



Designation: B524/B524M – 23

# Standard Specification for Concentric-Lay-Stranded Aluminum Conductors, Aluminum-Alloy Reinforced (ACAR, 1350/6201)<sup>1</sup>

This standard is issued under the fixed designation B524/B524M; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This specification covers concentric-lay-stranded conductors made from round aluminum 1350-H19 (extra hard) wires and round aluminum-alloy 6201-T81 (hard: solution heat treated, cold worked, and then artificially aged) core wires for use as overhead electrical conductors (Explanatory [Note 1](#)).

**NOTE 1**—The aluminum, alloy, and temper designations conform to ANSI H35.1/ANSI H35.1[M]. Aluminum 1350 and Alloy 6201 correspond to unified numbering system A91350 and A96201, respectively, in accordance with Practice [E527](#).

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

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

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 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:

<sup>1</sup> 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 April 1, 2023. Published April 2023. Originally approved in 1970. Last previous edition approved in 2018 as B0524/B524M – 18. DOI: 10.1520/B0524\_B0524M-23.

## 2.2 ASTM Standards:<sup>2</sup>

[B193 Test Method for Resistivity of Electrical Conductor Materials](#)

[B230/B230M Specification for Aluminum 1350–H19 Wire for Electrical Purposes](#)

[B263/B263M Test Method for Determination of Cross-Sectional Area of Stranded Conductors](#)

[B354 Terminology Relating to Uninsulated Metallic Electrical Conductors](#)

[B398/B398M Specification for Aluminum-Alloy 6201-T81 and 6201-T83 Wire for Electrical Purposes](#)

[B682 Specification for Standard Metric Sizes of Electrical Conductors](#)

[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:

[ANSI H35.1 American National Standard for Alloy and Temper Designation Systems for Aluminum<sup>3</sup>](#)

[ANSI H35.1\[M\] American National Standard for Alloy and Temper Designation Systems for Aluminum<sup>3</sup>](#)

## 2.4 NIST Document:

[NBS Handbook 100—Copper Wire Tables<sup>4</sup>](#)

## 3. Ordering Information

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

3.1.1 Quantity of each size and stranding;

3.1.2 Conductor size (see [7.1](#));

3.1.3 Total number of wires, aluminum 1350 and aluminum alloy 6201 ([Table 1](#) or [Table 2](#));

3.1.4 Direction of lay of outer layer of wires if other than right-hand (see [6.3](#));

3.1.5 Special tension test, if required (see [8.2](#));

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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

<sup>4</sup> Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 1070, Gaithersburg, MD 20899-1070, <http://www.nist.gov>.



TABLE 1 Construction Requirements of Concentric-Lay-Stranded Aluminum Conductors, Aluminum Alloy Reinforced

Conductor Size			Required Construction					Recommended Package Sizes <sup>A</sup>				
			Number of Wires <sup>B</sup>	Diameter of Wires		Nominal Outside Diameter		Reel Designation	Approximate Length of Each Piece		Approximate Mass of Each Length <sup>C</sup>	
cmil	AWG	mm <sup>2</sup>		in.	mm	in.	mm		ft	m	lb	kg
3 000 000		1520	91	0.1816	4.613	1.998	50.74	RMT 90.45	3 200	975	9 100	4130
2 750 000		1393	91	0.1738	4.415	1.912	48.56	RMT 90.45	3 490	1065	9 100	4130
2 500 000		1267	91	0.1657	4.209	1.823	46.30	RMT 90.45	3 840	1170	9 100	4130
2 493 000		1263	91	0.1655	4.204	1.8207	46.25	RMT 96.60	6 500	1981	15 400	6970
2 338 000		1185	61	0.1958	4.973	1.7620	44.75	RMT 96.60	7 500	2286	16 700	7540
2 250 000		1140	91	0.1572	3.993	1.729	43.92	RMT 90.45	4 270	1300	9 100	4130
2 000 000		1013	91	0.1482	3.764	1.630	41.40	RMT 90.45	4 850	1480	9 100	4130
2 000 000		1013	61	0.1811	4.600	1.630	41.40	RMT 90.45	5 200	1585	9 760	4425
1 933 000		979	61	0.1780	4.522	1.6021	40.69	RMT 96.60	9 200	2804	16 700	7570
1 900 000		963	61	0.1765	4.483	1.588	40.35	RMT 90.45	5 470	1665	9 760	4425
1 800 000		912	61	0.1718	4.364	1.546	39.28	RMT 90.45	5 780	1760	9 760	4425
1 798 000		911	61	0.1717	4.361	1.5452	39.25	RMT 96.60	9 200	2804	15 600	7040
1 750 000		887	61	0.1694	4.303	1.525	38.73	RMT 90.45	5 940	1810	9 760	4425
1 703 000		863	61	0.1671	4.244	1.8380	46.68	RMT 96.60	9 000	2743	14 400	6530
1 700 000		861	61	0.1669	4.239	1.502	38.15	RMT 90.45	6 120	1865	9 760	4425
1 600 000		811	61	0.1620	4.115	1.458	37.04	RMT 90.45	6 500	1980	9 760	4425
1 534 400		777	61	0.1586	4.028	1.4274	36.26	RMT 96.60	10 000	3048	14 400	6530
1 500 000		760	61	0.1568	3.983	1.411	35.85	RMT 90.45	6 930	2110	9 760	4425
1 400 000		709	61	0.1515	3.848	1.364	34.63	RMT 90.45	7 430	2265	9 760	4425
1 361 500		690	61	0.1494	3.795	1.3446	34.15	RMT 96.60	11 250	3429	14 400	6530
1 300 000		659	61	0.1460	3.708	1.314	33.37	RMT 90.45	8 000	2440	9 760	4425
1 300 000		659	37	0.1874	4.760	1.312	33.32	RMT 84.45	6 065	1850	7 400	3355
1 277 000		647	61	0.1447	3.675	1.3022	33.08	RMT 96.60	12 000	3658	14 400	6520
1 250 000		633	61	0.1431	3.635	1.288	32.72	RMT 90.45	8 320	2535	9 760	4425
1 250 000		633	37	0.1838	4.669	1.287	32.70	RMT 84.45	6 310	1920	7 400	3355
1 200 000		608	61	0.1403	3.564	1.263	32.08	RMT 90.45	8 660	2640	9 760	4425
1 200 000		608	37	0.1801	4.575	1.261	32.02	RMT 84.45	6 565	2000	7 400	3355
1 198 000		607	37	0.1799	4.570	1.2596	31.99	RMT 96.60	12 850	3917	14 500	6550
1 172 000		594	37	0.1780	4.521	1.2458	31.64	RMT 96.60	14 400	4389	15 900	7180
1 109 000		562	37	0.1731	4.397	1.2119	30.78	RMT 96.60	13 850	4221	14 500	6540
1 100 000		557	61	0.1343	3.411	1.209	30.70	RMT 90.45	9 450	2880	9 760	4425
1 100 000		557	37	0.1724	4.379	1.207	30.65	RMT 84.45	7 160	2180	7 400	3355
1 080 600		548	37	0.1709	4.341	1.1963	30.39	RMT 96.60	15 600	4755	15 800	7170
1 024 500		519	37	0.1664	4.227	1.1648	29.59	RMT 96.60	15 000	4572	14 500	6540
1 000 000		507	61	0.1280	3.251	1.152	29.26	RMT 90.45	10 400	3170	9 760	4425
1 000 000		507	37	0.1644	4.176	1.151	29.23	RMT 84.45	7 880	2400	7 400	3355
950 000		481	37	0.1602	4.069	1.121	28.48	RMT 84.45	8 300	2530	7 400	3355
927 200		470	37	0.1583	4.021	1.1081	28.15	RMT 90.45	10 400	3170	9 050	4110
900 000		456	37	0.1560	3.962	1.092	27.73	RMT 84.45	8 760	2670	7 400	3355
853 700		433	37	0.1519	3.858	1.0633	27.01	RMT 96.60	18 000	5486	14 500	6540
850 000		431	37	0.1516	3.851	1.061	26.96	RMT 84.45	9 270	2825	7 400	3355
800 000		405	37	0.1470	3.734	1.029	26.14	RMT 84.45	9 850	3000	7 400	3355
750 000		380	37	0.1424	3.617	0.997	25.32	RMT 84.45	10 510	3200	7 400	3355
739 800		375	37	0.1414	3.592	0.9898	25.14	RMT 90.45	13 010	3965	9 020	4090
700 000		355	37	0.1375	3.493	0.962	24.45	RMT 84.45	11 260	3430	7 400	3355
653 100		331	19	0.1854	4.709	0.9270	23.55	RMT 84.45	9 910	3021	6 070	2760
650 000		329	37	0.1325	3.366	0.928	23.56	RMT 84.45	12 130	3695	7 400	3355
649 500		329	37	0.1325	3.365	0.9274	23.56	NR 66.28	6 890	2100	4 200	1910
600 000		304	37	0.1273	3.233	0.891	22.63	RMT 84.45	13 140	4005	7 400	3355
600 000		304	19	0.1777	4.513	0.888	22.56	RM 66.32	6 750	2060	3 800	1725
								NR 66.28				
587 200		298	19	0.1758	4.465	0.8790	22.33	NR 66.28	8 030	2448	4 430	2010
550 000		279	37	0.1219	3.096	0.853	21.67	RMT 84.45	14 330	4365	7 400	3355
550 000		279	19	0.1701	4.321	0.850	21.60	RM 66.32	7 360	2245	3 800	1725
								NR 66.28				
503 600		255	19	0.1628	4.135	0.8140	20.68	NR 66.28	8 030	2448	3 800	1730
500 000		253	37	0.1162	2.951	0.813	20.66	RMT 84.45	15 765	4805	7 400	3355
500 000		253	19	0.1622	4.120	0.811	20.60	RM 66.32	8 100	2470	3 800	1725
								NR 66.28				
450 000		228	19	0.1539	3.909	0.770	19.54	RM 66.32	9 000	2745	3 800	1725
								NR 66.28				
400 000		203	19	0.1451	3.685	0.726	18.42	RM 66.32	10 120	3085	3 800	1725
								NR 66.28				
350 000		177	19	0.1357	3.447	0.678	17.24	RM 66.32	11 560	3530	3 800	1725
								NR 66.28				
300 000		152	19	0.1257	3.193	0.628	15.96	RM 66.32	13 490	4115	3 800	1725
								NR 66.28				
250 000		127	19	0.1147	2.913	0.574	14.56	RM 66.32	16 190	4940	3 800	1725
								NR 66.28				

**TABLE 1** *Continued*

Conductor Size			Required Construction					Recommended Package Sizes <sup>A</sup>					
			Number of Wires <sup>B</sup>	Diameter of Wires		Nominal Outside Diameter		Reel Designation	Approximate Length of Each Piece		Approximate Mass of Each Length <sup>C</sup>		
cmil	AWG	mm <sup>2</sup>		in.	mm	in.	mm		ft	m	lb	kg	
246	900		125	7	0.1878	4.770	0.563	14.31	NR 36.22	3 020	920	700	318
211	600	4/0	107	7	0.1739	4.417	0.522	13.25	NR 36.22	3 525	1075	700	318
195	700		99.1	7	0.1672	4.247	0.502	12.74	NR 36.22	3 810	1165	700	318
167	800	3/0	85.0	7	0.1548	3.932	0.464	11.80	NR 36.22	4 445	1355	700	318
155	400		78.7	7	0.1490	3.785	0.447	11.35	NR 36.22	4 800	1465	700	318
133	100	2/0	67.4	7	0.1379	3.503	0.414	10.52	NR 36.22	5 605	1710	700	318
123	300		62.5	7	0.1327	3.371	0.398	10.11	NR 36.22	6 050	1845	700	318
105	600	1/0	53.5	7	0.1228	3.119	0.368	9.35	NR 36.22	7 065	2155	700	318
77	470		39.3	7	0.1052	2.672	0.316	8.03	NR 36.22	9 630	2940	700	318
66	360	2	33.6	7	0.0974	2.474	0.292	7.42	NR 36.22	11 235	3430	700	318
48	690		24.7	7	0.0834	2.118	0.250	6.35	NR 36.22	15 315	4675	700	318
41	740	4	21.2	7	0.0772	1.961	0.232	5.89	NR 36.22	17 855	5455	700	318
30	580		15.5	7	0.0661	1.679	0.198	5.03	NR 36.22	24 390	7445	700	318

<sup>A</sup> See Table 4 for dimensions of standard reels.

<sup>B</sup> Recommended standard stranding combinations are shown in Table 5.

<sup>C</sup> See Table 7 for mass per unit length for each stranding.

- 3.1.6 Place of inspection (see 14.2);
- 3.1.7 Package size and type (see 16.1);
- 3.1.8 Heavy wood lagging, if required (Section 16); and
- 3.1.9 Special package marking, if required (Section 15).

#### 4. Requirement for Wires

- 4.1 Before stranding, the 1350-H19 wire used shall meet the requirements of Specification B230/B230M.
- 4.2 Before stranding, the 6201-T81 wire used shall meet the requirements of Specification B398/B398M.

#### 5. Joints

5.1 In conductors composed of seven wires, only cold-pressure welds and electric butt, cold-upset welds may be made in the six outer finished wires. No welds are permitted in the center core wire. In other conductors, cold-pressure welds, electric-butt, cold-upset welds, or electric-butt welds may be made in the finished wires. Such joints in the same wire or any other wire in the conductor shall be not closer than prescribed in Table 3. Following welding, electric-butt welds in 6201 wires shall be annealed for a distance of at least 6 in. (150 mm) on each side of the weld (Explanatory Note 2).

#### 6. Lay

6.1 The length of lay of a layer of wires shall not be less than 10 nor more than 16 times the outside diameter of that layer.

6.2 In a conductor having multiple layers of aluminum wires, the length of lay of any aluminum layer shall not be less than the length of lay of the aluminum layer immediately beneath it.

6.3 The direction of lay of the outer layer shall be right-hand unless specified otherwise by the purchaser. The direction of lay shall be reversed in successive layers.

#### 7. Construction

7.1 The number and diameter of wires and the areas of cross section of conductors shall conform to the requirements prescribed in Table 1 or Table 2.

7.2 Recommended standard strandings are as shown in Table 4.

7.3 The nominal wire diameter shall be as specified in Table 1 and this diameter shall be referred to as the “mean diameter”. The nominal outside diameter of the conductor shall be calculated by summing the mean diameter of the core wire and twice the mean diameter of each layer. The minimum and maximum outside diameter shall be based on calculations made using the method described above and the mean diameter tolerances as specified by Specification B230/B230M and Specification B398/B398M for the corresponding mean diameter of each layer.

#### 8. Strength of Conductor

8.1 The rated strength of completed conductors shall be taken as the aggregate strength of the aluminum 1350 and the aluminum-alloy 6201 components, calculated as follows. The strength contribution of the aluminum 1350 wires shall be taken as the percentage indicated in Table 6, of the sum of the strengths of the aluminum 1350 wires, calculated from their specified nominal wire diameter and the appropriate specified minimum average tensile strength given in Specification B230/B230M. The strength contribution of the aluminum-alloy 6201 wires shall be taken as that percentage, according to the number of layers of aluminum-alloy 6201 wires, indicated in Table 6, of the sum of the strengths of the aluminum-alloy 6201 wires, calculated from their specified nominal wire diameter and the minimum stress at 1 % extension. This shall be considered to be 95 % of the minimum average tensile strength specified for the wire diameter in Specification B398/B398M.

**TABLE 2 Construction Requirements, Mass, Mass Per Unit Length, Recommended Reel Sizes, and Shipping Lengths of Conductors**

NOTE 1—The sizes in boldface type indicate those preferred sizes from Specification B682.

Conductor Size, mm <sup>2</sup>	Diameter of Wires, mm	Conductor Diameter, mm	Mass per Unit Length <sup>A</sup>			Related Strength kN	Recommended Package Sizes <sup>B</sup>		
			1350, kg/km	6201, kg/km	Total, kg/km		Reel Designation <sup>C</sup>	Nominal Length of Each Piece, m	Nominal Mass of Each Length, kg
<b>Stranding 72/19</b>									
<b>1600</b>	4.73	52.03	3559	934	4493	283	RMT 90.45	960	4315
1400	4.43	48.73	3092	812	3904	248	RMT 90.45	1060	4140
<b>1250</b>	4.18	45.98	2753	723	3476	221	RMT 90.45	1185	4120
1120	3.96	43.56	2471	648	3119	198	RMT 90.45	1320	4120
<b>1000</b>	3.74	41.14	2204	578	2782	180	RMT 90.45	1495	4160
<b>Stranding 63/28</b>									
<b>1600</b>	4.73	52.03	3114	1377	4491	300	RMT 90.45	960	4310
1400	4.43	48.73	2705	1196	3901	263	RMT 90.45	1060	4135
<b>1250</b>	4.18	45.98	2409	1065	3474	234	RMT 90.45	1185	4115
1120	3.96	43.56	2162	956	3118	210	RMT 90.45	1320	4115
<b>1000</b>	3.74	41.14	1928	852	2780	190	RMT 90.45	1495	4155
<b>Stranding 54/37</b>									
<b>1600</b>	4.73	52.03	2669	1819	4488	323	RMT 90.45	960	4310
1400	4.43	48.73	2319	1580	3899	283	RMT 90.45	1060	4135
<b>1250</b>	4.18	45.98	2065	1407	3472	253	RMT 90.45	1185	4115
1120	3.96	43.56	1853	1263	3116	226	RMT 90.45	1320	4115
<b>1000</b>	3.74	41.14	1653	1126	2779	204	RMT 90.45	1495	4155
<b>Stranding 54/7</b>									
<b>1000</b>	4.57	41.13	2468	318	2786	166	RMT 90.45	1495	4165
900	4.33	38.97	2194	214	2478	148	RMT 90.45	1785	4425
<b>800</b>	4.09	36.81	1957	252	2209	133	RMT 90.45	2000	4420
710	3.85	34.64	1734	224	1958	118	RMT 90.45	2260	4425
<b>630</b>	3.63	32.67	1542	199	1741	107	RMT 90.45	2540	4420
560	3.42	30.78	1369	176	1545	96.1	RMT 9.45	2860	4420
<b>500</b>	3.23	29.07	1221	157	1378	86.5	RMT 90.45	3210	4425
<b>Stranding 48/13</b>									
<b>1000</b>	4.57	41.13	2194	591	2786	178	RMT 90.45	1495	4165
900	4.33	38.97	1950	525	2475	159	RMT 90.45	1785	4420
<b>800</b>	4.09	36.81	1740	469	2209	142	RMT 90.45	2000	4420
710	3.85	34.65	1542	415	1957	126	RMT 90.45	2260	4425
<b>630</b>	3.63	32.67	1371	369	1740	114	RMT 90.45	2540	4420
560	3.42	30.78	1217	328	1545	102	RMT 90.45	2860	4420
<b>500</b>	3.23	29.07	1085	292	1377	93.6	RMT 90.45	3210	4420
<b>Stranding 42/19</b>									
<b>1000</b>	4.57	41.13	1919	864	2783	192	RMT 90.45	1495	4160
900	4.33	38.97	1706	768	2474	173	RMT 90.45	1785	4415
<b>800</b>	4.09	36.81	1522	685	2207	154	RMT 90.45	2000	4415
710	3.85	34.65	1349	607	1956	137	RMT 90.45	2260	4420
<b>630</b>	3.63	32.67	1199	540	1739	123	RMT 90.45	2540	4415
560	3.42	30.78	1065	479	1544	110	RMT 90.45	2860	4415
<b>500</b>	3.23	29.07	950	427	1377	100	RMT 90.45	3210	4420
<b>Stranding 33/28</b>									
<b>1000</b>	4.57	41.13	1508	1273	2781	206	RMT 90.45	1495	4160
900	4.33	38.97	1341	1131	2472	187	RMT 90.45	1785	4415
<b>800</b>	4.09	36.81	1196	1009	2205	167	RMT 90.45	2000	4410
710	3.85	34.65	1060	894	1954	148	RMT 90.45	2260	4415
<b>630</b>	3.63	32.67	942	795	1737	133	RMT 90.45	2540	4410
560	3.42	30.78	836	706	1542	119	RMT 90.45	2860	4410
<b>500</b>	3.23	29.07	746	630	1376	109	RMT 90.45	3210	4415
<b>Stranding 33/4</b>									
<b>630</b>	4.66	32.62	1553	187	1740	104	RMT 90.45	2540	4420
560	4.39	30.73	1378	166	1544	92.4	RMT 90.45	3860	4415
<b>500</b>	4.15	29.05	1232	148	1380	82.6	RMT 84.45	2430	3355
450	3.94	27.58	1110	134	1244	74.4	RMT 84.45	2695	3355
<b>400</b>	3.71	25.97	984	119	1103	67.3	RMT 84.45	3040	3355
355	3.50	24.50	876	106	982	60.8	RMT 84.45	3415	3355
<b>315</b>	3.29	23.03	774	93	867	53.7	RMT 84.45	3865	3350
280	3.10	21.70	687	83	770	48.1	RMT 84.45	4350	3350
<b>250</b>	2.93	20.51	614	74	688	42.9	RMT 84.45	4875	3355
<b>Stranding 30/7</b>									
<b>630</b>	4.66	32.62	1412	328	1740	113	RMT 90.45	2540	4420
560	4.39	30.73	1253	291	1544	100	RMT 90.45	2860	4415
<b>500</b>	4.15	29.05	1119	260	1379	89.5	RMT 84.45	2430	3350
450	3.94	27.58	1009	234	1243	80.6	RMT 84.45	3415	3350
<b>400</b>	3.71	25.97	895	208	1103	72.7	RMT 84.45	3040	3355
355	3.50	24.50	796	185	981	65.5	RMT 84.45	3415	3350
<b>315</b>	3.29	23.03	704	163	867	57.9	RMT 84.45	3865	3350
280	3.10	21.70	625	145	770	52.1	RMT 84.45	4350	3350
<b>250</b>	2.93	20.51	558	130	688	46.6	RMT 84.45	4875	3355
<b>Stranding 24/13</b>									

**TABLE 2** *Continued*

Conductor Size, mm <sup>2</sup>	Diameter of Wires, mm	Conductor Diameter, mm	Mass per Unit Length <sup>A</sup>			Related Strength kN	Recommended Package Sizes <sup>B</sup>		
			1350, kg/km	6201, kg/km	Total, kg/km		Reel Designation <sup>C</sup>	Nominal Length of Each Piece, m	Nominal Mass of Each Length, kg
<b>630</b>	4.66	32.62	1129	608	1737	125	RMT 90.45	2540	4410
560	4.39	30.73	1002	540	1542	111	RMT 90.45	2860	4410
<b>500</b>	4.15	29.05	896	483	1379	98.8	RMT 84.45	2430	3350
450	3.94	27.58	807	435	1242	89.0	RMT 84.45	2695	3345
<b>400</b>	3.71	25.97	716	386	1102	79.9	RMT 84.45	3040	3350
355	3.50	24.50	637	343	980	71.7	RMT 84.45	3415	3345
<b>315</b>	3.29	23.03	563	303	866	63.4	RMT 84.45	3865	3345
280	3.10	21.70	500	269	769	57.6	RMT 84.45	4350	3345
<b>250</b>	2.93	20.51	446	240	686	51.4	RMT 84.45	4875	3360
Stranding 18/19									
<b>630</b>	4.66	32.62	847	889	1736	139	RMT 90.45	2540	4410
560	4.39	30.73	752	789	1541	123	RMT 90.45	2860	4410
<b>500</b>	4.15	29.05	672	705	1377	110	RMT 84.45	2430	3345
450	3.94	27.58	606	636	1242	99.2	RMT 84.45	2695	3345
<b>400</b>	3.11	25.97	537	563	1100	88.7	RMT 84.45	3040	3345
355	3.50	24.50	478	501	979	79.5	RMT 84.45	3415	3345
<b>315</b>	3.29	23.03	422	443	865	70.2	RMT 84.45	3865	3345
280	3.10	21.70	375	393	768	64.2	RMT 84.45	4350	3340
<b>250</b>	2.93	20.51	335	352	687	57.4	RMT 84.45	4875	3350
Stranding 12/7									
280	4.33	21.65	488	283	771	57.6	RM 66.32 NR 66.28	2235 2235	1725 1725
<b>250</b>	4.09	20.45	435	252	687	51.4	RM 66.32 NR 66.28	2505 2505	1720 1720
224	3.87	19.35	389	226	615	46.0	RM 66.32 NR 66.28	2795 2795	1720 1720
<b>200</b>	3.66	18.30	348	202	550	41.6	RM 66.32 NR 66.28	3125 3125	1720 1720
180	3.47	17.35	313	182	495	37.8	RM 66.32 NR 66.28	3480 3480	1725 1725
<b>160</b>	3.27	16.35	278	161	439	33.5	RM 66.32 NR 66.28	3920 3920	1720 1720
140	3.06	15.30	242	141	384	30.1	RM 66.32 NR 66.28	4470 4470	1715 1715
Stranding 15/4									
280	4.33	21.65	609	162	771	50.8	RM 66.32 NR 66.28	2235 2235	1725 1725
<b>250</b>	4.09	20.45	544	144	688	45.3	RM 66.32 NR 66.28	2505 2505	1725 1725
224	3.87	19.35	487	129	616	40.6	RM 66.32 NR 66.28	2795 2795	1720 1720
<b>200</b>	3.66	18.30	435	115	550	36.9	RM 66.32 NR 66.28	3125 3125	1720 1720
180	3.47	17.35	391	104	495	33.6	RM 66.32 NR 66.28	3480 3480	1725 1725
<b>160</b>	3.27	16.35	348	92	440	29.8	RM 66.32 NR 66.28	3920 3920	1725 1725
140	3.06	15.30	304	81	385	26.5	RM 66.32 NR 66.28	4470 4470	1720 1720
Stranding 4/3									
<b>125</b>	4.77	14.31	197.2	147.1	344.3	26.7	NR 36.22	930	320
112	4.51	13.53	176.3	131.5	307.8	23.9	NR 36.22	1040	320
<b>100</b>	4.26	12.78	157.3	117.3	274.6	17.2	NR 36.22	1160	320
80.0	3.81	11.43	125.8	93.9	219.7	17.2	NR 36.22	1455	320
<b>63.0</b>	3.39	10.17	99.6	74.3	173.9	13.7	NR 36.22	1835	320
50.0	3.02	9.06	79.1	59.0	138.1	11.2	NR 36.22	2315	320
<b>40.0</b>	2.70	8.10	63.2	47.1	110.3	8.95	NR 36.22	2895	320
31.5	2.39	7.17	49.5	36.9	86.4	7.01	NR 36.22	3695	320
<b>25.0</b>	2.13	6.39	39.3	29.3	68.6	5.57	NR 36.22	4650	320
20.0	1.91	5.73	31.6	23.6	55.2	4.48	NR 36.22	5785	320
<b>16.0</b>	1.71	5.13	25.3	18.9	44.2	3.59	NR 36.22	7205	320

<sup>A</sup> Mass per Unit Length is based on a density of 2705 kg/m<sup>3</sup> for 1350 and 2690 kg/m<sup>3</sup> for 6201.

<sup>B</sup> For information only.

<sup>C</sup> Recommended standard stranding combination are shown in Table 4.

8.2 Tests for determining the rated strength of the completed conductor are not required by this specification but may be made if agreed upon by the manufacturer and the purchaser at the time of placing an order. If tested, the breaking strength of the completed conductor shall be not less than the rated

strength if failure occurs in the free length at least 1 in. (25 mm) beyond the end of either gripping device, or shall be not less than 95 % of the rated strength if failure occurs inside, or within 1 in. (25 mm) of the end of, either gripping device (Explanatory Note 3).



**TABLE 3 Minimum Distance Between Joints in the Completed Conductor**

Number of Wires in Conductor <sup>A</sup>	Distance Between Joints, min. ft (m)
7	50 <sup>B</sup> (15)
19	50 (15)
37	25 (7.5)
61 and over	25 (7.5)

<sup>A</sup> Conductors of an intermediate number of wires shall conform to those having the next smaller number.

<sup>B</sup> Only cold-pressure welds and electric-butt, cold-upset welds are permitted in the six outer wires of conductors composed of seven wires.

**TABLE 4 Recommended Standard Strandings**

Total No. of Wires	No. of 1350-H19 Wires/No. of 6201-T81 Wires			
7	4/3	...	...	...
19	15/4	12/7	...	...
37	33/4	30/7	24/13	18/19
61	54/7	48/13	42/19	33/28
91	...	72/19	63/28	54/37

8.3 Rated strength and breaking strength values shall be rounded to three significant figures, in the final value only, in accordance with the rounding method in Practice E29.

8.4 Rated strength of conductors is given in Table 2 or Table 7.

## 9. Density

9.1 For the purpose of calculating mass, mass per unit length, cross sections, and so forth, the density of 1350-H19 shall be taken from Specification B230/B230M and the density of 6201-T81 shall be taken from Specification B398/B398M.

## 10. Mass Electrical Resistance

10.1 The mass and electrical resistance of a unit length of stranded conductor are a function of the length of lay. The approximate mass per unit length and electrical resistance may be determined using the standard increments shown in Table 8. When greater accuracy is desired, the increment based on the specific lay of the conductor may be calculated (Explanatory Note 4).

10.2 In the calculation of the electrical resistance of a completed conductor, the resistance of both the aluminum 1350 and the aluminum-alloy 6201 wires must be taken into consideration. (Explanatory Note 6).

10.3 In the calculation of the electrical resistance of a conductor, the electrical volume resistivity at 20 °C of the 1350 H19 aluminum wires shall be taken as 0.028172 Ω•mm<sup>2</sup>/m (16.946 Ω•cmil/ft) (which is equivalent to 61.2 % IACS conductivity at 20 °C). In the calculation of the electrical resistance of a conductor, the electrical resistivity at 20 °C of the 6201 T81 aluminum alloy wires shall be taken as 0.032841 Ω•mm<sup>2</sup>/m (19.755 Ω•cmil/ft) (which is equivalent to 52.5 % IACS conductivity at 20 °C).

## 11. Variation in Area

11.1 The total area of cross section of the conductor shall be not less than 98 % of the area specified in Table 1 or Table 2.

Unless otherwise specified by the purchaser, the manufacturer may have the option of determining the cross-sectional area by either of the following methods, except that in case of question regarding area compliance, the method given in 11.1.2 shall be used.

11.1.1 The area of cross section may be determined by calculations from diameter measurements, expressed to four decimal places, of the component wires at any point when measured perpendicularly to their axes.

11.1.2 The area of cross section of the wires of a conductor may be determined by Test Method B263/B263M. In applying that method, the increment in mass per unit length resulting from stranding may be the applicable value specified in 10.1 or may be calculated from the measured component dimensions of the sample under test. In case of question regarding area compliance, the actual mass increment due to stranding shall be calculated.

## 12. Finish

12.1 The conductor shall be free of all imperfections not consistent with good commercial practice.

## 13. Mechanical and Electrical Tests

13.1 Tests for mechanical and electrical properties of component wires shall be made before stranding (Explanatory Note 1).

13.2 Routine testing after stranding is not required. When requested by the purchaser at the time of placing the order, tension tests on wires before stranding may be waived and tests may be made of wires removed from the completed conductor. When so tested, the wires of aluminum 1350 and aluminum-alloy 6201 shall have tensile strengths not less than 95 % of the minimum tensile strengths prescribed for individual tests in Specification B230/B230M in the case of aluminum 1350 and in Specification B398/B398M in the case of aluminum-alloy 6201 (Explanatory Note 5).

13.2.1 The aluminum 1350 wires removed from a completed conductor shall be capable of meeting the bending properties stated in Specification B230/B230M.

13.2.2 The aluminum-alloy 6201 wires removed from a completed conductor shall be capable of meeting the bending properties stated in Specification B398/B398M.

## 14. Inspection

14.1 Unless otherwise specified in the contract or purchase order, the manufacturer shall be responsible for the performance of all inspection and test requirements specified.

14.2 All inspections and tests shall be made at the place of manufacture unless otherwise especially agreed upon between the manufacturer and the purchaser at the time of the purchase.

14.3 The manufacturer shall afford the inspector representing the purchaser all reasonable access to manufacturer's facilities to satisfy him that the material is being furnished in accordance with this specification.

## 15. Marking

15.1 The net mass, length, size, kind of conductor, stranding, and any other necessary identification shall be

**TABLE 5 Dimensions of Standard Reels  
(For Information Only)**

Reel Designation <sup>A,B</sup>	Reel Capacity		Reel Dimensions									
			Flange Diameter		Drum Diameter		Width				Arbor Hole Diameter	
							Inside		Outside			
in. <sup>3</sup>	m <sup>3</sup>	in.	m	in.	m	in.	m	in.	m	in.	mm	
NR 36.22	16 800	0.275	36	0.91	18	0.46	22	0.56	25	0.64	3 to 3¼	76 to 83
NR 66.28 <sup>C</sup>	76 000	1.245	66	1.68	30	0.76	28	0.71	32½	0.83	3 to 3¼	76 to 83
RM 66.32 <sup>D</sup>	76 900	1.260	66	1.68	36	0.91	32	0.81	38	0.97	3 to 3¼	76 to 83
RM 68.38 <sup>D</sup>	99 300	1.627	68	1.73	36	0.91	38	0.97	44	1.12	3 to 3¼	76 to 83
RMT 84.45 <sup>E</sup>	152 700	2.502	78	1.98	42	1.07	45	1.14	52	1.32	5 to 5¼	127 to 133
			(84)	(2.13)								
RMT 90.45 <sup>E</sup>	187 000	3.064	84	2.13	42	1.07	45	1.14	52	1.32	5 to 5¼	127 to 133
			(90)	(2.29)								

<sup>A</sup> Prefix “NR” denotes wooden nonreturnable reel, “RM” metal returnable reel, and “RMT” metal returnable reel with I-beam tires.

<sup>B</sup> Reels are not designed to withstand the forces required for breaking during tension stringing operations.

<sup>C</sup> Reel RM 66.32 has flat rims.

<sup>D</sup> Reels RM 66.32 and RM 68.38 have flat rims.

<sup>E</sup> Reels RMT 84.45 and RMT 90.45 have 3 in. (76 mm) I-beam tires. Reels with similar dimensions except without I-beam tires are sometimes used.

**TABLE 6 Rating Factors**

Stranding				Rating Factor, %	
Number of Wires		Number of Layers <sup>A</sup>		1350-H19	6201-T81
1350-H19	6201-T81	1350-H19	6201-T81		
4	3	1	1	96	96
15	4	2	1	93	96
12	7	1	1	96	96
33	4	3	1	91	96
30	7	2	1	93	96
24	13	2	2	93	93
18	19	1	2	96	93
54	7	3	1	91	96
48	13	3	2	91	93
42	19	2	2	93	93
33	28	2	3	93	91
72	19	3	2	91	93
63	28	3	3	91	91
54	37	2	3	93	91

<sup>A</sup> For purposes of determining strength rating factors, mixed layers are considered to be full layers for each material.

<https://standards.iteh.ai/catalog/standards/sist/13674f67-892d-40a0-8b92-df65049ec1a3/astm-b524-b524m-23>

marked on a tag attached to the end of the conductor inside the package. This same information, together with the purchaser’s order number, the manufacturer’s serial number (if any), and all shipping marks and other information required by the purchaser shall appear on the outside of the package.

NOTE 2—Multiple lengths per package are allowable only when the bare conductor is intended for remanufacture, such as adding a covering or insulation. In such cases the position of each end of a length is to be clearly marked and the length of each portion shall be shown on the attached to the end of the conductor.

## 16. Packaging and Shipping

16.1 Package sizes and kind of package, reels or coils, shall be agreed upon between the manufacturer and the purchaser. Recommended package sizes are shown in Table 1 or Table 2.

16.2 There shall be only one length of conductor on a reel.

16.3 The conductors shall be protected against damage in ordinary handling and shipping. If heavy wood lagging is required, it shall be specified by the purchaser at the time of placing the purchase order.

## 17. Keywords

17.1 aluminum alloy electrical conductors; aluminum electrical conductors; concentric-lay stranded aluminum conductors; aluminum alloy reinforced (ACAR, 1350/6201); electrical conductors; electrical conductors - aluminum; electrical conductors - aluminum alloy; overhead electrical conductors; stranded conductors