AEROSPACE STANDARD

AS7220™	REV. A

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Superseding AS7220

(R) Aluminum Rivets, UNS A91100 99Al (1100-H14)

FSC 5320

RATIONALE

General revision, delete AQLs and MIL-STD-105 sampling requirements, add drivability requirement, update references, and editorial update.

1. SCOPE

1.1 Type

This procurement specification covers rivets fabricated from an aluminum alloy designated as 1100-H14, strain hardened.

1.2 Application

Primarily for joining aluminum parts where a low 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.

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 +1 724-776-4970 (outside USA), www.sae.org.

AMS2355 Quality Assurance, Sampling and Testing Aluminum Alloys and Magnesium Alloy Wrought Products (Except Forging Stock), and Rolled, Forged, or Flash Welded Rings

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AS7220A/

2.1.2 AIA/NAS Publications

Available from Aerospace Industries Association, 1000 Wilson Boulevard, Suite 1700, Arlington, VA 22209-3928, Tel: 703-358-1000, www.aia-aerospace.org.

NASM1312-13 Fastener Test Methods, Method 13 Double Shear

NASM1312-20 Fastener Test Methods, Method 20, Single Shear

2.1.3 ASME Publications

Available from ASME, P.O. Box 2900, 22 Law Drive, Fairfield, NJ 07007-2900, Tel: 800-843-2763 (U.S./Canada), 001-800-843-2763 (Mexico), 973-882-1170 (outside North America), www.asme.org.

ASME Y14.5M Dimensioning and Tolerancing

2.1.4 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 B565 Standard Test Method for Shear Testing of Aluminum and Aluminum-Alloy Rivets and Cold-Heading Wire and Rods

2.1.5 U.S. Government Publications

Copies of these documents are available online at http://quicksearch.dla.mil.

MIL-STD-2073-1 Standard Practice for Military Packaging

2.2 Definitions

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

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

PRODUCTION INSPECTION LOT: A 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 in Table 1 determined in accordance with AMS2355.

Table 1 - Composition, percentages by weight

Element	Min	Max
Aluminum	99.0	---
Iron + Silicon	---	0.95
Copper	0.05	0.20
Zinc	---	0.10
Manganese	---	0.05
Other Impurities, each	---	0.05
Other Impurities, total	---	0.15

3.1.2 Heading Stock

Shall be wire or rod in the half hard temper.

3.2 Design

Rivet design shall be as specified on the applicable drawing.

3.3 Mechanical Properties

Rivets shall conform to the following requirements:

3.3.1 Shear Strength

The undriven strength of rivets greater than 0.094 inch in nominal diameter shall be not less than 10200 psi in single shear or not less than 20400 psi in double shear at room temperature and shall be tested as specified in 4.6.2.1, unless shear strength is otherwise specified on the part drawing.

3.3.2 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 as specified in 4.6.2.2. The wire or rod samples shall be taken from the same material lot that the rivets are made. Room temperature tensile strength shall be not less than 16000 psi, unless otherwise specified on the part drawing.

3.4 Circular Runout of Head

The circular runout (see ASME Y14.5M) 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

Rivet Shank, Ø NOM Inch	Rivet Head Circular Runout Tolerance (FIM) Flush Head Inch	Rivet Head Circular Runout Tolerance (FIM) 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

3.5 Drivability

The driven 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 when tested in accordance with 4.6.2.3. After driving, rivets shall show no cracks when visually inspected.

3.6 Identification

Rivets conforming to this specification shall be identified by a plain head, free from depressions or raised teats, for material identification.

3.7 Workmanship

Rivets shall be uniform in quality and condition, free from seams, fins, clinch or die marks, cracks, cold shuts, and other injurious defects.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of parts shall supply all samples and shall be responsible for performing all required tests. Purchaser reserves the right to perform such confirmatory testing as 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 non-conformance rather than detecting the non-conformance 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

Production acceptance tests are performed on each production inspection lot to demonstrate conformance to the requirements of this specification within the uncertainty inherent in random sampling.

4.3.1 Tests for 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	3.6	TABLES 4 & 5	VISUAL EXAMINATION
PACKAGING & IDENTIFICATION	5.1	4.5	MIL-STD-2073-1
DIMENSIONS	3.2	TABLES 4 & 5	CONVENTIONAL MEASURING METHODS
CIRCULAR RUNOUT OF HEAD	3.4	TABLES 4 & 5	CONVENTIONAL MEASURING METHODS
WORKMANSHIP	3.7	TABLES 4 & 5	VISUAL EXAMINATION
DESTRUCTIVE TESTS			
MATERIAL COMPOSITION	3.1.1	4.4.1	AMS2355
SHEAR STRENGTH	3.3.1	TABLE 6	NASM1312-13 OR ASTM B565
MATERIAL TENSILE STRENGTH (IF APPLICABLE)	3.3.2	TABLE 6	AMS2355
Drivability	3.5	Table 6	Conventional methods

4.4 Acceptance Test Sampling

4.4.1 Material Composition

Sampling, inspection, and testing of the wire or rod for each heat from which the rivets are manufactured shall be in accordance with AMS2355.

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-Destuctive Tests Visual and Dimensional Characteristics For Classes Major A and Minor A (see Table 5)		
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
35001 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

4.4.3 Destructive Tests

A random sample shall be selected from each production inspection lot; the size of the sample shall be as specified in Table 6. The sample units may be selected from those that have been subjected to and passed the non-destructive tests with additional units selected at random from the production inspection lot as necessary.

Table 6 - Sampling data

Destructive Tests Mechanical and Metallurgical Characteristics	
Production Inspection Lot Size	Sample Size
Up to 500	3
501 to 3200	5
3201 to 35000	8
35001 & over	13

4.4.4 Acceptance Quality

Of random samples tested, acceptance quality shall be based on zero non-conforming units.

4.5 Preparation of Specimens

4.5.1 Shear Strength Specimens

Rivet samples with a shank length 2.5 times the nominal shank diameter and greater shall be double or single shear tested as specified in 4.6.2.1. Rivet samples with a shank length less than 2.5 times the nominal shank diameter shall be single shear tested.

4.5.2 Tension Test Specimens

Tension test specimens, tested as specified in 4.6.2.2, shall be not less than 18 inches long, or three specimens not less than 6 inches long. The specimens shall be taken from the wire or rod used to make the rivets.

4.6 Inspection Methods

4.6.1 Examinations

4.6.1.1 Visual Inspection

The rivets shall be visually inspected to determine conformance to 3.7.

4.6.1.2 Dimensional Inspection

Conformance to the dimensions on the part drawing and the requirements of 3.4, when applicable, shall be performed with conventional measuring methods.

4.6.2 Tests

4.6.2.1 Shear Strength

4.6.2.1.1 The double shear strength tests shall be per MIL-STD-1312-13 in accordance with NASM1312-13 or ASTM B565.

4.6.2.1.2 The single shear test method shall be per MIL-STD-1312-20 in accordance with NASM1312-20.