		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(4) Minimum external pitch diameter, d_2 min. = Maximum external pitch diameter, d_2 max. – external pitch diameter tolerance, Td_2	d_2 min. = d_2 max. – Td_2	...
	$Td_2 = 0.0015\sqrt[3]{d\ \text{bsc}} + 0.0015\sqrt{LE} + 0.015\sqrt[3]{P^2}$	Length of engagement, LE, required in this example is equal to 9P. See ASME B1.1 for LE applications for the other thread series.
	$Td_2 = 0.0015\sqrt[3]{0.5000} + 0.0015\sqrt{9(0.03571429)} + 0.015\sqrt[3]{(0.03571429)^2}$	...
	$Td_2 = 0.0015\sqrt[3]{0.5000} + 0.0015\sqrt{0.321429} + 0.015\sqrt[3]{0.001276}$	...
	$Td_2 = (0.0015)(0.793701) + (0.0015)(0.566947) + (0.015)(0.108463)$	...
	$Td_2 = 0.001191 + 0.000850 + 0.001627$	...
	$Td_2 = 0.003668$	This figure is rounded to four decimal places to obtain the final value of Td_2.
	$Td_2 = 0.0037$	...
	d_2 min. = 0.4757 – 0.0037	...
	d_2 min. = 0.4720	This figure is the four decimal place final value of d_2 min.
(5) Maximum external UNR minor diameter, d_3 max. = Maximum external major diameter, d max. – double height of external UNR thread, $2h_s$	d_3 max. = d max. – $2h_s$	...
	$2h_s = 1.22686932P$	...
	$2h_s = 1.22686932(0.03571429)$	All thread calculations are performed using the ten decimal place truncated value of P rounded to eight decimal places.
	$2h_s = 0.043817$	...
	d_3 max. = 0.4989 – 0.043817	...
	d_3 max. = 0.455083	This figure is rounded to four decimal places to obtain the final value of d_3 max.
	d_3 max. = 0.4551	...
(6) Maximum external UN minor diameter, d_1 max. = Maximum external major diameter, d max. – double height of external UN thread, $2h_s$	d_1 max. = d max. – $2hs$	...
	$2h_s = 1.08253175P$	For UN threads, $2h_s = 2h_n$
	$2h_s = 1.08253175(0.03571429)$	All thread calculations should be performed using P rounded to eight decimal places.
	$2h_s = 0.038662$	...
	$d1$ max. = 0.4989 – 0.038662	...
	$d1$ max. = 0.460238	This figure is rounded to four decimal places to obtain the final value of d_1 max.
	$d1$ max. = 0.4602	...

GENERAL NOTES:
(a) All dimensions expressed in inches for calculations in this table.
(b) $P = 1/n = 1/28 = 0.03571429$.

Table 3.2-2
Example of Internal Inch Screw Threads, $^{1}/_{2}$-28 UNEF-2B

Thread Size = $^{1}/_{2}$-28 or 0.5000-28 UNEF-2B		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(1) Minimum internal minor diameter, D_1 min. = Basic major diameter, D bsc − double height of internal thread, $2h_n$	D_1 min. = D bsc − $2h_n$	...
	$2h_n = 1.08253175P$	...
	$2h_n = 1.08253175(0.03571429)$	All thread calculations should be performed using the ten decimal place truncated value of P rounded to eight decimal places.
	$2h_n = 0.038662$	...
	D_1 min. = 0.5000 − 0.038662	...
	D_1 min. = 0.461338	For the Class 2B thread used in this example, this figure is rounded to three decimal places to obtain the final value of D_1 min. Other sizes and classes may be expressed in a four-place decimal. See para. 3.1.3(a)(1).
	D_1 min. = 0.461	...
(2) Maximum internal minor diameter, D_1 max. = Minimum internal minor diameter, D_1 min., rounded to six decimal places + internal minor diameter tolerance, TD_1	D_1 max. = D_1 min. (to six decimal places) + TD_1	See para 3.1.3(a)(2) for exception rule when calculating D_1 max.
	$TD_1 = 0.25P - 0.4P^2$	See ASME B1.1 for limitations on use of this formula.
	$TD_1 = 0.25(0.03571429) - 0.4(0.03571429)^2$	All thread calculations should be performed using the ten decimal place truncated value of P rounded to eight decimal places.
	$TD_1 = 0.25(0.03571429) - 0.4(0.001276)$	...
	$TD_1 = 0.008929 - 0.000510$	...
	$TD_1 = 0.008419$	This figure is rounded to four decimal places to obtain the final value of TD_1.
	$TD_1 = 0.0084$	...
	D_1 max. = 0.461338 + 0.0084	...
	D_1 max. = 0.469738	For the Class 2B thread used in this example, this figure is rounded to three decimal places to obtain the final value of D_1 max. Other sizes and classes may be expressed in a four-place decimal. See para. 3.1.3(a)(2).
	D_1 max. = 0.470	...

Table 3.2-2
Example of Internal Inch Screw Threads, $^{1}/_{2}$-28 UNEF-2B (Cont'd)

Thread Size = $^{1}/_{2}$-28 or 0.5000-28 UNEF-2B		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(3) Minimum internal pitch diameter, D_2 min. = Basic major diameter, D bsc − twice the external thread addendum, h_b	D_2 min. = D bsc − h_b	...
	h_b = 0.64951905P	...
	h_b = 0.64951905(0.03571429)	All thread calculations should be performed using the ten decimal place truncated value of P rounded to eight decimal places.
	h_b = 0.023197	...
	D_2 min. = 0.5000 − 0.023197	...
	D_2 min. = 0.476803	This figure is rounded to four decimal places to obtain the final value of D_2 min.
	D_2 min. = 0.4768	...
(4) Maximum internal pitch diameter, D_2 max. = Minimum internal pitch diameter, D_2 min. + internal pitch diameter tolerance, TD_2	D_2 max. = D_2 min. + TD_2	...
	TD_2 = 1.300 (Td_2 for class 2A)	The constant 1.300 is for this Class 2B example and will be different for Classes 1B and 3B. See ASME B1.1.
	TD_2 = 1.300(0.003668)	For TD_2, the six-place decimal value of the Class 2A pitch diameter is used. See Table 3.2-1, Characteristic Description (4).
	TD_2 = 0.004768	This figure is rounded to four decimal places to obtain the final value of TD_2
	TD_2 = 0.0048	...
	D_2 max. = 0.4768 + 0.0048	...
	D_2 max. = 0.4816	...
(5) Minimum internal major diameter, D min. = Basic major diameter, D bsc	D min. = D bsc	...
	D bsc = 0.5000	...
	D min. = 0.5000	...

GENERAL NOTES:
(a) All dimensions expressed in inches for calculations in this table.
(b) $P = 1/n = 1/_{28} = 0.03571429$

Table 3.2-3
Example of External Inch Screw Threads, $^{7}/_{16}$-14 UNC-3A

Thread Size = $^{7}/_{16}$-14 or 0.4375-14 UNC-3A		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(1) Maximum external major diameter, d max. = Basic major diameter, d bsc	d max. = D bsc	...
	D bsc = 0.4375	This is the final value of the basic major diameter, which is expressed in four decimal places.
	d max. = 0.4375	...
(2) Minimum external major diameter, d min. = Maximum external major diameter, d max. − Major diameter tolerance, Td	d min. = d max. − Td	...
	$Td = 0.060\sqrt[3]{P^2}$	...
	$Td = 0.060\sqrt[3]{0.07142857^2}$	All thread calculations should be performed using the ten decimal place truncated value of P rounded to eight decimal places.
	$Td = 0.060\sqrt[3]{0.005102}$	...
	Td = 0.060(0.172153)	...
	Td = 0.010329	This figure is rounded to four decimal places to obtain the final value of Td.
	Td = 0.0103	...
	d min. = 0.4375 − 0.0103	...
	d min. = 0.4272	...
(3) Maximum external pitch diameter, d_2 max. = Maximum external major diameter, d max. − twice the external thread addendum, h_b	d_2 max. = d max. − h_b	...
	h_b = 0.64951905P	...
	h_b = 0.64951905(0.07142857)	All thread calculations should be performed using the ten decimal place truncated value of P rounded to eight decimal places.
	h_b = 0.046394	...
	d_2 max. = 0.4375 − 0.046394	...
	d_2 max. = 0.391106	This figure is rounded to four decimal places to obtain the final value of d_2 max.
	d_2 max. = 0.3911	...

Table 3.2-3
Example of External Inch Screw Threads, $^{7}/_{16}$-14 UNC-3A (Cont'd)

Thread Size = $^{7}/_{16}$-14 or 0.4375-14 UNC-3A		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(4) Minimum external pitch diameter, d_2 min. = Maximum external pitch diameter, d_2 max. – external pitch diameter tolerance, Td_2	d_2 min. = d_2 max. – Td_2	...
	$Td_2 = 0.7500[0.0015\sqrt[3]{D\,bsc} + 0.0015\sqrt{\text{LE}} + 0.015\sqrt[3]{\text{P}^2}\,]$	Length of engagement, LE, required in this example is equal to 1 diameter. See ASME B1.1 for LE applications for other thread series.
	$Td_2 = 0.7500[0.0015\sqrt[3]{0.4375} + 0.0015\sqrt{0.4375} + 0.015\sqrt[3]{(0.07142857)^2}\,]$	...
	$Td_2 = 0.7500[0.0015\sqrt[3]{0.4375} + 0.0015\sqrt{0.4375} + 0.015\sqrt[3]{0.005102}\,]$	...
	$Td_2 = 0.7500[(0.0015)(0.759147) + (0.0015)(0.661438) + (0.015)(0.172153)]$	...
	$Td_2 = 0.7500(0.001139 + 0.000992 + 0.002582)$	...
	$Td_2 = 0.7500(0.004713)$	...
	$Td_2 = 0.003535$	...
	$Td_2 = 0.0035$	...
	d_2 min. = 0.3911 – 0.0035	This figure is rounded to four decimal places to obtain the final value of the external pitch diameter tolerance, Td_2.
	d_2 min = 0.3876	...
(5) Maximum external UNR minor diameter, d_3 max. = Maximum external major diameter, d max. – double height of external UNR thread, $2h_s$	d_3 max. = d max. – $2h_s$	...
	$2h_s = 1.22686932P$	...
	$2h_s = 1.22686932(0.07142857)$	All thread calculations should be performed using the ten decimal place truncated value of P rounded to eight decimal places.
	$2h_s = 0.087634$	...
	d_3 max. = 0.4375 – 0.087634	...
	d_3 max. = 0.349866	This figure is rounded to four decimal places to obtain the final value of d_3 max.
	d_3 max. = 0.3499	...
(6) Maximum external UN minor diameter, d_1 max. = Maximum external major diameter, d max. – double height of external UN thread, $2h_s$	d_1 max. = d max. – $2h_s$	...
	$2h_s = 1.08253175P$	For UN threads, $2h_s = 2h_n$
	$2h_s = 1.08253175(0.07142857)$	All thread calculations should be performed using the ten decimal place truncated value of P rounded to eight decimal places.
	$2h_s = 0.077324$	...
	d_1 max. = 0.4375 – 0.077324	...
	d_1 max. = 0.360176	This figure is rounded to four decimal places to obtain the final value of d_1 max.
	d_1 max. = 0.3602	...

Table 3.2-3
Example of External Inch Screw Threads, $^7/_{16}$-14 UNC-3A (Cont'd)

GENERAL NOTES:
(a) All dimensions are expressed in inches for calculations in this table.
(b) $P = 1/n = 1/14 = 0.07142857$

Table 3.2-4
Example of Internal Inch Screw Threads, $^{7}/_{16}$-14 UNC-3B

Thread Size = $^{7}/_{16}$-14 or 0.4375-14 UNC-3B		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(1) Minimum internal minor diameter, D_1 min. = Basic major diameter, D bsc − double height of internal thread, $2h_n$	D_1 min. = D bsc − $2h_n$	...
	$2h_n = 1.08253175P$	All thread calculations should be performed using the ten decimal place truncated value of P rounded to eight decimal places.
	$2h_n = 1.08253175(0.07142857)$	...
	$2h_n = 0.077324$	This value is used in an intermediate calculation and is therefore rounded to six decimal places (see para. 3.1.1 and Tables 3.1.1-1 and A-1).
	D_1 min. = 0.4375 − 0.077324	...
	D_1 min. = 0.360176	For the Class 3B thread used in the example, this figure is rounded to three decimal places and a zero is added to yield a four decimal place final value of D_1 min. Other sizes and classes may be expressed in a three-place decimal. See para 3.1.3(a)(1).
	D_1 min. = 0.360	
	D_1 min. = 0.3600	
(2) Maximum internal minor diameter, D_1 max. = Minimum internal minor diameter, D_1 min., rounded to six decimal places + internal minor diameter tolerance, TD_1	D_1 max. = D_1 min. (to six decimal places) + TD_1	See para. 3.1.3(a)(2) for the exception rule when calculating D_1 max.
	TD_1 =	The value used for TD_1 is determined by one of three calculations based on certain limitations. See ASME B1.1 for limitations.
	$TD_1 = [0.05\sqrt[3]{P^2} + (0.03P)/D - 0.002]$	See ASME B1.1 for limitations on the use of this formula.
	$= [0.05\sqrt[3]{0.07142857^2} + (0.03)(0.07142857)/0.4375) - 0.002]$	All thread calculations should be performed using the ten decimal place truncated value of P rounded to eight decimal places.
	$= [0.05\sqrt[3]{0.005102} + (0.002143/0.4375) - 0.002]$	...
	$= [0.05(0.172153) + (0.004898 - 0.002)]$	...
	$= 0.008608 + 0.004898 - 0.002$	Limitation on the use of this value is based on the next two calculations.
	$= 0.011506$	...
	$= 0.394P$	Limitation as listed in ASME B1.1. Tolerance shall be not greater than $0.394P$.
	$= 0.394(0.07142857)$	
	$= 0.028143$	

Table 3.2-4
Example of Internal Inch Screw Threads, $^{7}/_{16}$-14 UNC-3B (Cont'd)

Thread Size = $^{7}/_{16}$-14 or 0.4375-14 UNC-3B		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(2) (Cont'd)	$TD_1 = 0.23P - 1.5P^2$ $= 0.23(0.07142857) - 1.5(0.07142857)^2$	Limitation as listed in B1.1. Tolerance shall be not less than $0.2300P - 1.500P^2$ for 80 to 13 threads per inch, inclusive.
	$= 0.016429 - 1.5(0.005102)$	...
	$= 0.016429 - 0.007653$	...
	$= 0.008776$	...
	$TD_1 = 0.011506$	For TD_1 in the example, 0.011506 is not greater than 0.028143 and not less than 0.008776, so the value of 0.011506 is used. NOTE: Six decimal place values are used for the comparison of limitation values to the calculated TD_1 value, and then the final determination is rounded to four places.
	$TD_1 = 0.0115$	This figure is rounded to four decimal places to obtain the final value of TD_1.
	D_1 max. $= 0.360176 + 0.0115$	...
	D_1 max. $= 0.371676$	For the Class 3B thread used in the example, this figure is rounded to four decimal places to obtain the final value of D_1 max. Other sizes and classes may be expressed in a three-place decimal. See para. 3.1.3(a)(2).
	D_1 max. $= 0.3717$	...
(3) Minimum internal pitch diameter, D_2 min. = Basic major diameter, D bsc − twice the external thread addendum, h_b	D_2 min. $= D$ bsc $- h_b$	...
	$h_b = 0.64951905P$	...
	$h_b = 0.64951905(0.07142857)$	All thread calculations should be performed using the ten decimal place truncated value of P rounded to eight decimal places.
	$h_b = 0.046394$	...
	D_2 min. $= 0.4375 - 0.046394$	...
	D_2 min. $= 0.391106$	This figure is rounded to four decimal places to obtain the final value of D_2 min.
	D_2 min. $= 0.3911$	...

Table 3.2-4
Example of Internal Inch Screw Threads, $^{7}/_{16}$-14 UNC-3B (Cont'd)

Thread Size = $^{7}/_{16}$-14 or 0.4375-14 UNC-3B		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(4) Maximum internal pitch diameter, D_2 max. = Minimum internal pitch diameter, D_2 min. + internal pitch diameter tolerance, TD_2	D_2 min. = 0.3911	...
	D_2 max. = D_2 min. + TD_2	...
	TD_2 = 0.9750(Td_2 for class 2A)	The constant 0.9750 is for this Class 3B example and will be different for Classes 1B and 2B. See ASME B1.1.
	TD_2 = 0.9750(0.004713)	For the Td_2 class 2A pitch diameter tolerance, see para. 3.1.3(b). The six place decimal place value is used.
	TD_2 = 0.004595 TD_2 = 0.0046	This figure is rounded to four decimal places to obtain the final value of TD_2.
	D_2 max. = 0.3911 + 0.0046	...
	D_2 max. = 0.3957	...
(5) Minimum internal major diameter, D min. = Basic major diameter, D bsc	D min. = D bsc	...
	D bsc = 0.4375	...
	D min. = 0.4375	...

GENERAL NOTES:
(a) All dimensions are expressed in inches for calculations in this table.
(b) $P = 1/n = 1/14 = 0.07142857$

Table 3.2-5
Example of External Inch Screw Threads, $^{19}/_{64}$-36 UNS-2A

Thread Size = $^{19}/_{64}$-36 or 0.2969 (0.296875 Rounded to Four Decimal Places)-36 UNS-2A		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(1) Maximum external major diameter, d max. = Basic major diameter, d bsc − allowance, es	d max. = d bsc − es	...
	d bsc = 0.2969	This is the final value of the basic major diameter, which is rounded to four decimal places.
	es = 0.300 (Td_2 for Class 2A)	For the Class 2A pitch diameter tolerance, see Characteristic Description (4).
	es = 0.300(0.003127)	The six decimal place value for Class 2A pitch diameter tolerance, Td_2, is used in this calculation.
	es = 0.000938	This figure is rounded to four decimal places to obtain the final value of es.
	es = 0.0009	...
	d max. = 0.2969 − 0.0009	...
	d max. = 0.2960	...
(2) Minimum external major diameter, d min. = Maximum external major diameter, d max. − major diameter tolerance, Td	d min. = d max. − Td	...
	$Td = 0.060 \sqrt[3]{P^2}$	...
	$Td = 0.060 \sqrt[3]{0.02777778^2}$	All thread calculations should be performed using the ten decimal place truncated value of P rounded to eight decimal places.
	$Td = 0.060 \sqrt[3]{0.000772}$	...
	Td = 0.060(0.091736)	...
	Td = 0.005504	This figure is rounded to four decimal places to obtain the final value of Td.
	Td = 0.0055	...
	d min. = 0.2960 − 0.0055	...
	d min. = 0.2905	...
(3) Maximum external pitch diameter, d_2 max. = Maximum external major diameter, d max. − twice the external thread addendum, h_b	d_2 max. = d bsc − h_b	...
	h_b = 0.64951905P	...
	h_b = 0.64951905(0.02777778)	All thread calculations should be performed using the ten decimal place truncated value of P rounded to eight decimal places.
	h_b = 0.018042	...
	d_2 max. = 0.2960 − 0.018042	...
	d_2 max. = 0.277958	This figure is rounded to four decimal places to obtain the final value of d_2 max.
	d_2 max. = 0.2780	...

Table 3.2-5
Example of External Inch Screw Threads, $^{19}/_{64}$-36 UNS-2A (Cont'd)

Thread Size = $^{19}/_{64}$-36 or 0.2969 (0.296875 Rounded to Four Decimal Places)-36 UNS-2A		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(4) Minimum external pitch diameter, d_2 min. = Maximum external pitch diameter, d_2 max. – external pitch diameter tolerance, Td_2	d_2 min. = $d_2$max. – Td_2	...
	$Td_2 = 0.0015\sqrt[3]{d\ \text{bsc}} + 0.0015\sqrt{LE} + 0.015\sqrt[3]{P^2}$	Length of engagement, LE, required in this example is equal to 9P. See ASME B1.1 for LE applications for other thread series.
	$Td_2 = 0.0015\sqrt[3]{0.2969} + 0.0015\sqrt{9(0.02777778)} + 0.015\sqrt[3]{(0.02777778)^2}$	...
	$Td_2 = 0.0015\sqrt[3]{0.2969} + 0.0015\sqrt{0.250000} + 0.015\sqrt[3]{(0.000772)}$	...
	$Td_2 = (0.0015)(0.667119) + 0.0015(0.5000) + 0.015(0.091736)$	...
	$Td_2 = 0.001001 + 0.000750 + 0.001376$	...
	$Td_2 = 0.003127$	This figure is rounded to four decimal places to obtain the final value of the external pitch diameter tolerance, Td_2.
	$Td_2 = 0.0031$	
	d_2 min. = 0.2780 – 0.0031	...
	d_2 min. = 0.2749	...
(5) Maximum external UNR minor diameter, d_3 max. = Maximum external major diameter, d max. – double height of external UNR thread, $2h_s$	d_3 max. = d max. – $2h_s$	...
	$2h_s = 1.22686923P$	...
	$2h_s = 1.22686923(0.02777778)$	All thread calculations should be performed using the ten decimal place truncated value of P rounded to eight decimal places.
	$2h_s = 0.034080$	...
	d_3 max. = 0.2960 – 0.034080	...
	d_3 max. = 0.261920	This figure is rounded to four decimal places to obtain the final value of d_2 max.
	d_3 max. = 0.2619	...
(6) Maximum external UN minor diameter, d_1 max. = Maximum external major diameter, d max. – double height of external UN thread, $2h_s$	d_1 min. = d max. – $2h_s$	...
	$2h_s = 1.08253175P$	For UN threads, $2h_s = 2h_n$
	$2h_s = 1.08253175(0.02777778)$	All thread calculations should be performed using the 10 decimal place truncated value of P rounded to 8 decimal places.
	$2h_s = 0.030070$	...
	d_1 max. = 0.2960 – 0.030070	...
	d_1 max. = 0.265930	This figure is rounded to four decimal places to obtain the final value of the external minor diameter, d_1 max.
	d_1 min. = 0.2659	...

Table 3.2-5
Example of External Inch Screw Threads, $^{19}/_{64}$-36 UNS-2A (Cont'd)

GENERAL NOTES:
(a) All dimensions expressed in inches for calculations in this table.
(b) $P = 1/n = 1/36 = 0.02777778$.

Table 3.2-6
Example of Internal Inch Screw Threads, $^{19}/_{64}$-36 UNS-2B

Thread Size = $^{19}/_{64}$-36 or 0.2969 (0.296875 Rounded to Four Decimal Places)-36 UNS-2B		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(1) Minimum internal minor diameter, D_1 min. = Basic major diameter, D bsc − double height of internal thread, $2h_n$	D_1 min. = D bsc − $2h_n$	...
	$2h_n = 1.08253175P$	...
	$2h_n = 1.08253175(0.02777778)$	All thread calculations should be performed using the ten decimal place truncated value of P rounded to eight decimal places.
	$2h_n = 0.030070$	...
	D_1 min. = 0.2969 − 0.030070	...
	D_1 min. = 0.266830	For the Class 2B thread used in this example, this figure is rounded to three decimal places to obtain the final value of D_1 min. Other sizes and classes may be expressed in a four-place decimal. See para. 3.1.3(a)(1).
	D_1 min. = 0.267	...
(2) Maximum internal minor diameter, D_1 max. = Minimum internal minor diameter, D_1 min., rounded to six decimal places + internal minor diameter tolerance, TD_1	D_1 max. = D_1 min. (to six decimal places) + TD_1	See para 3.1.3(a)(2) for exception rule when calculating D_1 max.
	$TD_1 = 0.2500P - 0.400P^2$	See ASME B1.1 for limitations on use for this formula.
	$TD_1 = 0.2500(0.02777778) - 0.4(0.02777778)^2$	All thread calculations should be performed using the ten- decimal place truncated value of P rounded to eight decimal places.
	$TD_1 = 0.2500(0.02777778) - 0.400(0.000772)$	...
	$TD_1 = 0.006944 - 0.000309$	...
	$TD_1 = 0.006635$	This value is rounded to four places to obtain the final value of TD_1.
	$TD_1 = 0.0066$	...
	D_1 max. = 0.266830 + 0.0066	...
	D_1 max. = 0.273430	For the Class 2B thread used in this example, this figure is rounded to three decimal places to obtain the final value of D_1 max. Other sizes and classes are expressed in a four-place decimal. See para. 3.1.3(a)(2).
	D_1 max. = 0.273	...

Table 3.2-6
Example of Internal Inch Screw Threads, $^{19}/_{64}$-36 UNS-2B (Cont'd)

Thread Size = $^{19}/_{64}$-36 or 0.2969 (0.296875 Rounded to Four Decimal Places)-36 UNS-2B		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(3) Minimum internal pitch diameter, D_2 min. = Basic major diameter, D bsc − twice the external thread addendum, h_b	D_2 min. = D bsc − h_b	...
	h_b = 0.64951905P	...
	h_b = 0.64951905(0.02777778)	All thread calculations should be performed using the ten decimal place truncated value of P rounded to eight decimal places.
	h_b = 0.018042	...
	D_2 min. = 0.2969 − 0.018042	...
	D_2 min. = 0.278858	This figure is rounded to four decimal places to obtain the final value of D_2 min.
	D_2 min. = 0.2789	...
(4) Maximum internal pitch diameter, D_2 max. = Minimum internal pitch diameter, D_2 min. + internal pitch diameter tolerance, TD_2	D_2 max. = D_2 min. + TD_2	...
	TD_2 = 1.300(Td_2 for Class 2A)	The constant 1.300 is for this Class 2B example and will be different for Classes 1B and 3B. See ASME B1.1.
	TD_2 = 1.300(0.003127)	For Class 2A pitch diameter tolerance, see Table 3.2-5, Characteristic Description (4).
	TD_2 = 0.004065	This figure is rounded to four decimal places to obtain the final value of TD_2.
	TD_2 = 0.0041	...
	D_2 max. = 0.2789 + 0.0041	...
	D_2 max. = 0.2830	...
(5) Minimum internal major diameter, D min. = Basic major diameter, D bsc	D min. = D bsc	...
	D bsc = 0.296875	This figure is rounded to four decimal places to obtain the final value of D bsc.
	D bsc = 0.2969	...
	D min. = 0.2969	...

GENERAL NOTES:
(a) All dimensions expressed in inches for calculations in this table.
(b) $P = {}^{1}/_{n} = {}^{1}/_{36} = 0.02777778$.

Table 3.2-7
Example of External Metric Screw Threads, M12 x 1.75-4g6g

Thread Size = M12 x 1.75-4g6g [Notes (1), (2)]		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(1) Maximum external major diameter, d max. = Basic major diameter, d bsc − allowance, es	d max. = d bsc − $\|es\|$; $\|es\|$ is absolute value	...
	d bsc = 12.000	...
	$\|es_g\|$ = 0.034	Tabulated value from ASME B1.13M.
	d max. = 12.000 − 0.034	This figure is rounded to three decimal places to obtain the final value of d max.
	d max. = 11.966 when rounded	...
(2) Minimum external major diameter, d min. = Maximum external major diameter, d max. − major diameter tolerance, Td	d min. = d max. − Td	...
	d max. = 11.966	See Characteristic Description (1).
	Td = 0.265	Tabulated value from ASME B1.13M.
	d min. = 11.966 − 0.265	...
	d min. = 11.701 when rounded	This figure is rounded to three decimal places to obtain the final value of d min.
(3) Maximum external pitch diameter, d_2 max. = Basic major diameter, d bsc − allowance, es − 0.6495191P or maximum external major diameter, d max. − 0.6495191P	d_2 max. = d max. − 0.6495191P	...
	d max. = 11.966	See Characteristic Description (1).
	0.6495191P = (0.6495191)(1.75)	
	0.6495191P = 1.1366584	This figure is rounded to five decimal places, two decimal places beyond the three-decimal place final value d_2 max.
	0.6495191P = 1.13666	This value may also be found in thread data table in ASME B1.13M.
	d_2 max. = 11.966 − 1.13666	...
	d_2 max. = 10.82934	This figure is rounded to three decimal places to obtain the final value of d_2 max.
	d_2 max. = 10.829 when rounded	...
(4) Minimum external pitch diameter, d_2 min. = Maximum external pitch diameter, d_2 max. − external pitch diameter tolerance, Td_2	d_2 min. = d_2 max. − Td_2	...
	d_2 max. = 10.829	See Characteristic Description (3).
	Td_2 = 0.095	Tabulated value from ASME B1.13M.
	d_2 min. = 10.829 − 0.095 = 10.734	...
	d_2 min. = 10.734 when rounded	...

Table 3.2-7
Example of External Metric Screw Threads, M12 x 1.75-4g6g (Cont'd)

Thread Size = M12 x 1.75-4g6g [Notes (1), (2)]		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(5) Maximum external minor diameter, d_1 max. (flat form) = Maximum external pitch diameter, d_2 max. − 0.4330127P	d_1 max. = d_2 max. − 0.4330127P	...
	d_2 max. = 10.829	See Characteristic Description (3).
	0.4330127P = (0.4330127)(1.75)	...
	0.4330127P = 0.7577722	This figure is rounded to five decimal places, two places beyond the three decimal place final value of d_1 max.
	0.4330127P = 0.75777	This value may also be found in the Thread Data Table in ASME B1.13M.
	d_1 max. = 10.829 − 0.75777	...
	d_1 max. = 10.07123	This value may also be rounded to three decimal places to obtain the final value of d_1 max.
	d_1 max. = 10.071 when rounded	...
(6) For reference, minimum external minor diameter, d_3 min. (round form) = Minimum external pitch diameter, d_2 min. − 0.6160254P	d_3 min. = d_2 min. − 0.6160254P	...
	d_2 min. = 10.734	See Characteristic Description (4).
	0.6160254P = (0.6160254)(1.75)	...
	0.6160254P = 1.0780445	This figure is rounded to five decimal places, two places beyond the three decimal place final value, d_3 min.
	0.6160254P = 1.07804	This value may also be found in the Thread Data Table in ASME B1.13M.
	d_3 min. = 10.734 − 1.07804 = 9.65596	This figure is rounded to four decimal places to obtain the final value of d_3 min.
	d_3 min. = 9.656 when rounded	...

GENERAL NOTE: All dimensions are expressed in millimeters.

NOTES:
(1) Example of how tabulated values for allowances and tolerances (in accordance with ISO 965-1) are used for the calculation of size limits (in ASME B1.13M tables) for standard diameter and pitch combinations listed in ISO 261.
(2) For an example of size limit calculations using formulas for sizes not listed, see Tables 3.2-9 (external) and 3.2-10 (internal).

Table 3.2-8
Example of Internal Metric Screw Threads, M12 x 1.75-6H

Thread Size = M12 x 1.75-6H [Notes (1), (2)]		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(1) Minimum internal major diameter, D min. = Basic internal major diameter, D bsc + allowance, EI	D min. = D bsc + $\|EI\|$; $\|EI\|$ is absolute value	...
	D bsc = d bsc = 12.000	See Table 3.2-7, Characteristic Description (1).
	$\|EI_H\|$ = 0	Tabulated value from ASME B1.13M.
	D min. = 12.000 + 0.000	...
	D min. = 12.000	...
(2) Minimum internal pitch diameter, D_2 min. = Basic internal major diameter, D bsc − 0.6495191P + allowance, EI, or minimum internal major diameter, D min. − 0.6495191P	D min. = D min. − 0.6495191P	...
	D min. = 12.000	See Characteristic Description (1).
	0.6495191P = 0.6495191(1.75)	...
	0.6495191P = 1.1366584	This figure is rounded to five decimal places, two places beyond the three decimal place final value of D min.
	0.6495191P = 1.13666	This value may also be found in the Thread Data Table in ASME B1.13M.
	D_2 min. = 12.000 − 1.13666	...
	D_2 min. = 10.86334	This figure is rounded to obtain the final value of minimum internal pitch diameter.
	D_2 min. = 10.863 when rounded	...
(3) Maximum internal pitch diameter, D_2 max. = Minimum internal pitch diameter, D_2 min. + internal pitch diameter tolerance, TD_2	D_2 max. = D_2 min. + TD_2	...
	D_2 min. = 10.863	See Characteristic Description (2).
	TD_2 (6) = 0.200	Tabulated value from ASME B1.13M for internal tolerance grade 6.
	D_2 max. = 10.863 + 0.200	...
	D_2 max. = 11.063	...
(4) Minimum internal minor diameter, D_1 min. = Minimum internal major diameter, D min. − 1.0825318P	D_1 min. = D min. − 1.0825318P	...
	D min. = 12.000	See Characteristic Description (1).
	1.0825318P = (1.0825318)(1.75)	...
	1.0825318P = 1.8944306	This figure is rounded to five decimal places, two places beyond the three decimal place final value, D min.
	1.0825318P = 1.89443	This value may also be found in the Thread Data Table in ASME B1.13M.
	D_1 min. = 12.000 − 1.89443	...
	D_1 min. = 10.10557	This figure is rounded to three decimal places to obtain the final value of the minimum pitch diameter.
	D_1 min. = 10.106 when rounded	...

Table 3.2-8
Example of Internal Metric Screw Threads, M12 x 1.75-6H (Cont'd)

Thread Size = M12 x 1.75-6H [Notes (1), (2)]		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(5) Maximum internal minor diameter, D_1 max. = Minimum internal minor diameter, D_1 min. + internal minor diameter tolerance, TD_1	D_1 max. = D_1 min. + TD_1	...
	D_1 min. = 10.106	See Characteristic Description (4).
	TD_1 (6) = 0.335	Tabulated value from ASME B1.13M for internal tolerance grade 6.
	D_1 max. = 10.106 + 0.335	...
	D_1 max. = 10.441	...
(6) For reference, maximum internal major diameter, D max. = Maximum internal pitch diameter, D_2 max. + 0.7938566P	D max. = D max. + 0.7938566P	...
	D_2 max. = 11.063	See Characteristic Description (3).
	0.7938566P = (0.7938566)1.75	...
	0.7938566P = 1.3892490	This figure is rounded to five decimal places, two places beyond the three decimal place value of final value D max.
	0.7938566P = 1.38925	This value may also be found in the Thread Data Table in ASME B1.13M.
	D max. = 11.063 + 1.38925	...
	D max. = 12.45225	This figure is rounded to three decimal places to obtain the final value of maximum major diameter.
	D max. = 12.452 when rounded	...

GENERAL NOTE: All dimensions are expressed in millimeters.

NOTES:
(1) Example of how tabulated values for allowances and tolerances (in accordance with ISO 965-1) are used for the calculation of size limits (in ASME B1.13M tables) for standard diameter and pitch combinations listed in ISO 261.
(2) For an example of size limit calculations using formulas for sizes not listed, see Tables 3.2-9 (external) and 3.2-10 (internal).

Table 3.2-9
Example of External Metric Screw Threads, M13 x 0.9-4g6g

Thread Size = M13 x 0.9-4g6g [Notes (1), (2)]		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(1) Maximum external major diameter, d max. = Basic major diameter, d bsc − allowance, es	d max. = d bsc − $\lvert es \rvert$; $\lvert es \rvert$ is absolute value	...
	d bsc = 13.000	This is the final value of the basic major diameter and is therefore expressed with three decimal places.
	$\lvert es_g \rvert = 0.015 + 0.011P$	es for tolerance position g is not tabulated for P = 0.9 so it must be calculated.
	$\lvert es_g \rvert = 0.015 + 0.011(0.9)$	...
	$\lvert es_g \rvert = 0.0249$	This figure is rounded to three decimal places to obtain the final absolute value of allowance for tolerance position g.
	$\lvert es_g \rvert$ = 0.025 when rounded	...
	d max. = 13.000 − 0.025	...
	d max. = 12.975	...
(2) Minimum external major diameter, d min. = Maximum external major diameter, d max. − tolerance, Td	d min. = d max. − Td	...
	d max. = 12.975	See Characteristic Description (1).
	$Td\ (6) = 0.18\sqrt[3]{P^2} - \frac{0.00315}{\sqrt{P}}$	Td for tolerance grade 6 is not tabulated for P= 0.9 so it must be calculated.
	$Td\ (6) = 0.18\sqrt[3]{0.9^2} - \frac{0.00315}{\sqrt{0.9}}$	...
	$Td\ (6) = 0.18\sqrt[3]{0.81000} - \frac{0.00315}{0.94868}$	...
	$Td\ (6) = 0.18(0.93217) - \frac{0.00315}{0.94868}$	...
	$Td\ (6) = 0.16779 - 0.00332$	...
	$Td\ (6) = 0.16447$	This figure is rounded to three decimal places to obtain the final value of the major diameter tolerance for tolerance grade 6.
	$Td\ (6) = 0.164$ when rounded	...
	d min. = 12.975 − 0.164	...
	d min. = 12.811	...

Table 3.2-9
Example of External Metric Screw Threads, M13 x 0.9-4g6g (Cont'd)

Thread Size = M13 x 0.9-4g6g [Notes (1), (2)]		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(3) Maximum external pitch diameter, d_2 max. = Basic major diameter, d bsc − allowance, es − 0.6495191P or maximum external major diameter, d max. − 0.6495191P	d_2 max. = d max. − 0.6495191P	...
	d max. = 12.975	See Characteristic Description (1).
	0.6495191P = 0.6495191(0.9)	...
	0.6495191P = 0.5845672	This figure is rounded to five decimal places, two places beyond the three decimal place final value of d_2 max.
	0.6495191P = 0.58457	...
	d_2 max. = 12.975 − 0.58457	...
	d_2 max. = 12.39043	This figure is rounded to three decimal places to obtain the final value of d_2 max.
	d_2 max. = 12.390 when rounded	...
(4) Minimum external pitch diameter, d_2 min. = Maximum external pitch diameter, d_2 max. − external pitch diameter tolerance, Td_2	d_2 min. = d_2 max. − Td_2	...
	d_2 max. = 12.390	See Characteristic Description (3).
	Td_2 (4) = 0.63 Td_2 (6)	Td_2 for tolerance grade 4 is not tabulated for P = 0.9 so it must be calculated.
	Td_2 (4) = 0.63[0.09$P^{0.4}d^{0.1}$]	...
	Td_2 (4) = 0.63[0.09(0.9)$^{0.4}$(13$^{0.1}$)]	...
	Td_2 (4) = 0.63[0.09(0.95873)(1.29239)]	...
	Td_2 (4) = 0.63[(0.08629)(1.29239)]	...
	Td_2 (4) = (0.63)(0.11152)	...
	Td_2 (4) = 0.07026	This figure is rounded to three decimal places to obtain the final value of pitch diameter tolerance for tolerance grade 4.
	Td_2 (4) = 0.070 when rounded	...
	d_2 min. = 12.390 − 0.070	...
	d_2 min. = 12.320	...

Table 3.2-9
Example of External Metric Screw Threads, M13 x 0.9-4g6g (Cont'd)

Thread Size = M13 x 0.9-4g6g [Notes (1), (2)]		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(5) Maximum external minor diameter, d_1 max. (flat form) = Maximum external pitch diameter, d_2 max. − 0.4330127P	d_1 max. = d_2 max. − 0.4330127P	...
	d_2 max. = 12.390	See Characteristic Description (3).
	0.4330127P = 0.4330127(0.9)	...
	0.4330127P = 0.3897114	This figure is rounded to five decimal places, two decimal places beyond the three decimal place value of d_1 max.
	0.4330127P = 0.38971	...
	d_1 max. = 12.390 − 0.38971	...
	d_1 max. = 12.00029	This figure is rounded to three decimal places to obtain the final value of the major diameter tolerance for tolerance grade 6.
	d1 max. = 12.000 when rounded	...
(6) For reference: Minimum external minor diameter, d_3 min. (round form) = Minimum external pitch diameter, d_2 min. − 0.6160254P	d_3 min. = d_2 min. − 0.6160254P	...
	d_2 min. = 12.320	See Characteristic Description (4).
	0.6160254P = 0.6160254(0.9)	...
	0.6160254P = 0.5544229	This figure is rounded to five decimal places, two decimal places beyond the three decimal place final value of d_3 min.
	0.6160254P = 0.55442	...
	d_3 min. = 12.320 − 0.55442	...
	d_3 min. = 11.76558	This figure is rounded to three decimal places to obtain the final value of minimum minor diameter.
	d_3 min. = 11.766 when rounded	...

GENERAL NOTE: All dimensions are expressed in millimeters.

NOTES:
(1) For an example of how tabulated values for allowances and tolerances (in accordance with ISO 965-1) are used for the calculation of size limits (in ASME B1.13M tables) for standard diameter and pitch combinations listed in ISO 261, see Tables 3.2-7 and 3.2-8.
(2) Example of size limit calculations using formulas for diameter and pitch combinations not listed in ISO 261.

Table 3.2-10
Example of Internal Metric Screw Threads, M13 x 0.9-6H

Thread Size = M13 x 0.9-6H [Notes (1), (2)]		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(1) Minimum internal major diameter, D min. = Basic internal major diameter, D bsc + allowance, EI	D min. = D bsc + $\|EI\|$; $\|EI\|$ is absolute value	...
	D bsc = d bsc = 13.000	See Table 3.2-9, Characteristic Description (1).
	EI_H = 0	Tabulated value from ASME B1.13M for internal tolerance position H
	D min. = 13.000 + 0.000	...
	D min. = 13.000	...
(2) Minimum internal pitch diameter, D_2 min. = Basic internal major diameter, D min. − 0.6495191P + allowance, EI, or minimum internal major diameter, D min. − 0.6495191P	D_2 min. = D min. − 0.6495191P	...
	D min. = 13.000	See Characteristic Description (1).
	0.6495191P = 0.6495191(0.9)	...
	0.6495191P = 0.5845672	This figure is rounded to five decimal places, two places beyond the three decimal place final value of D_2 min.
	0.6495191P = 0.58457	...
	D_2 min. = 13.000 − 0.58457	...
	D_2 min. = 12.41543	This figure is rounded to three decimal places to obtain the final value of minimum pitch diameter
	D_2 min. = 12.415 when rounded	...
(3) Maximum internal pitch diameter, D_2 max. = Minimum internal pitch diameter, D_2 min. + internal pitch diameter tolerance, TD_2	D_2 max. = D_2 min. + TD_2	...
	D_2 min. = 12.415	See Characteristic Description (2).
	TD_2 (6) = 1.32Td_2 (6)	TD_2 (or Td_2) for tolerance grade 6 is not tabulated for P 0.9 so it must be calculated.
	TD_2 (6) = $1.32(0.09P^{0.4}d(13)^{0.1})$	...
	TD_2 (6) = $1.32[(0.09)(0.9)^{0.4}(13)^{0.1}]$	...
	TD_2 (6) = 1.32[(0.09)(0.95873)(1.29239)]	...
	TD_2 (6) = 0.14721	This figure is rounded to three decimal places to obtain the final value of pitch diameter tolerance for tolerance grade 6.
	TD_2 (6) = 0.147 when rounded	...
	D_2 max. = 12.415 + 0.147	...
	D_2 max. = 12.562	...

Table 3.2-10
Example of Internal Metric Screw Threads, M13 x 0.9-6H (Cont'd)

Thread Size = M13 x 0.9-6H [Notes (1), (2)]		
Characteristic Description	**Example of Size Calculation**	**Additional Information**
(4) Minimum internal minor diameter, D_1 min. = Minimum internal major diameter, D min. − 1.0825318P	D_1 min. = D min. − 1.0825318P	...
	D min. = 13.000	See Characteristic Description (1).
	1.0825318P = 1.0825318(0.9)	...
	1.0825318P = 0.9742786	This figure is rounded to five decimal places, two places beyond the three decimal place final value of D_1 min.
	1.0825318P = 0.97428	...
	D_1 min. = 13.000 − 0.97428	...
	D_1 min. = 12.02572	This figure is rounded to three decimal places to obtain the final value of minimum pitch diameter.
	D_1 min. = 12.026 when rounded	...
(5) Maximum internal minor diameter, D_1 max. = Minimum internal minor diameter, D_1 min. + internal minor diameter tolerance, TD_1	D_1 max. = D_1 min. + TD_1	...
	D_1 min. = 12.026	See Characteristic Description (4).
	TD_1 (6) = 0.218	P = 0.9 is not tabulated nor is there any ISO formula applicable to this pitch. Therefore, a tolerance midway between the tabulated values for P = 0.8 and P = 1.0 has been selected. This value is TD_1 (6) = 0.218.
	D_1 max. = 12.026 + 0.218 = 12.244	...
	D_1 max. = 12.244	...
(6) For reference, maximum internal major diameter, D max. = Maximum internal pitch diameter, D_2 max. + 0.7938566P	D max. = D_2 max. + 0.7938566P	...
	D_2 max. = 12.562	See Characteristic Description (3).
	0.7938566P = (0.7938566)(0.9)	...
	0.7938566P = 0.7144709	This figure is rounded to five decimal places which is two places beyond the three decimal place final value of D max.
	0.7938566P = 0.71447	...
	D max. = 12.562 + 0.71447	...
	D max. = 13.27647	This figure is rounded to three decimal place final value of maximum major diameter.
	D max. = 13.276 when rounded	

GENERAL NOTE: All dimensions are expressed in millimeters.

NOTES:
(1) For an example of how tabulated values for allowances and tolerances (in accordance with ISO 965-1) are used for the calculation of size limits (in ASME B1.13M tables) for standard diameter and pitch combinations listed in ISO 261, see Tables 3.2-7 and 3.2-8.
(2) Example of size limit calculations using formulas for diameter and pitch combinations not listed in ISO 261.