



Designation: B401 – 22

Standard Specification for Compact Round Concentric-Lay-Stranded Aluminum Conductors, Steel-Reinforced (ACSR/COMP)¹

This standard is issued under the fixed designation B401; 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 compact round concentric-lay-stranded conductors made from aluminum 1350-H19 (extra hard) wires and round zinc-coated, aluminum-coated, or aluminum-clad steel core wires usually used in overhead lines. These conductors shall be constructed with one steel core wire surrounded by one or more layers of helically-laid compacted or otherwise shaped aluminum wires (Explanatory [Note 1](#) and [Note 2](#)).

1.2 Compact ACSR covered by this specification has five types of steel core wire which are designated by abbreviations as follows (Explanatory [Note 2](#) and [Note 7](#)).

1.2.1 *ACSR/GA2/COMP*—Compact ACSR using Class A zinc-coated steel wire,

1.2.2 *ACSR/GC2/COMP*—Compact ACSR using Class C zinc-coated steel wire,

1.2.3 *ACSR/AW2/COMP*—Compact ACSR using aluminum-clad steel wire, AW2 (Normal Strength),

1.2.4 *ACSR/AW3/COMP*—Compact ACSR using aluminum-clad steel wire, AW3 (High Strength).

1.3 The SI values of density and resistivity are to be regarded as standard. For all other properties the inch-pound values are to be regarded as standard and the SI units may be approximate.

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](#).

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.*

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.

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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](#)

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

[B232/B232M Specification for Concentric-Lay-Stranded Aluminum Conductors, Coated-Steel Reinforced \(ACSR\)](#)

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

[B341/B341M Specification for Aluminum-Coated \(Aluminized\) Steel Core Wire for Aluminum Conductors, Steel Reinforced \(ACSR/AZ\) \(Withdrawn 2007\)](#)³

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

[B498/B498M Specification for Zinc-Coated \(Galvanized\) Steel Core Wire for Use in Overhead Electrical Conductors](#)

[B500/B500M Specification for Metallic Coated or Aluminum Clad Stranded Steel Core for Use in Overhead Electrical Conductors](#)

[B502/B502M Specification for Aluminum-Clad Steel Core Wire for Use in Overhead Electrical Aluminum Conductors](#)

[B802/B802M Specification for Zinc–5 % Aluminum-Mischmetal Alloy-Coated Steel Core Wire for Aluminum Conductors, Steel Reinforced \(ACSR\)](#)

[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 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 The last approved version of this historical standard is referenced on www.astm.org.

2.3 Other Documents:

ANSI H35.1 American National Standard Alloy and Temper Designation Systems For Aluminum⁴

NBS Handbook 100—Copper Wire Tables of the National Bureau of Standards⁵

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 (Table 1),
- 3.1.2 Conductor size: circular-mil area or AWG (Section 6, and Table 1),
- 3.1.3 Steel wire coating or aluminum-clad (see 11.3),
- 3.1.4 Special tension test, if required (see 15.3),
- 3.1.5 Place of inspection (Section 16), and
- 3.1.6 Packaging and Package Marking (Section 17).

4. Joints

4.1 Electric-butt welds, electric-butt, cold-upset welds, or cold-pressure welds in the individual round-drawn or shaped aluminum wires may be made during the stranding process. No weld shall occur within 50 ft (15 m) of a weld in the same wire or in any other wire of the completed conductor.

4.2 There shall be no joints of any kind made in the finished coated, or aluminum-clad steel wires.

5. Lay

5.1 The length of lay of the aluminum wires of aluminum conductors, steel-reinforced, having a single wire steel core and one layer of aluminum wires, shall not be less than 13 nor more than 16 times the outside diameter of that layer.

5.2 The length of lay of the outside layer of aluminum wires of aluminum conductors, steel-reinforced, having multiple layers of aluminum wires, shall not be less than 11 nor more than 14 times the outside diameter of that layer.

5.3 The length of lay of the layer immediately beneath the outside layer of aluminum wires of aluminum conductors, steel-reinforced, having multiple layers of aluminum wires, shall not be less than 11 nor more than 17.5 times the outside diameter of that layer.

5.4 The length of lay of the various layers of steel wire shall conform to the requirements of Specification **B500/B500M**.

5.5 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.

5.6 The direction of lay of the outside layer of aluminum wires shall be right hand.

5.7 The direction of lay shall be reversed in successive layers.

6. Construction

6.1 The diameter of the steel core wire, the number of aluminum wires, the aluminum cross-sectional area, the diameter and weight of the compact round concentric-lay-stranded aluminum conductors, steel-reinforced, shall be as shown in Table 1.

7. Rated Strength of Conductor

7.1 The rated strength of a completed conductor shall be taken as the aggregate strength of the aluminum and steel components, calculated as follows: The strength contribution of the aluminum wires shall be taken as the percentage, according to the number of layers of aluminum wires, indicated in Table 2, of the sum of the strengths of the 1350-H19 wires, calculated on the basis of the nominal wire diameter for the corresponding noncompacted construction given in Specification **B232/B232M** and the appropriate specified minimum average tensile strength given in Specification **B230/B230M**. The strength contribution of the steel core shall be taken as 96 % of the strength of the steel wire calculated from its specified nominal diameter and the appropriate specified minimum stress at 1 % extension given in Specification **B341/**

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

⁵ Available from National Technical Information Service (NTIS), 5301 Shawnee Rd., Alexandria, VA 22312, <http://www.ntis.gov>.

TABLE 1 Construction Requirements for Compact Round Concentric-Lay-Stranded Aluminum Conductors, Steel Reinforced

Required Construction						Nominal Mass for Conductors With:					
Conductor Size (Aluminum Wires)			Number of Aluminum Wires	Steel Wire Diameter		Compact Conductor Diameter	Coated Steel Core Wire		Aluminum-Clad Steel Core Wire		
cmil	mm ²	AWG		in.	mm		in.	mm	lb/1000 ft	kg/km	lb/1000 ft
336 400	170.2	...	18	0.1367	3.47	0.628	15.95	364.8	543.3	357.2	531.1
266 800	135.0	...	18	0.1217	3.09	0.559	14.20	289.1	430.8	283.1	421.1
211 600	107.2	0000	6	0.1878	4.77	0.517	13.13	290.8	433.4	276.5	412.1
167 800	85.1	000	6	0.1672	4.25	0.461	11.71	230.5	343.9.0	219.2	327.1
133 100	67.3	00	6	0.1489	3.78	0.410	10.41	182.8	272.3	173.8	258.9
105 600	53.5	0	6	0.1327	3.37	0.365	9.27	145.2	216.4	138.1	205.8
83 690	42.4	1	6	0.1181	3.00	0.326	8.28	115.0	171.4	109.4	163.0
66 360	33.6	2	7	0.1299	3.30	0.298	7.57	106.6	158.6	99.8	148.4
66 360	33.6	2	6	0.1052	2.67	0.290	7.37	91.2	135.9	86.8	129.2
52 620	26.7	3	6	0.0937	2.38	0.258	6.55	72.4	107.9	68.8	102.6
41 740	21.1	4	7	0.1029	2.61	0.236	5.99	67.0	99.7	62.7	93.4
41 740	21.2	4	6	0.0834	2.12	0.229	5.82	57.3	85.6	54.5	81.4
26 240	13.3	6	6	0.0661	1.68	0.182	4.62	36.0	53.7	...	...