



AEROSPACE MATERIAL SPECIFICATION

AMS7496™**REV. K**

Issued 1951-06
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Reaffirmed 2022-06

Superseding AMS7496J

Rings, Flash Welded
Carbon and Low-Alloy Steels

RATIONALE

AMS7496K has been reaffirmed to comply with the SAE Five-Year Review policy.

1. SCOPE

1.1 Form

This specification covers flash welded rings fabricated from carbon and low-alloy steels.

1.2 Application

This product has been used typically for parts such as flanges and rings, but usage is not limited to such applications.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS2370	Quality Assurance Sampling and Testing, Carbon and Low-Alloy Steel Wrought Products and Forging Stock
AMS6302	Low-Alloy Steel, Heat-Resistant, Bars, Forgings, and Tubing, 0.65Si - 1.25Cr - 0.50Mo - 0.25V (0.28 - 0.33C)
AMS6303	Steel Bars and Forgings, Low Alloy, Heat-Resistant, 0.65Si - 1.25Cr - 0.50Mo - 0.85V (0.25 - 0.30C)
AMS6412	Steel, Bars and Forgings, 0.80Cr - 1.8Ni - 0.25Mo (0.35 - 0.40C) (4337)

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For more information on this standard, visit
<https://www.sae.org/standards/content/AMS7496K/>

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM A 370 Mechanical Testing of Steel Products

ASTM E 10 Brinell Hardness of Metallic Materials

3. TECHNICAL REQUIREMENTS

3.1 Material

Shall be as specified on the drawing.

3.2 Fabrication

3.2.1 Forming

Rings shall be formed from suitably rolled, extruded, or forged shapes. Grain flow in the formed rings shall be substantially circumferential.

3.2.2 Preparation for Welding

3.2.2.1 Formed rings shall be clean and free from foreign materials in the area of electrode contact and at the surfaces to be welded.

3.2.2.2 Formed rings may be preheated, before welding, as agreed upon by purchaser and supplier.

3.2.3 Welding

The ends of the formed rings shall be flash butt-welded together; there shall be only one weld per ring. Welding shall be performed on a machine provided with control of the following:

Feed of joint during flashing

Rate and Distance of travel of the sections to be welded

Secondary Voltage and Current Magnitude

Timing and current cut off

The flash shall be maintained during the flashing interval of the welding operation. The amount of manual flashing, for purposes of preheating, shall be limited to 10% of total flashing distance. The machine shall be capable of repeating the sequence of operations independently of the skill of the operator. A record of all machine settings and sequence of operations for welding each different ring shall be kept by the vendor and be made available to purchaser.

3.2.4 Heat Treatment

The welded rings shall be normalized by heating to the appropriate temperature, holding at heat for not less than 1 hour, and cooling in air or other method acceptable to purchaser and tempered as necessary to produce the specified hardness. Steels, such as AMS6302, AMS6303, and AMS6412, may be cycle annealed to produce the specified hardness. For rings under 0.188 inch (4.78 mm) in nominal thickness, time at normalizing heat may be reduced to 15 to 30 minutes.

3.2.4.1 For rings under 0.188 inch (4.78 mm) in nominal thickness, austenitizing and cooling are not normally required but, when required by purchaser, may be performed locally.

3.2.4.2 Other Heat Treatment

When the drawing or applicable material specification requires additional heat treatment after the heat treatment of 3.2.4, rings shall be so heat treated.

3.2.5 Proof Testing of Welds (Sizing)

Each ring, after cooling to room temperature following heat treatment, shall be tested to determine the quality of the weld. Each ring shall have flash and excess metal at the weld removed to within +1/32 inch (+0.8 mm) of parent metal surface either before or after heat treatment as in 3.2.4 but before sizing. Preliminary sizing may be done before cooling but final sizing shall be done at room temperature. The stress applied for final sizing shall be sufficient to provide a permanent expansion of not less than 1% across a 2-inch (50.8-mm) gage length centered on the weld. Sizing shall be performed in such a way as to provide uniform stress distribution throughout the ring.

3.2.5.1 For rings made from steel under 0.188 inch (4.78 mm) in nominal thickness, flash removal may reduce thickness below that of parent metal provided that the finished weld blends smoothly into adjacent metal and provided that thickness is not reduced below the minimum specified on the drawing for the parent metal. Proof testing of such rings will be waived if welding precedes a final forming operation which involves an expansion of the weld equivalent to or exceeding that required by 3.2.5.

3.2.5.2 When permitted by purchaser, statistical data developed for each part/process combination may be used to substantiate proof testing in lieu of actual measurements taken on the weld.

3.2.6 When the drawing or applicable material specification requires additional heat treatment, rings shall be so heat treated after sizing.

3.2.7 Restoration to Shape

If it is necessary to restore shape of rings following sizing or following final heat treatment when specified, such operation shall be done on suitable presses and not by localizing blows as from a hammer. Except as specified in 3.2.7.1, rings may be reheated for such operation but shall not be heated to a temperature higher than any prior tempering temperature.

3.2.7.1 When permitted by purchaser, restoration to shape may be performed in conjunction with cooling from a heat treatment operation by placing the ring on a press which will produce slight (approximately 1/4%) expansion or compression of the ring diameter and flattening of the ring.

3.3 Properties

Rings shall conform to the following requirements:

3.3.1 Tensile Properties

Shall be as follows, determined in accordance with ASTM A 370 on specimens cut, after final heat treatment of the lot, from welded rings processed to this specification. When permitted by purchaser, rings to be supplied with additional heat treatment after the heat treatment of 3.2.4 may be tested in the normalized and tempered or the cycle annealed condition by the vendor, but the final basis for acceptance shall be tests made on fully heat treated rings. Tensile testing will not be required on rings made from steel under 0.188 inch (4.78 mm) in nominal thickness that proof testing is waived in accordance with 3.2.5.1.

3.3.1.1 Rings Having Specified Maximum Hardness Up to 241 HB, Incl, or Equivalent

Shall be as shown in Table 1.

TABLE 1 - MINIMUM TENSILE PROPERTIES

Property	Value
Tensile Strength	90% of parent metal in same ring
Elongation in 4D	60% of parent metal in same ring but not less than 15%

3.3.1.2 Rings Having Specified Maximum Hardness Higher than 241 HB or Equivalent (See 8.2)

Shall be as shown in Table 2.

TABLE 2 - MINIMUM TENSILE PROPERTIES

Property	Value
Tensile Strength	90% of parent metal in same ring
Elongation in 4D	50% of parent metal in same ring

3.3.1.3 When permitted by purchaser, rings not conforming to 3.3.1 will be considered acceptable if the tensile properties through the welded area, determined after final heat treatment, are not lower than the minimum requirements of the material specification or part drawing.

3.3.1.4 When permitted on the part drawing, representative weld test segments may be used in lieu of rings. The weld test segments shall be welded utilizing the same size, shape, type of stock, and welder set-up at the same time as production and with the same current shunt, and shall be heat treated with the production lot.

3.3.2 Hardness

Shall be not higher than 241 HB or equivalent (See 8.2), determined in accordance with ASTM E 10.

3.3.3 Microstructure

When required, shall conform to standards agreed upon by purchaser and vendor.

3.4 Quality

Rings, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to usage of the rings.

3.4.1 Any controlled grain size requirement shall be as agreed upon by purchaser and vendor.

3.4.2 Parts shall be subjected to nondestructive testing. Method of test and standards for acceptance shall be as agreed upon by purchaser and vendor.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of rings shall supply all samples for vendor's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the rings conform to specified requirements.