

FED. SUPPLY CLASS

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1. SCOPE

- 1.1 **Purpose.** This specification establishes the requirements for Titanium Pull-Type and Stump-Type Flush and Protruding Head, Pin, Rivet, Grooved, and Titanium Collar, Grooved, Pin, Rivet as permanent attachment fasteners on composite materials.
- 1.2 **Classification.** The pins and collars covered by this specification shall be of the types, sizes, and materials designated by the part number specified on the applicable NAS part standards.

2. REFERENCED DOCUMENTS

- 2.1 **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 (see 6.5).

2.1.1 Governmental

MIL-STD-129 Marking for Shipment and Storage
MIL-STD-2073/1 Standard Practice for Military Packaging

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

2.1.2 Non-Governmental

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 B348 Commercially Pure Titanium
ASTM D5486/D5486M Standard Specification for Pressure-Sensitive Tape for Packaging, Box Closure, and Sealing
ASTM D3951 Standard Practice for Commercial Packaging
ASTM E120 Methods for Chemical Analysis of Titanium and Titanium Alloys
ASTM E1417 Standard Practice for Liquid Penetrant Testing

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

SAE International

AMS2249 Chemical Check Analysis Limits, Titanium and Titanium Alloys
AMS4967 Titanium Alloy Bars and Forgings, 6Al-4V Annealed, Heat Treatable
AMS-H-81200 Heat Treatment of Titanium and Titanium Alloys

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

ASME

ASME B46.1 Surface Texture (Surface Roughness, Waviness, and Lay)

Copies can be obtained from ASME, Three Park Ave., New York, NY 10016-5990. www.asme.org

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THIRD ANGLE PROJECTION	CUSTODIAN NATIONAL AEROSPACE STANDARDS COMMITTEE	REVISION 1
PROCUREMENT SPECIFICATION NONE	TITLE PIN, RIVET, GROOVED, AND COLLAR, FOR COMPOSITE MATERIALS	CLASSIFICATION SPECIFICATION NAS2014
		SHEET 1 OF 13

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.
1000 WILSON BLVD.
ARLINGTON, VA 22209

THIS DRAWING SUPERSEDES ALL ANTECEDENT STANDARD DRAWINGS FOR THE SAME
PRODUCT AND SHALL BECOME EFFECTIVE NO LATER THAN SIX MONTHS FROM THE LAST
REVISION DATE.

FORM 09-01

REVISION DATE: JUNE 29, 2012

ISSUE DATE: JUNE 1991

Aerospace Industries Association

NAS527	Inspection Procedure for Flush Fasteners
NAS1495	Recommended Qualification Test Procedure for Compliance with NAS Specifications and Standards Drawings
NAS1563	Gages, Pins and Collar Inspection, Swage Locking
NAS2013	Collar, Grooved, Pin-Rivet, Titanium (Composite Application)
NAS2015 THRU NAS2022	Pin-Rivet, Grooved, Titanium (Composite Applications) Protruding Head, Pull-Type
NAS2025 THRU NAS2032	Pin-Rivet, Grooved, Titanium (Composite Applications) 100° Flush Head, Pull-Type
NAS2035 THRU NAS2042	Pin-Rivet, Grooved, Titanium (Composite Applications) 130° Flush Head, Pull-Type
NAS2045 THRU NAS2052	Pin-Rivet, Grooved, Titanium (Composite Applications) Protruding Head, Pull-Type
NAS2055 THRU NAS2062	Pin-Rivet, Grooved, Titanium (Composite Applications) 100° Flush Head, Pull-Type
NAS2065 THRU NAS2072	Pin-Rivet, Grooved, Titanium (Composite Applications) 130° Flush Head, Pull-Type
NASM1312	Fastener, Test Methods

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

3. REQUIREMENTS

3.1 General. Pins and collars supplied to this specification shall comply with the design requirements of their respective NAS drawing and the requirements of this specification and shall have passed all the applicable tests herein.

3.2 Material

Pins: Titanium 6Al-4V per AMS4967
Collars: Titanium, commercially pure per ASTM B348

3.3 Collars. Collars for use with pins shall conform to NAS2013 and meet the requirements of Table I.

3.4 Design and construction

3.4.1 Pull-type. The pull-type design shall be such that bucking on the head end is not required during installation. The fastener assembly shall consist of a pin inserted from one side of the work with a collar swaged in place on the opposite side. The installation tool shall grip the pin of the collar side, clamp the sheet together with uniformly retained clamping force, swage the collar in place, and break off the pulling end of the stem. The installed assembly shall meet the strength requirements specified herein. Interchangeability of the pulling end detail is required between like products to ensure standardized installation tooling.

3.4.2 Stump-type. The stump-type design shall be such that restraint of the head end is required during installation. The fastener assembly shall consist of a pin inserted from one side of the work with a collar swaged in place on the opposite side. The installation shall consist of a device to provide head restraint and to swage or squeeze the collar in place. The installed assembly with uniformly retained clamping force shall meet the strength requirements specified herein.

3.4.3 Dimensions. Dimensions shall be in accordance with applicable NAS drawings.

3.4.4 Grip lengths. Grip lengths of the pins shall be in increments as shown on the applicable NAS drawings.

3.4.5 Sealant escape groove option. When applying sealant to pins not having sealant escape grooves, the sealant must be wiped clean from the locking grooves before the collar is installed to achieve properly engaged collar installations. Sealant escape grooves cut through the pin locking grooves allow the sealant material to escape from the locking grooves as the collar is swaged during installation. Part number codes for sealant escape groove pins are shown on the applicable NAS part standards and shall meet the requirements of Figure 4.

3.4.6 Head protrusion. Head protrusion shall be in accordance with applicable NAS drawings.

3.4.7 Surface texture. Surface texture shall be in accordance with applicable NAS drawings.

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- 3.4.8 Identification. Identification shall be in accordance with applicable NAS drawings.
- 3.4.9 Lubrication. Lubrication shall be in accordance with applicable NAS drawings.
- 3.5 Mechanical properties
- 3.5.1 Tensile strength. Tensile strength shall meet the minimum requirements of Table II.
- 3.5.2 Shear strength. Double shear strength shall meet the minimum requirements of Table II.
- 3.5.3 Head to shank fillet. Head to shank fillet shall conform to the applicable NAS drawing and meet the requirements of Figure 3.
- 3.5.4 Clamp force. Clamp force shall meet the requirements of Table II.
- 3.5.5 Fatigue life. Fatigue life shall next the requirements of Table VII.
- 3.6 Metallurgical properties
- 3.6.1 Hydrogen. Finished pins shall not have a hydrogen content exceeding .0125 percent (125 ppm) per AMS2249.
- 3.6.2 Head grain flow. Head grain flow shall meet the grain flow pattern of Figure 5.
- 3.6.3 Grinding burns. None permitted subsequent to all grinding operations on: shank, head to shank fillet.
- 3.6.4 Cracks. No cracks are permitted in any location. A crack is a clean, irregular break passing through the grain boundary.
- 3.6.5 Discontinuities and surface contamination. Permitted only as described in Figure 1 and subject to requirements of Table VI.
- 3.6.6 Microstructure. The material shall show no evidence of inclusions, alloy segregation, or surface contamination. The microstructure shall be free of acicular (basketweave) structure. Microstructure that is 100 percent transformed beta is considered overheated and unacceptable.
- 3.7 Heat treatment. Heat treatment shall develop mechanical properties as defined herein, without adverse effect on metallurgical properties specified herein. Production parts must be heat treated in the same manner as the qualification test parts.
- 4. QUALITY ASSURANCE PROVISION**
- 4.1 Qualification requirements. Qualification requirements shall consist of tests per Table III. Evidence shall be submitted satisfactory to the purchaser, that the supplier has produced fasteners of the same basic part number (excluding grip designation) diameter and material as those for which quotations are asked. These fasteners shall meet requirements this specification.
- 4.2 Quality conformance inspection. Quality conformance inspection shall consist of tests per Tables IV and V.
- 4.3 Quality control records pertaining to the specific work order, lot number or job number shall be available for inspection by the purchaser, for a period of 5 years after manufacturer's final inspection date.
- 4.3.1 Lot. The inspection lot shall consist of finished parts which are of the same part number, fabricated by the same process, which are treated together in one furnace load from the same heat of material and submitted for manufacturer's inspection at the same time.

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- 4.3.2 Inspection report. Each shipment shall be accompanied by an inspection report as part of or separate from the shipment notice. If more than one inspection lot is included in a shipment, a separate inspection report is necessary for each inspection lot and unit packages must clearly identify the applicable lot. The report(s) shall be in duplicate and be signed by an authorized employee of the shipper. This report shall provide the following:
1. A statement substantially as follows: "The parts contained in this shipment have been manufactured and inspected in accordance with applicable drawings and specifications".
 2. Customer's name (and division, if applicable).
 3. Purchase order number and date.
 4. Part number (manufacturer's part number may also be included).
 5. Part name or type.
 6. Inspection lot size(s) and lot number(s).
 7. Quantity shipped.
 8. Material heat number.
 9. Material composition (include mill heat report, independent lab test or part manufacturer's test – state which).
 10. Mechanical test results (individual test results, averages or statistical analysis as required) and required minimums.
 11. Deviations, if any (explanation required).
 12. Other data desired by vendor.
- 4.4 Test methods
- 4.4.1 Material. As desired by pin manufacturer to assure that production parts conform to applicable specification.
- 4.4.2 Dimensions. Conventional measuring methods shall be utilized.
- 4.4.3 Identification. Identification shall be visually inspected to meet the requirements of the applicable NAS standard.
- 4.4.4 Lubrication. Lubrication shall be tested in accordance with applicable lubrication specification.
- 4.4.5 Collars. Collars shall be tested in accordance with Table I.
- 4.4.6 Sealant escape groove. Conventional measuring methods shall be utilized.
- 4.4.7 Head protrusion. Head protrusion shall be measured in accordance with NAS527.
- 4.4.8 Surface texture. Surface texture shall be measured in accordance with ASME B46.1.
- 4.4.9 Tensile strength. Tensile strength shall be tested in accordance MIL-STD-1312-8.
- 4.4.10 Shear strength. Shear strength shall be tested in accordance with MIL-STD-1312-13.
- 4.4.11 Head to shank fillet. Head to shank fillet shall be tested utilizing an optical comparator.
- 4.4.12 Clamp force. Clamp force shall be tested in accordance with MIL-STD-1312-16.
- 4.4.13 Fatigue life. Fatigue life shall be tested in accordance with Table VII and MIL-STD-1312-11.
- 4.4.14 Cracks and discontinuities. The presence of cracks and discontinuities such as laps, seams and inclusions shall be determined by post emulsification penetrant inspections per ASTM E1417. Penetrant indication shall be evaluated by metallurgical examination of cross sections per Figure 2 at 50x to 60x magnification. Fluorescent penetrant inspection per ANSI/ASQ Z1.4, Level II, .04 percent AQL. Reduced inspection plan may be applied as authorized per ANSI/ASQ Z1.4, Section 8.

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