Maximum measured values of earth fault loop impedance (Z_s)

The values of maximum earth fault loop impedance (Z_s) given in Tables 41.2, 41.3 and 41.4 in Chapter 41 of *BS 7671: 2008*, for commonly-used overcurrent protective devices, should not be exceeded when the conductors are at their normal operating temperature (such as up to 70 °C for thermoplastic insulated conductors).

However, values of Z_s are generally measured under no-load conditions, when the conductors are at ambient temperature (usually not to exceed 20 °C) and their resistance is therefore lower than when at normal operating temperature.

Where this is the case, then as indicated in Appendix 14 of *BS 7671*, the fault protection requirements of Regulations 411.4.5 (TN system) or 411.5.4 (TT system) are considered to be met when the measured value of Z_s does not exceed 80% of the applicable maximum value (such as that given in Tables 41.2, 41.3 and 41.4 of *BS 7671*).

Tables 1 and 2 of this pocket guide give maximum measured values of Z_s for fuses and circuit-breakers or the overcurrent characteristic of RCBOs, equal to 80% (rounded down) of the applicable maximum values given in Tables 41.2, 41.3 and 41.4 of *BS 7671*.

Table 1 – Maximum measured values of Z_s for fuses

Rated current (A)	Fuses					
	BS 88 (gG) Parts 2 and 6		BS 1361 or BS 1362		BS 3036	
	0.4 s	5 s	0.4 s	5 s	0.4 s	5 s
3	N/A	N/A	13.12	18.56	N/A	N/A
5	N/A	N/A	8.35	13.11	7.66	14.16
6	6.81	10.81	N/A	N/A	N/A	N/A
10	4.08	5.93	N/A	N/A	N/A	N/A
13	N/A	N/A	1.94	3.06	N/A	N/A
15	N/A	N/A	2.63	4.00	2.04	4.27
16	2.16	3.34	N/A	N/A	N/A	N/A
20	1.41	2.33	1.36	2.24	1.41	3.06
25	1.15	1.84	N/A	N/A	N/A	N/A
30	N/A	N/A	0.92	1.47	0.87	2.11
32	0.83	1.47	N/A	N/A	N/A	N/A
40	0.65	1.08	N/A	N/A	N/A	N/A
45	N/A	N/A	0.46	0.76	0.47	1.27
50	0.48	0.83	N/A	N/A	N/A	N/A
60	N/A	N/A	N/A	0.55	N/A	0.89
63	0.36	0.65	N/A	N/A	N/A	N/A
80	0.24	0.46	N/A	0.39	N/A	N/A
100	0.18	0.33	N/A	0.29	N/A	0.42
125	0.14	0.26	N/A	N/A	N/A	N/A

Note: Values of Z_s for disconnection times other than 0.4 s or 5 s shown may be required by *BS 7671*. For example, 0.2 s may be required for a 230 V final circuit not exceeding 32 A in a TT system (Table 41.1 refers).

Maximum measured values of earth fault loop impedance (Z_s)

Table 2 – Maximum measured values of Z_s for circuit-breakers or the overcurrent characteristic of RCBOs

Rated current (A)	Circuit-breakers to BS 3871 or BS EN 60898 or RCBOs to BS EN 61009				
	Type 1	Type 2	Type B	Type 3 and C	Type D
	0.1 s to 5 s				
3	N/A	N/A	12.26	N/A	N/A
5	9.20	5.26	N/A	3.68	1.84
6	7.66	4.37	6.13	3.06	1.53
10	4.60	2.63	3.68	1.84	0.92
13	N/A	N/A	N/A	N/A	N/A
15	3.06	1.75	N/A	1.22	0.61
16	2.87	1.64	2.30	1.15	0.57
20	2.30	1.31	1.84	0.92	0.46
25	1.84	1.04	1.47	0.73	0.36
30	1.53	0.87	N/A	0.61	0.30
32	1.44	0.82	1.15	0.57	0.29
40	1.15	0.65	0.92	0.46	0.23
45	1.02	0.58	0.82	0.40	0.20
50	0.92	0.52	0.73	0.36	0.18
60	N/A	N/A	N/A	N/A	N/A
63	0.72	0.41	0.58	0.29	0.14
80	0.57	0.32	0.46	0.23	0.11
100	0.46	0.26	0.36	0.18	0.08
125	N/A	N/A	0.29	0.14	0.07

N/A (Not Applicable) – indicates that the device is not available or not appropriate.

The values of Z_s in Tables 1 and 2 are based on the 'worst case limits' of *BS 7671*. Some manufacturers' protective devices operate at higher values of Z_s than the values shown.

Where a measured value of Z_s exceeds the value given in Table 1 or 2, as applicable, a more precise assessment of compliance with Regulation 411.4.5 or 411.5.4 may be made by evaluating the value of Z_s using the procedure given towards the end of Appendix 14 of *BS 7671*.

Guidance on measuring and reporting measured values of Z_s is given in NICEIC books *Domestic Periodic Inspection, Testing and Reporting* and *Inspection, Testing and Certification*. Values of Z_s given in this pocket guide are taken from tables given in these books.

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