AEROSPACE STANDARD

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Superseding AS7235

Rivets, UNS S66286, Steel, Corrosion and Heat Resistant, 80 ksi Shear Strength, Procurement Specification for

FSC 5320

RATIONALE

This document has been determined to contain basic and stable technology which is not dynamic in nature.

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1. SCOPE:

1.1 Type:

This procurement specification covers solid rivets and hollow end rivets made from a corrosion and heat resistant steel of the type identified under the Unified Numbering System as UNS S66286 and of 80 ksi single shear strength at room temperature.

1.2 Application:

Primarily for joining corrosion resistant steel parts having high strength up to 1200 °F and requiring oxidation resistance up to approximately 1500 °F.

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.

AMS 2750	Pyrometry
AMS 5731	Steel Bars, Forgings, and Rings, Corrosion and Heat Resistant, 15Cr - 25.5Ni - 1.2Mo - 2.1Ti - 0.006B - 0.30V, Consumable Electrode Melted, 1800 °F (982 °C) Solution Heat Treated
AMS 5734	Steel Bars, Forgings, and Tubing, Corrosion and Heat Resistant, 15Cr - 25.5Ni - 1.2Mo - 2.1Ti - 0.006B - 0.30V, Consumable Electrode Melted, 1650 °F (899 °C) Solution Heat Treated

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

QQ-P-35	Passivation Treatments for Corrosion Resistant Steel
MIL-STD-1312	Fasteners, Test Methods
MIL-STD-2073-1	DoD Materiel, Procedures for Development and Application of Packaging Requirements
MS9403	Rivet Solid - Universal Head, AMS 5737
MS9460	Rivet Solid - 100°, Flush Head, AMS 7235

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
% - percent (1% = 1/100)
°F - degree Fahrenheit
°C - degree Celsius
ksi - kips (1000 pounds) per square inch

3. TECHNICAL REQUIREMENTS:

3.1 Material:

The rivets shall be made from AMS 5731 or AMS 5734 heading stock or bar and wire.

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 MS9403 and MS9460 for solid rivets.

3.3 Fabrication:

Cold headed, unless purchaser permits forming heads by machining from bar or wire.

3.3.1 Condition: Rivets which have been cold headed shall be solution heat treated as in 3.4.1; all rivets shall be partially precipitation heat treated as in 3.4.2.

3.4 Heat Treatment:

Rivets shall be heat treated as follows; furnace atmosphere shall not cause change in composition at the surface. Furnace surveys and calibration of temperature controllers and recorders shall be in accordance with AMS 2750.

3.4.1 Solution Heat Treatment: Cold headed rivets shall be solution heat treated by heating to a temperature within the range 1650 to 1800 °F, holding at the selected temperature within ±25 °F for not less than 15 minutes, and cooling as required.

3.4.2 Precipitation Heat Treatment: All rivets shall be partially precipitation heat treated by heating to a temperature within the range 1200 to 1450 °F, holding at the selected temperature within ±15 °F for not less than 30 minutes, and cooling in air.

3.5 Passivation:

Finished parts shall be passivated in accordance with QQ-P-35.

3.5.1 Staining: The passivated parts shall not show staining when subjected to the copper-sulfate test specified in QQ-P-35.

3.6 Runout of Head:

The circular runout of rivet head relative to its shank shall be within the full indicator movement (FIM) specified in Table 1, 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 1 - 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	0.003	0.010
0.094	0.003	0.010
0.125	0.005	0.010
0.156	0.005	0.015
0.188	0.005	0.015
0.250	0.005	0.020
0.312	0.010	0.020
0.375	0.010	0.020

3.7 Properties:

Rivets shall conform to the following requirements:

3.7.1 Shear Strength: The shank of an undriven rivet shall have shear strength of 80 to 95 ksi, determined in accordance with MIL-STD-1312-20 for single shear test. For shank lengths 2.5 times the nominal shank diameter and longer, double shear test in accordance with MIL-STD-1312-13 may be performed.

3.7.2 Formability: Solid shank rivets shall withstand being driven cold to form a crack-free head having a diameter of 1.25 to 1.50 times the nominal shank diameter and a height within the range shown in Table 2 and with expansion of the shank to the full diameter of the hole in which it is installed, using a rivet having a grip length of 1.5 times the nominal shank diameter, provided that the hole diameter is not more than 0.006 inch greater than the nominal shank diameter.

TABLE 2 - Rivet Driven Head Height

Rivet Shank Nominal Diameter inch	Head Height Proportion of Nominal Diameter
0.062 and 0.094	0.5 to 1.0
0.125 and 0.250	0.5 to 0.8
0.312 and 0.375	0.5 to 0.7

3.7.3 Flarability: Hollow end rivets, when flared to angle of 90° and a diameter of 1.5 times the nominal shank diameter, shall neither show evidence of bending the shank nor show cracks in the flared end of more than 10% of the rivets flared.

3.8 Quality:

Rivets as received by purchaser, shall be uniform in quality and condition, 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 the 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 (3.6), and shear strength (3.7.1) are classified as 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
Nondestructive Tests			
Design & Dimensions	3.2	Table 4	Conventional measuring methods
Runout of Head	3.6	Table 4	Conventional measuring methods
Staining	3.5.1	Table 4	Per QQ-P-35
Quality	3.8	Table 4	Visual
Destructive Tests			
Material Composition	3.1	4.5.1	Per AMS 5731 or AMS 5734
Shear Strength	3.7.1	4.5.3	MIL-STD-1312-20 or -13

4.4.2 Periodic Tests: Tests to determine conformance to requirements for formability (3.7.2) or flarability (3.7.3) as applicable, 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, wire, or heading stock 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 4.

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

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

TABLE 4 - Sampling Data

Nondestructive Tests Visual and Dimensional	
Production Inspection Lot	Sample Size
2 to 5	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

4.6 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 chemical composition of the parts conforms to the applicable material specification, showing the results of tests to determine conformance to the shear strength requirements, and stating that the rivets conform to the other technical requirements of this specification. This report shall include the purchase order number, lot number, AS7235, contractor or other direct supplier of material, part number, nominal size, and quantity.