

AERONAUTICAL MATERIAL SPECIFICATION

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PISTON RINGS, CENTRIFUGALLY CAST ALLOY IRON 0.5Mo - 0.5Cu

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

2. **COMPOSITION:**

Total Carbon	2.85 - 3.50
Manganese	0.50 - 1.00
Silicon	1.00 - 1.65
Phosphorus	0.30 max
Sulfur	0.12 max
Molybdenum	0.35 - 0.66
Copper	0.35 - 0.65

3. **CONDITION:** All rings shall be made from centrifugally cast sleeves which have been annealed, quenched, and tempered.

4. **TECHNICAL REQUIREMENTS:**

4.1 **Physical Properties:**

4.1.1 Test specimens prepared and tested according to paragraphs 4.1.3 and 4.1.4 below shall conform to the following requirements:

Tensile Strength, psi	88,000 min
Modulus of Elasticity, psi	20,000,000 min
Impact Value, Izod, in-lb	10 min
Hardness, Rockwell	C 24-30

4.1.2 Finished rings shall have hardness of Rockwell C 24-30 or equivalent.

4.1.3 Tensile test blanks shall be cut longitudinally from representative finish heat treated sleeves and machined into test specimens not smaller than the cross-section of the machined piston ring.

4.1.4 Modulus of elasticity and Izod impact blanks shall be cut longitudinally from the same representative finish heat treated sleeves and machined to rectangular cross-section of 0.140 x 0.260 in. The Izod specimen shall be unnotched. In conducting modulus tests, steadily increasing load shall be applied to the 0.260-in. face; in conducting impact tests, weight shall strike the 0.260-in. face.

4.2 **Microstructure of Rings:** Shall consist of a tempered, partly spheroidized martensitic matrix with evenly distributed, isolated particles of cementite. Graphite shall be present for the most part as temper carbon nodules; primary graphite shall exist only as small, isolated areas. Free ferrite shall be absent.

4.3 **Finish:** Sides of rings shall be ground or lapped. Periphery shall be turned smooth, unless otherwise specified on drawing.

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- 4.4 Circularity: The diameter through the gap shall exceed the diameter 90 degrees from the gap by not less than 0.0025 in. per in. of nominal ring diameter when finished ring is held around periphery by a flexible steel band 0.0025 - 0.0035 in. thick and of width approximately equal to that of ring and whose inside circumference is equal to the nominal outside circumference of ring plus or minus 0.003 in.
- 4.5 Light-Tightness of Periphery: When finished ring is placed in a circular gage whose inside diameter is equal to nominal outside diameter of ring plus or minus 0.0005 in. the portion of periphery on each side of the gap equal to 20% of the nominal outside diameter of the ring shall be light-tight. The space between the balance of ring periphery and inside diameter of gage shall be not greater than 0.0005 in. at any point and not less than 85% of the periphery of the ring shall be light-tight. Intermittent or fuzzy light shall be considered the same as light-tight.
- 4.6 Flatness: When weight of not more than 0.50 lb per in. of nominal outside diameter of ring is applied to a ring supported in a gage having the same nominal diameter plus 0.001 in. minus 0.000 in. and having the same interior angle as the nominal angle between side face and periphery of ring, the ring shall show, by light gage, bluing, or other acceptable method, at least line contact around not less than 85% of the side face of the ring. This contact may be anywhere between the inside and outside circumference and may vary between these limits on any one ring. This contact shall indicate ring side faces are not wavy.
- 4.7 Heat Stability: Finished rings, when heated at 600 F for 1 hr and cooled to room temperature, while confined in a retaining ring having inside diameter equal to the nominal outside diameter of ring plus or minus 0.001 in., shall retain not less than 90% of the original free gap opening.
5. QUALITY: Finished rings shall be uniform in quality and condition, clean, sound, and free from foreign materials and from defects detrimental to performance of parts.
6. REPORTS:
- 6.1 Unless otherwise specified, the vendor, before the first shipment, shall furnish for each purchase order three copies of a notarized report stating that the piston rings will conform to the chemical and physical requirements specified. This report shall include the purchase order number, material specification number, and part number.
- 6.2 Unless otherwise specified, the vendor shall furnish to the purchaser's Materials Laboratory one copy of a weekly cumulative laboratory report showing the chemical composition and physical properties of typical sleeves cast during the period.
7. PROTECTIVE TREATMENT: Rings shall be protected during shipment and storage by a coating of suitable corrosion preventive compound which is readily removable by washing in hydrocarbon solvents.
8. APPROVAL: A vendor shall not supply production piston rings to this specification until samples have been approved by purchaser. After such approval, the methods of manufacture shall not be changed without purchaser's permission.