FED-STD-H28/19A
18 February 1988
SUPERSEDING
FED-STD-H28/19
31 August 1978

FEDERAL STANDARD

SCREW-THREAD STANDARDS FOR FEDERAL SERVICES

SECTION 19

MISCELLANEOUS THREADS

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

AMSC N/A

THDS

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All users of Federal Standards should keep them up to date by inserting revised or new pages as issued and removing superseded and cancelled pages.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 under 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 Change Notices should be retained and filed in front of the standard until such times as they are superseded by a reissue of the entire standard.

FOREWORD

This section was developed in order to provide data on miscellaneous threads. The present issue is a complete revision of FED-STD-H28/19 dated 31 August 1978.

FED-STD-H28/19A was prepared by the Defense Industrial Supply Center (DLA-IS). The following significant changes from the previous issue are included:

(1) 60° Stub thread and modified square thread presentation has been updated to utilize the latest formats and symbols.

(2) Dairy fitting threads and threads for glass and plastic containers are more fully described.

SECTION 19 - MISCELLANEOUS THREADS

1. Scope. This section describes 60° stub threads, modified square threads, threads used for dairy sanitary fittings and single lead threads used on glass and plastic containers.

2. Referenced documents.

2.1 Government publications. The issues of the following documents in effect on the date of invitation for bids or request for proposal form a part of this standard to the extent specified herein.

Federal standards.

FED-STD-H28/1 - Nomenclature, Definitions and Letter Symbols for Screw Threads
FED-STD-H28/12 - Acme Threads
FED-STD-H28/20 - Inspection Methods for Acceptability of UN, UNR, UNJ, M, and MJ Screw Threads

(Activities outside the Federal Government may obtain copies of Federal specifications, standards and commercial item descriptions as outlined under General Information in the Index of Federal Specifications, Standards, and Commercial Item Descriptions. The Index, which includes cumulative bi-monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this standard and other Federal specifications, standards and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available from the General Services Administration, Specification Section, Room 6662, 7th and D Streets, S.W., Washington, DC 20407.

(Federal Government activities may obtain copies of Federal standardization documents, and the Index of Federal Specifications, Standards, and Commercial Item Descriptions from established distribution points in their agencies.)

Military standard.

MIL-STD-1373 - Screw-Thread, Modified, 60° Stub, Double

(Copies of Military specifications and standards required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contacting officer.)

2.2 Other publications. The following documents form a part of this standard to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

ASTM Standard.

ASTM D 2911 - Dimensions and Tolerances for Plastic Bottles

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

3-A Sanitary Standards.

Number 08-17 - Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products

(Application for copies should be addressed to the Dairy and Food Industries Supply Association, 6245 Executive Boulevard, Rockville, MD 20852-3938.)

Glass Packaging Institute Drawings.

GPI Drawings of Glass Finishes

(Application for copies should be addressed to the Glass Packaging Institute, 6845 Elm Street, McLean, VA 22101.)

British Standards.

BS 1918: Part 1 - Glass Container Finishes: Part 1, Specification for Continuous Thread Finish
BS 5789 - Screw Thread Finishes for Plastic Containers

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

3. Definitions. Screw thread terms and symbols applicable to this standard are defined in FED-STD-H28/1.

4. General requirements. Screw threads within the scope of this document are described in the following subsections.

5. 60° Stub threads.

5.1 Application. These threads have been used in translation applications instead of Acme/Stub Acme or square form threads. Shear strength is higher, but load transmission efficiency is lower.

5.2 Reference. Double stub threads, which use a modified 60° stub form, are covered in MIL-STD-1373. These threads are used for electrical connectors and other devices requiring fast coupling action and strong, shallow threads.

5.3 Design profiles. The design profiles for external and internal threads are defined in Figure 19.1. Characteristic data is tabulated in Table XIX.1.

5.3.1 Allowances. External thread major and pitch diameters have no allowances, i.e., these diameters are basic. Minor diameter allowance is 0.04P. Internal thread minor diameter has no allowance; it is basic. Major diameter allowance is 0.04P. Pitch diameter allowance must be specified (see 5.3.3).

5.3.2 Tolerances. Tolerances on thread characteristic diameters must be specified (see 5.3.3).

5.3.3 Backlash. For backlash equal to that of an Acme or Stub Acme thread, pitch diameter allowance and tolerance for these threads are multiplied by ratio of tangents of 14.5° and 30° (approximately 0.45). Resulting figures may be used as guidance in selecting pitch diameter and tolerance for 60° stub threads.

5.4 Limiting dimensions. Calculate dimensions in accordance with notations under Figure 19.1.

TABLE XIX.1 - Characteristic data for 60° stub threads.

Threads per inch	Pitch, P	Height of thread (basic) 0.433P	Total height of thread, 0.453P	Thread thickness (basic) 0.5P	Width of Flat	
					Crest of screw (basic), 0.250P	Root of screw, 0.227P
1	2	3	4	5	6	7
	in.	in.	in.	in.	in.	in.
16	0.06250	0.0271	0.0283	0.0313	0.0156	0.0142
14	.07143	.0309	.0324	.0357	.0179	.0162
12	.08333	.0361	.0378	.0417	.0208	.0189
10	.10000	.0433	.0453	.0500	.0250	.0227
9	.11111	.0481	.0503	.0556	.0278	.0252
8	.12500	.0541	.0566	.0625	.0313	.0284
7	.14286	.0619	.0647	.0714	.0357	.0324
6	.16667	.0722	.0755	.0833	.0417	.0378
5	.20000	.0866	.0906	.1000	.0500	.0454
4	.25000	.1083	.1133	.1250	.0625	.0567

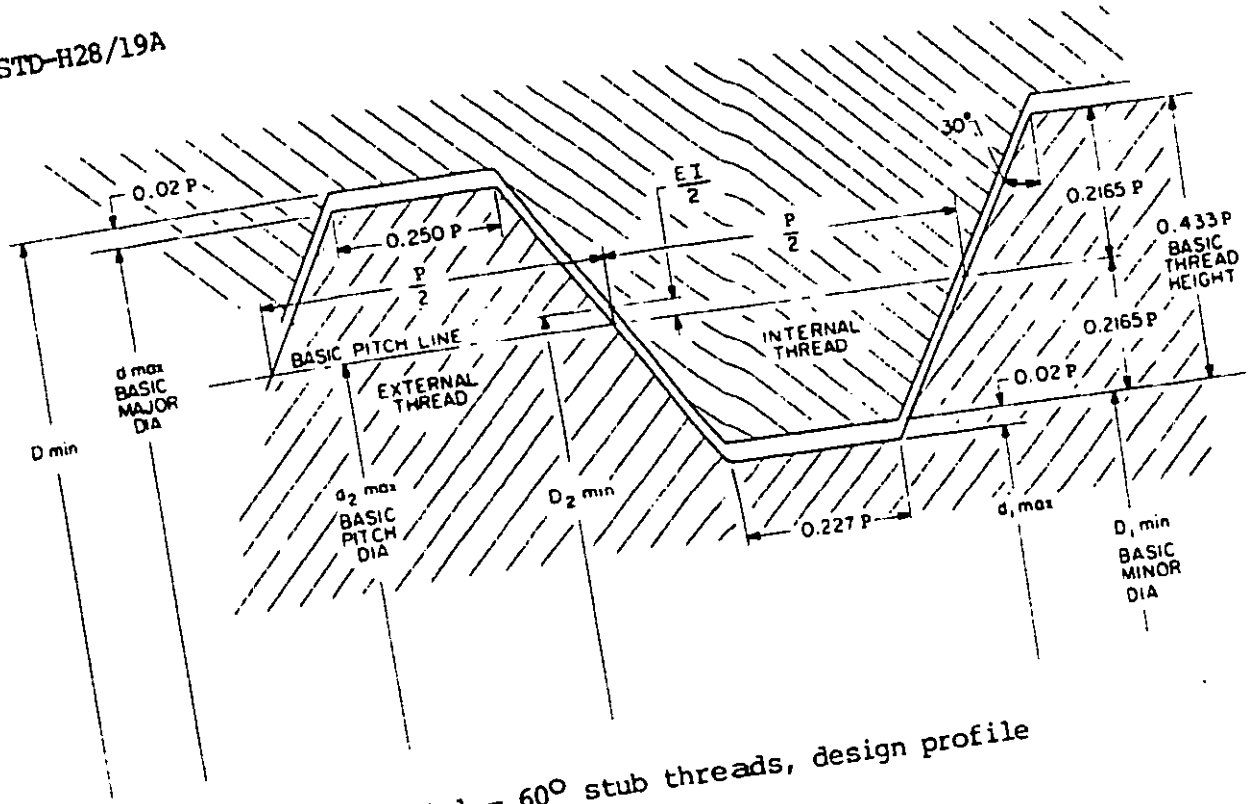


Figure 19.1 - 60° stub threads, design profile

NOTATION

External Threads

d_{max} = Max Major Dia = Basic Size

d_{min} = Min Major Dia = d_{max} - Td

d_1max = Max Minor Dia = D_1min - 0.04P

d_1min = Min Minor Dia = d_1max - Td_1

d_2max = Max Pitch Dia = d_{max} - 0.433P

d_2min = Min Pitch Dia = d_2max - Td_2

Internal Threads

D_{min} = Min Major Dia = d_{max} + 0.04P

D_{max} = Max Major Dia = D_{min} + TD

D_1min = Min Minor Dia = d_{max} - 0.866P

D_1max = Max Minor Dia = D_1min + TD_1

D_2min = Min Pitch Dia = d_2max, + EI

D_2max = Max Pitch Dia = D_2min + TD_2

EI = Pitch Dia Allowance (To be Specified)

n = Number of threads per inch

P = Pitch = 1/n

Td, Td_1, Td_2, TD, TD_1, TD_2 = Tolerances for d, d_1, d_2, D, D_1, D_2, respectively (To be Specified)

5.5 Thread designation. In accordance with the latest standard practice, the 60° stub thread is designated as a special 60° form thread.

Example: $1\frac{1}{8}$ -9 SPL 60° FORM-EXT (22)
Major dia. 1.1250-1.1150
PD 1.0769-1.0697
Minor dia. 1.0183 max.
LE 1.00

NOTE: EXT or INT for external or internal threads, respectively, are included in the designation where necessary for identification. Thread acceptability gaging system designation, such as (22) shown in the example, is in accordance with FED-STD-H28/20. It need not be added to the thread designation if it is specified elsewhere in a pertinent procurement document.

6. Modified square threads.

6.1 Application. These threads have been used in translation applications and for resisting axial loads where only small radial loads are permitted. A thin wall tube is an example of the latter.

6.2 Design profiles. The design profiles for external and internal threads are shown in Figure 19.2.

6.2.1 Allowances. External thread major and pitch diameters and internal thread minor diameter have no allowances, i.e., these diameters are basic. Allowances should be applied to the external thread minor diameter, the internal thread major diameter and the internal thread pitch diameter. The amounts of these allowances must be determined from the application of the thread assembly.

6.2.2 Tolerances. Tolerances on thread characteristic diameters must be specified.

6.3 Thread designation. In accordance with the latest standard practice, the modified square thread is designated as a special 10° form thread.

Example: $1\frac{3}{4}$ -6 SPL 10° FORM-EXT
Major dia. 1.3750-1.3650
PD 0.9166-0.8666
Minor dia. 1.1884-1.1730
LE 2.00

NOTE: EXT or INT for external or internal threads, respectively, are included in the designation where necessary for identification.

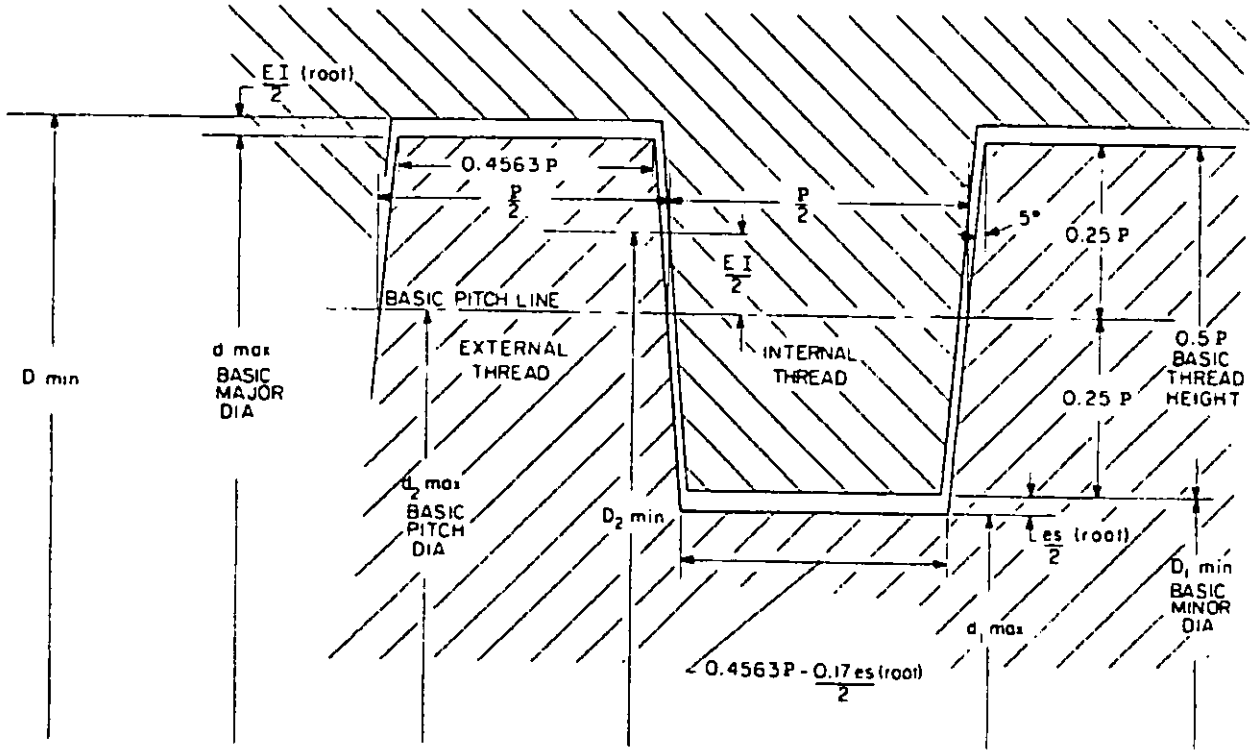


Figure 19.2 - Modified square thread (10° included angle), design profile

NOTATION

External Threads

d_{max} = Max Major Dia = Basic Size

d_{min} = Min Major Dia = d_{max} - Td

d_1max = Max Minor Dia = D_1min - es(root)

d_1min = Min Minor Dia = d_1max - Td_1

d_2max = Max Pitch Dia = d_{max} - 0.5P

d_2min = Min Pitch Dia = d_2max - Td_2

es(root) = Allowance at thread root (To be Specified)

Internal Threads

D_{min} = Min Major Dia = d_{max} + EI(root)

D_{max} = Max Major Dia = D_{min} + TD

D_1min = Min Minor Dia = d_{max} - P

D_1max = Max Minor Dia = D_1min + TD_1

D_2min = Min Pitch Dia = d_2max + EI

D_2max = Max Pitch Dia = D_2min + TD_2

EI(root) = Allowance at thread root (To be Specified)

EI = Pitch Dia Allowance (To be Specified)

n = Number of threads per inch
P = Pitch = 1/n
Td, Td_1, Td_2, TD, TD_1, TD_2 = Tolerances for
d, d_1, d_2, D, D_1, D_2, respectively (To be Specified)

7. Threads for dairy sanitary fittings.

7.1 Application. Threads are used on fittings for milk and milk products equipment and sanitary lines. Equipment and fittings have external threads and the mating union nuts have internal threads.

7.2 Reference. Threads described herein are specified by the Dairy and Food Industries Supply Association, Inc., in the 3-A Sanitary Standards for Fittings Used on Milk and Milk Products Equipment and Used on Sanitary Lines Conducting Milk and Milk Products, as amended, Parts I and II, Number 08-17.

7.3 Design profiles. The design profiles for the external and internal threads are defined in Figure 19.3. They are based upon the ACME screw thread form of FED-STD-H28/12, but vary in design allowances and tolerances.

7.3.1 Allowances. External thread major and pitch diameters have no allowances, i.e., these diameters are basic. Minor diameter allowance is a constant 0.020 inches. Internal thread minor and pitch diameter allowances are a constant 0.075 inches. Major diameter allowance is a constant 0.035 inches.

7.3.2 Tolerances. Tolerances for external and internal thread major, minor and pitch diameters are the same as the pitch diameter tolerance for Class 2G ACME screw threads (see Figure 19.3).

7.4 Series. The following special series is standard.

Nominal Fitting Size	Threads per Inch	Basic Major Diameter
1	8	1.462
1-1/2	8	1.994
2	8	2.526
2-1/2	8	3.058
3	8	3.590
4	6	4.695

7.5 Limiting dimensions. Calculate dimensions in accordance with notations under Figure 19.3 and series data in 7.4 above. Gages may be designed in accordance with FED-STD-H28/12.

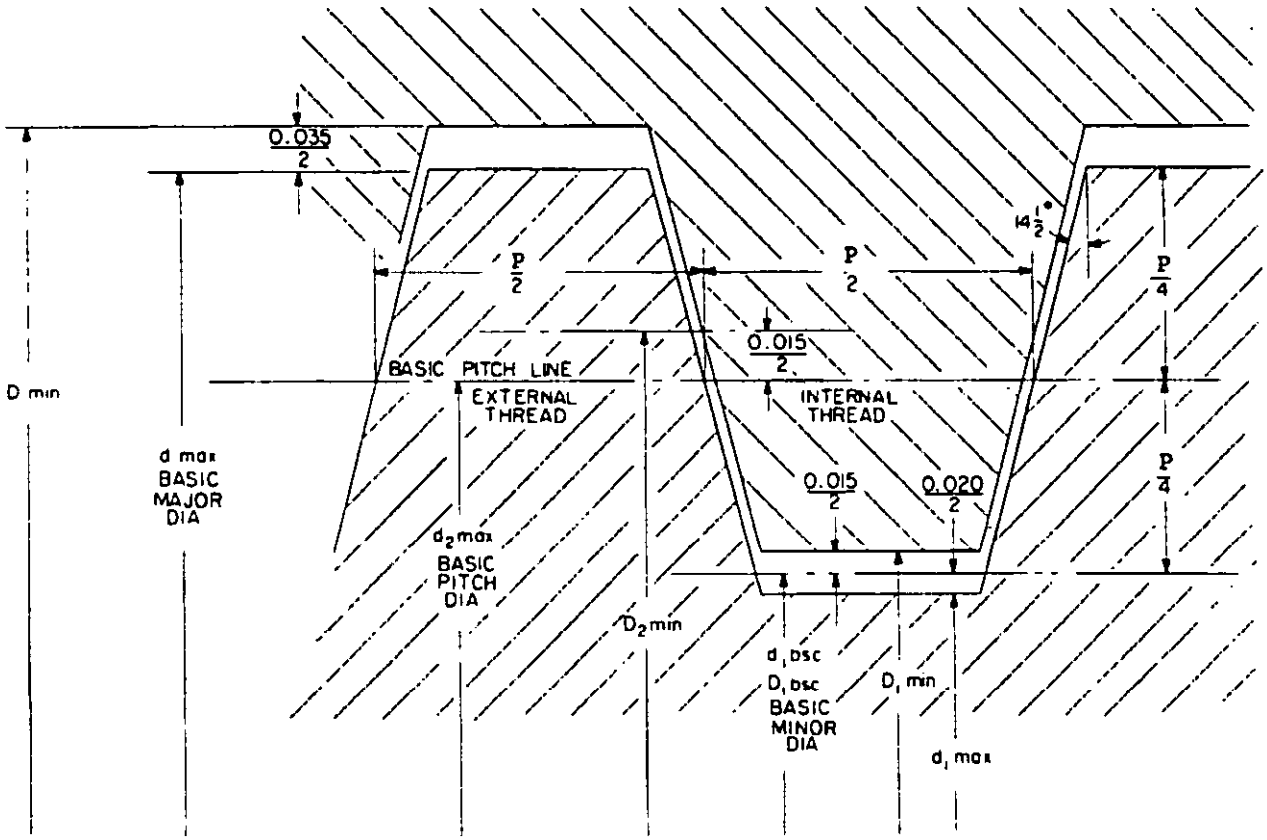


Figure 19.3 - Sanitary fitting threads (ACME form), design profile

NOTATION

External Threads

d_{max} = Max Major Dia = Basic Size

d_{min} = Min Major Dia = d_{max} - Td

d_1max = Max Minor Dia = D_{max} - P -0.020

d_1min = Min Minor Dia = d_1max - Td_1

d_2max = Max Pitch Dia = $d_{max} - \frac{P}{2}$

d_2min = Min Pitch Dia = d_2max - Td_2

Internal Threads

D_{min} = Min Major Dia = d_{max} + 0.035

D_{max} = Max Major Dia = D_{min} + TD

D_1min = Min Minor Dia = d_{max} - P +0.015

D_1max = Max Minor Dia = D_1min + TD_1

D_2min = Min Pitch Dia = $d_{max} - \frac{P}{2}$ +0.015

D_2max = Max Pitch Dia = D_2min + TD_2

n = Number of threads per inch

P = Pitch = 1/n

Td = Td_1 = Td_2 = TD = TD_1 = TD_2 = Tolerance

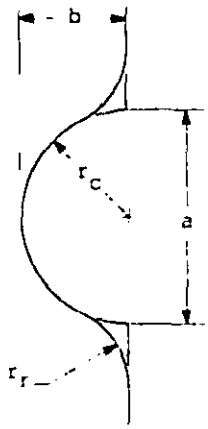
$= 0.030\sqrt{P} + 0.006\sqrt{d_{max}}$

8. Glass and plastic container threads.

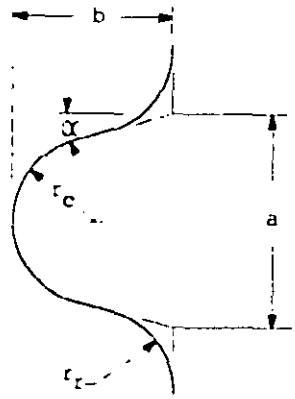
8.1 Application. Threads are used on glass and plastic containers with mating metal or plastic closures. Multiple lead threads are not included in this section.

8.2 References. Threaded glass finishes are specified by the Glass Packaging Institute (formerly Glass Container Manufacturers Institute) in a series of detailed drawings. Threaded plastic finishes are established by the Plastic Bottle Institute and are specified in ASTM D2911. British threaded finishes are specified by the British Standards Institution.

8.3 Thread designs. Basic designs of glass bottle threads are shown in Tables XIX.2 and XIX.3. Table XIX.4 shows plastic bottle threads. For complete finish details, see 8.2.



TYPE A



TYPES B, C and BS 1918

TABLE XIX.2 - Single lead continuous thread for glass finishes.

Type	Threads per inch	Root Width a (ref)	Thread Height b	r_c	r_r max	α	Remarks
A[1]	4	0.124	0.0625	0.062	0.047	-	
A[1]	5	0.120	0.060	0.060	0.047	-	
A[1]	6	0.094	0.047	0.047	0.031	-	
A[1]	8	0.084	0.042	0.042	0.016	-	Sizes 18-24
A[1]	8	0.084	0.047	0.042	0.016	-	Sizes 28-63
A[1]	10	0.058	0.031	0.029	0.016	-	
A[1]	12	0.045	0.030	0.0225	0.016	-	
A[1]	14	0.036	0.0275	0.018	0.016	-	Size 10
A[1]	14	0.036	0.025	0.018	0.016	-	Size 8
C[2]	4	0.125	0.0935	0.049	0.047	15°	Size 86
B[3]	4	0.114	0.0625	0.046	0.047	23°	Size 70
B[3]	4	0.151(Calc.)	0.079	0.062	0.047	24°	Size 132
B[3]	6	0.074(Calc.)	0.047	0.025	0.031	24°	
B[3]	8	0.070(Calc.)	0.042	0.025	0.016	24°	
BS 1918[4]	5	0.120	0.060	0.043	0.030	30°	
BS 1918[4]	6	0.094	0.047	0.033	0.026	30°	
BS 1918[4]	8	0.084	0.042	0.031	0.016	30°	
BS 1918[4]	12	0.059	0.030	0.022	0.012	30°	

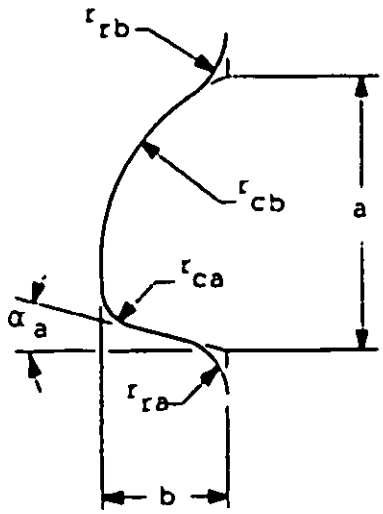
NOTES:

1. Used in Glass Packaging Institute finishes 400, 410, 415, 425, 430, 435, 445, 450, 460, 470, 490, 1600 (except r_r = 0.031 max), 1605 and 1620.

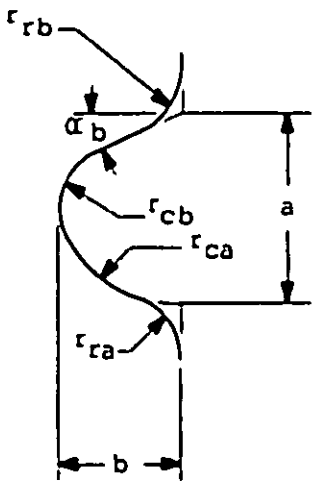
2. Used in Glass Packaging Institute finish 460.

3. Used in Glass Packaging Institute finishes 400, 410, 415, 430, 435, 450, 460, 470, 480 and 485.

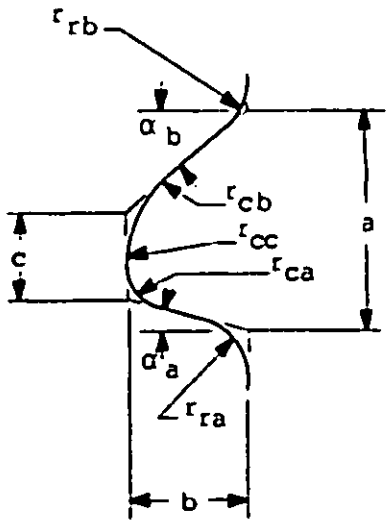
4. Used in British Standard, BS 1918 Part 1, finishes R3, R4, R5 and R6. Dimensions shown are approximate translation from metric.



Finishes 420 (6 tpi), 455



Finish 465



Finishes 420 (8, 10 tpi), 421, 422, 423, 491, 1610, 1630, 1650, 1660

TABLE XIX.3 - Single lead continuous thread for glass finishes - buttress form.

Finish[1]	Threads per inch	Root Width a	Thread Height b	Crest Width c	α_a	α_b	r_{cc}	r_{ra}	r_{ca}	r_{rb}	r_{cb}
420	6	0.109	0.047		15°	-	-	0.024	0.016	0.031	0.078
455	8	0.088	0.047		15°	-	-	0.024 max	0.016	0.031	0.062
465	6	0.0755	0.047		-	24°	-	0.031 max	0.050	0.031 max	0.025
420-423	8	0.088	0.047		15°	19°	-	0.024 max	0.016	0.024	0.047
420-422	10	0.072	0.042		15°	30°	-	0.016 max	0.018	0.024	0.024
421	12	0.059	0.042		15°	30°	- -	0.012 max	0.010	0.016	0.024
495	8	0.093	0.047		15°	34°	-	0.024 max	0.016	0.024	0.047
1610 1615 1630	8		0.047	0.046	24°	20°	-	0.031 max	0.024 max	0.024 max	0.035 max
1650	7		0.0525	0.059	20°	24°	0.078	0.024	0.024	0.030	0.030
1660	6		0.0615	0.055	20°	24°	-	0.035 ±0.005	0.024 max	0.031 max	0.035 max

NOTE:

1. Glass Packaging Institute finish numbers.

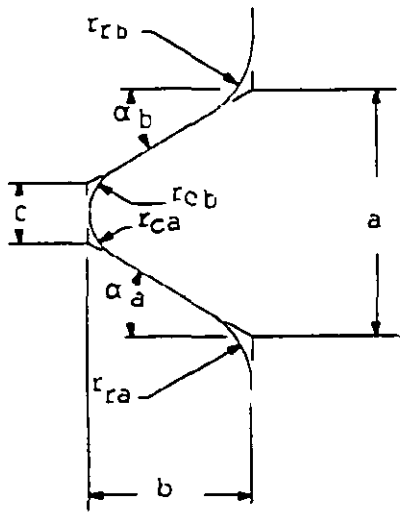


TABLE XIX.4 - Single lead continuous thread for plastic finishes.

Style	Threads per inch	Root Width a	Thread Height b	Crest Width c	α_a	α_b	r_{ra}	r_{ca}	r_{rb}	r_{cb}
L[1]	4	0.125	0.062	0.053	30°	30°	0.020	0.020	0.020	0.020
L[1]	5	0.120	0.060	0.051	30°	30°	0.020	0.020	0.020	0.020
L[1]	6	0.094	0.047	0.040	30°	30°	0.020	0.020	0.020	0.020
L[1]	8	0.084	0.042	0.036	30°	30°	0.020	0.020	0.020	0.020
L[1]	12	0.045	0.030	0.011	30°	30°	0.015	0.005	0.015	0.005
L[2]	12	0.045	0.030	0	30°	30°	0.015	0.005	0.015	-
M[3]	5	0.120	0.060	0.049	10°	45°	0.010	0.010	0.030	0.030
M[3,4]	6	0.094	0.047	0.039	10°	45°	0.010	0.010	0.030	0.030
M[3,4]	8	0.084	0.042	0.035	10°	45°	0.010	0.010	0.030	0.030
M[3]	12	0.051	0.030	0.016	10°	45°	0.010	0.010	0.020	0.008
BS 5789[4]	12	0.059	0.030	0.024	10°	45°	0.010	0.010	0.020	0.008
P[5]	6	0.102	0.054	0	10°	50°	0.005	0.023	0.030	-
P[5]	8	0.100	0.052	0	10°	50°	0.005	0.024	0.024	-

NOTES:

1. Used in Plastic Bottle Institute finishes SP400, SP410, SP415 and SP444.
2. Used in Plastic Bottle Institute finish SP425.
3. Used in Plastic Bottle Institute finishes SP400, SP410, SP415 and SP425.
4. Used in British Standard BS 5789. Dimensions shown are approximate translations from metric.
5. Used in Plastic Bottle Institute finishes SP100, SP103, SP110 and SP200.

MILITARY INTERESTS:

Custodians:

Army - AR
Navy - AS
Air Force - 99

Review Activities:

Air Force - 82

CIVIL AGENCY COORDINATING ACTIVITIES:

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(DoD Project THDS-0065)

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(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
FED-STD-H28/19A	MISCELLANEOUS THREADS

3a. NAME OF SUBMITTING ORGANIZATION

b. ADDRESS *(Street, City, State, ZIP Code)*

4. TYPE OF ORGANIZATION *(Mark one)*

- ☐ VENDOR
- ☐ USER
- ☐ MANUFACTURER
- ☐ OTHER *(Specify)*: _____

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

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