

FF-S-210B
July 16, 1981

SUPERSEDING
Fed. Spec. FF-S-210A
October 24, 1969
(See 6.5)

FEDERAL SPECIFICATION

SETSCREWS: SQUARE HEAD (INCH) AND SLOTTED HEADLESS (INCH AND METRIC)

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal Agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers square head (inch) and slotted headless setscrews (inch and metric). See 6.1 for recommended style usage limitation.

1.2 Classification.

1.2.1 Types. Setscrews shall be of the following types, as specified (see 6.2).

- Type I - Square head, inch dimensions
- Type II - Slotted headless, inch dimensions
- Type III - Slotted headless, metric dimensions

1.2.2 Styles. Setscrews shall be of the following styles, as specified (see 6.2).

- Style 1 - Flat point
- Style 2 - Cone point
- Style 3 - Oval point
- Style 4 - Cup point
- Style 5 - Full-dog point
- Style 6 - Half-dog point

1.2.3 Size. Setscrews shall be classified by size in accordance with the basic major diameter of the thread (see 6.2).

1.2.4 Length. Setscrews shall be of the length specified in 6.2.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

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Federal Specifications

- QQ-B-637 - Brass, Naval: Rod, Wire, Shapes, Forgings and Flat Products with Finished Edges (Bar, Flat Wire, and Strip)
- QQ-N-281 - Nickel-Copper-Alloy Bar, Rod, Plate, Sheet, Strip, Wire, Forging, and Structural and Special Shaped Sections
- QQ-P-416 - Plating, Cadmium (Electrodeposited)
- QQ-W-321 - Wire, Copper Alloy
- PPP-H-1581 - Hardware (Fasteners and Related Items), Packaging and Packing for Shipment and Storage of

Federal Standards

- FED-STD-66 - Steel, Chemical Composition and Hardenability
- FED-STD-151 - Metal, Test Methods
- FED-STD-H28/2 - Screw-Thread Standards for Federal Services, Section 2, Unified Thread Form and Thread Series for Bolts, Screws, Nuts, Tapped Holes and General Applications
- FED-STD-H28/21 - Screw-Thread Standards for Federal Services, Section 21, Metric, Screw-Threads

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions as outlined under General Information in the Index of Federal Specifications, Standards and Commercial Item Descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification, other Federal specifications, and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston; New York; Washington, DC; Philadelphia; Atlanta; Chicago; Kansas City, MO; Fort Worth; Houston; Denver; San Francisco; Los Angeles; and Seattle, WA.

(Federal Government activities may obtain copies of Federal specifications, standards, and commercial item descriptions, and the Index of Federal Specifications, Standards, and Commercial Item Descriptions from established distribution points in their agencies.)

Military Specifications

- MIL-F-495 - Finish, Chemical, Black, for Copper Alloys
- MIL-H-6875 - Heat Treatment of Steels (Aircraft Practice), Process for
- MIL-C-13924 - Coating, Oxide, Black, for Ferrous Metals
- MIL-I-17214 - Indicator, Permeability; Low-Mu (Go-No Go)

Military Standards

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
- DS51409 - Setscrew, Slotted Headless, Cone Point, Carbon Steel, Cadmium Plated, Metric
- DS51410 - Setscrew, Slotted Headless, Cup Point, Carbon Steel, Cadmium Plated, Metric
- DS51411 - Setscrew, Slotted Headless, Flat Point, Carbon Steel, Cadmium Plated, Metric

(Copies of Military specifications and standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

American National Standards Institute (ANSI) Standard:

- ANSI B18.6.2 - Slotted Head Cap Screws, Square Head Set Screws, and Slotted Headless Set Screws

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

American Society for Testing and Materials (ASTM) Standards:

- ASTM E18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials, Test For
- ASTM A380 - Cleaning and Descaling Stainless Steel Parts, Equipment and Systems

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

3. REQUIREMENTS

3.1 Material. Recycled and reclaimed materials shall be used to the maximum extent practicable. Setscrews shall be made of one of the following materials, as specified (see 6.2).

3.1.1 Low-carbon steel. Low-carbon steel shall be composition 1010 thru 1020 or free machining low-carbon steel, composition 1112, 1113 and leaded steels in accordance with FED-STD-66.

3.1.2 Medium-carbon steel. Medium-carbon steel shall be composition 1035 thru 1045 or 1137 thru 1144 in accordance with FED-STD-66.

3.1.3 Alloy steel. Alloy steel shall be composition 4032, 4037, 4137, 4140, 8630, 8740 or equivalent in accordance with FED-STD-66, which can be heat treated in accordance with MIL-H-6875 to meet the hardness requirement of 3.3.

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3.1.4 Corrosion-resistant steel.

3.1.4.1 Austenitic. Austenitic corrosion-resistant steel shall be of the 300 Series in accordance with FED-STD-66 or any other austenitic corrosion-resistant steel developed for cold heading or free machining.

3.1.4.1.1 Magnetic permeability. Austenitic corrosion-resistant steel setscrews shall have a magnetic permeability of 2.0 max (air = 1.0) for a field strength of $H = 200$ oersteds (16 kA/m) when using a magnetic indicator in accordance with MIL-I-17214.

3.1.4.2 Martensitic. Martensitic corrosion-resistant steel shall be steel nos. 410 or 416 in accordance with FED-STD-66.

3.1.5 Brass. Brass shall be in accordance with alloy no. 462 of QQ-B-637 or alloy nos. 260, 270 and 274 of QQ-W-321.

3.1.6 Nickel-copper alloy. Nickel-copper alloy shall be in accordance with QQ-N-281.

3.2 Protective finish. Unless otherwise specified (see 6.2), setscrews shall be furnished uncoated. When specified (see 6.2), protective finishes shall be as follows.

3.2.1 Cadmium plating. Carbon and alloy steel setscrews shall be cadmium plated in accordance with QQ-P-416, type II, class 3 (0.0002 in. thick or 5.1 μ m thick).

3.2.2 Passivation. Corrosion-resistant steel setscrews shall be passivated in accordance with ASTM A380.

3.2.3 Black oxide.

3.2.3.1 Brass. Brass setscrews shall be black oxide coated in accordance with MIL-F-495.

3.2.3.2 Corrosion-resistant steel. Corrosion-resistant steel setscrews shall be black oxide coated in accordance with MIL-C-13924, class 4.

3.2.4 Hydrogen embrittlement. Cadmium plated alloy steel setscrews shall be subjected to an embrittlement relief treatment in accordance with QQ-P-416 as soon as possible after plating to minimize the resulting embrittlement.

3.3 Hardness. Alloy steel setscrews shall be hardened by heat treatment to 45-53HRC. Low and medium carbon steel setscrews shall be hardened by heat treatment to 30-37HRC or shall be surface hardened to not less than 64HR30N. Martensitic corrosion-resistant steel setscrews shall be hardened by heat treatment to 35-45HRC.

3.3.1 Decarburization. The complete and partial decarburization of the threads of heat-treated setscrews shall not exceed the amounts shown in figure 1 or the amount for any other class as may be specified in the contract or order. A carbon content throughout the threads equivalent to that of the core is desirable.

3.4 Design.

3.4.1 Dimensions. Dimensions and tolerances of setscrews with inch dimensions shall be in accordance with ANSI B18.6.2. Slotted setscrews with metric dimensions shall be in accordance with applicable Military Standards.

3.4.2 Threads. Unless otherwise specified (see 6.2), the inch system threads shall be class 2A in both UNC and UNF series in accordance with FED-STD-H28/2. Metric system threads shall be "M" profile tolerance class 6g, before coating or plating in accordance with FED-STD-H28/21.

3.5 Workmanship. Setscrews shall be free from burrs, seams, laps, loose scale, irregular surfaces and any other defects which may affect serviceability.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the contractor may use his own or any other facilities suitable for the performance of inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Inspection provisions.

4.2.1 Lot. A lot shall consist of all setscrews of the same type, style, material, protective finish, size and thread produced under essentially the same conditions and offered for acceptance at one time.

4.2.2 Sampling for examination. A random sample of setscrews shall be taken from each lot in accordance with MIL-STD-105, inspection level II. The Acceptable Quality Level (AQL) shall be as specified in table I.

4.2.3 Sampling for hardness and decarburization tests. A random sample of setscrews shall be taken from each lot in accordance with MIL-STD-105, inspection level S-1, with an AQL of 1.0 percent defective.

4.2.4 Sampling for protective finish tests. Sampling for tests of protective finishes shall be in accordance with the applicable specifications in 3.2.

4.2.5 Sampling for chemical analysis. When specified (see 6.2), a random sample of setscrews shall be taken from each lot in accordance with MIL-STD-105, inspection level S-1, with an AQL of 1.5 percent defective. Samples previously selected for examination or for the hardness and decarburization tests may be used.

4.2.6 Sampling for examination of packaging and packing. Sampling for examination of packaging, packing and marking shall be in accordance with PPP-H-1581.

4.3 Examination. Each setscrew taken as specified in 4.2.2 shall be examined to verify conformance with this specification. Examination shall be conducted in accordance with table I. Any setscrew in the sample containing one or more defects shall be rejected and if the number of defective setscrews in any sample exceeds the acceptance number for that sample, the lot represented by the sample shall be rejected.

TABLE I. Classification of defects.

Categories	Defects	Inspection method
Critical	None Defined	
Major 101 102	AQL = 2.5 Thread Width across flats	SIE* SIE
Minor 201 202 203 204 205 206 207	AQL = 4.0 Thread length Applicable point dimensions Setscrew length Other dimensions Eccentricity Workmanship (see 3.5) Magnetic permeability (see 3.1.4.1.1)	SIE SIE SIE SIE SIE Visual SIE

*SIE = Standard inspection equipment

4.4 Tests.

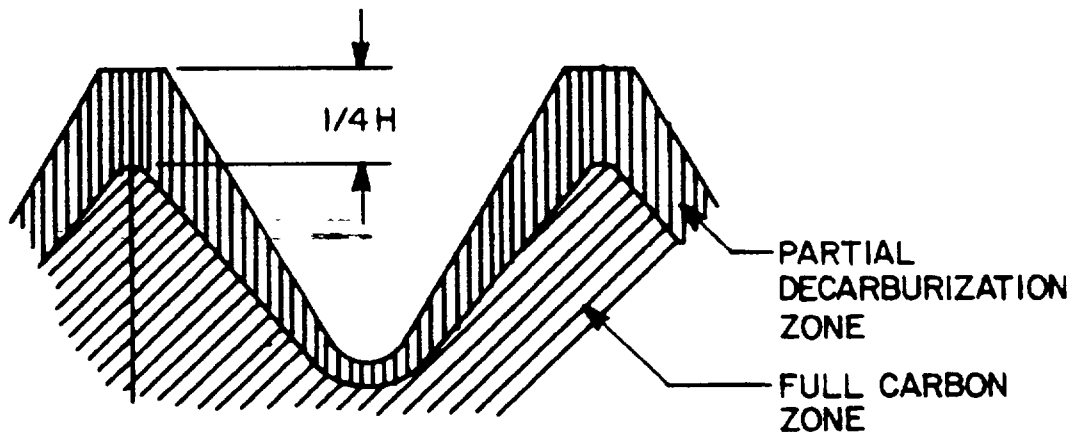
4.4.1 Hardness. Each setscrew taken as specified in 4.2.3 shall be subjected to a hardness test in accordance with ASTM E18.

a. Setscrews, having a length of 2 diameters or longer, shall be tested on a transverse section through the threads at a point one-quarter of the nominal diameter from the axis and one nominal diameter from the point.

b. Setscrews having a length less than 2 diameters shall be tested on a transverse section through the threads at a point one-quarter of the nominal diameter from the axis and located at the first full thread from the point.

c. Setscrews having nominal diameters of 1/4" (6 mm) and larger shall be tested using the Rockwell C scale. For sizes smaller than 1/4" (6 mm) the Rockwell 30N scale shall be used.

4.4.2 Decarburization Each setscrew taken as specified in 4.2.3 shall be subjected to a decarburization test conducted as follows: The threaded part of the setscrew shall be sectioned longitudinally through the axis and polished so that rounding of the thread edges is held to a minimum. The section shall be etched with the usual metallographic etchants (such as nital) and examined with a metal-lurgical microscope. Measurements shall be made from the crest of the thread to the end of the decarburized zone. This distance shall not exceed that indicated in figure 1 for inch and metric setscrews. Measurements shall be made with a fixed-scale micrometer eyepiece. This test does not apply to austenitic corrosion-resistant steel.



Inch	
Thds per inch	$\frac{1}{4} H \frac{1}{\text{inches}}$
80	.002
72	.002
64	.003
56	.003
48	.003
44	.004
40	.004
36	.005
32	.005
28	.006
24	.007
20	.008
18	.009
16	.010
14	.012
13	.012
12	.014
11	.015
10	.016
9	.018
8	.020
7	.023
6	.027

Metric	
Thread Pitch	$\frac{1}{4} H \frac{1}{\text{mm}}$
0.30	0.047
0.40	0.054
0.45	0.061
0.50	0.068
0.70	0.095
0.80	0.108
1.00	0.135
1.25	0.169
1.50	0.203
1.75	0.237
2.00	0.271
2.50	0.338
3.00	0.406

$\frac{1}{4} H = \frac{1}{4} \text{ BASIC THREAD DEPTH}$

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FIGURE 1. Decarburization limits.

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4.4.3 Protective finish. Protective finish tests shall be conducted in accordance with the applicable specifications in 3.2.

4.4.4 Chemical analysis. Each setscrew selected as specified in 4.2.5 shall be subjected to a chemical analysis conducted in accordance with FED-STD-151 to verify conformance to the applicable material specification. A steel mill certification will be acceptable in lieu of this test.

4.4.5 Examination and test of packaging and packing. Examination and test of packaging, packing and marking shall be in accordance with PPP-H-1581.

4.4.6 Hydrogen embrittlement. The contractor shall furnish the Government certification that cadmium plated alloy steel setscrews have been subjected to the embrittlement relief treatment specified in 3.2.4.

5. PREPARATION FOR DELIVERY.

5.1 Packaging requirements. The requirements for packaging shall be in accordance with PPP-H-1581, as specified (see 6.2).

6. NOTES

6.1 Intended use. Setscrews covered by this specification are intended to be used to locate machine parts in relation to each other, either permanently or temporarily. It is recommended that cup point setscrews, style 4, be used wherever possible. For hardened shafts or when the cutting in of the cup point is objectionable, styles 1 or 6 should be used. It is recommended that styles 2, 3 or 5 be used only when it is impractical to use the other styles. For metric setscrews, it is recommended that styles be limited to 1, 2, or 4.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

- a. Title, number and date of this specification.
- b. Title, number and date of military standard, if applicable.
- c. Military standard part number, if applicable.
- d. Type, style, size, length (see 1.2).
- e. Thread series and class (see 3.4.2).
- f. Material (see 3.1).
- g. Protective finish, if required (see 3.2).
- h. Chemical analysis, when required (see 4.2.5).
- i. Level (degree) of protection, in accordance with PPP-H-1581, ordering data (see 5.1).

6.3 Metric terms and definitions. Metric terms used in this specification are defined in American Society for Testing and Materials Standard ASTM E 380, Standard for Metric Practice.

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6.4 Military procurement. Items procured under this specification for military use are to be limited (whenever possible) to the variety shown on the applicable Military Standards. Personnel of military departments are requested to refer to these documents for guidance.

6.5 Supersession data. Cross reference between the types and styles of setscrews covered in part by this specification and FF-S-200, and the types and styles of the superseded FF-S-103, dated October 7, 1958, is as follows:

FF-S-103 Types	FF-S-210 Types	FF-S-200 Types
Type I - Square Head	Type I - Square Head - Inch	---
Type II - Slotted Headless	Type II - Slotted Headless - Inch	---
Type III - Hexagon Socket, Headless	---	Type I - Hexagon Socket, Headless
Type IV - Fluted Socket, Headless	---	Type II - Spline Socket, Headless
	Type III - Slotted Headless - Metric	
Styles	Styles	Styles
Style 1 - Flat point Style 2 - Cone point Style 3 - Oval point Style 4 - Cup point Style 5 - Full-dog point Style 6 - Half-dog point	Style 1 - Flat point Style 2 - Cone point Style 3 - Oval point Style 4 - Cup point Style 5 - Full-dog point Style 6 - Half-dog point	Style 1 - Flat point Style 2 - Cone point Style 3 - Oval point Style 4 - Cup point Style 5 - Full-dog point Style 6 - Half-dog point

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Military Custodians:

Army - AR
Air Force - 99

Reviewing Activities:

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NSA - NS

User Activities:

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Navy - MC, OS, SH

Civil Agency Coordinating Activities:

GSA-FSS
Commerce - NBS

Preparing Activity:

Army - AR

Agent:

DLA-IS

Project Number:

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