PUBLICATION
DEF/487
DECEMBER 1990

GEC ALSTHOM INSTALLATION EQUIPMENT LIMITED

GENERAL/MOTOR
HV HRC FUSE LINKS

GEC ALSTHOM

TYPE 'K' HIGH VOLTAGE HRC FUSE LINKS

For use in air on Motor Starting and General Applications

Voltage Range 3.6kV to 12kV
Current Range 5 Amp to 450 Amp*

High Voltage fuse links used in motor circuits must have the ability to withstand, without deterioration, the repeated surges associated with motor starting. Reliability in this respect is essential and must be provided without compromise to other essential parameters of performance.

Fault energy limitation to minimise damage resulting from electrical faults, ability to co-ordinate precisely with contactors and 'upstream' protective devices in the same system, together with adequate short circuit capacity are all essential for safety.

This range meets these requirements and represents a significant advance in the design of high voltage fuse links for motor starting applications. The range has the following advantages:

- High current rating in single body dimensions.
- Ability to resist ageing under repeated starting conditions.
- Low values of current and energy let-through under maximum fault conditions.
- Excellent performance under low over-current conditions.
- Meeting the dimensional and performance requirements of BS 2692: 1986 and IEC 282: 1985.

Ability to withstand motor starting

Where fuse links are used for motor circuit protection in conjunction with contactors, the current rating of the fuse is usually of secondary consideration. The main criterion in the choice of rating is the ability of the fuse link to withstand repeated starting current surges for the run-up time of the motor without deterioration.

AC short circuit performance

Short circuit testing has been carried out by KEMA and ASTA at the breaking capacities listed opposite. Certificates in accordance with either BS 2692-1975 or IEC 282-1 : 1974 are available.

The maximum values of breaking capacity quoted are test values which may be limited by test station capability or the economics of testing. Generally the fuse link capability will be considerably higher and no practical limit is imposed on these fuse links for maximum breaking capacity under service conditions.

* *Higher current ratings, at each voltage level, can be obtained by using two identical standard ratings in parallel with an appropriate current derating of the combination. Technical information available on request.*

Available ranges

Max. 3-Phase Service Voltage kV RMS	Fuse Type The letter X denotes a striker and is omitted in non striker versions	Current Rating* Amp	Breaking Capacity† kA RMS SYM
3.6	K2PA	5. 10. 16. 20. 25. 32. 40. 50	40
	K3PGX	5. 10. 16. 20. 25. 32. 40. 50. 63. 80. 100	40
	K4PHX	125. 160. 200	40
	K81PEX	100. 125. 160. 200. 250. 315. 350	40
	K81PRX	450	40
7.2	K81SDX	50. 63. 80. 100. 125. 160. 200. 225. 250. 280. 315	45
	K81SVX	50. 63. 80. 100. 125. 160. 200. 250	45
	K81SRX	315. 350	45
12	K81EAX	32. 40. 50. 63. 75, 100, 125	20
	K81ERX	160. 200. 250. 315. 350	56

To establish list numbers for ordering purposes combine fuse types with current rating i.e. K81PEX 200.

**Higher current ratings, at each voltage level, can be obtained by using two identical standard ratings in parallel with an appropriate current derating of the combination. Technical information available upon request.*

†Breaking capacity quoted are test values and apply at the maximum voltage rating.

Low overcurrent performance

Excellent performance is provided under low overcurrent conditions. The minimum breaking current for each rating is shown on the time/current characteristic on Pages 2/5 to 2/16 as the point where the curve becomes discontinuous – for the majority of ratings the minimum breaking current is between 2 and 3 times the rated current of the fuse link.

Where an instantaneous trip-all-phase load break switch is used in conjunction with a striker pin fuse link, the combination will be self-protecting at fault currents below the minimum breaking current of the fuse link. This is made possible by the use of low melting point alloy which is applied to the centre of the elements thus ensuring that unacceptable temperatures are not reached during the prolonged pre-arcing period. The striker functions normally for all currents down to minimum melting current.

Where the HV fuse link is co-ordinated with an over current protective device, for example, an overload relay, then the minimum breaking current must be lower than the intersection of the prospective time/current characteristics.

Where instantaneous striker operated tripping of HV fuse switch combinations is employed then the minimum breaking current of the HV fuse link must be less than the maximum interrupting current of the associated switch.

Characteristics

These are shown on Pages 2/5 to 2/16.

The time/current characteristics relate to mean pre-arcing times and are accurate to within a manufacturing tolerance of ±10% related to current.

The cut-off current characteristics show the maximum peak current a given fuse link will permit for various fault currents.

The pre-arcing I^2t values given are for adiabatic conditions and in service pre-arcing values will normally be higher.

The total I^2t values given are obtained during tests under the most onerous conditions. They are particularly affected by applied voltage and in service the values will generally be much less than those quoted. Because the total I^2t/prospective current characteristic tends towards a constant value, the figures quoted will also apply to prospective current greater than the maximum tested breaking capacity.

Arc voltage

The overvoltage produced by the fuse link during the arcing period is limited by values in the appropriate standards. Type 'K' fuse links have maximum values well within those quoted in Table IX of BS 2692 and IEC 282.

Striker pins

Fuse links are generally equipped with a striker pin which can be used to indicate fuse link operation or to operate a trip mechanism where provided. The striker pin, which is actuated by a small pyrotechnic device, has characteristics shown in Table XII heavy type, of BS 2692-1986.

This requires a projection of 10mm minimum/16mm maximum from the end face of the fuse link and during this travel an energy output of 2±1 joules must be produced. Type 'K' fuse links are designed to produce energy towards the upper end of this band. A lockout feature is also incorporated with a minimum withstand force of 40 Newtons, which can be required to hold the trip bar of an associated switch in the locked out position. This prevents reclosure of the switch until the fuse links have been replaced.

Dimensions

All standard ratings are in a single body with dimensions shown on Pages 2/18 and 2/19. Higher current ratings can be obtained by using two identical standard ratings in parallel. Further information is available upon request.

Dimensions conform to type III of BS 2692-1986 for most types.

Fuse Link Selection Charts

Application Notes

Three selection charts (A, B and C) are provided for each range of fuse links. They cover motor run-up times of 6, 15 and 60 seconds respectively.

These selection charts enable the minimum rating of fuse link to be determined for particular Motor Starting conditions and the following points must be considered in choosing the correct fuse link rating.

1. The number of starts per hour indicated in the charts are based on two of these starts being in immediate succession, the remainder being evenly spaced in the 1 hour period.

   The charts indicate a rate of starting: For example 8 starts in 15 mins. is represented as 32 starts per hour.
2. They enable the selection of the lowest rated fuse link to withstand the specified starting conditions. However it is also necessary to ensure that the fuse link rating is *not less* than 1.33 times the normal motor full load current.

Methods of Selection

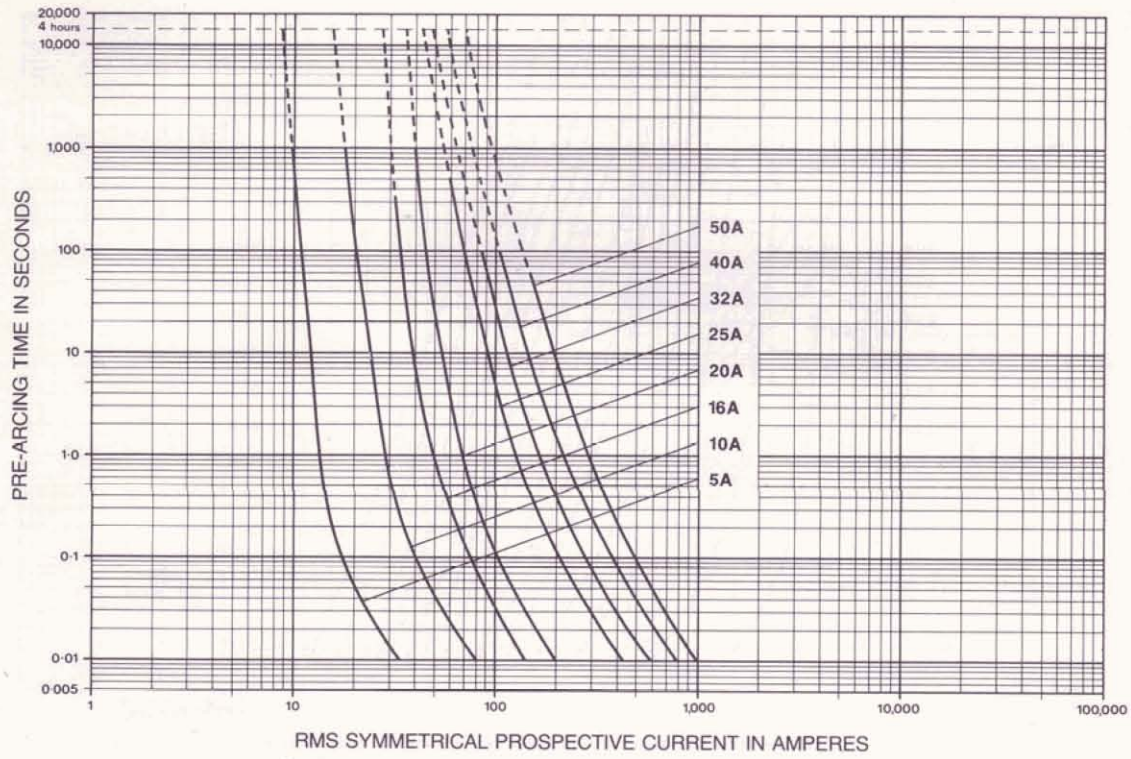
a) Select the chart covering the voltage rating and run-up time of the motor.
b) Select starting current on the horizontal axis.
c) Read off on vertical axis fuse link rating corresponding to intersection of starting current and required number of starts per hour line.

Example:

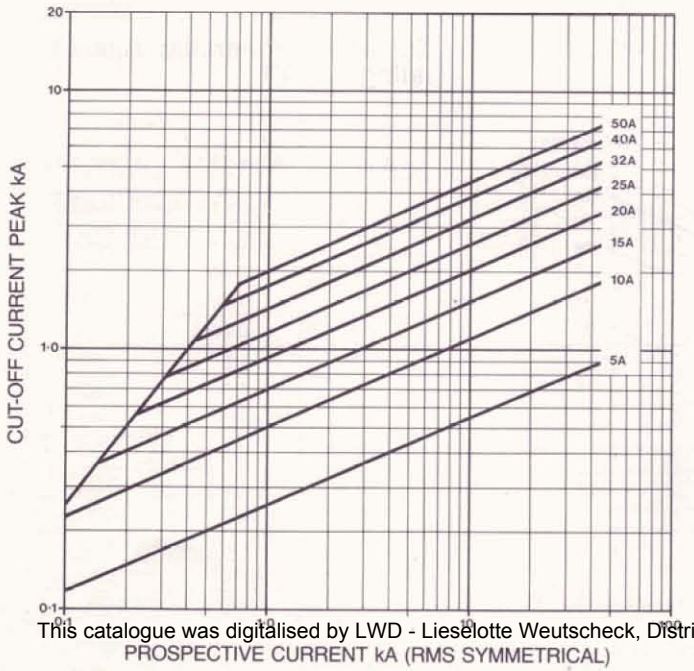
A 12kV motor with run-up times 6 secs.
16 starts per hour.
F.L.C. 140A.
Starting current 840A.

i) Select chart 'A' on page 2/17.
ii) Select 840A on horizontal axis.
iii) Read off, on vertical axis, the fuse link rating corresponding to intersection of 840A on the 16 starts per hour line, which in this case is 315A rating.
iv) This fuse link rating is greater than 1.33 times the 140A motor full load current, therefore the final fuse link selection will be 315A rating.

Type K2PA
Time/Current Characteristics
5-50 Amp



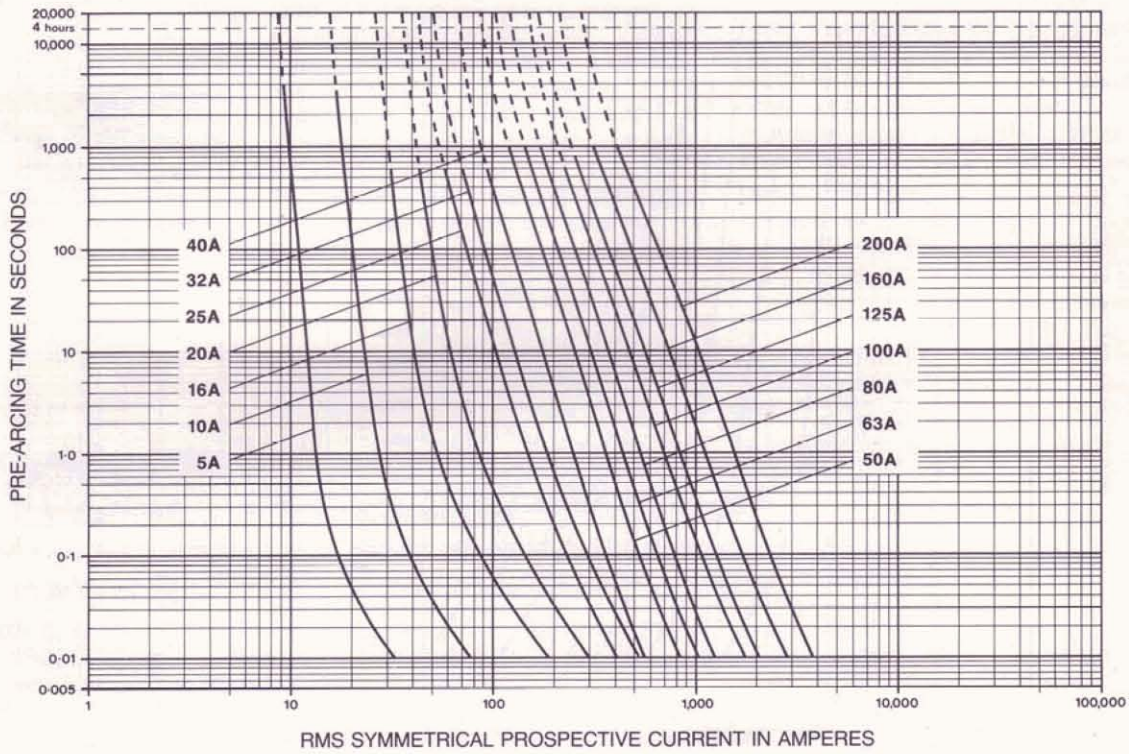
Type K2PA
Cut-off Current Characteristics
5-50 Amp



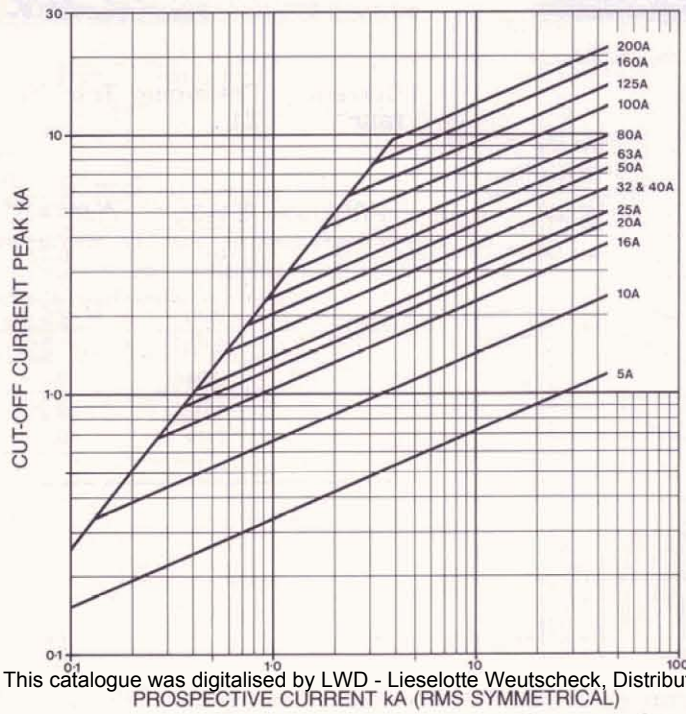
Type K2PA
I^2t Values
5-50 Amp

Current rating	Pre-arcing I^2t	Total I^2t
Amp	A^2 sec x 10^3	A^2 sec x 10^3
5	0.011	0.22
10	0.1	2.0
16	0.38	7.5
20	0.68	13.0
25	0.94	20.0
32	1.0	30.0
40	2.44	60.0
50	4.25	100.0

Types K3PGX & K4PHX Time/Current Characteristics 5-200 Amp



Types K3PGX & K4PHX Cut-off Current Characteristics 5-200 Amp



Types K3PGX & K4PHX I^2t Values 5-200 Amp

Current rating	Pre-arcing I^2t	Total I^2t
Amp	A^2 sec x 10^3	A^2 sec x 10^3
5	0.011	0.22
10	0.1	2.0
16	0.38	7.5
20	0.68	13.0
25	0.94	20.0
32	1.0	30.0
40	1.0	30.0
50	3.2	60.0
63	4.5	90.0
80	7.0	150.0
100	15.0	300.0
125	26.0	470.0
160	42.0	800.0
200	70.0	1500.0

Types K3PGX & K4PHX Selection Charts 5-200 Amp

Chart A

Motors with run-up times not exceeding
6 seconds

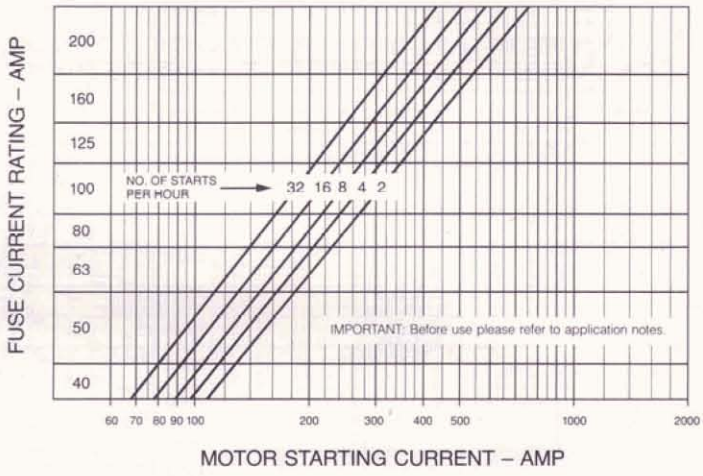


Chart B

Motors with run-up times not exceeding
15 seconds

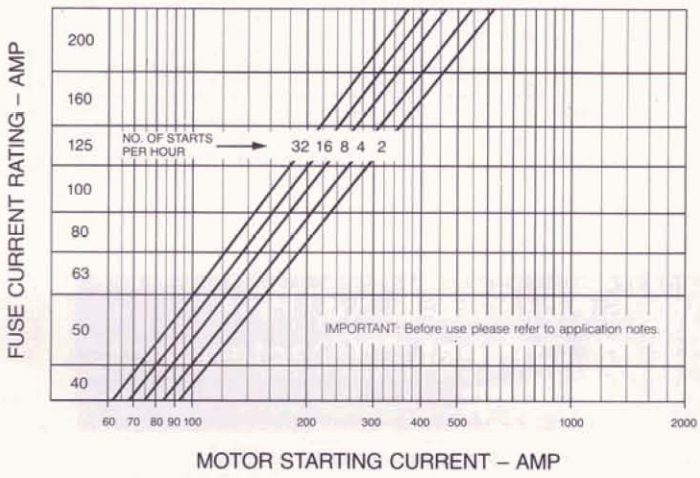
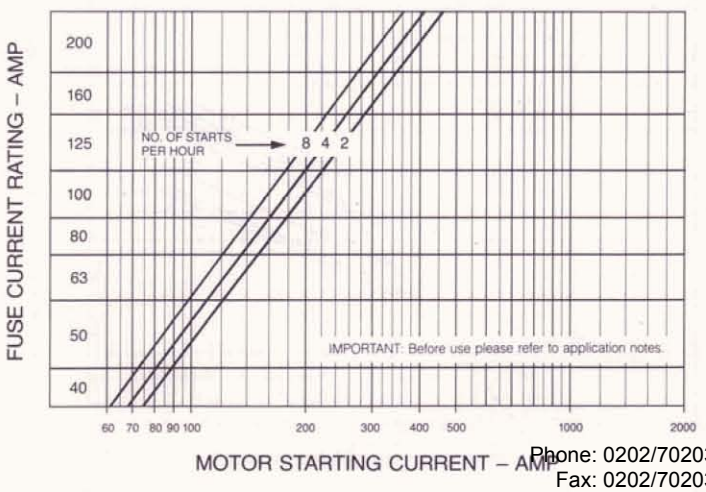
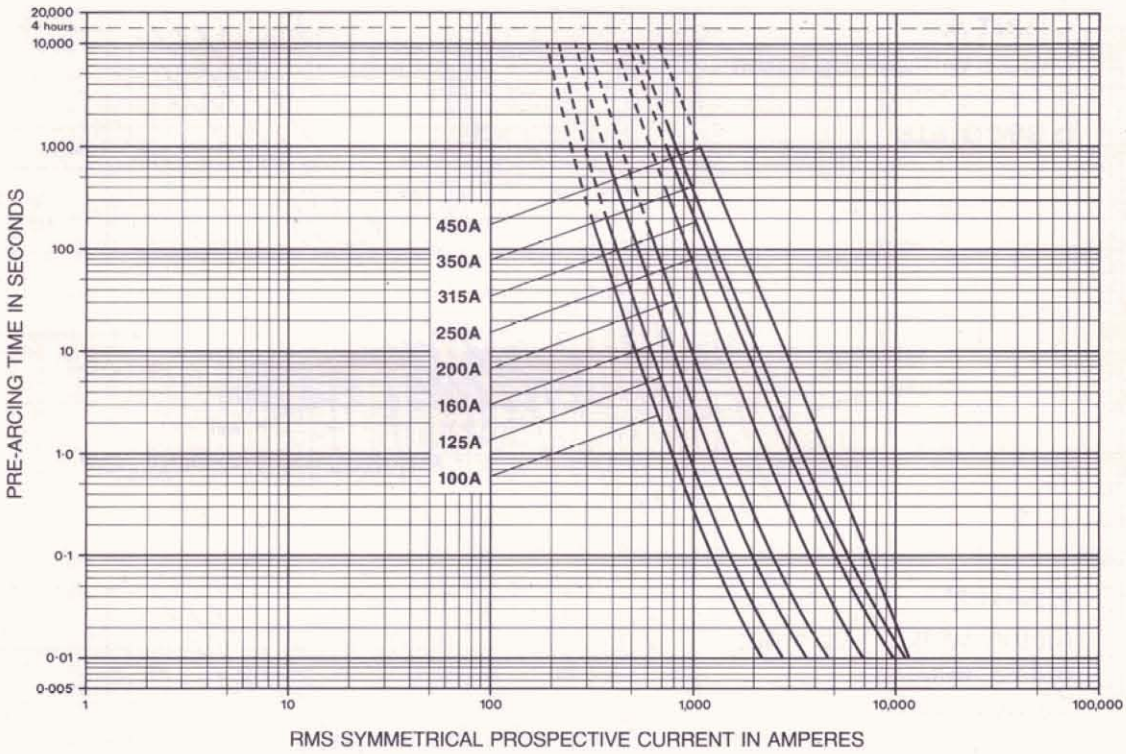


Chart C

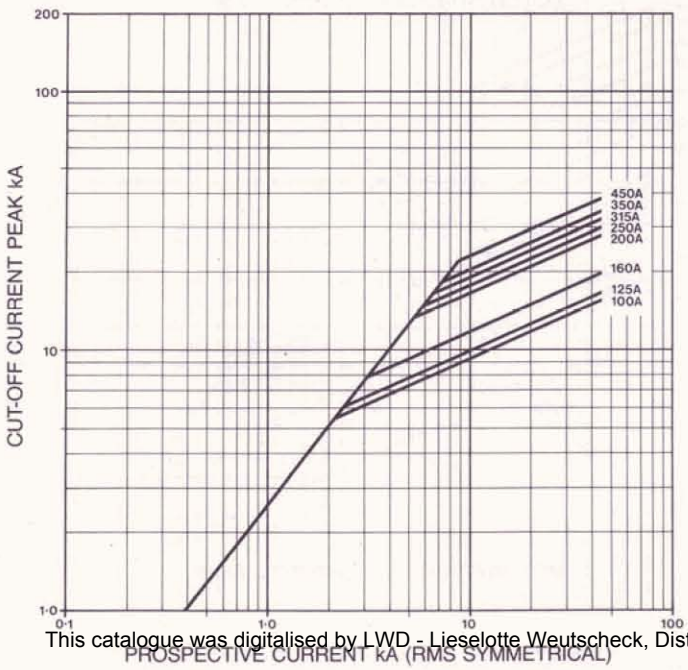
Motors with run-up times not exceeding
60 seconds



Types K81PEX & K81PRX Time/Current Characteristics 100-450 Amp



Types K81PEX & K81PRX Cut-off Current Characteristics 100-450 Amp



Types K81PEX & K81PRX I^2t Values 100-450 Amp

Current rating	Pre-arcing I^2t	Total I^2t
Amp	A^2 sec x 10^3	A^2 sec x 10^3
100	23.0	270.0
125	33.0	340.0
160	59.0	570.0
200	92.0	770.0
250	235.0	1400.0
315	367.0	2200.0
350	540.0	3100.0
450	540.0	6400.0

Types K81PEX & K81PRX Selection Charts 100-450 Amp

Chart A

Motors with run-up times not exceeding
6 seconds

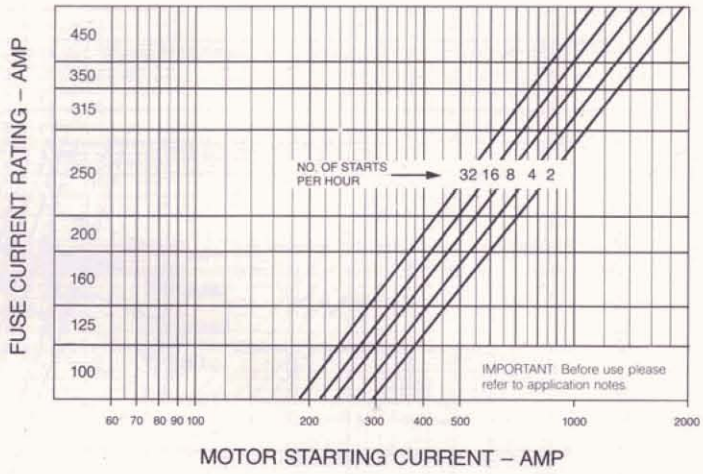


Chart B

Motors with run-up times not exceeding
15 seconds

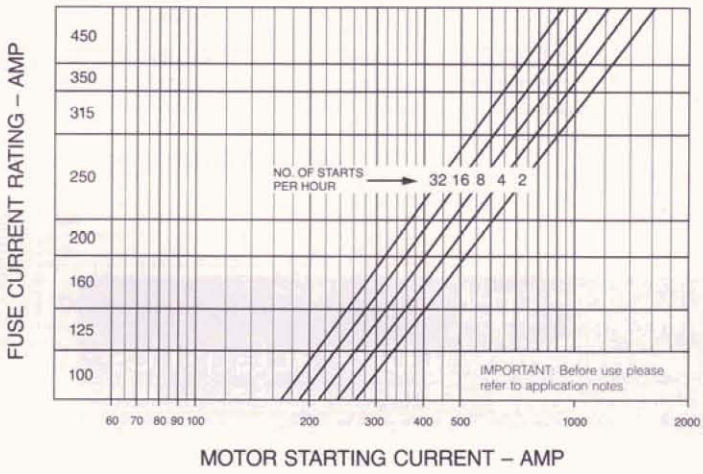
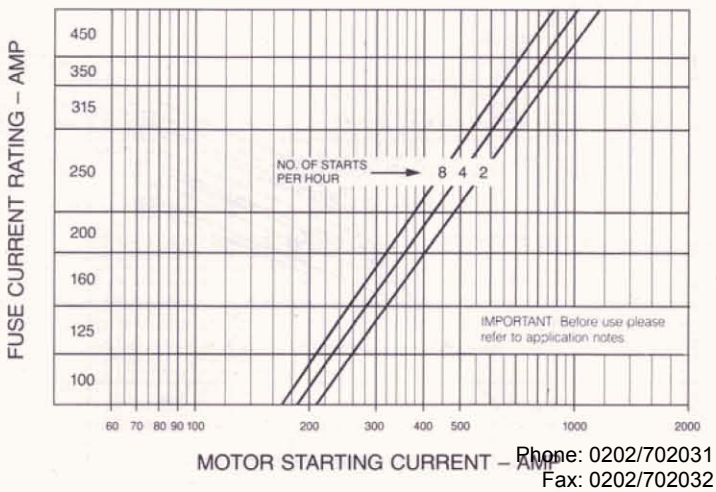
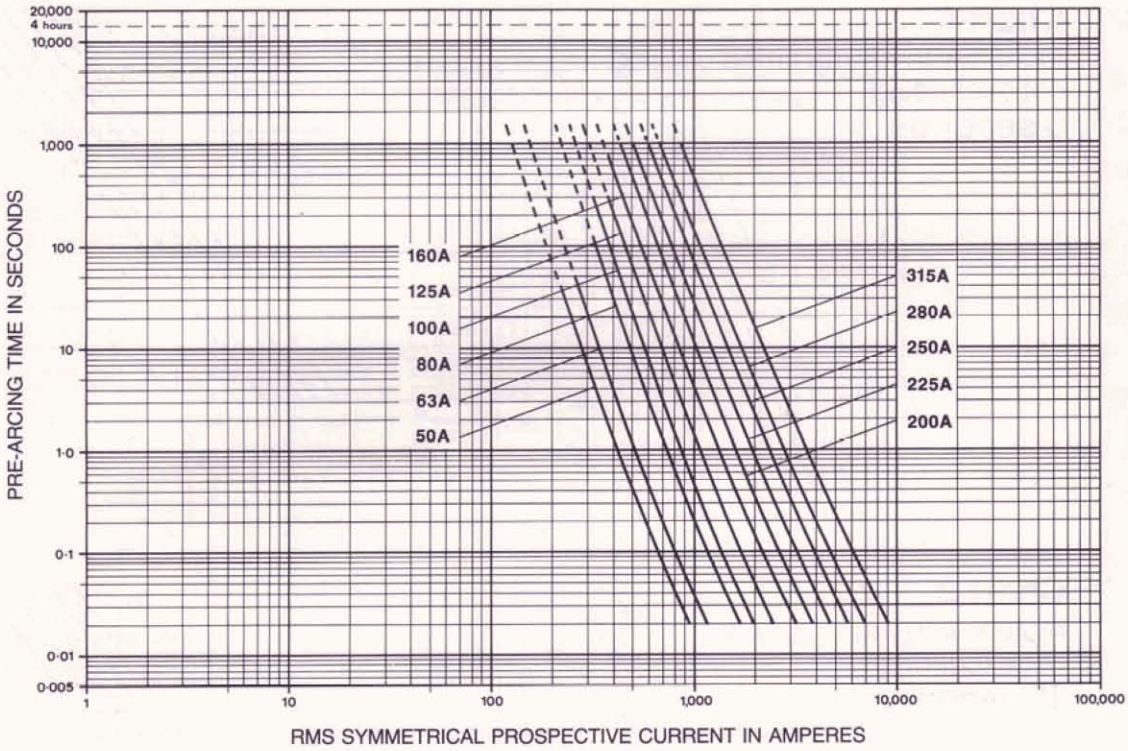


Chart C

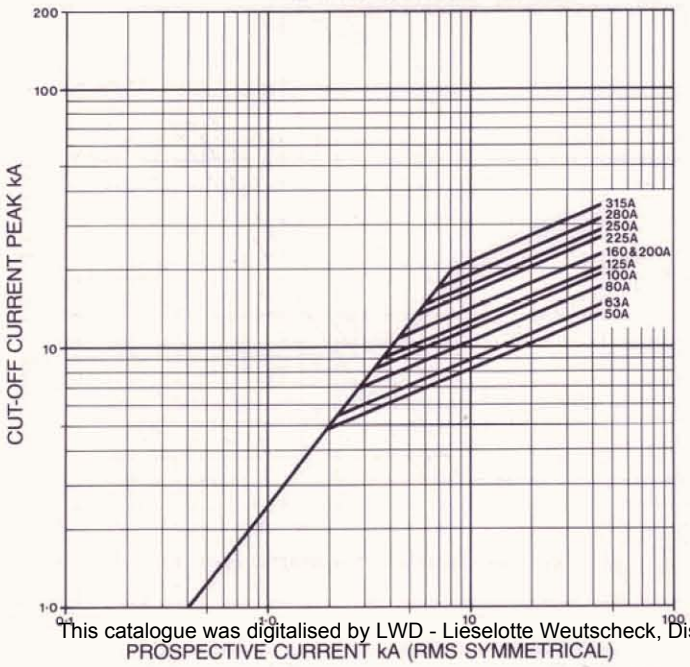
Motors with run-up times not exceeding
60 seconds



Type K81SDX
Time/Current Characteristics
50-315 Amp



Type K81SDX
Cut-off Current Characteristics
50-315 Amp



Type K81SDX
I^2t Values
50-315 Amp

Current rating	Pre-arcing I^2t	Total I^2t
Amp	A^2 sec x 10^3	A^2 sec x 10^3
50	5.1	210.0
63	6.7	240.0
80	16.3	415.0
100	23.5	515.0
125	33.8	640.0
160	60.1	920.0
200	94.0	920.0
225	135.0	1360.0
250	211.0	1770.0
280	376.0	1600.0
315	587.0	2230.0

Type K81SDX Selection Charts 50-315 Amp

Chart A
Motors with run-up times not exceeding
6 seconds

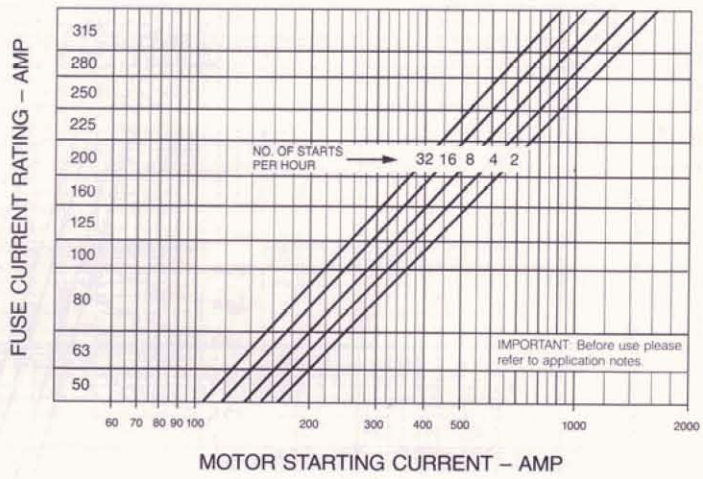


Chart B
Motors with run-up times not exceeding
15 seconds

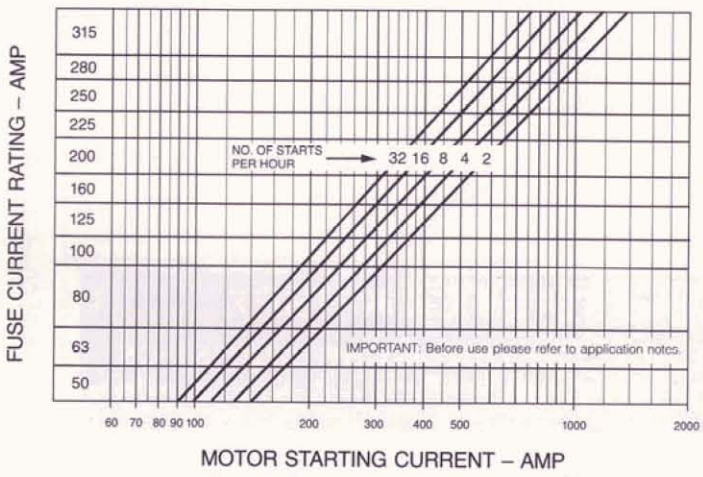
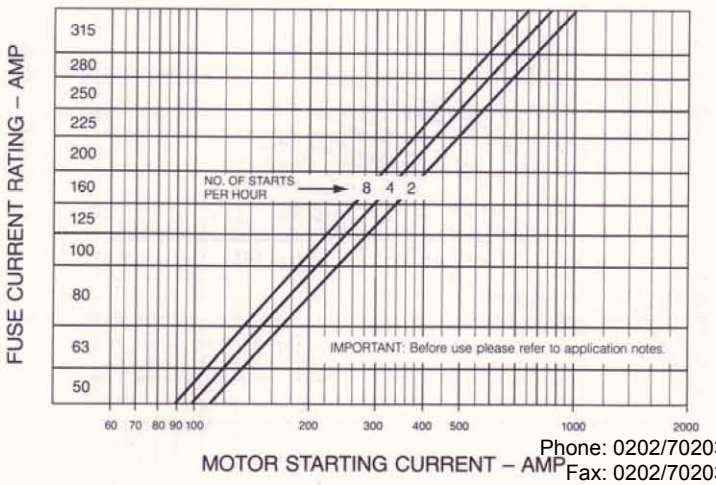
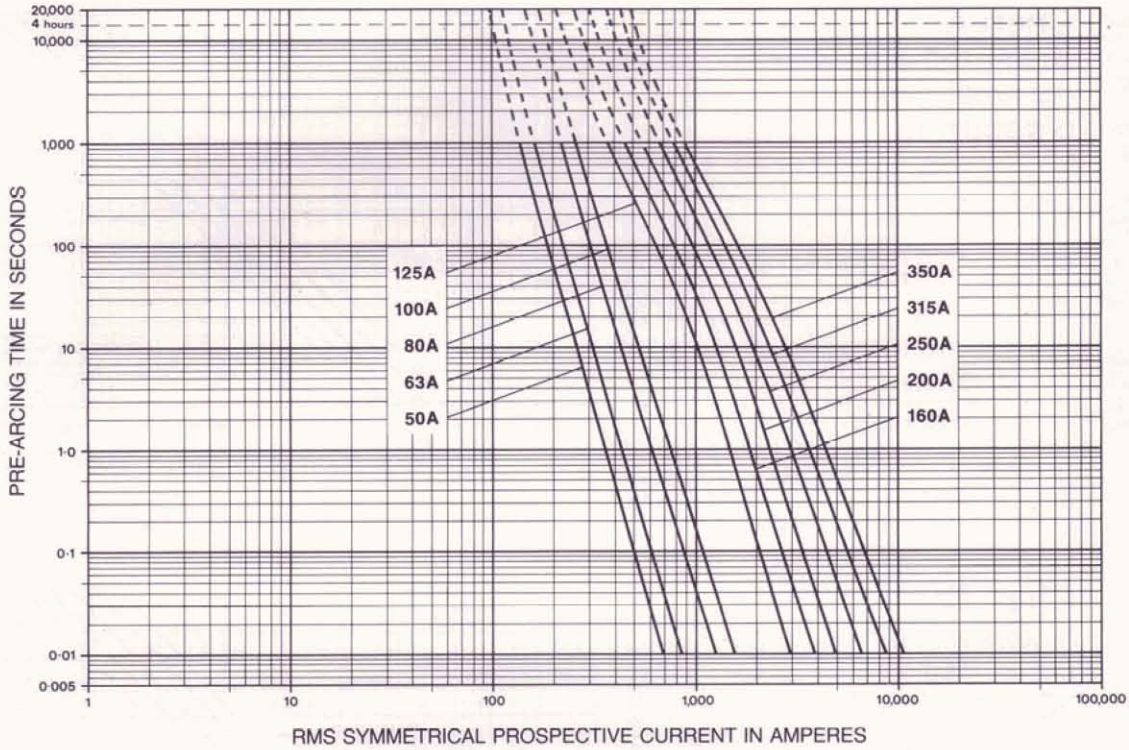


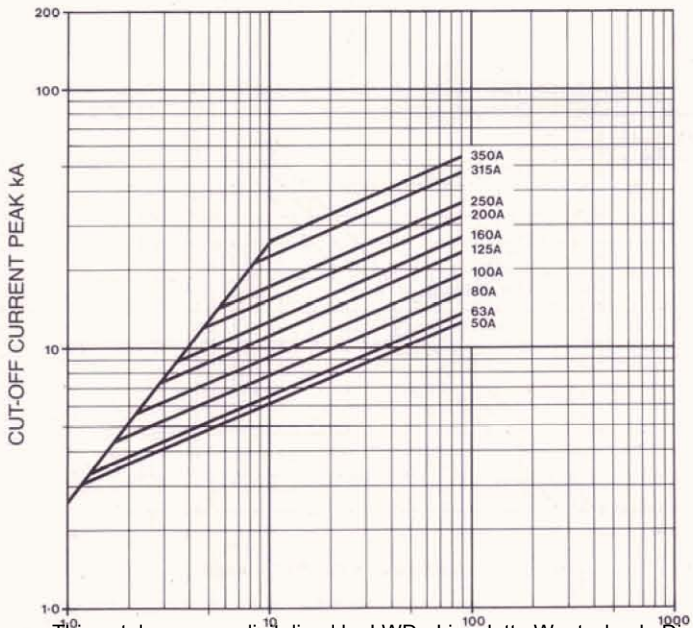
Chart C
Motors with run-up times not exceeding
60 seconds



Types K81SVX & K81SRX Time/Current Characteristics 50-350 Amp



Types K81SVX & K81SRX Cut-off Current Characteristics 50-350 Amp



Types K81SVX & K81SRX I^2t Values 50-350 Amp

Current rating	Pre-arcing I^2t	Total I^2t
Amp	A^2 sec x 10^3	A^2 sec x 10^3
50	2.8	32.0
63	4.3	49.0
80	9.7	110.0
100	17.2	195.0
125	33.9	315.0
160	60.1	500.0
200	136.0	990.0
250	241.0	1600.0
315	541.0	3100.0
350	845.0	4500.0

Types K81SVX & K81SRX Selection Charts 50-350 Amp

Chart A

Motors with run-up times not exceeding **6 seconds**

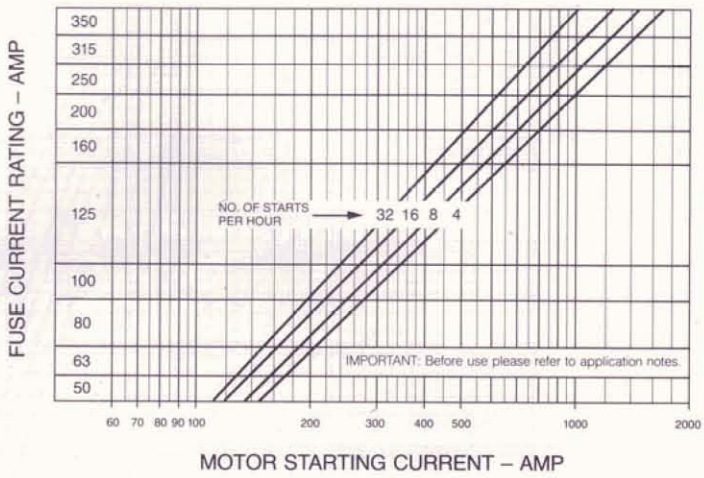


Chart B

Motors with run-up times not exceeding **15 seconds**

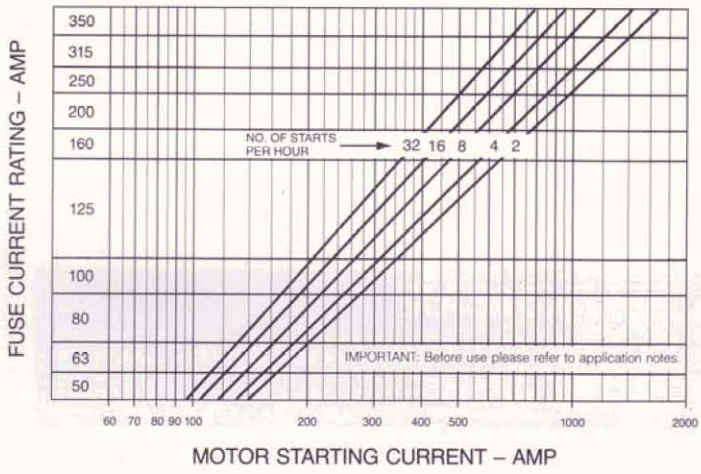
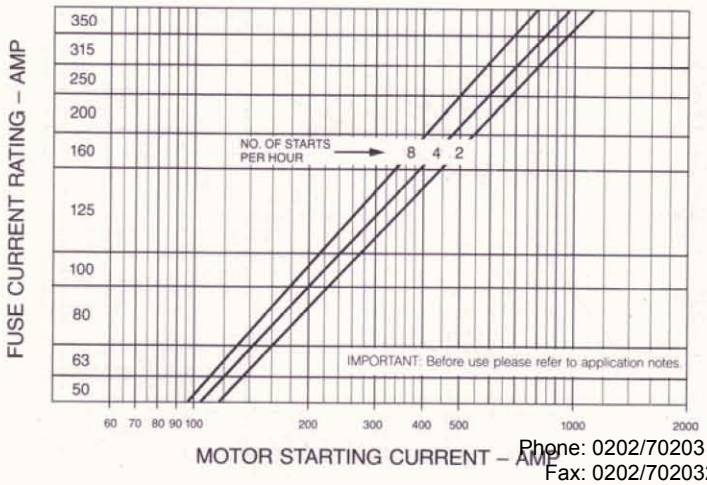
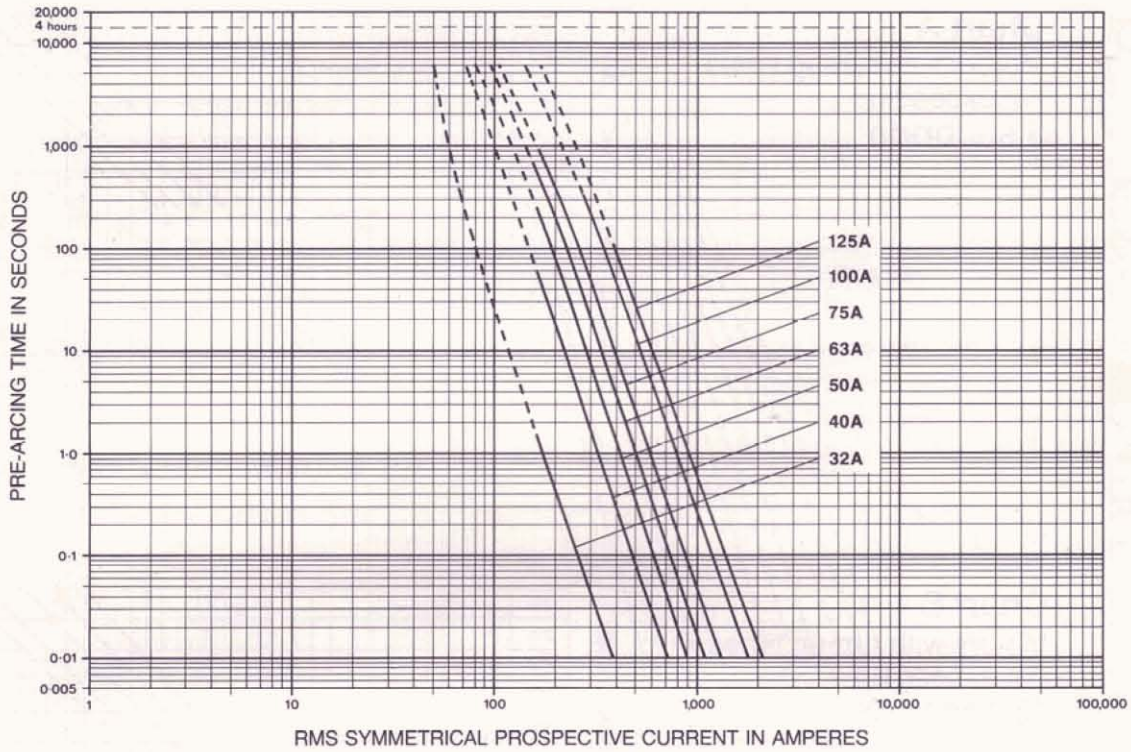


Chart C

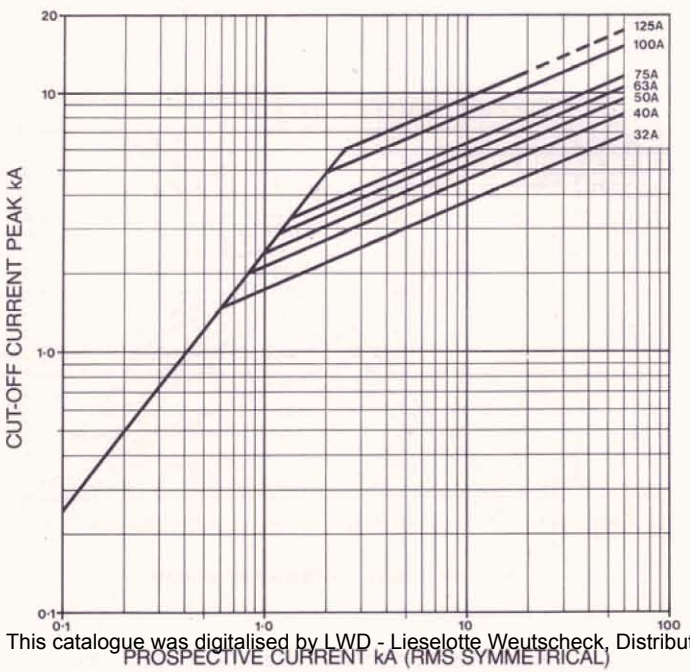
Motors with run-up times not exceeding **60 seconds**



Type K81EAX
Time/Current Characteristics
32-125 Amp



Type K81EAX
Cut-off Current Characteristics
32-125 Amp



Type K81EAX
I^2t Characteristics
32-125 Amp

Current rating	Pre-arcing I^2t	Total I^2t
Amp	A^2 sec x 10^3	A^2 sec x 10^3
32	0.8	4.8
40	2.75	17.0
50	4.3	27.0
63	6.4	40.0
75	8.6	52.0
100	19.0	110.0
125	26.0	290.0

Type K81EAX Selection Charts 32-125 Amp

Chart A

Motors with run-up times not exceeding **6 seconds**

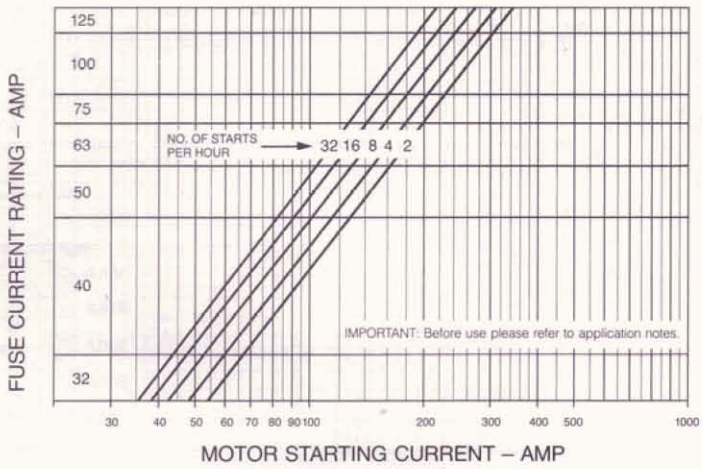


Chart B

Motors with run-up times not exceeding **15 seconds**

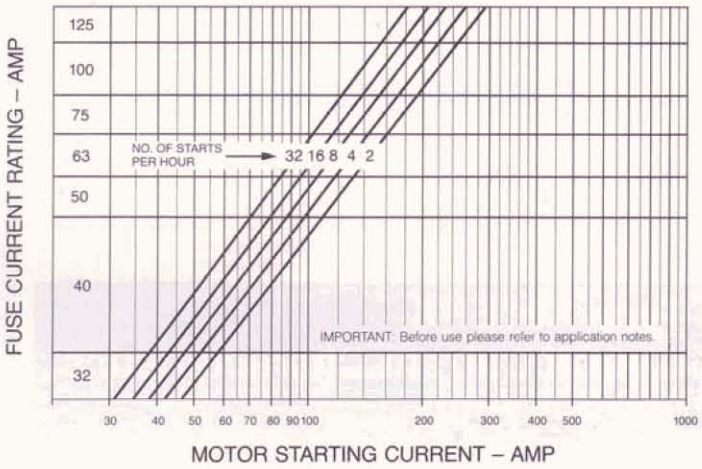
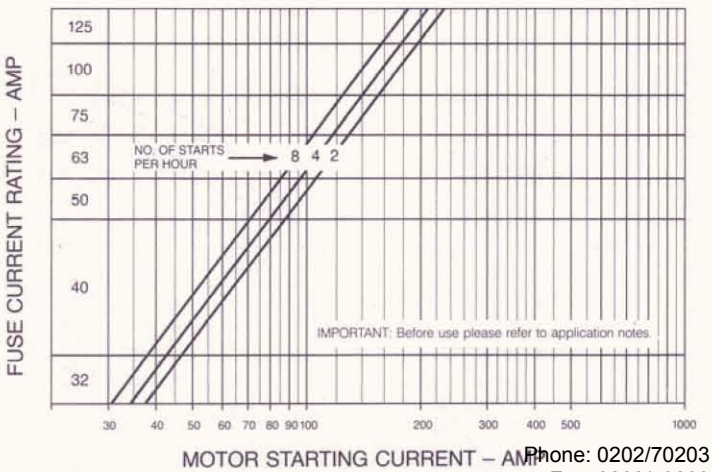
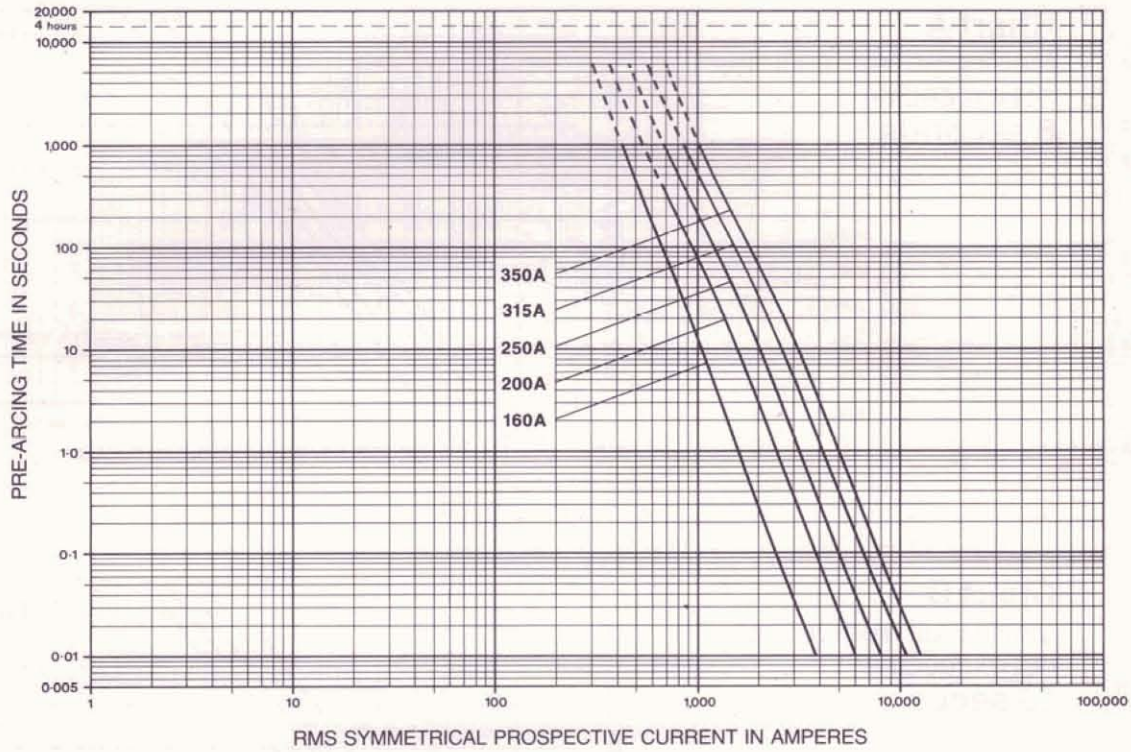


Chart C

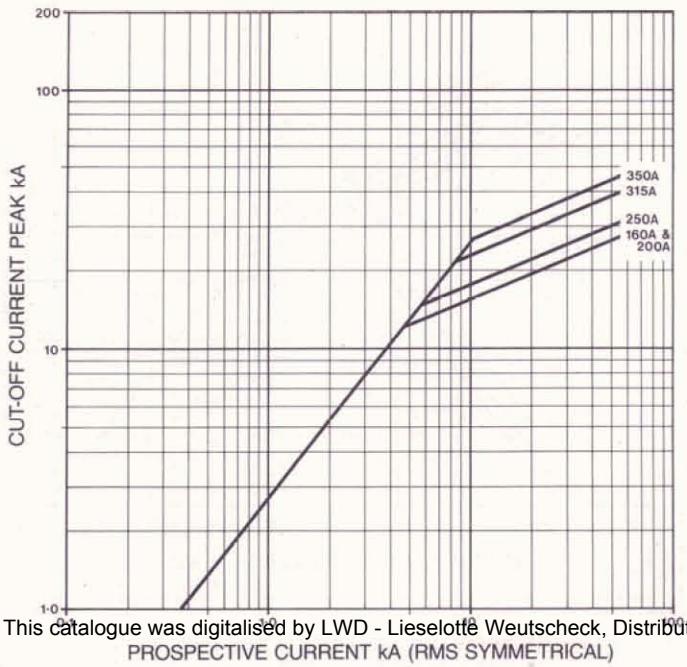
Motors with run-up times not exceeding **60 seconds**



Type K81ERX
Time/Current Characteristics
160-350 Amp



Type K81ERX
Cut-off Current Characteristics
160-350 Amp



Type K81ERX
I^2t Values
160-350 Amp

Current rating	Pre-arcing I^2t	Total I^2t
Amp	A^2 sec x 10^3	A^2 sec x 10^3
160	85.0	1250.0
200	190.0	1350.0
250	300.0	2000.0
315	540.0	3100.0
350	850.0	4500.0

Type K81ERX Selection Charts 160-350 Amp

Chart A
Motors with run-up times not exceeding
6 seconds

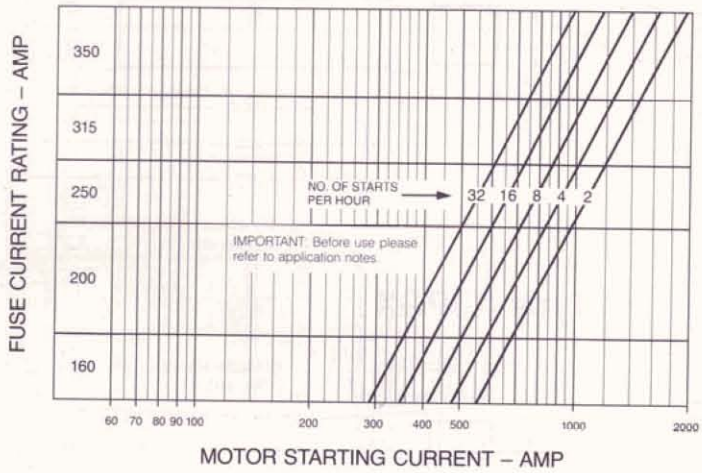


Chart B
Motors with run-up times not exceeding
15 seconds

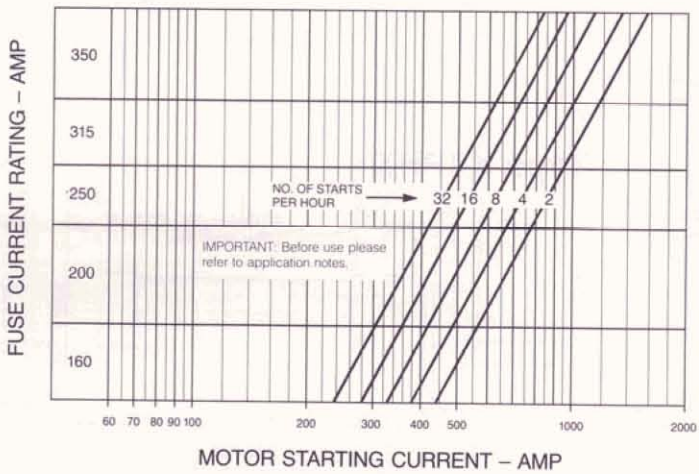
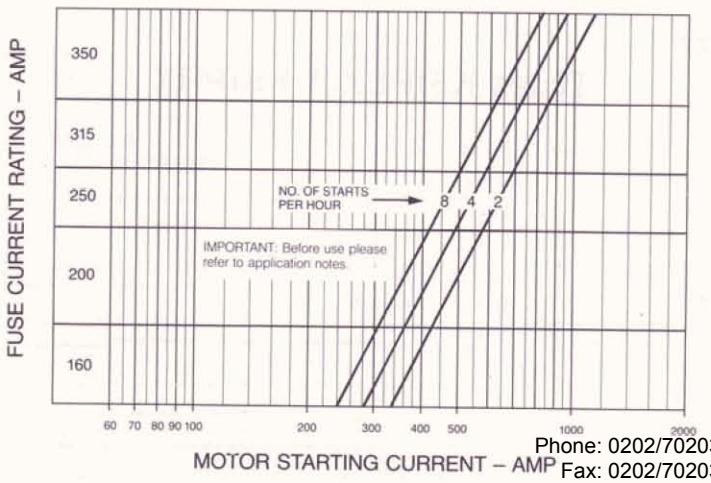
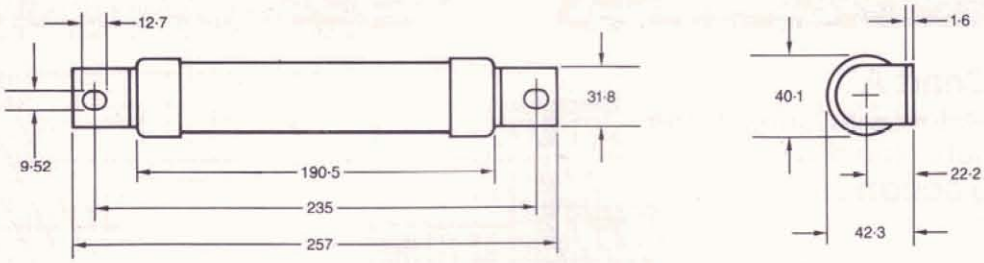


Chart C
Motors with run-up times not exceeding
60 seconds

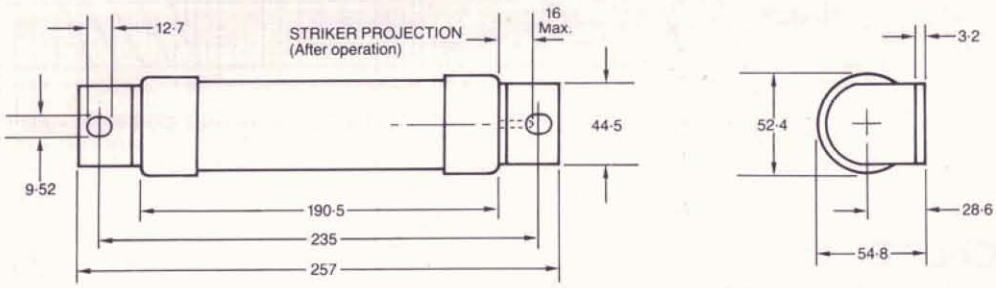


Dimensions in millimetres

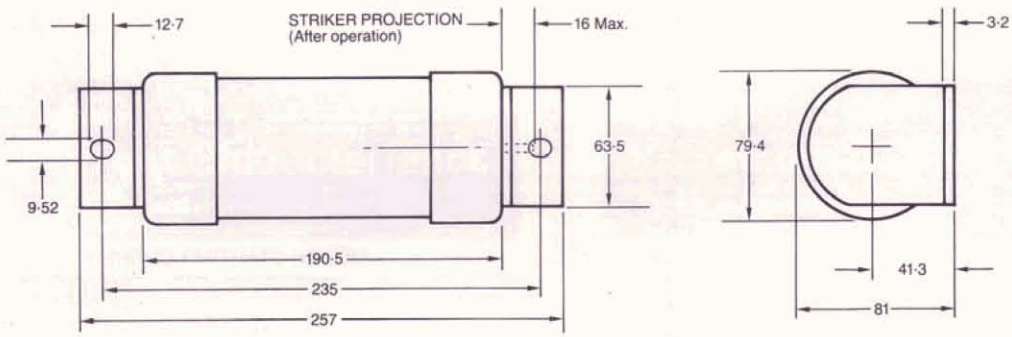
Type K2PA



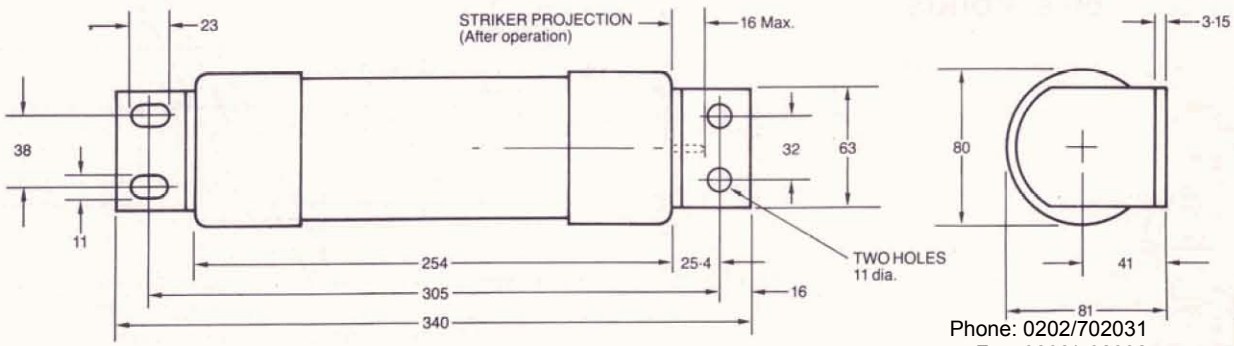
Type K3PGX



Type K4PHX

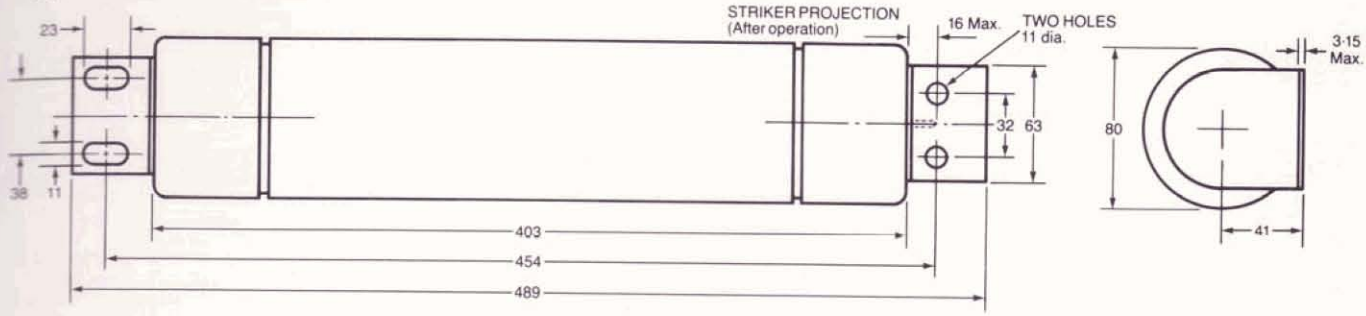


Types K81PEX & K81PRX

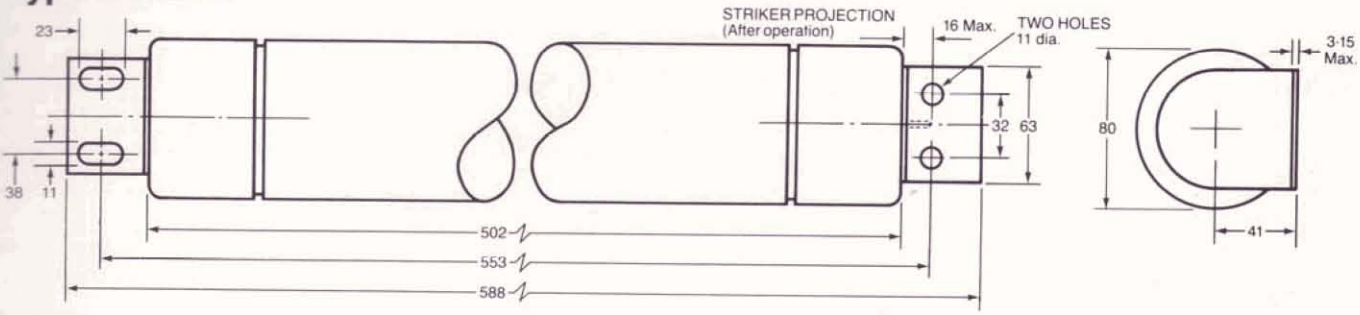


Dimensions in millimetres

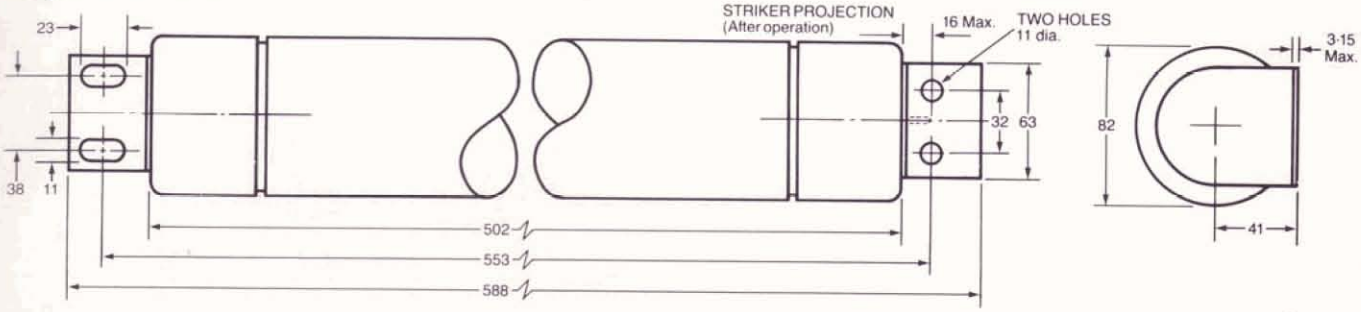
Type K81SDX



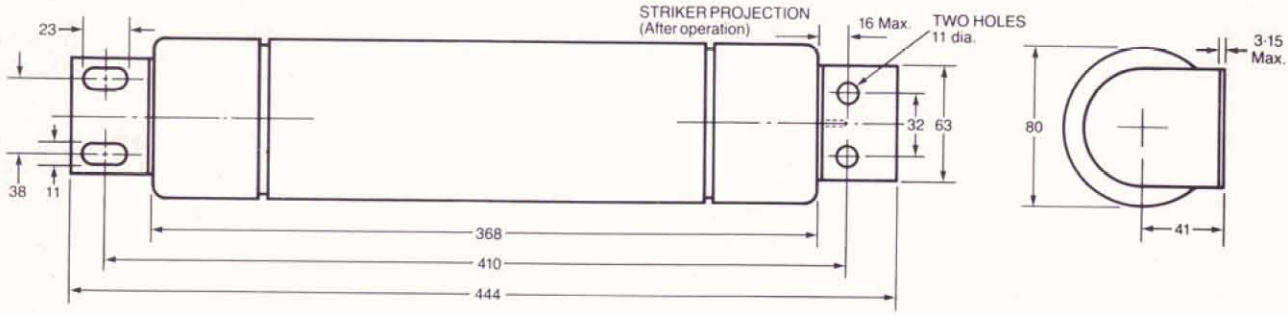
Type K81SVX



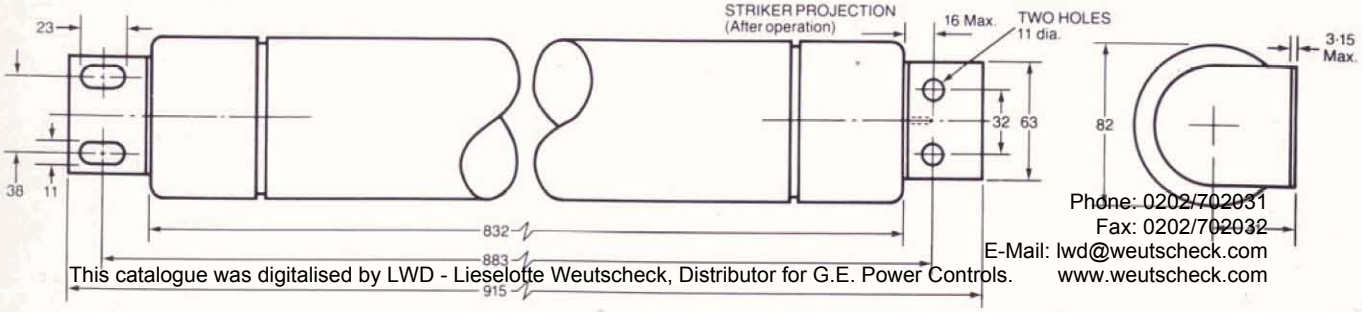
Type K81SRX



Type K81EAX



Type K81ERX



Non-Standard Dimensions

Dimensions in millimetres

Type 'K' fuses with alternative fixings for use in air on motor branch circuits and general applications.
Characteristics and further details available on request.

Rating kV	Rating Amp	List number	Fig. No.
12	10	K5EAX10	1
	25	K5EAX25	
	40	K5EAX40	
	50	K5EAX50	
	60	K5EAX60	
	75	K5EAX75	
	100	K5EAX100	
7.2	150	K5SAX150	1
12	15*	K16EAX15	2
	20*	K16EAX20	
	25*	K16EAX25	
	30*	K16EAX30	
	45*	K16EAX45	
	50*	K16EAX50	
	60*	K16EAX60	
	70*	K16EAX70	
	85*	K16EAX85	
	100*	K16EAX100	

Rating kV	Rating Amp	List number	Fig. No.
7.2	135*	K16SAX135	2
3.6	100	K24PGX100	3
5.5	400	K81DDX400	4
7.2	100	KSCX100	5
	125	KSCX125	
	160	KSCX160	
	200	KSCX200	
7.2	300	KSCX300	6
	350	KSCX350	

** These fuse links are for use in ring main units and are assigned with in-unit air ratings.*
Larger current ratings in K81 motor circuit ranges can be achieved by mounting fuse links in parallel. i.e. 2 - K81DDX400 in parallel=710 Amps.
Application details available upon request.

Figure 1

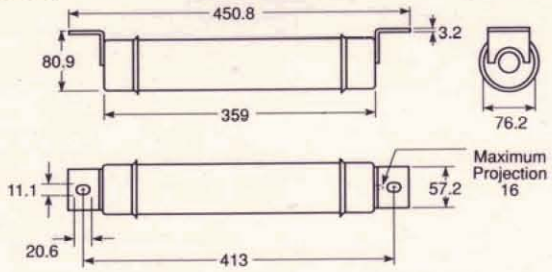


Figure 2

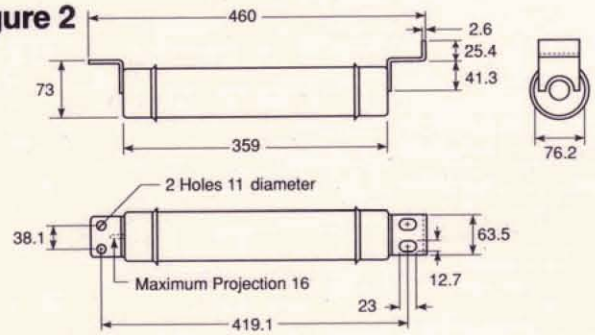


Figure 3

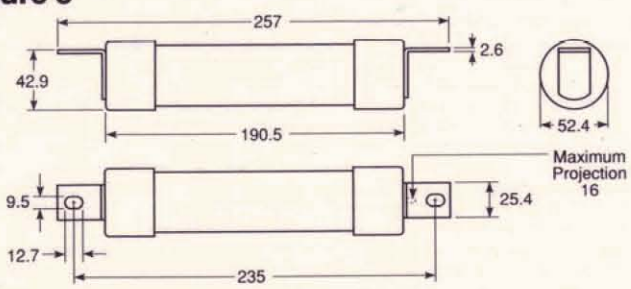


Figure 4

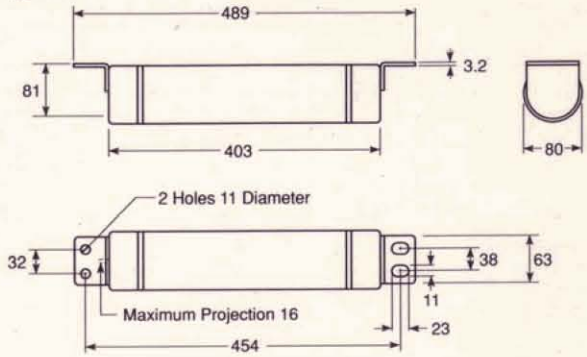


Figure 5

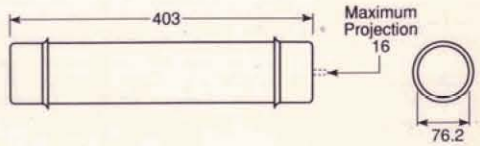
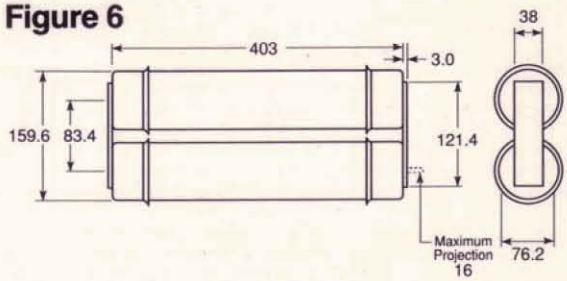


Figure 6



GEC ALSTHOM

GEC ALSTHOM INSTALLATION EQUIPMENT LIMITED
East Lancashire Road/Liverpool L10 5HB/England
Telephone 051-525 8371/Telex 627324 FGEAR G/FAX 051-523-7087

Note: The Company's policy is one of continuous development and improvement of its products and therefore the right is reserved to supply products which may differ from those described in this publication.

 Publication IEF/487 Printed in England 129050 SB