



Designation: B609/B609M-99 (Reapproved 2010) Designation: B609/B609M - 12

Standard Specification for Aluminum 1350 Round Wire, Annealed and Intermediate Tempers, for Electrical Purposes¹

This standard is issued under the fixed designation B609/B609M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers aluminum 1350-O (annealed), 1350-H12 or -H22 ($1/4$ hard), 1350-H14 or -H24 ($1/2$ hard), 1350-H16 or -H26 ($3/4$ hard) and 1350-H142 or -H242 ($1/2$ hard), suitable for stranding into conductors or for solid single conductors, either bare or insulated (see Table 1 or Table 2).

1.2 The values stated in inch-pound units or SI units are to be regarded separately as standard. The values in each system are not exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

1.2.1 For density, resistivity, and temperature, the values stated in SI units are to be regarded as standard.

NOTE 1—Prior to 1975, aluminum 1350 was designated as EC-aluminum.

NOTE 2—The aluminum and temper designations conform to ANSI H35.1. Aluminum 1350 corresponds to Unified Numbering System A91350 in accordance with Practice E527.

2. Referenced Documents

2.1 The following documents of the issue in effect on date of material purchase form a part of this specification to the extent referenced herein.

2.2 *ASTM Standards*:²

B193 Test Method for Resistivity of Electrical Conductor Materials

B233 Specification for Aluminum 1350 Drawing Stock for Electrical Purposes

B354 Terminology Relating to Uninsulated Metallic Electrical Conductors

B557 Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products

B682 Specification for Metric Sizes of Electrical Conductors

B830 Specification for Uniform Test Methods and Frequency

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

2.3 *ANSI Standard*:³

ANSI H35.1 American National Standard for Alloy and Temper Designation Systems for Aluminum

ANSI H35.1[M] American National Standard for Alloy and Temper Designation Systems for Aluminum

2.4 *NIST Standards*:⁴

NBS Handbook 100—Copper Wire Tables of the National Bureau of Standards

NBS Handbook 109—Aluminum Wire Tables of the National Bureau of Standards

3. Terminology

3.1 *Definitions of Terms Specific to This Standard*:

3.1.1 *lot, n*—a group of production units, up to 30 000 lb of mass, of one type and size of wire, which was produced during

¹ This specification is under the jurisdiction of ASTM Committee B01 on Electrical Conductors and is the direct responsibility of Subcommittee B01.07 on Conductors of Light Metals.

Current edition approved Oct. 1, 2010. Published December 2010. Originally approved in 1977. Last previous edition approved in 2004 as B609/B609M-99 (Reapproved 2004). DOI: 10.1520/B0609_B0609M-99R10.

Current edition approved April 1, 2012. Published May 2012. Originally approved in 1977. Last previous edition approved in 2010 as B609/B609M-99 (2010). DOI: 10.1520/B0609_B0609M-12.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁴ Available from National Technical Information Service (NTIS), U.S. Department of Commerce, 5285 Port Royal Rd., Springfield, VA 22161.

⁴ Available from National Technical Information Service (NTIS), 5301 Shawnee Rd., Alexandria, VA 22312, <http://www.ntis.gov>.

TABLE 1 Standard Nominal Diameters, Cross-Sectional Areas, and Mass Per Unit Length of Solid Round Aluminum Wires and Conductors at 20°C AWG or cmil Sizes

NOTE 1—Metric values listed as follows represent a soft conversion and as such they may not be the same as those metric mass per unit length which are calculated from the basic metric density.

Conversion factors:

$$1 \text{ lb}/1000 \text{ ft} = 1.488 \text{ kg}/\text{km}$$

$$1 \text{ in.} = 25.4 \text{ mm}$$

Size cmil or AWG	Diameter		Cross-Sectional Area			Mass Per Unit Length	
	mils	mm	cmil	in. ²	mm ²	lb/1000 ft	kg/km
500 000	707.1	17.960	500 000	0.3927	253.3	459.4	683.7
450 000	670.8	17.040	450 000	0.3534	228.0	413.5	615.3
400 000	632.5	16.070	400 000	0.3142	202.7	367.6	547.0
350 000	591.6	15.030	350 000	0.2749	177.3	321.6	478.6
300 000	547.7	13.910	300 000	0.2356	152.0	275.7	410.2
250 000	500.0	12.700	250 000	0.1963	126.7	229.7	341.8
0000	460.0	11.680	211 600	0.1662	107.2	194.4	289.3
000	409.6	10.4000	167 800	0.1318	85.01	154.2	229.4
00	364.8	9.2660	133 100	0.1045	67.43	122.3	182.0
0	324.9	8.2520	105 600	0.08291	53.49	97.00	144.3
1	289.3	7.3480	83 690	0.06573	42.41	76.91	114.4
2	257.6	6.5430	66 360	0.05212	33.62	60.98	90.73
3	229.4	5.8270	52 620	0.04133	26.67	48.36	71.96
4	204.3	5.1890	41 740	0.03278	21.15	38.35	57.07
5	181.9	4.6200	33 090	0.02599	16.77	30.40	45.24
6	162.0	4.1150	26 240	0.02061	13.30	24.12	35.88
7	144.3	3.6650	20 820	0.01635	10.55	19.13	28.47
8	128.5	3.2640	16 510	0.01297	8.67	15.17	22.58
9	114.4	2.9060	13 090	0.01028	6.631	12.03	17.89
10	101.9	2.5880	10 380	0.008455	5.261	9.542	14.20
11	90.7	2.3040	8 226	0.006461	4.168	7.559	11.25
12	80.8	2.0520	6 529	0.005128	3.308	5.999	8.927
13	72.0	1.8290	5 184	0.004072	2.627	4.764	7.088
14	64.1	1.6280	4 109	0.003227	2.082	3.776	5.618
15	57.1	1.4500	3 260	0.002561	1.652	2.996	4.458
16	50.8	1.2900	2 581	0.002027	1.308	2.371	3.529
17	45.3	1.1510	2 052	0.001612	1.040	1.886	2.806
18	40.3	1.0240	1 624	0.001276	0.8229	1.492	2.221
19	35.9	0.9119	1 289	0.001012	0.6531	1.184	1.762
20	32.0	0.8128	1 024	0.0008042	0.5189	0.9410	1.400
21	28.5	0.7239	812.2	0.0006379	0.4116	0.7464	1.111
22	25.3	0.6426	640.1	0.0005027	0.3243	0.5882	0.8752
23	22.6	0.5740	510.8	0.0004011	0.2588	0.4693	0.6984
24	20.1	0.5105	404.0	0.0003173	0.2047	0.3713	0.5542
25	17.9	0.4547	320.4	0.0002516	0.1624	0.2944	0.4381
26	15.9	0.4039	252.8	0.0001986	0.1281	0.2323	0.3457
27	14.2	0.3607	201.6	0.0001589	0.1022	0.1853	0.2757
28	12.6	0.3200	158.8	0.0001247	0.08045	0.1459	0.2171
29	11.3	0.2870	127.7	0.0001003	0.06470	0.1173	0.1746
30	10.0	0.2540	100.0	0.00007854	0.05067	0.09189	0.1367

the same time period, under similar production conditions, and is presented for acceptance at the same time (Explanatory Notes 1 and 2).

3.1.2 *production unit* production unit, *n*—a coil, reel, spool, or other package of wire that represents a single usable length.

3.1.3 *sample* sample, *n*—the production unit or units from which a test specimen or specimens has been removed, and which is considered to have properties representative of the lot.

3.1.4 *specimen* specimen, *n*—a length of wire removed for test purposes.

4. Ordering Information

4.1 Orders for material under this specification shall include the following information:

4.1.1 Quantity of each size,

4.1.2 Wire size; diameter in inches or millimetres (see 11.1),

4.1.3 Temper (Section 5),

4.1.4 Special tension test if required (see 7.2),

TABLE 2 Standard Nominal Diameters, Cross-Sectional Areas, and Mass per Unit Length of Solid Round Aluminum Wires and Conductors at 20°C

NOTE 1—The data in Table 2 were extracted in part from Specification B682.

Diameter, mm	Cross-Sectional Area, mm ²	Mass per Unit Length, kg/km
18.0	255.0	702.0
16.0	201.0	555.0
14.0	154.0	425.0
12.5	123.0	339.0
11.2	98.5	272.0
10.0	78.5	217.0
9.00	63.6	176.0
8.00	50.3	139.0
7.10	39.6	109.0
6.30	31.2	86.0
5.60	24.6	68.0
5.00	19.6	54.2
4.50	15.9	43.9
4.00	12.6	34.7
3.55	9.90	27.3
3.15	7.79	21.5
2.80	6.16	17.0
2.50	4.91	13.5
2.24	3.94	10.9
2.00	3.14	8.67
1.80	2.55	7.02
1.60	2.01	5.55
1.40	1.54	4.25
1.25	1.23	3.39
1.12	0.985	2.72
1.00	0.785	2.17
0.900	0.636	1.76
0.800	0.503	1.39
0.710	0.396	1.09
0.630	0.312	0.860
0.560	0.246	0.680
0.500	0.196	0.542
0.450	0.159	0.439
0.400	0.126	0.347
0.355	0.0990	0.273
0.315	0.0779	0.215
0.280	0.0616	0.170
0.250	0.0491	0.135

4.1.5 Special jointing procedures if permitted (see 12.2),

4.1.6 Place of inspection (see 15.2),

4.1.7 Package size and type (see 16.1), and

4.1.8 Special package marking, if required, (see 16.1).

5. Materials and Manufacture

5.1 The aluminum wire shall be made from drawing stock meeting the requirements of Specification B233.

5.2 Unless otherwise specified, the manufacturer shall have the option of producing the intermediate tempers by either strain-hardening only (H12, H14, H16, H142) or by strain-hardening and partial annealing (H22, H24, H26, H242) (Explanatory Note 1 and ANSI H35.1 or ANSI H35.1[M]).

5.2.1 When the manufacturer is to be given the option in 5.2, the intermediate tempers should be specified as H12 or H22, H14 or H24, H16 or H26, or H142 or H242.

5.2.2 When the manufacturer is not to be given the option in 5.2, the specific temper must be specified, for example, H12, H22, and so forth.

6. Workmanship, Finish and Appearance

6.1 The wire shall be free of imperfections not consistent with good commercial practice.

7. Tensile Properties

7.1 *Tensile Strength*—The wire shall conform to the tensile requirements prescribed in Table 3 (Explanatory Note 2).

7.2 When requested by the purchaser, tension tests of joints as permitted in 12.2 shall be made and the joints shall comply with the minimum tensile requirements shown in Table 3. Sampling shall be as agreed upon between the purchaser and the manufacturer.