Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS2658

Issued 4-15-80
Revised

HARDNESS AND CONDUCTIVITY INSPECTION OF HEAT TREATED ALUMINUM ALLOY PARTS

1. SCOPE:

1.1 Purpose: This specification establishes hardness and electrical conductivity acceptance criteria of finished or semi-finished parts of wrought aluminum alloys.

1.2 Application: Primarily for nondestructive testing of aluminum alloy parts heat treated by the user or his vendor, except the producing mill, in section thicknesses less than 3 in. (75 mm).

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) and Aerospace Recommended Practices (ARP) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

2.1.2 Aerospace Recommended Practices:

ARP 891 - Determination of Aluminum Alloy Tempers through Electrical Conductivity Measurement (Eddy Current)

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM B342 - Electrical Conductivity by Use of Eddy Currents
ASTM E10 - Brinell Hardness of Metallic Materials
ASTM E18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

3. TECHNICAL REQUIREMENTS:

3.1 Equipment: The equipment used for hardness and electrical conductivity testing shall meet the requirements of ASTM E10, ASTM E18, or ASTM B342 as applicable.

3.2 Procedure:

3.2.1 Hardness: Shall be determined in accordance with ASTM E10 for Brinell hardness and ASTM E18 for Rockwell hardness.

3.2.2 Electrical Conductivity: Shall be determined in accordance with ASTM B342 and ARP 891.

3.3 Properties: Parts shall conform to the hardness and electrical conductivity values in Table I for bare alloys and Table II for clad alloys after heat treatment or annealing in accordance with the applicable specification.

Printed in U.S.A.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The inspection source shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that hardness and conductivity conform to the requirements of this specification.

4.2 Calibration: The test equipment shall be calibrated initially with standards and at not longer than three-month intervals thereafter. The calibration shall include confirmation of repeatability.

4.3 Verification: The equipment shall be checked daily or more frequently, when in use, against test blocks to ensure accurate and reproducible results. Equipment which does not provide accurate or reproducible readings shall be corrected and recalibrated.

4.4 Sampling: Shall be in accordance with the applicable heat treatment specification or as agreed upon by the processing vendor and the purchaser.

4.5 Reports: The inspection source shall furnish with each shipment three copies of a report showing the actual minimum and maximum values obtained. This report shall include the purchase order number, AMS 2658, heat treatment specification number, part number, and quantity.

4.6 Nonconforming Parts: Parts failing to meet the hardness or electrical conductivity acceptance values specified herein shall be referred to the cognizant quality organization.

5. PREPARATION FOR DELIVERY: Not applicable.

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

7. REJECTIONS: Parts not inspected in accordance with this specification or not conforming to the specified hardness and conductivity requirements or to modifications authorized by purchaser will be subject to rejection.

8. NOTES:

8.1 Parts: Finished and semi-finished parts also include raw stock heat treated by the user during the fabrication process.

TABLE I

Bare Aluminum Alloy Hardness and Conductivity Acceptance Values

Alloy	(1) Temper	Hardness					Conductivity % (4)
		Brinell (2) min	Rockwell, min (3)				
			B	E	H	15T	
1100	0	-	-	-	50 max	--	57.0 - 62.0
3003	0	-	-	-	65 max	--	44.5 - 50.5
5052	0	-	-	70 max	95 max	--	34.0 - 37.0
2014	0	-	22 max	70 max	95 max	--	43.5 - 51.5
	T3	100	65	95	-	82	31.5 - 35.0
	T4	100	65	95	-	82	31.5 - 35.0
	T6	125	78	102	-	86	35.0 - 41.5
2024	0	-	22 max	70 max	95 max	--	46.0 - 51.0
	T3	100	63	94	-	82	28.5 - 32.5
	T4	100	63	94	-	82	28.5 - 34.0
	T6	125	72	98	-	84	34.0 - 44.0
	T72	125	72	98	-	82	38.0 - 45.0
	T8	120	74	99	-	85	35.0 - 42.5
	T86	135	83	105	-	87.5	37.0 - 41.0
2048	T8	120	72	98	-	--	35.0 - 42.5
2124	T3	110	69	97	-	--	28.5 - 32.5
	T8	120	74	99	-	--	35.0 - 42.5
2219	0	-	22 max	70 max	95 max	--	44.0 - 49.0
	T3	77	60	92	-	79	26.0 - 31.0
	T37	100	62	93	-	81	27.0 - 31.0
	T4	100	58	90	-	78	28.0 - 32.0
	T6	110	62	93	-	81	32.0 - 35.0
	T8	115	71	98	-	83	31.0 - 35.0
	T87	125	75	100	-	84	31.0 - 35.0

TABLE I

Bare Aluminum Alloy Hardness and Conductivity Acceptance Values (Cont.)

Alloy	(1) Temper	Hardness Brinell (2) min	Hardness Rockwell, min (3) B	E	H	15T	Conductivity % (4)
6061	0	40 max	-	-	75 max	--	42.0 - 49.0
	T4	50	-	60	-	64	35.5 - 43.0
	T6	80	-	85	-	78	40.0 - 47.0
6063	0	-	-	-	70 max	--	57.0 - 65.0
	T1	-	-	37	-	53	48.0 - 58.0
	T4	-	-	40	-	54	48.0 - 58.0
	T5	-	-	44	-	57	50.0 - 60.0
	T6	60	-	70	-	68	50.0 - 60.0
6066	0	-	-	40 max	-	--	42.0 - 47.0
	T4	-	-	85	-	76	34.0 - 41.0
	T6	100	65	95	-	82	38.0 - 50.0
7049	0	-	22 max	70 max	95 max	--	44.0 - 50.0
	T73	135	81	104	-	85	40.0 - 44.0 (5)
	T76	140	84	106	-	87	38.0 - 44.0 (6)
7050	0	-	22 max	70 max	95 max	--	44.0 - 50.0
	T73	135	81	104	-	85	41.0 - 44.0
	T736	135	82	105	-	86	40.0 - 44.0
	T76	140	84	106	-	87	39.0 - 44.0
7075	0	-	22 max	70 max	95 max	--	44.0 - 48.0
	T6	135	84	106	-	87	30.5 - 36.0
	T73	125	78	102	-	85	40.0 - 43.0 (5)
	T76	130	82	104	-	86	38.0 - 42.0 (6)
7178	0	-	-	-	95 max	--	43.0 - 47.0
	T6	145	87	108	-	88	29.0 - 34.0
	T76	140	84	106	-	87	38.0 - 42.0

TABLE II

Aluminum Alloy Clad Sheet Hardness and Conductivity Acceptance Values

Alloy	Temper (7)	Nominal Thickness (8) Inch (mm)	Hardness Rockwell, min (3) B	E	15T	Conductivity (4)
2014	T6	Up to 0.062 (1.57), incl	76	102	85	35.5 - 44.0
		Over 0.062 (1.57)	75	101	--	35.5 - 44.0
2024	T3	Up to 0.062 (1.57), incl	57	91	79	28.5 - 35.0
		Over 0.062 (1.57)	60	93	--	28.5 - 35.0
	T4	Up to 0.062 (1.57), incl	57	91	79	28.5 - 35.0
		Over 0.062 (1.57)	60	93	--	28.5 - 35.0
	T6	Up to 0.062 (1.57), incl	60	93	81	35.0 - 45.0
		Over 0.062 (1.57)	62	94	--	35.0 - 45.0
	T72	Up to 0.062 (1.57), incl	52	91	80	39.0 - 45.0
		Over 0.062 (1.57)	52	93	80	39.0 - 45.0
	T8	All	65	97	82	35.0 - 45.0
	T86	All	83	105	87	36.0 - 42.0
2219	T6	Up to 0.062 (1.57), incl	61	92	80	32.0 - 37.0
		Over 0.062 (1.57)	60	91	--	32.0 - 37.0
	T8	Up to 0.062 (1.57), incl	64	96	82	31.0 - 37.0
		Over 0.062 (1.57)	63	95	--	31.0 - 37.0
6061	T6	All	--	84	74	40.0 - 47.0
7075	T6	Up to 0.032 (0.81), incl	78	103	86	30.5 - 36.0
		Over 0.032 to 0.062, incl (Over 0.81 to 1.57, incl)	76	102	--	30.5 - 36.0
		Over 0.062 (1.57)	75	101	--	30.5 - 36.0
	T76	Up to 0.032 (0.81), incl	76	102	84	38.0 - 42.0 (6)
		Over 0.032 to 0.062, incl (Over 0.81 to 1.57, incl)	75	101	--	38.0 - 42.0 (6)
		Over 0.062 (1.57)	74	100	--	38.0 - 42.0 (6)
7178	T6	Up to 0.032 (0.81), incl	79	104	86	29.0 - 34.0
		Over 0.032 to 0.062, incl (Over 0.81 to 1.57, incl)	78	103	--	29.0 - 37.0
		Over 0.062 (1.57)	76	102	--	29.0 - 37.0