



~~Designation: F 880-01a~~ Designation: F 880 - 02 (Reapproved 2008)

Standard Specification for Stainless Steel Socket-Set Screws¹

This standard is issued under the fixed designation F 880; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers the requirements for austenitic grade stainless steel socket-set screws (SSS) sizes 0.060 through 0.500 in., in two conditions, AF and CW.

~~1.2 The following hazards caveat pertains only to Test Method Section, Section 12 of this specification. This standard does not purport to address (all of) the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.~~

1.2 Units—The values stated in inch-pound units are to be regarded as standard. No other units of measurement are included in this standard.

NOTE 1—A complete metric companion to Specification F 880 has been developed—F 880M; therefore, no metric equivalents are shown in this specification.

1.3 The following hazards caveat pertains only to Test Method Section, Section 12 of this specification. This standard does not purport to address (all of) the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards:²

A 262 Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels

A342/A 342M Test Methods for Permeability of Feebly Magnetic Materials

A 380 Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems

A 555/A 555M Specification for General Requirements for Stainless and Heat-Resisting Steel Wire and Wire Rods

A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products

A 967 Specification for Chemical Passivation Treatments for Stainless Steel Parts

D 3951 Practice for Commercial Packaging

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

~~E 353 Test Methods for Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys~~ Test Methods for Rockwell Hardness of Metallic Materials

F 593 Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs

F 788/F 788M Specification for Surface Discontinuities of Bolts, Screws, and Studs, Inch and Metric Series

F 1470 Guide for Fastener Sampling for ~~Specific~~ Specified Mechanical Properties and Performance Inspection

2.2 ASME Standard:³

B 18.3 Socket Cap, Shoulder and Set Screws, Inch Series

3. Classification

3.1 The designation of the alloy group and condition for the two materials and conditions of this specification shall be consistent with the stainless steel designations in Specification F 593.

¹ This specification is under the jurisdiction of ASTM Committee F16 on Fasteners and is the direct responsibility of Subcommittee F16.04 on Nonferrous Fasteners. Current edition approved Oct. 10, 2001. Published November 2001. Originally published as F880-86. Last previous edition F880-01.

Current edition approved May 1, 2008. Published August 2008. Originally approved in 1986. Last previous edition approved in 2002 as F 880 - 02.

² Annual Book of ASTM Standards, Vol 01.03.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, refer to the standard's Document Summary page on the ASTM website.

³ Annual Book of ASTM Standards, Vol 03.04.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

3.2 The austenitic stainless steel socket set screw shall be designated F 880 Group 1 Condition AF (solution annealed) or F 880 Group 1 Condition CW (cold worked).

4. Ordering Information

4.1 Orders for material under this specification shall include the following information:

- 4.1.1 Quantity (number of ~~screws~~; screws);
- 4.1.2 Dimensions, including nominal thread designation, thread pitch, nominal screw length (inches) and point configuration.

A standard part number may be used for this definition:

- 4.1.3 Name of the screw (~~SSS~~); (SSS);
 - 4.1.4 Condition ~~AF/CW~~; AF/CW;
 - 4.1.5 Surface finish, if required. If a finish other than passivation is required, it must be specified on the order or product ~~standard~~; standard;
 - 4.1.6 ASTM specification and year of ~~issue~~; issue; and
 - 4.1.7 Any special or supplemental requirements.
- 4.2 *Example*—50 000 pieces 0.250-20 × 0.375 cone point SSS CW ASTM ~~F880-XX~~; F 880 – XX.

5. Materials and Manufacture

5.1 The screw may be forged, formed, extruded, machined, or ground to meet the dimensional characteristics and performance requirements.

5.2 *Heat Treatment*—Austenitic alloys Group 1 Condition AF screw shall be annealed by heating to 1900 ± 50°F to obtain maximum corrosion resistance and minimum permeability. The screws shall be held for a sufficient time at temperature, then cooled at a rate sufficient to prevent precipitation of the carbide and provide the properties in accordance with Table 1.

5.3 When condition CW is specified, the austenitic alloys shall be annealed as specified in 5.2, generally by the raw material manufacturer, and then cold worked to develop specific properties.

6. Chemical Composition

6.1 The analysis of the screw material shall conform to the chemical composition specified in Table 2.

6.2 Unless otherwise specified in the inquiry and purchase order (see Supplementary Requirement S2), the choice of alloy used shall be that of the fastener manufacturer as determined by his fabrication methods and material availability. The specific alloy used by the manufacturer shall be clearly identified on all certification required in the purchase order and shall have a chemical composition conforming to the limits specified in Table 2.

6.3 When chemical analysis is performed by the purchaser using finished fasteners representing each lot, the chemical contents obtained shall conform to the limits specified in Table 2 for the specific alloy. Chemical composition shall conform to the tolerances specified in Specification A 555/A 555M.

6.3.1 In the event of a discrepancy, a referee analysis of the samples for each lot as specified in 12.1 shall be made in accordance with 11.3.1.

7. Mechanical Properties

7.1 Socket-set screws, when subjected to a torque test in accordance with 12.3.1, shall withstand application of the test tightening torque specified in Table 1 without evidence of the socket reaming or the screw bursting.

7.2 The hardness limits from 70 to 95 HRB (125 to 210 DPH) for Condition AF and 96 HRB to 33 HRC (216 to 327 DPH) for Condition CW shall be met as determined using Test Methods E 18.

TABLE 1 Torsional Strength Requirements

Nominal Screw Size	Shortest Nominal Screw Lengths Subject to Torque Testing			Test Torque, in.-lb, min	
	Cup and Flat Points, mm	Cone and Oval Points	Half Dog Points, mm	AF	CW
0 0.060	0.109	0.125	0.109	0.3	0.6
1 0.073	0.125	0.141	0.125	0.7	1.2
2 0.086	0.125	0.141	0.141	0.7	1.2
3 0.099	0.141	0.156	0.156	1.6	3.3
4 0.112	0.141	0.172	0.156	1.6	3.3
5 0.125	0.188	0.188	0.172	3	5
6 0.138	0.172	0.203	0.188	3	5
8 0.164	0.188	0.219	0.203	9	16
10 0.190	0.188	0.250	0.234	16	26
¼ 0.250	0.250	0.312	0.297	40	67
⅝ 0.312	0.312	0.391	0.359	79	135
¾ 0.375	0.375	0.438	0.438	138	237
7/16 0.437	0.438	0.547	0.484	220	378
½ 0.500	0.500	0.609	0.547	358	600

TABLE 2 Chemical Requirements

UNS Designation	Alloy	Composition, % maximum except as shown								
		Carbon	Manganese	Phosphorus	Sulfur	Silicon	Chromium	Nickel	Copper	Molybdenum
Austenitic Alloys										
S30300	303	0.15	2.00	0.20	0.15 min	1.00	17.0 to 19.0	8.0 to 10.0		0.60 max ^A
S30300	303	0.15	2.00	0.20	0.15 min	1.00	17.0 to 19.0	8.0 to 10.0		0.60 max ^A
S30323	303Se	0.15	2.00	0.20	0.060	1.00	17.0 to 19.0	8.0 to 10.0		Se 0.15 min
S30323	303Se	0.15	2.00	0.20	0.060	1.00	17.0 to 19.0	8.0 to 10.0		Se 0.15 min
S30400	304	0.08	2.00	0.045	0.030	1.00	18.0 to 20.0	8.0 to 10.5	1.00	...
S30400	304	0.08	2.00	0.045	0.030	1.00	18.0 to 20.0	8.0 to 10.5	1.00	...
S30403	304L	0.030	2.00	0.045	0.030	1.00	18.0 to 20.0	8.0 to 12.0	1.00	...
S30403	304L	0.030	2.00	0.045	0.030	1.00	18.0 to 20.0	8.0 to 12.0	1.00	...
S30500	305	0.12	2.00	0.045	0.030	1.00	17.0 to 19.0	10.5 to 13.0	1.00	...
S30500	305	0.12	2.00	0.045	0.030	1.00	17.0 to 19.0	10.5 to 13.0	1.00	...
S38400	384	0.08	2.00	0.045	0.030	1.00	15.0 to 17.0	17.0 to 19.0		...
S38400	384	0.08	2.00	0.045	0.030	1.00	15.0 to 17.0	17.0 to 19.0		...
S20300	XM1	0.08	5.0 to 6.5	0.040	0.18 to 0.35	1.00	16.0 to 18.0	5.0 to 6.5	1.75 to 2.25	0.50 max ^A
S20300	XM1	0.08	5.0 to 6.5	0.040	0.18 to 0.35	1.00	16.0 to 18.0	5.0 to 6.5	1.75 to 2.25	0.50 max ^A
S30430†	XM7	0.03	2.00	0.045	0.030	1.00	17.0 to 19.0	8.0 to 10.0	3.00 to 4.00	...
S30430	18-9LW	0.10	2.00	0.045	0.030	1.00	17.0 to 19.0	8.0 to 10.0	3.0 to 4.0	...
S30433	302HQ	0.03	2.00	0.045	0.030	1.00	17.0 to 19.0	8.0 to 10.0	3.0 to 4.0	...

^AAt the manufacturer's option, determined only when intentionally added.

† Corrected editorially.

8. Corrosion Resistance Requirements Corrosion Resistance Requirements

8.1 Carbide Precipitation:

8.1.1 Rod, bar, and wire in the austenitic alloy groups 1, 2, and 3, except the free-machining grades, 303 and 303Se, used to make fasteners in accordance with this specification shall be capable of passing the test for susceptibility to intergranular corrosion as specified in Practice E of Practices A 262.

8.1.2 As stated in Practices A 262, samples may be subjected to the faster and more severe screening test in accordance with Practice A. Failing Practice A, specimens shall be tested to Practice E and be considered satisfactory if passing Practice E.

9. Dimensions

9.1 Unless otherwise specified, the product shall conform to the requirements of ASME B 18.3.

10. Workmanship, Finish, and Appearance

10.1 *Surface Treatment*—Unless otherwise specified, screws shall be cleaned, descaled, and passivated in accordance with Practice A 380 or Specification A 967 at the option of the manufacturer.

10.2 Surface Discontinuities:

10.2.1 The surface discontinuities for these products shall conform to Specification F 788/F 788M and the additional limitations specified herein.

10.2.1.1 Processing cracks that connect the socket to the periphery of the screw are not permissible. Defects originating on the periphery with a traverse indicating a potential to intersect are not permissible. For peripheral discontinuities, the maximum depth may be 0.06 *D*.

11. Number of Tests

11.1 The requirements of this specification shall be met in continuous mass production for stock and the manufacturer shall make sample inspections to ensure that the product conforms to the specified requirements. Additional tests of individual shipments of fasteners are not ordinarily necessary. A record of the individual heat of steel in each lot shall be maintained. The containers shall be coded to permit identification of the lot.

11.2 When specified in the purchase order, the manufacturer shall furnish a test report of the last complete set of chemical analysis and mechanical tests for each stock size in each shipment.

11.3 When tests of individual shipments are required, Supplementary Requirement S1 must be specified in the inquiry and order.

11.3.1 When the purchaser does not specify the sampling plan and basis of acceptance, the following shall apply.

11.3.1.1 The lot, for purposes of selecting samples, shall consist of all products offered for inspection and testing at one time, that are of the same style, nominal diameter, thread pitch, nominal length, material type, and condition, and surface finish.

11.3.1.2 From each lot, samples shall be selected at random and tested for each requirement in accordance with the following:

Number of Pieces in Lot	Number of Samples
800 and less	1
Over 800 to 8000, incl	2