



## Designation: ~~F880M—02 (Reapproved 2008)~~ F880M – 02 (Reapproved 2015)

# Standard Specification for Stainless Steel Socket Set Screws (Metric)<sup>1</sup>

This standard is issued under the fixed designation F880M; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

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

## 1. Scope

1.1 This specification covers the requirements for austenitic grade stainless steel socket set screws (SSS), sizes M1.6 through M24, having Property Classes A1-50 and A1-70.

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

NOTE 1—This specification is the metric companion of Specification **F880**.

1.3 The following hazard caveat pertains only to Section 11, the Test Method Section: *This standard does not purport to address 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*:<sup>2</sup>

**A262** Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels

**A342/A342M** Test Methods for Permeability of Weakly Magnetic Materials

**A380** Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems

**A555/A555M** Specification for General Requirements for Stainless Steel Wire and Wire Rods

**A751** Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products

**A967** Specification for Chemical Passivation Treatments for Stainless Steel Parts

**D3951** Practice for Commercial Packaging

**E3** Guide for Preparation of Metallographic Specimens

**E18** Test Methods for Rockwell Hardness of Metallic Materials

**E92** Test Method for Vickers Hardness of Metallic Materials (Withdrawn 2010)<sup>3</sup>

**E384** Test Method for Knoop and Vickers Hardness of Materials

**F738M** Specification for Stainless Steel Metric Bolts, Screws, and Studs (Withdrawn 2014)<sup>3</sup>

**F788/F788M** Specification for Surface Discontinuities of Bolts, Screws, and Studs, Inch and Metric Series

**F880** Specification for Stainless Steel Socket, Square Head, and Slotted Headless-Set Screws

**F1470** Practice for Fastener Sampling for Specified Mechanical Properties and Performance Inspection

2.2 *ASME Standard*:

**B 18.3.6M** Metric Series Socket Set Screws R<sup>4</sup>

## 3. Classification

3.1 The designation of the property class for the two materials and conditions of this specification shall be consistent with the stainless steel designations in Specification **F738M**.

3.2 The austenitic stainless steel socket set screw shall be designation F880MA1–50 or F880M A1–70.

<sup>1</sup> 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 May 1, 2008; Sept. 1, 2015. Published August 2008; November 2015. Originally approved in 1984. Last previous edition approved in 2002; 2008 as **F880M—02.M—02(2008)**. DOI: 10.1520/F0880M-02R08; 10.1520/F0880M-02R15.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

<sup>4</sup> Available from Global Engineering Documents, 15 Inverness Way, East Englewood, CO 80112-5704, <http://www.global.ihs.com>.

#### 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 (millimetres) and point configuration. A standard part number may be used for this definition;
- 4.1.3 Name of the screw (SSS);
- 4.1.4 Property Class A1-50 or A1-70;
- 4.1.5 Coating, if required. If a finish other than passivation is required, it must be specified on the order or product standard;
- 4.1.6 ASTM designation and year of issue; and
- 4.1.7 Any special or supplemental requirements.

4.2 *Example*—50 000 pieces M6 × 1 × 8 cone point SSS A1-70 ASTM F880M – 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 alloy Class A1-50 screws shall be annealed by heating to  $1040 \pm 30^\circ\text{C}$  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 A1-70 is specified, the austenitic alloys shall be annealed as specified in [5.2](#), generally by the raw material manufacturer, 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 [A555/A555M](#).

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 [12.2.1](#), shall withstand application of the test tightening torque specified in [Table 2](#) without evidence of the socket reaming or the screw bursting.

7.2 The hardness of 95 HRB (210 Vickers) maximum for condition A1-50 and 80 HRB (150 Vickers) minimum for condition A1-70 shall be met as determined using Test Methods [E18](#), [E92](#), or Test Method [E384](#) as appropriate.

**TABLE 1 Torsional Strength Requirements**

Nominal Screw Size	Shortest Nominal Screw Lengths Subject to Torque Testing for:			Test Torque, N-m, min	
	Cup and Flat Points, mm	Cone and Oval Points, mm	Half Dog Points, mm	A1-50	A1-70
1.6	3	3	3	0.03	0.05
2	4	4	4	0.06	0.1
2.5	4	4	4	0.18	0.3
3	4	5	5	0.25	0.42
4	5	6	6	0.8	1.4
5	5	8	8	1.7	2.8
6	6	8	8	3	5
8	8	10	10	7	12
10	10	12	12	14	24
12	12	16	16	25	42
16	16	20	20	63	105
20	25	25	25	126	210
24	25	30	30	200	332

**TABLE 2 Chemical Requirements**

UNS Designation	Alloy	Composition, % maximum except as shown									
		Carbon	Manganese	Phosphorus	Sulfur	Silicon	Chromium	Nickel	Copper	Molybdenum	Other
<b>Austenitic Alloys</b>											
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 <sup>A</sup>	...
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	...	...
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	...	...
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 <sup>A</sup>	...
S30430	18–9LW	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	...	...
S30433	302HQ	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	...	...

<sup>A</sup> At the manufacturer's option, determined only when intentionally added.

## 8. Corrosion Resistance Requirements

### 8.1 Carbide Precipitation:

8.1.1 Rod, bar, and wire in the austenitic alloys groups 1, 2, 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 [A262](#).

8.1.2 As stated in Practices [A262](#), 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 18.3.6M.

## 10. Workmanship, Finish, and Appearance

10.1 *Surface Treatment*—Unless otherwise specified, screws shall be cleaned, descaled, and passivated in accordance with Practice [A380](#) or Specification [A967](#) at the option of the manufacturer.

### 10.2 Surface Discontinuities:

10.2.1 The surface discontinuities for these products shall conform to Specification [F788/F788M](#) 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 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
Over 8000 to 22 000, incl	3
Over 22 000	5

11.3.1.3 Should any sample fail to meet the requirements of a specified test, double the number of samples from the same lot shall be retested for the requirement(s) in which it failed. All of the additional samples shall conform to the specification or the lot shall be rejected.

11.3.1.4 If the failure of a test specimen is due to improper preparation of the specimen or an incorrect testing technique, the specimen shall be discarded and another test specimen submitted.