



AEROSPACE INFORMATION REPORT

AIR4923™**REV. B**

Issued 1996-05
Reaffirmed 2006-10
Revised 2022-11

Superseding AIR4923A

Bolts and Screws, Aerospace Engine -
Materials, Procurement Specifications, and Properties

RATIONALE

Corrected typos in 3.3 references for DOD-STD-1312-108, DOD-STD-1312-111, and DOD-STD-1312-113 (changed NASM to NAM).

1. SCOPE

1.1 Type

This SAE Aerospace Information Report (AIR) includes general design information on materials, procurement specifications, and mechanical properties for bolts and screws developed for use on aerospace propulsion systems. Both inch and metric (SI) designs are included.

1.2 Purpose

The list gives a brief overview of the various combinations of SAE Aerospace Material Specifications (AMS) and SAE Aerospace Procurement Specifications (AS) available when developing bolt and screw part standards.

1.2.1 Summary

Table 1 - Aerospace engine bolts - general properties and ratings - inch

Table 2 - Aerospace engine bolts - tested properties and specification limits - inch

Table 3 - Aerospace engine bolts - general properties and ratings - metric

Table 4 - Aerospace engine bolts - tested properties and specification limits - metric

Table 5 - Density (ρ) of bolt materials

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2. REFERENCES

2.1 Applicable Documents

There are no referenced publications specified herein.

2.2 Symbols and Abbreviations

AISI	American Iron and Steel Institute
AS	Aerospace Standard
AMS	Aerospace Material Specification
°C	Degree Celsius
°F	Degree Fahrenheit
HRC	Hardness, Rockwell C scale
ksi	Kips (1000 lbf) per square inch
max	Maximum
min	Minimum
MPa	Megapascals
SI	International system of units
temp	Temperature
thd	Thread
UNS	Unified Numbering System for metals and alloys
ρ	ρ = density, lb/in ³ (g/cm ³)

3. GENERAL

3.1 Cadmium Plate

Due to concerns about the ability of cadmium plated parts to meet health and safety regulations, it is recommended that these parts are not used in new designs. Existing cadmium and nickel-cadmium plated bolts are included here, but are only for reference purposes to historical designs. Note that cadmium plating may be found in either the procurement specification or on the part standard.

3.2 Machined Bolt Heads

Some procurement specifications listed in Tables 1 and 3 allow for machined bolt heads. Machined bolt heads are not recommended for aerospace applications. Part standards that limit head manufacturing to forged or upset heads should be used.

3.3 Test Methods

The mechanical properties listed in Tables 1 and 2 are based on the following test methods:

- a. Double shear: MIL-STD-1312-13 in accordance with NASM1312-13.
- b. Hardness: MIL-STD-1312-6 in accordance with NASM1312-6.
- c. Stress rupture: MIL-STD-1312-10 in accordance with NASM1312-10.
- d. Tensile strength - room temperature: MIL-STD-1312-8 in accordance with NASM1312-8.
- e. Tensile strength - elevated temperature: MIL-STD-1312-18 in accordance with NASM1312-18.
- f. Tension fatigue: MIL-STD-1312-11 in accordance with NASM1312-11.

The mechanical properties listed in Tables 3 and 4 are based on the following test methods:

- a. Double shear: DOD-STD-1312-113 in accordance with NAM1312-113.
- b. Hardness: MIL-STD-1312-6 in accordance with NASM1312-6.
- c. Stress rupture: MIL-STD-1312-10 in accordance with NASM1312-10.
- d. Tensile strength - room temperature: DOD-STD-1312-108 in accordance with NAM1312-108.
- e. Tensile strength - elevated temperature: MIL-STD-1312-18 in accordance with NASM1312-18.
- f. Tension fatigue: DOD-STD-1312-111 in accordance with NAM1312-111.

Table 1 - Aerospace engine bolts - general properties and ratings - inch

Material Specification	Material Trade Designations	Procurement Specification	Temperature Rating /1/	Tensile Rating /2/	Hardness	Manufacturing Process and Sequence /5/
AMS4967	Titanium 6Al-4V UNS R56400	AS7460	600 °F	165 ksi /3/	-	Head hot formed or machined. Blanks solution and precipitation heat treated. Cold work fillet (when specified) and roll thread on heat treated blank.
AMS4967	Titanium 6Al-4V UNS R56400	AS7461	600 °F	165 ksi /3/	-	Head hot formed. Blanks solution and precipitation heat treated. Cold work fillet and roll thread on heat treated blank.
AMS5061	Carbon Steel UNS K00802	AS7473-1	450 °F	-	-	Head forged or machined. Cold work fillet (when specified) and roll thread on blank after oxide and carbide removal.
AMS5616	Greek Ascoloy UNS S41800	AS7470	900 °F	140 ksi	30-38 HRC	Head forged or machined. Harden and temper blanks. Cold work fillet (when specified) and roll thread on heat treated and finished blank.
AMS5624	High Expansion Alloy Steel UNS K91505	AS7473-2	600 °F	-	27-38 HRC	Head forged or machined. Cold work fillet (when specified) and roll thread on blank after oxide and carbide removal.
AMS5625	High Expansion Alloy Steel UNS K91456	AS7473-3	600 °F	125 ksi	-	Head forged or machined. Cold work fillet (when specified) and roll thread on blank after oxide and carbide removal.
AMS5637	Corrosion-Resistant Steel 302 CRES UNS S30200	AS7472	800 °F	125 ksi	-	Head forged or machined. Cold work fillet (when specified) and roll thread on blank after oxide removal
AMS5643	Corrosion-Resistant Steel 17-4PH UNS S17400	AS7474	600 °F	140 ksi	32-38 HRC	Head forged. Solution and precipitation heat treat (H1100). Cold work fillet and roll thread on heat treated blank.

/1/ Maximum service temperature, °F.

/2/ Ultimate tensile strength at room temperature, ksi.

/3/ Up to 0.500-inch thread diameter.

/4/ For U.S. Department of Defense Contracts Class 347 material condition shall not be used.

/5/ Machined bolt heads are not recommended. Select part standards that limit manufacturing to forged or upset heads.