SAE Aerospace
An SAE International Group

AEROSPACE STANDARD

SAE AS7225

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Superseding AMS 7225E

Rivets, Carbon Steel
Procurement Specification for

FSC 5320

RATIONALE

This document has been reaffirmed to comply with the SAE 5-year Review policy.

1. SCOPE:

1.1 Type:

This procurement specification covers aircraft-quality solid rivets and tubular end rivets made from a carbon steel of the type identified under the Unified Numbering System as UNS G10100.

1.2 Application:

Primarily for joining steel parts where a low shear strength is adequate and destruction of the fastener for repair or replacement is permissible.

1.3 Dimensions 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 specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other documents shall be the issue in effect on the date of the purchase order.

2.1.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

2.1.1.1 Aerospace Material Specifications:

AMS 2259 Chemical Check Analysis Limits, Wrought Low-Alloy and Carbon Steels
AMS 2400 Cadmium Plating

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

2.1.1.2 Aerospace Standards:

AS125101 thru AS125250 Rivet - 100E Countersunk Head, Mild Steel

2.1.2 U.S. Government Publications: Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

2.1.2.1 Military Specification:

MIL-STD-2073-1 DOD Materiel, Procedures for Development and Application of Packaging Requirements

2.1.2.2 Air Force-Navy Aeronautical Standard:

AN125551 thru AN125700 Rivet, Universal Head, Mild Steel

2.1.3 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM E 18 Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
ASTM E 350 Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

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 of alloy, heat treated at the same time to the same specified condition, produced as one continuous run, and submitted for vendor's inspection at the same time.

2.3 Unit Symbols:

° - degree, angular
HRB - hardness, Rockwell B scale
% - percent (1% = 1/100)

3. TECHNICAL REQUIREMENTS:

3.1 Material:

The rivets shall be made from material conforming to the following:

3.1.1 Composition: Shall conform to the percentages by weight specified in Table 1, determined by wet chemical methods in accordance with ASTM E 350 or by spectrochemical or other analytical methods acceptable to purchaser.

TABLE 1 - Material Composition

Element	% by Weight min	% by Weight max
Carbon	0.05	0.15
Manganese	0.20	0.50
Phosphorus	--	0.040
Sulfur	--	0.050

3.1.1.1 Check Analysis: Composition variations shall meet the applicable requirements of AMS 2259.

3.1.2 Condition: Cold drawn wire or bar and annealed.

3.2 Design:

Unless otherwise specified on the part drawing, rivets furnished to this specification shall conform to the design, dimensions, and other requirements specified on the applicable AS standard drawing as in 2.1.1.2 or the applicable AN standard drawing as in 2.1.2.2.

3.3 Fabrication:

Cold headed, unless purchaser permits machining, annealed, and descaled if necessary.

3.4 Runout of Head:

The circular runout of rivet head relative to its shank shall be within the full indicator movement (FIM) specified in Table 2, unless otherwise specified on the part drawing. The measurement shall be taken with the indicator stylus touching the periphery of the protruding head, or the conical surface near the top of the flush head, as the rivet is rotated with its shank as an axis.

TABLE 2 - Circular Runout Tolerance

Rivet Shank Nominal Diameter inch	Rivet Head Runout Tolerance FIM, inch Flush Head	Rivet Head Runout Tolerance FIM, inch Protruding Head
0.062	0.010	0.010
0.094	0.010	0.010
0.125	0.010	0.010
0.156	0.010	0.015
0.188	0.010	0.015
0.250	0.010	0.020
0.312	0.015	0.020
0.375	0.015	0.020

3.5 Properties:

Rivets shall conform to the following requirements:

3.5.1 Hardness: Shall be not higher than 60 HRB, determined in accordance with ASTM E 18 on a flat, smooth, filed or ground surface near the mid-length of the shank.

3.5.2 Formability: Solid-shank rivets shall withstand being driven cold to form a crack-free upset head. The cold driven, upset head shall have a diameter of 1.25 to 1.66 times the nominal shank diameter and a height within the range shown in Table 3. Using a rivet having a grip length of 1.5 times the nominal shank diameter, the cold driven rivet shall have an expansion of the shank to the full diameter of the hole in which it is installed, provided that the hole diameter is not more than 0.006 inch greater than the nominal shank diameter.

TABLE 3 - Rivet Driven Head Height

Rivet Shank Nominal Diameter inch	Head Height Proportion of Nominal Diameter
0.062 and 0.094	0.33 to 1.0
0.125 and 0.156	0.33 to 0.8
0.188 and 0.250	0.33 to 0.8
0.312 and 0.375	0.33 to 0.7

3.5.3 Flarability: Hollow-end rivets shall withstand being flared to a diameter of 1.5 times the nominal shank diameter without bending the shank and without cracking in the flared end.

3.6 Plating:

Where AS7225 is specified, any protective treatment shall be as specified on the part drawing. Where AS7225-1 is specified, parts shall be cadmium plated in accordance with AMS 2400.

3.7 Quality:

Rivets as received by purchaser, shall be sound, smooth, and free from foreign materials and from imperfections detrimental to usage of the parts.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of parts shall supply all samples for vendor's test and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the parts conform to the requirements of this specification.

4.2 Responsibility for Compliance:

The manufacturer's system for parts production shall be based on preventing product 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 tests 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:

4.4.1 Acceptance Tests: Tests to determine conformance to requirements for material (3.1), design, dimensions and tolerances (3.2), runout of head (3.4), hardness (3.5.1), and plating (3.6) are classified as acceptance tests and shall be performed on each production inspection lot. A summary of acceptance tests is specified in Table 4.

TABLE 4 - Summary of Acceptance Tests

TABLE 4A - Nondestructive Tests

Characteristic	Req. Para.	Sample Size	Test Method
Design & Dimensions	3.2	Table 5	Conventional measuring methods
Runout of Head	3.4	Table 5	Conventional measuring methods
Quality	3.7	Table 5	Visual

TABLE 4B - Destructive Tests

Characteristic	Req. Para.	Sample Size	Test Method
Material Composition	3.1.1	4.5.1	ASTM E 350
Hardness	3.5.1	4.5.3	ASTM E 18
Plating	3.6	4.5.4	Per AMS 2400 or microscopic measurement of sectioned specimens

4.4.2 Periodic Tests: Tests to determine conformance to requirements for formability (3.5.2) and flarability (3.5.3) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by the purchaser.

4.5 Acceptance Tests Sampling:

4.5.1 Material: One sample from bars or wire from each heat of alloy.

4.5.2 Nondestructive Tests - Visual and Dimensional: A random sample shall be selected from each production inspection lot in accordance with Table 5.

TABLE 5 - Sampling Data

Nondestructive Tests Visual and Dimensional	
Production Inspection Lot	Sample Size
2 to 15	2
16 to 50	3
51 to 150	5
151 to 500	8
501 to 3200	13
3201 to 35000	20
35001 to 500000	32
500001 and over	50

4.5.3 Hardness: A random sample consisting of five rivets shall be selected from each production inspection lot.

4.5.4 Plating: A random sample consisting of five rivets shall be selected from each production inspection lot.

4.5.5 Acceptance Quality: Of random samples tested, acceptance quality shall be based on zero defectives.

4.6 Periodic Tests Sampling:

As agreed upon by purchaser and vendor.

4.7 Reports:

The vendor of parts shall furnish with each shipment a report stating that the parts conform to the condition, chemical composition, and other technical requirements of this specification. This report shall include the purchase order number, AS7225, lot number, contractor or other direct supplier of material, part number, nominal size, and quantity.

4.8 Rejected Lots:

If a production inspection lot is rejected, the vendor of parts may perform corrective action to screen out or rework the defective parts, and resubmit for acceptance tests inspection as in Table 4. Resubmitted lots shall be clearly identified as reinspected lots.