

FED. SUPPLY CLASS

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1. SCOPE

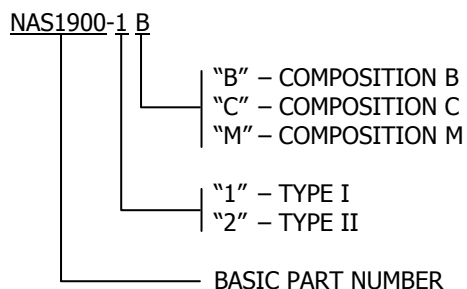
1.1 **Purpose.** This specification establishes the requirements for procurement of mechanically expanded, self-plugging, blind rivets with a mechanically-locked-spindle and bulbed blind side. Blind rivets covered by this specification are for general purpose use in both thin and thick sheet applications in aerospace structures and other applications where only one side of the assembly may be accessible.

1.2 **Classification.** Rivets covered by this specification shall be of the following types and compositions:

Type I – Protruding head rivets (NAS1919)
Type II – 100° Flush head rivets (NAS1921)

Composition B – Aluminum alloy (5056)
Composition C – CRES (A286)
Composition M – Nickel-Copper alloy

1.3 **Classification requirement identifier.** The requirements defined in this specification shall be identified by the requirement identifying numbers derived as shown below:



2. APPLICABLE DOCUMENTS

The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

2.1 Federal Specifications

QQ-A-250/4 Aluminum Alloy 2024 Plate and Sheet
 QQ-A-250/5 Aluminum Alloy ALCLAD 2024 Plate and Sheet
 QQ-A-250/12 Aluminum Alloy 7075 Plate and Sheet
 QQ-A-250/13 Aluminum Alloy ALCLAD 7075 Plate and Sheet
 QQ-A-430 Aluminum Alloy Rod and Wire; For Rivets and Cold Heading
 QQ-N-281 Nickel-Copper-Alloy; Forgings, Plates, Rods, Shapes, Sheets, Strips and Wire
 A-A-59281 Cleaning Compound, Solvent Mixtures

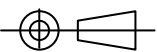
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2.2 Military Specifications

MIL-DTL-5541 Chemical Films and Chemical Film Materials for Aluminum and Aluminum Alloys
 MIL-A-8625 Anodic Coatings for Aluminum and Aluminum Alloys
 MIL-T-9046 Titanium and Titanium Alloy, Sheet, Strip and Plate
 MIL-S-18729 Steel Plate, Sheet, and Strip, Alloy 4130, Aircraft Quality

Copies can be obtained from the Department of Defense Single Stock Point (DODSSP). <http://dodssp.daps.dla.mil>

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PROCUREMENT
SPECIFICATION

NONE

TITLE

**RIVET, BLIND, GENERAL PURPOSE, BULBED, SELF
PLUGGING, MECHANICALLY-LOCKED-SPINDLE**

CLASSIFICATION
SPECIFICATION

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2.3 Industry Standards and Specifications

ASTM International

ASTM A693	Specification for Precipitation-Hardening Stainless and Heat-Resisting Steel Plate, Sheet, and Strip
ASTM B117	Salt Spray (Fog) Testing, Standard Method of
ASTM B209	Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM D3951	Standard Practice for Commercial Packaging
ASTM D5486/D5486M	Pressure-Sensitive Tape for Packaging, Box Closure, and Sealing

Copies can be obtained from ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. www.astm.org

Aerospace Industries Association

NAS1495	Recommended Qualification Test Procedure for Compliance with NAS Specifications and Standard Drawings
NAS1919	Rivet, Blind - General Purpose, Bulbed, Protruding Head, Mechanically-Locked-Spindle
NAS1921	Rivet, Blind - General Purpose, Bulbed, 100° Flush Head, Mechanically-Locked-Spindle
NAS4006	Aluminum Coating
NASM1312-8	Fastener Test Methods, Method 8, Tension Test
NASM1312-20	Fastener Test Methods, Method 20, Single Shear Test
NASM33522	Rivet for Blind Attachment, Self-Plugging and Chemically Expanded Types, Limitations for Design and Usage

Copies can be obtained from the Aerospace Industries Association, 1000 Wilson Blvd., Suite 1700, Arlington, VA 22209. www.aia-aerospace.org

SAE International

AMS2770	Heat Treatment of Aluminum Alloys
AMS2700	Passivation Treatments for Austenitic, Ferritic and Martensitic CRES (Fastening Devices)
AMS4048	Aluminum Alloy Sheet and Plate, Alclad 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (Alclad 7075-O) Annealed or when specified, "As Fabricated"
AMS4049	Aluminum Alloy, Sheet and Plate, Alclad 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (Alclad 7075; -T6 Sheet - T651 Plate) Solution and Precipitation Heat Treated
AMS4376	Plate, 3.0 Al- 1.0 Zn- .20 Mn Magnesium Alloy, Cold Rolled and Partially Annealed
AMS5690	Steel, Corrosion and Heat Resistant, wire, 17Cr-12Ni-2.5Mo, Solution Heat Treated
AMS5737	Steel Bars, Forgings, and Tubing, Corrosion and Heat Resistant
AMS6345	Steel, Sheet, Strip, and Plate 0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130) Normalized or Otherwise Heat Treated (UNS G41300)
AMS6350	Steel Sheet, Strip, and Plate 0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130) (UNS G41300)
AMS6351	Steel, Sheet, Strip, and Plate 0.95Cr - 0.20Mo (0.28 - 0.33C) (SAE 4130) Spheroidized (UNS G41300)
AMS-QQ-P-416	Plating, Cadmium (Electrodeposited)
AMS-QQ-A-250/4	Aluminum Alloy 2024 Plate and Sheet
AMS-QQ-A-250/12	Aluminum Alloy 7075 Plate and Sheet
AMS-T-9046	Titanium and Titanium Alloy, Sheet, Strip, and Plate

Copies can be obtained from SAE International, 400 Commonwealth Dr., Warrendale, PA 15096-0001. www.sae.org

American Society for Quality

ANSI/ASQ Z1.4	Sampling Procedures and Tables for Inspection by Attributes
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Copies can be obtained from the American Society for Quality, 600 North Plankinton Ave., Milwaukee, WI 53203. www.asq.org

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Metal Powder Industries Federation

MPIF Standard 35 Materials Standards for PM Structural Parts

Copies can be obtained from Metal Powder Industries Federation, 105 College Road East, Princeton, NJ 08540, and www.mpif.org

3. REQUIREMENTS

3.1 Qualification. Rivets supplied to this specification shall comply with all of the requirements of this specification and shall have passed all of the applicable tests herein. (Reference Qualification Test Procedure NAS1495.)

3.2 Materials. The materials used in the manufacture of these rivets shall be as follows:

- (a) Composition B aluminum alloy rivets: Sleeve to be 5056 (UNS A95056), spindle 2024 alloy (UNS A92024) per QQ-A-430.
- (b) Composition M nickel-copper rivets: Sleeve to be Nickel-Copper alloy per QQ-N-281, spindle to be A286 CRES (UNS S66286) per chemical requirements of AMS5737.
- (c) Composition C A286 CRES rivets: Sleeve and spindle to be A286 CRES (UNS S66286) per chemical requirements of AMS5737.
- (d) Lock Collars for Composition C rivets shall be A286 CRES (UNS S66286) per chemical requirements of AMS5737 or 316 CRES (UNS S31600) per AMS5690. When nonintegral collars are employed on Composition B rivets, they shall be made from 5056 aluminum alloy (UNS A95056) per QQ-A-430. Collars may be integral with the 5056 aluminum alloy sleeves. For Composition M rivets, lock collar may be A286 CRES (UNS S66286) per chemical requirements of AMS5737, 316 CRES (UNS S31600) per AMS5690 or Nickel-Copper alloy per chemical requirements of QQ-N-281, wrought or sintered per MPIF Standard 35, Suffix T.

3.3 Design and construction

3.3.1 Construction. The rivet may be of multiple piece construction, assembled to insure integral retention of the component parts through installation. The rivet shall include a means, other than friction, of mechanically locking the spindle to the rivet sleeve. The rivet shall be installed by pulling the spindle (pin) into the rivet sleeve and locking the spindle to the sleeve by mechanical tools in one operation. The pull pin portion of the rivet spindle shall be separated from the rivet after the blind-side bulb has formed and the lock collar set in place. The rivets produced to this specification shall be capable of being installed by tools available at government facilities or in use by airframe manufacturers.

3.3.2 Expansion. The rivet shall be expanded by mechanical means. Expansion shall be accomplished by action of the spindle being drawn into the rivet sleeve. The rivets when expanded shall meet a minimum requirement of .0005 inches over the maximum hole diameters of NASM33522, Type II, using test methods specified in 4.4.2. This requirement is applicable only to rivets with grips up through twice their diameter.

3.3.3 Spindle Retention. Tests are to be performed as specified in 4.4.5. The rivet spindle shall withstand an axial spindle pushout load as shown in Table I.

TABLE I – SPINDLE RETENTION

NOMINAL RIVET DIAMETER (INCH)	MINIMUM SPINDLE PUSHOUT LOAD (POUNDS)		
	COMPOSITION B AL ALLOY	COMPOSITION M NICKEL-COPPER	COMPOSITION C A286 CRES
.125	125	200	200
.156	200	320	320
.190	290	465	465
.250	510	815	815

3.3.4 Dimensions. Rivets shall conform dimensionally to the applicable NAS standards.

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- 3.3.5 Roundness and concentricity of heads. Rivet heads shall be round and concentric within the limits specified in Table II when tested as specified in 4.3.1.1 and 4.3.1.2.
- 3.3.6 Spindle flushness. After the rivet is installed, the remaining portion of the spindle shall be flush within the limits of Figure 1.
- 3.3.7 Finish. Rivets shall be finished in accordance with applicable NAS standards.
- 3.3.8 Heat treatment. Heat treatment when required in the fabrication of aluminum alloy blind rivet shall be in accordance with AMS2770.

TABLE II – TOLERANCES ON CONCENTRICITY OF HEADS

NOMINAL RIVET DIAMETER (INCH)	TOTAL VARIATION IN INDICATOR READINGS ON RIVET HEAD	
	FLUSH HEAD (INCH)	PROTRUDING HEAD (INCH)
.125	.010	.010
.156	.010	.015
.190	.010	.015
.250	.010	.020

- 3.3.9 Grip lengths. Grip lengths of rivets shall be in .0625 inch increments or as shown on applicable NAS standard.
- 3.3.10 Lubrication
- 3.3.10.1 Apply lubrication as necessary to assure proper function of the rivet. The lubricant shall pass the lubricant coating corrosion test specified in 4.4.9.
- 3.3.10.2 When the suffix letter "P" is called out in the standard part number, a dry film lubricant shall be applied as required to the rivet components. Such rivets shall be able to withstand slosh cleaning with A-A-59281 cleaner prior to installation without affecting the function of the rivet.
- 3.4 Shear strength. The single shear strength of the installed rivet shall be equal to or greater than the value shown in Table III when tested as specified in 4.4.6.
- 3.5 Tensile strength. The tensile strength of the installed rivet shall be equal to or greater than the value shown in Table III when tested as specified in 4.4.7.
- 3.6 Fatigue. Fatigue loading of rivets shall conform to values shown in Table III when they are tested as specified in 4.4.8.
- 3.7 Sheet take-up. Rivets shall be capable of closing the gap in the amount shown in Table IV for each diameter using test methods specified in 4.4.4.
- 3.8 Thin sheet installation test. Rivets shall be capable of fastening an assembly stackup including a .020 +.000/-.005 inches aluminum alloy sheet on the blind side in minimum grip +.002/-.000 inches and maximum grip +.000 /-.002 inches using test method specified in 4.4.3.

TABLE III – PHYSICAL CHARACTERISTICS

NOMINAL RIVET DIAMETER (INCH)	MINIMUM SHEAR STRENGTH (LBF)			MINIMUM TENSILE STRENGTH (LBF)			FATIGUE LOAD (LBF)		
	COMP B ALUMINUM ALLOY	COMP M NICKEL-COPPER	COMP C A286 CRES	COMP B ALUMINUM ALLOY	COMP M NICKEL-COPPER	COMP C A286 CRES	COMP B ALUMINUM ALLOY	COMP M NICKEL-COPPER	COMP C A286 CRES
.125	495	1,020	1,090	325	675	675	135	270	405
.156	755	1,565	1,670	490	1,050	1,050	155	310	465
.190	1,090	2,260	2,400	715	1,500	1,500	174	348	522
.250	1,970	4,000	4,250	1,200	2,600	2,600	256	512	768

TABLE IV – SHEET TAKE-UP

NOMINAL RIVET DIAMETER (INCH)	RIVET GRIP DASH NUMBER	SHEET THICKNESS (INCH)	SHEET HOLE SIZE +.0005 -.0000 (INCH)	POUNDS RESISTING SHEET CLOSURE			"A" MIN GAP CLOSURE (INCH)
				COMP B ALUMINUM ALLOY	COMP M NICKEL-COPPER	COMP C A286 CRES	
.125	03	.125	.1300	10	15	15	.010
.156	04	.187	.1620	15	22	22	.015
.190	05	.250	.1940	20	30	30	.020
.250	06	.312	.2580	30	45	45	.025

3.9 Discontinuities. Rivet parts shall be free from discontinuities as follows:

3.9.1 Seam and tool marks. Except as specified in 3.9.2 and 3.9.3, rivets may possess seams and tool marks which do not exceed .005 inches in depth on any of the components of the rivet.

3.9.2 Manufactured head. The rivet head shall not possess more than three discontinuities; comprised of seams, inclusions, nicks, or gouges having a depth exceeding the following when measured normal to the surface:

- (a) On top of the rivet head – .010 inches.
- (b) On periphery of the rivet head – .020 inches.
- (c) On bearing surface of the rivet head – .005 inches. Discontinuities on the bearing surface that would prevent firm seating are not acceptable.

3.9.3 Head shank junction. Longitudinal seams exceeding .005 inches shall not be permitted. Slight tool marks or undercuts with depth not exceeding .005 inches will be permitted provided they blend smoothly into the shank.

3.10 Identification. Rivets shall be identified as shown on the applicable NAS standards. Identification may be raised or depressed .010 inches maximum.

4. QUALITY ASSURANCE PROVISIONS

4.1 Qualification consists of all tests listed in Table V.

4.2 Quality conformance consists of examinations and tests listed in Table VI. These tests shall be applied to all lots of parts supplied to the purchaser.

4.3 Examinations. All sample rivets from the inspection lot shall be examined to determine conformance to the requirements of this specification with respect to material, design, discontinuities, and dimensions. Dimensions shall be checked by means of applicable gages. In cases of controversy, gages certified by government laboratories shall be used. Conformance to 4.4.1.1 shall be determined by metallographic examination.

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