



Designation: F 880 – 02

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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

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 hazard 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.*

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

2. Referenced Documents

2.1 ASTM Standards:

- A 262 Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels²
- A 342 Test Methods for Permeability of Feebly Magnetic Materials³
- A 380 Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems²
- A 555/A 555M Specification for General Requirements for Stainless Steel Wire and Wire Rods²
- A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products²
- A 967 Specification for Chemical Passivation Treatments for Stainless Steel Parts²
- D 3951 Practice for Commercial Packaging⁴
- E 18 Test Methods for Rockwell Hardness and Rockwell

Superficial Hardness of Metallic Materials⁵

F 593 Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs⁶

F 788/F 788M Specification for Surface Discontinuities of Bolts, Screws, and Studs, Inch and Metric Series⁶

F 1470 Guide for Fastener Sampling for Specific Mechanical Properties and Performance Inspection⁶

2.2 ASME Standard:⁷

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.

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);

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);

4.1.4 Condition 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;

4.1.6 ASTM specification and year of 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 F 880 – XX.

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.

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² Annual Book of ASTM Standards, Vol 01.03.

³ Annual Book of ASTM Standards, Vol 03.04.

⁴ Annual Book of ASTM Standards, Vol 15.09.

⁵ Annual Book of ASTM Standards, Vol 03.01.

⁶ Annual Book of ASTM Standards, Vol 01.08.

⁷ Available from American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036.

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 $1900 \pm 50^\circ\text{F}$ 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.

8. 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

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
⅜ 0.312	0.312	0.391	0.359	79	135
½ 0.375	0.375	0.438	0.438	138	237
⅞ 0.437	0.438	0.547	0.484	220	378
1½ 0.500	0.500	0.609	0.547	358	600