



Designation: F 880M – 02

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

This standard is issued under the fixed designation F 880M; 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 ( $\epsilon$ ) 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 M1.6 through M24, having Property Classes A1-50 and A1-70.

NOTE 1—This specification is the metric companion of Specification F 880.

1.2 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:

- A 262 Practices for Detecting Susceptibility to Intergranular Attack in Stainless Steels<sup>2</sup>
- A 342 Test Methods for Permeability of Feebly Magnetic Materials<sup>3</sup>
- A 380 Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems<sup>2</sup>
- A 555/A555M Specification for General Requirements for Stainless Steel Wire and Wire Rods<sup>2</sup>
- A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products<sup>2</sup>
- A 967 Specification for Chemical Passivation Treatments for Stainless Steel Parts<sup>2</sup>
- D 3951 Practice for Commercial Packaging<sup>4</sup>
- E 3 Practice for Preparation of Metallographic Specimens<sup>5</sup>
- E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials<sup>5</sup>
- E 92 Test Method for Vickers Hardness Metallic Materials<sup>5</sup>
- E 384 Test Method for Microindentation Hardness of Materials<sup>5</sup>

F 738M Specification for Stainless Steel Metric Bolts, Screws, and Studs<sup>6</sup>

F 788/F788M Specification for Surface Discontinuities of Bolts, Screws, and Studs, Inch and Metric Series<sup>6</sup>

F 880 Specification for Stainless Steel Socket-Set Screws<sup>6</sup>

F 1470 Guide for Fastener Sampling for Specified Mechanical Properties and Performance Inspection<sup>6</sup>

2.2 ASME Standard:

B 18.3.6M Metric Series Socket Set Screws R<sup>7</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 F 738M.

3.2 The austenitic stainless steel socket set screw shall be designation F 880M A1–50 or F 880M A1–70.

### 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 F 880M – 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.

<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.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 01.03.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 03.04.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 15.09.

<sup>5</sup> *Annual Book of ASTM Standards*, Vol 03.01.

<sup>6</sup> *Annual Book of ASTM Standards*, Vol 01.08.

<sup>7</sup> Available from Global Engineering Documents, 15 Inverness Way East, Englewood, CO 80112.

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 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 12.2.1, 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 **E 18**, **E 92**, or Test Method **E 384** as appropriate.

## 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 **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 18.3.6M.

## 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.

**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