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Appendix 4 – Cable data-resistance, impedance and '$R_1 + R_2$' values

Table 4.1 Resistance of copper cables at 20°C.

Conductor nominal cross-sectional area (mm^2)	Maximum resistance of copper conductors at 20°C (Ω/km)
0.5	36
0.75	24.5
1	18.1
1.5	12.1
2.5	7.41
4	4.61
6	3.08
10	1.83
16	1.15
25	0.727
35	0.524
50	0.387
70	0.268
95	0.193
120	0.153
150	0.124
185	0.0991
240	0.0754
300	0.0601
400	0.0470
500	0.0366
630	0.0221
1000	0.0176
2000	0.0090

Notes:
Values are for stranded conductors but solid conductors are nearly identical.
Taken from BS 6360: 1991.

Guide to the Wiring Regulations: 17th Edition IEE Wiring Regulations (BS 7671: 2008) Darrell Locke
 ISBN: 978-0-470-51685-0

Table 4.2 Values of $R_1 + R_2$ for cables using wire for cpc at 20°C.

Conductor nominal cross-sectional area (mm²)	Maximum resistance of copper conductors at 20°C (Ω/km)
1.5	24.2
2.5	14.82
4	9.22
6	6.16
10	3.66
16	2.30
25	1.454
35	1.048
50	0.774
70	0.536
95	0.386
120	0.306
150	Generally at these sizes a cable cpc is not used. If needed, $R_1 + R_2$ can be worked out from Table 4.1
185	
240	
300	
400	
500	
630	
1000	
2000	

Notes:
Values are for stranded conductors but solid conductors are nearly identical.
Taken from BS 6360: 1991.

Table 4.3 Values of $R_1 + R_2$ for twin and earth cables to BS 6004 at 20°C.

Cable size (mm²)	Size of CPC	$R_1 + R_2$ (Ω/km)	50 m value of $R_1 + R_2$ 50 m run (Ω)
1.5	1	30.2	1.51
2.5	1.5	19.51	0.98
4	1.5	16.71	0.84
6	2.5	10.49	0.52
10	4	6.44	0.32
16	6	4.23	0.211

Table 4.4 Resistance data for armoured cables at 20°C (copper conductors).

Nominal CSA of conductor (mm²)	R_1 resistance (Ω/km)	Armour resistance steel wire			
		2-core (Ω/km)	3-core (Ω/km)	4-core (Ω/km)	5-core (Ω/km)
1.5	12.1	10.2	9.5	8.8	8.2
2.5	7.41	8.8	8.2	7.7	6.8
4	4.61	7.9	7.5	6.8	6.2
6	3.08	7.0	6.7	4.3	3.9
10	1.83	6.0	4.0	3.7	3.4
16	1.15	3.7	3.5	3.1	2.2
25	0.727	3.7	2.5	2.3	1.8
35	0.524	2.6	2.3	2.0	1.6
50	0.387	2.3	2.0	1.8	1.1
70	0.268	2.0	1.8	1.2	0.94
95	0.193	1.4	1.3	1.1	—
120	0.153	1.3	1.2	0.76	—
150	0.124	1.2	0.78	0.68	—
185	0.099	0.82	0.71	0.61	—
240	0.075	0.73	0.63	0.54	—
300	0.060	0.67	0.58	0.49	—
400	0.047	0.59	0.52	0.35	—

Note 1: Data is adapted from BS 5467 for XLPE shaped conductors but other conductor shapes and PVC cables have negligible differences.

Table 4.5 $R_1 + R_2$ data for armoured cables at 20°C, copper conductors.

Nominal CSA of conductor (mm²)	$R_1 + R_2$ values using armour steel wire	
	2- core $R_1 + R_2$ (Ω/km)	4- core $R_1 + R_2$ (Ω/km)
1.5	22.3	20.9
2.5	16.21	15.11
4	12.51	11.41
6	10.08	7.38
10	7.83	5.53
16	4.85	4.25
25	4.43	2.93
35	3.12	2.52

Nominal CSA of conductor (mm^2)	$R_1 + R_2$ values using armour steel wire	
	2- core $R_1 + R_2$ (Ω/km)	4- core $R_1 + R_2$ (Ω/km)
50	2.69	2.19
70	2.27	1.47
95	1.59	1.29
120	1.45	0.91
150	1.33	0.80
185	0.92	0.71

Note 1: Data is adapted from BS 5467 for XLPE shaped conductors but other conductor shapes and PVC cables have negligible differences.

Table 4.6 Correction factors for temperature of copper and steel.

Temperature of component	Correction factor for copper	Correction factor for steel
20	1.000	1.000
25	1.020	1.025
30	1.039	1.050
35	1.059	1.075
40	1.079	1.100
45	1.098	1.125
50	1.118	1.150
55	1.138	1.175
60	1.157	1.200
65	1.177	1.225
70	1.197	1.250
75	1.216	1.275
80	1.236	1.300
85	1.256	1.325
90	1.275	1.350
95	1.295	1.375
100	1.314	1.400
105	1.334	1.425