



<b>AEROSPACE STANDARD</b>	<b>AS7222</b>	<b>REV. A</b>
	Issued 1991-09 Revised 1998-11 Reaffirmed 2013-10  Superseding AS7222	
Aluminum Rivets, UNS A92117 2.5Cu - 0.3Mg (2117-T4) Procurement Specification		FSC 5320

### RATIONALE

AS7222A has been reaffirmed to comply with the SAE five-year review policy.

#### 1. SCOPE:

##### 1.1 Type:

This procurement specification covers rivets made from an aluminum alloy designated as 2117-T4, solution treated. The following specification designations and their rivet coatings are covered:

AS7222	Rivets anodized per AMS 2470, chromic acid process
AS7222-1	Rivets anodized per AMS 2471, sulfuric acid process

##### 1.2 Application:

Primarily for joining aluminum parts where rivets having 26 ksi minimum ultimate shear strength is adequate.

#### 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 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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<http://www.sae.org/technical/standards/AS7222A>

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

AMS 2355	Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products Except Forging Stock and Rolled, Forged, or Flash Welded Rings
AMS 2470	Anodic Treatment of Aluminum Alloys, Chromic Acid Process
AMS 2471	Anodic Treatment of Aluminum Alloys, Sulfuric Acid Process, Undyed Coating
AMS 2770	Heat Treatment of Wrought Aluminum Alloy Parts
AS125251 thru AS125400	Rivet - 100° Countersunk Head, Aluminum Alloy
AS125701 thru AS125850	Rivet - Universal Head, Aluminum Alloy

2.1.2 NAS Publications: Available from Aerospace Industries Association, 1250 Eye Street NW, Washington, DC 20005.

MIL-STD-1312-13	Fastener Test Methods, Method 13, Double Shear
MIL-STD-1312-20	Fastener Test Methods, Method 20, Single Shear

2.1.3 ASTM Publications: Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM B 565	Shear Testing of Aluminum Alloy Rivets and Cold Heading Wire and Rods
ASTM D 3951	Commercial Packaging

2.1.4 ASME Publications: Available from ASME, 22 Law Drive, Box 2900, Fairfield, NJ 07007-2900.

ASME Y14.5M-1982	Dimensioning and Tolerancing
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2.2 Definitions:

**NON-CONFORMANCE:** A departure from a specified requirement for any characteristic.

**NON-CONFORMING UNIT:** A unit of product that has one or more non-conformances.

**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.

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 shown in Table 1, determined in accordance with AMS 2355.

TABLE 1 - Composition

Element	Min	Max
Silicon	---	0.8
Iron	---	0.7
Copper	2.2	3.0
Manganese	---	0.20
Magnesium	0.20	0.50
Chromium	---	0.10
Zinc	---	0.25
Other Impurities, each	---	0.05
Other Impurities, total	---	0.15
Aluminum	remainder	

3.1.2 Heading Stock: Shall be wire or rod in the T4 temper with an ultimate tensile strength not lower than 38 ksi, determined in accordance with AMS 2365.

### 3.2 Design:

Rivet design shall be for standard 100° countersunk head in accordance with AS125251 thru AS125400, and for standard universal head in accordance with AS125701 thru AS125850 standard part drawings.

3.2.1 Dimensions: The dimensions of finished parts, after all processing, shall conform to the part drawing.

3.2.2 Circular Runout of Head: The circular runout (see ASME Y14.6M-1982) of rivet head relative to the shank, from a maximum shank length equal to two nominal shank diameters from the head, shall not vary by an amount which will produce a full indicator movement (FIM) greater than the value specified in Table 2 for the corresponding rivet diameter, unless otherwise specified on the part drawing. The indicator reading shall be taken with the indicator stylus touching the periphery of the head as the rivet is rotated with the shank as an axis.

TABLE 2 - Rivet Head Circular Runout Tolerance

Nominal Diameter of Rivet Shank inch	Circular Runout Tolerance, FIM	
	Flush Head inch	Protruding Head inch
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

### 3.3 Fabrication:

3.3.1 Heat Treatment: Following cold heading, rivets shall be solution heat treated and quenched in accordance with AMS 2770, unless otherwise specified on the part drawing.

3.3.2 Coating: Following solution heat treatment as in 3.3.1, rivets shall be coated as specified for the following specification designations:

- a. Where AS7222 is specified, rivets shall be anodized in accordance with AMS 2470.
- b. Where AS7222-1 is specified, rivets shall be anodized in accordance with AMS 2471.

### 3.4 Product Marking:

Rivets shall be marked with a dimple 0.030 inch in diameter maximum and depressed 0.020 inch maximum, and located in the center of the top surface of the head, for material identification.

### 3.5 Mechanical Properties:

Rivets shall conform to the following requirements:

- 3.5.1 Shear Strength: The undriven strength of rivets greater than 0.094 inch in nominal diameter shall have a minimum ultimate shear strength of 26 ksi at room temperature when tested as follows:
- Double shear test in accordance with MIL-STD-1312-13 or ASTM B 565.
  - Single shear test in accordance with MIL-STD-1312-20.
- 3.5.1.1 Rivets with a shank length 2.5 times the nominal shank diameter and longer shall be double or single shear tested as specified in 3.5.1. Rivets with a shank length shorter than 2.5 times the nominal shank diameter shall be single shear tested.
- 3.5.2 Material Tensile Strength: For rivets 0.094 inch in nominal diameter or smaller, or for nonstandard diameters for which a shear test fixture is not available, tensile test shall be made on wire or rod specimens as in 3.5.2.1. Room temperature ultimate tensile strength shall be not less than 38 ksi for T4 temper, unless otherwise specified on the part drawing. The tensile strength test method shall be in accordance with AMS 2355.
- 3.5.2.1 Heat Treatment of Tension Test Specimens: Tension test specimens shall be not less than 18 inches long, or three specimens each 6 inches long. The specimens shall be taken from the same material lot of wire or rod used to make the rivets and heat treated with the lot of rivets it represents.
- 3.5.3 Driveability: Using a proper driver, the rivet shall be driven in a sheet specimen of suitable thickness. The bucked rivet head shall drive satisfactorily with head diameter of not less than 1.4 times the rivet diameter and head height not less than 0.3 times the rivet diameter. After driving, rivets shall show no cracks when visually inspected.
- 3.6 Quality:
- Rivets shall be uniform in quality and condition, free from cracks, clinch or die marks, seams, fins, cold shuts, coarse grain, and other injurious non-conformances.

#### 4. QUALITY ASSURANCE PROVISIONS:

##### 4.1 Responsibility for Inspection:

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

##### 4.2 Responsibility for Compliance:

The manufacturer's system for parts production shall be based on preventing product non-conformance rather than detecting the non-conformances 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.

- 4.3.1 All technical requirements are acceptance tests and shall be performed on each production inspection lot. A summary of acceptance tests is specified in Table 3.

TABLE 3 - Summary of Acceptance Tests

Characteristic	Req. Para.	Sample Size	Test Method
Non-Destructive Tests			
Product Marking	3.4	Tables 4 & 5	Visual examination
Packaging & Identification	5.1	None	Visual
Dimensions	3.2.1	Tables 4 & 5	Conventional measuring methods
Circular Runout of Head	3.2.2	Tables 4 & 5	Conventional measuring methods
Quality	3.6	Tables 4 & 5	Visual
Destructive Tests			
Material	3.1	4.4.1	Per AMS 2355
Shear Strength	3.5.1	Table 6	MIL-STD-1312-13 or ASTM B 565 MIL-STD-1312-20
Material Tensile Strength (When applicable)	3.5.2	Table 6	Per AMS 2355
Driveability	3.5.3	Table 6	Per 3.5.3

#### 4.4 Acceptance Test Sampling:

- 4.4.1 Material: Sampling for material composition on each heat shall be in accordance with AMS 2355.
- 4.4.2 Non-Destructive Tests - 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 non-conforming when out of tolerance.

TABLE 4 - Sampling Data

Non-Destructive Tests  
Visual and Dimensional Characteristics  
For Classes Major A and Minor A

Production Inspection Lot Size	Major A Sample Size	Minor A Sample Size
Up to 90	8	6
91 to 150	12	7
151 to 280	19	10
281 to 500	21	11
501 to 1200	27	15
1201 to 3200	35	18
3201 to 10000	38	22
10001 to 35000	46	29
35000 to 150000	56	29
150001 and over	64	29

TABLE 5 - Classification of Visual and Dimensional Characteristics

Class	Characteristic
Major A	
101	Shank diameter
102	Head diameter
103	Circular runout of head
Minor A	
201	Fillet radius under head
202	Burrs and tool marks
203	Head height
204	Other characteristics not listed