AMERICAN STANDARD

Miniature Screws

ASA B18.11-1961
REAFFIRMED 1983
UDC 621.882

REAFFIRMED 2000

FOR CURRENT COMMITTEE PERSONNEL
PLEASE SEE ASME MANUAL AS-11

Sponsors

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The American Society of Mechanical Engineers

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Foreword

MINIATURE screws, as covered by this standard, are those having threads of a nominal diameter from 0.0118 inch (0.3 mm) to 0.0551 inch (1.4 mm). Demand for screws and threads of such sizes has extended in recent years from the needs of the watch industry to subminiaturization requirements of control mechanisms, instruments, and other devices. This led to the development of Unified Miniature Screw Threads, ASA B1.10–1958. This is the complement to the screw thread standard to provide a recommended series of miniature screws and nuts.

Subcommittee 13 of Sectional Committee B18 first undertook development of a product standard for miniature screws which was submitted to letter ballot of the Sectional Committee February 9, 1960. Final approval as an American Standard was given on February 20, 1961. Standards for nuts are in process of development.

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AMERICAN STANDARD

Slotted Head Miniature Screws

INTRODUCTION

1. Scope. This standard establishes head types, their dimensions, and lengths of slotted head miniature screws, threaded in conformance with American Standard Unified Miniature Screw Threads, ASA B1.10.

This standard is predicated upon information derived through research of the maximum using industries. The inclusion of four head types and the given thread sizes in the data tables is not intended to imply that all of those described in this standard are stock production items. Preferred diameter pitch combinations for general use are shown in bold type in the tables. Consumer interests are requested to consult manufacturers' catalogs for lists of current stock production miniature screws.

HEAD TYPES

2. Fillister Head. The fillister head has a flat top surface (oval crown optional), cylindrical sides, and a flat bearing surface. Head proportions are given in Table 1.

3. Pan Head. The pan head has a flat top surface, cylindrical sides, and a flat bearing surface. The head height is less than the fillister but the head diameter is slightly larger. Head proportions are given in Table 2.

4. Flat Head. The flat head has a flat top surface and a conical bearing surface with an included angle of approximately 100°. Head proportions are given in Table 3.

5. Binding Head. The head height is less than the pan head but the head diameter is greater, and is intended for applications which would otherwise require washers. Head proportions are given in Table 4.

SPECIFICATIONS

6. Head Height. The head heights given in the dimensional tables represent the metal measurement (after slotting).

7. Depth of slots. The depth of slots on fillister, pan and binding head screws is measured from the bearing surface to the intersection of the bottom of the slot with the head diameter. On heads with a conical bearing surface, the depth of slots is measured parallel to the axis of the screw from the flat top surface to the intersection of the bottom of the slot with the bearing surface. The maximum permissible concavity of the slot shall not exceed 3 per cent of the mean head diameter.

8. Bearing surface. The bearing surface of fillister, pan and binding head screws shall be at right angles to the axis of the body within 2°.

9. Eccentricity. Eccentricity is defined as one-half of the total indicator reading.

9(a). ***Head Eccentricity.*** The heads of miniature fastening screws shall not be eccentric with the screw bodies by more than 2 per cent of the maximum head diameter or 0.001, whichever is the greater.

9(b). ***Eccentricity of Slots.*** Slots in miniature fastening screw heads shall not be eccentric with screw bodies by more than 5 per cent of the nominal body diameter.

10. Underhead Fillets. The radius of the fillet under perpendicular bearing surface type heads shall not exceed 1/2 times the pitch of the thread. The radius of the fillet under conical bearing surface type heads shall not exceed 2 times the pitch of the thread. The radius of the fillet under the binding head is given in Table 4.

11. Unthreaded Diameter. On miniature fastening screws not threaded to the head, the diameter of the unthreaded body shall not be more than the maximum major diameter of the thread nor less than the minimum pitch diameter of the thread.

12. Length. The length of miniature screws having perpendicular bearing surface type heads shall be measured from the bearing surface to the extreme end in a line parallel to the axis of the screw. The length of screws with conical bearing surface type heads shall be measured from the top of the head to the extreme end in a line parallel to the axis of the screw. Preferred lengths are those listed in Table 5.

13. Tolerance on Length. The length tolerance of miniature screws shall conform to the limits given in Table 5.

14. Length of Thread. On all miniature screws having a length four times the nominal body diameter or less the threaded length shall extend to within two threads of the bearing surface of the head. Screws of greater length shall possess complete threads for a minimum of four diameters.

15. End of Body. Miniature fastening screws shall be regularly supplied with flat ends having a chamfer of approximately 45° extending to the minor diameter of the thread as a minimum depth.

16. Thread Series and Tolerances. The screw threads of miniature screws shall be in conformance with American Standard Unified Miniature Screw Threads, ASA B1.10–1958.

17. Material and Finish. Miniature screws are generally supplied in ferrous and nonferrous materials, coatings and heat treatments which must be specified by the user. Coatings, when required, are limited to those of electro-plating or chemical oxidation.

18. Designation. Screws in conformance with this standard shall be identified by the designation for thread size in conformance with American Standard ASA B1.10 followed by the nominal length in units of 1/1000 inch (omitting the decimal point) and the head type. Typical examples are:

60 UNM × 040 FIL HD
100 UNM × 080 PAN HD
120 UNM × 120 FLAT HD
140 UNM × 250 BIND HD

19. Machined Finish. Roughness of the machined surfaces of heads shall not exceed 63 micro-inches arithmetical average (per ASA B46.1, Surface Texture) determined by visual comparison with roughness comparison specimens.

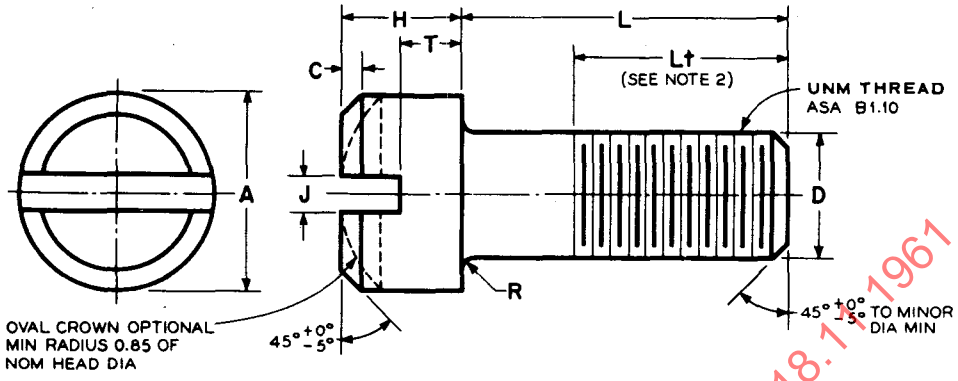

Table 1 – Fillister Head

Size Designation (a)	Thds per Inch	D Basic Major Dia	Fillister Head Dimensions									
			A Head Dia		H Head Hgt		J Slot Width		T (b) Slot Depth		C Chamfer	R (c) Radius
		Max	Max	Min	Max	Min	Max	Min	Max	Min	Max	Max
30 UNM	**318**	**0.0118**	**0.021**	**0.019**	**0.012**	**0.010**	**0.004**	**0.003**	**0.006**	**0.004**	**0.002**	**0.002**
35 UNM	282	0.0138	0.023	0.021	0.014	0.012	0.004	0.003	0.007	0.005	0.002	0.002
40 UNM	**254**	**0.0157**	**0.025**	**0.023**	**0.016**	**0.013**	**0.005**	**0.003**	**0.008**	**0.006**	**0.002**	**0.002**
45 UNM	254	0.0177	0.029	0.027	0.018	0.015	0.005	0.003	0.009	0.007	0.002	0.002
50 UNM	**203**	**0.0197**	**0.033**	**0.031**	**0.020**	**0.017**	**0.006**	**0.004**	**0.010**	**0.007**	**0.003**	**0.002**
55 UNM	203	0.0217	0.037	0.035	0.022	0.019	0.006	0.004	0.011	0.008	0.003	0.002
60 UNM	**169**	**0.0236**	**0.041**	**0.039**	**0.025**	**0.021**	**0.008**	**0.005**	**0.012**	**0.009**	**0.004**	**0.003**
70 UNM	145	0.0276	0.045	0.043	0.028	0.024	0.008	0.005	0.014	0.011	0.004	0.003
80 UNM	**127**	**0.0315**	**0.051**	**0.049**	**0.032**	**0.028**	**0.010**	**0.007**	**0.016**	**0.012**	**0.005**	**0.004**
90 UNM	113	0.0354	0.056	0.054	0.036	0.032	0.010	0.007	0.018	0.014	0.005	0.004
100 UNM	**102**	**0.0394**	**0.062**	**0.058**	**0.040**	**0.035**	**0.012**	**0.008**	**0.020**	**0.016**	**0.006**	**0.005**
110 UNM	102	0.0433	0.072	0.068	0.045	0.040	0.012	0.008	0.022	0.018	0.006	0.005
120 UNM	**102**	**0.0472**	**0.082**	**0.078**	**0.050**	**0.045**	**0.016**	**0.012**	**0.025**	**0.020**	**0.008**	**0.006**
140 UNM	85	0.0551	0.092	0.088	0.055	0.050	0.016	0.012	0.028	0.023	0.008	0.006

(a) Bold face type indicates preferred size (b) "T" measured from bearing surface (c) Relative to max. major dia.

MATERIAL: CORROSION RESISTANT STEELS: ASTM Designation A276
CLASS 303, COND A
CLASS 416, COND A, HEAT TREAT TO APPROX 120,000–150,000 PSI (ROCKWELL C28–34)
CLASS 420, COND A, HEAT TREAT TO APPROX 220,000–240,000 PSI (ROCKWELL C50–53)
BRASS: TEMPER HALF HARD ASTM Designation B16
NICKEL SILVER: TEMPER HARD ASTM Designation B151, Alloy C

MACHINE FINISH: Machined surface roughness of heads shall be approximately 63MU in. arithmetical average determined by visual comparison.

APPLIED COATINGS: CORROSION RESISTANT STEEL: Passivate
BRASS: Bare, Black Oxide or Nickel Flash.
NICKEL SILVER: None

NOTE:
1. The diameter of the unthreaded body shall not be more than the maximum major diameter nor less than the minimum pitch diameter of the thread.
2. For screw lengths four times the major diameter or less, thread length (Lt) shall extend to within two threads of the head bearing surface. Screws of greater length shall have complete threads for a minimum of four major diameters.
3. Screws shall be free of all projecting burrs, observed at 3X magnification.
4. All dimensions are in inches.

SLOTTED HEAD MINIATURE SCREWS

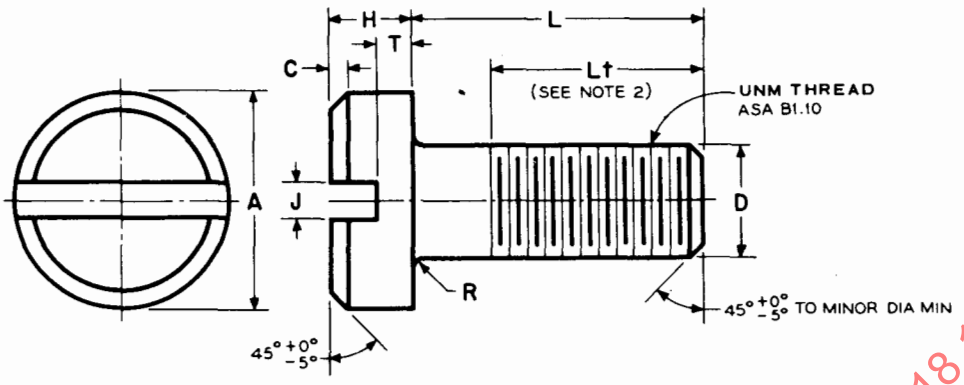

Table 2 – Pan Head

Size Designation (a)	Thds per Inch	D Basic Major Dia	Pan Head Dimensions									
			A Head Dia		B Head Hgt		J Slot Width		T (b) Slot Depth		C Chamfer	R (c) Radius
		Max	Max	Min	Max	Min	Max	Min	Max	Min	Max	Max
30 UNM	**318**	**0.0118**	**0.025**	**0.023**	**0.010**	**0.008**	**0.005**	**0.003**	**0.005**	**0.003**	**0.002**	**0.002**
35 UNM	282	0.0138	0.029	0.027	0.011	0.009	0.005	0.003	0.006	0.004	0.002	0.002
40 UNM	**254**	**0.0157**	**0.033**	**0.031**	**0.012**	**0.010**	**0.006**	**0.004**	**0.006**	**0.004**	**0.002**	**0.002**
45 UNM	254	0.0177	0.037	0.035	0.014	0.012	0.006	0.004	0.007	0.005	0.002	0.002
50 UNM	**203**	**0.0197**	**0.041**	**0.039**	**0.016**	**0.013**	**0.008**	**0.005**	**0.008**	**0.006**	**0.003**	**0.002**
55 UNM	203	0.0217	0.045	0.043	0.018	0.015	0.008	0.005	0.009	0.007	0.003	0.002
60 UNM	**169**	**0.0236**	**0.051**	**0.049**	**0.020**	**0.017**	**0.010**	**0.007**	**0.010**	**0.007**	**0.004**	**0.003**
70 UNM	145	0.0276	0.056	0.054	0.022	0.019	0.010	0.007	0.011	0.008	0.004	0.003
80 UNM	**127**	**0.0315**	**0.062**	**0.058**	**0.025**	**0.021**	**0.012**	**0.008**	**0.012**	**0.009**	**0.005**	**0.004**
90 UNM	113	0.0354	0.072	0.068	0.028	0.024	0.012	0.008	0.014	0.011	0.005	0.004
100 UNM	**102**	**0.0394**	**0.082**	**0.078**	**0.032**	**0.028**	**0.016**	**0.012**	**0.018**	**0.014**	**0.006**	**0.005**
110 UNM	102	0.0433	0.092	0.088	0.036	0.032	0.016	0.012	0.018	0.014	0.006	0.005
120 UNM	**102**	**0.0472**	**0.103**	**0.097**	**0.040**	**0.035**	**0.020**	**0.015**	**0.020**	**0.016**	**0.008**	**0.006**
140 UNM	85	0.0551	0.113	0.107	0.045	0.040	0.020	0.015	0.022	0.018	0.008	0.006

(a) Bold face type indicates preferred size (b) "T" measured from bearing surface (c) Relative to max. major dia

MATERIAL: CORROSION RESISTANT STEELS: ASTM Designation A276
CLASS 303, COND A
CLASS 416, COND A, HEAT TREAT TO APPROX 120,000–150,000 PSI (ROCKWELL C28–34)
CLASS 420, COND A, HEAT TREAT TO APPROX 220,000–240,000 PSI (ROCKWELL C50–53)
BRASS: TEMPER HALF HARD ASTM Designation B16
NICKEL SILVER: TEMPER HARD ASTM Designation B151, Alloy C

MACHINE FINISH: Machined surface roughness of heads shall be approximately 63MU in. arithmetical average determined by visual comparison.

APPLIED COATINGS: CORROSION RESISTANT STEEL: Passivate.
BRASS: Bare, Black Oxide or Nickel Flash.
NICKEL SILVER: None

NOTE:
1. The diameter of the unthreaded body shall not be more than the maximum major diameter nor less than the minimum pitch diameter of the thread.
2. For screw lengths four times the major diameter or less, thread length (Lt) shall extend to within two threads of the head bearing surface. Screws of greater length shall have complete threads for a minimum of four major diameters.
3. Screws shall be free of all projecting burrs, observed at 3X magnification.
4. All dimensions are in inches.

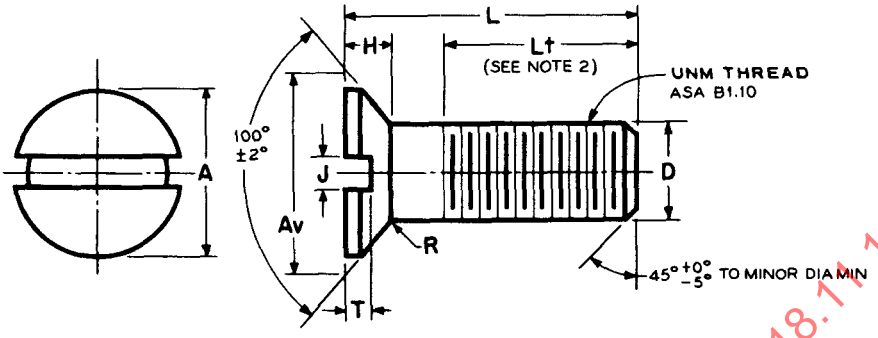

Table 3 – 100-Deg Flat Head

Size Designation (a)	Thds per Inch	D Basic Major Dia	Head Dimensions										
			A Head Dia		Av (b) Dia of Full Cone At Max H	H Head Hgt		J Slot Width		T Slot Depth		R (c) Radius
		Max	Max	Min		Max	Min	Max	Min	Max	Min	Max
30 UNM	**318**	**0.0118**	**0.023**	**0.021**	**0.0285**	**0.007**	**0.005**	**0.004**	**0.003**	**0.004**	**0.002**	**0.005**
35 UNM	282	0.0138	0.025	0.023	0.0305	0.007	0.005	0.004	0.003	0.004	0.002	0.005
40 UNM	**254**	**0.0157**	**0.029**	**0.027**	**0.0348**	**0.008**	**0.006**	**0.005**	**0.003**	**0.005**	**0.003**	**0.006**
45 UNM	254	0.0177	0.033	0.031	0.0392	0.009	0.007	0.005	0.003	0.005	0.003	0.006
50 UNM	**203**	**0.0197**	**0.037**	**0.035**	**0.0459**	**0.011**	**0.008**	**0.006**	**0.004**	**0.006**	**0.004**	**0.008**
55 UNM	203	0.0217	0.041	0.039	0.0503	0.012	0.009	0.006	0.004	0.006	0.004	0.008
60 UNM	**169**	**0.0236**	**0.045**	**0.043**	**0.0546**	**0.013**	**0.010**	**0.008**	**0.005**	**0.008**	**0.005**	**0.010**
70 UNM	145	0.0276	0.051	0.049	0.0610	0.014	0.011	0.008	0.005	0.008	0.005	0.010
80 UNM	**127**	**0.0315**	**0.056**	**0.054**	**0.0696**	**0.016**	**0.012**	**0.010**	**0.007**	**0.010**	**0.006**	**0.012**
90 UNM	113	0.0354	0.062	0.058	0.0759	0.017	0.013	0.010	0.007	0.010	0.006	0.012
100 UNM	**102**	**0.0394**	**0.072**	**0.068**	**0.0847**	**0.019**	**0.015**	**0.012**	**0.008**	**0.012**	**0.008**	**0.016**
110 UNM	102	0.0433	0.082	0.078	0.0957	0.022	0.018	0.012	0.008	0.012	0.008	0.016
120 UNM	**102**	**0.0472**	**0.092**	**0.088**	**0.1068**	**0.025**	**0.020**	**0.016**	**0.012**	**0.016**	**0.010**	**0.020**
140 UNM	85	0.0551	0.103	0.097	0.1197	0.027	0.022	0.016	0.012	0.016	0.010	0.020

(a) Bold face type indicates preferred sizes (b) (Av) Derived from max D, max H and mean angle
(c) Relative to max major dia

MATERIAL: CORROSION RESISTANT STEELS: ASTM Designation A276
CLASS 303, COND A
CLASS 416, COND A, HEAT TREAT TO APPROX 120,000–150,000 PSI (ROCKWELL C28–34)
CLASS 420, COND A, HEAT TREAT TO APPROX 220,000–240,000 PSI (ROCKWELL C50–53)
BRASS: TEMPER HALF HARD ASTM Designation B 16
NICKEL SILVER: TEMPER HARD ASTM Designation B151 Alloy C

MACHINE FINISH: Machined surface roughness of heads shall be approximately 63MU in. arithmetical average determined by visual comparison.

APPLIED COATINGS: CORROSION RESISTANT STEEL: Passivate
BRASS: Bare, Black Oxide or Nickel Flash.
NICKEL SILVER: None

NOTE:
1. The diameter of the unthreaded body shall not be more than the maximum major diameter nor less than the minimum pitch diameter of the thread.
2. For screw lengths four times the major diameter or less, thread length (Lt) shall extend to within two threads of the head bearing surface. Screws of greater length shall have complete threads for a minimum of four major diameters.
3. Screws shall be free of all projecting burrs, observed at 3X magnification.
4. All dimensions are in inches.

SLOTTED HEAD MINIATURE SCREWS

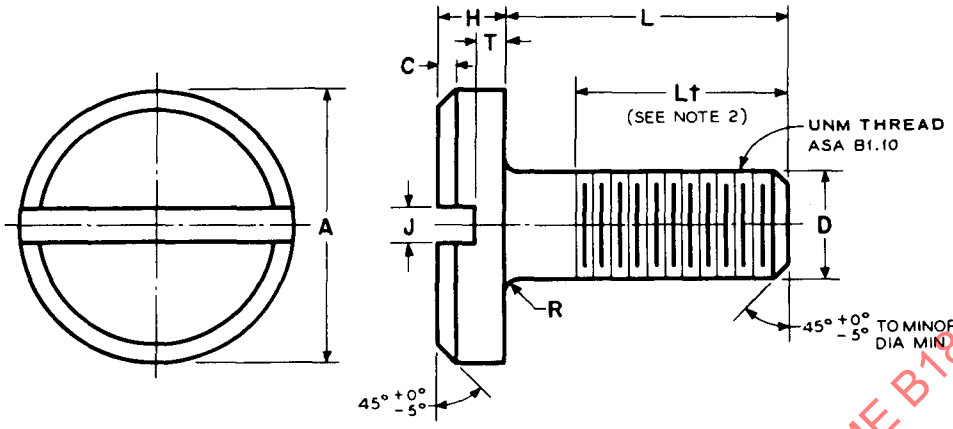

Table 4 – Binding Head

Size Designation (a)	Thds per Inch	D Basic Major Dia	Binding Head Dimensions										
			A Head Dia		H Head Hgt		J Slot Width		T (b) Slot Depth		C Chamfer	R Radius	
		Max	Max	Min	Max	Min	Max	Min	Max	Min	Max	Max	Min
40 UNM	**254**	0.0157	0.041	0.039	0.010	0.008	0.006	0.004	0.005	0.003	0.002	0.004	0.002
45 UNM	254	0.0177	0.045	0.043	0.011	0.009	0.006	0.004	0.006	0.004	0.002	0.004	0.002
50 UNM	**203**	0.0197	0.051	0.049	0.012	0.010	0.008	0.005	0.006	0.004	0.003	0.004	0.002
55 UNM	203	0.0217	0.056	0.054	0.014	0.012	0.008	0.005	0.007	0.005	0.003	0.004	0.002
60 UNM	**169**	0.0236	0.062	0.058	0.016	0.013	0.010	0.007	0.008	0.006	0.004	0.006	0.003
70 UNM	145	0.0276	0.072	0.068	0.018	0.015	0.010	0.007	0.009	0.007	0.004	0.006	0.003
80 UNM	**127**	0.0315	0.082	0.078	0.020	0.017	0.012	0.008	0.010	0.007	0.005	0.008	0.004
90 UNM	113	0.0354	0.092	0.088	0.022	0.019	0.012	0.008	0.011	0.008	0.005	0.008	0.004
100 UNM	**102**	0.0394	0.103	0.097	0.025	0.021	0.016	0.012	0.012	0.009	0.006	0.010	0.005
110 UNM	102	0.0433	0.113	0.107	0.028	0.024	0.016	0.012	0.014	0.011	0.006	0.010	0.005
120 UNM	**102**	0.0472	0.124	0.116	0.032	0.028	0.020	0.015	0.016	0.012	0.008	0.012	0.006
140 UNM	85	0.0551	0.144	0.136	0.036	0.032	0.020	0.015	0.018	0.014	0.008	0.012	0.006

(a) Bold face type indicates preferred sizes (b) "T" measured from bearing surface

MATERIAL: CORROSION RESISTANT STEELS: ASTM Designation A276
CLASS 303, COND A
CLASS 416, COND A, HEAT TREAT TO APPROX 120,000–150,000 PSI (ROCKWELL C28–34)
CLASS 420, COND A, HEAT TREAT TO APPROX 220,000–240,000 PSI (ROCKWELL C50–53)
BRASS: TEMPER HALF HARD ASTM Designation B 16
NICKEL SILVER: TEMPER HARD ASTM Designation B151 Alloy C

MACHINE FINISH: Machined surface roughness of heads shall be approximately 63MU in. arithmetical average determined by visual comparison.

APPLIED COATINGS: CORROSION RESISTANT STEEL: Passivate.
BRASS: Bare, Black Oxide or Nickel Flash.
NICKEL SILVER: None

NOTE:
1. The diameter of the unthreaded body shall not be more than the maximum major diameter nor less than the minimum pitch diameter of the thread.
2. For screw lengths four times the major diameter or less, thread length (Lt) shall extend to within two threads of the head bearing surface. Screws of greater length shall have complete threads for a minimum of four major diameters.
3. Screws shall be free of all projecting burrs, observed at 3X magnification.
4. All dimensions are in inches.

Table 5

FILLISTER AND PAN HEAD

L Length (In.) Max	L Length (In.) Min	Standard Lengths (a) 30 UNM (0.0118)	35 UNM (0.0138)	40 UNM (0.0157)	45 UNM (0.0177)	50 UNM (0.0197)	55 UNM (0.0217)	60 UNM (0.0236)	70 UNM (0.0276)	80 UNM (0.0315)	90 UNM (0.0354)	100 UNM (0.0394)	110 UNM (0.0433)	120 UNM (0.0472)	140 UNM (0.0551)
0.020	0.016	**30–020**													
0.025	0.021	**30–025**	35–025	**40–025**											
0.032	0.027	**30–032**	35–032	**40–032**	45–032	**50–032**									
0.040	0.035	**30–040**	35–040	**40–040**	45–040	**50–040**	55–040	**60–040**							
0.050	0.044	**30–050**	35–050	**40–050**	45–050	**50–050**	55–050	**60–050**	70–050	**80–050**					
0.060	0.054	**30–060**	35–060	**40–060**	45–060	**50–060**	55–060	**60–060**	70–060	**80–060**	90–060	**100–060**			
0.080	0.072	**30–080**	35–080	**40–080**	45–080	**50–080**	55–080	**60–080**	70–080	**80–080**	90–080	**100–080**	110–080	**120–080**	
0.100	0.092	**30–100**	35–100	**40–100**	45–100	**50–100**	55–100	**60–100**	70–100	**80–100**	90–100	**100–100**	110–100	**120–100**	140–100
0.120	0.110	**30–120**	35–120	**40–120**	45–120	**50–120**	55–120	**60–120**	70–120	**80–120**	90–120	**100–120**	110–120	**120–120**	140–120
0.160	0.150		35–160	**40–160**	45–160	**50–160**	55–160	**60–160**	70–160	**80–160**	90–160	**100–160**	110–160	**120–160**	140–160
0.200	0.188				45–200	**50–200**	55–200	**60–200**	70–200	**80–200**	90–200	**100–200**	110–200	**120–200**	140–200
0.250	0.238						55–250	**60–250**	70–250	**80–250**	90–250	**100–250**	110–250	**120–250**	140–250
0.320	0.304								70–320	**80–320**	90–320	**100–320**	110–320	**120–320**	140–320
0.400	0.384										90–400	**100–400**	110–400	**120–400**	140–400
0.500	0.480												110–500	**120–500**	140–500
0.600	0.580														140–600

(a) Bold face type indicates preferred sizes

100 DEG FLAT HEAD

L Length (In.) Max	L Length (In.) Min	Standard Lengths (a) 30 UNM (0.0118)	35 UNM (0.0138)	40 UNM (0.0157)	45 UNM (0.0177)	50 UNM (0.0197)	55 UNM (0.0217)	60 UNM (0.0236)	70 UNM (0.0276)	80 UNM (0.0315)	90 UNM (0.0354)	100 UNM (0.0394)	110 UNM (0.0433)	120 UNM (0.0472)	140 UNM (0.0551)
0.025	0.020	**30–025**													
0.032	0.027	**30–032**	35–032	**40–032**											
0.040	0.035	**30–040**	35–040	**40–040**	45–040	**50–040**									
0.050	0.044	**30–050**	35–050	**40–050**	45–050	**50–050**	55–050	**60–050**							
0.060	0.054	**30–060**	35–060	**40–060**	45–060	**50–060**	55–060	**60–060**	70–060	**80–060**					
0.080	0.072	**30–080**	35–080	**40–080**	45–080	**50–080**	55–080	**60–080**	70–080	**80–080**	90–080	**100–080**			
0.100	0.092	**30–100**	35–100	**40–100**	45–100	**50–100**	55–100	**60–100**	70–100	**80–100**	90–100	**100–100**	110–100	**120–100**	
0.120	0.110	**30–120**	35–120	**40–120**	45–120	**50–120**	55–120	**60–120**	70–120	**80–120**	90–120	**100–120**	110–120	**120–120**	140–120
0.160	0.150	**30–160**	35–160	**40–160**	45–160	**50–160**	55–160	**60–160**	70–160	**80–160**	90–160	**100–160**	110–160	**120–160**	140–160
0.200	0.188		35–200	**40–200**	45–200	**50–200**	55–200	**60–200**	70–200	**80–200**	90–200	**100–200**	110–200	**120–200**	140–200
0.250	0.238				45–250	**50–250**	55–250	**60–250**	70–250	**80–250**	90–250	**100–250**	110–250	**120–250**	140–250
0.320	0.304						55–320	**60–320**	70–320	**80–320**	90–320	**100–320**	110–320	**120–320**	140–320
0.400	0.384								70–400	**80–400**	90–400	**100–400**	110–400	**120–400**	140–400
0.500	0.480										90–500	**100–500**	110–500	**120–500**	140–500
0.600	0.580												110–600	**120–600**	140–600

(a) Bold face type indicates preferred sizes