

APPLICATION INFORMATION

The Bussmann standard range of high breaking capacity fuse links for low voltage industrial and general purpose applications meet the requirements of BS88 and IEC60269. By using advanced fuse technology the current ratings up to 400A have compact dimensions but still within the standardised dimensional and performance requirements. These designs have been optimised for 415/240V systems. The standard range of fuse links are available from 2-1250A in the following tag forms: OFFSET BLADED - OFFSET BOLTED - CENTRE BOLTED.

Supplementary ranges cover applications up to 690V a.c. and 500V d.c. including those with non-standard tag fixings.

Bussmann fuse links are manufactured under Quality Systems independently assessed to ISO 9001 and appropriate ratings carry the ASTA 20 endorsement.

APPLICATION DATA

One of the long standing advantages of fuse protection is that fuse selection is relatively simple and effective.

The following notes cover the majority of applications. For further information contact Bussmann technical services on 01509 882699.

Reference should also be made to the appropriate Wiring Installation rules, in the UK the 16th Edition of the IEE Wiring Regulations for Electrical Installations which aligns with IEC 60364.

CIRCUIT LOADING

The current rating of the fuse link should not be less than the full load current of the circuit. The circuit should be so designed that small overloads of long duration will not be of frequent occurrence.

CABLE RATINGS

There is an increasing move away from 70°C P.V.C. insulation to materials which are more environmentally friendly, for example 90°C XLPE. The ratings of fusegear, switches, accessories etc. are generally based upon the equipment being connected to conductors intended to be operated at a temperature not exceeding 70°C in normal service.

In view of the above it is recommended that the practice of designs based upon conductor temperatures of 70°C be regarded as the norm. In accordance with clause 512-02-01 of the Wiring Regulations the equipment manufacturer should be consulted to ascertain the reduction of nominal current rating of the equipment if conductor temperatures exceeding 70°C are used. In addition an overriding factor is often voltage drop consideration.

CABLE PROTECTION

Bussmann fuse links with gG characteristics protect associated cables against both overload and short circuit current, provided that the current rating of the fuse link I_n is equal or less than the current carrying capacity of the cable I_z .

In motor circuits, the motor starter will provide the overload protection and the fuse links will provide the short circuit protection. The maximum size of fuse link that can be used depends upon the type of cable used and is determined in accordance with the Wiring Regulations using the appropriate K factor. The following table gives maximum sizes of fuse links that are recommended for two popular cables with copper conductors, 70°C P.V.C. (K=115) and 90°C thermosetting (K=143).

Cable Size mm ²	Max. Fuse Rating	
	K = 115 A	K = 143 A
1	16	16
1.5	20	25*
2.5	32*	32*
4	50*	50*
6	63*	63*
10	100*	125*
16	125*	160*
25	200*	250*
35	315*	355*
50	400*	500
70	560	630
95	710	800
120	800	1000

*Extended motor circuit dual ratings can be used

Zs OHMS IMPEDANCE VALUES

The rules for protection against indirect contact are given in Chapter 413 of the Wiring Regulations.

For a TN System a disconnecting time not exceeding 5s is permitted for a distribution circuit. The maximum values of earth fault loop impedance (Zs) corresponding to a disconnecting time of 5s for nominal voltage to earth (Uo) of 240V for Bussmann gG fuse links.

Rating (A)	Zs Ohms Ω	Rating (A)	Zs Ohms Ω
2	60		
4	27		
6	14	100	0.44
10	7.7	125	0.35
16	4.3	160	0.27
20	3.0	200	0.20
25	2.4	250	0.16
32	1.9	315	0.13
40	1.4	400	0.096
50	1.1	500	0.073
63	0.86	630	0.054
80	0.60	800	0.044

AMBIENT TEMPERATURE

A de-rating in terms of current of 0.5% per °C above an ambient of 35°C is recommended.

BREAKING CAPACITY

The standardised values of Breaking Capacity are 80kA for voltages of 415V a.c. and above, and 40kA for d.c. applications.

DISCRIMINATION

All fuse links will give a discrimination ratio of 2:1 and for most practical situations a ratio of 1.6:1 (two steps in the R10 series). Example: an upstream fuse rated at 160A will discriminate with a downstream fuse rated at 100A.

CURRENT AND ENERGY LIMITATION

The Bussmann range of fuse links have pre-arcing I²t values towards the bottom limits of the standards. This ensures excellent current and energy limitation. They also have lower power losses at rated current. This assists in the appropriate interchangeability with other makes of fuse links.

TRANSFORMERS

When fuse links are used on the primary side of transformers the normal current rating of the fuse links should be at least twice the nominal transformer primary current.

FLUORESCENT LIGHTING

The normal current rating of the fuse link should be at least twice the normal full load current of the maximum number of lights to be switched simultaneously.

CAPACITOR CIRCUITS

In capacitor circuits, for example power factor correction, the fuse link should be chosen with a current rating greater than 1.5 times the rated capacitor current. This takes account of the high transient inrush current, circuit harmonics and capacitor tolerances.

MOTOR CIRCUITS

In motor circuits the fuse link has to withstand the starting current of the motor and often requires a higher rating than the full load current of the motor.

Co-ordination recommendations are made by the manufacturers of motor starters in accordance with IEC 60947-4-1. To give the desirable type 2 co-ordination with fuse links, tests are performed with the latest gG or gM fuse links, to BS88 or IEC60269 which have pre-arcing I²t values toward the bottom specified limits. This means that Bussmann fuse links are suitable to give type 2 co-ordination.

Extended dual ratings of motor circuit protection fuse links with gM characteristics are available in most popular sizes of fuse links to extend the use of associated equipment with appropriate economies. In the majority of applications, gG fuse links are used. It is not essential for gM fuse links to be used for motor circuit protection, they simply extend the utilisation of standard equipment.

The attached table shows the recommended fuse links at 415V. In most applications the run-up time is less than five seconds and duty is infrequent - no more than twice per hour. The next larger rating should be used for more arduous conditions.

Motor Rating		DirectOn-line		Asst Start Standard (gG)
		Standard (gG)	Motor Circuit (gM)	
kW	A	A	A	A
0.25	0.8	4	-	2
0.37	1.1	4	-	2
0.55	1.5	6	-	4
0.75	2.0	6	-	4
1.1	3.0	10	-	6
1.5	3.6	16	-	10
2.2	5.0	16	-	10
3.0	6.5	20	-	16
4.0	8.4	20	-	16
5.5	11	25	20M25	20
7.5	15	40	32M40	25
11.0	20	50	32M50	32
15.0	27	63	32M63	40
18.5	33	80	63M80	50
22.0	38	80	63M80	50
30.0	54	100	63M100	80
37.0	66	125	100M125	80
45.0	79	160	100M160	100
55.0	98	160	100M160	100
75.0	135	250	200M250	160
90.0	155	250	200M250	160
110.0	185	315	200M315	200
132.0	220	355	315M400	250
150.0	250	355	315M400	315
185.0	310	450	400M500	355
200.0	335	500	400M500	400
225.0	375	560	-	400
250.0	415	560	-	450
280.0	460	630	-	500
335.0	562	710	-	630
355.0	596	800	-	710