Designation: F 912M – 00

METRIC

Standard Specification for Alloy Steel Socket Set Screws [Metric][1]

This standard is issued under the fixed designation F 912M; 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 quenched and tempered alloy steel socket set screws (SSS) M1.6 through M24 sizes having hardnesses 45 to 53 HRC, ISO 898/5 property class 45H.

1.2 These set screws are intended for compression applications only and are not customarily subjected to embrittlement tests. For tensile applications, consult with the manufacturer for proper alloy and hardness.

1.3 The hazard statement pertains only to the test method section, Section 11 of this specification. *This standard does not purport to address all of the safety concerns, if any, 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—This specification is the metric companion of Specification F 912.

2. Referenced Documents

2.1 *ASTM Standards:*

A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products[2]

D 3951 Practice for Commercial Packaging[3]

E 3 Methods of Preparation of Metallographic Specimens[4]

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials[4]

E 112 Test Methods for Determining Average Grain Size[4]

E 384 Test Method for Microhardness of Materials[4]

F 788/F788M Specification for Surface Discontinuities of Bolts, Screws, and Studs, Inch and Metric Series[5]

2.2 *ANSI/ASME Standards:*

B18.3.6M Hexagon Socket Set Screws Metric Series[6]

B18.24.1 Part Identifying Number (PIN) Code System[7]

2.3 *ISO Standard:*

898/5 Mechanical Properties of Fasteners—Set Screws and Similar Threaded Fasteners Not Under Tensile Stress[6]

3. Ordering Information

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

3.1.1 Quantity (number of screws).

3.1.2 Dimensions, including nominal thread designation, thread pitch, nominal screw length (millimetres) and point configuration. A standard part number may be used for this definition.

3.1.3 Name of the screw (SSS).

3.1.4 Coating, if required. See 4.4.

3.1.5 Lot testing, if required. See 10.3.

3.1.6 Certification, if required. See 14.1.

3.1.7 ASTM designation and year of issue.

3.1.8 Any special or supplemental requirements.

3.1.9 For establishment of a part identifying system, see ASME B18.24.1.

3.2 *Example*—50 000 pieces M6x1x8 cone point SSS—certification per 14.1—ASTM F 912M–_ _(state issue date), or 25000 pcs B1836A 060008K SSS—certification per 14.1—ASTM F 912M– _ _(state issue date).

4. Material and Manufacture

4.1 The screws shall be fabricated from alloy steel made to a fine grain practice. In the event of controversy over grain size, referee tests on finished screws conducted in accordance with Test Method E 112 shall prevail.

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

[1] This specification is under the jurisdiction of ASTM Committee F16 on Fasteners and is the direct responsibility of Subcommittee F16.02 on Steel Bolts, Nuts, Rivets, and Washers.

Current edition approved May 10, 2000. Published July 2000. Originally published as F 912M – 85. Last previous edition F 912M – 99.

[2] *Annual Book of ASTM Standards*, Vol 01.03.

[3] *Annual Book of ASTM Standards*, Vol 15.09.

[4] *Annual Book of ASTM Standards*, Vol 03.01.

[5] *Annual Book of ASTM Standards*, Vol 01.08.

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

[7] Available from American Society of Mechanical Engineers, Three Park Avenue, New York, NY 10016–5990.

***A Summary of Changes section appears at the end of this standard.**

4.3 Set screws shall be heat treated by quenching in oil from above the transformation temperature and then tempered by reheating to meet the hardness range specified in 6.2.

4.4 *Standard Finishes*—Unless otherwise specified, the screws shall be furnished with one of the following standard surfaces as manufactured, at the option of the manufacturer; *(1)* bright uncoated; *(2)* thermal black oxide; or *(3)* chemical black oxide. Hydrogen embrittlement tests shall not be required for screws furnished in these conditions.

4.5 *Protective Coatings*:

4.5.1 When a protective finish other than as specified in 4.4 is required, it shall be specified on the purchase order with the applicable finish specification.

4.5.2 When protective or decorative coatings are applied to the screws, precautions specified by the coating requirements to minimize embrittlement shall be exercised.

5. Chemical Composition

5.1 The chemical composition of the screw material shall conform to the heat analysis specified in Table 1.

5.2 One or more of the alloying elements chromium, nickel, molybdenum, or vanadium shall be present in the steel in sufficient quantity to assure that specific strength properties are met after oil quenching and tempering. The steel shall meet the AISI definition of alloy steel, that is, maximum and minimum element content requirement or minimum element limits specified.

5.3 Alloy steel to which bismuth, selenium, tellurium, or lead has been intentionally added to improve machinability shall be permitted.

5.4 Material analysis may be made by the purchaser from finished products and the chemical composition thus determined shall confirm to the requirements specified for the product analysis in Table 1.

6. Mechanical Properties

6.1 Socket set screws when subjected to a torque test in accordance with 11.2 shall withstand application of the test tightening torque specified in Table 2 without evidence of the socket reaming or the screw bursting.

6.2 Socket set screws shall have a hardness of 45 to 53 HRC. The point end hardness within 0.04 mm distance from the surface shall be equal to or greater than the measured core hardness but shall not exceed 53 HRC (560 DPH).

7. Other Requirements

7.1 *Decarburization*:

7.1.1 There shall be no evidence of gross decarburization of the surfaces of the heat-treated screws when measured in accordance with 11.4.

TABLE 1 Chemical Requirements

NOTE 1—Plus alloys per 5.2.

Element	Composition, %	
	Heat Analysis	Product Analysis
Carbon	0.30 to 0.48	0.28 to 0.50
Phosphorus, max	0.035	0.040
Sulfur, max	0.040	0.045

TABLE 2 Torsional Strength Requirements

Nominal Screw Size	Shortest Nominal Screw Lengths Subject to Torque Testing for			Test Torque N-m, min
	Cup and Flat Points	Cone and Oval Points	Half Dog Points	
1.6	3	3	3	0.1
2	4	4	4	0.2
2.5	4	4	4	0.6
3	4	5	5	1.0
4	5	6	6	2.1
5	5	8	8	4.7
6	6	8	8	7.7
8	8	10	10	17.8
10	10	12	12	35
12	12	16	16	57
16	16	20	20	126
20	25	25	25	252
24	25	30	30	420

7.1.2 The depth of partial decarburization shall be limited to the values in Table 3 when measured as shown in Fig. 1. and in accordance with 11.4.

8. Dimensions

8.1 Unless otherwise specified, the product shall conform to the requirements of ANSI/ASME B18.3.6M.

9. Workmanship, Finish, and Appearance

9.1 *Surface Discontinuities*:

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

9.1.2 Processing defects that connect the socket to the periphery of the screw are not permissible. Defects originating on the periphery and with a traverse indicating a potential to intersect are not permissible.

9.1.3 Threads shall have no laps at the root or on the flanks, as shown in Fig. 2(*a*). Laps are permitted at the crest (Fig. 2(*c*)) that do not exceed 25 % of the basic thread depth and on the flanks outside the pitch cylinder. Longitudinal seams rolled

TABLE 3 Decarburization Limits for Threads[A]

Thread Pitch, *P*, mm	Basic Thread Height, $h = 0.6135P$ mm	$N = 3/4$ h min, mm	Root, 0.1 h, mm
0.7	0.429	0.322	0.043
0.8	0.491	0.368	0.049
1	0.613	0.460	0.061
1.25	0.767	0.575	0.077
1.5	0.920	0.690	0.092
1.75	1.074	0.806	0.107
2	1.227	0.920	0.123
2.5	1.534	1.151	0.153
3	1.840	1.380	0.184
3.5	2.147	1.610	0.215
4	2.454	1.841	0.245
4.5	2.761	2.071	0.276
5	3.068	2.301	0.307

[A] See Fig. 2.