

FED. SUPPLY CLASS

5320

1. SCOPE

1.1 Scope. The specification establishes the requirements for procurement of self-plugging blind rivets, with a visual mechanically locked solid spindle, which can be installed in assemblies or construction. These blind rivets are intended for use in aircraft structural or similar applications in both thick and thin sheets. The bulbed blind head configuration makes these rivets especially suited for thin sheet or double dimpled applications.

1.2 Styles, Classes and Codes. Rivets shall be furnished in the following styles, classes and codes.

Style A – Nominal Shank Diameter

Class 1 – Protruding Head Rivets (MS20615)
Code M – Nickel-Copper Sleeve – CRES Spindle

Class 2 – 100° Flush Head (MS20427)
Code M – Nickel-Copper Sleeve – CRES Spindle

Class 3 – 100° Flush Shear Head (NAS1200)
Code M – Nickel-Copper Sleeve – CRES Spindle

Style B – 1/64" Oversize Shank Diameter

Class 1 – Protruding Head Rivets (MS20615)
Code M – Nickel-Copper Sleeve – CRES Spindle
Code C – Nickel Alloy 600 Sleeve – Nickel Alloy X-750 Spindle

Class 2 – 100° Flush Head (MS20427)
Code M – Nickel-Copper Sleeve – CRES Spindle
Code C – Nickel Alloy 600 Sleeve – Nickel Alloy X-750 Spindle

Class 4 – Flanged Dome Head
Code M – Nickel-Copper Sleeve – CRES Spindle

2. APPLICABLE DOCUMENTS

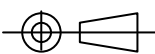
2.1 Publications. The following publications of the issue in effect on date of invitation for bids shall form a part of this specification to the extent specified herein.

2.1.1 Federal Specifications

QQ-N-281 Nickel-Copper-Alloy (Nickel-Copper and R-Nickel-Copper) Bars, Plates, Rods, Sheets, Strips, Wire, Forgings, and Structural and Special Shaped Sections.

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

③ COMPLETELY REVISED

THIRD ANGLE PROJECTION 	CUSTODIAN NATIONAL AEROSPACE STANDARDS COMMITTEE	REVISION 3
PROCUREMENT SPECIFICATION NONE	TITLE RIVET, BLIND, NICKEL-COPPER AND NICKEL ALLOY, MECHANICALLY LOCKED SPINDLE, BULBED	CLASSIFICATION SPECIFICATION NAS1687 SHEET 1 OF 21

2.1.2 Military and Air Force-Navy Aeronautical Specifications and Standards

MIL-R-85188	Riveter, Power, Pneumatic-Hydraulic
MIL-C-83488	Coating, Aluminum, High Purity
MIL-STD-2073/1	Standard Practice for Military Packaging
MMPDS	Metallic Materials and Elements for Aerospace Vehicle Structures
MIL-STD-129	Marking For Shipment and Storage

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

2.1.3 Industry Specifications and Standards

American Society for Quality

ANSI/ASQ Z1.4 Sampling Procedures and Tables for Inspection by Attributes

Copies can be obtained from the American Society for Quality, 600 North Plankinton Ave., Milwaukee, WI 53203.
www.asq.org

ASTM International

ASTM D3951 Standard Practice for Commercial Packaging

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

NAS4006	Coating, Aluminum Pigmented, Organically Bonded
NASM1312-1	Fastener Test Methods – Salt Spray
NASM1312-8	Fastener Test Methods – Tensile Strength
NASM1312-20	Fastener Test Methods – Single Shear
NASM1312-21	Fastener Test Methods – Shear Joint Fatigue
NASM33522	Rivet, Blind, Structural, Mechanically Locked and Friction Retainer Spindle, (Reliability and Maintainability), Design and Construction for

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

SAE International

AMS5639	CRES, Bars, Wire, Forgings, Tubing and Rings
AMS5657	Alloy Wire, Corrosion and Heat Resistant (15-7 PH CRES)
AMS5687	Alloy Wire, Corrosion and Heat Resistant (INCO 600 CRES)
AMS5698	Alloy Wire, Corrosion and Heat Resistant (INCO X750 CRES)
AMS5731	Steel Bars, Forgings, Corrosion and Heat Resistant (A286 CRES)
AMS5737	Steel Bars, Forgings, Corrosion and Heat Resistant (A286 CRES)
AMS2759	Heat Treatment of Steels, Process For
AMS-QQ-P-416	Plating, Cadmium (Electro-Deposited)

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

3. REQUIREMENTS

- 3.1 Qualification. The rivets furnished under this specification shall be a product which has been tested and has passed the qualification tests specified herein. The rivet manufacturer shall be responsible for conducting the tests of this specification. Results of these tests shall be submitted upon application for qualification. Changes to the fastener that affect its ability to meet the requirements of this specification shall require requalification for those requirements which are affected.

③ COMPLETELY REVISED

REVISION
3
NAS1687
SHEET 2



Documents
SHEET 2

Document Sharing Hub

- 3.2 Materials. The rivets shall be fabricated from materials specified in the applicable NAS part standards.
- 3.3 Design and Construction
- 3.3.1 Construction. The blind rivet is of multiple piece construction, must be an integral assembly and shall include a means, other than friction or the use of adhesives, of mechanically locking the solid spindle to the blind rivet sleeve. The blind rivet assembly shall consist principally of a blind rivet sleeve and solid spindle plus any other elements required with a visible metallic locking element to lock the spindle to the blind rivet sleeve, and a disposable driving anvil. The blind rivets produced to this specification must be capable of being installed using tooling manufactured to the requirements of MIL-R-85188.
- 3.3.2 Installation. When tested as specified in Paragraph 4.4.5, the blind rivet shall be installed by mechanical means. Installation is to be accomplished by action of a spindle being pulled into the blind rivet sleeve. The installation tool shall be capable of installing the blind rivet and mechanically locking the spindle to the blind rivet sleeve. The excess portion of the blind rivet solid spindle shall be separated during the installation operation.
- 3.3.3 Spindle Retention. When tested as specified in Paragraph 4.4.6, the installed blind rivet spindle shall withstand the axial pushout load values specified in Table VIII. The spindle of an uninstalled blind rivet shall be capable of withstanding axial pushout loads of the values specified in Table IX.
- 3.3.4 Dimensions. Blind rivets shall conform dimensionally to the applicable NAS standards.
- 3.3.5 Concentricity of Heads. The blind rivet manufactured head shall be concentric with the shank within the limits specified in Table IV when tested as specified in Paragraph 4.4.2.
- 3.3.6 Installed Flushness. The installed solid spindle and locking element shall be flush within the limits shown in Figure 1. A means of visual inspection shall be provided to show that the rivet is properly locked.
- 3.3.7 Finish. The blind rivet shall be finished in accordance with applicable NAS standards. When the NAS part standard requires parts be cadmium plated to the requirements of AMS-QQ-P-416. The following exceptions apply:
1. Cadmium plated 15-7 spindles shall be baked at $375^{\circ}\text{F} \pm 25^{\circ}\text{F}$ ($191^{\circ}\text{C} \pm 14^{\circ}\text{C}$) for a minimum of four (4) hours within four (4) hours after plating.
 2. Hydrogen embrittlement relief testing will not be required.
- 3.3.8 Heat Treatment. Heat treatment of 15-7 PH CRES, Nickel Alloy, and A286 CRES shall be per AMS2759.
- 3.3.9 Shear Strength. The single shear strength of the blind rivet shall be not less than the value specified in Table V when tested in accordance with Paragraph 4.4.3.
- 3.3.10 Tensile Strength. The tensile strength of the driven blind rivet shall be not less than the value listed in Table VI when tested in accordance with Paragraph 4.4.4.
- 3.3.11 Thin Sheet Pull-Thru. The blind rivet shall be not less than the minimum pull-through strength value specified in Table VII when tested as specified in Paragraph 4.4.4.1.
- 3.3.12 Fatigue Strength. The blind rivet shall withstand 3 million fatigue cycles at the loads specified in Table XI when tested as specified in Paragraph 4.4.11.
- 3.3.13 Sheet Take-Up. The blind rivet shall be capable of closing a gap per Table X when the total stack up thickness (not including gap) is equal to the prescribed maximum and minimum grip for the blind rivet tested. Minimum grip testing not required for all "02" grip fasteners; minimum grip testing not required for "6" diameter 100° flush head "03" grip fasteners. The force resisting closure of the gap shall not be less than that specified in Table X when tested per Paragraph 4.4.7.

③ COMPLETELY REVISED

REVISION

3

NAS1687
SHEET 3



Document Sharing Hub

- 3.3.13.1 Sheet take-up performance compliance shall be documented for initial qualification as defined in Table I, and every six months thereafter for each style, class, code and diameter rivet to demonstrate continued compliance. In the event of failure, begin sheet take-up tests for each lot of the affected style, class, code and diameter rivet produced and document results. After five consecutive lots of the affected style, class, code and diameter rivets are accepted in accordance with Paragraph 3.3.13, testing may be discontinued and periodic testing resumed. Initial qualification and all performance compliance test data shall be retained for a period of seven years by the manufacturer for review by any procuring activity.
- 3.3.14 Lubrication. Lubrication as necessary to assure proper function of the blind rivet is permissible. The lubricants used shall pass the lubricant tests as specified in Paragraph 4.4.9. Cadmium or zinc shall not be used for a lubricant unless specified as a finish on the applicable NAS standards sheets. Lubricants used shall be stable and not subject to deterioration under normal handling and storage conditions not to exceed 150 °F.
- 3.3.15 Workmanship. The blind rivet shall be of uniform quality and shall be finished in a workmanlike manner in accordance with high grade aircraft manufacturing practice. Discontinuities such as seams and clinch or die marks are permitted within the limits specified in Table III provided they do not affect other requirements of this specification. Blind rivets shall be free from fins.
- 3.3.16 Installation and Tensile Test with Sloped Blind Side Surface. The blind rivet shall be capable of being installed and meet the minimum tensile strength value specified in Table VI, when tested with a sloped blind side surface as specified in Paragraph 4.4.10.
- 3.3.17 Head Marking. The rivet shall be marked in accordance with the applicable NAS standards.

4. QUALITY ASSURANCE PROVISIONS

- 4.1 Classification of Tests. The inspection and testing of blind rivets shall be classified as follows:

- (A) Qualification Tests (See 4.2)
- (B) Quality Conformance Tests (See 4.3)

- 4.2 Qualification Tests. Qualification tests are those tests accomplished on samples submitted for qualification as a satisfactory product and must be manufactured on production equipment using production methods. Qualification of flush head rivets constitutes qualification of the other head classes, except that those tests listed in Table II shall be performed on all head classes submitted for qualification.

- 4.2.1 Sampling Instructions. Qualification test samples shall be selected in accordance with Table I. Qualification test samples shall be accompanied by the manufacturer's test results, or the results of tests conducted by an approved independent test laboratory, of the tests listed herein, and four copies of the manufacturer's instructions. Samples shall be identified as required and forwarded to the activity responsible for qualification, designated in the letter of authorization from that activity. Samples shall be packaged in accordance with the requirements of Section 5, and plainly identified by securely attached labels or tags marked with the following information:

Sample for Qualification Test
Rivets, Blind, Self-Plugging, Mechanically Locked Solid Spindle, Bulbed
Specification NAS1687
Code: (Material)
Class: (Flush or Protruding Head)
Grip Length:
Diameter:
Manufactured By: (Name, Symbol, Cage Code)
Submitted By: (Name)

③ COMPLETELY REVISED

REVISION
3
NAS1687
SHEET 4



Documents

Document Sharing Hub

- 4.2.2 Tests. The qualification tests of blind rivets shall consist of all the tests of this specification as described under "Test Methods" and as specified in Table I. After each significant manufacturing design or process change, qualification tests shall be performed upon authorization of the activity responsible for qualification, on materials previously found satisfactory, and at other times as may be specified. Re-qualification tests may be waived on minor design or process changes, provided substantiating test data is submitted indicating no change in performance characteristics, and upon acceptance of such test data by the qualification activity.
- 4.2.2.1 Qualification reports must specify the specific material used in each component of the assembled rivet used in the qualification. Use of any optional material as allowed by the applicable NAS part standard which was not previously authorized by the qualification activity requires separate qualification and approval.
- 4.3 Quality Conformance Tests. Quality conformance inspection shall consist of the examination and tests listed in Table II and conducted for every lot. The rivet manufacturer shall use sufficient in process controls and/or inspection of product to assure conformance to the requirements of the specification.
- 4.3.1 Sampling Inspections. Sampling shall be in accordance with Table II and ANSI/ASQ Z1.4.
- 4.3.2 Lot. A lot shall consist of finished blind rivets which are of the same code, class, grip and diameter, fabricated by the same process, heat treated in the same manner, and produced as one continuous run or order.
- 4.3.2.1 A lot of component members of blind rivets (such as sleeves or solid spindles) shall consist of those components which are of the same code, class, grip, and diameter, fabricated by the same processes, heat treated in the same manner, and produced as one continuous run, or order, or part thereof. Dimensional inspection already performed on component members need not be repeated after assembly of finished blind rivets submitted as an inspection lot.
- 4.3.3 Sampling Plan A Tests. Samples shall be selected at random in accordance with ANSI/ASQ Z1.4, Inspection Level S3, Acceptance Quality Level (AQL) 4.0 and shall be subjected to the following tests described under "Test Methods":
- | | |
|-----------------------------------|---------|
| Visual and Dimensional Inspection | (4.4.1) |
| Concentricity of Head | (4.4.2) |
- 4.3.4 Sampling Plan B Tests. Samples shall be selected at random in accordance with ANSI/ASQ Z1.4, Inspection Level S3, acceptance number of zero, and shall be subjected to the following tests described under "Test Methods":
- | | |
|-------------------|---------|
| Shear Strength | (4.4.3) |
| Tensile Strength | (4.4.4) |
| Spindle Retention | (4.4.6) |
- The number of tests to be made shall be the smallest number shown under the multiple sampling plan.
- 4.3.5 Sampling Plan C Tests. Samples shall be selected at random in accordance with ANSI/ASQ Z1.4, Inspection Level S3, Acceptance Quality Level (AQL) 4.0 and shall be subjected to the following test described under "Test Methods":
- | | |
|--------------|---------|
| Installation | (4.4.5) |
|--------------|---------|
- 4.3.6 Blind rivets may be subjected to any or all of the tests specified herein which the procuring activity considers necessary to determine conformance with the requirements of this specification.
- 4.3.7 Resubmitted Inspection Lots. Paragraph 6.4 of ANSI/ASQ Z1.4 shall apply except that a resubmitted inspection lot shall be inspected by the contractor under supervision of the procuring activity inspector using tightened inspection. Where the original acceptance number was zero, a sample size represented by the next higher sample size code letter shall be chosen. Before resubmitting, full particulars concerning the cause of previous rejection and action taken to correct the defects found in the inspection lot shall be furnished by the contractor to the cognizant contracting office.

③ COMPLETELY REVISED

REVISION
3
NAS1687
SHEET 5



Documents
Document Sharing Hub

4.4 Test Methods

4.4.1 Visual and Dimensional Inspection. All blind rivets in the samples selected in accordance with 4.3.3 shall be subject to examination to determine conformance to the requirement of this specification with respect to material, workmanship, construction, finish and dimensions. Finish and dimensions shall be checked visually and by means of applicable gages. In case of controversy, gages certified by accredited laboratories shall be used.

4.4.2 Concentricity of Head

4.4.2.1 Class 1 and Class 4 Protruding Head Blind Rivets. Concentricity of protruding head blind rivets shall be determined by observing the full indicator movement of a dial indicator testing the periphery of the head, as the blind rivet is rotated with its shank as an axis (see Table IV).

4.4.2.2 Class 2 and Class 3 Flush Head Blind Rivets. Concentricity of flush head blind rivets shall be determined by observing the full indicator movement of a dial indicator testing the conical surface of the head (adjacent to the top of the blind rivet) as the blind rivet is rotated with its shank as an axis (see Table IV).

4.4.3 Shear Strength. Test blind rivets shall be installed in a fixture per MIL-STD-1312-20. Test fixture holes shall be in accordance with Table XII. The actual tests of the specimens shall be conducted at the maximum grip of the particular rivet under test and shall be in accordance with the methods specified in MIL-STD-1312-20. The tests need not be carried to destruction if the test specimens meet the rated strengths specified in Table V without failure. Failure is defined as the maximum load attained by the fastener.

4.4.4 Tensile Strength. Tensile strength of blind rivet specimens shall be tested in a fixture as shown in Figure 2. Blind rivet grip lengths that will not accommodate the minimum sheet thickness specified in the Figure 2 table need not be tested. Tests shall be in accordance with methods specified in MIL-STD-1312-8. Failure is defined as the maximum load attained by the fastener. Fasteners to be tested in maximum grip condition.

4.4.4.1 Thin Sheet Pull-Thru. The resistance to pull-thru of the blind side head shall be determined using the specimen shown in Figure 3. Test method procedure shall be per MIL-STD-1312-8. Unless otherwise specified, tests shall be conducted such that the blind head bears against the thin sheet. Blind rivets shall meet the appropriate requirement in pounds of Table VII and hole size per Table XII prior to pull-thru of the blind head or blind rivet failure. Fasteners to be tested in minimum grip.

4.4.5 Installation. The blind rivet shall be installed in sheet specimens equivalent to minimum grip and maximum grip for the particular blind rivet under test in accordance with Figure 9. The blind rivets shall be installed in accordance with the manufacturer's instructions with the tool conforming to MIL-R-85188. Superficial surface cracking in the rivet blind head as the result of installation is not cause for rejection. Splits, blind rivets failing to expand, and improper locking element and spindle position, as the result of driving, in more than 5% of the blind rivets installed shall be cause for rejection during qualification.

4.4.6 Spindle Retention. One half of the blind rivet test specimens shall be installed in a test plate of minimum specified thickness (except that blind rivets with grip length equal to or less than their diameters shall be installed in a test plate of maximum specified thickness). The remaining test specimens shall be in the uninstalled condition. In determining the solid spindle retention loads, a test device shown in Figure 5 shall be used. The load shall be applied to the spindle, from the manufactured head side of the blind rivet, in such a manner which provides movement rate not exceeding 3.0 inches per minute. A means for accurately determining the force applied to the solid spindle shall be provided. The push out load shall be applied directly in line with the axis of the solid spindle. The spindle retention load of the installed test specimens shall meet or exceed the loads specified in Table VIII. The spindle retention load of the uninstalled test specimens shall meet or exceed the loads specified in Table IX.

4.4.7 Sheet Take-Up. The blind rivet sheet material and hole sizes shall be as shown in Figure 7. Three tests of each category shall be made and the rivet shall clinch remove all of the gap in each test. Gap removal shall be measured with the use of a .0015" thick gage. The gage shall not be able to penetrate the fay surface to touch the rivet shank (see Figure 8). The force resisting the closing of the gap and the gap to be closed shall be not less than the value shown in Table X.

③ COMPLETELY REVISED

REVISION

3

NAS1687

SHEET 6



Document Sharing Hub

USE OF OR RELIANCE UPON THIS DOCUMENT OR ANY NATIONAL AEROSPACE STANDARD IS ENTIRELY VOLUNTARY. AIA DOES NOT QUALIFY SUPPLIERS OR CERTIFY

Copyright Aerospace Industries Association of America, Inc. ALL RIGHTS RESERVED. THIS DOCUMENT IS PRODUCED UNDER NATIONAL AEROSPACE STANDARD: AIA MAKES NO REPRESENTATION OR CLAIM RESPECTING (1) THE SUITABILITY OF PROVIDED BY IHS UNDER LICENSE WITH AIA/NAS. ANY PARTICULAR APPLICATION OR (2) THE EXISTENCE OF OR APPLICABLE LICENSEE: www.sepana.ir/5991803002, User=sam, albert

No reproduction or networking permitted without license from IHS. Not for Resale, 01/04/2016 10:33:43 MST TRADEMARK RIGHTS.

Full document details: AIA NAS1687 2012

- 4.4.8 Retest. When test failures are ascribable to faulty test procedures, retests may be authorized by the activity responsible for qualification.
- 4.4.9 Suitability of Lubricant Coatings. Lubricant coated and unlubricated "scratch specimens" made of the same materials as the finished rivet sleeves and having the same protective or other surface finish (if any) shall be scratched through to the base metal. Specimens may be of any convenient size and shape, but the total surface area of each should exceed 6 square inches. These specimens shall be subjected to a 96-hour salt spray test in accordance with MIL-STD-1312-1. After exposure, no significant increase in corrosion shall be found when a comparison is made between lubricated and unlubricated panels.
- 4.4.10 Installation and Tensile Test With Sloped Blind Side Surface. The blind rivet shall be capable of being installed and tested in a 10° blind side sloped surface as shown in Figure 6.
- 4.4.11 Fatigue Strength (Qualification Only). Fatigue strength shall be determined by using the full load transfer method per MIL-STD-1312-21 and the fixture shown in Figure 4. Minimum load shall be 10% of maximum load as indicated in Table XI. Minimum life requirement at the loads listed in Table XI shall be 3×10^6 cycles. If no failure after 3×10^6 cycles, tests may be discontinued. See Figure 4.

5. PREPARATION FOR DELIVERY

- 5.1 Packaging. To the requirements of MIL-STD-2073/1 for Classes A and B, and ASTM D3951 for Class C as specified, and marking requirements per MIL-STD-129 unless otherwise specified.

6. NOTES

- 6.1 Intended Use. This specification is intended to establish and control the quality of blind rivets for use in structural applications.
- 6.2 Design Information. Design information concerning the use of rivets for blind attachment is contained in standard NASM33522, "Rivet, Blind, Structural, Mechanically Locked and Friction Retainer Spindle, (Reliability and Maintainability), Design and Construction For."
- 6.3 Joint Allowables Verification. User may choose to verify that the respective manufacturer has demonstrated compliance to MMPDS allowables to the extent they exist.
- 6.4 Installation Tools. For government use only, procurement of blind rivets may be limited to those acceptable NAS rivets which may be driven by installation tools already in the service stock system and comply with MIL-R-85188.
- 6.5 Order Data. Procurement documents should specify the following:
- (A) Style, Class and Code of Rivets by NAS Part Number (See Paragraph 1.2).
 - (B) Quantity.
 - (C) Selection of Applicable Levels of Packaging and Packing (See Section 5).

③ COMPLETELY REVISED

REVISION
3
NAS1687
SHEET 7



Documents
SHEET 7

Document Sharing Hub