

FED. SUPPLY CLASS

53GP

1. SCOPE

- 1.1 This specification defines the requirements for alloy steel externally threaded fasteners procured under part numbers listed on drawings which refer to this specification. Typically these fasteners are used for shear applications where 95 KSI Fsu is desired with a service temperature capability to 450 °F. Receiving contractors may reject any manufactured lot which does not conform.
- 1.2 Workmanship of fasteners shall conform with aircraft fastener manufacturing processes.
- 1.3 Recommendations for improvements or corrections to this specification should be directed to an NASC representative of a using company or to the Executive Secretary of the National Aerospace Standards Committee.
- 1.4 Specifications listed herein, of the issue in effect on date of price inquiry are a part of this specification to the extent indicated. In the case of conflict, the requirements herein shall take precedence.

2. APPLICABLE DOCUMENTS

2.1 Industry Standards

2.1.1 ASME (www.asme.org)

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

2.1.2 American Society for Quality (www.asq.org)

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

2.1.3 ASTM International (www.astm.org)

ASTM E 112 Grain Size, Standard Test Methods for Determining Average

ASTM E 140 Standard Hardness Conversion Tables for Metals

ASTM E 340 Standard Test Methods for Macroetching Metals & Alloys

ASTM E 407 Standard Test Practice for Microetching Metals & Alloys

ASTM E 1444 Standard Practice for Magnetic Particle Testing

2.1.4 Aerospace Industries Association (www.aia-aerospace.org)

~~NAS526~~ ~~Flushness Gage & Stylus for 100° Countersunk Flush Fasteners~~

~~NAS527~~ ~~Inspection Procedure for Flush Fastener~~

NAS9800 Head Protrusion Gaging 100° Flush Head Gage Block, Gage Diameter and Stylus

NASM1312-6 Fasteners, Test Methods, Method 6, Hardness

NASM1312-13 Fasteners, Test Methods, Method 13, Double Shear Test

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

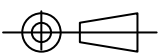
NASM14191 Recess, Offset Cruciform, Ribbed, Dimensions of Recess, Gage and Driver for

NASM33750 Recess, Dovetail Slot and Conical Dovetail Slot, Dimensions of Recess, Gage and Driver for

NASM33781 Recess, Offset Cruciform, Dimensions of Recess, Gage and Driver for

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PROCUREMENT
SPECIFICATION

NONE

TITLE

**FASTENERS, ALLOY STEEL
EXTERNALLY THREADED, 95 KSI Fsu, 450 °F**

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2.1.5 SAE International (www.sae.org)

AMS-QQ-P-416	Plating, Cadmium (Electrodeposited)
AMS-S-5000	Steel, Chrome-Nickel-Molybdenum (E4340) Bars and Reforging Stock
AMS2759	Heat Treatment of Steel Raw Materials
AMS6320	Steel Bars, Forgings, and Rings, 0.50Cr - 0.55Ni - 0.25Mo (0.33 - 0.38C) (SAE8735)
AMS6322	Steel Bars, Forgings, and Rings, 0.5Cr-0.55 Ni-0.25Mo (0.38-0.43C) (SAE8740)
AMS6325	Steel, Bars and Forgings, 0.50Cr - 0.55Ni - 0.25Mo (0.38 - 0.43C) (SAE8740)
	Heat Treated, 105 ksi (724 MPa) Tensile Strength
AMS6327	Steel Bars and Forgings, 0.50Cr - 0.55Ni - 0.25Mo (0.38 - 0.43C) (SAE8740)
	Heat Treated, 125 ksi (862 MPa) Tensile Strength
AMS6349	Steel Bars, 0.95Cr 0.20Mo (0.38-0.43C), Normalized (SAE4140)
AMS6382	Steel Bars, Forgings, and Rings, 0.95Cr-0.20Mo (0.38-0.43C) (SAE4140)
AMS6415	Steel Bars, Forgings, and Tubing, 0.80Cr-1.8Ni-0.25Mo (0.38-0.43C) (SAE4340)
AMS6448	Steel Bars, Forgings, and Tubing, 0.95Cr - 0.22V (0.48 - 0.53C) (SAE 6150)
AMS6484	Steel Bars, Forgings, and Tubing, 0.80Cr-1.8Ni-0.25Mo (0.38-0.43C) (SAE4340), Normalized and Tempered
AS8879	Screw Threads – UNJ Profile, Inch, Controlled Radius Root with Increased Minor Diameter

TABLE I – BASIC REQUIREMENTS

CHARACTERISTICS	ENGINEERING REQUIREMENTS	TESTING REQUIREMENTS (SEE 3.1)	
		TEST METHOD	SAMPLING PLAN
MATERIAL	Alloy Steel per; AMS6322 (8740) AMS6325 (8740) AMS6327 (8740) AMS6349 (4140) AMS6382 (4140) AMS6415 (4340) AMS6484 (4340) AMS-S-5000 (4340) AMS6320 (8735) AMS6448 (6150)	Per material specification. Spectrographic analysis for routine checking. Chemical analysis for doubtful material.	Check material composition for 25% (or more) of the parts used for metallurgical examination. Not mandatory.
DIMENSIONS	After all plating.	Conventional measuring methods.	Per TABLE X.
PROTRUDING HEAD	Bearing surface to be perpendicular to shank within two degrees for fasteners with .500 shank diameter and less and one degree for fasteners with a shank diameter greater than .500 inch. Concentricity per TABLE III.	Conventional measuring methods.	Per TABLE X.
FLUSH HEAD 100°	Unless otherwise specified, concentricity per TABLE III. Head protrusion per ~~NAS526~~ NAS9800.	~~Per NAS526 & NAS527.~~ Per NAS9800.	Per TABLE X.
SHANK STRAIGHTNESS	Per TABLE IV.	Conventional measuring methods.	Per TABLE X.

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TABLE I – BASIC REQUIREMENTS (CONT)

CHARACTERISTICS	ENGINEERING REQUIREMENTS	TESTING REQUIREMENTS (SEE 3.1)	
		TEST METHOD	SAMPLING PLAN
WRENCHING HEAD OR RECESS	Per fastener part standard or drawing and TABLE II.	Check recess per applicable part standard and specification.	Per TABLES II and X.
SURFACE TEXTURE		Per ASME B46.1 by visual or fingernail comparison. In case of controversy, profilometer may be used for checking roughness if surface is accessible.	
IDENTIFICATION		Visual examination to assure legibility. Control stamp depth to assure max. is not exceeded.	Per TABLE X, 4.0% AQL.
THREADS	Thread form per AS8879 and FIGURES 2, 3 and 4.	Indicating gages, micrometer, caliper and/or comparator.	Per TABLES II and X.
HEAT TREATMENT	Per AMS2759. Shall develop mechanical properties as defined herein.	Test of mechanical and metallurgical properties verifies heat treatment.	As indicated for each test requirement.
HARDNESS	Individual hardness readings shall be within the limits of 36 to 40 HRC (or equivalent per ASTM E 140).	Hardness test per MIL-STD-1312-6. /a/	Destructive test per TABLE VII or nondestructive test per TABLE X, 0.15% AQL, manufacturer's option.
SHEAR STRENGTH	Minimum shear strength per TABLE XII. Limitations per note /q/ under TABLE XII.	Double shear test per MIL-STD-1312-13 or single shear test per MIL-STD-1312-20. If part is too short for test, use HRC value.	Per TABLE XI.
METALLURGICAL	No cracks permitted in any location. A crack is a separation, of depth of the grain, which crosses over into another grain. Other discontinuities permitted only as described in TABLE V.	By longitudinal and circular method per ASTM E 1444. Apply magnetic inspection after plating. Magnetic inspection is not required on fasteners with thread size smaller than .1900. Fasteners shall not be marked for indication of magnetic inspection.	Sample per TABLE X, 0.15% AQL. If evidence of valid indications are found exceeding the acceptance level of TABLE X, reexamine in accordance with TABLE VII, note /m/, number 2.

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TABLE I – BASIC REQUIREMENTS (CONT)

CHARACTERISTICS	ENGINEERING REQUIREMENTS	TESTING REQUIREMENTS (SEE 3.1)	
		TEST METHOD	SAMPLING PLAN
UNTEMPERED MARTENSITE	Acceptable condition only when: (1) no cracks are found in any location, (2) condition is not found in root of threads or head to shank fillet, (3) does not exceed depth allowed for laps, per TABLE V, and (4) condition does not produce discontinuities, crests, or burrs which result in dimensions out of tolerance.	Strip plating and etch in 2% to 5% Nital solution. Examine at 10X to 100X.	Per TABLE VII for destructive test.
GRINDING BURNS	None permitted on shank, head to shank fillet, threads, or bearing surface of head.	Examine fasteners for grinding burns during metallurgical examination or check for untempered martensite.	Use samples for metallurgical examination and untempered martensite.
MICROSTRUCTURE	Shall be free from bursts, voids, and overheating. Alloy segregation which adversely affects the mechanical or physical properties of the part is not acceptable.	Specimens shall be cut per Figure 5, etched per ASTM E 340 and ASTM E 407, and examined per 3.3.	Per TABLE VII.
HYDROGEN EMBRITTLEMENT	Plated fasteners shall be capable of meeting hydrogen embrittlement requirements of AMS-QQ-P-416.	AMS-QQ-P-416.	AMS-QQ-P-416.
DECARBURIZATION	Per TABLE VIII.	Metallurgical examination. See 3.3.	Per TABLE VII.
GRAIN GROWTH	Grain size in vicinity of head or threads shall not differ from grain size in shank by more than one size (as defined in ASTM E 112).	Metallurgical examination. See 3.3.	Per TABLE VII.
THREAD FORMING	May be ground, cut, or rolled in a single rolling process.	Thread major diameter shall be .001 inch less than the minimum shank diameter. Incomplete threads per FIGURES 2 & 4.	Per TABLE II.
HEAD FORMING	Heads may be machined, ground, or forged.	Metallurgical examination. See 3.3.	Per TABLE VII.
FINISH	Per fastener part standard or drawing and TABLE II.	Per applicable specification.	Per TABLE IX.

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TABLE I – BASIC REQUIREMENTS (CONT)

CHARACTERISTICS	ENGINEERING REQUIREMENTS	TESTING REQUIREMENTS (SEE 3.1)	
		TEST METHOD	SAMPLING PLAN
PACKAGING	Package to prevent nicking, scratching, or damage during transportation, handling, or storage. Unit packages must contain parts of one part number and one manufacturing lot only. Assortment of unit packages may be in larger packages. Packaging must allow economical transportation.	Visual examination.	Not applicable.
PACKAGING CONTAINER(S) MARKING	Shipping packages and containers shall be marked in a durable and legible manner, located so it will not be damaged. Marking on shipping packages will include at least the following: Part number, purchase order number, and manufacturer's inspection lot number.	Visual examination.	Not applicable.

- /a/ The well-prepared surface and procedure required by MIL-STD-1312-6 is considered a destructive test and shall be applied to all lots as follows: Fasteners which pass the shear test may be accepted for hardness on the basis of a nondestructive test, which may be applied to the threaded end before or after plating without the plating being removed. In the case of controversy over nondestructive hardness readings, the destructive hardness test method shall be the referee.

3. INSPECTION

- 3.1 INSPECTION TESTS, listed in TABLE I, are required on each lot as defined in 3.1.2, for the fastener manufacturer. Receiving contractor may apply any or all tests, specified herein, to any production lot on fasteners, at any time, to verify conformance of the lot.
- 3.1.1 INSPECTION REPORT: Each shipment shall be accompanied by an inspection report as a part of or separate from the shipment notice. If more than one inspection report is included in the 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 and part standard revision level (manufacturer's document number with part number may be included).
 5. Part name and type.
 6. Procurement specification number and revision level.
 7. Material heat number.

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