Society of Automotive Engineers, Inc.
TWO PENNSYLVANIA PLAZA, NEW YORK, N.Y. 10000

AEROSPACE MATERIAL SPECIFICATION

AMS 7493F
Superseding AMS 7493E
Issued 6-1-51
Revised 11-1-68

RINGS, FLASH WELDED
Non-Austenitic Corrosion Resistant Steels

1. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

2. APPLICATION: Primarily for parts such as flanges and rings, requiring corrosion and moderate heat resistance, fabricated by flash welding non-austenitic corrosion resistant steels, usually AMS 5613, AMS 5614, AMS 5615, AMS 5616, or AMS 5627.

3. MATERIAL: Material from which rings are made shall be as specified on the drawing.

4. FABRICATION:

4.1 Forming: Rings as applicable for the particular parts shall be formed from suitably rolled, extruded, or forged shapes. Grain flow in the formed rings shall be substantially circumferential. Ø

4.2 Preparation for Welding: Formed rings shall be clean and free from foreign materials in the area of electrode contact and at the surfaces to be welded.

4.3 Welding: The ends of the formed rings shall be flash butt-welded together; unless otherwise permitted by purchaser, there shall be only one weld per ring. Welding shall be performed on a machine provided with accurate control of feed of joint during flashing, rate and distance of travel of sections to be welded, secondary voltage and current magnitude, and 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 the purchaser upon written request.

4.4 Annealing: The welded rings shall be annealed by heating to 1200 - 1500 F (648.9 - 815.6 C), holding at heat for not less than 1 hr, and cooling in air. Unless otherwise specified, rings made of AMS 5613, AMS 5614, AMS 5615, and AMS 5616 shall be austenitized by heating to not lower than 1750 F (954 C) and not higher than 1850 F (1010 C) and cooled to room temperature before annealing.

4.4.1 For rings less than 0.188 in. in thickness, austenitizing and cooling are not required and, when permitted by purchaser, annealing may be performed locally by heating the weld zone to the proper temperature within the range specified in 4.4, holding at heat for 15 - 30 min., and cooling in air.

4.5 Proof Testing of Welds (Sizing): Unless otherwise specified, each ring, after cooling to room temperature following annealing, 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 in. of parent metal surfaces either before or after annealing as in 4.4 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 in. gage length centered on the weld. Sizing shall be performed in such a way as to provide uniform stress distribution throughout the ring. Ø

4.5.1 For rings made of material less than 0.188 in. thick, 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; when so specified by purchaser, 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 4.5.

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

4.7 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 localized blows as from a hammer. Rings may be reheated for such operation but shall not be heated to a temperature higher than any prior tempering temperature.

4.8 Any descaling requirement shall be as agreed upon by purchaser and vendor.

5. TECHNICAL REQUIREMENTS:

5.1 Test specimens cut, after final heat treatment of the lot, from welded rings processed to this specification shall conform to the following requirements. When permitted by purchaser, rings to be supplied with additional heat treatment after annealing may be tested in the annealed condition by the vendor, but the final basis for acceptance or rejection shall be tests made on fully heat treated rings.

5.1.1 Rings Having Specified Maximum Hardness Up to Brinell 241, Incl, or Equivalent:

Tensile Strength	
Through Welded Area	90% min of parent metal in same ring
Elongation, % in 2 in. or 4D	
Through Welded Area	60% min of parent metal in same ring

5.1.2 Rings Having Specified Maximum Hardness Higher Than Brinell 241 or Equivalent:

Tensile Strength	
Through Welded Area	90% min of parent metal in same ring
Elongation, % in 2 in. or 4D	
Through Welded Area	50% min of parent metal in same ring

5.1.2.1 Ø When permitted by purchaser, rings not conforming to 5.1.2 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 of the drawing.

5.2 Hardness: Rings shall have hardness not higher than Brinell 241 or equivalent, unless otherwise specified in the applicable material specification or on the drawing or purchase order.

6. QUALITY:

6.1 Parts shall be uniform in quality and condition, clean, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or performance. Any controlled grain size requirement shall be as agreed upon by purchaser and vendor.

6.2 Parts shall be subject to nondestructive testing as agreed upon by purchaser and vendor.