



# AEROSPACE MATERIAL

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## AMS 4906

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Revised

### TITANIUM ALLOY SHEET AND STRIP

6Al - 4V

Continuously Rolled, Annealed

1. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.
2. APPLICATION: Primarily for parts requiring strength up to 750 F (399 C)
3. COMPOSITION:

|                           | min       | max              |
|---------------------------|-----------|------------------|
| Aluminum                  | 5.50      | 6.75             |
| Vanadium                  | 3.50      | 4.50             |
| Iron                      | --        | 0.30             |
| Oxygen                    | --        | 0.20             |
| Carbon                    | --        | 0.08             |
| Nitrogen                  | --        | 0.05 (500 ppm)   |
| Hydrogen                  | --        | 0.0125 (125 ppm) |
| Other Elements, total (1) | --        | 0.40             |
| Titanium                  | remainder |                  |

(1) Determination not required for routine acceptance.

- 3.1 Check Analysis: Composition variations shall meet the requirements of the latest issue of AMS 2249.
4. CONDITION: Unless otherwise ordered, the product shall be supplied hot rolled, with subsequent cold reduction, annealed, descaled, and flattened, having a surface appearance comparable to a corrosion resistant steel No. 2D finish.
5. TECHNICAL REQUIREMENTS:
  - 5.1 Annealing: Unless otherwise specified, material shall be line annealed by a procedure agreed upon by purchaser and vendor which will result in material meeting all requirements of this specification.
  - 5.2 Tensile Properties: These properties apply when the rate of strain is maintained at 0.003 - 0.007 in. per in. per min. through the yield strength and then is increased so as to produce failure in approximately one additional minute. When a dispute occurs between purchaser and vendor over the yield strength values, a referee test shall be performed on a test machine having a strain rate pacer, using a rate of 0.005 in. per in. per min. through the yield strength and a minimum crosshead speed of 0.10 in. per min. above the yield strength; for such referee tests, yield strength shall be determined by the offset method.

# REAFFIRMED

16-9

## Documents

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| Nominal Thickness<br>Inch | Tensile<br>Strength<br>psi | Yield Strength at 0.2% Offset<br>or at Extension Indicated<br>(E = 16,400,000) |                                      | Elongation<br>% in 2 in.<br>or 4D, min |
|---------------------------|----------------------------|--------------------------------------------------------------------------------|--------------------------------------|----------------------------------------|
|                           |                            | psi, min                                                                       | Extension Under Load<br>in. in 2 in. |                                        |
| Up to 0.008, incl         | 140,000                    | 126,000                                                                        | 0.0194                               | --                                     |
| Over 0.008 to 0.025, incl | 140,000                    | 126,000                                                                        | 0.0194                               | 8                                      |
| Over 0.025 to 0.060, incl | 140,000                    | 126,000                                                                        | 0.0194                               | 10                                     |

- 5.2.1 Tensile property requirements for material over 0.060 in. thick shall be as agreed upon by purchaser and vendor.
- 5.2.2 For widths 9 in. and over, tensile test specimens shall be taken with the axis perpendicular to the direction of rolling. For widths less than 9 in., tensile test specimens shall be taken with the axis parallel to the direction of rolling.
- 5.3 **Bending:** Material shall withstand, without evidence of cracking when examined at 20X magnification, bending at room temperature through an angle of 105 deg around a diameter equal to the bend factor times the nominal thickness of the material, using either V-block, U-channel, or free bend procedure, with axis of bend either parallel or perpendicular to the direction of rolling. For V-block and U-channel bend tests, specimen width shall be not less than 10 times the nominal thickness but not less than 1 inch. For free bend tests, minimum specimen width shall, when possible, be not less than 10 times the nominal thickness; maximum width need not be greater than 1 inch. Only one of these tests will be required in routine inspection. In case of dispute, results of bend tests using the V-block procedure shall govern.

| Nominal Thickness<br>Inch  | Bend Factor                            |                                            |
|----------------------------|----------------------------------------|--------------------------------------------|
|                            | Axis Parallel to<br>Rolling Direction  | Axis Perpendicular<br>to Rolling Direction |
| Up to 0.025, incl          | 9                                      | 11                                         |
| Over 0.025 to 0.070, excl  | 10                                     | 12                                         |
| Over 0.070 to 0.1875, excl | As agreed upon by purchaser and vendor |                                            |

- 5.4 **Microstructure:** Shall be essentially that resulting from alpha-beta processing. Microstructure shall not be cause for rejection unless standards have been agreed upon by purchaser and vendor.
- 5.5 **Surface Contamination:** Material shall be free of any oxygen-rich layer, such as alpha case, or other surface contamination.
6. **QUALITY:** Unless otherwise specified, material shall be produced by multiple melting using consumable electrode practice; at least one of the melting cycles shall be under vacuum. The product shall be uniform in quality and condition, clean, sound, and free from "oil cans" of depth in excess of the flatness tolerance, ripples, and foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts.

Note. An "oil can" is defined as an excess of material in a localized area of a sheet which causes the sheet to buckle in that area. When the sheet is placed on a flat surface and hand pressure applied to the buckle, the buckle will spring through to the opposite surface or spring up in another area of the sheet.

7. **TOLERANCES:** Unless otherwise specified, tolerances shall conform to the following:

- 7.1 **Thickness, Width, Length, and Straightness:** The latest issue of AMS 2242.