



Standard Practice for Selection of Wire and Cable Size in AWG or Metric Units¹

This standard is issued under the fixed designation F 1883; 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 reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This practice is intended as a guide to shipbuilders, shipowners, and design agents for use in the selection of conductor size for single conductor or multiple conductor cable sizes either in American Wire Gauge (AWG) or metric designations for commercial ship design and construction.

1.2 The comparison chart of electrical conductor sizes shown in Table 1 presents a combined listing of international standard sizes of annealed copper conductors in accordance with AWG (Specification B 8) English units or IEC (IEC 228) metric units.

1.3 As a precautionary caveat, some conductor sizes listed in Table 1 may exceed minimal size requirements of the U.S. Coast Guard, the American Bureau of Shipping, and IEEE STD 45 for specific applications.

1.4 The values stated for ampacity and dc resistance are presented as typical values and are provided for information only.

TABLE 1 Conversion Table—AWG/Metric Preferred Sizes of Conductors

Size Metric, mm ²	Size AWG/MCM	Area in Circ Mils (Nominal)	Ampacity ^A	dc Resistances at 20°C ^B	
				Ohms per 1000 ft	Ohms per km
	2000* ^C	2 000 000	1155	0.0053	0.0174
1000*		1 970 000	1145	0.0054	0.0176
	1750*	1 750 000	1070	0.0063	0.0199
800*		1 580 000	1009	0.0067	0.0218
	1500*	1 500 000	980	0.0071	0.0232
	1250*	1 250 000	890	0.0085	0.0278
630*		1 240 000	886	0.0096	0.0280
	1000*	1 000 000	780	0.0106	0.0347
500*		987 000	772	0.0105	0.0347
400*		789 000	675	0.0133	0.0438
	750*	750 000	655	0.0141	0.0463
	600*	600 000	575	0.0176	0.0578
300*		592 000	570	0.0211	0.0580
	500*	500 000	515	0.0211	0.0694
240*		474 000	499	0.0219	0.0720
	400*	400 000	455	0.0264	0.0867
185*		365 000	431	0.0286	0.0938
	350*	350 000	420	0.0302	0.0990
	300*	300 000	375	0.0353	0.1157

¹ This specification is under the jurisdiction of ASTM Committee F-25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.10 on Electrical.

Current edition approved May 10, 1998. Published October 1998.

TABLE 1 Continued

Size Metric, mm ²	Size AWG/MCM	Area in Circ Mils (Nominal)	Ampacity ^A	dc Resistances at 20°C ^B	
				Ohms per 1000 ft	Ohms per km
150*		296 000	372	0.0353	0.1157
	250*	250 000	340	0.0423	0.1388
120*		237 000	327	0.0436	0.1492
	4/0*	211 600	300	0.0500	0.1639
95*		187 000	265	0.0551	0.1808
	3/0*	167 000	260	0.0631	0.2065
70*		138 000	230	0.0752	0.2467
	2/0*	133 100	225	0.0794	0.2605
	1/0*	105 600	195	0.1002	0.3288
50*		98 000	185	0.1044	0.3424
	1	83 690	165	0.1261	0.4139
35*		69 100	144	0.1495	0.4904
	2*	66 360	140	0.1588	0.5211
	3	52 620	120	0.2005	0.6577
25*		49 300	115	0.2057	0.6748
	4*	41 740	105	0.2528	0.8295
16*		31 600	89	0.3259	1.069
	6*	26 240	80	0.4023	1.320
10*		19 700	63	0.5167	1.695
	8*	16 510	55	0.6380	2.093
6.0*		11 800	43	0.8543	2.803
	10*	10 380	40	1.017	3.335
4.0*		7 890	30	1.304	4.277
	12*	6 530	25	1.620	5.315
2.5*		4 930	22	2.067	6.782
	14*	4 110	20	2.573	8.442
1.5*		2 960	...	3.417	11.21
	16*	2 580	...	4.020	13.19
1.0*		1 970	...	5.213	17.11
0.90		1 773	...	6.45	21.10
	18*	1 620	...	6.82	20.95
0.80		1 576	...	6.52	21.40
0.75*		1 480	...	6.82	22.37
0.60*		1 182	...	9.5	31.16
	20*	1 020	...	10.5	34.45
0.50*		987	...	11.4	37.40
	22*	640	...	16.9	55.44
0.20*	24*	404	...	26.7	87.60
	26*	253	...	43.6	143.04

^AAmpacity of single-conductor cable in air at ambient temperature of 30°C and maximum conductor temperature not exceeding 60°C.

^BTemperature correction: the conductor resistance may be corrected for moderate temperature differences from the noted reference temperature by the following equation. The parameter, α_T , varies with conductivity and temperature. For a list of common temperature coefficients see Test Methods B 193.

$$R_T = R_t [1 + \alpha_T (t - T)] \quad (1)$$

where:

- R_T = resistance at reference temperature T ,
- R_t = resistance as measured at temperature t ,
- α_T = known or given temperature coefficient of resistance of the conductor being measured at reference temperature T . At 20°C, the value is 0.003 93,

T = reference temperature, and
 t = temperature at which measurement is made.

^cAn asterisk (*) indicates preferred sizes for wires of American Wire Gauge or per IEC 228 (metric) as appropriate.

2. Referenced Documents

2.1 ASTM Standards:

B 8 Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft²

B 193 Test Method for Resistivity of Electrical Conductor Materials²

2.2 IEC Standards:³

IEC 92-3 Electrical Installations in Ships—Part 3: Cables (Construction, Testing, and Installations)

IEC 228 Conductors of Insulated Cables

2.3 IEEE Standard:⁴

IEEE STD 45 Recommended Practice for Electric Installations on Shipboard

3. Significance and Use

3.1 The selection criteria is to be applied for uses of (1) new cable and (2) replacement cable.

3.2 For the selection of new cable or the selection of replacement cable, this practice defines the choice criteria for conductor selection for cables in AWG (ASTM) or metric (IEC) sizes.

² Annual Book of ASTM Standards, Vol 02.03.

³ Available from International Electrochemical Commission, 1 rue de Varembe, Geneva, Switzerland.

⁴ Available from Institute of Electrical and Electronics Engineers, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08554.

4. Selection Criteria

4.1 When selecting cable for any application, AWG or metric sizing should be selected according to preferred sizes. The sizes of conductors that have been marked with an asterisk in Table 1 designate preferred sizes per Specification B 8 and IEC 228. Those sizes not marked are given for reference, and it is recommended that their use be discouraged.

4.2 When selecting cable for any application, AWG or metric sizing should be selected with full consideration of the relationship of type of insulation and ampacity. Direct selection between AWG and metric sizes can be made only after a determination of the equivalence of insulation is made.

4.3 When selecting cable, the conductor size will be determined from analysis of required ampacity, voltage drop considerations, type of cable insulation, and planned installation. Recommended practices for selection and installation of cable systems are detailed in IEEE STD 45 and IEC 92-3.

4.4 For the selection of cable sizes for new applications, conductor size that satisfies ampacity requirements, voltage drop factors, and the adequacy for application in the available cable space must also be considered.

4.5 For the selection of cable sizes for replacement applications, cable size should be selected in excess of or equal to the replaced cable size. Existing cable space limitations should then be determined to ensure that space for installation of the replacement cable is adequate.

5. Keywords

5.1 AWG conductor sizes; cable selection; conductor comparison; metric conductor sizes

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org).