

FED-STD-H28/13

31 August 1978

Superseding
NBS Handbook H28 (1957)
Part III, Section XIII

FEDERAL STANDARD
SCREW-THREAD STANDARDS FOR FEDERAL SERVICES
SECTION 13
STUB ACME THREADS

This standard was approved by the Commissioner Federal Supply Service, General Services Administration, for the use of all Federal agencies.

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FED-STD-H28/13
31 August 1978

INFORMATION SHEET ON FEDERAL STANDARDS

This Federal Standard is issued in loose leaf form to permit the insertion or removal of new or revised pages and sections.

All Users of Federal Standards should keep them up to date by inserting revised or new pages as issued and removing superseded and cancelled pages.

New and revised pages will be issued with Change Notices which will be numbered consecutively and will bear the date of issuance. Change Notices should be retained and filed in front of the Standard until such time as they are superseded by a reissue of the entire Standard.

NOTICE

From 1939, the Interdepartmental Screw Thread Committee (ISTC), under the Chairmanship of the National Bureau of Standards (NBS), Department of Commerce had developed and published NBS Handbook H28, Screw-Thread Standards for Federal Services.

Section 487 of Title 40 of the U.S. Code states that the authority for development of Federal Standards for procurement purposes rests with the General Services Administration (GSA).

In November 1976, the ISTC was terminated, and the General Services Administration (GSA) accepted the responsibility for NBS Handbook H28 and agreed to convert it and maintain it as a Federal Standard.

The standards which had been published as NBS Handbook H28, Part I, Part II and Part III will now be promulgated as a fully coordinated FED-STD-H28, maintaining the existing sections and identifying them with slant lines. For example, NBS Handbook H28, Part I, Section 3 will be detailed standard FED-STD-H28/3 which must be procured individually.

Military Custodians

ARMY - AR
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AIR FORCE - 11

Preparing Activity

DLA-IS
(Project No. THDS-0016)

Civil Agency Coordinating Activity

ACO	FPI	MSF
AFS	FRA	NBS
BPA	FSS	PCD
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CONTENTS

	<u>Page</u>
1. GENERAL AND HISTORICAL	1
2. SPECIFICATIONS FOR STUB ACME FORM OF THREAD	1
3. STANDARD STUB ACME THREAD SERIES	2
4. CLASSIFICATION AND TOLERANCES, STANDARD STUB ACME THREADS	2
5. LIMITS OF SIZE, STANDARD STUB ACME THREADS	3
6. THREAD DESIGNATIONS	4
7. ALTERNATIVE STUB ACME THREADS	5
8. GAGES FOR STUB ACME THREADS	8
(a) GAGE TOLERANCES	8
(b) GAGES FOR EXTERNAL THREADS	9
(c) GAGES FOR INTERNAL THREADS	9
(d) CONCENTRICITY	10
(e) GAGE DIMENSIONS	10

The text of this section is reprinted from the NBS HANDBOOK H28 with minor editorial corrections. Pages 6, 10 contain corrections indicated by an asterisk.

Reorganization of the document from NBS HANDBOOK H28 to FED-STD-H28 creates an editorial inconvenience, when maintaining continuity of cross references amongst the pages, paragraphs, tables and figures of the different sections. For this standard individual sections will be numbered sequentially starting with (1) one. If the reprinted text refers to another page, such as Page 6.3, this will be understood to mean section 6 page 3. All figures and tables will maintain the established designations, prefixed with the section; e.g. Table 3.1 and Figure 2.5 to identify their location in this standard. All appendices will be incorporated in the basic document FED-STD-H28 with other general information and will continue to be identified with the prefix A.

1. GENERAL AND HISTORICAL

When formulated prior to 1895, regular Acme threads were intended to replace square threads and a variety of threads of other forms used chiefly for the purpose of producing traversing motions on machines, tools, etc. Acme threads are now extensively used for a variety of purposes.

FED-STD-H28/12, provides information and data pertaining to the use of the regular standard Acme thread form. The Stub Acme thread came into being early in the 1900's. Its use has been generally confined to those unusual applications where a coarse-pitch thread of shallow depth is required due to mechanical or metallurgical considerations.

While threads for valve operation may be made to this standard, this application is highly specialized and these data should not be used without consultation with the valve manufacturer.

2. SPECIFICATIONS FOR THE STUB ACME FORM OF THREAD

1. ANGLE OF THREAD.—The angle between the flanks of the thread measured in an axial plane shall be 29° . The line bisecting this 29° angle shall be perpendicular to the axis of the thread.

2. PITCH OF THREAD.—The pitch of a thread is the distance, measured parallel to its axis, between corresponding points on adjacent thread forms.

3. HEIGHT OF THREAD.—The basic height of Stub Acme threads shall be as follows:

Standard Stub Acme	$0.3p$,
Modified Form 1 Stub Acme	$0.375p$,
Modified Form 2 Stub Acme	$0.25p$.

4. THICKNESS OF THREAD.—The basic thickness of the thread at a diameter smaller by the basic height of thread (for which see previous paragraph) than the basic major diameter, shall be $0.5p$.

5. ALLOWANCE (MINIMUM CLEARANCE) AT MAJOR AND MINOR DIAMETERS. A minimum diametrical clearance is provided at the minor diameter of all Stub Acme thread assemblies by

FED-STD-H28/13
31 August 1978

establishing the maximum minor diameter of external threads 0.020 in. below the basic minor diameter on 10 tpi and coarser, and 0.010 in. below the basic minor diameter for finer pitches.

A minimum diametrical clearance at the major diameter is obtained by establishing the minimum major diameter of the internal thread 0.020 in. above the basic major diameter for 10 tpi and coarser, and 0.010 in. above the basic major diameter for finer pitches.

6. BASIC THREAD FORM DIMENSIONS.—The basic dimensions of the standard Stub Acme thread form for the most generally used pitches are given in table 13.1. The basic thread form is symmetrical and is illustrated in figure 13.1.

TABLE 13.1—Standard Stub Acme thread form, basic dimensions

Threads per inch, n	Pitch, p	Height of thread (basic), $A=0.3p$	Total height of thread, $A_1=A+allowance^*$	Thread thickness (basic), $T=p/2$	Width of flat at:	
					Crest of internal thread (basic), $F_{11}=0.4221p$	Root of internal thread, $F_{12}=0.259xallowance^*$
1	2	3	4	5	6	7
16	0.06250	0.01875	0.0238	0.03125	0.0254	0.0238
14	0.07143	0.2143	0.254	0.3571	0.302	0.278
12	0.08333	0.2500	0.300	0.4167	0.352	0.326
10	0.10000	0.3000	0.4000	0.5000	0.422	0.370
9	0.11111	0.33333	0.4333	0.5555	0.469	0.417
8	0.12500	0.3750	0.475	0.6250	0.528	0.476
7	0.14286	0.4286	0.529	0.7143	0.603	0.551
6	0.16667	0.5000	0.600	0.8333	0.704	0.652
5	0.20000	0.6000	0.700	1.0000	0.843	0.792
4	0.25000	0.7500	0.850	1.2500	1.056	1.004
3 1/2	0.28571	0.8571	0.957	1.4286	1.207	1.155
3	0.33333	1.0000	1.100	1.6667	1.408	1.356
2 1/2	0.40000	1.2000	1.300	2.0000	1.690	1.638
2	0.50000	1.5000	1.600	2.5000	2.112	2.060
1 1/2	0.66667	2.0000	2.100	3.3333	2.816	2.764
1 1/4	0.70000	2.1000	2.200	3.5000	3.008	2.956
1	1.00000	3.0000	3.100	5.0000	4.221	4.172

* Allowance is shown in table 13.3 col. 1.

(a) *Special requirements, deviations from nominal diameter.*—Applications requiring special machining processes resulting in a basic diameter less than the nominal shown in table 13.2, column 1, shall have allowances and tolerances in accordance with footnote b, table 13.3; table 13.4; and tabulated tolerances, table 13.5.

(b) *Special diameters.*—Special diameters not shown in table 13.2 and not divisible by 1/16 shall show the actual basic major diameter in decimals on drawings, specifications, and tools.

3. STANDARD STUB ACME THREAD SERIES

There has been selected a series of diameters and associated pitches of standard Stub Acme threads listed in table 13.2, which is recom-

mended as preferred. These diameters and pitches have been carefully selected to meet the present needs with the fewest number of items, in order to reduce to a minimum the inventory of both tools and gages.

4. CLASSIFICATION AND TOLERANCES, STANDARD STUB ACME THREADS

There is established herein only one class of thread for general usage. This class corresponds to the class 2G (General Purpose) FED-STD-H28/12. If a fit having less backlash is required, the threads shown in tables 12.3, 12.4, 12.5, 12.6 and 12.8 may be used to determine the limits of size for mating threads.

1. **BASIC DIAMETERS.**—The maximum major diameter of the external thread is the basic (nominal) major diameter. The minimum pitch diameter of the internal thread is basic and equal to the basic major diameter minus the basic height of thread. The basic minor diameter is the minimum minor diameter of the internal thread and is equal to the basic major diameter minus twice the basic thread height.

2. **LENGTH OF ENGAGEMENT.**—The tolerances specified herein are applicable to lengths of engagement not exceeding twice the nominal major diameter.

3. **TOLERANCES.**—The tolerances specified are such as to assure interchangeability and maintain a high grade of product.

The tolerances on diameters of internal threads shall be applied plus from the minimum sizes to above the minimum sizes.

The tolerances on diameters of external threads shall be applied minus from the maximum sizes to below the maximum sizes.

The pitch-diameter (or thread-thickness) tolerances for an external or an internal thread are the same as those given in table 12.6, FED-STD-H28/12.

The pitch-diameter (or thread-thickness) tolerances for the product include lead and angle deviations.

The tolerances on the major and minor diameters of external and internal threads for use with special threads are listed in table 13.3 and are based on the following formulas:

Major diameter tolerance		Minor diameter tolerance	
External thread	Internal thread	External thread	Internal thread
0.03 p. (Min = 0.005 in.) ^a	1.0xpitch diameter tolerance. ^b	1.0xpitch diameter tolerance. ^b	0.05 p. (Min = 0.005 in.) ^a

^a To avoid a complicated formula and still provide an adequate tolerance, the pitch factor is used as a base, with the minimum tolerance value set at 0.005 in.

^b For use only where the major diameter of the internal thread and the minor diameter of the external thread must be controlled, such as on thin-walled components. Pitch-diameter tolerances for various practicable combinations of diameter and pitch are given in table 12.6, FED-STD-H28/12.

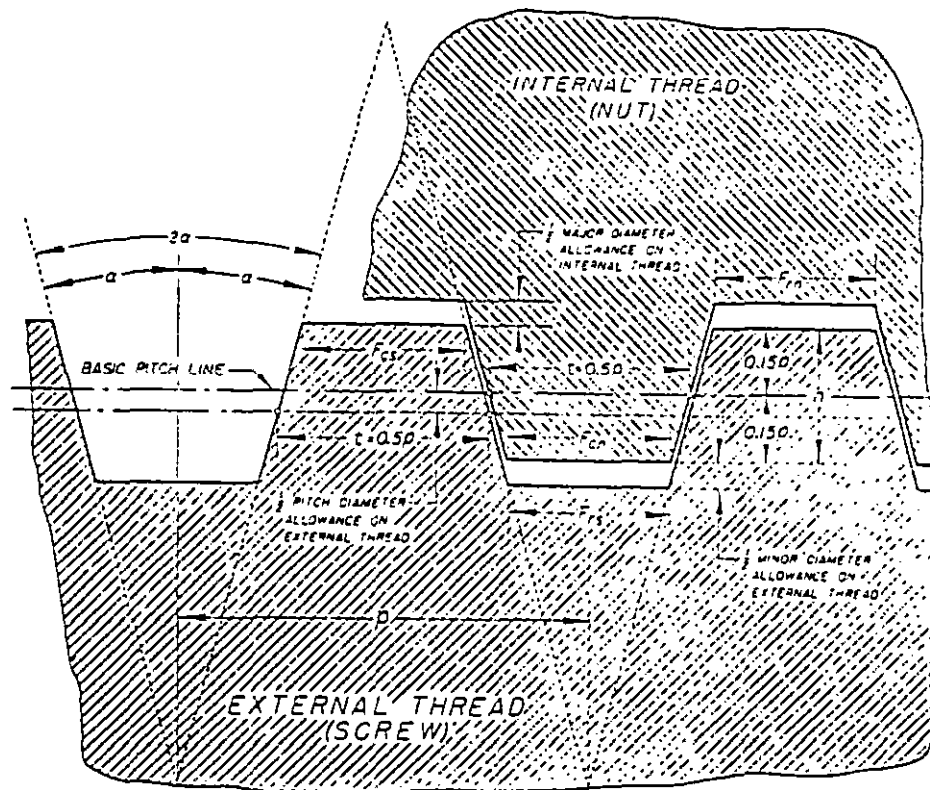


FIGURE 13.1 —Standard Stub Acme form of thread.

NOTATION

$2a = 29^\circ$
$a = 14^\circ 30'$
$p = \text{pitch}$
$n = \text{number of threads per inch}$
$N = \text{number of turns per inch}$
$A = 0.3p = \text{basic height of thread}$
$F_1 = 0.4224p = \text{basic width of flat of crest of internal thread}$
$F_2 = 0.4224p = \text{basic width of flat of crest of external thread}$
$F_3 = 0.4224p - 0.259 \times (\text{major diameter allowance on internal thread})$
$F_4 = 0.4224p - 0.259 \times (\text{minor diameter allowance on external thread})$

4. ALLOWANCES (MINIMUM CLEARANCES).—Allowances applied to the pitch diameter of the external thread are based on the major diameter and are given in table 13.4.

When the product has a length of engagement greater than the standard length of thread ring gage as shown in table 12.14, col. 3, and lead deviations not exceeding values shown in the footnote to that table, and when "go" thread ring gages of these lengths are to be used, the maximum pitch diameter of the external thread shall be decreased by the amount shown in table 12.14, col. 5. If the lead deviations in the product are greater than indicated, the allowance for the ring gage stated in col. 5 should be increased proportionately. However, if methods of gaging the external thread are to be used that will detect

angle deviation and cumulative lead deviation, the pitch diameter of the thread shall be below the tabular maximum pitch diameter by an amount sufficient to compensate for the measured deviations.

An increase of 10 percent in the allowance is recommended for each inch, or fraction thereof, that the length of engagement exceeds two diameters.

5. LIMITS OF SIZE, STANDARD STUB ACME THREADS

Limits of size for Stub Acme threads of the preferred series of diameters and pitches are given in table 13.5. The application of these limits

FED-STD-H28/13
31 August 1978

is illustrated in figure 13.2 . The values in table 13.5 are based on the following formulas:

External Threads (Screws)

- (Basic) Max major diam=Nominal size or diameter, *D*.
- Min major diam=Ext max major diam minus tolerance from table 13.3, col 6.
- Max pitch diam=Int min pitch diam minus allowance from table 13.4, col 3.
- Min pitch diam=Ext max pitch diam minus tolerance from table 13.6, p.
- Max minor diam=Int min minor diam minus allowance from table 13.3, col 4.
- Min minor diam=Ext max minor diam minus tolerance from table 13.3, col 7.

Internal Threads (Nuts)

- Min major diam=Ext max major diam plus allowance from table 13.3, col 3.
- Max major diam=Int min major diam plus tolerance from table 13.3, col 7.
- (Basic) Min pitch diam=Ext max major diam minus basic height of thread from table 13.2, col 8.

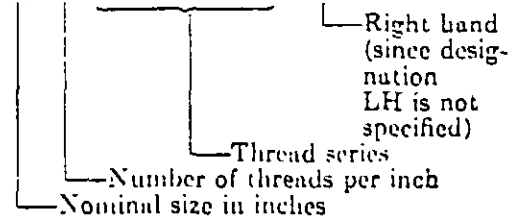
- Max pitch diam=Int min pitch diam plus tolerance from table 12.6, p. 7.
- (Basic) Min minor diam=Ext max major diam minus 2 times basic height of thread from table 13.2, col 8.
- Max minor diam=Int min minor diam plus tolerance from table 13.3, col 5.

6. THREAD DESIGNATIONS

Standard Stub Acme threads shall be designated as shown below on drawings and in specifications, and on tools and gages:

Right-hand thread:

1/2-20 STUB ACME



Left-hand thread:

1/2-20 STUB ACME-LH

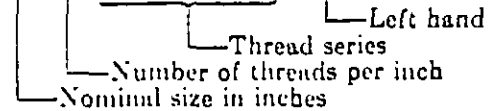


TABLE 13.2 —Standard Stub Acme thread series, basic diameters and thread data

Nominal sizes	Threads per inch, <i>n</i>	Basic diameters			Thread data				
		Major diameter, <i>D</i>	Pitch diameter, <i>E</i> = <i>D</i> - <i>A</i>	Minor diameter, <i>K</i> = <i>D</i> - 2 <i>A</i>	Pitch, <i>p</i>	Thread thickness at pitch line, <i>t</i> = <i>p</i> /2	Basic height of thread, <i>A</i> = 0.3 <i>p</i>	Basic width of flat, <i>F</i> = 0.4224 <i>p</i>	Lead angle at basic pitch diameter, <i>λ</i>
1	2	3	4	5	6	7	8	9	10
in.		in.	in.	in.	in.	in.	in.	in.	deg min
3/16	16	0.2500	0.2312	0.2125	0.06250	0.03125	0.01875	0.0254	4 34
1/8	14	.3125	.2911	.2690	.07143	.03572	.02143	.0302	4 28
3/8	12	.3750	.3500	.3250	.06250	.03125	.02290	.0332	4 20
1/2	12	.4375	.4125	.3875	.06250	.03125	.02500	.0372	3 41
5/8	10	.5000	.4700	.4400	.10000	.05000	.03000	.0432	3 32
3/4	8	.6250	.5875	.5500	.12500	.06250	.03750	.0528	3 32
7/8	6	.7500	.7000	.6500	.16667	.08333	.05000	.0704	4 20
1	6	.8750	.8250	.7750	.16667	.08333	.05000	.0704	3 41
1 1/8	5	1.0000	.9400	.8800	.20000	.10000	.06000	.0845	3 32
1 1/4	5	1.1250	1.0650	1.0050	.20000	.10000	.06000	.0845	3 25
1 3/8	5	1.2500	1.1800	1.1100	.20000	.10000	.06000	.0845	3 4
1 1/2	4	1.3750	1.3000	1.2250	.25000	.12500	.07500	.1056	3 30
1 3/4	4	1.5000	1.4250	1.3500	.25000	.12500	.07500	.1056	3 12
1 7/8	4	1.6250	1.6750	1.7000	.25000	.12500	.07500	.1056	2 43
2	4	2.0000	1.9700	1.9400	.25000	.12500	.07500	.1056	2 22
2 1/4	3	2.2500	2.1900	2.0700	.33333	.16667	.10000	.1408	2 50
2 3/4	3	2.5000	2.4000	2.3000	.33333	.16667	.10000	.1408	2 32
3	3	2.7500	2.6500	2.5500	.33333	.16667	.10000	.1408	2 18
3 1/2	2	3.0000	2.9000	2.7000	.50000	.25000	.15000	.2112	3 12
3 3/4	2	3.2500	3.1400	3.0300	.50000	.25000	.15000	.2112	2 43
4	2	3.5000	3.3400	3.1800	.50000	.25000	.15000	.2112	2 22
4 1/4	2	4.0000	3.8000	3.6000	.50000	.25000	.15000	.2112	2 6
4 3/4	2	4.5000	4.2500	4.0000	.50000	.25000	.15000	.2112	1 53

FED-STD-H28/15
31 August 1978

7. ALTERNATIVE STUB ACME THREADS

Recognizing the fact that the standard Stub Acme thread form may not provide a generally acceptable thread system to meet the requirements of all applications, basic data for two of the other commonly used forms are tabulated in tables 13.6 and 13.7. These threads are identified as Modified Form 1 Stub Acme Thread (shown on fig. 13.3) and Modified Form 2 Stub Acme Thread (shown on fig. 13.4). Wherever practicable, however, the standard Stub Acme Thread form should be used.

In applying the foregoing data to special designs, the allowances and tolerances can be taken directly from tables 13.3, 13.4 and 12.6, p. 7 for standard Stub Acme threads. Therefore the major diameter and basic thread thickness at pitch line for both external and internal threads will be the same as for the standard form as shown

in tables 13.2 and 13.5. The pitch diameter and minor diameter will vary from the data shown in tables 13.2 and 13.5; for modified form 1, the pitch and minor diameters will be smaller than similar values for the standard form, and for modified form 2 the pitch and minor diameters will be larger than those dimensions for the standard forms.

These threads shall be designated as shown below on drawings and in specifications, and on tools and gages:

Right-hand thread:

$\frac{1}{2}$ -20 STUB ACME M1 — Modified Form 1
 $\frac{1}{2}$ -20 STUB ACME M2 — Modified Form 2

Left-hand thread:

$\frac{1}{2}$ -20 STUB ACME M1—LH
 $\frac{1}{2}$ -20 STUB ACME M2—LH

TABLE 13.3 — Tolerances and allowances for major and minor diameters, Stub Acme threads *

Size ^b	Threads per inch, n	Allowances from basic major and minor diameters		Tolerance on minor diameter, all internal threads, plus 0.05p	Tolerance on major diameter, all external threads, minus 0.05p	Tolerance on major diameter, plus on all internal threads; also tolerance on minor diameter, minus on all external threads, = 1.0X P, D, tol.
		Major diam. all internal threads plus	Minor diam. all external threads minus			
1	2	3	4	5	6	7
in.		in.	in.	in.	in.	in.
1/4	16	0.010	0.010	0.0050	0.0050	0.0105
3/16	14	0.010	0.010	0.0050	0.0050	0.0114
1/8	12	0.010	0.010	0.0050	0.0050	0.0123
3/16	12	0.010	0.010	0.0050	0.0050	0.0129
1/4	10	0.020	0.020	0.0050	0.0050	0.0137
5/16	8	0.020	0.020	0.0062	0.0062	0.0154
3/8	6	0.020	0.020	0.0063	0.0063	0.0174
1/2	6	0.020	0.020	0.0063	0.0063	0.0179
3/4	5	0.020	0.020	0.0100	0.0100	0.0194
1 1/4	5	0.020	0.020	0.0100	0.0100	0.0198
1 1/2	5	0.020	0.020	0.0100	0.0100	0.0201
1 3/4	4	0.020	0.020	0.0125	0.0125	0.0220
1 3/4	4	0.020	0.020	0.0125	0.0125	0.0223
1 3/4	4	0.020	0.020	0.0125	0.0125	0.0229
2	4	0.020	0.020	0.0125	0.0125	0.0235
2 1/4	3	0.020	0.020	0.0167	0.0167	0.0263
2 1/4	3	0.020	0.020	0.0167	0.0167	0.0266
2 3/4	3	0.020	0.020	0.0167	0.0167	0.0273
3	2	0.020	0.020	0.0250	0.0250	0.0316
3 1/2	2	0.020	0.020	0.0250	0.0250	0.0324
4	2	0.020	0.020	0.0250	0.0250	0.0332
4 1/2	2	0.020	0.020	0.0250	0.0250	0.0339
5	2	0.020	0.020	0.0250	0.0250	0.0346

* Pitch-diameter tolerances for various practicable combinations of diameter and pitch are given in table 12.6, p. 7.
^b For an intermediate size, the tolerances and deviations for the next larger size given in this table shall apply.
^c The minimum clearance at the major diameter between the internal and external threads is equal to column 3.
^d The minimum clearance at the minor diameter between the internal and external threads is equal to column 4.
^e To avoid a complicated formula and still provide an adequate tolerance, the pitch factor is used as a base, with the minimum tolerance value set at 0.005 in.
^f For use only where the major diameter of the internal thread and the minor diameter of the external thread must be controlled, such as on thin-walled components.

TABLE 13.4 — Pitch diameter allowances for Stub Acme threads

Nominal size range *		Pitch diameter ^b allowances on external threads, 0.008 √D
Above	To and including	
1	2	3
in.	in.	in.
0	1/16	0.0024
1/16	1/8	0.0040
1/8	3/16	0.0049
3/16	1/4	0.0057
1/4	5/16	0.0063
5/16	3/8	0.0069
3/8	1/2	0.0075
1/2	5/8	0.0080
5/8	3/4	0.0085
3/4	7/8	0.0089
7/8	1	0.0094
1	1 1/8	0.0098
1 1/8	1 1/4	0.0103
1 1/4	1 3/8	0.0108
1 3/8	1 1/2	0.0113
1 1/2	1 5/8	0.0120
1 5/8	1 3/4	0.0125
1 3/4	1 7/8	0.0133
1 7/8	2	0.0140
2	2 1/8	0.0150
2 1/8	2 1/4	0.0160
2 1/4	2 3/8	0.0170
2 3/8	2 1/2	0.0181

* The values in column 3 are to be used for any nominal size within the range shown in cols 1 and 2. These values are calculated from the mean of the range.
^b It is recommended that the nominal sizes given in table 13.2 be used whenever possible.
^c An increase of 10 percent in the allowance is recommended for each inch, or fraction thereof, that the length of engagement exceeds two diameters.

FED-STD-H28/13
31 August 1978

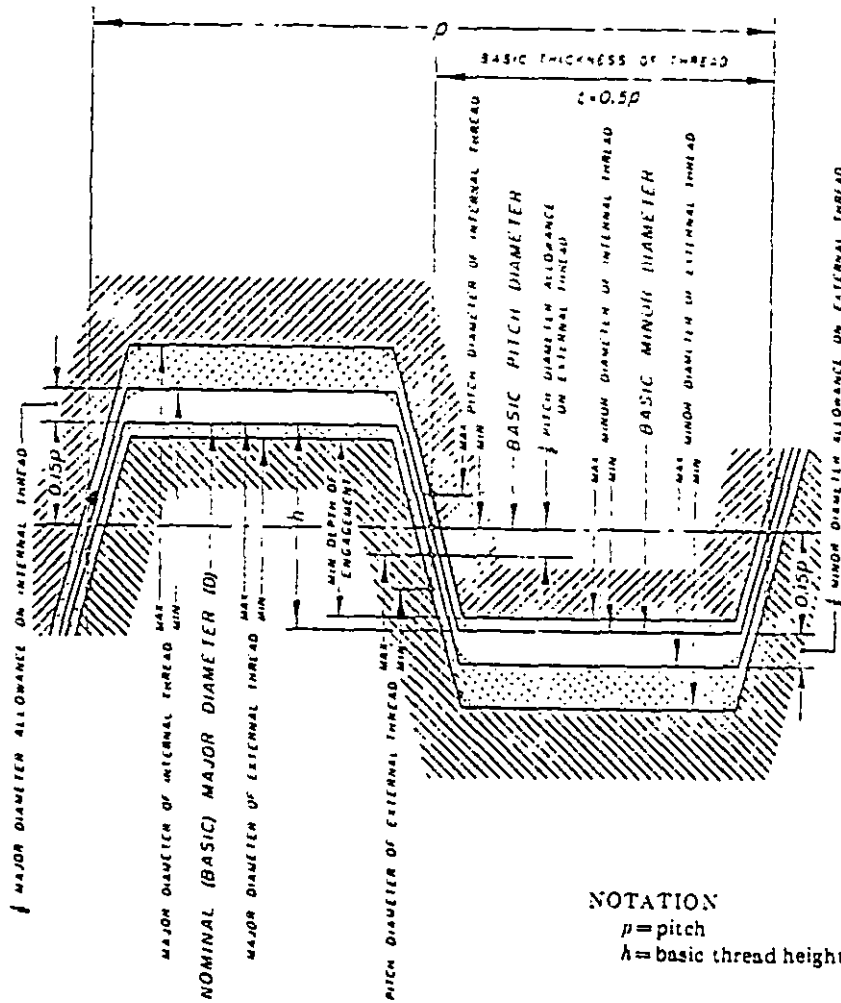
TABLE 13.5 — Limits of size and tolerances, Standard Stub Acme thread series

Size limits and tolerances	Nominal diameter, <i>D</i> , inches															
	Threads per inch *															
	16	14	12	12	10	8	6	6	5	5	4	4	4	3	3	3
EXTERNAL THREADS	Major diam															
	Pitch diam															
	Minor diam															
INTERNAL THREADS	Major diam															
	Pitch diam															
	Minor diam															

* The selection of threads per inch is arbitrary and is intended for the purpose of establishing a standard.

FED-STD-H28/13
31 August 1978

INTERNAL THREAD (NUT)



EXTERNAL THREAD (SCREW)

FIGURE 13.2 — Illustration of allowances, tolerances, and crest clearances for Stub Acme threads.

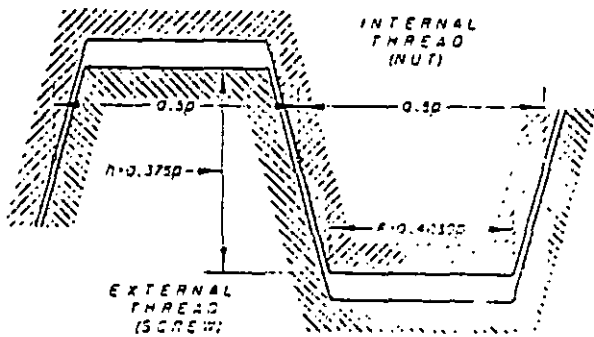


FIGURE 13.3 — Modified Form 1 Stub Acme thread with basic height of 0.375 pitch.

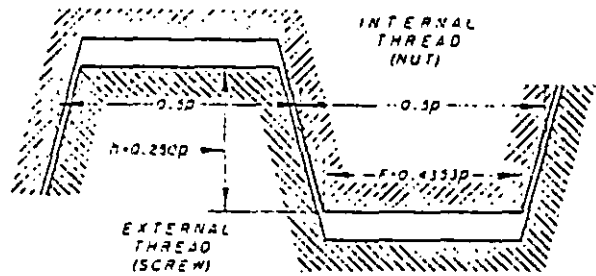


FIGURE 13.4 — Modified Form 2 Stub Acme thread with basic height of 0.25 pitch.

FED-STD-H28/13
31 August 1978

TABLE 13.6 — Modified Form 1 Stub Acme thread form, basic dimensions

Threads per inch, <i>n</i>	Pitch, <i>p</i>	Height of thread (basic), $h = 0.375p$	Total height of thread, $H_s = h + \frac{1}{2}$ allowance*	Thread thickness (basic), $t = p/2$	Width of flat at crest of internal thread (basic), $F_s = 0.4030p$
1	2	3	4	5	6
18.....	0.06250	0.02344	0.0254	0.03125	0.0252
14.....	0.07143	0.2679	0.318	0.03572	0.0258
12.....	0.08333	0.0125	0.0243	0.04167	0.0324
10.....	0.10000	0.3720	0.473	0.05000	0.0403
9.....	0.11111	0.4167	0.517	0.0556	0.0448
8.....	0.12500	0.4689	0.560	0.06250	0.0504
7.....	0.14286	0.5347	0.638	0.07143	0.0578
6.....	0.16667	0.6250	0.723	0.08333	0.0672
5.....	0.20000	0.7500	0.900	0.10000	0.0806
4.....	0.25000	0.9375	1.038	0.12500	0.1008
3½.....	0.28571	1.0714	1.171	0.14286	0.1151
3.....	0.33333	1.12500	1.350	0.16667	0.1343
2½.....	0.40000	1.5000	1.600	0.20000	0.1812
2.....	0.50000	1.8750	1.975	0.25000	0.2015
1½.....	0.66667	2.5000	2.441	0.33333	0.2687
1¼.....	0.75000	2.8125	2.910	0.37500	0.3023
1.....	1.00000	3.7500	3.850	0.50000	0.4030

* Allowance is shown in table 13.3, column 4.

TABLE 13.7 — Modified Form 2 Stub Acme thread form, basic dimensions

Threads per inch, <i>n</i>	Pitch, <i>p</i>	Height of thread (basic), $h = 0.250p$	Total height of thread, $H_s = h + \frac{1}{2}$ allowance*	Thread thickness (basic), $t = p/2$	Width of flat at crest of internal thread (basic), $F_s = 0.4330p$
1	2	3	4	5	6
18.....	0.06250	0.01563	0.0206	0.03125	0.0272
14.....	0.07143	0.01796	0.0229	0.03471	0.0311
12.....	0.08333	0.02063	0.0258	0.04167	0.0363
10.....	0.10000	0.02500	0.0320	0.05000	0.0435
9.....	0.11111	0.02778	0.0378	0.0556	0.0484
8.....	0.12500	0.03125	0.0413	0.06250	0.0544
7.....	0.14286	0.03571	0.0457	0.07143	0.0622
6.....	0.16667	0.04167	0.0517	0.08333	0.0720
5.....	0.20000	0.05000	0.0600	0.10000	0.0871
4.....	0.25000	0.06250	0.0725	0.12500	0.1088
3½.....	0.28571	0.07143	0.0814	0.14286	0.1244
3.....	0.33333	0.08333	0.0933	0.16667	0.1451
2½.....	0.40000	0.10000	0.1100	0.20000	0.1741
2.....	0.50000	0.12500	0.1350	0.25000	0.2177
1½.....	0.66667	0.16667	0.1767	0.33333	0.2902
1¼.....	0.75000	0.18750	0.1975	0.37500	0.3265
1.....	1.00000	0.25000	0.2500	0.50000	0.4330

* Allowance is shown in table 13.3, column 4.

8. GAGES FOR STUB ACME THREADS

Gages representing both product limits, or adequate gaging instruments for thread elements, are necessary for the proper inspection of Stub Acme threads. The dimensions of "go" and "not go" gages should be in accordance with the principles:

(a) that the maximum-metal limit, or "go," gage should check simultaneously as many elements as possible, and that a minimum-metal limit or "not go" thread gage can effectively check but one element; and (b) that permissible variations in the gages be kept within the extreme product limits.

(a) GAGE TOLERANCES

Tolerances for the thread elements of "go" and "not go" thread gages for Stub Acme threads are as specified below.

1. TOLERANCES ON PITCH DIAMETER.—The pitch diameter tolerances for gages for external and internal threads are given in table 13.8, col. 2.

2. TOLERANCES ON MAJOR AND MINOR DIAMETERS.—The major and minor diameter tolerances for Stub Acme thread gages are given in table 13.8, col. 3.

3. TOLERANCES ON LEAD.—The variation in lead of all Stub Acme thread gages shall not exceed 0.0003 in. between any 2 threads not farther apart than 1 in. However, the cumulative deviation in lead shall not exceed 0.0004 in. for gages with a length over 1 to 3 in., inclusive; or 0.0005 in., for gages with a length over 3 to 5 in., inclusive; or 0.0007 in., for gages with a length over 5 to 10 in., inclusive. For multiple threads the cumulative tolerance for any length of gage shall be obtained by multiplying by 1.5 the above tolerance applicable to that length.

TABLE 13.8 — Tolerances for "go" and "not go" thread gages, Stub Acme threads

Threads per inch	Tolerances on pitch diameter*	Tolerances on major and minor diameters	Tolerance on half angle of thread
1	2	3	4
18.....	in. 0.0006	in. 0.001	minutes 10
14.....	0.0006	0.001	10
12.....	0.0006	0.001	10
10.....	0.0007	0.001	10
9.....	0.0008	0.002	10
8.....	0.0008	0.002	8
7.....	0.0009	0.002	8
6.....	0.0009	0.002	8
5.....	0.0010	0.002	8
4.....	0.0011	0.002	8
3½.....	0.0013	0.002	8
3.....	0.0013	0.002	6
2½.....	0.0014	0.002	6
2.....	0.0015	0.002	6
1½.....	0.0018	0.002	5
1¼.....	0.0018	0.002	5
1.....	0.0021	0.002	5

* Intermediate pitches take the tolerances of the next coarser pitch listed in this table.
* These pitch diameter tolerances for thread gages are not cumulative, that is, they do not include tolerances on lead and on half angle.

FED-STD-H28/13
31 August 1978

TABLE 13.9—Tolerances for plain gages, Stub Acme threads

Size range		Tolerances for plain plug gages	Tolerances for plain ring and snap gages
Above	To and including		
1	2	3	4
<i>in.</i> 0.504	<i>in.</i> 0.525	<i>in.</i> 0.0010	<i>in.</i> 0.0020
.525	1.310	.0012	.0024
1.310	2.310	.0016	.0032
2.310	4.310	.0020	.0040
4.310	5.000	.0025	.0050

4. TOLERANCES ON ANGLE OF THREADS.—The tolerances on angle of thread, as specified in table 13.8, col. 4 for the various pitches, are tolerances on one-half the included angle. This insures that the bisector of the included angle will be perpendicular to the axis of the thread within proper limits. The equivalent deviation from the true thread form caused by such irregularities as convex or concave sides of the thread, or slight projections on the thread form, should not exceed the tolerances permitted on angle of thread.

(b) GAGES FOR EXTERNAL THREADS

1. "GO" THREAD RING OR THREAD SNAP GAGE.—(a) *Major diameter*.—The major diameter of the "go" thread ring or snap gage shall clear a diameter greater by 0.01 in. than the maximum major diameter of the external thread.

(b) *Pitch diameter*.—The pitch diameter shall fit the maximum-metal limit thread setting plug gage.

(c) *Minor diameter*.—The minor diameter shall be the same as the maximum minor diameter of the external thread plus 0.005 in. for pitches finer than 10 tpi and plus 0.010 in. for 10 tpi and coarser. The tolerance shall be applied minus.

(d) *Length*.—The length shall approximate the length of engagement but shall not exceed the length specified in table 12.14, col. 3, p. 17.

2. MAXIMUM-METAL LIMIT THREAD SETTING PLUG FOR "GO" THREAD RING OR SNAP GAGES.—

(a) *Major diameter*.—The major diameter of the maximum-metal limit thread setting plug shall be the same as the maximum major diameter of the external thread. The gage tolerance shall be applied plus.

(b) *Pitch diameter*.—The pitch diameter shall be the same as the maximum pitch diameter of the external thread, except when modified in accordance with table 12.14, p. 17.

(c) *Minor diameter*.—The minor diameter shall be cleared below the minimum minor diameter of the "go" thread ring or snap gage.

(d) *Length*.—The length shall approximate the length of the "go" thread ring or snap gage.

3. "GO" PLAIN RING OR SNAP GAGE FOR MAJOR DIAMETER.—The diameter of the "go" plain ring gage, or the gaging dimension of the "go" plain snap gage, shall be the same as the maximum major diameter of the external thread. Tolerances are shown in table 13.9, col. 4, and shall be applied minus.

4. "NOT GO" THREAD RING OR THREAD SNAP GAGE.—(a) *Major diameter*.—The major diameter of the "not go" thread ring or thread snap gage shall clear a diameter greater by 0.010 in. than the maximum major diameter of the external thread.

(b) *Pitch diameter*.—The pitch diameter shall fit the minimum-metal limit thread setting plug gage.

(c) *Minor diameter*.—The minor diameter shall be the basic minor diameter of the internal thread plus 0.15*p*, with the tolerance applied plus.

When this value is greater than the pitch diameter of the gage, the value for pitch diameter shall be used as the minor diameter of the gage.

(d) *Length*.—The length shall approximate three pitches except that, for multiple threads, the length shall provide at least one full turn of thread.

5. MINIMUM-METAL THREAD SETTING PLUG FOR "NOT GO" THREAD RING OR SNAP GAGE.—

(a) *Major diameter*.—The major diameter of the minimum-metal limit thread setting plug shall be the same as the maximum major diameter of the external thread. The gage tolerance shall be applied plus.

(b) *Pitch diameter*.—The pitch diameter shall be the same as the minimum pitch diameter of the external thread, with the tolerance applied plus.

(c) *Minor diameter*.—The minor diameter shall be cleared below the minimum minor diameter of the "not go" thread gage.

(d) *Length*.—The length shall be at least equal to the length of the "not go" thread ring or snap gage.

6. "NOT GO" PLAIN SNAP GAGE FOR MAJOR DIAMETER.—The gaging dimension of the "not go" plain snap gage shall be the same as the minimum major diameter of the external thread. Tolerances are shown in table 13.9, col. 4, and shall be applied plus.

(c) GAGES FOR INTERNAL THREADS

1. "GO" THREAD PLUG GAGE.—(a) *Major diameter*.—The major diameter of the "go" thread plug gage shall be equal to the minimum major diameter of the internal thread minus 0.005 in. for pitches finer than 10 tpi, and minus 0.010 in. for 10 tpi and coarser. The tolerance (table 13.8, col. 3) shall be applied plus.

FED-STD-H28/13
31 August 1978

(b) *Pitch diameter*.—The pitch diameter shall be equal to the minimum (basic) pitch diameter of the internal thread, with the tolerance (table 13.8, col. 2) applied plus.

(c) *Minor diameter*.—The minor diameter shall clear a diameter smaller by 0.010 in. than the minimum minor diameter of the internal thread.

(d) *Length*.—The length shall approximate the length of engagement (see footnote to table 12.14 p. 17) but shall not exceed twice the nominal major diameter, unless otherwise specified.

2. "NOT GO" THREAD PLUG GAGE FOR PITCH DIAMETER OF INTERNAL THREAD.—(a) *Major diameter*.—The major diameter of the "not go" thread plug gage shall be equal to the maximum (basic) major diameter of the external thread minus 0.15 ϕ with the tolerance (table 13.8, col. 3) applied minus.

When this value is less than the pitch diameter of the gage, the value for pitch diameter shall be used as the major diameter of the gage.

(b) *Pitch diameter*.—The pitch diameter shall be the same as the maximum pitch diameter of the internal thread, with the tolerance (table 13.8, col. 2) applied minus.

(c) *Minor diameter*.—The minor diameter shall clear a diameter less by 0.01 in. than the minimum minor diameter of the internal thread.

(d) *Length*.—The length shall approximate three pitches, except that for multiple threads the length shall provide at least one full turn of thread.

3. "GO" PLAIN PLUG GAGE FOR MINOR DIAMETER OF INTERNAL THREAD.—The diameter of the "go" plain plug gage shall be the same as the minimum minor diameter of the internal thread. The gage tolerance shall be applied plus. (See table 13.9, col. 3.) The gage length shall be in accordance with the latest revision of ANSI-B47.1, Gage Blanks.

4. "NOT GO" PLAIN PLUG GAGE FOR MINOR DIAMETER OF INTERNAL THREAD.—The diameter of the "not go" plain plug gage shall be the same as the maximum minor diameter of the internal thread. The gage tolerance shall be applied minus. (See table 13.9, col. 3.) The gage length shall be in accordance with the latest revision of ANSI-B47.1, Gage Blanks.

(d) CONCENTRICITY

When a special check of the concentricity between the major, pitch, and minor diameters of an external or internal thread is required, the method of checking this concentricity must be devised for each individual application.

(e) GAGE DIMENSIONS

It is recommended that wherever possible the general dimensions of the gages be in accordance with the latest revision of ANSI-B47.1, Gage Blanks.

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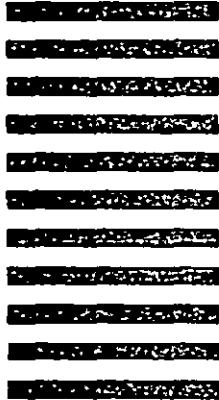
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