

MIL-P-10971E
23 May 1969
SUPERSEDING
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MILITARY SPECIFICATION
PIN, SPRING, TUBULAR (COILED AND SLOTTED)

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

1. SCOPE

1.1 Scope. This specification covers tubular-shaped spring pins constructed to resist reduction in pin diameter by means of spring action.

1.2 Classification. Spring pins shall be of the following types, classes and compositions as specified (see 6.2).

1.2.1 Types. Spring pins shall be of the following types:

Type I - Slotted
Type II - Coiled

1.2.2 Classes. Type II spring pins shall be of the following classes:

Class 1 - Heavy duty
Class 2 - Standard duty
Class 3 - Light duty

1.2.3 Compositions. Spring pins shall be of the following compositions:

Composition A - Carbon steel
Composition B1 - Austenitic corrosion-resisting steel
Composition B2 - Ferritic and martensitic corrosion-resisting steel
Composition C - Beryllium-copper alloy
Composition D - Alloy steel

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2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

Federal

- QQ-C-533 - Copper-Beryllium Alloy Strip
- QQ-P-35 - Passivation Treatments for Austenitic, Ferritic and Martensitic Corrosion-Resisting Steel
- QQ-P-416 - Plating, Cadmium (Electrodeposited)

Military

- MIL-H-3982 - Hardware (Fasteners and Related Items); Packaging and Packing for Shipment and Storage of
- MIL-P-16232 - Phosphate Coatings, Heavy Manganese or Zinc Base (For Ferrous Metals)
- MIL-I-17214 - Indicator, Permeability; Low MU (Go-No Go)

STANDARDS

Federal

- Fed. Std. No. 66 - Steel: Chemical Composition and Hardenability

Military

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
- MIL-STD-109 - Quality Assurance Terms and Definitions
- MIL-STD-129 - Marking for Shipment and Storage
- MS9047 - Pin-Spring, Steel, Phosphate Finish
- MS9048 - Pin-Spring, Steel, Cadmium Plated
- MS16562 - Pins, Spring, Tubular, Slotted
- MS33547 - Pins, Spring, Functional Limitations of a Design Standard
- MS39086 - Pin, Spring-Tubular, Coiled, Heavy Duty
- MS51923 - Pin, Spring-Tubular, Coiled, Standard Duty
- MS51987 - Pin, Spring-Tubular, Coiled, Light Duty
- MS171401 to MS171900 - Pin, Spring, Corrosion-Resisting Steel

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(Copies of specifications, standards, drawings, and publications required by suppliers 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 otherwise indicated, the issue in effect on date of invitation for bids or request for approval shall apply.

Aerospace Materials Specifications

- AMS2400 - Cadmium Plating
- AMS5120 - Steel Strip
- AMS5121 - Steel Strip
- AMS5506 - Steel Sheet and Strip, Corrosion and Moderate Heat Resistant

(Applications for copies of A.M.S. specifications should be addressed to the Society of Automotive Engineers, Inc., 2 Pennsylvania Plaza, New York, New York 10001.)

National Aerospace Standards

- NAS561 - Pins-Spring, Slotted and Coiled, Heavy Duty
- NAS1407 - Pin-Spring, Coiled

(Application for copies should be addressed to the National Standards Association, Inc., 1321 Fourteenth Street, N.W., Washington, D.C. 20005.)

"Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies."

3. REQUIREMENTS

3.1 Materials. Spring pins shall be manufactured from the materials specified in 3.1.1, 3.1.2, 3.1.3 or 3.1.4 as specified in the contract or order (see 1.2.3 and 6.2).

3.1.1 Composition A. Carbon steel shall conform to the requirements of any of the Steel Numbers 1070 thru 1095, as specified in Fed. Std. No. 66, AMS5120 and AMS5121 as specified in MS9047 and MS9048, or as shown on applicable documents.

3.1.2 Composition B.

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3.1.2.1 Composition B1 (Austenitic). Austenitic corrosion resisting steel shall have the composition of Steel Number 302 as specified in Fed. Std. No. 66 and shall have a magnetic permeability of 3.0 maximum (Air = 1.0) at a field strength of $H = 200$ oersteds (see 4.4.7).

3.1.2.2 Composition B2 (Ferritic and Martensitic). Ferritic and martensitic corrosion resisting steel shall have the composition of Steel Numbers 410 thru 420 where applicable and as specified in Fed. Std. No. 66, and AMS 5506 as specified in MS171401 thru MS171900.

3.1.3 Composition C. Beryllium-copper alloy shall conform to the requirements specified in QQ-C-533.

3.1.4 Composition D. Alloy steel shall conform to the requirements of Steel Number 6150 as specified in Fed. Std. No. 66 or shall be alloy spring steel conforming to the following chemical composition:

Carbon	0.52% - 0.60%
Manganese	0.70% - 1.00%
Silicon	1.50% - 1.80%
Sulphur	0.05% max
Phosphorous	0.05% max

3.2 Slotted pins. The designs, sizes, dimensions and tolerances of Type I (slotted) pins shall be as specified on MS9047, MS9048, MS16562, MS171401 thru 171900, and NAS561.

3.3 Coiled pins. The designs, sizes, dimensions and tolerances of Type II (coiled) pins shall be as specified on MS39086, MS51923, MS51987, NAS 561 and NAS 1407.

3.4 Protective finish.

3.4.1 Carbon and alloy steel pins. Carbon and alloy steel pins shall be furnished with one of the protective finishes specified in 3.4.1.1, 3.4.1.2 or 3.4.1.3 (see 6.2).

3.4.1.1 Black oiled finish. Pins shall be furnished with a black, tumbled, oil dipped finish.

3.4.1.2 Cadmium plating. Cadmium plating shall be in accordance with AMS 2400 as specified in MS9048 or QQ-P-416, Type II, Class 3.

3.4.1.3 Phosphate coating. Phosphate coating shall be Type 2, Class 2 in accordance with MIL-P-16232.

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3.4.1.4 Hydrogen embrittlement. Hydrogen embrittlement of the carbon and alloy steel pins due to protective finishes shall be relieved as specified in the applicable finish specification.

3.4.2 Corrosion resisting steel (CRES) pins. Corrosion resisting steel pins shall be passivated in accordance with QQ-P-35, unless otherwise specified.

3.4.3 Beryllium-Copper pins. Beryllium-copper pins shall be furnished with a plain finish and shall have a light film of high grade machine oil applied to prevent surface tarnishing.

3.5 Hardness. The hardness of the spring pins, except for the 302 austenitic corrosion resisting steel pins and the beryllium-copper pins, shall be as specified on MS16562, MS39086, MS51923 and MS51987. The 302 austenitic corrosion-resisting steel pins shall be hardened by cold working. The hardness of beryllium-copper pins shall be as follows:

<u>Stock Thickness</u> <u>Inch</u>	<u>Hardness</u>
0.250 and larger	Rockwell C36-42
0.109 to 0.249	Rockwell A68.4-71.5
0.108 and less	Rockwell 15N 78.3-81.5

3.6 Shear strength. The shear strength of the spring pins, except for the beryllium-copper pins and the 302 austenitic corrosion resisting steel pins, shall be as specified on the applicable documents. The shear strength of beryllium-copper pins shall be as specified in Table I. The shear strength of 302 austenitic corrosion resisting steel pins shall be as specified in Table II. Pins which have been tested for shear strength shall show a ductile shear without longitudinal cracks (see 4.4.5).

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Table I. Double Shear Strength (lbs-min)
Beryllium-Copper Pins

<u>Nominal Size (Inch)</u>	<u>Slotted and Heavy Coiled</u>	<u>Standard Coiled</u>	<u>Light Coiled</u>
1/32	--	45	--
.039	--	70	--
3/64	--	100	--
.052	--	140	--
1/16	270	180	100
5/64	400	280	165
3/32	660	425	225
7/64	850	575	325
1/8	1200	750	400
5/32	1800	1150	660
3/16	2600	1700	900
7/32	3700	2300	1250
1/4	4500	3000	1600
5/16	6800	4600	2600
3/8	10100	6800	3600
7/16	12200	9200	5000
1/2	16800	12000	6500

Table II. Double Shear Strength (lbs-min)
302 Austenitic Corrosion Resisting Steel Pins

<u>Nominal Size (Inch)</u>	<u>Slotted</u>	<u>Heavy Coiled</u>	<u>Standard Coiled</u>	<u>Light Coiled</u>
1/32	--	--	60	--
.039	--	--	100	--
3/64	--	--	140	--
.052	--	--	190	--
1/16	300	350	250	135
5/64	460	550	400	225
3/32	720	800	550	300
7/64	860	1125	750	425
1/8	1500	1700	1000	550
5/32	1830	2400	1550	875
3/16	2800	3500	2250	1200
7/32	3550	4600	3000	1700
1/4	4600	6200	4000	2200
5/16	7095	9200	6200	3500
3/8	10000	14000	9000	--
7/16	12000	18000	13000	--
1/2	15500	24000	16000	--
5/8	18800	37000	25000	--
3/4	23200	53000	36000	--

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3.7 Straightness. The straightness of the spring pins shall be as follows (see 4.3.3):

<u>Pin Length (Inches)</u>	<u>Gage Length (Inches)</u>	<u>Straightness Tolerance (Inch)</u>
1.000 and shorter	1.000 ± 0.005	0.007
1.001 thru 2.000	2.000 ± 0.005	0.010
2.001 and longer	3.000 ± 0.005	0.013

3.8 Edges and corners. Edges and corners, as applicable, shall be broken or rounded.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier 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 inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Inspection terms. Inspection terms shall be as defined in MIL-STD-109.

4.2 Inspection provisions.

4.2.1 Lot. A lot shall consist of all pins of the same type, class, composition, finish and size produced under essentially the same conditions and submitted for acceptance inspection at the same time.

4.2.2 Sampling for examination. A random sample of pins 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 4.3.1.

4.2.3 Sampling for tests. A random sample of pins shall be taken from each lot in accordance with MIL-STD-105, Inspection Level S4. The AQL for each test shall be 2.5 percent defective.

4.2.4 Sampling of packaging and packing. Sampling for inspection and test of packaging and packing shall be as specified in MIL-H-3982.

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4.3 Examination.

4.3.1 Visual and dimensional. Sample pins shall be examined to verify compliance with the requirements of this specification in accordance with the following Classification of Defects and MIL-STD-105.

Table III. Classification of Defects

<u>Categories</u>	<u>Defects</u>	<u>Method of Inspection</u>
Critical	None	
Major	AQL = 1.5 Percent Defective	
101	Diameter (see 4.3.2)	SIE*
102	Length (see 3.2 and 3.3)	SIE
103	Straightness (see 4.3.3)	SIE
Minor	AQL = 2.5 Percent Defective	
201	End chamfers (see 3.2 and 3.3)	SIE
202	Edges and corners broken	Visual

* Standard Inspection Equipment

4.3.2 Diameters.

4.3.2.1 Type I, slotted pins. The maximum diameter of the slotted pin, as specified on the applicable documents, shall be inspected with a "go" ring gage. This ring gage shall have a length of hole not greater than 0.125 inch. The minimum diameter shall be determined by averaging the three diameters D-1, D-2 and D-3 shown on the applicable documents. These diameters shall be measured at the center of the pin if the pin is 1 inch long or less. If the length of the pin is greater than 1 inch, the minimum diameter shall be measured 1/4 inch from each end.

4.3.2.1.1 Slot width. The slotted pins shall be inserted in a bushing gage within ± 0.0003 inch of the minimum hole size shown on the applicable documents without the sides of the gap or slot of the pin touching each other.

4.3.2.2 Type II, coiled pins. The maximum diameter of the coiled pin, as specified on the applicable documents, shall be inspected with a "go" ring gage. This ring gage shall have a length of hole not greater than 0.125 inch. The minimum diameter shall be inspected with a "no go" ring gage.

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4.3.3 Straightness. The straightness of the spring pins shall be determined by using a ring gage. The maximum inside diameter of this gage shall be greater than the maximum diameter specified for the pins on the applicable documents by the amount of the straightness tolerance. The pins shall fall through this gage by their own weight. These gages shall be as specified in 3.7.

4.3.4 Packaging and packing. Packaging and packing of the pins, as specified in Section 5 herein, shall be inspected in accordance with MIL-H-3982.

4.4 Tests. The sample pins of 4.2.3 shall be tested as specified herein using separate samples for each test except for the ductility test of 4.4.5. The AQL shall be as specified in 4.2.3.

4.4.1 Protective finish. When pins are furnished with a plating or coating (see 3.4), the minimum thickness and continuity of the plating or coating shall be determined in accordance with the applicable plating or coating specification.

4.4.2 Hydrogen embrittlement. The pins shall be tested for hydrogen embrittlement relief by the following method:

Plated or coated spring pins shall be installed in the minimum recommended hole size specified on the MS and NAS standards. The holes shall have a length of at least 75% of the length of the pin tested. The pins shall remain installed in these holes for a minimum of 100 hours without failure. Upon removal they shall show no cracks. Hydrogen embrittlement tests are not applicable to corrosion resisting steel or beryllium-copper pins.

4.4.3 Hardness.

4.4.3.1 Type I, slotted pins. Slotted pins shall be tested for hardness as follows:

a. A longitudinal flat shall be ground on the pin 90 degrees from the slot with a #120-grain size, or finer, belt.

b. The Rockwell impression shall be made near the middle of the longitudinal axis of the pin.

c. The hardness shall be within the hardness limits of 3.5.

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4.4.3.2 Type II, coiled pins. Coiled pins shall be tested for hardness as follows:

a. The coiled pin shall be ground or cut in half along its longitudinal axis, and the resulting outside half coil shall be tested.

b. A flat shall be ground on the half coil with a #120-grain size, or finer, belt.

c. The hardness shall be within the hardness limits of 3.5.

4.4.4 Shear strength. The shear strength test shall be conducted as follows:

a. The shear plane shall be at least one pin diameter away from the ends of the pin.

b. For Type I slotted pins, the slot shall be located approximately 90 degrees to the line of application of force.

c. Pins too short to be tested in double shear shall be tested by shearing two pins simultaneously in a single shear.

d. The maximum clearance between the loading member and the supporting member shall be 0.005 inch. The shearing surfaces of the test fixtures shall have a minimum hardness of Rockwell C-58. The test plates shall have a minimum total thickness of two times the outside diameter of the pin.

e. The shear values specified in Table I, Table II and the applicable documents shall apply to pins tested in the minimum recommended hole sizes that are specified thereon.

f. Pins shall be tested to destruction to determine conformance to the specified shear values.

4.4.5 Ductility. Spring pins, subjected to the shear strength test, shall be examined to determine conformance to the ductility requirement of 3.6.

4.4.6 Material. A material certification may be accepted in lieu of tests to determine conformance with the material requirements of 3.1.

4.4.7 Magnetic permeability. Austenitic corrosion resisting steel pins, subjected to visual and dimensional examination, shall also be tested to determine magnetic permeability (see 3.1.2.1) in accordance with MIL-I-17214.

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5. PREPARATION FOR DELIVERY

5.1 Packaging. Cleaning, preservation and packaging shall conform to Level A or C, as specified (see 6.2), in accordance with the requirements of MIL-H-3982.

5.2 Packing. Packing shall conform to Level A, B or C, as specified (see 6.2), in accordance with the requirements of MIL-H-3982.

5.3 Marking. In addition to any special marking required by the contract or order, all containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. Spring pins covered by this specification are intended to be used primarily for insertion in matching holes in adjoining pieces to position and hold these pieces in place. See MS33547 for functional limitations.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number and date of this specification.
- b. Type, class, composition and size of pin required.
- c. Protective finish required (see 3.4).
- d. Material certification, if applicable (see 4.4.6).
- e. Applicable levels of preservation, packaging and packing (see 5.1 and 5.2).
- f. Marking, if other than specified.
- g. Applicable standard (MS or NAS) (see 3.2 and 3.3).

6.3 Military procurement. Items procured under this specification for military use are to be limited, where possible, to the variety shown on the applicable standard. Personnel of the Military Departments should refer to these documents for guidance.

6.4 The Type II coiled spring pins are covered by Patent Number 2737843, patented 13 March 1956. The Government has a royalty free license under this patent for the benefit of manufacturers of the pin either for the Government or for use in equipment to be delivered to the Government.

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Custodians:

Army - WC
Navy - OS
Air Force - 82

Preparing Activity:

Army - WC

Project No. 5315-0185

Review Activities:

Army - AV, MI, MU
Navy - None
Air Force - 85
DSA - IS
NSA

User Activities:

Army - AT, EL, GL, ME
Navy - AS, MC, SA, SH
Air Force - None

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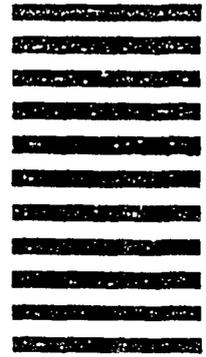


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