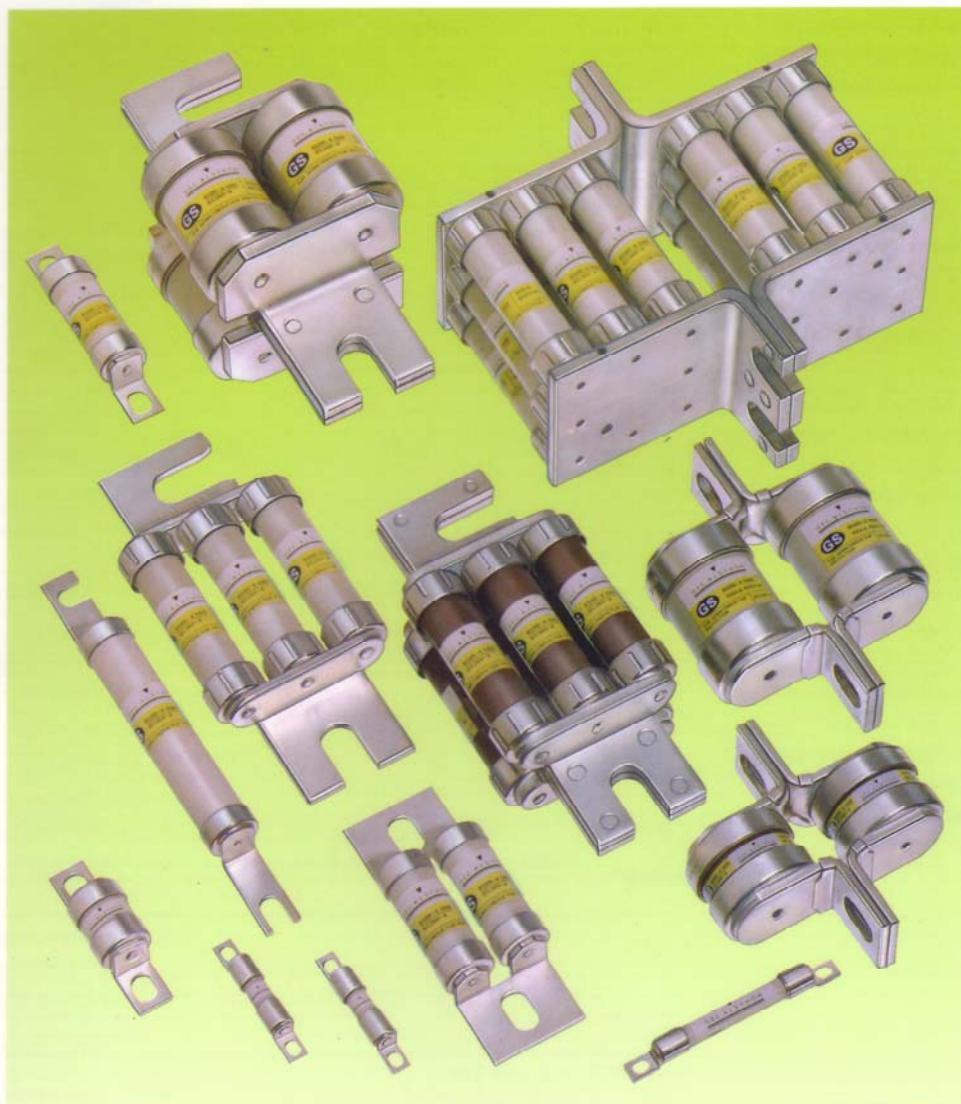


Semi Conductor Fuse Links



**GEC ALSTHOM**

LOW VOLTAGE EQUIPMENT

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Type GS

Fuse Links for the protection of Semi Conductor devices

1/2

- The GEC ALSTHOM Low Voltage Equipment's range of semi conductor fuse links have been proven in rectifier and thyristor installations throughout the world.
- Many years' experience of producing semi conductor fuse links involving close collaboration with semi conductor device manufacturers and users has enabled GEC ALSTHOM to provide a refined and fully proven range of fuse links for power semi conductor protection.
- The standard 'GS' range is ASTA 20 certified to BS 88:Part 4:1988 and is fully compliant with IEC269:4. For individual performance capability see relevant section.
- Fast acting fuse links are primarily designed to disconnect a failed semi conductor device within a group of devices.
- Ultra fast acting fuse links are primarily designed to co-ordinate with an individual semi conductor device and provide short circuit protection by means of characteristics closely matched with those of the device.

	Type	Current rating Amp	Nominal Voltage		Index	Page
			A.C.	D.C.		
Fast Acting	GSA	5 – 600	240	200	Specification and List Numbers	1/5
					Characteristics	1/6
					Dimensions	1/40
	GSD	125 – 700	180	200	Specification and List Numbers	1/9
					Characteristics	1/10
					Dimensions	1/40
	GSB	5 – 500	600	400	Specification and List Numbers	1/13
					Characteristics	1/14
					Dimensions	1/40
CGS1000	400 – 600	600	400	Specification and List Numbers	1/18	
				Characteristics	1/19	
				Dimensions	1/40	
Ultra Fast Acting	GSGB	16 – 900	660	400/350	Specification and List Numbers	1/22
					Characteristics	1/23
					Dimensions	1/41
	GSMJ	63 – 1200	800	500	Specification and List Numbers	1/29
					Characteristics	1/30
					Dimensions	1/42
	GSMK	32 – 1200	1000	700	Specification and List Numbers	1/29
					Characteristics	1/31
					Dimensions	1/42
'RED SPOT' Adaptor kits						1/38
Indicator Fuse Links and accessories						1/39

Application Notes

Relationship of Currents

			D.C. output current	RMS line current	RMS diode current
Single Phase	Half wave		1.0	1.57	1.57
	Full wave (Centre tap)		1.0	0.79	0.79
	Full wave (Bridge)		1.0	1.11	0.79
Three Phase	Half wave (Wye)		1.0	0.59	0.59
	Full wave (Bridge)		1.0	0.82	0.58
	Full wave (Double wye)		1.0	0.29	0.29
Six Phase	Half wave (Star)		1.0	0.41	0.41
	Full wave (Parallel bridge) without IPT		1.0	0.58	0.41
	Full wave (Parallel bridge) with IPT		1.0	0.41	0.29
	Full wave (Series bridge)		1.0	0.82	0.58

Nominal current rating

The ability of a fuse link to carry a predetermined current is verified in accordance with BS 88:Part 4:1988. This nominal current can be modified under specific application conditions, from a reduction in the rated current, in the case of raised ambient air temperature, to an increase in current rating in the case of forced air cooling. Information relating to this variation is provided within the enclosed technical data.

Time/current characteristics

Time/current characteristics are shown for each fuse link under 50Hz symmetrical fault conditions and therefore cease at 10ms where the fuse link starts to exhibit current limitation. A tolerance of $\pm 10\%$ on the current values should be taken into account.

Long time overload withstand combined with low power loss designs has ensured that the GEC ALSTHOM range is more than adequately rated to cope with the practicalities of fuse application.

Overloads

The time/current characteristics can be used to determine the fuse links ability to withstand overloads.

As a general rule the fuse link will not suffer from infrequent overloads approaching as close as 75% of the time/current characteristic. Repetitive cyclic loads however, should be considered separately.

Continued overleaf

Repetitive cyclic loads

Considerable work has been undertaken by GEC ALSTHOM over a number of years to satisfy the market requirements in this area. This has resulted in a number of pulse withstand factors being derived for GEC ALSTHOM fuse links to enable them to be selected for cyclic overcurrent.

Fuse Link Range	Pulse Withstand Factors 'p'			
	20s	20-60s	1-5 min	5-20 min
GSA	0.35	0.5	0.5	0.5
GSD	0.35	0.5	0.5	0.5
GSB	0.3	0.35	0.4	0.5
CGS1000	0.3	0.35	0.4	0.5
GSGB	0.3	0.35	0.4	0.5
GSMJ&K	0.35	0.4	0.45	0.5

Note: If cyclic duty is superimposed on a steady current, which is less onerous than cycling a fuse link down to zero current, then 'P' can be increased by 30% for pulses up to 20 seconds.

To determine the suitability of a fuse link for cyclic overcurrent duty, the individual elements of the cycle should be considered.

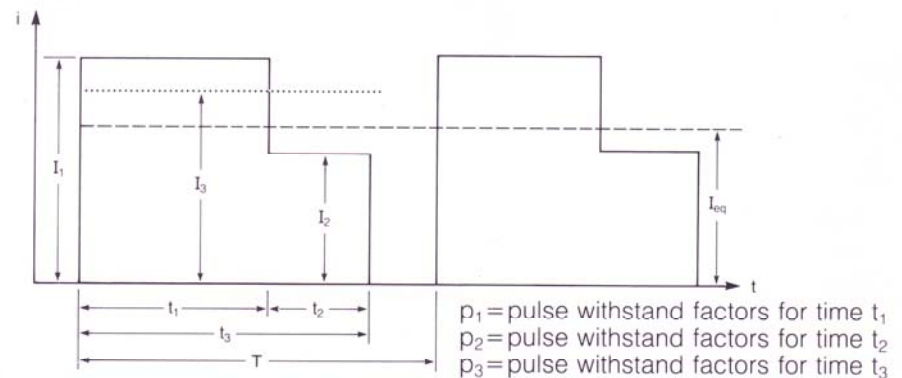
The equivalent rms current I_{eq} is then determined:

$$I_{eq} = \sqrt{\frac{I_1^2 t_1 + I_2^2 t_2}{T}} \leq \text{Minimum fuse link rating}$$

Current I_3 is then determined:

$$I_3 = \sqrt{\frac{I_1^2 t_1 + I_2^2 t_2}{t_1 + t_2}}$$

Example:



The pulse withstand factors above are then applied to the pulse currents I_1 , I_2 and I_3 .

Applying pulse withstand factors will determine pulse withstand currents I_p .

$$I_{p1} = \frac{I_1}{p_1}; \quad I_{p2} = \frac{I_2}{p_2}; \quad I_{p3} = \frac{I_3}{p_3}$$

The correct rating of fuse link for the cyclic duty is determined by selecting the fuse link whose time/current curve lies to the right hand side of the most onerous pulse withstand current determined. It must also have a continuous rating greater than I_{eq} .

I^2t Characteristics

Pre-arcing I^2t

The pre-arcing I^2t characteristics represent the minimum values achieved under short circuit conditions, ie. less than 10ms.

For longer times the time/current characteristics may be used to determine the pre-arcing I^2t .

Total I^2t

Total I^2t characteristics are given showing variation of total I^2t with voltage and prospective current. This can be used to determine the total I^2t under specific fault conditions, to enable fuse links to be fully co-ordinated with published I^2t withstand values of the semi conductor devices.

Cut-off current characteristics

Cut-off characteristics are produced for each fuse link. This enables the precise determination of peak let through current

under the worst possible operating conditions for specific values of prospective fault current and voltage.

Arc voltage

GEC ALSTHOM fuse link designers have ensured that the 'GS' range exhibits minimum arc voltage under normal operating conditions.

Variation of arc voltage with respect to applied voltage is incorporated within the technical data.

Parallel operation of fuse links

Higher current ratings can be achieved by paralleling fuse links. It can also be used to minimise the number of fuse link variants required in a range.

When applying fuse links in parallel it is important to ensure that substantial paralleling conductors are used to provide substantially equal current sharing

The time/current characteristics of a parallel arrangement can be derived by multiplying the operating current of a single fuse link from its time/current characteristics by the number of parallel paths.

The I^2t values can be determined by dividing the prospective fault current by the number of fuse links in parallel and using this value to determine the I^2t of the individual fuse link from its I^2t variation curve. This I^2t value must then be multiplied by the square of the number of parallel paths, ie. 2 fuse links in parallel multiply by 4.

In the same manner the individual fuse link cut-off current value can be determined as the prospective fault current divided by the number of fuse links in parallel. The resulting value is then multiplied by the number of parallel paths.

'GSA' Fast Acting HRC Fuse Links

Type GSA 5-600 Amp

Fast acting fuse links, rated 5 - 600 Amp.

A.C. rating: 240 Volt rms tested to
318 Volt rms.

D.C. rating: 200 Volt d.c. time constant 20ms.

1/5

Specification and List Numbers

Voltage Rating		Current Rating Amp	List Number	Minimum Pre-Arcing I^2t A ² sec	Total I^2t @ 100kA 240Volt RMS A ² sec	Cut-Off Current @ 100kA 240Volt RMS kA		Power Dissipation @ In @ 0.5 in		Top Cap Temp. Rise @ 20°C ambient °C	Indicator Pack Ref. ‡	Dimensional Reference
Volt a.c. RMS	Volt d.c. @ 20ms					@ In	@ 0.5 in	@ In	@ 0.5 in			
ASTA Certified 240 also tested to 318	200	5	GSA5	1.1	38	1.2	0.8	0.15	11			
		10	GSA10	4.3	140	2.0	1.6	0.3	18	*	1	
		15	GSA15	12	350	2.7	2.5	0.5	25			
		20	GSA20	17	590	2.8	3.5	0.7	33			
		25	GSA25	74	800	2.8	2.6	0.6	18			
		35	GSA35	150	1,700	3.8	4.0	0.8	27			
		50	GSA50	400	5,400	5.6	5.2	0.9	34	GSIPAS	2	
		75	GSA75	890	6,500	5.9	7.1	1.4	34			
		100	GSA100	2,000	14,400	9.4	9.0	1.8	40			
		125	GSA125	2,100	56,000	10.0	12.5	2.5	40			
		150	GSA150	3,200	84,000	12.0	14.5	3.0	42			
		200	GSA200	7,500	170,000	14.0	21.0	4.0	44	GSIPAL	3	
		250	GSA250	10,700	250,000	18.0	26.0	5.5	46			
		300	GSA300	13,100	190,000	17.0	31.0	5.5	60			
		350	GSA350	19,000	270,000	18.0	36.5	7.0	61			
		400	GSA400	34,300	510,000	22.0	38.5	7.0	62	GSIPAL	4	
		500	GSA500	55,000	780,000	27.0	48.0	9.0	64			
		600	GSA600	95,000	1,400,000	32.0	54.0	10.0	68			

* Indicator pack not available.

‡ Indicated fuse links.

"Add-on" indicator fuse link conversion kits
comprising a trip indicator fuse link and a
pair of easily assembled clips are available.

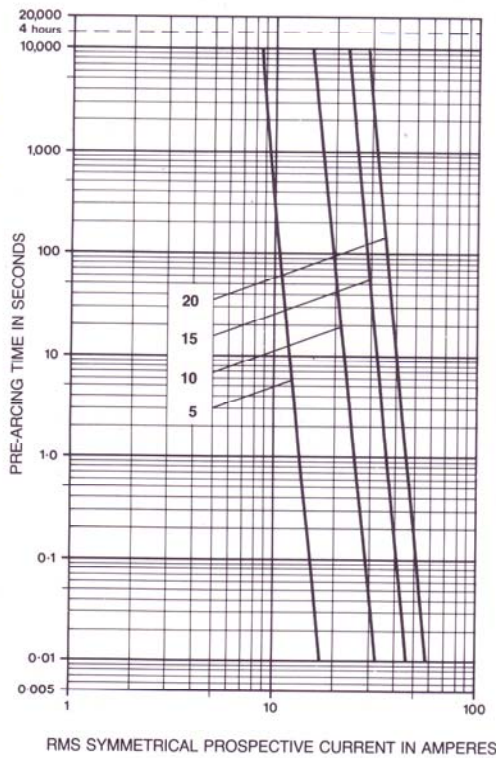
Characteristics

Type 'GSA'

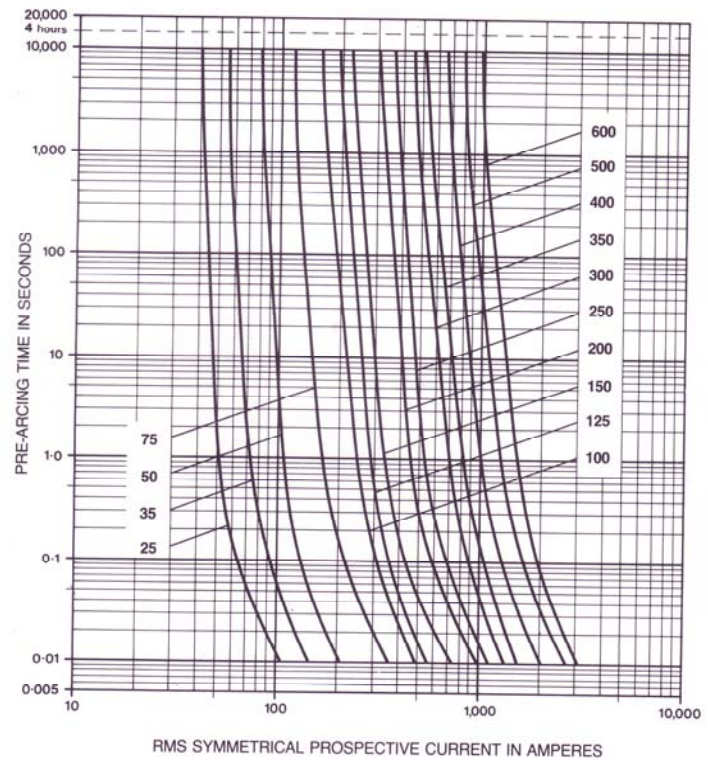
Time/Current Characteristics

5-600 Amp

5-20 Amp



25-600 Amp

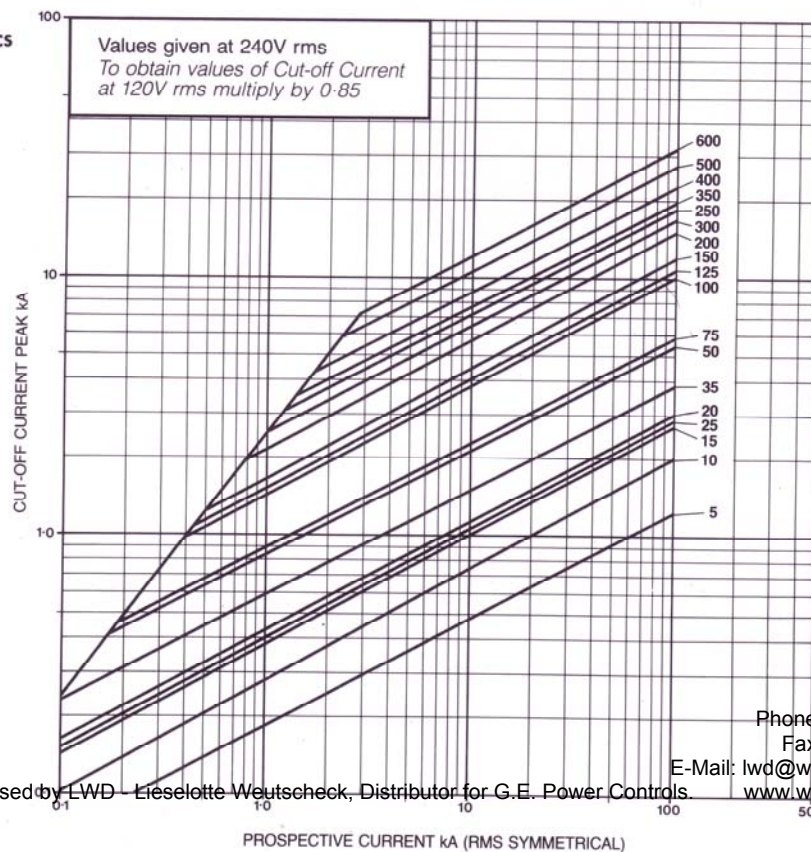


1/6

Type 'GSA'

Cut-off Current Characteristics

5-600 Amp



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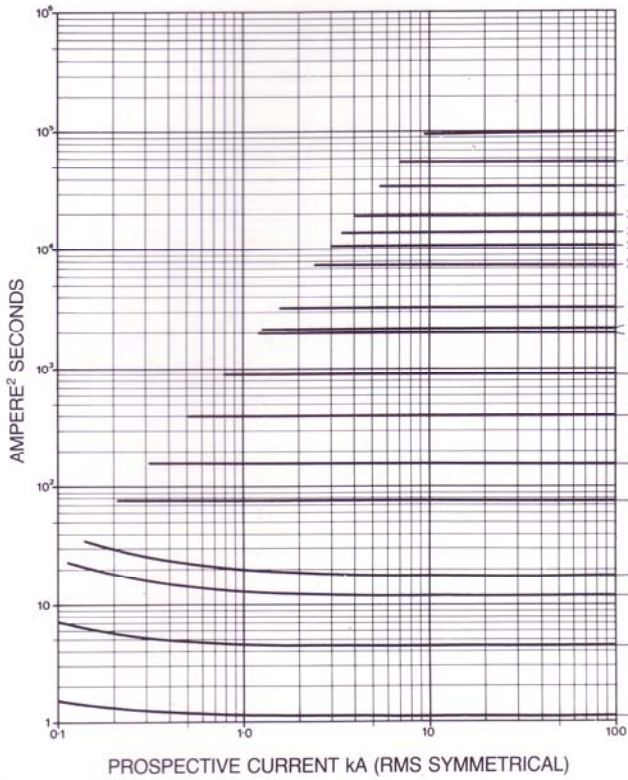
E-Mail: lwd@weutscheck.com

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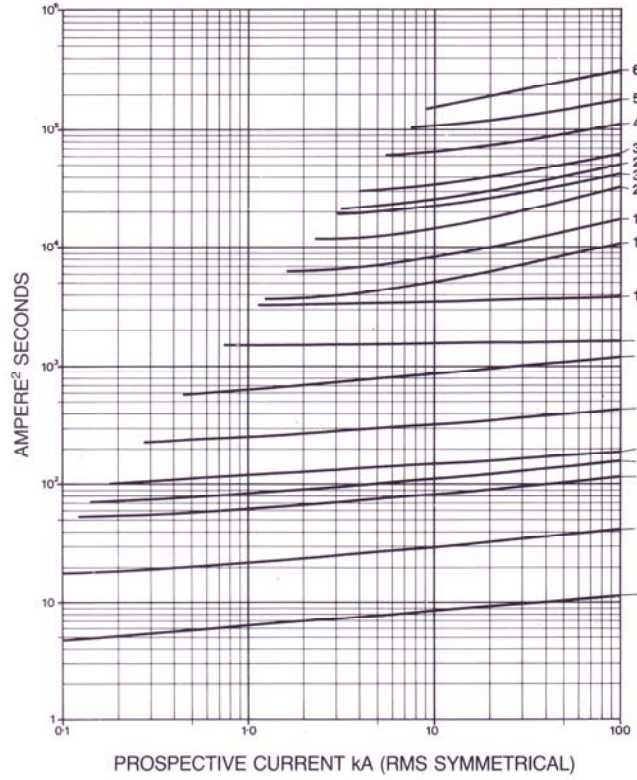
Type 'GSA'

I²t variations with prospective current

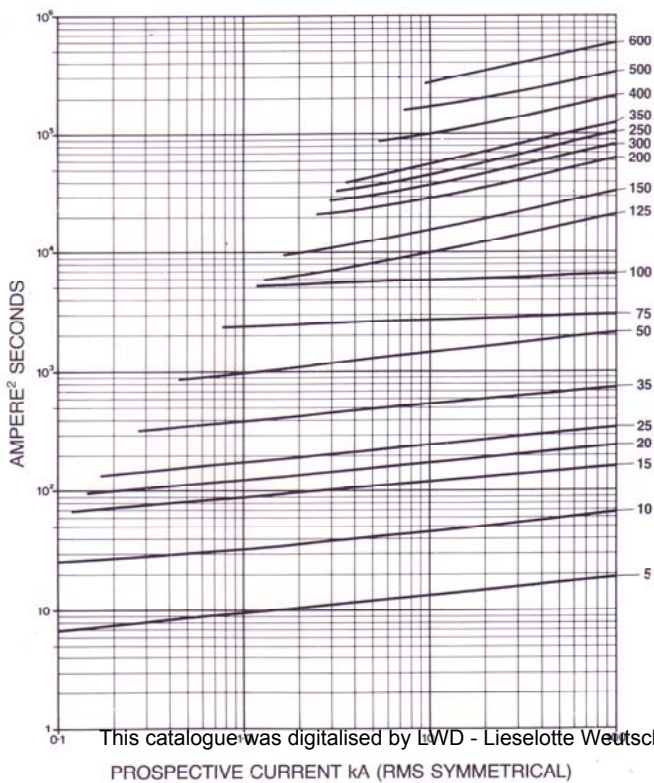
Pre-arcing



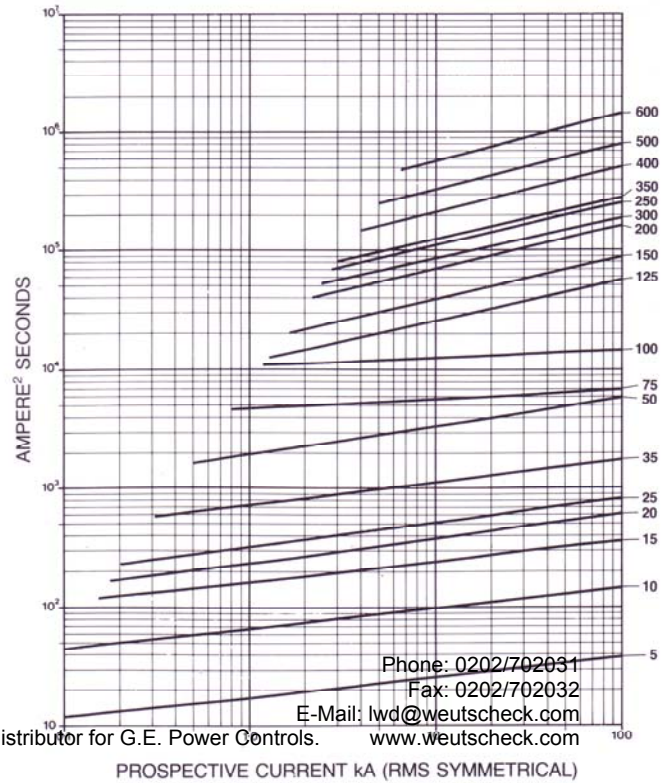
60 Volt RMS



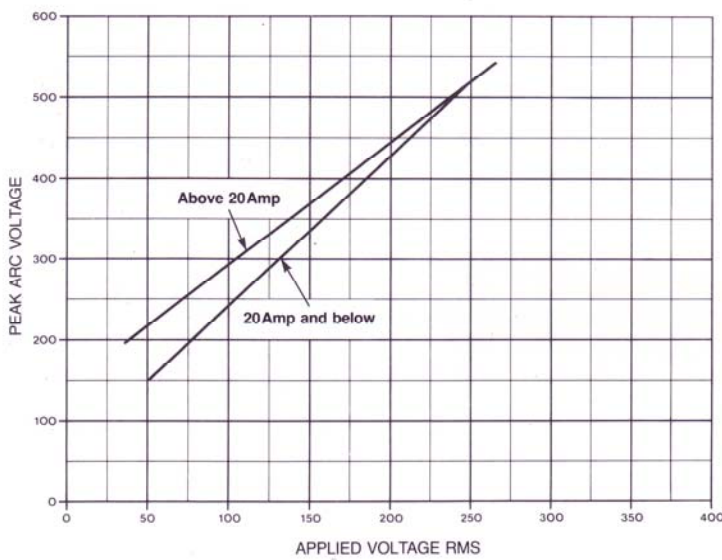
120 Volt RMS



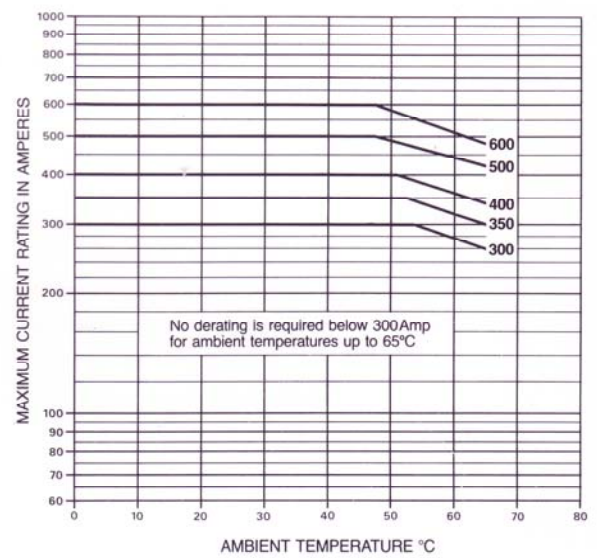
240 Volt RMS



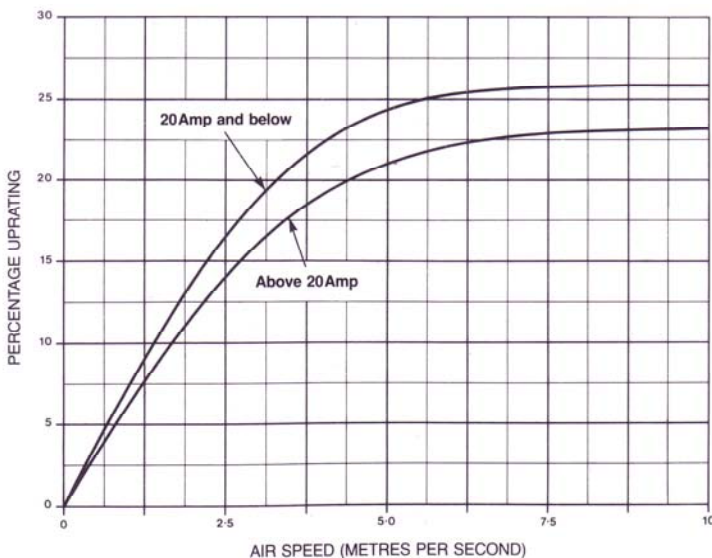
Type 'GSA'
 Variation of arc voltage
 with applied voltage



Type 'GSA'
 De-rating at high ambients



Type 'GSA'
 Forced air cooling up-rating curve



'GSB' Fast Acting HRC Fuse Links

Type 'GSB' 5-500 Amp

Fast acting fuse links, rated 5 - 500Amp.

A.C. rating: 600 Volt rms tested to 707 Volt rms.

D.C. rating: 400 Volt d.c. time constant 20ms.

1/13

Specification and List Numbers

Voltage Rating		Current Rating	List Number	Minimum Pre-Arcing I ² t	Total I ² t	Cut-Off Current		Power Dissipation	Top Cap Temp. Rise	Indicator Pack Ref. ‡	Dimensional Reference
Volt a.c. RMS	Volt d.c. @ 20ms	Amp		A ² sec	@ 100kA 600Volt RMS A ² sec	@ 100kA 600Volt RMS kA	@ In	@ 0.5 in	@ 20°C ambient °C		
ASTA Certified 600 also tested to 707	400	5	GSB5	0.57	15	0.75	2.1	0.4	26		
		10	GSB10	2.3	53	1.0	3.6	0.6	36	*	1
		15	GSB15	11	260	1.5	3.9	0.8	33		
		20	GSB20	28	580	1.9	7.3	1.2	52		
		25	GSB25	40	600	2.7	6.7	1.4	44		
		45	GSB45	170	2,300	4.4	10.0	2.0	60		
		50	GSB50	250	2,900	5.0	12.0	2.5	63	GSIPBS	2
		75	GSB75	1,000	11,000	7.0	12.5	2.5	47		
		100	GSB100	2,600	32,000	9.0	16.0	2.5	58		
		150	GSB150	5,500	49,000	10.0	26.0	4.0	62		
		200	GSB200	12,000	100,000	14.0	28.0	4.5	63	GSIPBL	3
		250	GSB250	25,000	170,000	17.0	37.0	6.5	76		
		300	GSB300	36,000	290,000	19.0	35.5	6.5	68		
		400	GSB400	62,000	480,000	24.0	62.0	11.5	85		
		450	GSB450	80,000	550,000	24.0	70.0	12.0	90	GSIPBL	4
		500	GSB500	100,000	610,000	27.0	80.0	13.0	90		

(Page 1/40)

* Indicator pack not available

‡ Indicated fuse links.

"Add-on" indicator fuse link conversion kits comprising a trip indicator fuse link and a pair of easily assembled clips are available.

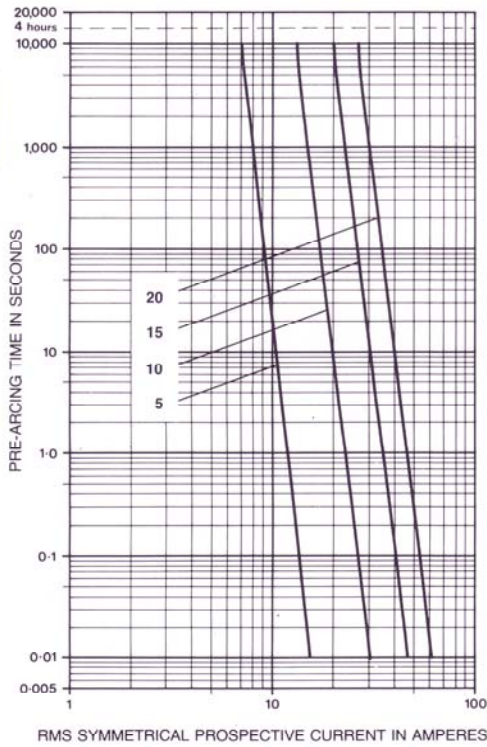
Characteristics

Type 'GSB'

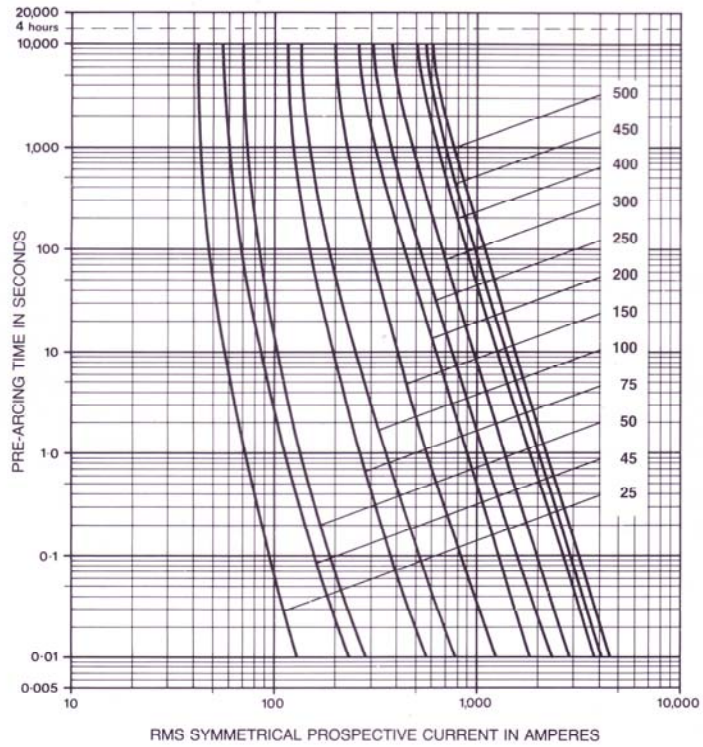
Time/Current Characteristics

5-500 Amp

5-20 Amp

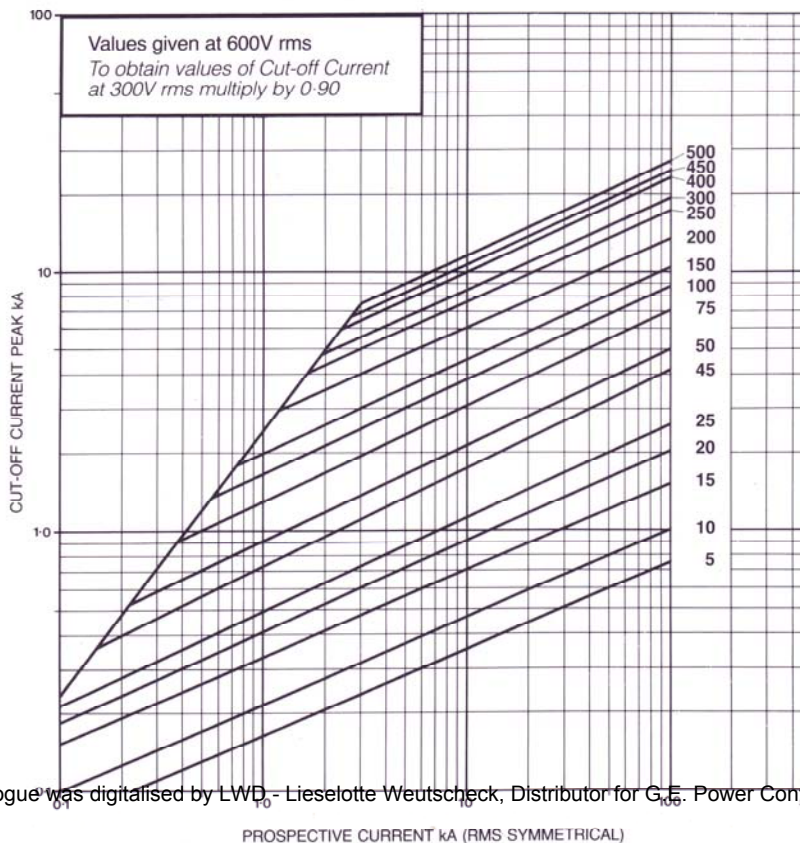


25-500 Amp



1/14

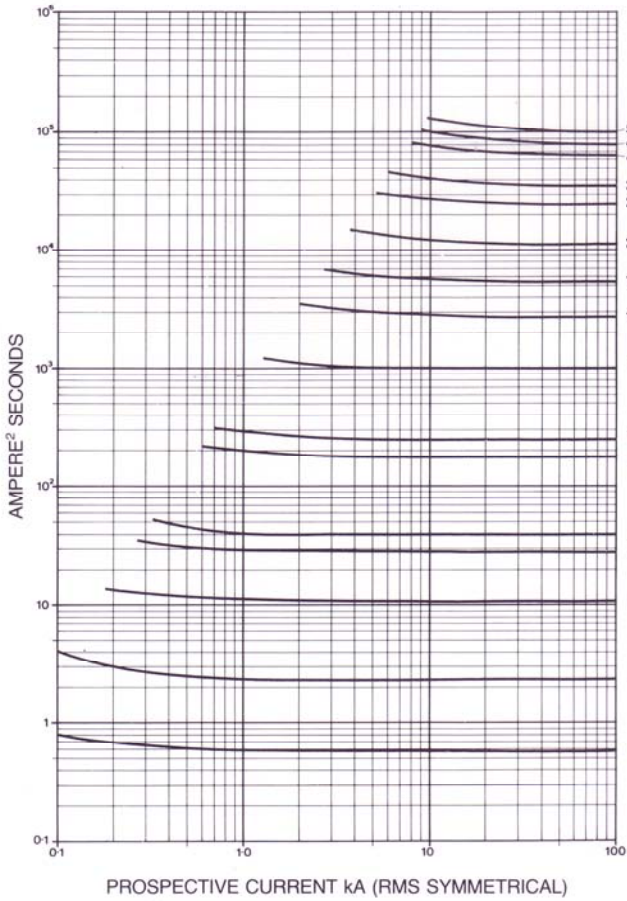
Type 'GSB'
Cut-off Current Characteristics
5-500 Amp



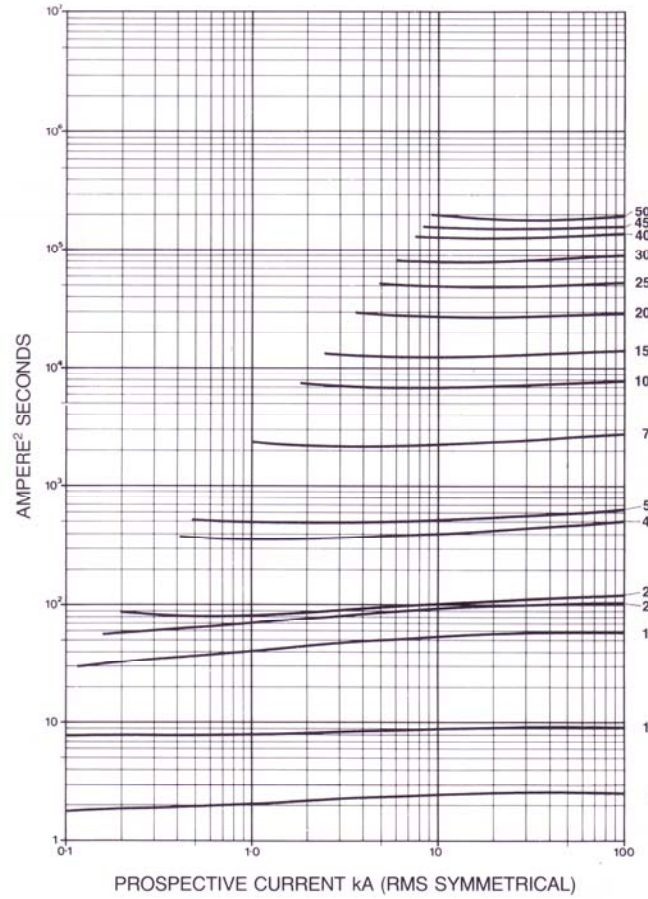
Type 'GSB'

I^2t variations with prospective current

Pre-arcing

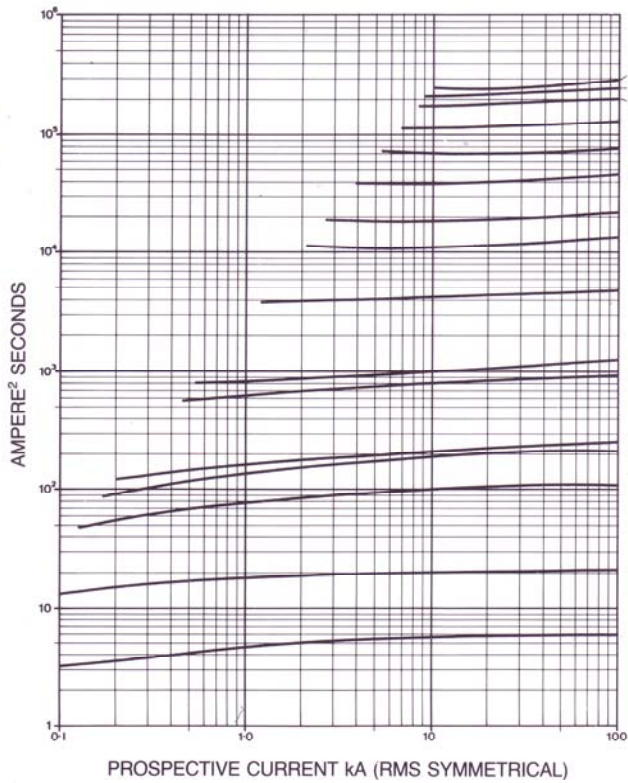


150 Volt RMS

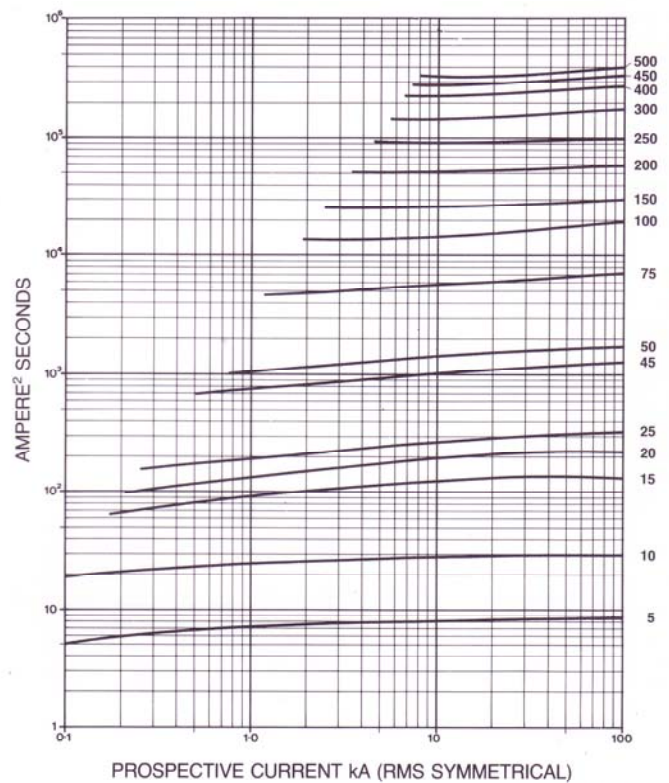


Type 'GSB'
 I^2t variations with prospective current

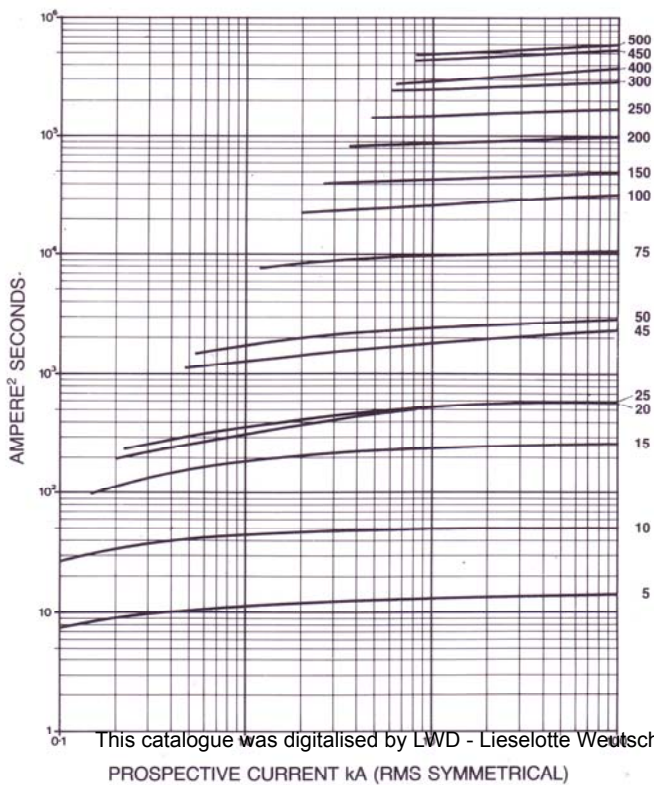
300 Volt RMS



415 Volt RMS

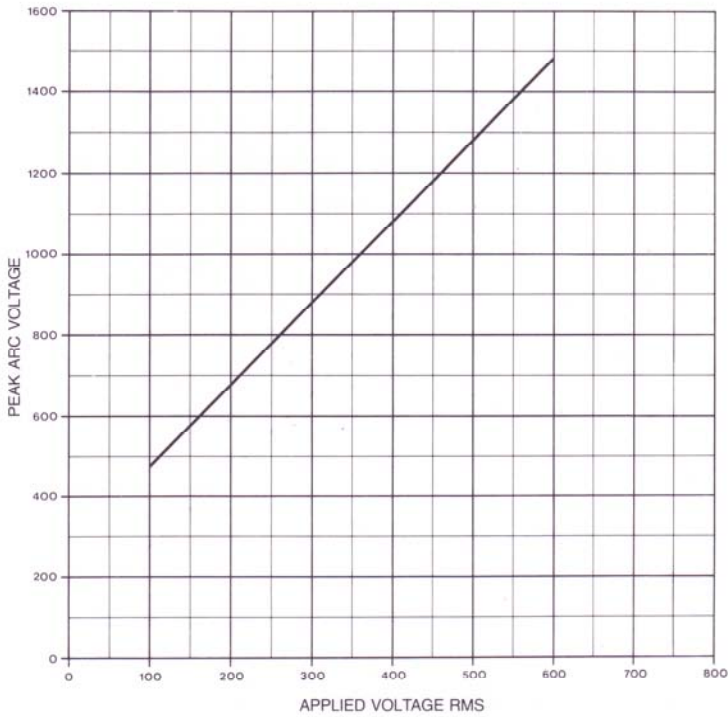


600 Volt RMS

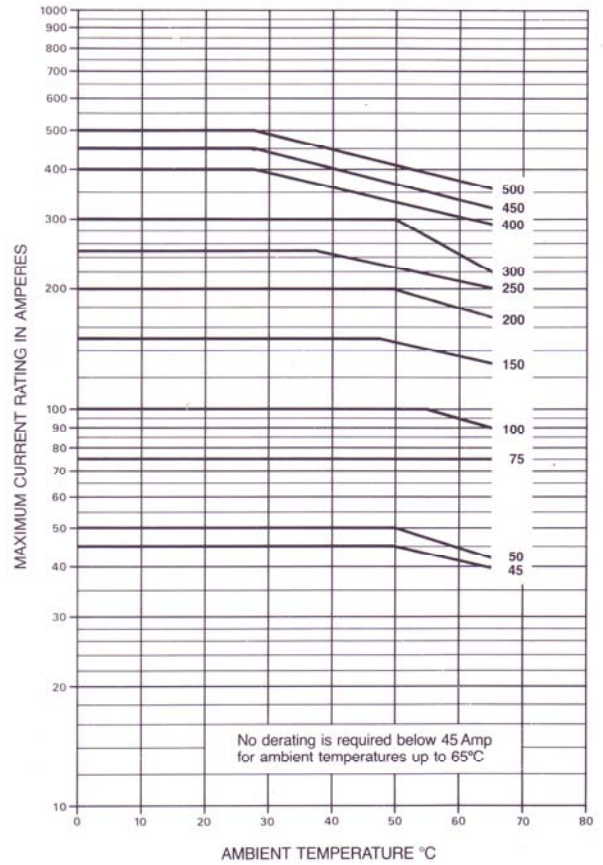


1/16

Type 'GSB'
 Variation of arc voltage with applied voltage



Type 'GSB'
 De-rating at high ambients



Type 'GSB'
 Forced air cooling up-rating curve



'GSGB' Ultra Fast Acting HRC Fuse Links

Specification and List Numbers

Type 'GSGB' 16-900 Amp

Ultra fast acting fuse links, rated 16 - 900 Amp.

A.C. rating: 660 Volt rms tested to 1000 Volt peak.

D.C. rating: 400 Volt d.c. time constant 20ms (16 - 160 Amp).

350 Volt d.c. time constant 20ms (170 - 900 Amp).

Voltage Rating	Current Rating		List Number	Minimum Pre-Arcing I ² t	Total I ² t	Cut-Off Current		Power Dissipation		Top Cap Temp. Rise	Indicator Pack Ref. ‡	Dimensional Reference
	Volt a.c. RMS	Volt d.c. @ 20ms				Amp	A ² sec	@ 100kA 660 Volt RMS A ² sec	@ 100kA 660 Volt RMS kA			
400			16	GSGB16	8	190	1.5	4.7	1.0	35	*	6
			25	GSGB25	23	320	2.0	8.3	1.5	44		
			30	GSGB30	36	450	2.4	9.6	1.7	48		
			35	GSGB35	70	570	2.7	9.3	1.6	48		
			40	GSGB40	110	800	3.2	9.3	1.6	48	GSIPBS	6
			45	GSGB45	140	1,200	3.8	10.8	1.9	50		
			55	GSGB55	205	1,800	3.8	14.7	2.5	58		
			63	GSGB63	280	2,400	4.3	16.4	2.6	62		
			80	GSGB80	460	3,500	5.0	23.0	3.6	79		
			75	GSGB75	280	2,100	4.3	23.0	3.7	83		
			85	GSGB85	560	5,100	5.4	20.0	3.4	58		
			110	GSGB110	800	6,600	5.7	30.0	5.2	88	GSIPBS	7
			125	GSGB125	1,100	8,100	6.4	37.0	5.7	88		
			150	GSGB150	1,800	12,500	7.4	39.0	6.3	87		
			160	GSGB160	2,200	17,000	8.0	42.0	6.6	98		
	350			170	GSGB170	3,200	39,500	9.0	33.0	5.8	63	
			190	GSGB190	4,200	45,500	9.9	43.0	7.3	76		
			225	GSGB225	7,400	80,000	11.8	45.0	7.6	80	GSIPBL	8
			250	GSGB250	11,000	105,000	13.2	46.0	7.8	88		
			175	GSGB175	2,200	40,000	8.0	41.0	7.4	58		
			200	GSGB200	3,200	45,500	9.0	56.0	8.9	63		
			235	GSGB235	5,700	59,000	9.9	54.0	9.0	84		
			300	GSGB300	10,000	120,000	13.2	71.0	11.2	86		
			325	GSGB325	13,000	160,000	14.2	73.0	11.5	87	GSIPBL	9
			350	GSGB350	16,500	185,000	15.3	68.0	11.0	90		
		400	GSGB400	23,000	270,000	17.5	83.0	13.2	95			
		450	GSGB450	36,000	340,000	19.0	84.0	13.4	96			
		500	GSGB500	44,000	450,000	22.0	95.0	15.0	104			
		510	GSGB510	40,000	480,000	20.0	98.0	17.0	72			
		580	GSGB580	52,000	570,000	22.0	111.0	20.0	81	NOT AVAILABLE		
		630	GSGB630	66,000	700,000	24.0	117.0	21.0	85	ORDER	10	
		710	GSGB710	93,000	1,100,000	28.0	126.0	22.0	92	GSGB		
		800	GSGB800	115,000	1,350,000	30.5	150.0	25.0	102	Phone: 0202/702031		
		900	GSGB900	170,000	1,800,000	35.0	146.0	26.0	104	Fax: 0202/702032		

* Indicator pack should not be used with GSGB16.

† Indicated fuse links. Add-on indicator fuse link conversion kits comprising a pair of easily assembled clips are available.

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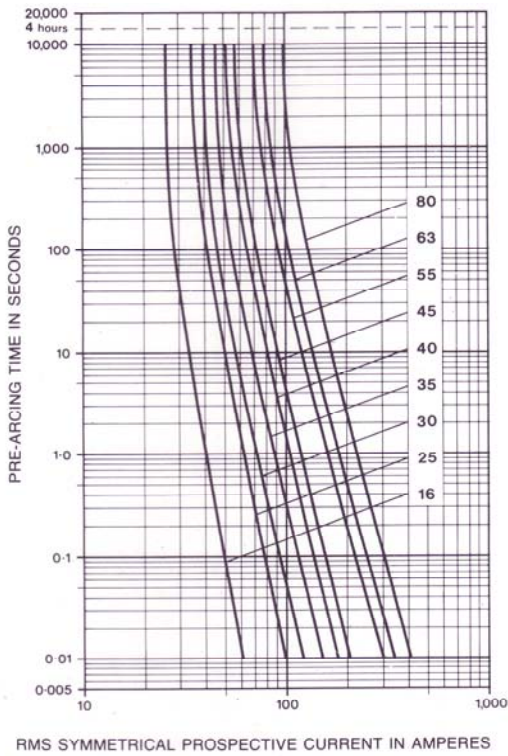
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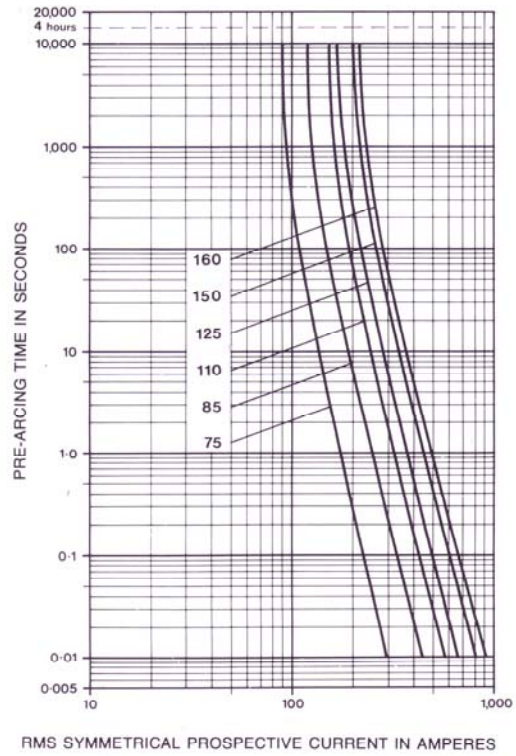
Characteristics

Type 'GSGB'
 Time/Current Characteristics
 16-250 Amp

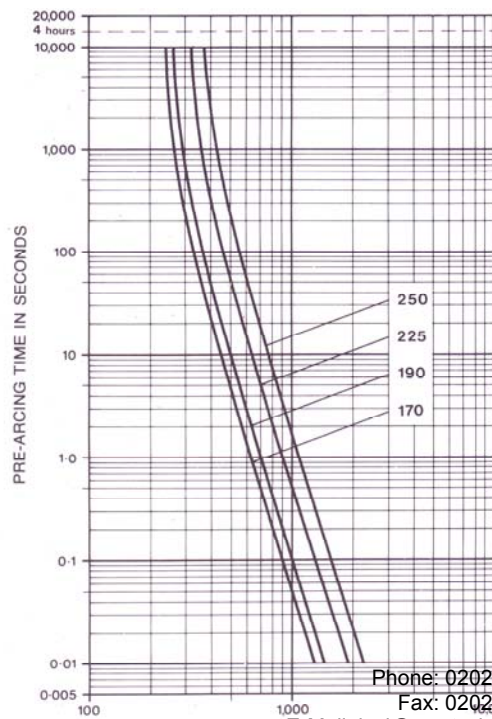
16-80 Amp



75-160 Amp



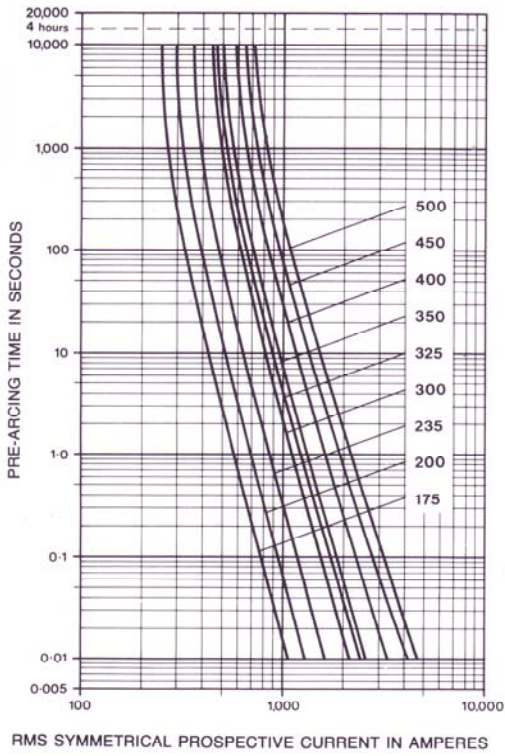
170-250 Amp



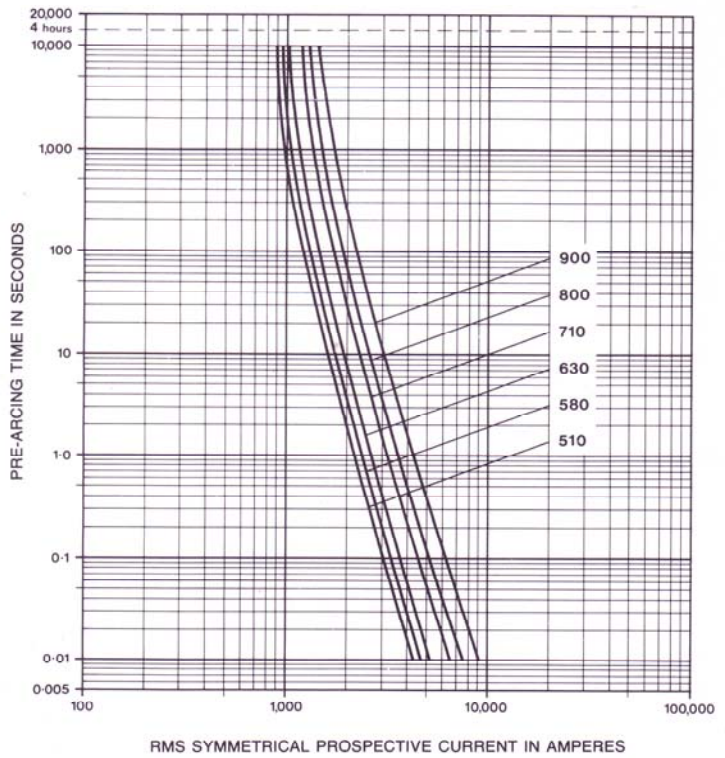
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 Fax: 0202/702032
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Type 'GSGB'
 Time/Current Characteristics
 175-900 Amp

175-500 Amp



510-900 Amp



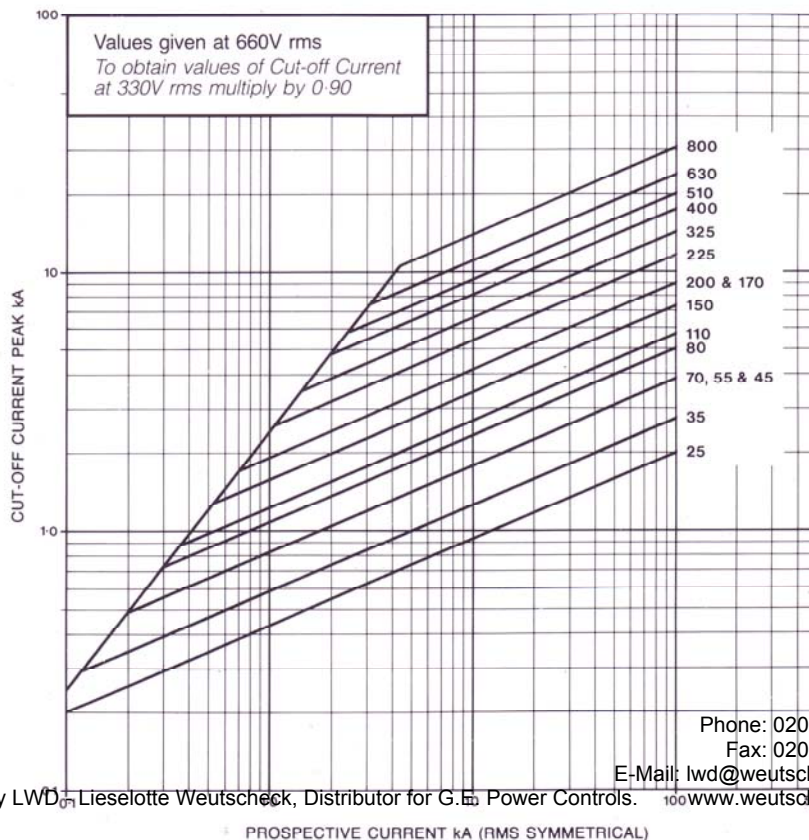
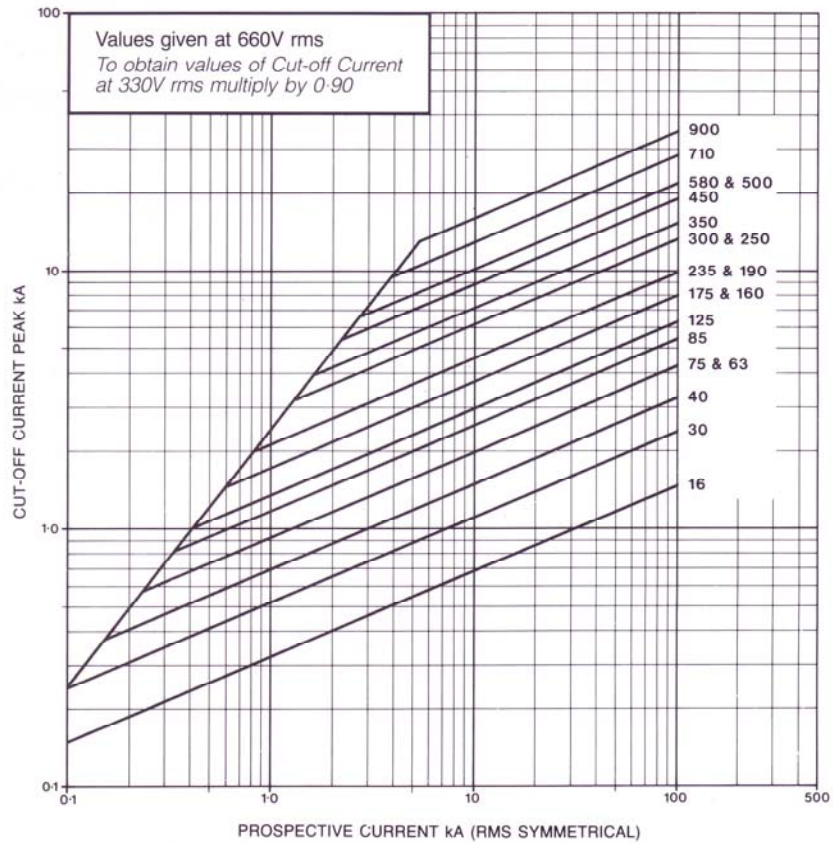
1/24

Type 'GSGB'

Cut-off Current Characteristics

16-900 Amp

To aid references, characteristics feature alternate ratings.

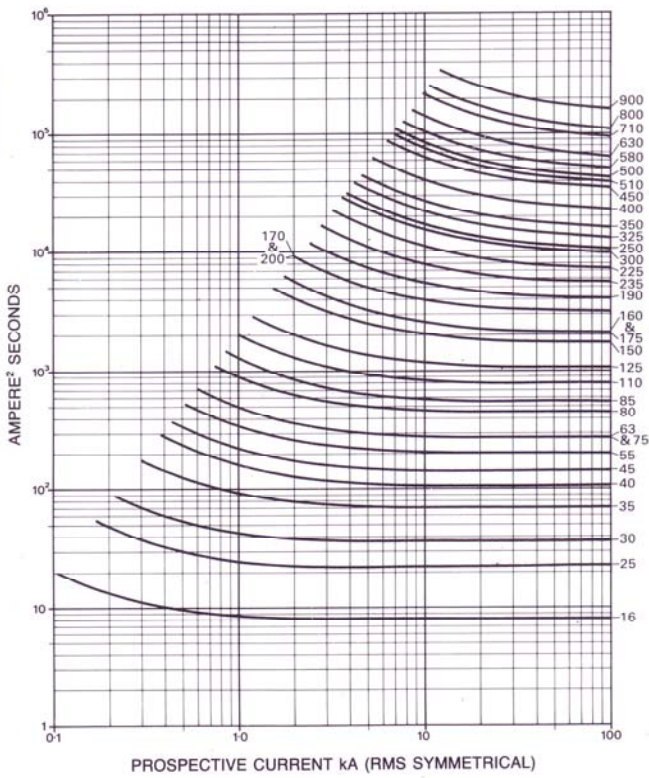


Type 'GSGB'

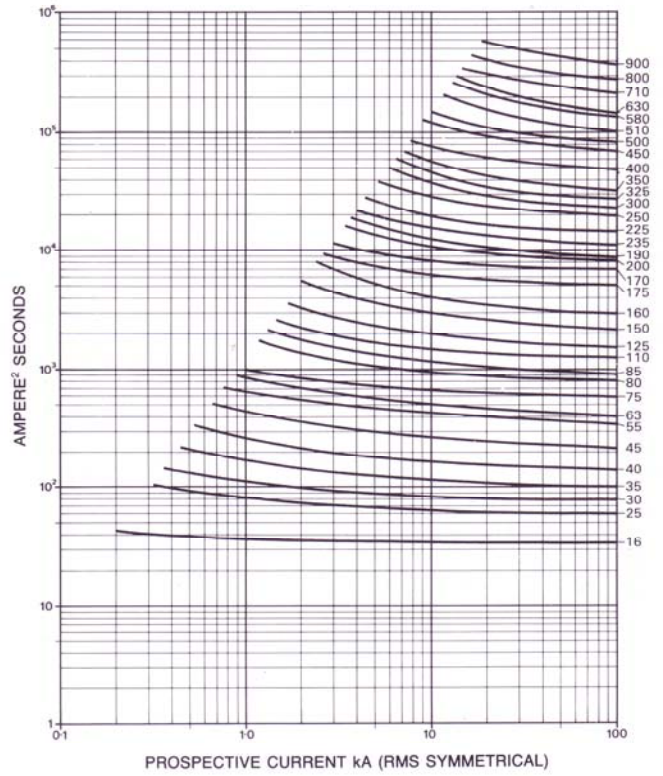
I²t variations with prospective current

1/26

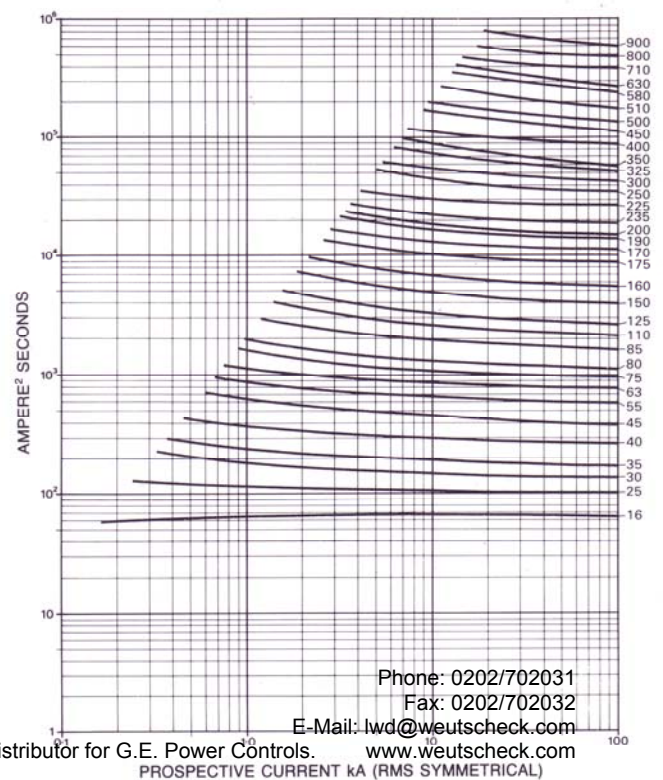
Pre-arcing



165 Volt RMS



330 Volt RMS



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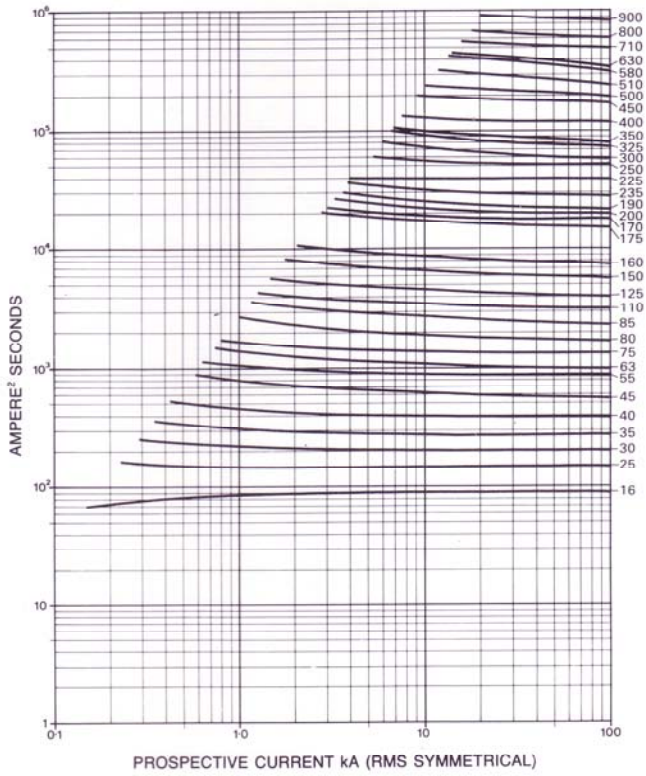
Fax: 0202/702032

E-Mail: lwd@weutscheck.com

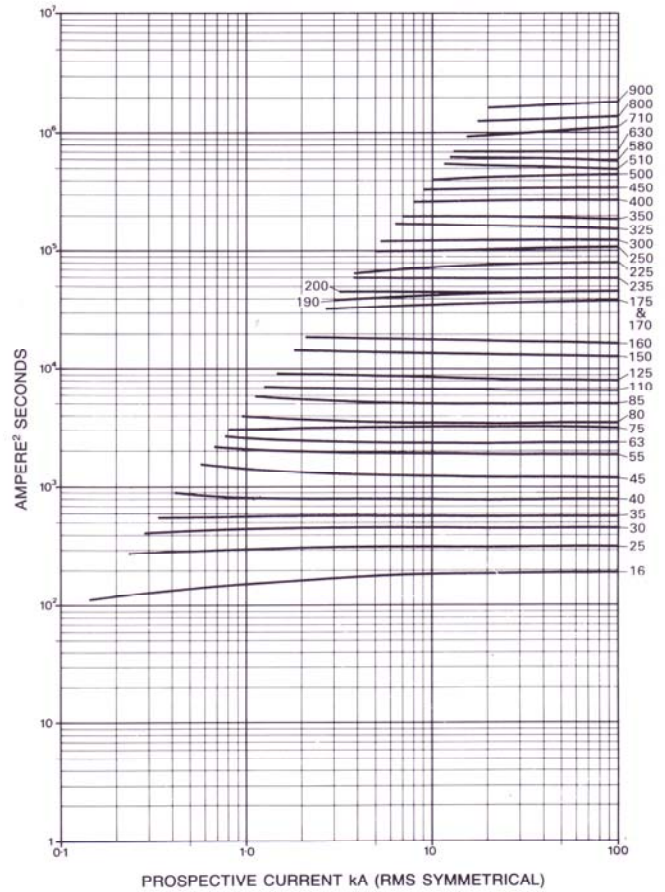
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Type 'GSGB'
 I^2t variations with prospective current

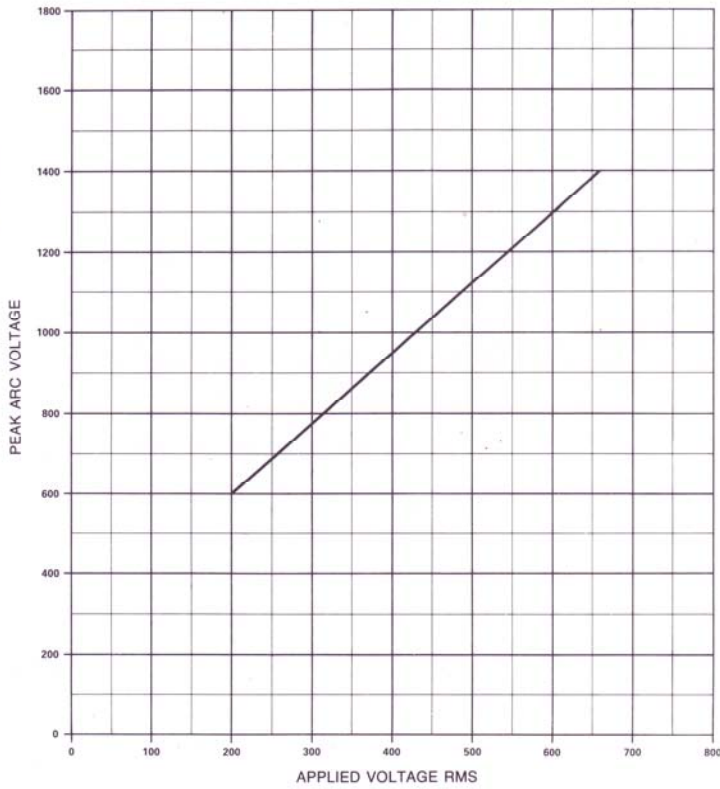
415 Volt RMS



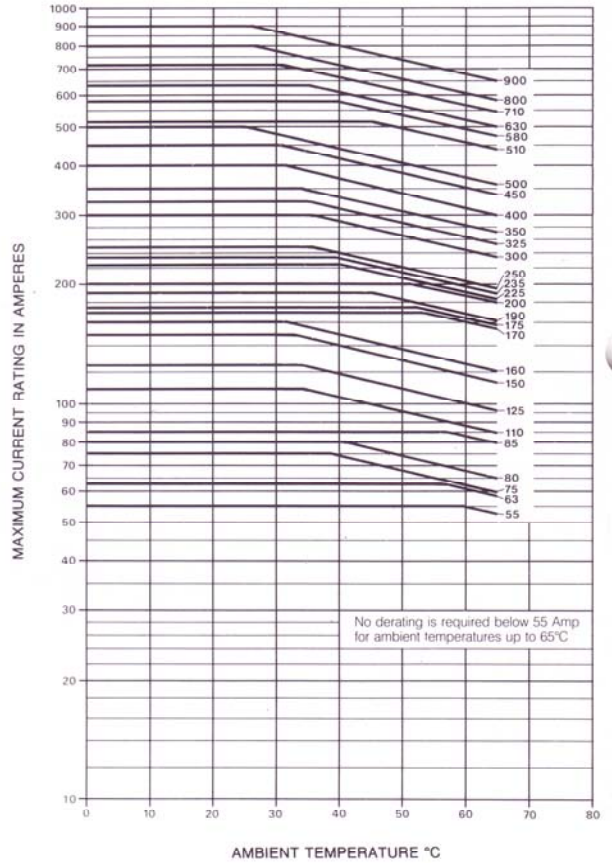
660 Volt RMS



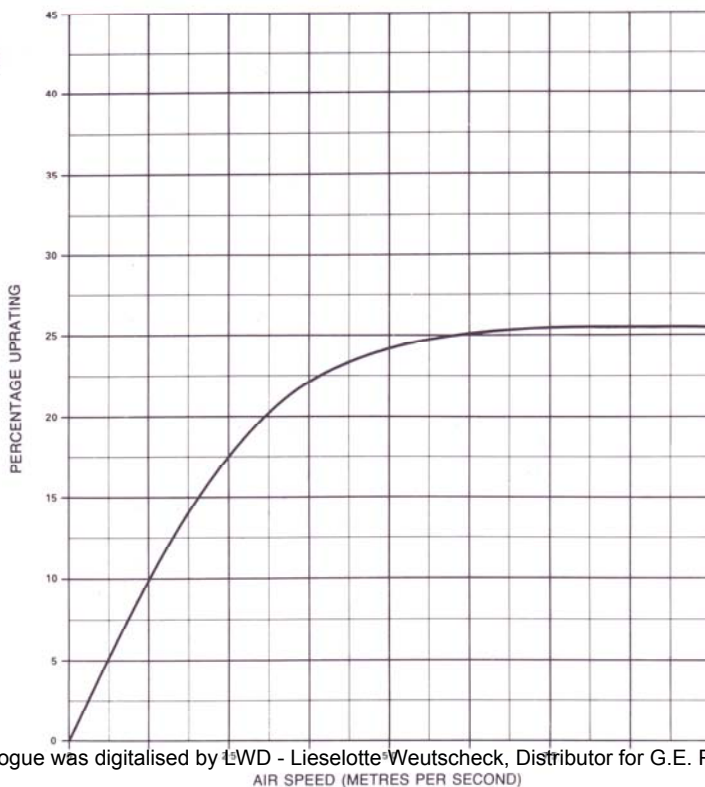
Type 'GSGB'
 Variation of arc voltage with
 applied voltage



Type 'GSGB'
 De-rating at high ambients



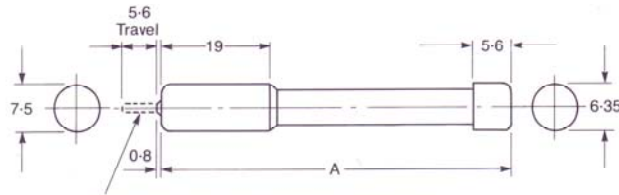
Type 'GSGB'
 Forced air cooling
 up-rating curve



Trip Indicator Fuse Links

A.C. RMS Voltage rating	D.C. Voltage rating	List number	Dimensions in millimetres
			A
450	200	GS700	46
660	400	GSL1000	60
800	500	GSL1200	107
1300	825	GSL2000 *GSH2000	121.4

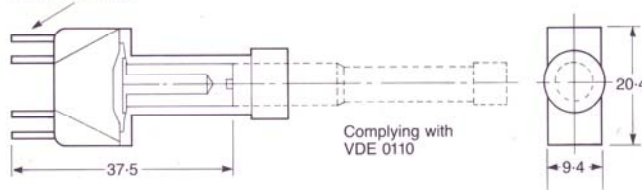
* For special applications only.



Spring loaded indication plunger (Released when fuse link operates) can also be used for operating auxiliary equipment.

Micro-switch and Adaptor

Terminals to suit AMP type "110 Faston receptacles"
List No. 150205-2



Contact Clip Assemblies

For use with Trip Indicator Fuse Links.

For Trip Indicator Fuse Link -	Dimensions in millimetres
	A
GS700	32
GSL1000	46
GSL1200	93
GSL2000	107.5
GSH2000	

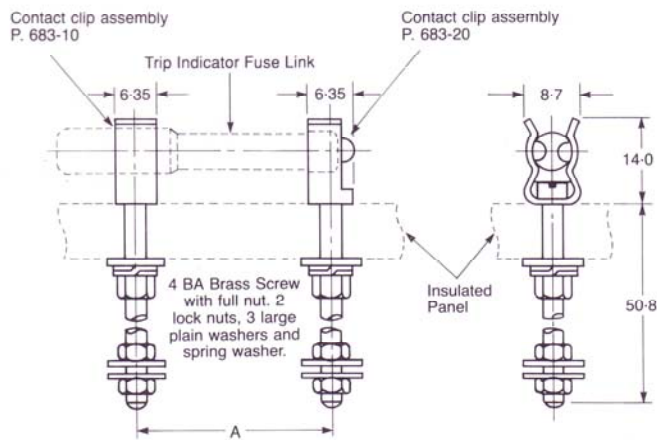


Figure 1

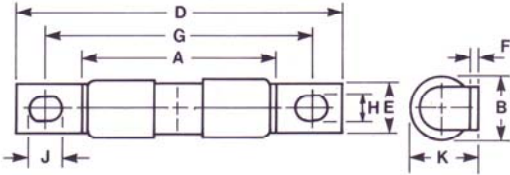


Figure 3

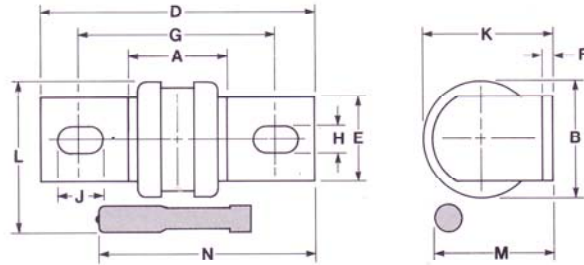


Figure 2

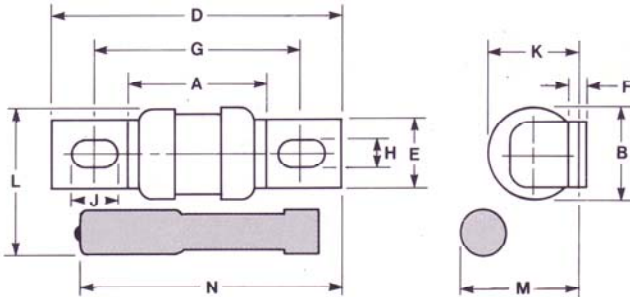


Figure 4

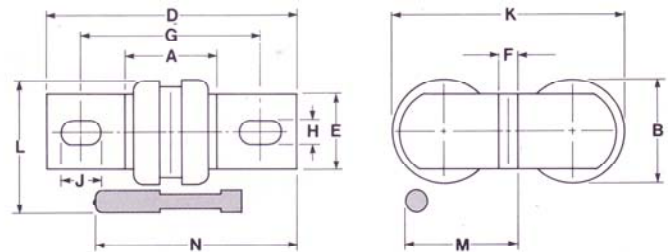
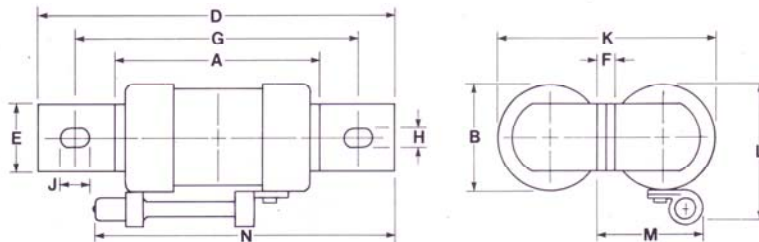


Figure 5



Type	Rating Amp	Fig. No.	Dimensions in millimetres											
			A max	B	D max	E	F	G	H	J	K	L	M	N
GSA#	5-20	1	28.2	8.0	47.6	6.4	0.8	38.1	3.8	5.0	8.7	-	-	-
GSA	25-100	2	29.2	17.3	58.4	12.7	1.6	41.8	6.4	7.9	18.2	28.6	24.6	52.4
	125-250	3	32.6	34.6	85	25.4	3.2	60.3	10.3	15.5	38.8	45.3	35.2	64.3
	300-600	4	32.6	34.6	85	25.4	6.4	60.3	10.3	15.5	77.6	45.3	38.4	64.3
GSD	125-150	2	29.2	17.3	58.4	12.7	1.6	41.8	6.4	7.9	18.2	28.6	24.6	52.4
	300, 350	3	32.6	34.6	85	25.4	3.2	60.3	10.3	15.5	38.8	45.3	35.2	64.3
	700	4	32.6	34.6	85	25.4	6.4	60.3	10.3	15.5	77.6	45.3	38.4	64.3
GSB	5-20	1	55.0	8.0	74.6	6.4	0.8	65.0	3.8	5.0	8.7	-	-	-
GSB	25-75	2	50.0	17.3	79.5	12.0	1.6	61.8	6.4	7.9	18.2	28.6	24.6	70.4
	100-250	3	55	34.6	107.0	25.4	3.2	81.7	10.3	15.5	38.8	45.3	35.2	84.1
	300-500	4	55	34.6	107.0	25.4	6.4	81.7	10.3	15.5	77.6	45.3	38.4	84.1
*CGS 1000 & CGIS 1000	400-600	5	77.8	40.5	136.5	25.4	6.4	110	10.3	15.5	83.3	49.6	35.0	113

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Note: Add-on indicator fuse link shown shaded.

* Add-on indicator fuse link conversion kits are not available for this range of fuse links. For indicated version of CGS 1000 & CGIS 1000, # Indicator not available on this size.

Figure 6

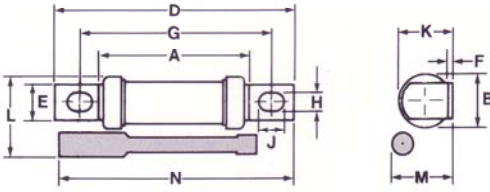


Figure 8

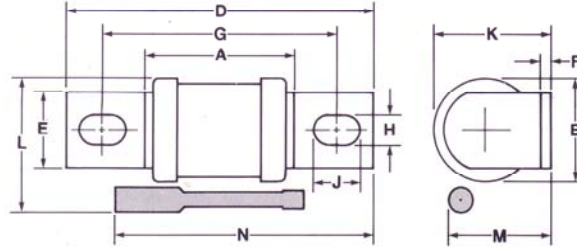


Figure 7

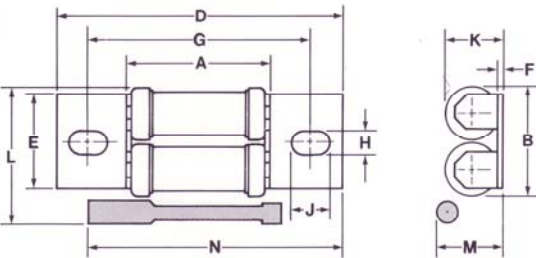


Figure 9

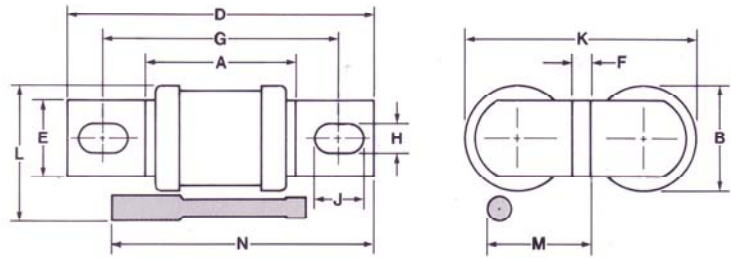
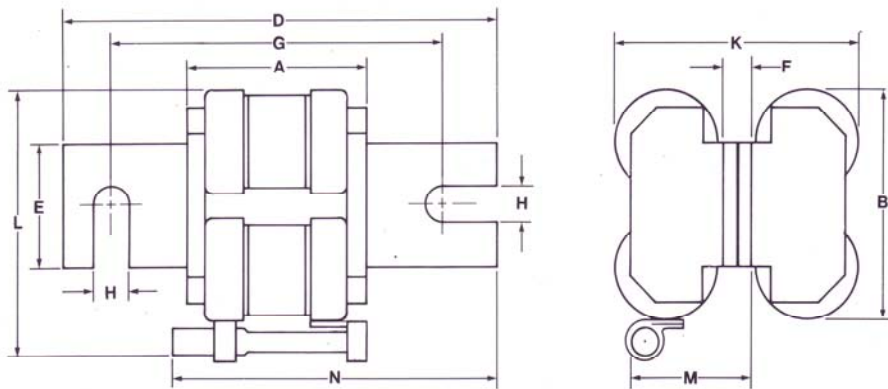


Figure 10



Type	Rating	Fig. No.	Dimensions in millimetres											
	Amp		A	B	D	E	F	G	H	J	K	L	M	N
GSGB#	16	6	50	17.3	79.5	12	1.6	61.8	6.4	7.9	18.2	-	-	-
GSGB	25-80	6	50	17.3	79.5	12	1.6	61.8	6.4	7.9	18.2	28.6	24.6	70.4
	75-160	7	48	35.7	95	31.8	1.6	72	8.3	13.4	19	46.4	23.8	80.2
	170-250	8	55	34.6	107	25.4	3.2	81.7	10.3	15.5	38.8	45.3	35.2	84.1
	175-500	9	55	34.6	107	25.4	6.4	81.7	10.3	15.5	77.6	45.3	38.4	84.1
*GSGB	510-900	10	57.2	73.8	143	39.7	9.6	110	11.5	-	80.8	84.5	40.8	102

Note: Add-on indicator fuse link shown shaded.
 * Add-on indicator fuse link conversion kits are not available for this range of fuse links.
 # Indicator not available on this size.

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