SAE Aerospace
An SAE International Group

AEROSPACE STANDARD

SAE AS7205

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Spring Pins, Tubular, Carbon Steel, Procurement Specification for

RATIONALE

AS7205 has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE

1.1 Type

This specification covers tubular-shaped pins, fabricated from carbon steel, having a full-length longitudinal slot to permit flexure when inserted into a hole.

1.2 Application

This product has been used typically to provide a pin with sufficient flexure to remain tight against the surface of a hole into which it has been inserted, after adjusting itself to the hole tolerances.

1.3 Dimensioning and Tolerances

Unless otherwise specified herein, dimensions and tolerances are in inches.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS 2370 Quality Assurance Sampling and Testing Carbon and Low-Alloy Steels, Wrought Products and Forging Stock

AMS 5120 Steel Strip, 0.68 - 0.80C (SAE 1074)

AMS 5121 Steel Sheet and Strip (0.90 1.04C) (SAE 1095) Annealed

2.1.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B 117 Salt Spray (Fog) Testing

ASTM E 18 Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

2.1.3 ASME Publications

Available from ASME, 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900, Tel: 973-882-1170, www.asme.org.

ASME B 18.8.2 Tappered Pins, Dowel Pins, Straight Pins, Grooved Pins and Spring Pins (Inch Series)

ASME B 46.1 Surface Texture (Surface Roughness, Waviness, and Lay)

2.2 Definitions

DEFECTIVE: A unit of product which contains one or more defects.

PRODUCTION INSPECTION LOT: Shall be all finished parts of the same part number, made from a single heat alloy, heat treated at the same time to the same specified condition, produced as one continuous run, and submitted for manufacturer's inspection at the same time.

3. TECHNICAL REQUIREMENTS

3.1 Material

Shall be steel strip conforming to AMS 5120 or AMS 5121.

3.2 Condition

Austempered, zinc phosphate treated, and oiled.

3.3 Design

Finished (completely manufactured) parts shall conform to the following requirements:

3.3.1 Design and Dimensions

In accordance with the applicable standard/drawing.

3.3.2 Surface Roughness

Surface roughness of finished parts shall conform to the requirements as specified on part drawing, determined in accordance with ASME B46.1.

3.3.3 Chamfer

Pins shall be chamfered at both ends as specified on the part drawing.

3.3.4 Minimum Average Diameter

Shall be as shown on the applicable standard/drawing, determined by averaging three measurements made at the angular locations, with respect to the slot, shown on the drawing. Measurements shall be made at midlength of pins 1.00 or less in length and at least 0.50 from the end of pins over 1.00 in length. Minimum diameter shall be as shown on the drawing, determined by means of a "no-go" ring gage having a length of hole not greater than 0.125.

3.3.5 Maximum Diameter

Shall be not greater than shown on the drawing, determined by means of a "go" ring gage having length of hole not greater than 0.125.

3.3.6 Straightness

Shall be such that the pins will pass freely through the appropriate ring gage constructed to meet the following requirements:

3.3.6.1 The maximum ID of the gage shall be equal to the maximum diameter shown on the drawing of the pin plus the straightness tolerance of Table 1. The length of the gages shall depend on the straightness tolerance and shall be as follows:

TABLE 1 - STRAIGHTNESS/GAGE LENGTH

Nominal Pin Length	Straightness Tolerance	Length of Gage
Up to 1.000, incl	0.007	0.995 to 1.005
Over 1.000 to 2.000, incl	0.010	1.995 to 2.005
Over 2.000	0.013	2.995 to 3.005

3.4 Fabrication

Pins shall be formed to meet design requirements as in 3.3 and heat treated to meet the properties as in 3.5.

3.4.1 Finish

In accordance with applicable standard/drawing.

3.5 Properties

Pins shall conform to the following requirements:

3.5.1 Shear Strength

Shall be as specified in Table 2, determined in accordance with ASME B 18.8.2.

TABLE 2 - SHEAR STRENGTH

Nominal Pin Diameter	Hole Diameter	Double Shear Strength lb, min
0.062	0.062 to 0.065	425
0.078	0.078 to 0.081	650
0.094	0.094 to 0.097	1000
0.125	0.109 to 0.112	1840
0.141	0.125 to 0.129	2200
0.156	0.156 to 0.160	2880
0.188	0.187 to 0.192	4140
0.219	0.219 to 0.224	5640
0.250	0.250 to 0.256	7360
0.312	0.312 to 0.318	11,500
0.375	0.437 to 0.445	16,580
0.438	0.437 to 0.445	20,000
0.500	0.500 to 0.510	25,800

3.5.2 Hardness

Shall be 83 to 87 HR15N or equivalent, determined in accordance with ASTM E 18 on a prepared flat surface on the pin OD.

3.5.3 Microstructure

Shall be bainite, determined by microscopic examination of a polished and etched specimen.

3.5.4 Ductility

Pins shall withstand, without cracking, squeezing in a vise until the gap closes. Pins which have been tested for shear strength shall show a ductile shear with no longitudinal cracks longer than 0.250 or one-third the total length of the pin, whichever is less.

3.5.5 Insertion

Pins shall withstand being inserted in the minimum recommended hole size shown on the drawing without the sides of the gap touching. The hole in the ring gage used for this test shall have a basic diameter equal to the minimum hole shown on the drawing and a tolerance of ±0.0003.

3.5.6 Corrosion Resistance

Pins shall withstand, without showing definite rusting, exposure for 72 h minimum to salt spray test conducted in accordance with ASTM B 117.

3.6 Quality

Pins, as received by purchaser, shall be sound, clean, smooth, and free from foreign materials and from internal and external imperfections detrimental to their performance.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The manufacturer of pins shall supply all samples and shall be responsible for the performance of all required tests. Purchaser reserves the right to perform such confirmatory testing as deemed necessary to ensure that the pins conform to specified requirements.

4.2 Responsibility for Compliance

The manufacturer's system for parts production shall be based on preventing production defects, rather than detecting the defects at final inspection and then requiring corrective action to be invoked. An effective manufacturing in-process control system shall be established, subject to the approval of the purchaser, and used during production of parts.

4.3 Production Acceptance Tests

The purpose of production acceptance test is to check, as simply as possible using a method which is inexpensive and representative of the part usage, with the uncertainty inherent in random sampling, that the parts comprising a production inspection lot satisfy the requirements of this specification.

4.4 Classification of Tests

The inspection and testing of parts are classified as follows:

a. Acceptance tests.

b. Periodic tests.

4.4.1 Acceptance Tests

Material (3.1), shear strength (3.5.1), hardness (3.5.2), microstructure (3.5.3), ductility (3.5.4), and design (3.3) are classified as acceptance tests and shall be performed on each production inspection lot. A summary of acceptance tests is specified in Table 3.

4.4.2 Periodic Tests

Insertion (3.5.5) and corrosion resistance (3.5.6) are classified as periodic/destructive tests and shall be performed on the manufacturer's first production run and following at a frequency selected by the manufacturer unless frequency of testing is specified by purchaser. Sampling shall be as specified in Table 6.

TABLE 3 - SUMMARY OF ACCEPTANCE TEST

TABLE 3A - NONDESTRUCTIVE TEST

Characteristic	Required Paragraph	Sample Size	Test Method
Material	3.1	AMS 5120 or AMS 5121	3.1
Design & Dimensions	3.3.1	Tables 4 & 5	Conventional measuring methods
Surface Roughness	3.3.2	Tables 4 & 5	ASME B 46.1
Chamfer	3.3.3	Tables 4 & 5	Conventional measuring methods
Minimum Average Diameter	3.3.4	Tables 4 & 5	Conventional measuring methods
Maximum Diameter	3.3.5	Tables 4 & 5	Go ring Gage
Straightness	3.3.6	Tables 4 & 5	Ring Gage

TABLE 3B - DESTRUCTIVE TESTS

Characteristic	Required Paragraph	Sample Size	Test Method
Shear Strength	3.5.1	Table 6	ASME B 18.8.2
Hardness	3.5.2	Table 6	ASTM E 18
Microstructure	3.5.3	Table 6	Microscopic Examination
Ductility	3.5.4	Table 6	3.5.4

4.5 Sampling, Acceptance Test

4.5.1 Material

In accordance with AMS 2370.

4.5.2 Nondestructive Test - Visual and Dimensional

A random sample of parts shall be taken from each production inspection lot, the size of the sample to be as specified in Table 4. The classification of dimensional characteristics shall be as specified in Table 5. All dimensional characteristics are considered defective when out of tolerance.

4.5.3 Destructive Tests

A random sample of parts shall be taken from each production inspection lot. The size of the sample to be as specified in Table 6. The sample parts may be selected from those that have been subjected to and passed the nondestructive tests.