

INCH-POUND

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SUPERSEDING
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MILITARY SPECIFICATION

PIN, STRAIGHT, HEADED

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification establishes the requirements for the manufacture and inspection of one type of straight headed pin.

1.2 Classification. Pins shall be fabricated from any one of the following compositions (see 3.1):

- a. 4037, 4130 or 8630, steel alloy.
- b. PH13-8Mo, corrosion resistant steel (cres).
- c. Ti-6Al-4v, titanium alloy.
- d. 8740 steel alloy.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards and handbooks. Unless otherwise specified, the following specifications, standards and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

Beneficial comments, (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to the Naval Air Engineering Center, Engineering Specifications and Standards Department (Code 93), Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or letter.

AMSC N/A
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FSC 5315

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SPECIFICATIONS

FEDERAL

QQ-C-320 Chromium Plating (Electrodeposited).
 QQ-P-416 Plating, Cadmium (Electrodeposited).
 PPP-H-1581 Hardware (Fasteners and Related Items),
 Packaging of.

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MIL-S-6049 Steel, Chrome-Nickel-Molybdenum (8740) Bars and
 Reforging Stock (Aircraft Quality)
 MIL-S-6050 Steel, Chrome-Nickel-Molybdenum (8630) Bars and
 Reforging Stock (Aircraft Quality).
 MIL-S-6758 Steel, Chrome-Molybdenum (4130) Bars and Reforging
 Stock Aircraft Quality.
 MIL-H-6875 Heat Treatment of Steels (Aircraft Practices),
 Process for.
 MIL-T-9047 Titanium and Titanium Alloy Bars (Rolled or
 Forged) and Reforging Stock, Aircraft Quality.
 MIL-L-46010 Lubricant, Solid Film, Heat Cured, Corrosion
 Inhibiting.
 MIL-C-83488 Coating, Aluminum, Ion Vapor Deposited.

STANDARDS

MILITARY

MIL-STD-105 Sampling Procedures and Tables for Inspection
 by Attributes.
 MIL-STD-1312 Fasteners, Test Methods.
 MS20392 Pin, Straight Headed.

(Copies of specifications, standards, handbooks, drawings, and
 publications required by manufacturers in connection with specific
 acquisition functions should be obtained from the contracting activity
 or as directed by the contracting officer.)

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2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

Society of Automotive Engineers, Inc.

- AMS 2300 Premium Aircraft Quality Steel Cleanliness, Magnetic Particle Inspection Procedure.
- AMS 2301 Aircraft Quality Steel Cleanliness, Magnetic Particle Inspection Procedure.
- AMS 2631 Ultrasonic Inspection of Titanium Alloys.
- AMS 5629 Steel Bars, Forgings, Rings, and Extrusions, Corrosion Resistant.
- AMS 2632 Ultrasonic Inspection of Thin Materials 0.5 Inch (13 mm) and Thinner.
- AMS 6300 Steel Bars and Forgings, 0.25 Mo (0.35-0.40C) (SAE 4037).

(Applications for copies of AMS publications should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096).

American Society for Testing and Materials

- ASTM A380 Cleaning and Descaling Stainless Steel Parts, Equipment and Systems.
- * ASTM E1444 Magnetic Particle Examination, Standard Practice for.

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

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

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3. REQUIREMENTS

3.1 Material. Headed straight pins shall be fabricated from any of the following materials as specified (see 6.2):

- a. Steel alloy - UNS G40370 (AISI 4037) per AMS 6300 or UNS G41300 (AISI 4130) per MIL-S-6758 or UNS G86300 (AISI 8630) per MIL-S-6050.
- b. Steel alloy - UNS G87400 (AISI 8740) per MIL-S-6049.
- c. Cres (PH13-Mo) - UNS S13800 (AISI S13800) per AMS 5629.
- d. Titanium alloy (Ti-6Al-4v) - UNS R56400 per MIL-T-9047.

3.2 Design and construction. Headed straight pins shall be of the material, size and dimensions specified on MS20392.

3.2.1 Shear strength. The shear strength of the pins shall be not less than that specified in table I, table II, table III, and table IV for 4037, 4130, and 8630 steel alloy, cres, titanium alloy and 8740 respectively.

TABLE I. Shear strength of steel alloy, 4037, 4130, and 8630, headed straight pins. 1/

Nominal Size	Minimum strength in double shear (pounds)	Minimum strength in single shear (pounds)
.125	1,840	920
.156	2,860	1,430
.188	4,140	2,070
.250	7,360	3,680
.312	11,500	5,750
.375	16,580	8,290
.438	22,540	11,270
.500	29,440	14,720
.562	37,280	18,640
.625	46,020	23,010
.750	66,280	33,140
.875	90,200	45,100
1.00	117,820	58,910

1/ Unit shear stress is 75,000 pounds per square inch (psi) in single shear, based on 125,000 psi minimum tensile strength.

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TABLE II. Shear strength of cres, PH13-8Mo, headed straight pins. 1/

Nominal Size	Minimum strength in double shear (pounds)	Minimum strength in single shear (pounds)
.125	3,080	1,540
.156	4,780	2,390
.188	6,900	3,450
.250	12,280	6,140
.312	19,180	9,590
.375	27,620	13,810
.438	37,580	18,790
.500	49,080	24,540
.562	62,120	31,060
.625	76,700	38,350
.750	110,460	55,230
.875	150,320	75,160
1.00	196,360	98,180

1/) Unit shear stress is 125,000 psi in single shear, based on 220,000 psi minimum tensile strength.

TABLE III. Shear strength of titanium alloy, Ti-6Al-4V, headed straight pins. 1/

Nominal Size	Minimum strength in double shear (pounds)	Minimum strength in single shear (pounds)
.125	2,340	1,170
.156	3,640	1,820
.188	5,240	2,620
.250	9,320	4,660
.312	14,580	7,290
.375	21,000	10,500
.438	28,560	14,280
.500	37,300	18,650
.562	47,220	23,610
.625	58,300	29,150
.750	83,940	41,970
.875	114,240	57,120
1.000	149,220	74,610

1/ Unit shear stress is 95,000 psi in single shear, based on 160,000 psi minimum tensile strength.

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TABLE IV. Shear strength of steel alloy, 8740, headed, straight pins. 1/

Nominal Size	Minimum strength in double shear (pounds)	Minimum strength in single shear (pounds)
.125	2,660	1,330
.156	4,120	2,060
.188	5,960	2,980
.250	10,600	5,300
.312	16,560	8,280
.375	23,860	11,930
.438	32,480	16,240
.500	42,420	21,210
.562	53,680	26,840
.625	66,260	33,130
.750	95,420	47,710
.875	129,880	64,940
1.000	169,640	84,820

1/ Unit shear stress is 108,000 psi in single shear, based on 180,000 psi minimum tensile strength.

3.3 Heat treatment. 4037, 4130, and 8630 steel alloy pins shall be heat treated to 125,000 to 150,000 psi tensile strength in accordance with MIL-H-6875 and shall have a Rockwell hardness of C26.5 to C32. Cres pins shall be heat treated to 220,000 to 240,000 psi tensile strength in accordance with MIL-H-6875. Titanium alloy pins shall be heat treated to 160,000 to 180,000 psi tensile strength in accordance with MIL-H-81200. 8740 steel alloy pins shall be heat treated 180,000 to 200,000 psi tensile strength in accordance with MIL-H-6875 and shall have a Rockwell hardness of 39 HRC to 43 HRC.

3.4 Finish. Steel alloy pins shall be cadmium plated in accordance with QQ-P-416, Type II, Class 2. Cres pins shall either be chrome plated in accordance with QQ-C-320, class 2, or cleaned, descaled and passivated in accordance with ASTM A380. Titanium alloy pins shall either have no finish or shall be aluminum coated in accordance with MIL-C-83488, Class 3, and lubricated with solid film lubricant in accordance with MIL-L-46010.

3.5 Workmanship. Pins shall be free from burrs, fins, cracks, tool marks, rust, scale and other defects which might adversely affect their serviceability.

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3.6 Recycled, virgin and reclaimed materials. There is no exclusion to the use of recycled or reclaimed materials and no mandate for the use of virgin materials as long as it meets the requirements of this specification.

4. QUALITY ASSURANCE

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

4.2 Classification of inspection. The inspection requirement specified herein is classified as quality conformance inspection.

4.3 Quality conformance inspection.

4.3.1 Inspection lot. An inspection lot shall be as defined in MIL-STD-105 and shall consist of all pins of the same MS part number which, if heat treated, shall have been heat treated in the same batch and shall be submitted for inspection at the same time in connection with the same contract or order.

4.3.2 Sampling plan. Sample pins shall be selected at random from the inspection lot in accordance with MIL-STD-105 for inspection level I, acceptable quality level (AQL) 2.5 percent defective for all tests except the shear test. Sample pins for the shear test shall be selected in accordance with MIL-STD-105 for special inspection level S-3. The AQL shall be 1.0 percent defective (see 4.4.4).

4.3.3 Rejected lots. If an inspection lot is rejected, the manufacturer may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. Where the original acceptance number was zero, a sample size represented by the next higher sample size code letter shall be selected. Resubmitted lots shall be inspected by the manufacturer under the supervision of the Government inspector using the tightened inspection procedure of MIL-STD-105 and shall not thereafter be tendered for acceptance unless the former rejection or requirement of correction is disclosed.

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4.4 Inspection methods.

4.4.1 Examination of product. Pins shall be inspected for conformance to the requirements of this specification and applicable military standard with respect to materials, finish, dimensions and workmanship. A steel producer's certification of the ladle analysis of material may be accepted in lieu of conducting a chemical analysis.

4.4.2 Hardness. Sample steel alloy pins shall be tested for hardness in accordance with MIL-STD-1312, Test 6. Steel alloy pins shall have a Rockwell hardness as specified in 3.3.

* 4.4.3 Discontinuities. Sample steel alloy and cres pins shall be magnetic particle inspected for discontinuities in accordance with ASTM E1444. Acceptance and rejection criteria shall be in accordance with AMS 2301 and AMS 2300 for steel alloy and cres pins respectively. Sample titanium pins, .500 inch or greater in diameter, shall be ultrasonically inspected per AMS 2631. Sample titanium pins, less than .500 inch, shall be ultrasonically inspected per AMS 2632.

4.4.4 Shear. The test specimens selected shall be tested in double shear in accordance with MIL-STD-1312, Test 13. When the pin is too short for double shear, it shall be tested in single shear in accordance with MIL-STD-1312, Test 20.

4.4.5 Inspection of packaging. The sampling and inspection of the preservation, packing and container marking shall be in accordance with the requirement of PPP-H-1581.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with PPP-H-1581.

6. NOTES

6.1 Intended use. The pins covered by this specification are intended for use with clevises, rod ends, and shackles.

6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number and date of this specification.
- b. MS part number and the quantity desired (see 3.2).
- c. Levels of preservation-packaging and packing (see 5.1).

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6.3 Subject term (key word) listing.

- a. Pin
- b. Pin, Straight
- c. Pin, Headed
- d. Pin, Steel

6.4 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:

Army - AR
Navy - AS
Air Force - 99

Preparing activity:

Navy - AS
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Review activities:

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Air Force - 82

User activity:

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