

# AEROSPACE

## MATERIAL SPECIFICATIONS

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc.

485 Lexington Ave., New York, N.Y. 10017

### AMS 4143

Issued 2-15-65

Revised

#### ALUMINUM ALLOY FORGINGS

6.3Cu - 0.3Mn - 0.2Zr - 0.1Ti - 0.1V (2219-T6)

Solution and Precipitation Heat Treated

1. **ACKNOWLEDGMENT:** A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.
2. **FORM:** Die forgings, hand forgings, rolled rings, and forging stock.
3. **APPLICATION:** Primarily for structural machined parts. May be welded in the -T6 condition, but properties are improved by re-heat treatment after welding. Certain design and fabricating procedures may cause this material to be susceptible to stress corrosion cracking; ARP 823 recommends practices to minimize such conditions.
4. **COMPOSITION:**

	min	max
Copper	5.8	6.8
Manganese	0.20	0.40
Zirconium	0.10	0.25
Vanadium	0.05	0.15
Titanium	0.02	0.10
Iron	--	0.30
Silicon	--	0.20
Zinc	--	0.10
Magnesium	--	0.02
Other Impurities, each	--	0.05
Other Impurities, total	--	0.15
Aluminum	remainder	

#### 5. **CONDITION:**

- 5.1 **Die Forgings, Hand Forgings, and Rolled Rings:** Solution and precipitation treated.
- 5.2 **Forging Stock:** As fabricated.

#### 6. **TECHNICAL REQUIREMENTS:**

##### 6.1 **Tensile Properties:**

- 6.1.1 **Test Specimens:** Test specimens machined from separately forged coupons or from forging stock representing the forgings and in either case heat treated with the forgings, or machined from prolongations on heat treated forgings, shall conform to the following requirements:

Tensile Strength, psi	58,000 min
Yield Strength at 0.2% Offset or at 0.0112 in.	
in 2 in. Extension Under Load (E = 10, 500, 000), psi	38,000 min
Elongation, % in 2 in. or 4D	10 min

6.1.2 Die Forgings, With Grain Flow: When test specimens are machined from forgings not over 4 in. in thickness with the axis approximately parallel to the forging flow lines, the tensile properties shall conform to those specified in 6.1.1 except that elongation may be as low as 7%, unless otherwise agreed upon by purchaser and vendor.

6.1.3 Die Forgings, Across Grain Flow: When test specimens are machined from forgings not over 4 in. in thickness with the axis other than approximately parallel to the forging flow lines, the tensile properties shall conform to the following requirements:

Tensile Strength, psi	53,000 min
Yield Strength at 0.2% Offset or at 0.0107 in. in 2 in. Extension Under Load (E = 10,500,000), psi	35,000 min
Elongation, % in 2 in. or 4D	3 min

6.1.3.1 The elongation requirement shall not apply to test specimens having a gage length diameter less than 0.25 in. or located in immediate proximity to an abrupt change in section thickness or located in such a way that any surface of the gage length has been prepared from material located within 1/8 in. of the trimmed flash line.

6.1.3.2 If any individual specimen fails to meet the requirements of 6.1.3, two additional specimens shall be cut from adjacent areas in the same forging or from the same area in two additional forgings. Should either of these specimens fail to meet the values specified in 6.1.3, the entire lot will be subject to rejection.

6.1.4 Hand Forgings: When test specimens are machined from hand forgings not over 4 in. in thickness, the tensile properties shall conform to the following requirements:

	Tensile Strength psi, min	Yield Strength at 0.2% Offset or at Extension Indicated (E = 10,500,000)		Elongation % in 2 in. or 4D min
		psi, min	in. in 2 in.	
Longitudinal	58,000	40,000	0.0116	6
Long Transverse	55,000	37,000	0.0111	4
Short Transverse (See Note 1)	53,000	35,000	0.0107	2

Note 1. Properties apply for thicknesses 2.375 in. and over.

6.1.5 Rolled Rings, Tangential: When test specimens are machined from rolled rings not over 2.5 in. in thickness with axis tangential to the ring OD (axis parallel to direction of rolling), the tensile properties shall conform to the following requirements:

Tensile Strength, psi	56,000 min
Yield Strength at 0.2% Offset or at 0.0116 in. in 2 in. Extension Under Load (E = 10,500,000), psi	40,000 min
Elongation, % in 2 in. or 4D	6 min

6.1.6 Rolled Rings, Axial: When test specimens are machined from rolled rings 2.375 in. and over in axial length but not over 2.5 in. in thickness, with axis parallel to axis of ring (axis transverse to direction of rolling), the tensile properties shall conform to the following requirements:

Tensile Strength, psi	55,000 min
Yield Strength at 0.2% Offset or at 0.0111 in. in 2 in. Extension Under Load (E = 10,500,000), psi	37,000 min
Elongation, % in 2 in. or 4D	4 min