Medium voltage fuses

Ferraz Shawmut

European Fuses
DIN Fuses
7.2kV - 36kV

IBD
7.2 UP TO 36 KV

HIGH-VOLTAGE FUSES DESIGNED FOR POWER TRANSFORMER PROTECTION

INTERIOR/EXTERIOR USE
CERAMIC HOUSING

"MEDIUM" CLASS TRIP-INDICATOR

COMBINED WITH A LOWERED MINIMUM BREAKING CURRENT

COMPLIES WITH IEC 282-1, DIN 43625 AND VDE 0670/4 RECOMMENDATIONS

COMPLIES WITH APPLICATION RULES OF IEC PUBLICATION 787

Presentation

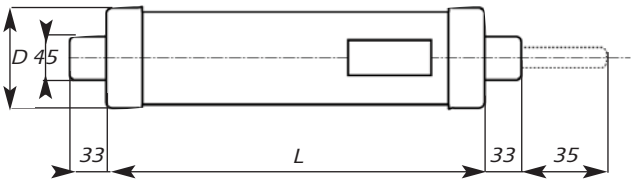
IBD fuses are designed for the protection of HV/LV distribution transformers. The fuse technology is known as "enclosed" melting. It ensures against any visible evidence of the fuse during its operation.
The main features include:

- enameled ceramic housing
- nickle-plated brass end caps
- solid silver fuse elements
- waterproof system for outdoor use.

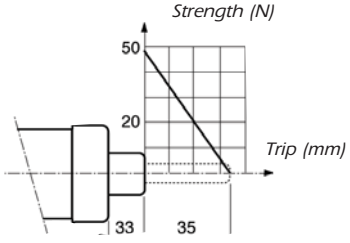
IBD fuses satisfy existing operational constraints for electric networks.

Their characteristics are based on operation at ambient temperatures ranging from -25°c to +40°c, and a maximum altitude of 1000 meters.

Dimensions (mm)



Trip indicator features



European Fuses
DIN Fuses
7.2kV - 36kV

Main characteristics

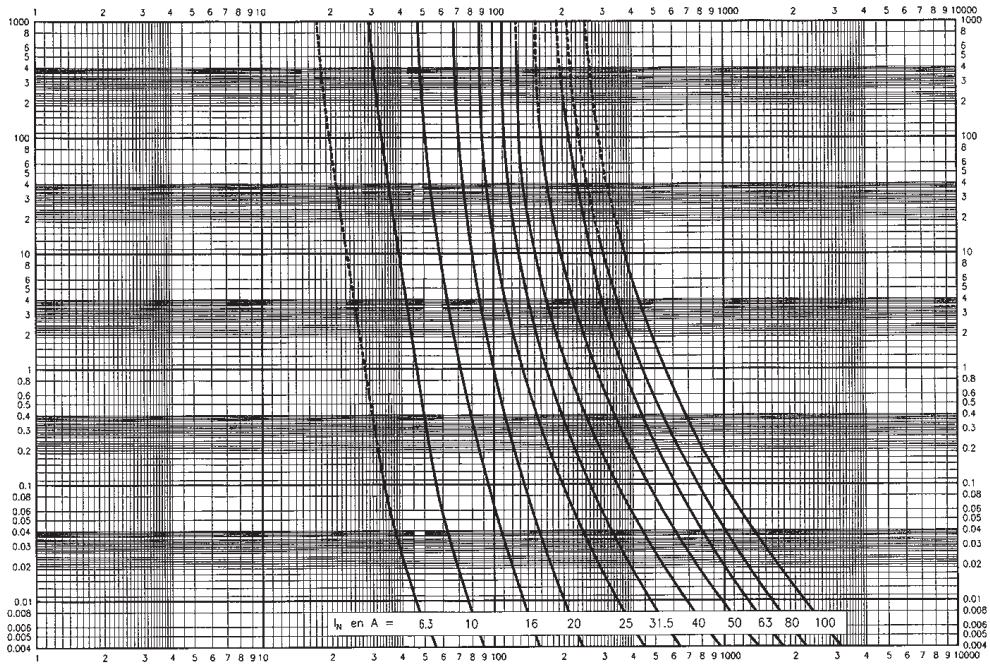
Rated voltage Un (Kv)	Rated current In (A)	Dimensions L (mm)	Dimensions D (mm)	Ref. Number	Minimum breaking current (A)	Breaking capacity (KA)	Maximum breaking voltage (Kv)	Power losses @ In (W)	Total I²t @ Un (103A2S)	Weight (kg)	Catalog number
3/7.2	6.3	192	D1 = 53	S209293	31	25	23	3.5	0.9	1.1	45DIN72V6,3P
	10			T209294	20	50	23	8.9	1.82	1.1	45DIN72V10P
	16			V209295	35	50	23	15	8.3	1.1	45DIN72V16P
	20			W209296	52	50	23	15	11	1.1	45DIN72V20P
	25			X209297	76	50	23	16	14	1.1	45DIN72V25P
	31.5			Y209298	102	50	23	20	19	1.1	45DIN72V31,5P
	40			Z209299	128	50	23	28	25	1.1	45DIN72V40P
	50		D2 = 73	A209300	159	50	23	29	48	1.8	45DIN72V50P
	63			B209301	210	50	23	35	60	1.8	45DIN72V63P
	80			C209302	280	25	23	53	160	1.8	45DIN72V80P
	100			D209303	350	25	23	67	205	1.8	45DIN72V100P
6/12	6.3	292	D1 = 53	F209305	31	25	37	12	0.9	1.6	45DIN120V6,3P
	10			G209306	20	50	37	19	1.82	1.6	45DIN120V10P
	16			H209307	34	50	37	27	8.3	1.6	45DIN120V16P
	20			J209308	51	50	37	28	11	1.6	45DIN120V20P
	25			K209309	76	50	37	29	14	1.6	45DIN120V25P
	31.5			L209310	101	50	37	36	19	1.6	45DIN120V31,5P
	40			M209311	125	50	37	50	25	1.6	45DIN120V40P
	50		D2 = 73	N209312	159	50	37	52	48	2.6	45DIN120V50P
	63			P209313	210	50	37	64	60	2.6	45DIN120V63P
	80			Q209314	290	25	37	115	160	2.6	45DIN120V80P
	100			R209315	350	25	37	120	205	2.6	45DIN120V100P
10/17.5	6.3	292	D1 = 53	T209317	31	25	55	14	4.5	1.6	45DIN175V6,3P
	10			V209318	20	50	55	30	22	1.6	45DIN175V10P
	16			W209319	35	50	55	40	28	1.6	45DIN175V16P
	20			X209320	52	50	55	42	31	1.6	45DIN175V20P
	25			Y209321	78	50	55	45	34	1.6	45DIN175V25P
	31.5			Z209322	104	50	55	55	39	1.6	45DIN175V31,5P
	40			A209323	125	50	55	82	42	1.6	45DIN175V40P
	50		D3 = 87	N220099*							45AL175V50P-2
	63			J220164*							45AL175V63P-2
	80			V202671*							45AL175V80P-2
	80	442	D3 = 87	D220458*							45AL175V80P-3
	100			H220186*							45AL175V100P-3
	125			K082027*	680	50	40	69	290	5,3	45AL175V125P-3
10/24	6.3	442	D1 = 53	S209339	31	25	70	20	4.5	2.3	45DIN240V6,3P
	10			T209340	20	50	70	42	22	2.3	45DIN240V10P
	16			V209341	35	50	70	57	28	2.3	45DIN240V16P
	20			W209342	52	50	70	60	31	2.3	45DIN240V20P
	25			X209343	78	50	70	64	34	2.3	45DIN240V25P
	31.5			Y209344	104	50	70	77	39	2.3	45DIN240V31,5P
	40			Z209345	128	50	70	115	42	2.3	45DIN240V40P
	50		D2=73	A209346	150	50	70	118	50	2.3	45DIN240V50P
	63			B209347	200	50	70	140	107	3.9	45DIN240V63P
	80		D3=87	H082186*	350	40	56	76	98	5,3	45AL240V80P-3
	100			T220541*							45AL240V100P-3
	50	537	D2=73	M209357	150	50	70	108	50	4.6	45DIN240V50P-4
	63			N209358	200	50	70	130	107	4.6	45DIN240V63P-4
	80		D3=87	M082190*	350	40	56	73	98	6,4	45AL240V80P-4
	100			N082191*	460	40	56	78	165	6,4	45AL240V100P-4
	125			P082192*	480	40	56	93	210	6,4	45AL240V125P-4
20/36	6.3	537	D1 = 53	S209362	31	25	106	32	0.9	2.7	45DIN360V6,3P
	10			T209363	22	40	106	55	1.82	2.7	45DIN360V10P
	16			V209364	38	40	106	82	8.3	2.7	45DIN360V16P
	20			W209365	57	40	106	85	11	2.7	45DIN360V20P
	25			X209366	85	40	106	87	14	2.7	45DIN360V25P
	31.5		D2=73	Y209367	102	40	106	125	19	4.6	45DIN360V31,5P
	40			Z209368	135	40	106	164	25	4.6	45DIN360V40P

** For indoor use only*

European Fuses
DIN Fuses
7.2kV - 36kV

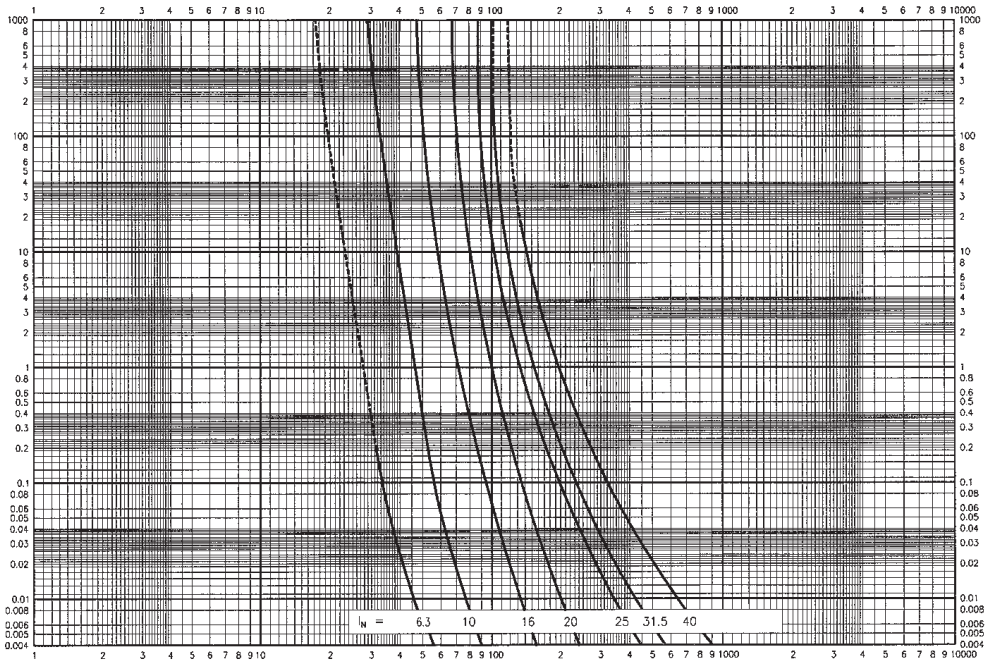
Main characteristics

Time vs. current characteristics



7.2 Kv
12 Kv
17.5 Kv
24 Kv

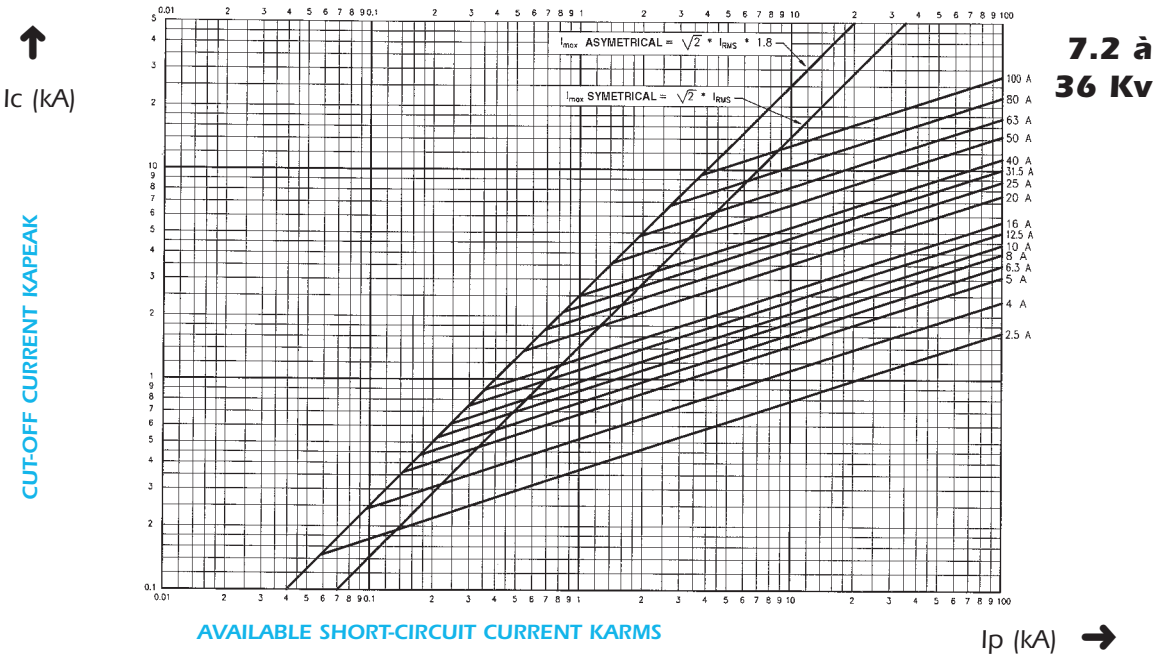
Time vs. current characteristics



36 Kv

European Fuses
DIN Fuses
7.2kV - 36kV

Cut-off current characteristics



7.2 à 36 Kv

Selection guide

The selection of fuses for the protection of HV/LV transformers must take into account:

a) transient currents occuring in the installation when the transformer power is switched on

b) overload currents related to normal operation of the transformer and liable to cause premature agin.

As a rule of thumb:
Fuse rating Δ 1.7 x transformer rated current

This relationship is given for an ambient temperature not exceeding 40°c. Beyond this, a derating factor A1 must be used

$$A1 = \sqrt{\frac{120-\theta}{80}}$$

with q = ambient temperature in °c.

E.g., a 40A rated fuse installed under 60°c ambient must be treated as a 34A rated fuse.

$$A1 = \sqrt{\frac{120-60}{80}} = 0.86$$

The table, opposite, may also be used. It has been computed using peak transient currents from 8 to 15 times the transformer current rating and a 130 % overload rate.

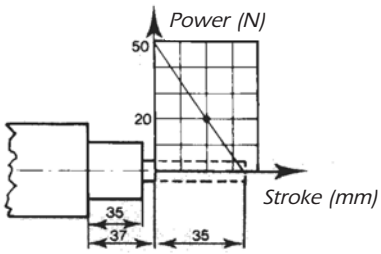
Using this table also means applying the temperature derating factor A1 to the selected rating when ambient exceeds 40°c in the fuse environment.

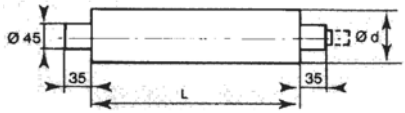
Transformer power (kVA)	Operating voltage (kV)							
	3.3	5/5.5	6/6.6	10/11	13.8	15	20/22	30/33
25	16	10	10	6.3	6.3	6.3	6.3	6.3
50	25	16	16	10	10	10	6.3	6.3
63	25	20	20	16	10	10	6.3	6.3
80	31.5	25	25	16	16	10	10	6.3
100	40	31.5	25	20	16	16	10	6.3
125	50	31.5	31.5	25	16	16	16	10
160	50	40	31.5	25	20	16	16	10
200	63	50	40	31.5	20	20	16	16
250	80	63	50	40	25	25	20	16
315	100	100	63	50	31.5	25	25	16
400	–	100	80	63	40	31.5	25	20
500	–	–	100	63	50	40	31.5	25
630	–	–	–	80	50	50	40	31.5
800	–	–	–	100	63	63	50	31.5
1000	–	–	–	–	80	80	50	40
1250	–	–	–	–	100	100	63	–
1600	–	–	–	–	–	–	80	–
2000	–	–	–	–	–	–	100	–

European Fuses
DIN Fuses for Motor
3.6kV to 12kV - Type aSJB/D

According to standard IEC 2.82.1, DIN 43625 and IEC application requirements Publication 644

Characteristics of trip-indicators



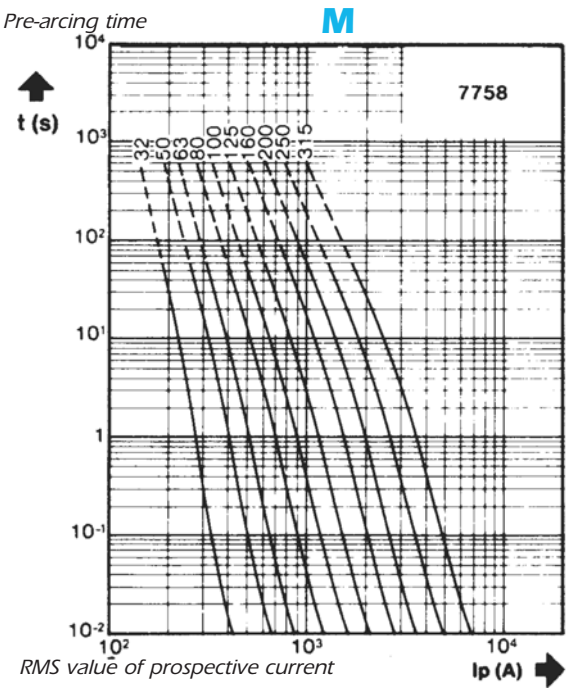


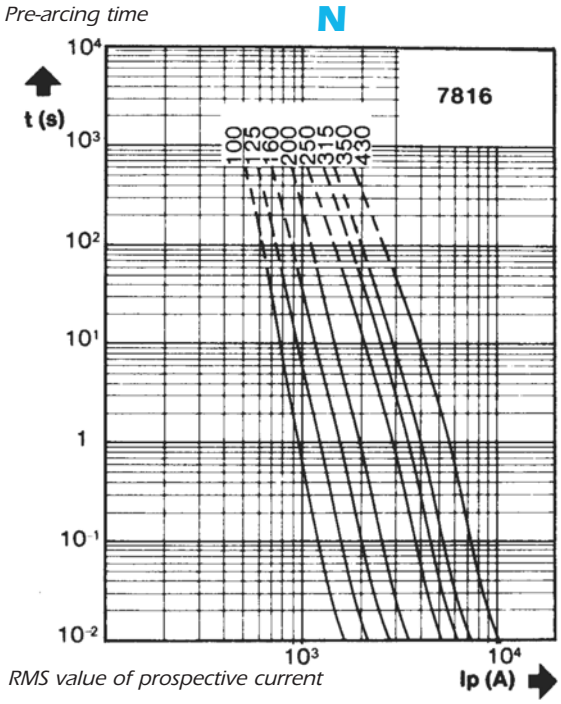
Rated Voltage (kV)	L (mm)	Rating I_n (A)	Designation	Reference Number	Diameter (mm)	Weight (Kg)	Catalog Number
3,6	192	32	369 P CP aSJB 45/50,8x192 32	S076468	50,8	1,0	45ASB36V32P-1
		50	369 P CP aSJB 45/50,8x192 50	T076469	50,8	1,0	45ASB36V50P-1
		63	369 P CP aSJB 45/50,8x192 63	V076470	50,8	1,0	45ASB36V63P-1
		80	369 P CP aSJB 45/50,8x192 80	W076471	50,8	1,0	45ASB36V80P-1
		100	369 P CP aSJB 45/50,8x192 100	X076472	50,8	1,0	45ASB36V100P-1
		125	369 P CP aSJB 45/50,8x192 125	Y076473	50,8	1,0	45ASB36V125P-1
		160	369 P CP aSJB 45/67x192 160	Z076474	67	1,7	45ASB36V160P-1
		200	369 P CP aSJB 45/67x192 200	A076475	67	1,7	45ASB36V200P-1
		250	369 P CP aSJB 45/76x192 250	B076476	76	2,2	45ASB36V250P-1
		315	369 P CP aSJB 45/90x192 315	C076477	88	3,0	45ASB36V315P-1
	292	100	369 P CP aSJB 45/50,8x292 100	N075521	50,8	1,6	45ASB36V100P-2
		125	369 P CP aSJB 45/50,8x292 125	P075522	50,8	1,6	45ASB36V125P-2
		160	369 P CP aSJB 45/50,8x292 160	Q075523	50,8	1,6	45ASB36V160P-2
		200	369 P CP aSJB 45/67x292 200	R075524	67	2,5	45ASB36V200P-2
		250	369 P CP aSJB 45/67x292 250	S075525	67	2,5	45ASB36V250P-2
		315	369 P CP aSJB 45/76x292 315	E075582	76	3,2	45ASB36V315P-2
		350	369 P CP aSJB 45/76x292 350	F075583	76	3,2	45ASB36V350P-2
		430	369 P CP aSJB 45/90x292 430	G075584	88	4,3	45ASB36V430P-2
7,2	292	32	729 P CP aSJB 45/50,8x292 32	J078162	50,8	1,6	45ASB72V32P-2
		50	729 P CP aSJB 45/50,8x292 50	K078163	50,8	1,6	45ASB72V50P-2
		63	729 P CP aSJB 45/50,8x292 63	L078164	50,8	1,6	45ASB72V63P-2
		80	729 P CP aSJB 45/50,8x292 80	M078165	50,8	1,6	45ASB72V80P-2
		100	729 P CP aSJB 45/50,8x292 100	N078166	50,8	1,6	45ASB72V100P-2
		125	729 P CP aSJB 45/67x292 125	P078167	67	2,5	45ASB72V125P-2
		160	729 P CP aSJB 45/67x292 160	Q078168	67	2,5	45ASB72V160P-2
		200	729 P CP aSJB 45/90x292 200	H093709	88	4,3	45ASB72V200P-2
		250	729 P CP aSJB 45/90x292 250	R078169	88	4,3	45ASB72V250P-2
	442	100	729 P CP aSJB 45/50,8x442 100	Y085581	50,8	2,8	45ASD72V100P-3
		125	729 P CP aSJB 45/50,8x442 125	Z085582	50,8	2,8	45ASD72V125P-3
		160	729 P CP aSJB 45/50,8x442 160	A085583	50,8	2,8	45ASD72V160P-3
		200	729 P CP aSJB 45/76x442 200	Q085620	76	4,8	45ASD72V200P-3
		250	729 P CP aSJB 45/76x442 250	R085621	76	4,8	45ASD72V250P-3
		315	729 P CP aSJB 45/90x442 315	S085622	88	6,8	45ASD72V315P-3
		400	729 P CP aSJB 45/90x442 400	V085624	88	6,8	45ASD72V400P-3
12	442	32	1209 P CP aSJB 45/50,8x442 32	D076478	50,8	2,8	45ASB120V32P-3
		50	1209 P CP aSJB 45/50,8x442 50	E076479	50,8	2,8	45ASB120V50P-3
		63	1209 P CP aSJB 45/50,8x442 63	F076480	50,8	2,8	45ASB120V63P-3
		80	1209 P CP aSJB 45/50,8x442 80	G076481	50,8	2,8	45ASB120V80P-3
		100	1209 P CP aSJB 45/50,8x442 100	H076482	50,8	2,8	45ASB120V100P-3
		125	1209 P CP aSJB 45/67x442 125	J076483	67	3,7	45ASB120V125P-3
		160	1209 P CP aSJB 45/67x442 160	K076484	67	3,7	45ASB120V160P-3
		200	1209 P CP aSJB 45/76x442 200	L076485	76	5,5	45ASB120V200P-3
		250	1209 P CP aSJB 45/90x442 250	M076486	88	6,2	45ASB120V250P-3

Note: These fuses are systematically equipped with a trip-indicator

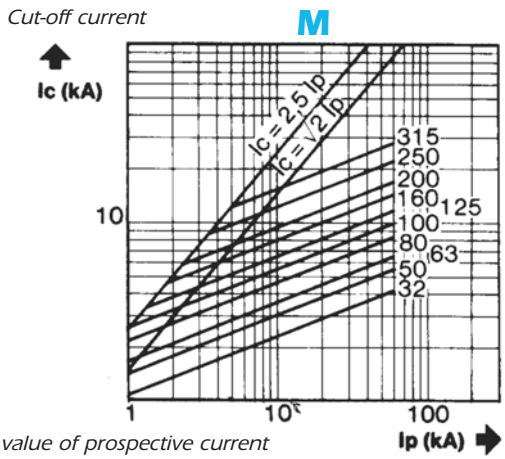
European Fuses
DIN Fuses for Motor
3.6kV to 12kV - Type aSJB/D

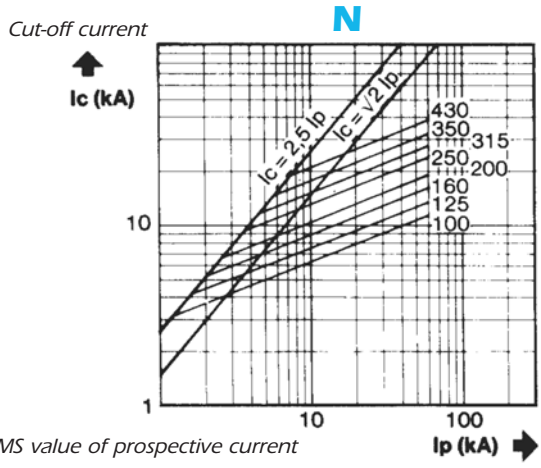
Times vs. current characteristics





Cut-off characteristics



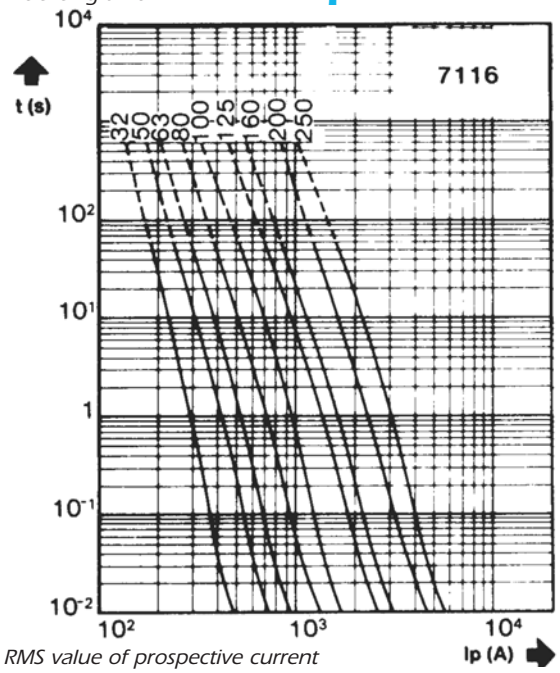


Rated Voltage (kV)	L (mm)	Rating I_n	Breaking Capacity (kA)	Peak arc Voltage (kV)	Minimum Breaking Current (A)	Power dissipation for 0,7 I_n (W)	Total operating I^2t at the rated voltage (10^3 A^2S)
3,6	192 M	32	60	6,8	180	6	4
		50	60	6,8	260	9	9
		63	60	6,8	310	11	15
		80	60	6,8	400	13	35
		100	60	6,8	490	15	60
		125	60	6,8	600	20	95
		160	60	6,8	800	27	160
		200	60	6,8	1000	32	340
		250	60	6,8	1200	35	540
		315	60	6,8	1600	41	1000
	292 N	100	60	6,8	700	16	88
		125	60	6,8	830	20	160
		160	60	6,8	1000	27	280
		200	60	6,8	1250	33	370
		250	60	6,8	1750	37	720
		315	60	6,8	2100	45	1200
		350	60	6,8	2400	47	1700
		430	60	6,8	3300	51	3200

European Fuses
DIN Fuses for Motor
3.6kV to 12kV - Type aSJB/D

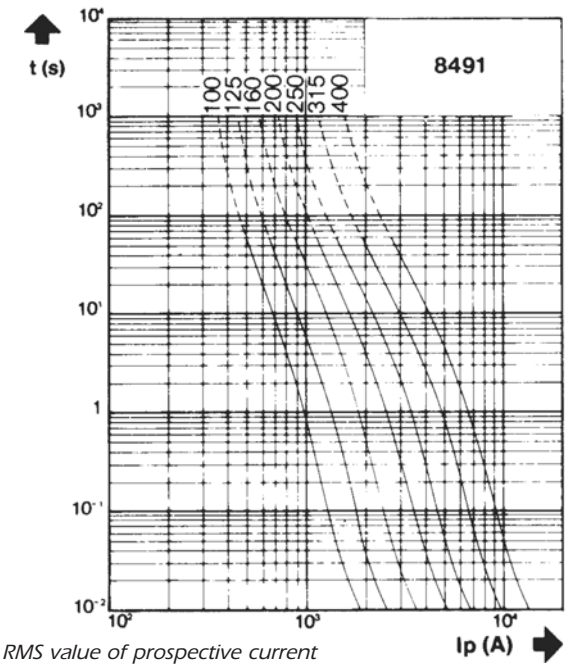
Times vs. current characteristics

Pre-arcing time **P**



RMS value of prospective current

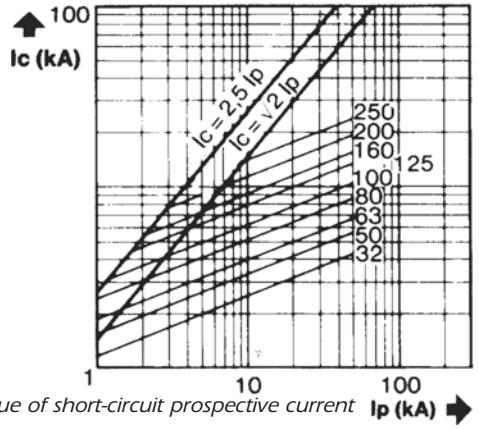
Pre-arcing time **Q**



RMS value of prospective current

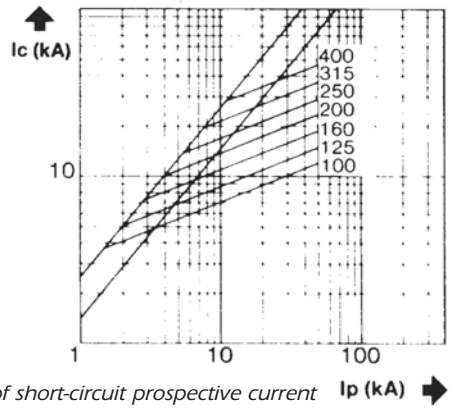
Cut-off characteristics

Cut-off current **P**



RMS value of short-circuit prospective current

Cut-off current **Q**



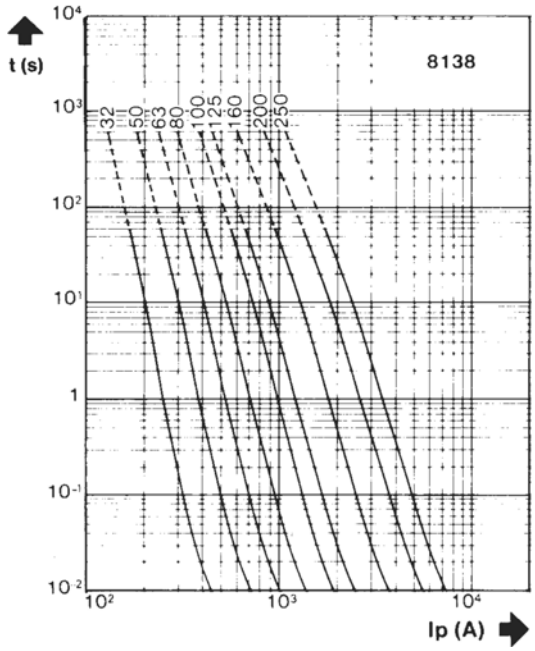
RMS value of short-circuit prospective current

Rated Voltage (kV)	L (mm)	Rating I_n	Breaking Capacity (kA)	Peak arc Voltage (kV)	Minimum Breaking Current (A)	Power dissipation for 0,7 I_n (W)	Total operating I^2t at the rated voltage (10^3 A^2S)
7,2	292 P	32	50	13	180	10	7
		50	50	13	220	14	16
		63	50	13	300	18	26
		80	50	13	380	20	60
		100	50	13	510	25	105
		125	50	13	700	29	195
		160	50	13	840	37	340
		200	50	13	1200	41	650
		250	50	13	1600	49	1100
	442 Q	100	50	15	500	30	78
		125	50	15	630	37	150
		160	50	15	880	41	290
		200	50	15	1100	47	560
		250	50	15	1400	52	1000
		315	50	15	1900	60	2000
		400	50	15	2700	69	4100

European Fuses
DIN Fuses for Motor
3.6kV to 12kV - Type aSJB/D

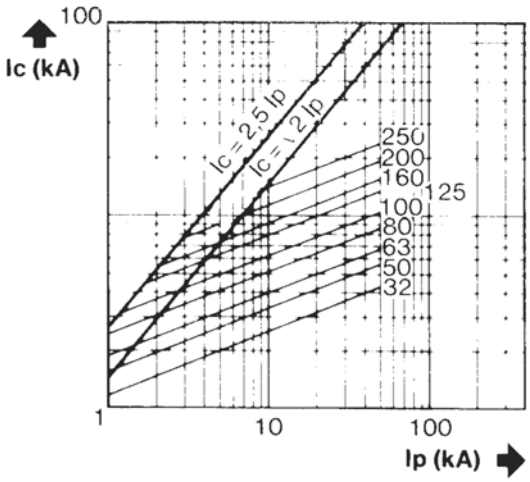
Times vs. current characteristics

Pre-arcing time **R**



RMS value of prospective current

Cut-off current **R**



RMS value of prospective current

Rated Voltage (kV)	L (mm)	Rating I_n	Breaking Capacity (kA)	Peak arc Voltage (kV)	Minimum Breaking Current (A)	Power dissipation for 0,7 I_n (W)	Total operating I^2t at the rated voltage (10^3 A^2S)
12	442 R	32	50	20	160	21	5
		50	50	20	240	31	12
		63	50	20	310	35	24
		80	50	20	410	41	48
		100	50	20	560	45	85
		125	50	20	650	53	150
		160	50	20	930	55	320
		200	50	20	1300	62	720
		250	50	20	1800	74	1280

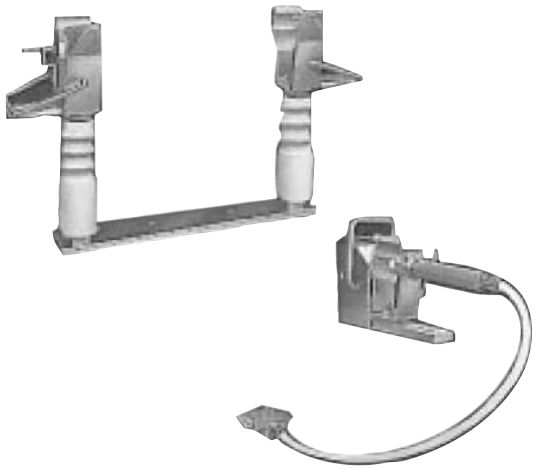
European Fuses
DIN Fuses for Motor
3.6kV to 12kV - Type aSJB/D

Use of motor fuses

Motor				Fuses Run up time							
kW	CV - HP	Operating voltage (kV)	Rated voltage (kV)	6		10		15		30	
70	95	3	3,6	45 x 192	32	45 x 192	32	45 x 192	32	45 x 192	50
		3,3	3,6	45 x 192	32	45 x 192	32	45 x 192	32	45 x 192	32
100	136	3	3,6	45 x 192	50	45 x 192	50	45 x 192	50	45 x 192	63
		3,3	3,6	45 x 192	50	45 x 192	50	45 x 192	50	45 x 192	50
		5,5	7,2	45 x 292	32	45 x 292	32	45 x 292	32	45 x 292	32
130	177	3	3,6	45 x 192	63	45 x 192	63	45 x 192	63	45 x 192	80
		3,3	3,6	45 x 192	63	45 x 192	63	45 x 192	63	45 x 192	80
		5,5	7,2	45 x 292	32	45 x 292	32	45 x 292	32	45 x 292	50
		6	7,2	45 x 292	32	45 x 292	32	45 x 292	32	45 x 292	32
180	245	3	3,6	45 x 192	80	45 x 292	80	45 x 192	100	45 x 192	100
		3,3	3,6	45 x 192	80	45 x 292	80	45 x 192	80	45 x 192	100
		5,5	7,2	45 x 292	50	45 x 292	50	45 x 292	50	45 x 292	63
		6	7,2	45 x 292	50	45 x 292	50	45 x 292	50	45 x 292	63
		6,6	7,2	45 x 292	32	45 x 292	50	45 x 292	50	45 x 292	50
220	300	3	3,6	45 x 192	100	45 x 192	100	45 x 192	125	45 x 192	125
		3,3	3,6	45 x 192	100	45 x 192	100	45 x 192	100	45 x 192	125
		5,5	7,2	45 x 292	63	45 x 292	63	45 x 292	63	45 x 292	80
		6	7,2	45 x 292	50	45 x 292	63	45 x 292	63	45 x 292	80
		6,6	7,2	45 x 292	50	45 x 292	50	45 x 292	63	45 x 292	63
250	340	3	3,6	45 x 192	100	45 x 192	125	45 x 192	125	45 x 192	160
		3,3	3,6	45 x 192	100	45 x 192	100	45 x 192	125	45 x 192	125
		5,5	7,2	45 x 292	63	45 x 292	80	45 x 292	80	45 x 292	80
		6	7,2	45 x 292	63	45 x 292	63	45 x 292	80	45 x 292	80
		6,6	7,2	45 x 292	63	45 x 292	63	45 x 292	63	45 x 292	80
		10	12	45 x 442	32	45 x 442	50	45 x 442	50	45 x 442	50
		11	12	45 x 442	32	45 x 442	32	45 x 442	50	45 x 442	50
315	430	3	3,6	45 x 192	160	45 x 192	160	45 x 192	160	45 x 192	200
		3,3	3,6	45 x 192	125	45 x 192	125	45 x 192	160	45 x 192	160
		5,5	7,2	45 x 292	80	45 x 292	80	45 x 292	80	45 x 292	100
		6	7,2	45 x 292	80	45 x 292	80	45 x 292	80	45 x 292	80
		6,6	7,2	45 x 292	80	45 x 292	80	45 x 292	80	45 x 292	80
		10	12	45 x 442	50	45 x 442	50	45 x 442	50	45 x 442	63
		11	12	45 x 442	50	45 x 442	50	45 x 442	50	45 x 442	50
420	570	3	3,6	45 x 192	160	45 x 192	200	45 x 192	200	45 x 192	250
		3,3	3,6	45 x 192	160	45 x 192	200	45 x 192	200	45 x 192	250
		5,5	7,2	45 x 292	100	45 x 292	100	45 x 292	125	45 x 292	125
		6	7,2	45 x 292	80	45 x 292	100	45 x 292	100	45 x 292	125
		6,6	7,2	45 x 292	80	45 x 292	80	45 x 292	100	45 x 292	125
		10	12	45 x 442	63	45 x 442	63	45 x 442	63	45 x 442	80
		11	12	45 x 442	63	45 x 442	63	45 x 442	63	45 x 442	63
560	760	3	3,6	45 x 192	250	45 x 192	250	45 x 192	250	45 x 192	315
		3,3	3,6	45 x 192	200	45 x 192	250	45 x 192	250	45 x 192	315
		5,5	7,2	45 x 292	125	45 x 292	125	45 x 292	160	45 x 292	160
		6	7,2	45 x 292	125	45 x 292	125	45 x 292	125	45 x 292	160
		6,6	7,2	45 x 292	100	45 x 292	100	45 x 292	125	45 x 292	160
		10	12	45 x 442	80	45 x 442	80	45 x 442	80	45 x 442	100
		11	12	45 x 442	80	45 x 442	80	45 x 442	80	45 x 442	80
700	950	3	3,6	45 x 192	250	45 x 192	315	45 x 192	315	45 x 292	315
		3,3	3,6	45 x 192	250	45 x 192	250	45 x 192	315	45 x 292	315
		5,5	7,2	45 x 292	160	45 x 292	160	45 x 292	160	45 x 292	200
		6	7,2	45 x 292	125	45 x 292	160	45 x 292	160	45 x 292	200
		6,6	7,2	45 x 292	125	45 x 292	125	45 x 292	160	45 x 292	160
		10	12	45 x 442	100	45 x 442	100	45 x 442	100	45 x 442	125
		11	12	45 x 442	80	45 x 442	100	45 x 442	100	45 x 442	100
1000	1360	3	3,6	45 x 192	350	45 x 292	350	45 x 292	430	45 x 292	430
		3,3	3,6	45 x 192	315	45 x 292	350	45 x 292	350	45 x 292	430
		5,5	7,2	45 x 292	200	45 x 292	200	45 x 292	250	45 x 292	250
		6	7,2	45 x 292	200	45 x 292	200	45 x 292	250	45 x 292	250
		6,6	7,2	45 x 292	200	45 x 292	200	45 x 292	200	45 x 292	250
		10	12	45 x 442	125	45 x 442	125	45 x 442	160	45 x 442	160
		11	12	45 x 442	125	45 x 442	125	45 x 442	125	45 x 442	160
1300	1770	3	3,6	45 x 292	430	45 x 292	430	*2 x 45 x 292	500	*2 x 45 x 292	630
		3,3	3,6	45 x 292	430	45 x 292	430	45 x 292	430	*2 x 45 x 292	630
		5,5	7,2	45 x 292	250	45 x 292	250	45 x 442	315	45 x 442	315
		6	7,2	45 x 292	250	45 x 292	250	45 x 292	250	45 x 442	315
		6,6	7,2	45 x 292	200	45 x 292	250	45 x 292	250	45 x 442	315
		10	12	45 x 442	160	45 x 442	160	45 x 442	160	45 x 442	200
		11	12	45 x 442	160	45 x 442	160	45 x 442	160	45 x 442	200
1600	2175	5,5	7,2	45 x 442	315	45 x 442	315	45 x 442	400	45 x 442	400
		6	7,2	45 x 292	250	45 x 442	315	45 x 442	315	45 x 442	400
		6,6	7,2	45 x 292	250	45 x 292	250	45 x 442	315	45 x 442	400
		10	12	45 x 442	160	45 x 442	200	45 x 442	315	45 x 442	200
		11	12	45 x 442	160	45 x 442	160	45 x 442	200	45 x 442	200
2000	2720	6	7,2	45 x 442	315	45 x 442	400	45 x 442	400	45 x 442	400
		6,6	7,2	45 x 442	315	45 x 442	315	45 x 442	400	45 x 442	400
		10	12	45 x 442	200	45 x 442	200	45 x 442	250	45 x 442	250
		11	12	45 x 442	200	45 x 442	200	45 x 442	200	45 x 442	250
2500	3400	6	7,2	45 x 442	400	45 x 442	400	*2 x 45 x 442	500	*2 x 45 x 442	630
		6,6	7,2	45 x 442	315	45 x 442	400	45 x 442	400	*2 x 45 x 442	630
		10	12	45 x 442	250	45 x 442	250	45 x 442	250	45 x 442	400
		11	12	45 x 442	200	45 x 442	200	45 x 442	250	*2 x 45 x 442	320

The notation 2 x 45 x 292 or 2 cx 45 x 442 indicates that ratings 320 A, 500 A or 600 A consist of two fuses in parallel.
The rating of each fuse body is then 160 A, 250 A or 315 A.

European Fuses
DIN Fuses for Motor
3.6kV to 12kV - Type aSJB/D



Indoor type equipment.
According to standard DIN 43624

Fuse-base

Rated Voltage (kV)	Fuse length L(mm)	Designation	Reference Number	Withstand voltage to earth		Weight (kg)	Catalog Number
				50 Hz - 1 mn (kV RMS)	1,2/50µS (kV peak)		
3,6 / 7,2	192	SI 130 45x192	R091187	27	60	2,6	SI130-45-192
	292	SI 130 45x292	P092818	27	60	2,8	SI130-45-292
	442	SI 130 45x442	Q092819	27	60	3	SI130-45-442
12	442	SI 175 45x442	Q075569	45	95	3,8	SI175-45-442

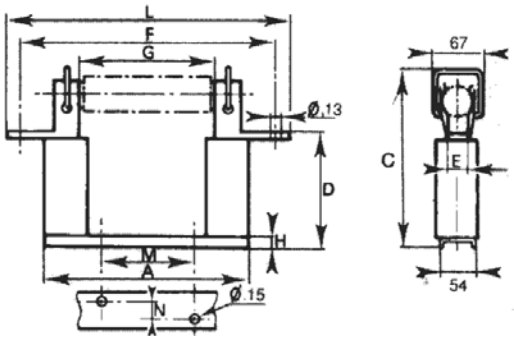
The clip MR 45 reference L 096 472 be supplied separately.

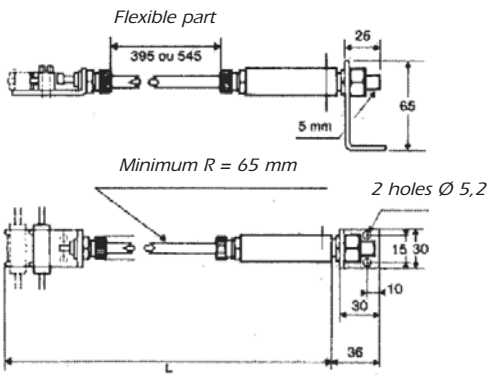
Reference Number	A (mm)	C (mm)	D (mm)	F (mm)	H (mm)	L (mm)	M (mm)	N (mm)
R091187	287	252	157	363	11	403	55	35
P092818	387	256	161	463	15	503	180	0
Q092819	538	256	161	613	15	653	300	0
Q075569	538	311	216	613	15	653	300	0

Indicating device

Rated Voltage of corresponding fuse-base (kV)	Designation	Reference Number	Number of microswitches	Length of flexible part (mm)	L (mm)	Weight (kg)	Catalog Number
7,2	MC 1-5 Flex Q	E092694	1	395	560	0,205	MC1-5NFLEXQ
7,2	MC 1-9 Flex Q	F092695	2	395	560	0,215	MC1-9NFLEXQ
12 to 36	MC 1-5 Flex Q 640	T092615	1	545	710	0,220	MC1-5NFLEXQ640
12 to 36	MC 1-9 Flex Q 640	K078945	2	545	710	0,230	MC1-9NFLEXQ640

The indicating device enables electrical actuating of the opening mechanism for a circuit or triggering of an indicator during the melting of a fuse equipped with a trip-indicator. This very robust and original device means freedom for any mechanical system and offers the advantage of being able to incorporate a microswitch unit or units according to the equipment configuration.





European Fuses
NF/UTE Fuses
7,2kV - 36kV Type FR

FR TYPE
RATED VOLTAGES 7.2, 12, 24 AND 36 kV
CURRENT RATINGS 6.3 TO 63 A

HIGH VOLTAGE FUSES FOR TRANSFORMER PROTECTION

SUPERIOR MECHANICAL STRENGTH

OUTSTANDING WITHSTAND TO OPERATING STRESSES

FOR INDOOR USE

100% SYNTHETIC STRUCTURE

UTE C 62110, UTE C 64200, UTE C 64203 AND IEC 282-1 COMPLIANT

MODEL WITH STRIKER IEC 420 COMPLIANT

Presentation

FR-type fuses are designed to protect HV/LV power distribution transformers. Designed to be coordinated with other equipment, these current-limiting fuses interrupt fault currents before they reach their peak. The fault current is interrupted inside the fuse body and although this is very fast there is no sign of it outside.
The main elements in these fuses are:

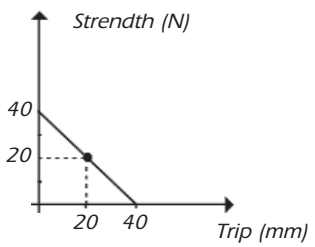
- a barrel of class F insulating synthetic material
- nickel plated aluminum end contacts
- very pure silver fuse elements
- composite material fuse element holder to withstand high temperatures

Thanks to their structure, based on a synthetic material, FR fuses are the perfect answer to the stresses involved in use inside HV bays and fuse chambers.

Technical characteristics

Rated voltage Un 7.7 to 36 kV
Current rating In 6.3 – 10 – 16 – 20 – 25 – 32 – 43 – 63 A
depending on voltage
Minimum interrupting current **I**3 as per chart page over
Breaking capacity **I**1 12,500 A
Temperature of use -25°C to +40°C
Striker: minimum force 0.5 Joules for minimum stroke 20 mm.

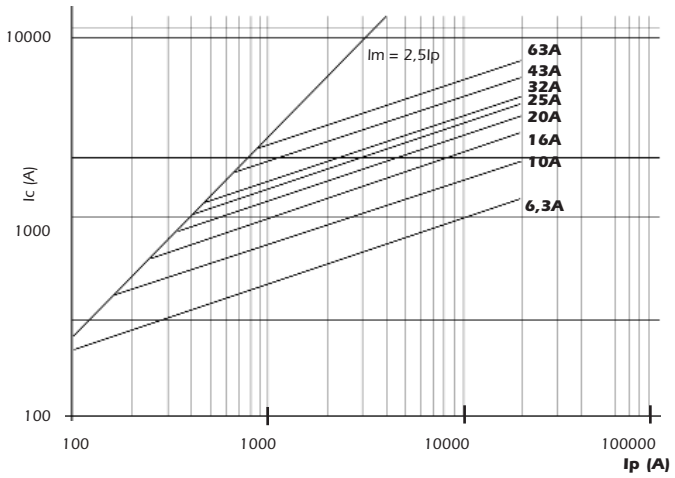
CHARACTERISTICS OF TRIP INDICATOR



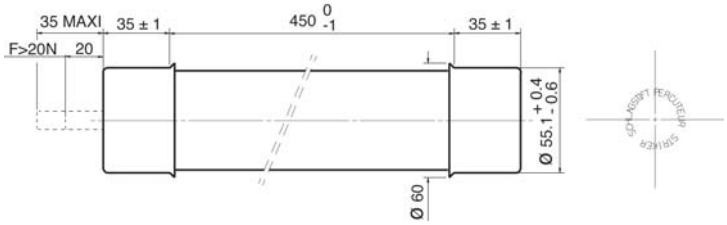
European Fuses
NF/UTE Fuses
7,2kV - 36kV Type FR

Rated voltage Un (kV)	Current rating I_n (A)	Dimensions L (mm)	Dimensions D (mm)	Minimum interrupting current (A)	Breaking capacity (kA)	Peak interrupting voltage (kV)	Power dissipation at In (W)	Total operating I^2t at Un (10^3A^2s)	Weight (kg)
7,2	6,3	520	55	31,5	12,5	20	12	0,3	2,1
7,2	16	520	55	80	12,5	20	26	1,6	2,1
7,2	32	520	55	160	12,5	20	44	6	2,1
7,2	43	520	55	215	12,5	20	61	12	2,1
7,2	63	520	55	315	12,5	20	71	24	2,1
12	6,3	520	55	31,5	12,5	34	25	0,3	2,1
12	16	520	55	80	12,5	34	53	1,6	2,1
12	32	520	55	160	12,5	34	89	6	2,1
12	43	520	55	215	12,5	34	123	12	2,1
12	63	520	55	315	12,5	34	142	24	2,1
24	6,3	520	55	31,5	12,5	58	25	0,63	2,1
24	16	520	55	80	12,5	58	53	3,3	2,1
24	32	520	55	160	12,5	58	89	13	2,1
24	43	520	55	215	12,5	58	123	25	2,1
24	63	520	55	315	12,5	58	142	50	2,1
36	6,3	520	55	31,5	12,5	-	-	-	2,1
36	10	520	55	50	12,5	-	-	-	2,1
36	16	520	55	80	12,5	-	-	-	2,1
36	20	520	55	100	12,5	-	-	-	2,1
36	25	520	55	125	12,5	-	-	-	2,1
36	32	520	55	160	12,5	-	-	-	2,1

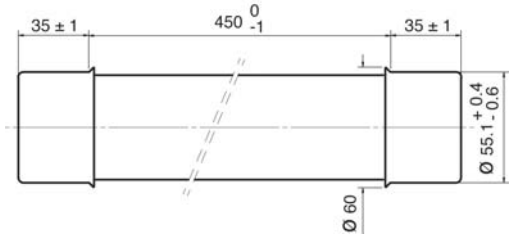
Amplitude of current interrupted 15 262 A



Dimension drawings with striker



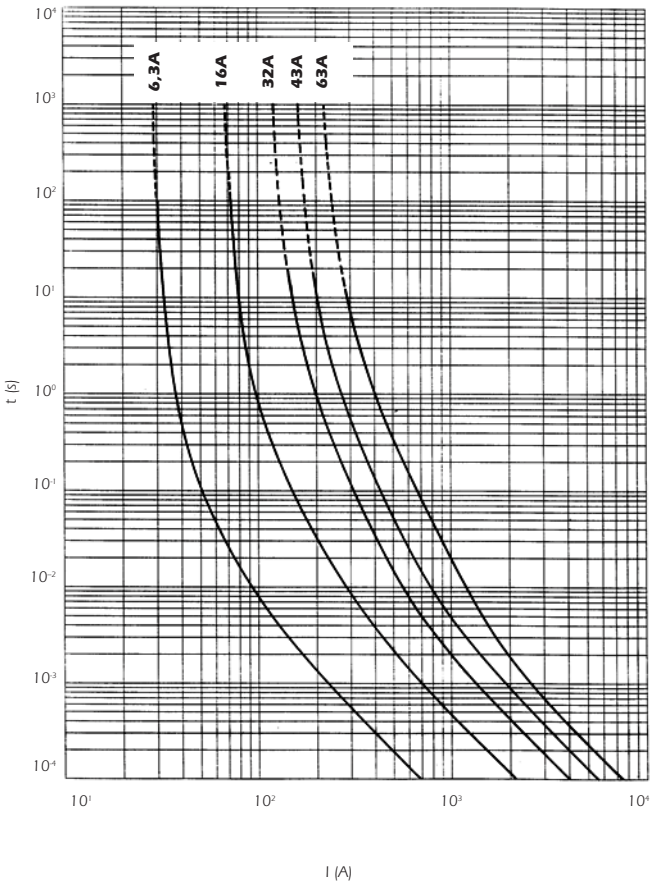
Dimension drawings w/o striker



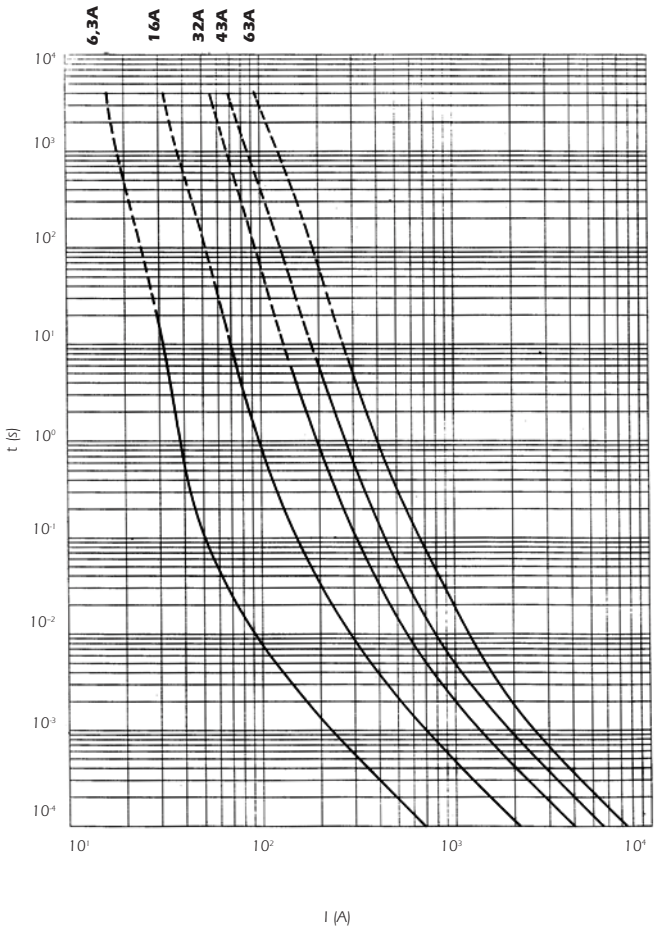
European Fuses
NF/UTE Fuses
7kV - 36kV Type FR

Time/current data

FR 7.2/36 type w/o striker



FR 7.2/36 type with striker



Guidelines for use

Rated network voltage (kV)	EDF recommendations Rated transformer power						
	50	100	160	250	400	630	1000
10	6,3	16	32	32	63	63	
15	6,3	16	16	16	43	43	63
20	6,3	6,3	16	16	43	43	43*

** Use of a 63 A fuse instead of a 43 A fuse is accepted when installed in an oil-tight compartment.*

European Fuses
NF/UTE Fuses
7kV - 36kV Type FR

Rated network voltage (kV)	C 13100 recommendations Rated transformer power																
	25	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250
5,5	6,3	16	16	16	32	32	32	63	63	63	63	63					
10	6,3	6,3	6,3	6,3	16	16	16	32	32	32	63	63	63	63			
15	6,3	6,3	6,3	6,3	6,3	16	16	16	16	16	43	43	43	43	43	63	
20	6,3	6,3	6,3	6,3	6,3	6,3	6,3	16	16	16	16	43	43	43	43	43	63
30	Pending																

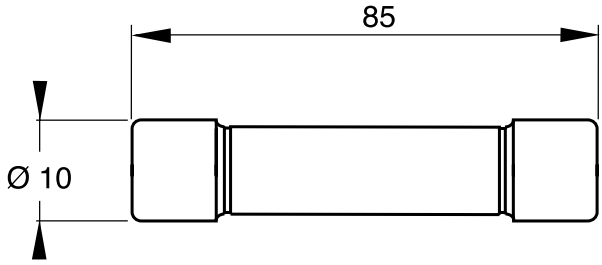
Reference and catalog number

Rated voltage Un (kV)	Current Rating I_n (A)	Without trip-indicator				With trip-indicator		
		Designation	EDF parts list number (3 fuses)	Reference Number	Catalog Number	Designation	Reference Number	Catalog Number
7,2	6,3	FR 7,2/6,3		Z227584	FR72V6,3	FR 7,2/6,3 P	E227589	FR72V6,3P
7,2	16	FR 7,2/16		A227585	FR72V16	FR 7,2/16 P	F227590	FR72V16P
7,2	32	FR 7,2/32		B227586	FR72V32	FR 7,2/32 P	G227591	FR72V32P
7,2	43	FR 7,2/43		C227587	FR72V43	FR 7,2/43 P	H227592	FR72V43P
7,2	63	FR 7,2/63		D227588	FR72V63	FR 7,2/63 P	J227593	FR72V63P
12	6,3	FR 12/6,3		X210240	FR120V6,3	FR 12/6,3 P	D210246	FR120V6,3P
12	16	FR 12/16	73.02.136	Y210241	FR120V16	FR 12/16 P	E210247	FR120V16P
12	32	FR 12/32	73.02137	Z210242	FR120V32	FR 12/32 P	F210248	FR120V32P
12	43	FR 12/43		A210243	FR120V43	FR 12/43 P	G210249	FR120V43P
12	63	FR 12/63	73.02.138	B210244	FR120V63	FR 12/63 P	H210250	FR120V63P
24	6,3	FR 24/6,3	73.02.132	A210795	LOT-FR240V6,3	FR 24/6,3 P	G227430	LOT-FR240V6,3P
24	16	FR 24/16	73.02.133	B210796	LOT-FR240V16	FR 24/16 P	H227431	LOT-FR240V16P
24	32	FR 24/32		G226234	LOT-FR240V32	FR 24/32 P	J227432	LOT-FR240V32P
24	43	FR 24/43	73.02.134	C210797	LOT-FR240V43	FR 24/43 P	K227433	LOT-FR240V43P
24	63	FR 24/63	73.02.135	D210798	LOT-FR240V63	FR 24/63 P	L227434	LOT-FR240V63P
36	6,3	FR 36/6,3		K227594	FR360V6,3	FR 36/6,3 P	J227616	FR360V6,3P
36	10	FR 36/10		L227595	FR360V10	FR 36/10 P	K227617	FR360V10P
36	16	FR 36/16		M227596	FR360V16	FR 36/16 P	L227618	FR360V16P
36	20	FR 36/20		N227597	FR360V20	FR 36/20 P	M227619	FR360V20P
36	25	FR 36/25		P227598	FR360V25	FR 36/25 P	N227620	FR360V25P
36	32	FR 36/32		Q227599	FR360V32	FR 36/32 P	P227621	FR360V32P

European Fuses
MV Intermediate Fuses (Lighting)
1.5kV - 10 x 85

Rated Voltage (V)	Size	Rating (A)	Reference Number	Catalog Number
		0,125	S093327	10GC15V0,125
		0,16	T093328	10GC15V0,16
		0,25	V093329	10GC15V0,25
		0,315	W093330	10GC15V0,315
		0,4	X093331	10GC15V0,4
		0,5	Z093333	10GC15V0,5
		0,63	A093334	10GC15V0,63
1500	10x85	0,8	B093335	10GC15V0,8
		1	A093426	10GC15V1
		1,6	B093427	10GC15V1,6
		2	C093428	10GC15V2
		3,15	D093429	10GC15V3,15
		4	E093430	10GC15V4
		5	Y093654	10GC15V5
		6,3	Z093655	10GC15V6,3
		8	A093656	10GC15V8
		10	B093657	10GC15V10
		12	C093658	10GC15V12
		16	F093431	10GC15V16

Packaging 10



European Fuses
MV Intermediate Fuses (lighting)
3.2kV and 5.5kV

Rated Voltage (kV)	Dimensions (mm)	Rating I_n (A)	Fuse without trip-indicator		Fuse with trip-indicator		Weight (kg)	Catalog Number
			Designation	Ref. Number	Designation	Ref. Number		
3,2	10 x 180 (figure 1)	0,16	3200 CP gLB 10.180/0,16	E081838	-	-	0,03	10GB32V0,16
		0,315	3200 CP gLB 10.180/0,315	F081839	-	-	0,03	10GB32V0,315
		0,5	3200 CP gLB 10.180/0,5	G081840	-	-	0,03	10GB32V0,5
		0,8	3200 CP gLB 10.180/0,8	H081841	-	-	0,03	10GB32V0,8
		1	3200 CP gLB 10.180/1	P089621	-	-	0,03	10GB32V1
		1,25	3200 CP gLB 10.180/1,25	R078744	-	-	0,03	10GB32V1,25
		1,6	3200 CP gLB 10.180/1,6	N081409	-	-	0,03	10GB32V1,6
		2	3200 CP gLB 10.180/2	Q089622	-	-	0,03	10GB32V2
		2,5	3200 CP gLB 10.180/2,5	S078745	-	-	0,03	10GB32V2,5
		3,15	3200 CP gLB 10.180/3,15	M081845	-	-	0,03	10GB32V3,15
		4	3200 CP gLB 10.180/4	R089623	-	-	0,03	10GB32V4
		5	3200 CP aLB 10.180/5	M087733	-	-	0,03	10GB32V5
		6	3200 CP aLB 10.180/6	S089624	-	-	0,03	10AB32V6
		8	3200 CP aLB 10.180/8	T089625	-	-	0,03	10AB32V8
		10	3200 CP aLB 10.180/10	V089626	-	-	0,03	10AB32V10
		12	3200 CP aLB 10.180/12	W089627	-	-	0,03	10AB32V12
	36 x 190 (figure 2)	2	3200 CP gLD 36.190/2	P081801	-	-	0,4	36GD32V2
		3,15	3200 CP gLD 36.190/3,15	Q081802	-	-	0,4	36GD32V3,15
		4	3200 CP gLD 36.190/4	R081803	-	-	0,4	36GD32V4
		5	3200 CP gLD 36.190/5	S081804	-	-	0,4	36GD32V5
		6	3200 CP gLD 36.190/6	T081805	329 CP gLD 36.190/6	K081797	0,4	36GD32V6,3
		8	3200 CP gLD 36.190/8	V081806	329 CP gLD 36.190/8	J081796	0,4	36GD32V8
		10	3200 CP gLD 36.190/10	W081807	329 CP gLD 36.190/10	H081795	0,4	36GD32V10
		12	3200 CP gLD 36.190/12	X081808	329 CP gLD 36.190/12	G081794	0,4	36GD32V12
		16	3200 CP gLD 36.190/16	Y081809	329 CP gLD 36.190/16	F081793	0,4	36GD32V16
		20	3200 CP gLD 36.190/20	Z081810	329 CP gLD 36.190/20	E081792	0,4	36GD32V20
		25	3200 CP gLD 36.190/25	A081811	329 CP gLD 36.190/25	D081791	0,4	36GD32V25
		32	3200 CP gLD 36.190/32	B081812	329 CP gLD 36.190/32	C081790	0,4	36GD320V32
		40	3200 CP gLD 36.190/40	C081813	329 CP gLD 36.190/40	B081789	0,4	36GD32V40
		50	3200 CP gLD 36.190/50	D081814	329 CP gLD 36.190/50	A081788	0,4	36GD32V50
		63	3200 CP gLD 36.190/63	L081798	329 CP gLD 36.190/63	Z081787	0,4	36GD32V63
		80	3200 CP gLD 36.190/80	M081799	329 CP gLD 36.190/80	Y081786	0,4	36GD32V80
		100	3200 CP gLD 36.190/100	N081800	329 CP gLD 36.190/100	X081785	0,4	36GD32V100
5,5	10 x 180 (figure 1)	0,16	5500 CP gLB 10.180/0,16	A093035	-	-	0,03	10GB55V0,16
		0,315	5500 CP gLB 10.180/0,315	B093036	-	-	0,03	10GB55V0,315
		0,5	5500 CP gLB 10.180/0,5	W081140	-	-	0,03	10GB55V0,5
		0,8	5500 CP gLB 10.180/0,8	V081139	-	-	0,03	10GB55V0,8
		1	5500 CP gLB 10.180/1	T081138	-	-	0,03	10GB55V1
		1,25	5500 CP gLB 10.180/1,25	N093162	-	-	0,03	10GB55V1,25
		1,6	5500 CP gLB 10.180/1,6	S081137	-	-	0,03	10GB55V1,6
		2	5500 CP gLB 10.180/2	R081136	-	-	0,03	10GB55V2
		2,5	5500 CP gLB 10.180/2,5	P093163	-	-	0,03	10GB55V2,5
		3,15	5500 CP gLB 10.180/3,15	Q081135	-	-	0,03	10GB55V3,15
		4	5500 CP gLB 10.180/4	N081133	-	-	0,03	10GB55V4
	36 x 250 (figure 3)	2	5500 CP gLB 36.250/2	V081622	-	-	0,5	36GB55V2
		3,15	5500 CP gLB 36.250/3,15	A081397	-	-	0,5	36GB55V20
		4	5500 CP gLB 36.250/4	T081621	-	-	0,5	36GB55V4
		5	5500 CP gLB 36.250/5	S081620	-	-	0,5	36GB55V5
		6	5500 CP gLB 36.250/6	R081619	559 CP gLB 36.250/6	G081610	0,5	36GB55V6
		8	5500 CP gLB 36.250/8	Q081618	559 CP gLB 36.250/8	F081609	0,5	36GB55V8
		10	5500 CP gLB 36.250/10	P081617	559 CP gLB 36.250/10	E081608	0,5	36GB55V10
		12	5500 CP gLB 36.250/12	N081616	559 CP gLB 36.250/12	D081607	0,5	36GB55V12
		16	5500 CP gLB 36.250/16	M081615	559 CP gLB 36.250/16	C081606	0,5	36GB55V16
		20	5500 CP gLJB 36.250/20	L081614	559 CP gLJB 36.250/20	E078802	0,5	36GJB55V20
		25	5500 CP gLJB 36.250/25	Q078789	559 CP gLJB 36.250/25	F078803	0,5	36GJB55V25
		32	5500 CP gLJB 36.250/32	R078790	559 CP gLJB 36.250/32	G078804	0,5	36GJB55V32
		40	5500 CP gLJB 36.250/40	S078791	559 CP gLJB 36.250/40	H078805	0,5	36GJB55V40
		50	5500 CP gLJB 36.250/50	T078792	559 CP gLJB 36.250/50	J078806	0,5	36GJB55V50
		63	5500 CP aLJB 36.250/63	V078793	559 CP aLJB 36.250/63	K078807	0,5	36AJB55V63
		75	5500 CP aLJB 36.250/75	W078794	559 CP aLJB 36.250/75	L078808	0,5	36AJB55V75
	55 x 259 (figure 4)	2	5500 CP gLD 55.259/2	S081505	-	-	1,4	55GD55V2
		3,15	5500 CP gLD 55.259/3,15	S081390	-	-	1,4	55GD55V3,15
		4	5500 CP gLD 55.259/4	R081504	-	-	1,4	55GD55V4
		5	5500 CP gLD 55.259/5	Q081503	-	-	1,4	55GD55V5
		6	5500 CP gLD 55.259/6	P081502	559 CP gLD 55.259/6	A081489	1,4	55GD55V6
		8	5500 CP gLD 55.259/8	N081501	559 CP gLD 55.259/8	Z081488	1,4	55GD55V8
		10	5500 CP gLD 55.259/10	M081500	559 CP gLD 55.259/10	Y081487	1,4	55GD55V10
		12	5500 CP gLD 55.259/12	L081499	559 CP gLD 55.259/12	X081486	1,4	55GD55V12
		16	5500 CP gLD 55.259/16	K081498	559 CP gLD 55.259/16	W081485	1,4	55GD55V16
		20	5500 CP gLD 55.259/20	J081497	559 CP gLD 55.259/20	V081484	1,4	55GD55V20
		25	5500 CP gLD 55.259/25	H081496	559 CP gLD 55.259/25	T081483	1,4	55GD55V25
		32	5500 CP gLD 55.259/32	G081495	559 CP gLD 55.259/32	S081482	1,4	55GD55V32
		40	5500 CP gLD 55.259/40	F081494	559 CP gLD 55.259/40	R081481	1,4	55GD55V40
		50	5500 CP gLD 55.259/50	E081493	559 CP gLD 55.259/50	Q081480	1,4	55GD55V50
		63	5500 CP gLD 55.259/63	D081492	559 CP gLD 55.259/63	P081479	1,4	55GD55V63
		80	5500 CP gLD 55.259/80	C081491	559 CP gLD 55.259/80	N081478	1,4	55GD55V80
		100	5500 CP gLD 55.259/100	B081490	559 CP gLD 55.259/100	M081477	1,4	55GD55V100

European Fuses
MV Intermediate Fuses (lighting)
3.2kV and 5.5kV

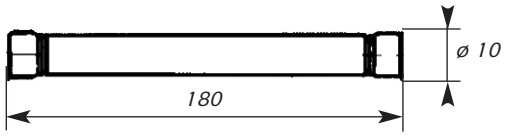
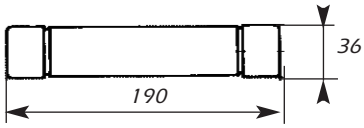
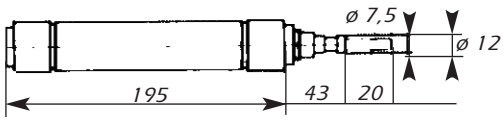


FIGURE 1

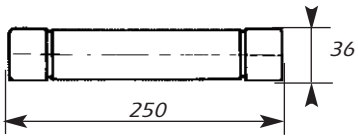


Without trip-indicator

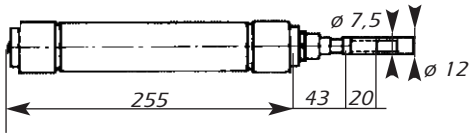


With trip-indicator

FIGURE 2

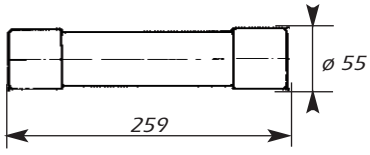


Without trip-indicator

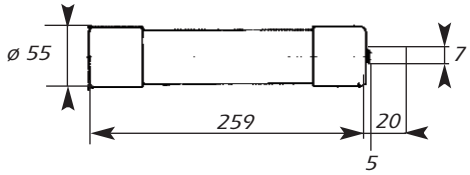


With trip-indicator

FIGURE 3



Without trip-indicator



With trip-indicator

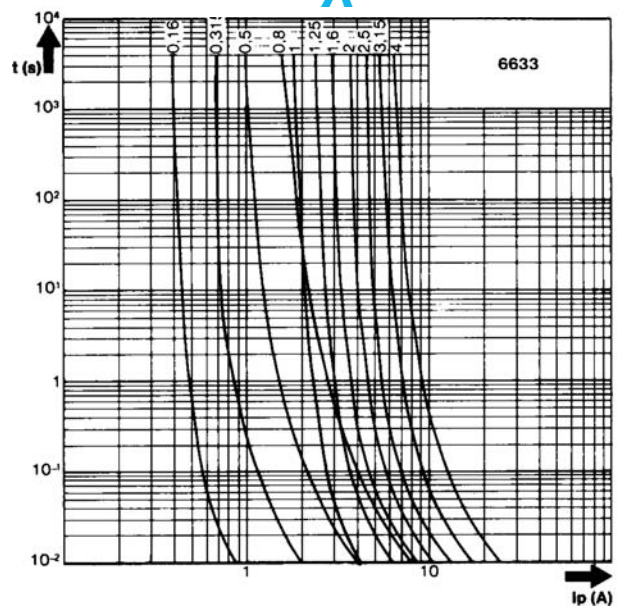
FIGURE 4

European Fuses
MV Intermediate Fuses (lighting)
3.2kV and 5.5kV

Time/Current characteristics

Pre-arcing time

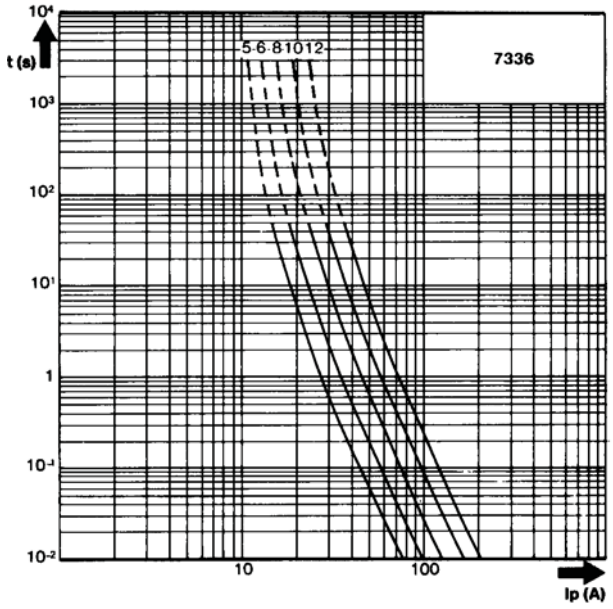
A



RMS value of short-circuit prospective current

Pre-arcing time

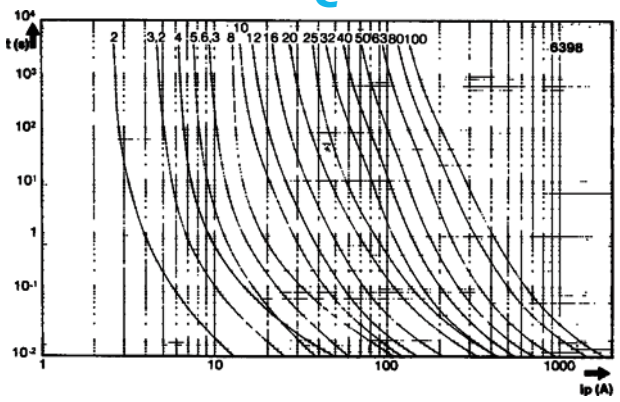
B



RMS value of short-circuit prospective current

Pre-arcing time

C

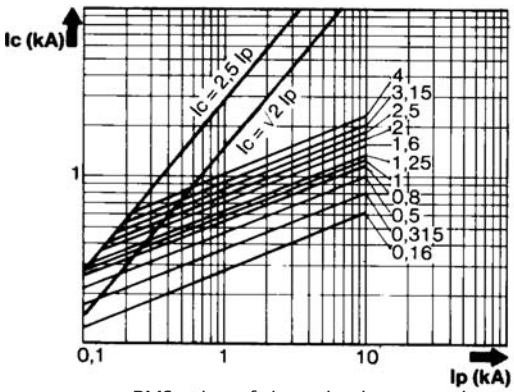


RMS value of short-circuit prospective current

European Fuses
MV Intermediate Fuses (lighting)
3.2kV and 5.5kV

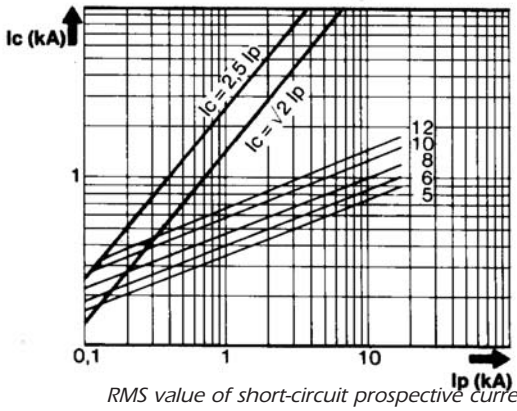
Cut-off characteristics

Cut-off current **A**



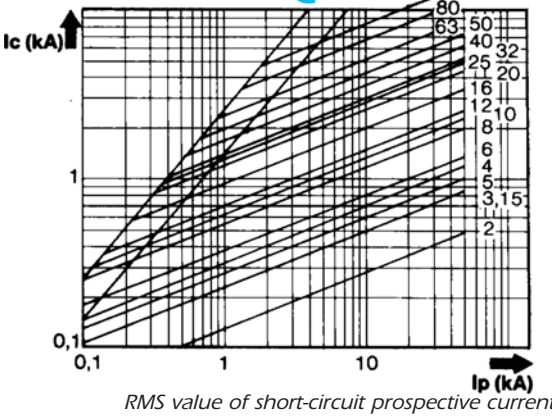
RMS value of short-circuit prospective current

Cut-off current **B**



RMS value of short-circuit prospective current

Cut-off current **C**



RMS value of short-circuit prospective current

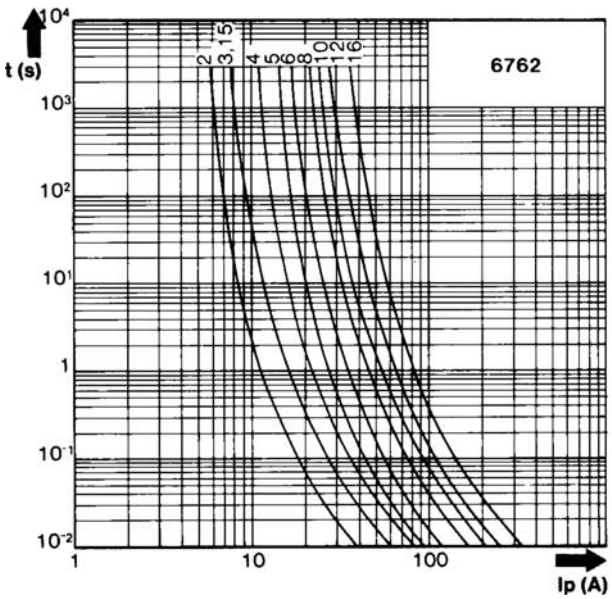
Rated Voltage (kV)	Dimenssions (mm)	Rating (A)	Breaking Capacity (kA)	Peak arc voltage (kV)	Minimum Breaking Current (A)	Power Dissipation at I_n (W)
3,2	10x180 **A B**	0,16	15	12		
		0,315	15	12		
		0,5	15	12		
		0,8	15	12		
		1	15	12		
		1,25	15	12		
		1,6	15	12		
		2	15	12		
		2,5	15	12		
		3,15	15	12		
		4	15	12		
		5	17,5	8	14	2
		6	17,5	8	18	2,5
		8	17,5	8	21	3,7
		10	17,5	8	30	4
		12	17,5	8	36	4,8
	36x190 **C**	2	50	15		
		3,15	50	15		
		4	50	15		
		6	50	15		
		8	50	15		
		10	50	15		14
		12	50	15		17
		16	50	15		19
		20	50	15		20
		25	50	15		25
		32	50	7,2		17
		40	50	7,2		19
		50	50	7,2		23
		63	50	7,2		25
		80	50	7,2		25
		100	50	7,2		30

European Fuses
MV Intermediate Fuses (lighting)
3.2kV and 5.5kV

Time/Current characteristics

Pre-arcing time

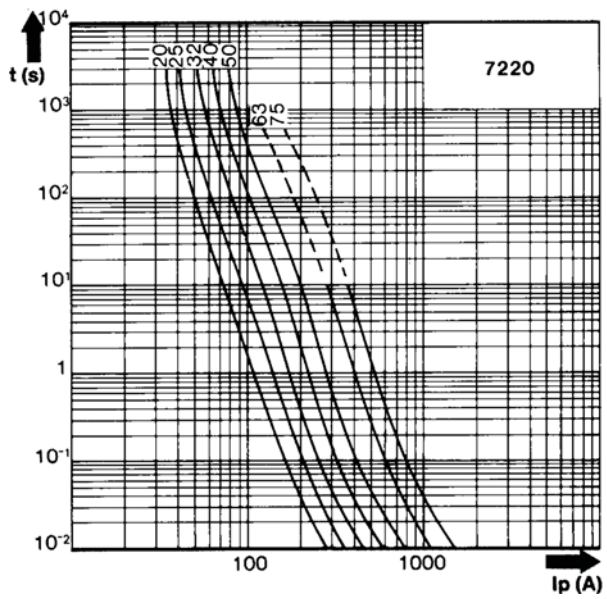
D



RMS value of short-circuit prospective current

Pre-arcing time

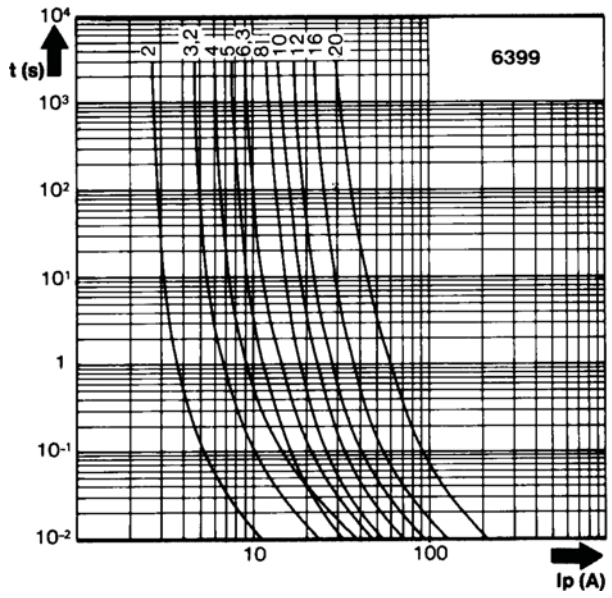
E



RMS value of short-circuit prospective current

Pre-arcing time

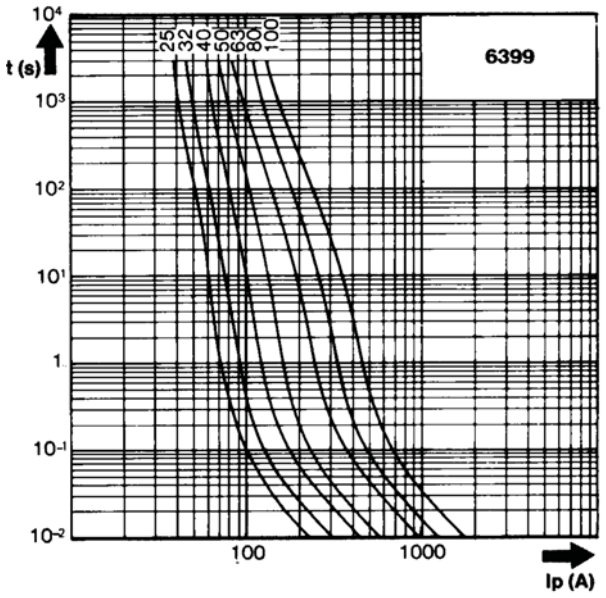
F



RMS value of short-circuit prospective current

Pre-arcing time

G

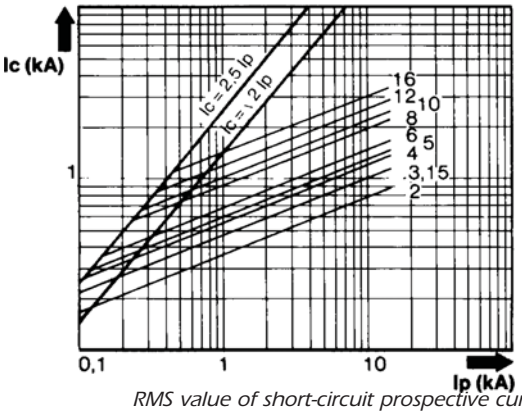


RMS value of short-circuit prospective current

European Fuses
MV Intermediate Fuses (lighting)
3.2kV and 5.5kV

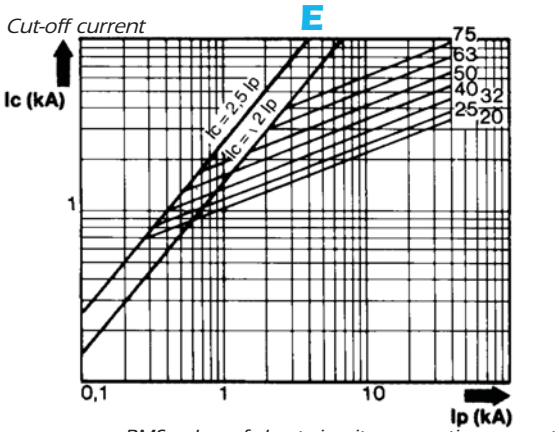
Cut-off characteristics

Cut-off current **D**



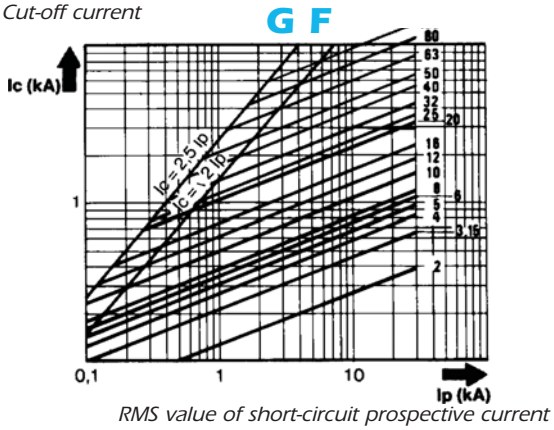
RMS value of short-circuit prospective current

Cut-off current **E**



RMS value of short-circuit prospective current

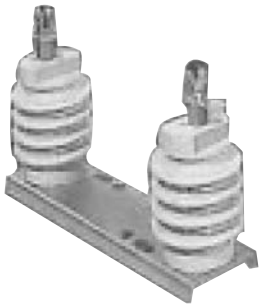
Cut-off current **G F**

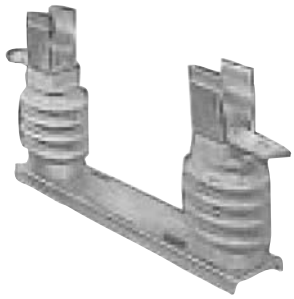


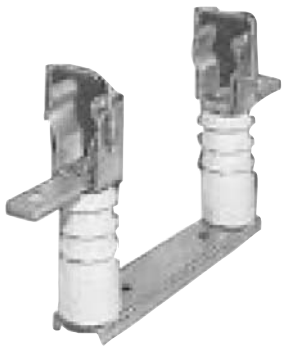
RMS value of short-circuit prospective current

Rated Voltage (kV)	Dimenssions (mm)	Rating (A)	Breaking Capacity (kA)	Peak arc voltage (kV)	Minimum Breaking Current (A)	Power Dissipation at I_n (W)
5,5	10x180 **A**	0,16	10	12		
		0,315	10	12		
		0,5	10	12		
		0,8	10	12		
		1	10	12		
		1,25	10	12		
		1,6	10	12		
		2	10	12		
		2,5	10	12		
		3,15	10	12		
		4	10	12		
	36x250 **D E**	2	15	15		1,5
		3,15	15	15		2
		4	15	15		2,3
		5	15	15		2,8
		6	15	15		4
		8	15	15		5
		10	15	15		8
		12	15	15		9
		16	15	15		14
		20	40	12		16
		25	40	12		20
		32	40	12		24
		40	40	12		30
		50	40	12		35
		63	40	12		38
		75	40	12		40
	55x259 **F G**	2	30	18		
		3,15	30	18		
		4	30	18		
		5	30	18		
		6	30	18		
		8	30	18		
		10	30	18		
		12	30	18		
		16	30	18		
		20	30	18		
		25	30	12		25
		32	30	12		30
		40	30	12		34
		50	30	12		40
		63	30	12		40
		80	30	12		50
		100	30	12		55

European Fuses
MV Intermediate Fuses (lighting)
3.2kV and 5.5kV







Fuse holder

Rated voltage (kV)	Withstand Voltage to earth		Designation	Figure	Reference Number	Weight (kg)	Catalog Number
	50 Hz - 1 mn (kV RMS)	1,2/50µS (kV peak)					
3,6	21	45	SI 50 10x180	5	S092706	0,22	SI50-10-180
7,2	27	60	SI 85 36x190	6	C092738	1,05	SI85-36-190TRA
7,2	27	60	SI 85 10x180	7	D092693	0,27	SI85-10-180
7,2	27	60	SI 85 36x250	8	P092864	1,15	SI85-36-250
7,2	27	60	SI 120 55x259	9	X092227	3,9	SI130-55-259

The clips MR 10, MR 36 and MR 55 can be supplied separately

Indicating device

Designation	Reference Number	Number of microswitches	Type of fuse that can be equipped	Length of flexible part (mm)	Weight (kg)	Catalog Number
MC 1-5 Flex	E098674	1	Figure 2&3	395	0,110	MC1-5NFLEX
MC 1-9 Flex	F098675	2	Figure 2&3	395	0,120	MC1-9NFLEX
MC 1-5 Flex Q	E092694	1	Figure 4	395	0,205	MC1-5NFLEXQ
MC 1-9 Flex Q	F092695	2	Figure 4	395	0,215	MC1-9NFLEXQ

The electrical data of microswitches is given

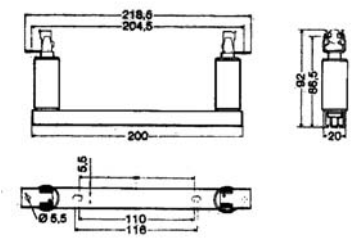


FIGURE 5

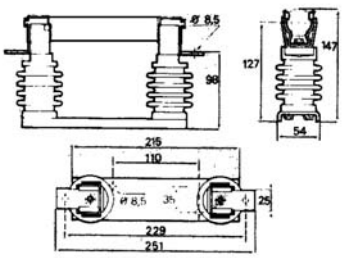


FIGURE 6

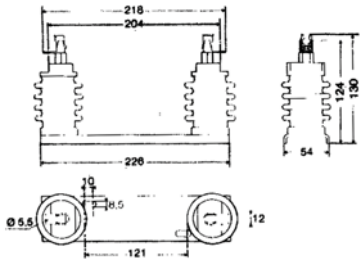


FIGURE 7

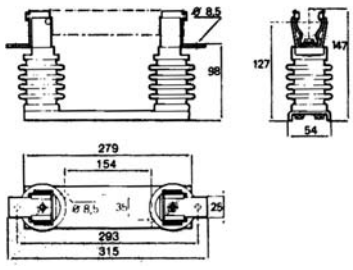


FIGURE 8

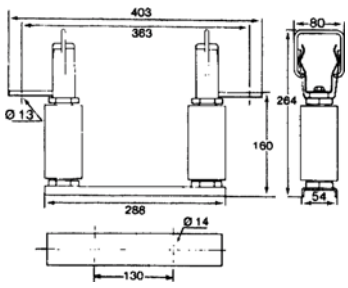


FIGURE 9

European Fuses
Potential Transformer Fuses
5.5kV to 25.5kV - 20x127 to 20x340

Fuses for the protection of low power receptors

Complying with IEC 282-1 standard
Interior equipment

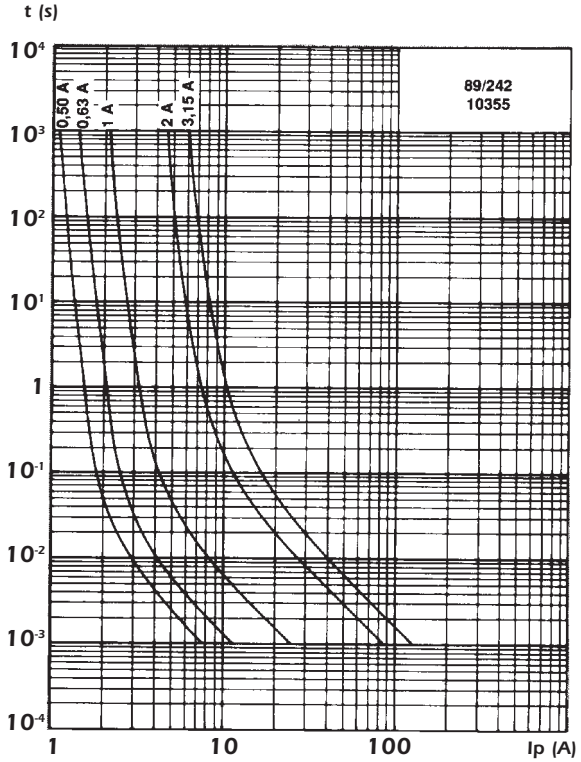
Rated voltage (kV)	L (mm)	Rating In (A)	Designation	Reference Number	Weight (kg)	Catalog number
5,5	127	0,63	5 500 CP gL 20x127/0,63	F076802	0,08	20GG55V0,63
		1	5 500 CP gL 20x127 /1	G076803	0,08	20GG55V1
		2	5 500 CP gL 20x127 /2	J076805	0,08	20GG55V2
		3,15	5 500 CP gL 20x127/3,15	K076806	0,08	20GG55V3,15
7,2	190	0,63	7 200 CP gL 20x190/0,63	V077850	0,12	20GF72V0,63
		1	7 200 CP gL 20x190 /1	W077851	0,12	20GF72V1
		2	7 200 CP gL 20x190 /2	Y077853	0,12	20GF72V2
		3,15	7 200 CP gL 20x190/3,15	Z077854	0,12	20GF72V3,15
8,25	190	0,63	8 250 CP gL 20x190/0,63	D095775	0,12	20GC82,5V0,63
		1	8 250 CP gL 20x190 /1	E095776	0,12	20GC82,5V1
		2	8 250 CP gL 20x190 /2	G095778	0,12	20GC82,5V2
		3,15	8 250 CP gL 20x190/3,15	H095779	0,12	20GC82,5V3,15
12	254	0,63	12 000 CP gL 20x254/0,63	L076807	0,16	20GC120V0,63
		1	12 000 CP gL 20x254 /1	M076808	0,16	20GC120V1
		2	12 000 CP gL 20x254 /2	P076810	0,16	20GC120V2
		3,15	12 000 CP gL 20x254/3,15	Q076811	0,16	20GC120V3,15
15,5	254	0,63	15 500 CP gL 20x254/0,63	K095827	0,16	20GC155V0,63
		1	15 500 CP gL 20x254 /1	V097814	0,16	20GC155V1
		2	15 500 CP gL 20x254 /2	W097815	0,16	20GC155V2
		3,15	15 500 CP gL 20x254/3,15	H220025	0,16	20GC155V3,15
24	340	0,63	24 000 CP gL 20x340/0,63	N078235	0,215	20GLC240V0,63
25,5	340	0,5	25 500 CP gL 20x340/0,5	D099915	0,215	20GC255V0,5

Note: These fuses are never equipped with a trip-indicator. Connecting clips MR 20,6.

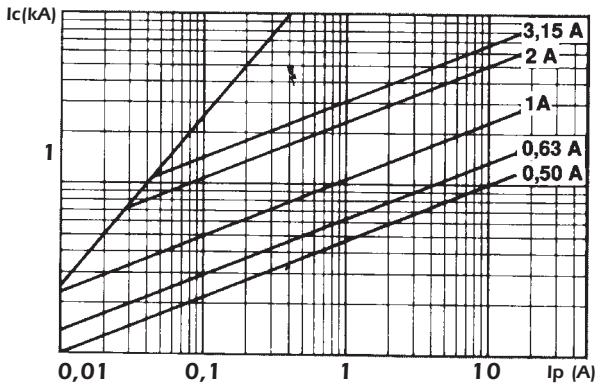
European Fuses
Potential Transformer Fuses
5.5kV to 25.5kV - 20x127 to 20x340

Electrical data on fuses for the protection of low power receptors

Time-current characteristics



Cut-off characteristics



Ip = RMS value of short-circuit prospective current
t(s)= Pre-arcing time
Ic = Cut-off current

Rated voltage (kV)	L (mm)	Rating I_n (A)	Breaking capacity (kA)	Peak arc voltage (kV)	Power dissipation at I_n (W)
5,5	127	0,63	20	22	1,6
		1	20	22	1,8
		2	20	22	2,5
		3,15	20	22	4,1
7,2 / 8,25	190	0,63	20	25 /33	1,9 / 2,5
		1	20	25 /33	2,2 / 2,9
		2	20	25 /33	3,1 / 4,1
		3,15	20	25 /33	6,0 / 6,7
12 / 15,5	254	0,63	20 /16	42 / 62	3,2 / 4,8
		1	20 / 16	42 /62	3,6 / 5,6
		2	20 / 16	42 / 62	5,2 / 7,8
		3,15	20 / 16	42 / 62	8,6 / 13
24	340	0,63	16	84	6,7
25,5	340	0,5	16	102	11,8

American Fuses
E-Rated
5.5kV, 8.25kV and 15.5kV - CS 3 Series

5kV, 8 kV and 15kV Ferrule mounted fuses

Amp-trap CS-3 E-rated 5kV, 8kV and 15kV fuses have either 2" or 3" diameter barrels with ferrules and are mounted in spring reinforced clips. They are UL listed as "general purpose current-limiting fuses" and are for use indoors (or outdoors in a weatherproof enclosure). The unique time-current characteristic of Ferraz Shawmut E-rated fuses allows them to be closely sized to transformer full-load rated current, as recommended by IEEE guidelines, without being affected by normal magnetizing inrush current. CS-3 fuses are typically sized at transformer rated current of 133%, thereby providing superior overall protection.

Features/Benefits

- UL Listed for compatibility with UL listed equipment
- Ferrule mounting for standard clips and interchangeability with other brands of fuses
- Current Limiting for superior equipment protection
- Blown-fuse indicator gives positive identification of open fuse
- Non-venting for silent operation

Ratings

A055F
AC: 5E to 450E
5.5kV, 63kA I.R. Sym.

A825X
AC: 10E to 200E
8.25kV, 50kA I.R. Sym.

A155F
AC: 5E TO 200E
15.5kV, 50kA I.R. Sym.

Highlights

- E-Rated
- UL Listed
- Complies with ANSI C37.46

Applications

Protection for 5.5, 8.25 or 15.5kV transformers or distribution systems

Definitions

E-rating
E-rated fuses operate as follows:
100E or less - must melt in 300 seconds (5 mins.) on 200 to 240% of E (ampere) rating.
Over 100E - must melt in 600 seconds (10 mins.) on 220 to 264% of E (ampere) rating.

Example - A 100E fuse must melt in 300 seconds with an applied current of 200 to 240 amperes.

General Purpose Current-Limiting Fuse
A general purpose current-limiting power fuse is one that is capable of interrupting all currents from its rated interrupting rating down to the current that causes melting of the fusible element in one hour.

Spring-Reinforced Clips for CS-3 Fuses:
228-700-530 (One pair of clips)
For 3" diameter, 2 barrels max.

Approvals

UL Listed to JEEG, "Fuses Over 600 Volts"
File # E 143362

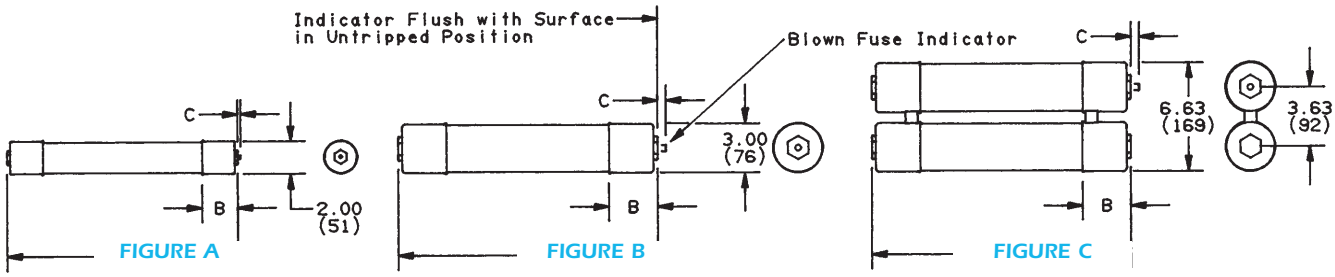
American Fuses
E-Rated
5.5kV, 8.25kV and 15.5kV - CS 3 Series

5.5kV Ferrule Mounted

CATALOG NUMBERING SYSTEM

A 0 5 5 F 1 D 0 R 0 - 1 0 0 E

- A: Amp-trap Fuse
- 055: Max. Voltage Rating (055=5.5kV)
- F: Style (F=Ferrule Mount)
- 1: No. of Barrels
- D: Diameter (C=2", D=3")
- 0: Special Features
- R0: Revision/No.
- 100E: Ampere Rating

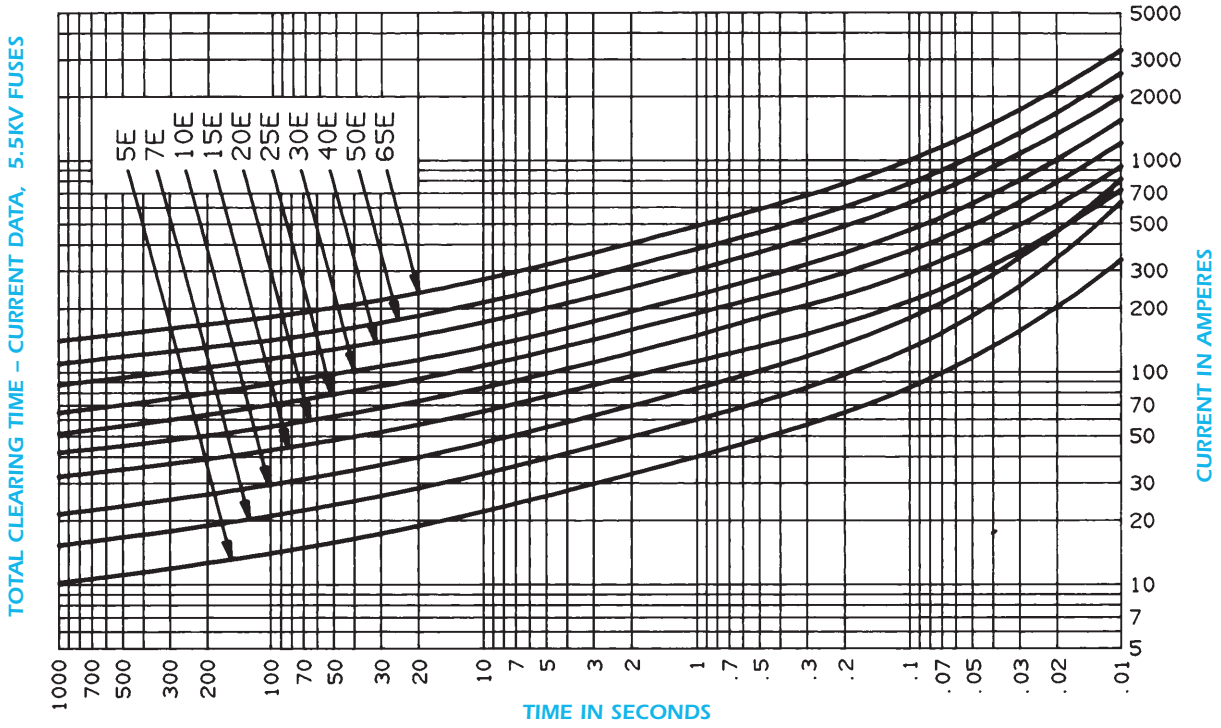


Reference Numbers, Ratings, Dimensions, CS-3 Series, 5.5kV

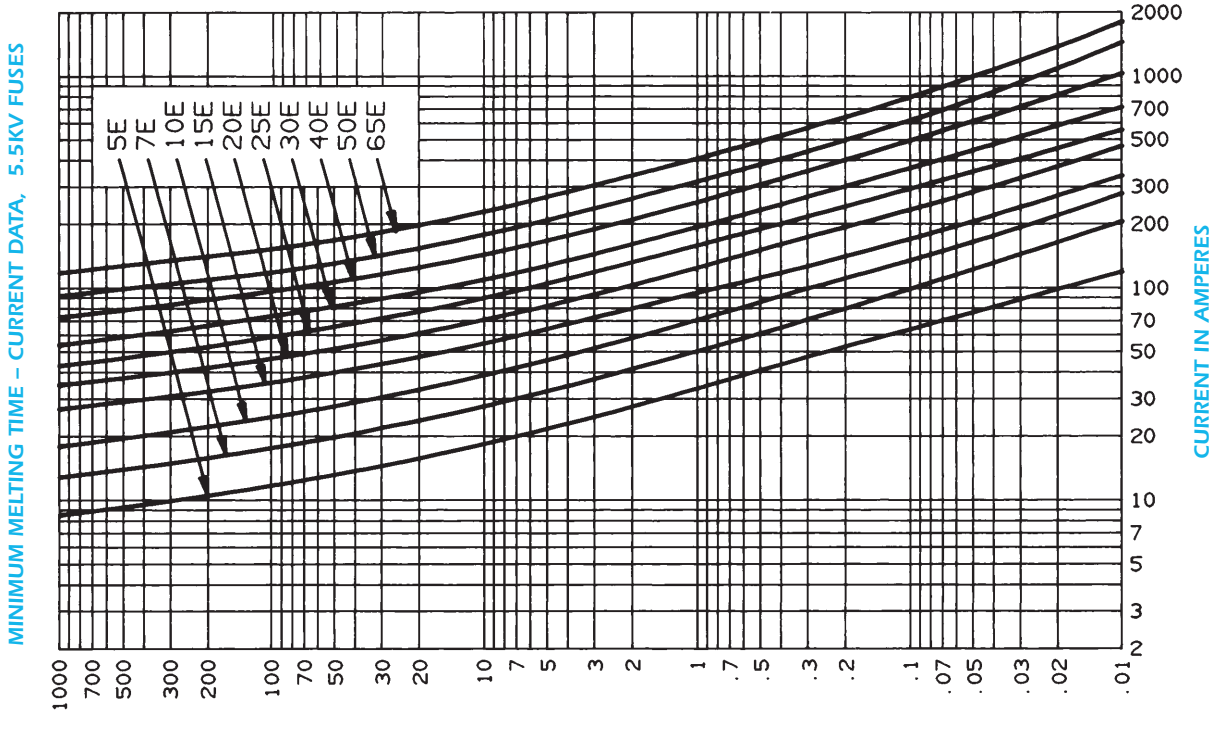
Catalog Number	Reference Number	Ampere Rating	Number of Barrels	Fig.	Dimensions Inches (mm) A	B	C	Interrupting Rating RMS SYM.*Amp.
5.5kV Max. – Ferrule Mounted Style – 12″ (305mm) Clip Centers – 2″ (50.8mm) Barrel Diameter								
A055F1CORO-5E	S213364	5E	1	A	14.11 (358)	2.2 (56)	.19 (4.8) Tripped Force 1 lb.	63,000
A055F1CORO-7E	T214377	7E						
A055F1CORO-10E	A222709	10E						
A055F1CORO-15E	P223228	15E						
A055F1CORO-20E	E201047	20E						
A055F1CORO-25E	N201561	25E						
A055F1CORO-30E	H203557	30E						
A055F1CORO-40E	V212331	40E						
A055F1CORO-50E	J212850	50E						
A055F1CORO-65E	J213862	65E						
5.5kV Max. – Ferrule Mounted Style – 12″ (305mm) Clip Centers – 3″ (76.2mm) Barrel Diameter								
A055F1DORO-10E	T214883	10E	1	B	15.88 (403)	3.0 (76)	0.5 (13) Tripped Force 2 lbs.	63,000
A055F1DORO-15E	M218465	15E						
A055F1DORO-20E	T221967	20E						
A055F1DORO-25E	C222711	25E						
A055F1DORO-30E	Q223229	30E						
A055F1DORO-40E	G201049	40E						
A055F1DORO-50E	Q201563	50E						
A055F1DORO-65E	V203591	65E						
A055F1DORO-80E	A211301	80E						
A055F1DORO-100E	V214378	100E						
A055F1DORO-125E	Y217440	125E						
A055F1DORO-150E	G217954	150E						
A055F1DORO-175E	F218988	175E						
A055F1DORO-200E	Y219510	200E						
A055F2DORO-250E	G218989	250E						
A055F2DORO-300E	Z219511	300E	2	C				
A055F2DORO-350E	V221968	350E						
A055F2DORO-400E	D222712	400E						
A055F2DORO-450E	R223230	450E						

American Fuses
E-Rated
5.5kV, 8.25kV and 15.5kV - CS 3 Series

A055F1CORO – 5E to 65E

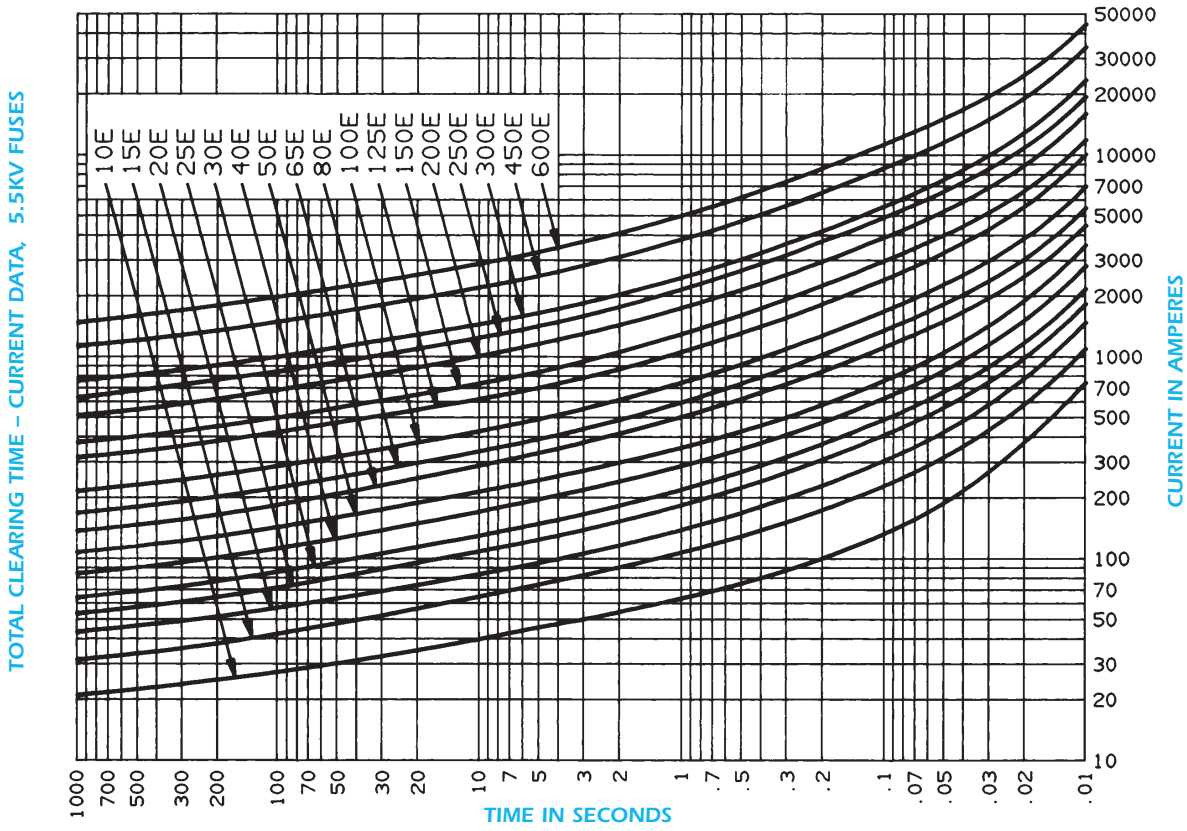


A055F1CORO – 5E to 65E

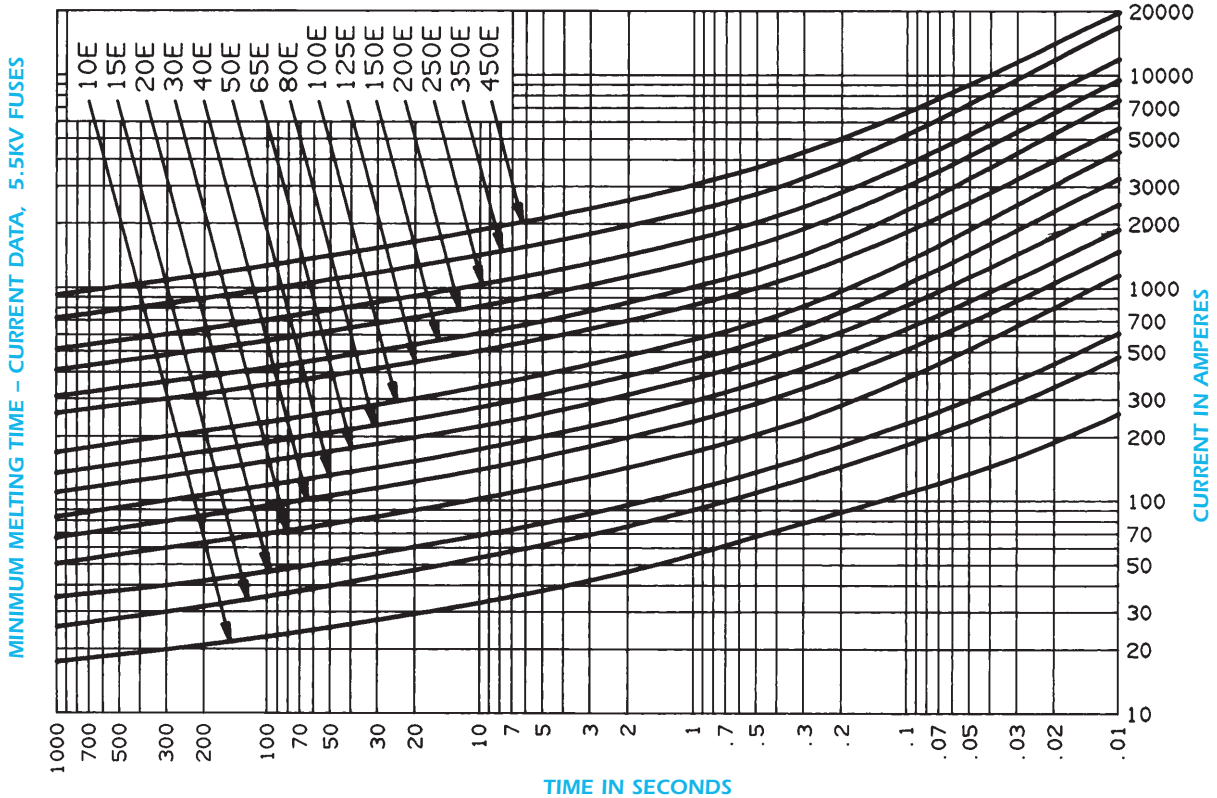


American Fuses
E-Rated
5.5kV, 8.25kV and 15.5kV - CS 3 Series

A055F1DORO – 10E to 200E and A055F2DORO – 250E to 450E

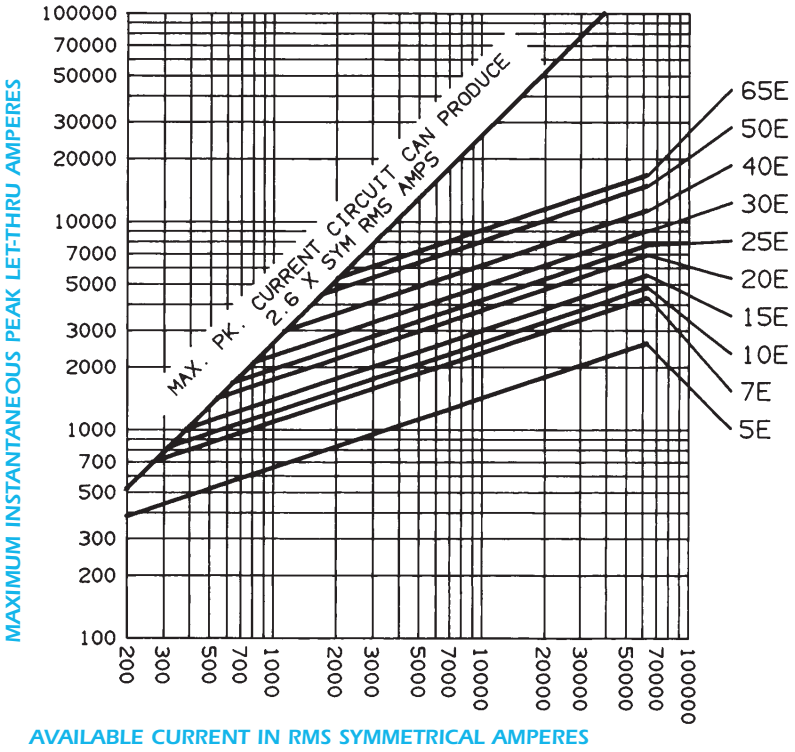


A055F1DORO – 10E to 200E and A055F2DORO – 250E to 450E

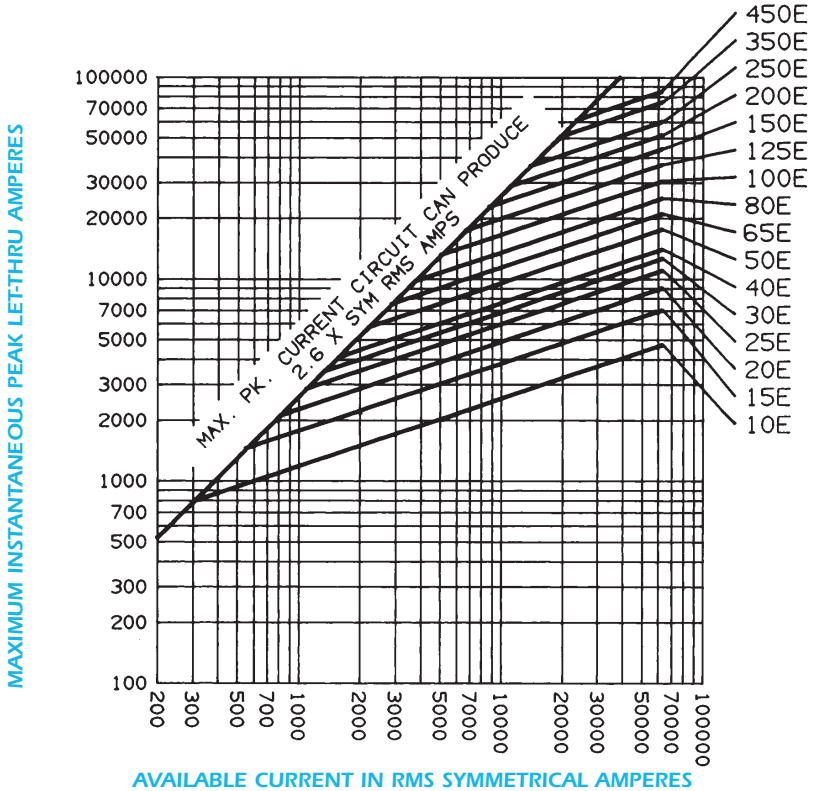


American Fuses
E-Rated
5.5kV, 8.25kV and 15.5kV - CS 3 Series

A055F1CORO – 5E to 65E
Peak Let-Thru Current Data, 5.5kV CS-3 Fuses



A055F1DORO – 10E to 200E and A055F2DORO – 250E to 450E
Peak Let-Thru Current Data, 5.5kV CS-3 Fuses



American Fuses
E-Rated
5.5kV, 8.25kV and 15.5kV - CS 3 Series

8.25kV Ferrule Mounted

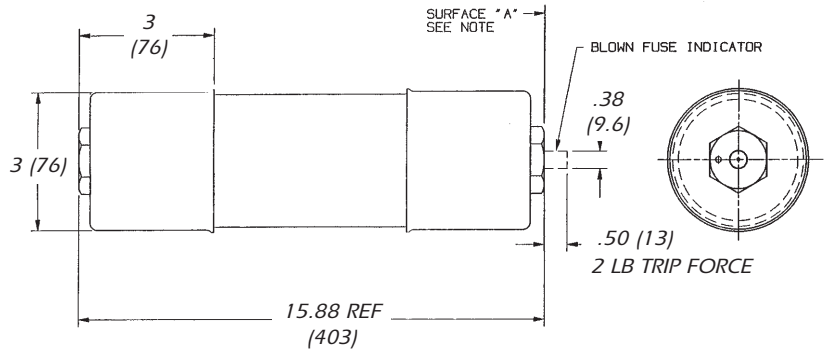


FIGURE A

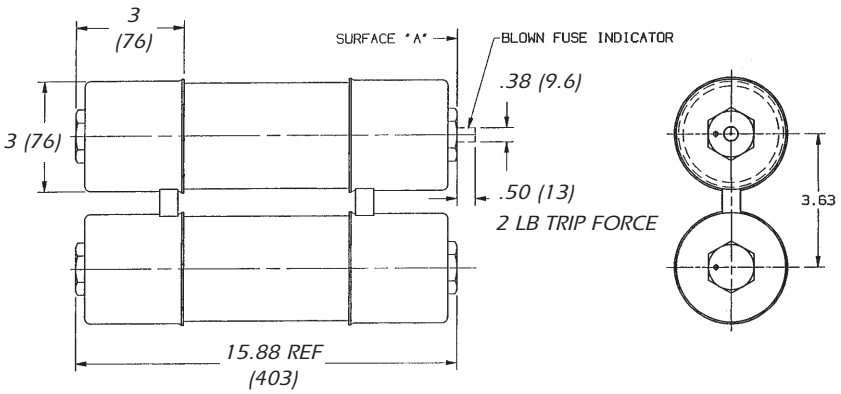


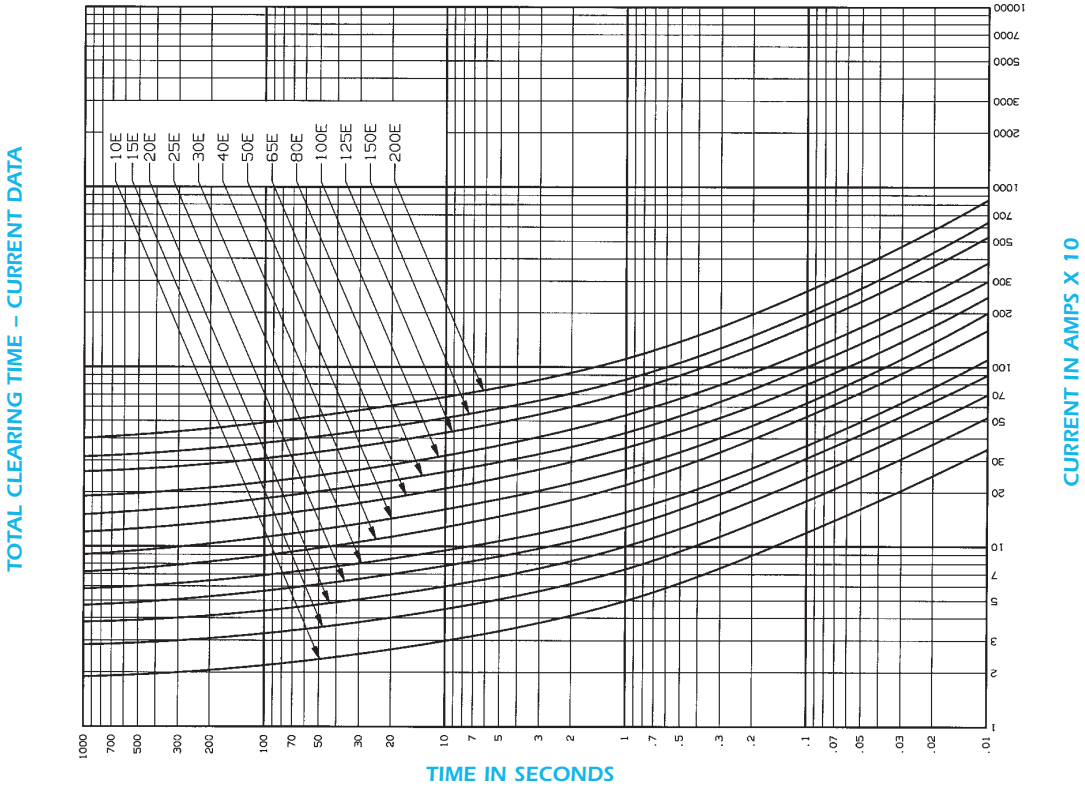
FIGURE B

Catalog Number	Reference Number	Ampere Rating	Number of Barrels	Figure SYM. Amperes*	Interrupting Rating RMS
8.25kV Max. – Ferrule Mounted Style – 12" (305mm) Clip Center – 3" (76.2mm) Barrel Diameter					
A825X10E-1	-	10E	1	A	
A825X15E-1	-	15E	1	A	
A825X20E-1	C215903	20E	1	A	
A825X25E-1	G216413	25E	1	A	
A825X30E-1	P216926	30E	1	A	50,000
A825X40E-1	L217958	40E	1	A	
A825X50E-1	R218469	50E	1	A	
A825X65E-1	K218992	65E	1	A	
A825X80E-1	C219514	80E	1	A	
A825X100E-1	M211818	100E	1	A	
A825X125E-1	A212336	125E	2	B	
A825X150E-1	N213866	150E	2	B	50,000
A825X200E-1	X214886	200E	2	B	

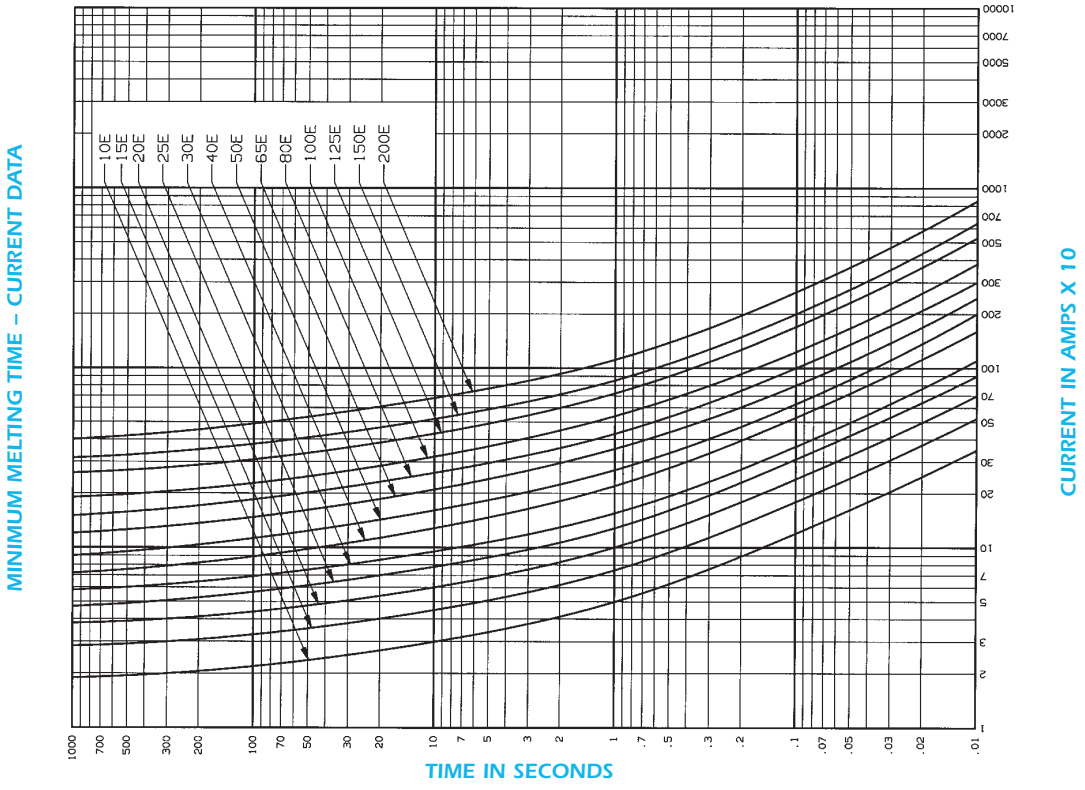
** RMS ASYM. AMPS = RMS SYM. AMPERES x 1.6*

American Fuses
E-Rated
5.5kV, 8.25kV and 15.5kV - CS 3 Series

A825X (10E to 200E) -1

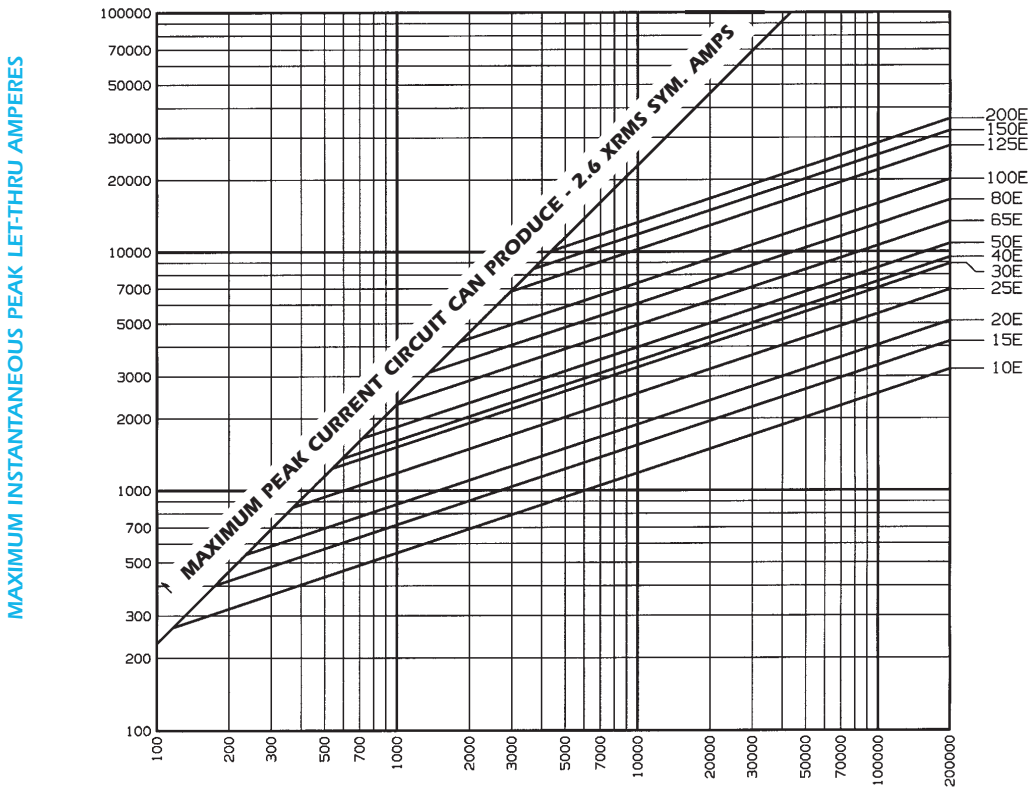


A825X (10E to 200E) -1



American Fuses
E-Rated
5.5kV, 8.25kV and 15.5kV - CS 3 Series

A825X (10E to 200E) -1
Peak Let-Thru Current Data, E-Rated Fuses



American Fuses
E-Rated
5.5kV, 8.25kV and 15.5kV - CS 3 Series

15.5kV Ferrule Mounted

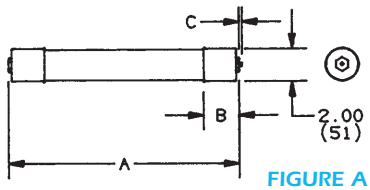


FIGURE A

CATALOG NUMBERING SYSTEM

A 1 5 5 F 1 D 0 R 0 - 1 0 0 E

- A: Amp-trap Fuse
- 155: Max. Voltage Rating (155=15.5kV)
- F: Style (F=Ferrule Mount)
- 1: No. of Barrels
- D: Diameter (C=2", D=3")
- 0: Special Features
- R0: Revision/No.
- 100E: Ampere Rating

Indicator Flush with Surface in Untripped Position

Blown Fuse Indicator

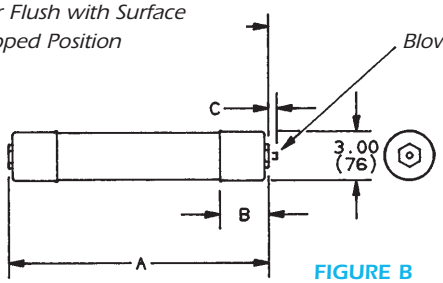


FIGURE B

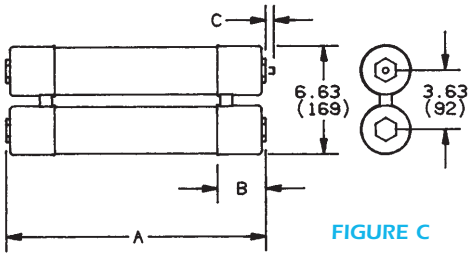


FIGURE C

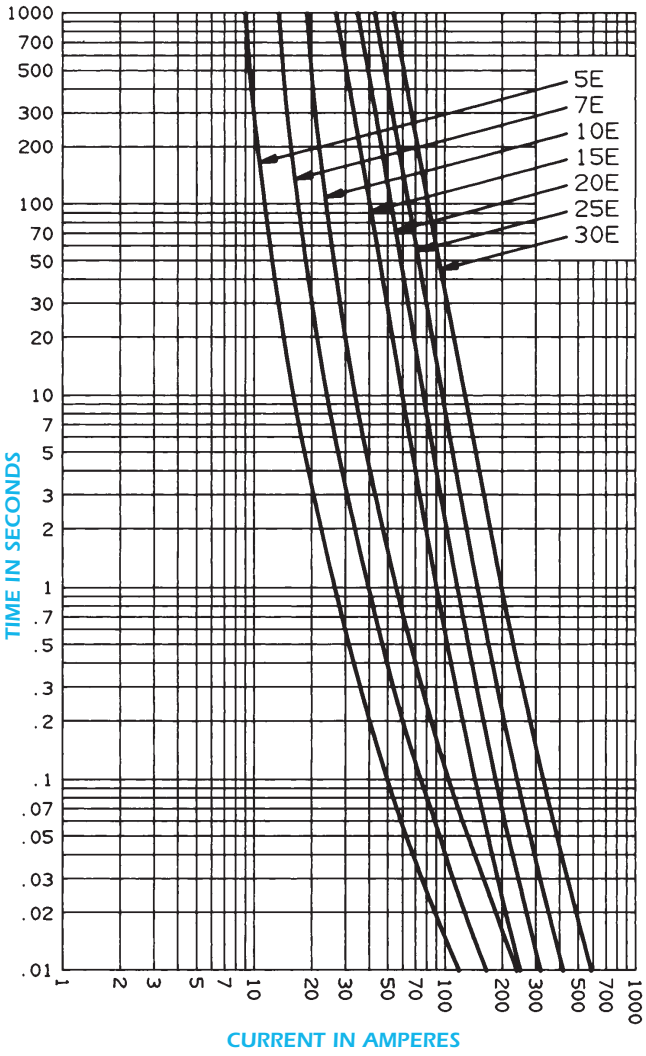
Catalog Numbering System, Ratings, Dimensions, CS-3 Series, 15.5kV

Catalog Number	Reference Number	Ampere Rating	Number of Barrels	Fig.	Dimensions Inches (mm) A	B	C	Interrupting Rating RMS SYM.*Amp.
15.5kV Max. – Ferrule Mounted Style – 15" (381 mm) Clip Centers – 2" (50.8mm) Barrel Diameter								
A155F1CORO - 5E	E218E987	5E	1	A	17.03 (433)	2.2 (56)	.19 (4.8) Tripped Force 1 lb.	50,000
7E	X219509	7E						
10E	S214882	10E						
15E	X215392	15E						
20E	L216923	20E						
25E	F217953	25E						
30E	L218464	30E						
15.5kV Max. – Ferrule Mounted Style – 15" (381mm) Clip Centers – 3" (76.2mm) Barrel Diameter								
A155F1DORO - 10E	E216411	10E	1	B	18.87 (479)	3.0 (76)	0.5 (13) Tripped Force 2 lbs.	50,000
15E	A217442	15E						
20E	J217956	20E						
25E	P218467	25E						
30E	H218990	30E						
40E	A219512	40E						
50E	W221969	50E						
A155F2DORO - 65E	Q218468	65E	2	C				
80E	J218991	80E						
100E	B215902	100E						
15.5kV Max. – Ferrule Mounted Style – 18" (457mm) Clip Centers – 3" (76.2mm) Barrel Diameter								
A155F1DORO - 65E	S223231	65E	1	B	21.75 (552)	3.0 (76)	0.5 (13) Tripped Force 2 lbs.	50,000
80E	J201051	80E						
100E	A215901	100E						
A155F2DORO - 125E	F216412	125E	2	C				
150E	N216925	150E						
175E	B217443	175E						
200E	K217957	200E						

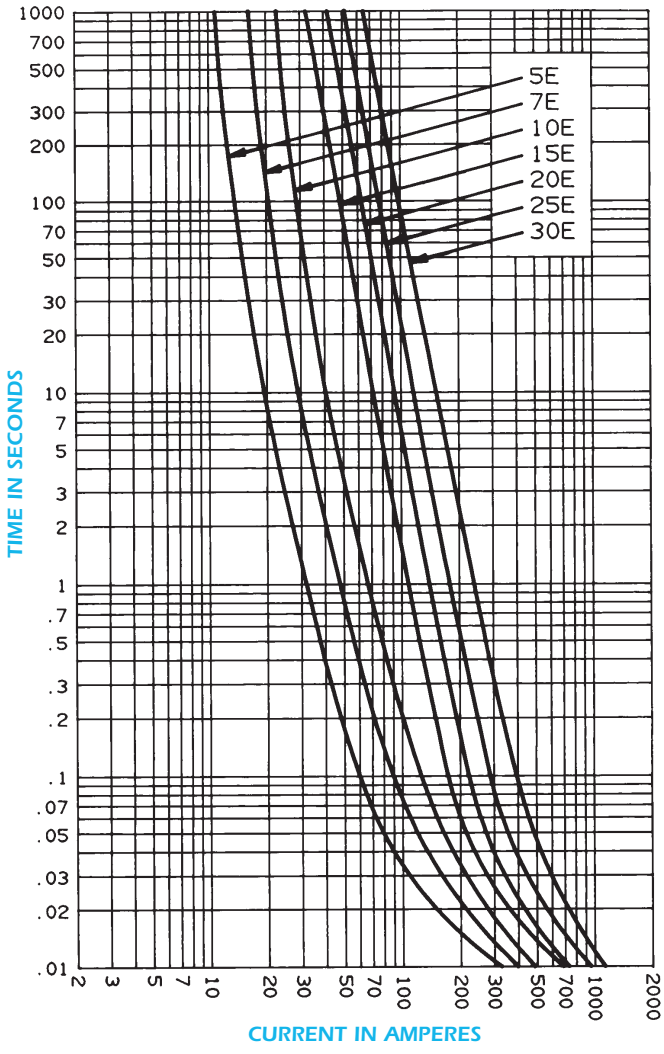
** RMS ASYM. AMPERES = RMS SYM. AMPERES x 1.6*

American Fuses
E-Rated
5.5kV, 8.25kV and 15.5kV - CS 3 Series

A155F1CORO – 5E to 30E
Minimum Melting Time – Current Data, 15.5kV Fuses

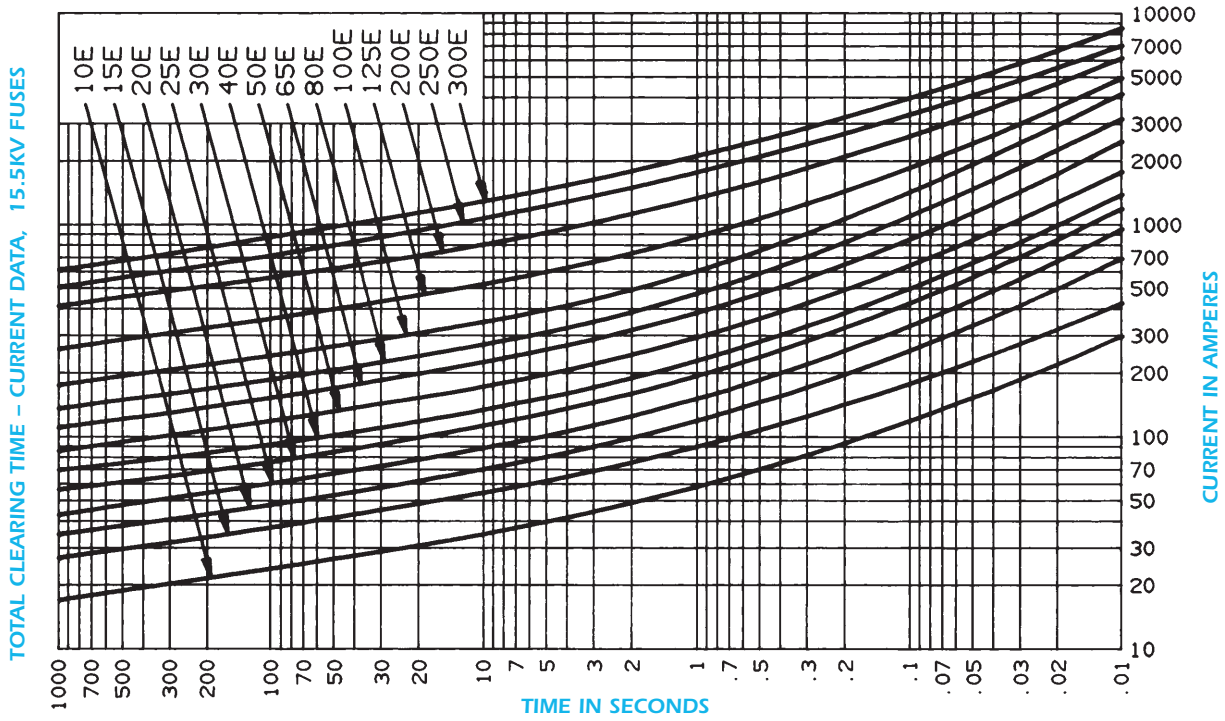


A155F1CORO – 5E to 30E
Total Clearing Time – Current Data, 15.5kV Fuses

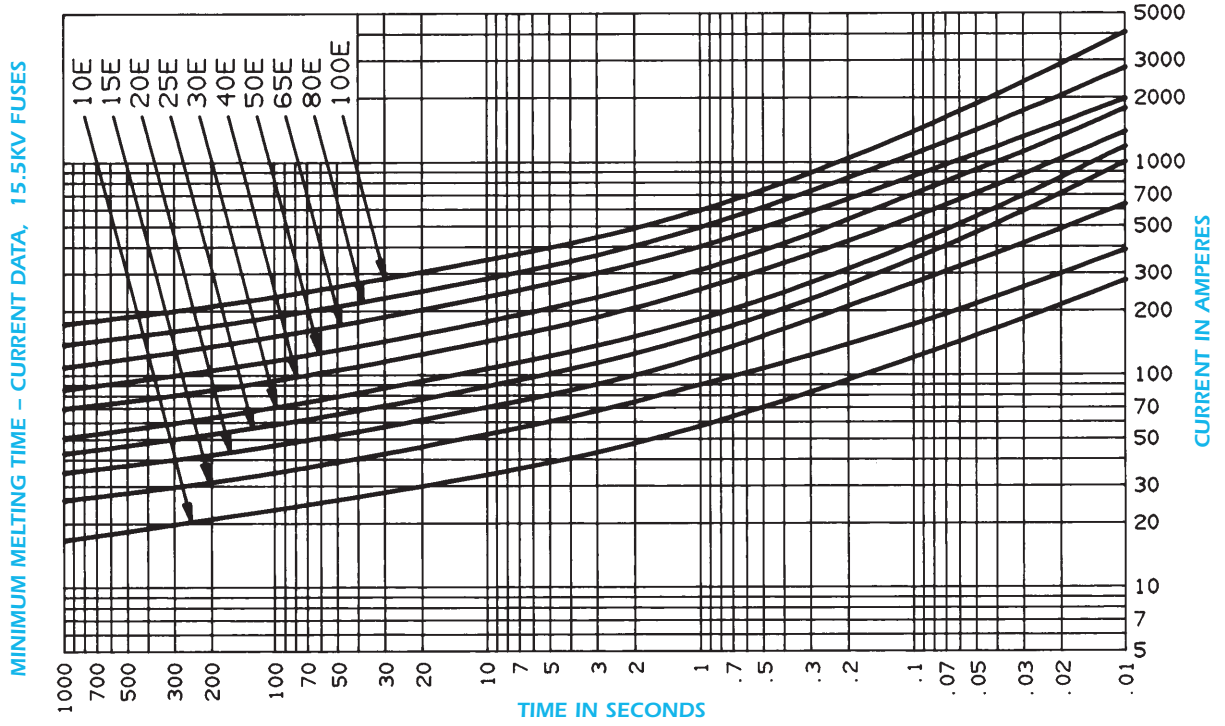


American Fuses
E-Rated
5.5kV, 8.25kV and 15.5kV - CS 3 Series

A155F1DORO – 10E to 50E and A155F2DORO – 65E to 100E

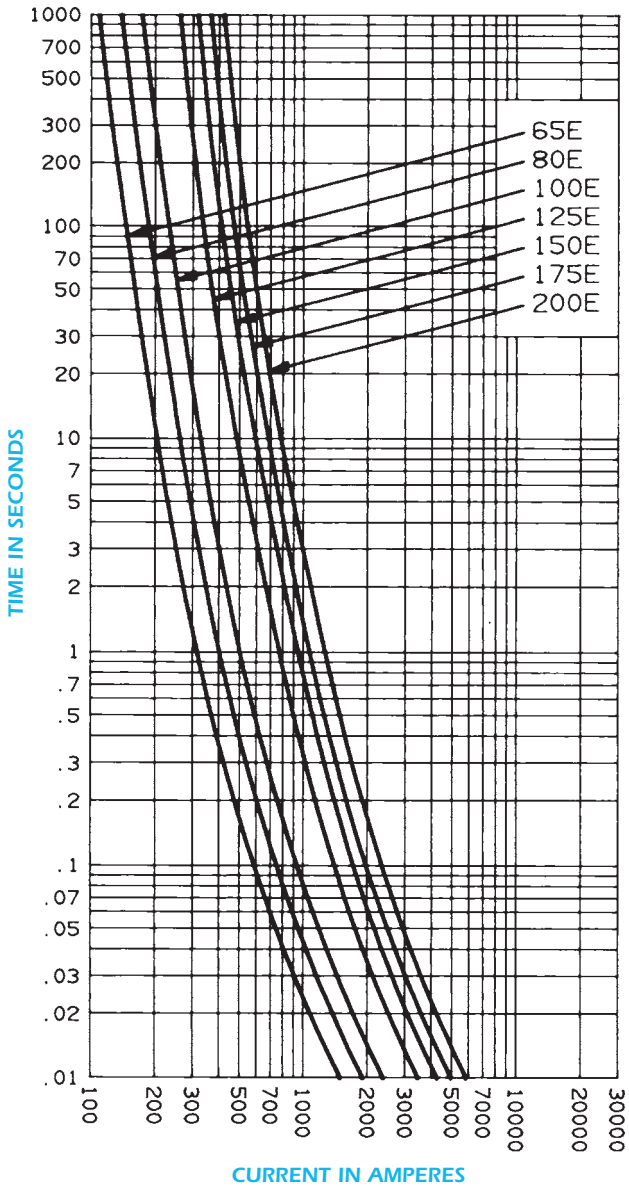


A155F1DORO – 10E to 50E and A155F2DORO – 65E to 100E

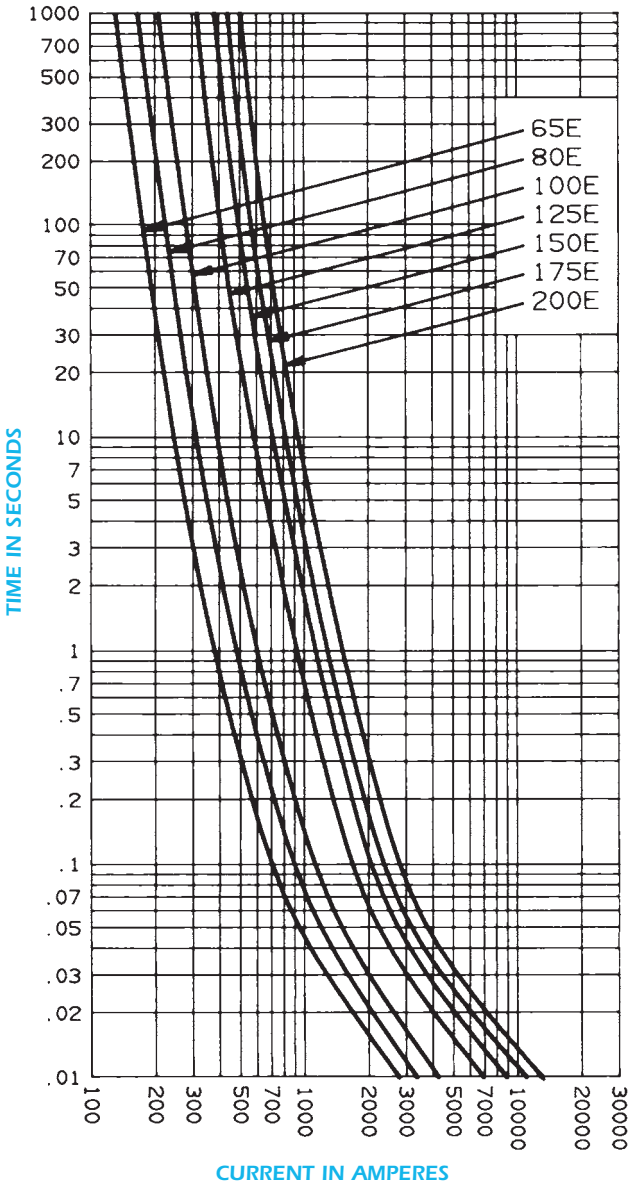


American Fuses
E-Rated
5.5kV, 8.25kV and 15.5kV - CS 3 Series

A155F1DORO – 65E to 100E and A155F2DORO – 125E to 200E Minimum Melting Time – Current Data, 15.5kV Fuses

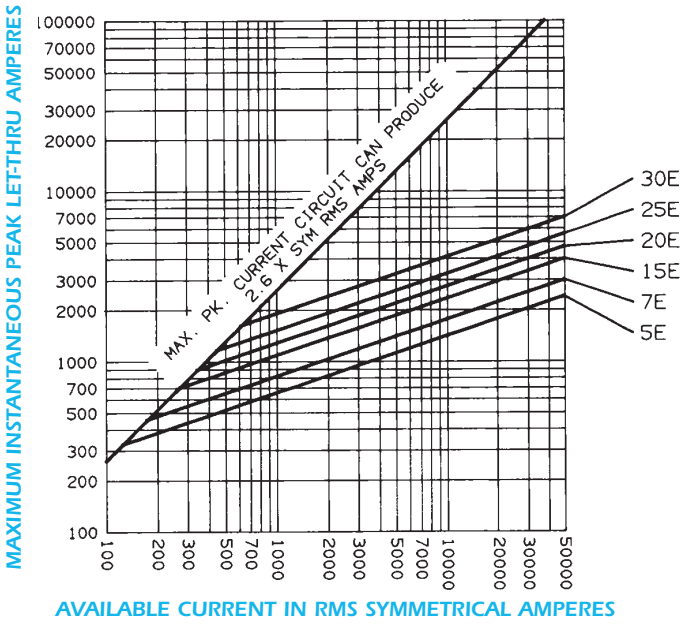


A155F1DORO – 65E to 100E and A155F2DORO – 125E to 200E Total Clearing Time – Current Data, 15.5kV Fuses

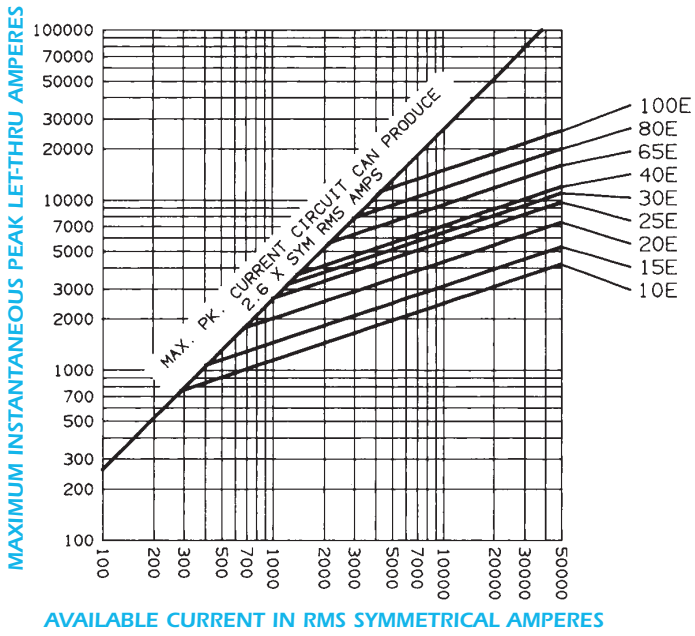


American Fuses
E-Rated
5.5kV, 8.25kV and 15.5kV - CS 3 Series

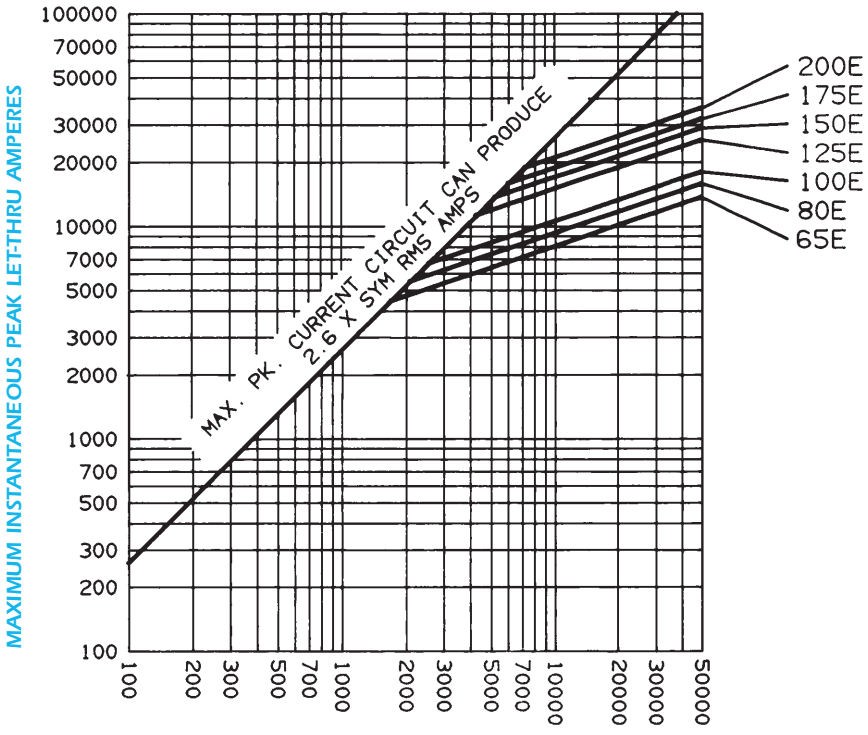
A155F1CORO – 5E to 30E
Peak Let-Thru Current Data, 15.5kV CS-3 Fuses



A155F1DORO – 10E to 50E
A155F2DORO – 65E to 100E
Peak Let-Thru Current Data, 15.5kV CS-3 Fuses



A155F1DORO – 65E to 100E
A155F2DORO – 125E to 200E
Peak Let-Thru Current Data, 15.5kV CS-3 Fuses



American Fuses
E-Rated
5.5kV - Bolt-in Series

5kV Bolt-in fuses

Amp-trap Bolt-in Series E-rated fuses are single, double or triple barrel (3" diam.) with end mounts designed for bolting directly to equipment bus or terminal pads. They are UL listed and are for use indoors (or outdoors in a weatherproof enclosure). The unique time-current characteristic of Ferraz Shawmut E-rated fuses allows them to be closely sized to transformer full load rated current, as recommended by IEEE guidelines, without being affected by normal magnetizing inrush current. Bolt-in fuses are typically sized at transformer rated current of 133%, thereby providing superior overall protection.

Features/Benefits

- **UL Listed** for compatibility with UL listed equipment
- **Bolt-in mounting** for direct connection to bus or terminals
- **Current Limiting** for superior equipment protection
- **Blown-fuse indicator** gives positive identification of open fuse
- **Non-venting** for silent operation
- **Metal Embossed Catalog Number** and manufacturing date for lasting identification

Ratings

A055B

AC: 10E to 900E
5500V max, 63kA I.R. Sym.

Approvals

- UL Listed to JEEG, "Fuses Over 600 Volts"
- UL File # E143362

Highlights

- E-Rated
- UL Listed
- Complies with ANSI C37.46

Applications

- Protection for 5.5kV transformers or distribution systems

Definitions

E-rating
E-rated fuses operate as follows:
Over 100E - must melt in 600 seconds (10 mins.) on 220 to 264% of E (ampere) rating.
Example - A 750E fuse must melt in 600 seconds with an applied current of 1650 to 1980 amperes.

General Purpose Current-Limiting Fuse
A general purpose current-limiting power fuse is one that is capable of interrupting all currents from its rated interrupting rating down to the current that causes melting of the fusible element in one hour.

American Fuses
E-Rated
5.5kV - Bolt-in Series

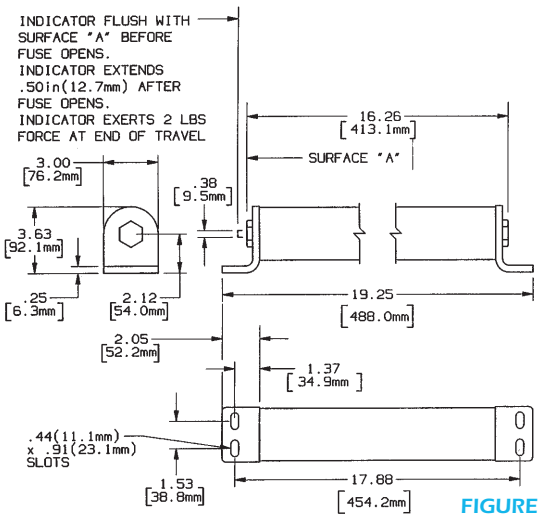


FIGURE A

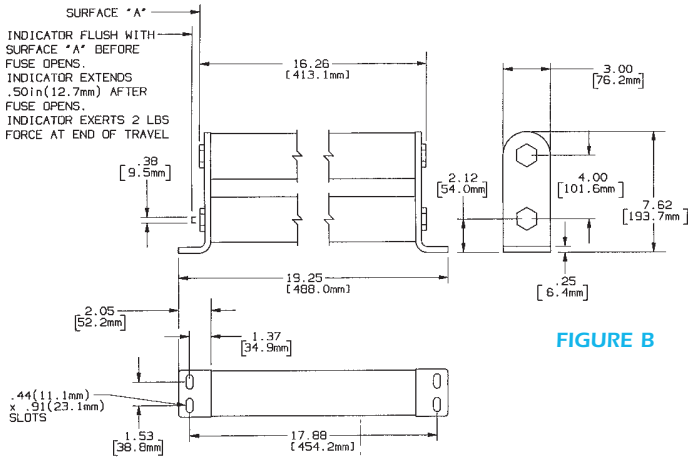


FIGURE B

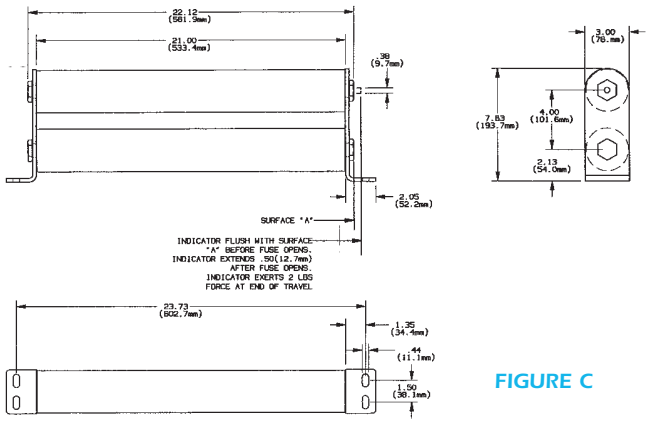


FIGURE C

CATALOG NUMBERING SYSTEM

A 0 5 5 B 1 D A R 0 - 5 0 E

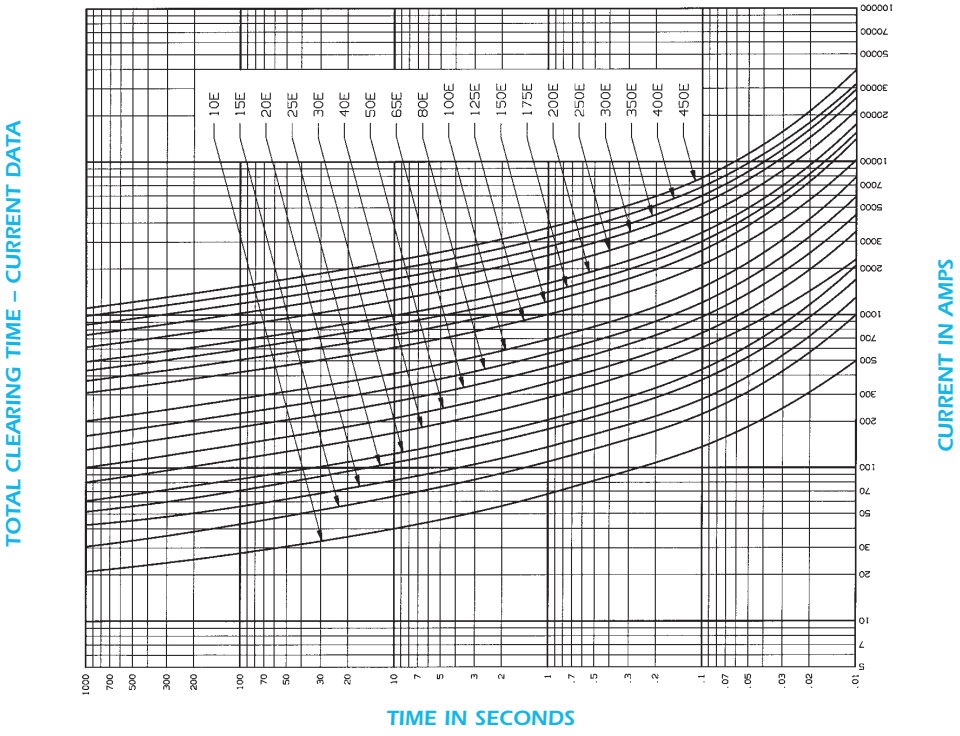
- Amp-trap Fuse
- Max. Voltage Rating (055=5.5kV)
- Style (B= Bolt-in Mount)
- No. of Barrels
- Diameter (D=3")
- Special Features
- Revision/No.
- Ampere Rating

Designation	Reference Number	Ampere Rating	Number Of Barrels	Figure	Interrupting Rating RMS SYM. Amperes*
5.5kV Max. – Bolt-in Style – 17.88" (454mm) Hole Centers – 3" (76.2mm) Barrel Diameter					
A055B1DARO-10E		10E	1	A	
A055B1DARO-15E		15E	1	A	
A055B1DARO-20E		20E	1	A	
A055B1DARO-25E		25E	1	A	
A055B1DARO-30E		30E	1	A	
A055B1DARO-40E		40E	1	A	
A055B1DARO-50E		50E	1	A	
A055B1DARO-65E		65E	1	A	63,000
A055B1DARO-80E		80E	1	A	
A055B1DARO-100E		100E	1	A	
A055B1DARO-125E		125E	1	A	
A055B1DARO-150E		150E	1	A	
A055B1DARO-175E		175E	1	A	
A055B1DARO-200E		200E	1	A	
5.5kV Max. – Bolt-in Style – 17.88" (454mm) Hole Centers – 3" (76.2mm) Barrel Diameter					
A055B2DARO-250E	S221966	250E	2	B	
A055B2DARO-300E	B222710	300E	2	B	
A055B2DARO-350E	F201048	350E	2	B	63,000
A055B2DARO-400E	P201562	400E	2	B	
A055B2DARO-450E	W212332	450E	2	B	
5.5kV Max. – Bolt-in Style – 23.73 (602,7mm) Hole Centers – 3" (76.2mm) Barrel Diameter					
A055B2DORO-450E		450E	2	C	
A055B2DORO-500E		500E	2	C	63,000
A055B2DORO-600E		600E	2	C	

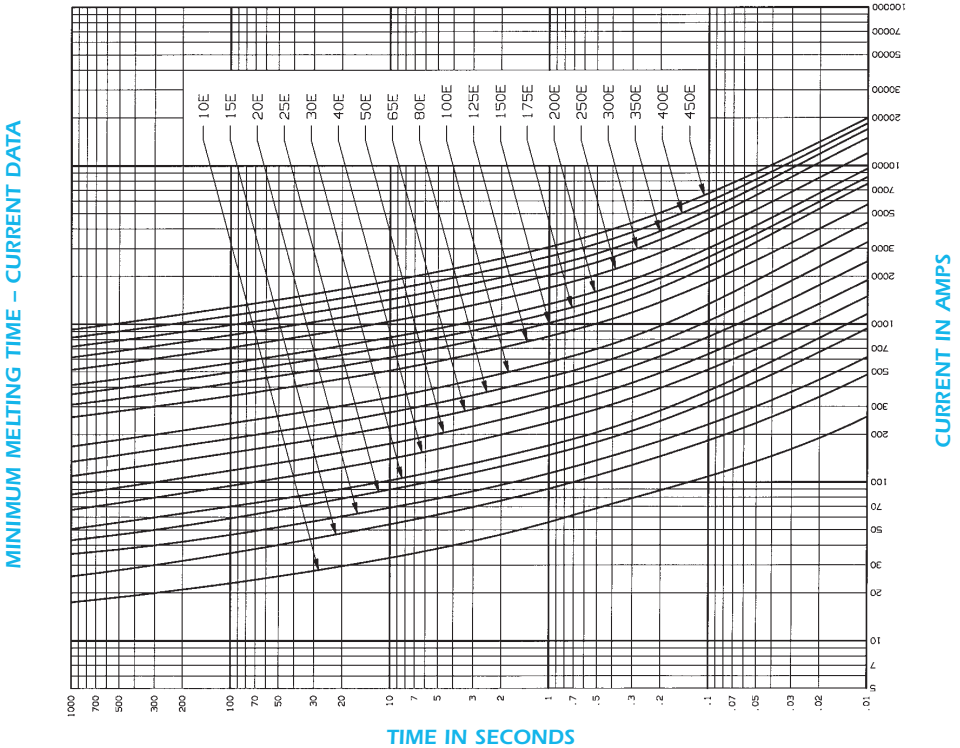
** RMS ASYM. AMPS = RMS SYM. AMPERES x 1.6*

American Fuses
E-Rated
5.5kV - Bolt-in Series

A055B1DARO - 10E to 200E - A055B2DARO - 250E to 450E

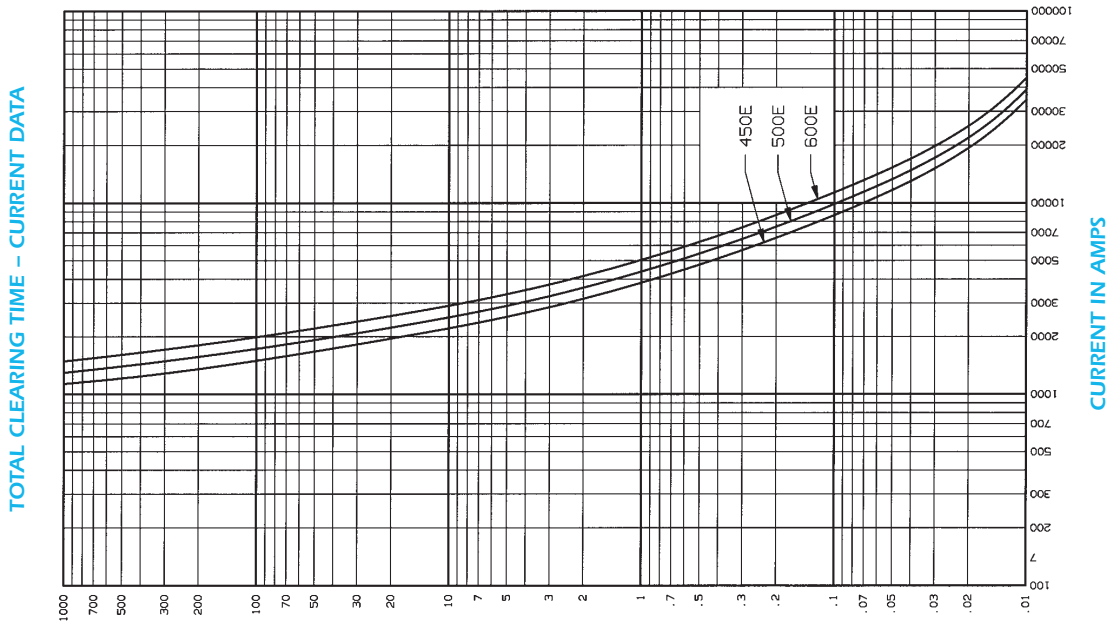


A055B1DARO - 10E to 200E - A055B2DARO - 250E to 450E

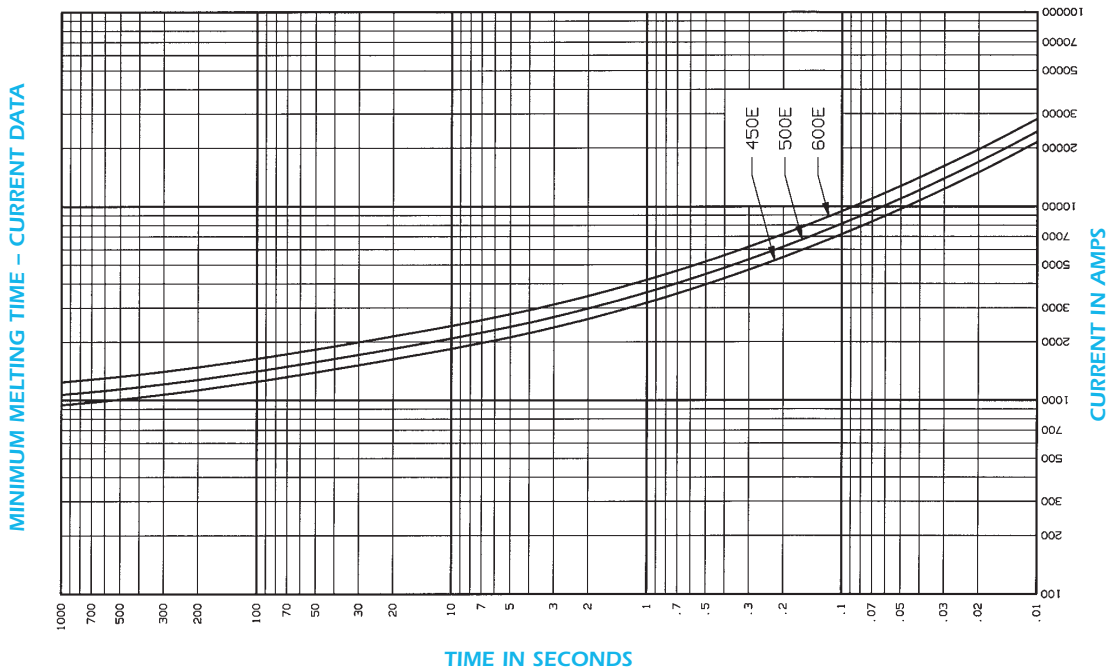


American Fuses
E-Rated
5.5kV - Bolt-in Series

A055B2D0RO - 450E to 600E

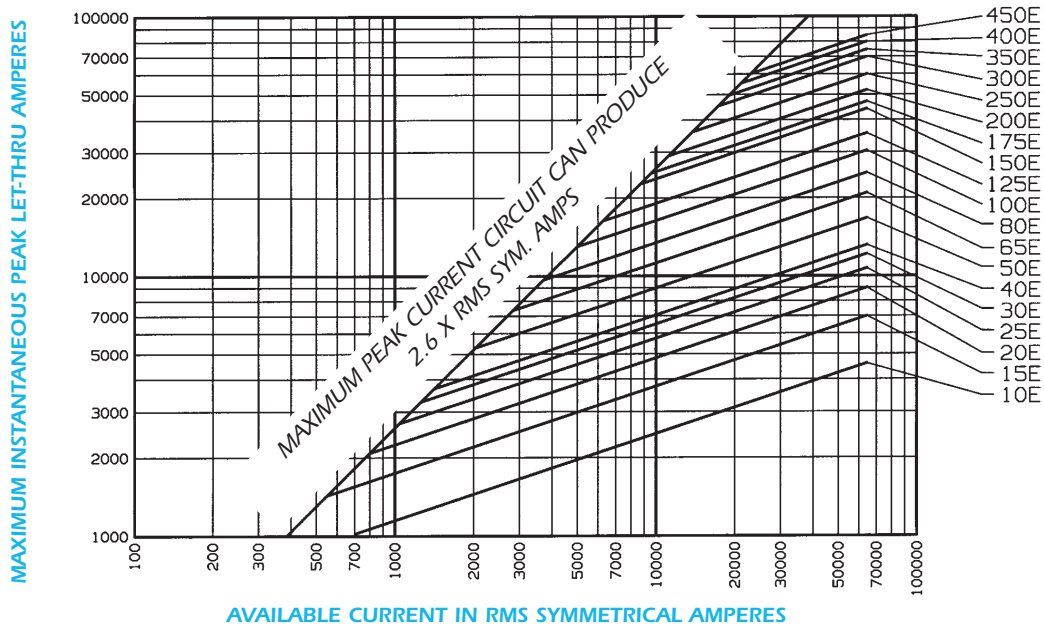


A055B2D0RO - 450E to 600E

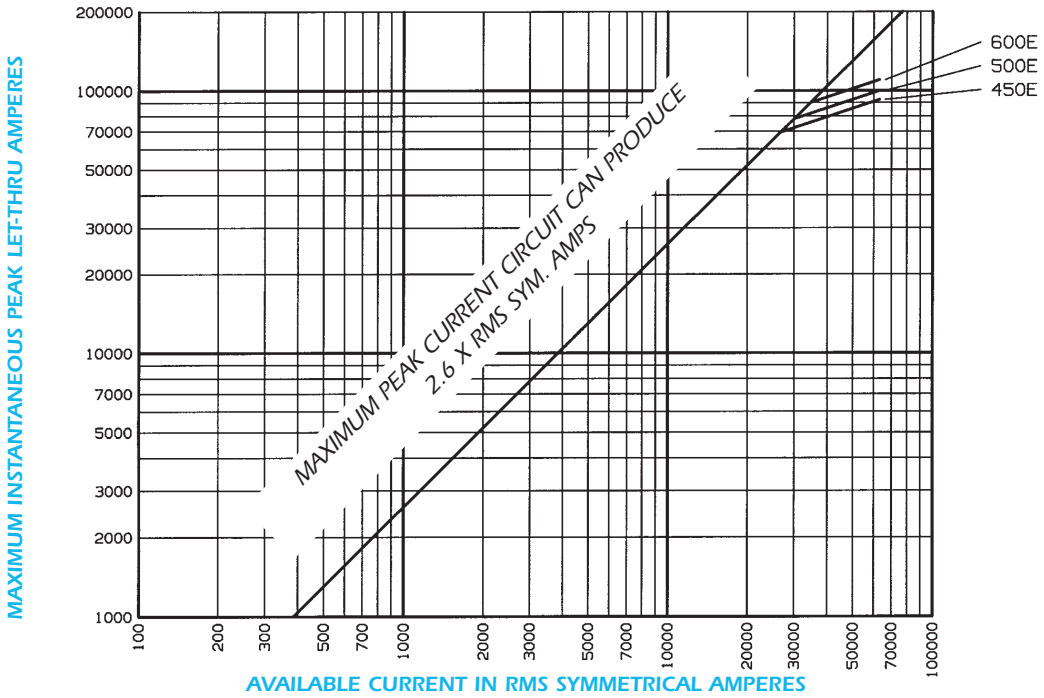


American Fuses
E-Rated
5.5kV - Bolt-in Series

A055B1DARO - 10E to 200E - A055B2DARO - 250E to 450E
Peak Let-Thru Current Data, E-Rated Fuses



A055B2D0RO - 450E to 600E
Peak Let-Thru Current Data, E-Rated Fuses



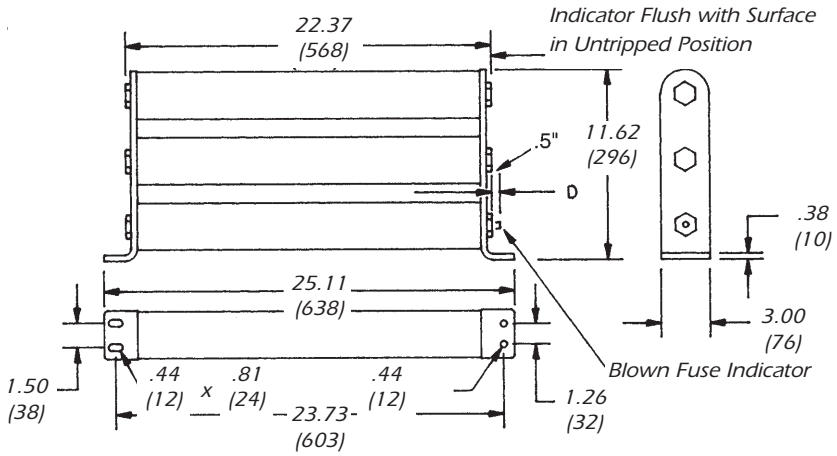
American Fuses
E-Rated
5.5kV - Bolt-in Series

5.5kV Bolt-in

CATALOG NUMBERING SYSTEM

A 0 5 5 B 3 D 0 R 0 - 9 0 0 E

- A — Amp-trap Fuse
- 055 — Max. Voltage Rating (055=5.5kV)
- B — Style (C= Bolt-in Mount)
- 3 — No. of Barrels
- D — Diameter (D=3")
- 0 — Special Features
- R0 — Revision/No.
- 900E — Ampere Rating



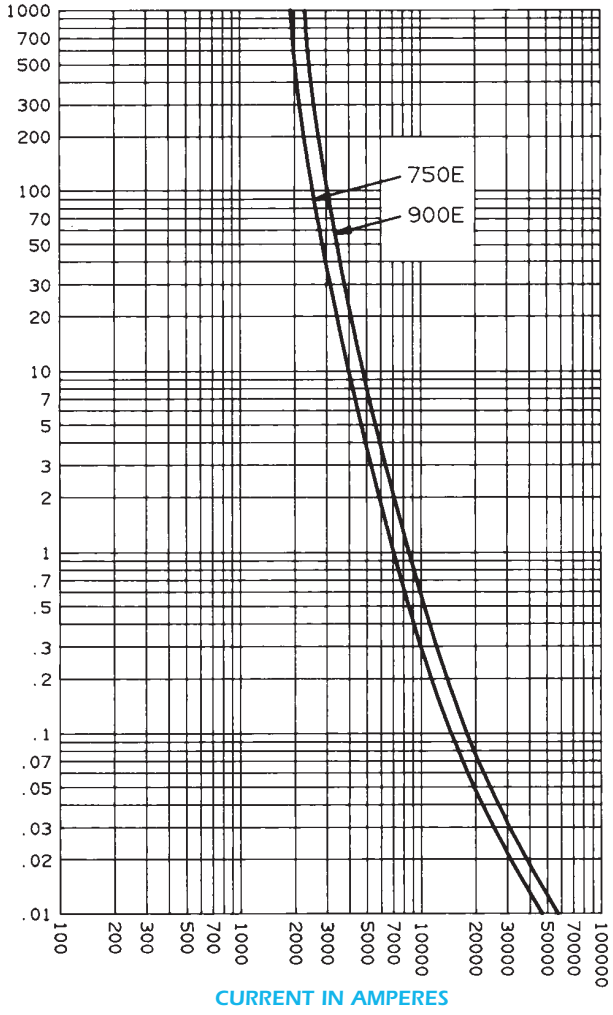
Catalog Numbers, Ratings, Dimensions, Bolt-in Series, 5.5kV

Designation	Reference Number	Old Catalog Number	Ampere Rating	Number of Barrels	Interrupting Rating RMS SYM.* Amperes
5.5kV Max. – Bolt-in Style – 23.73" (603mm) Hole Centers – 3" (76.2mm) Barrel Diameter					
A055B3DORO-750E 900E	K212851 T213365	A550X750E-4 900E-4	750E 900E	3	63,000

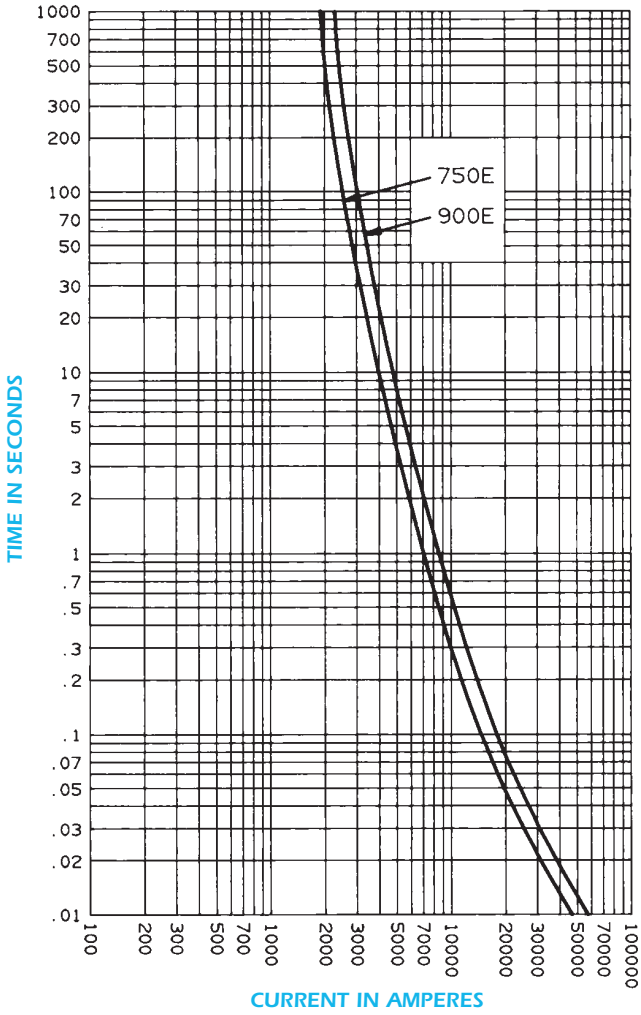
** RMS ASYM. AMPERES = RMS SYM. AMPERES x 1.6*

American Fuses
E-Rated
Bolt-in Series

A055B3DORO – 750E to 900E
Minimum Melting Time – Current Data, 5.5kV Fuses

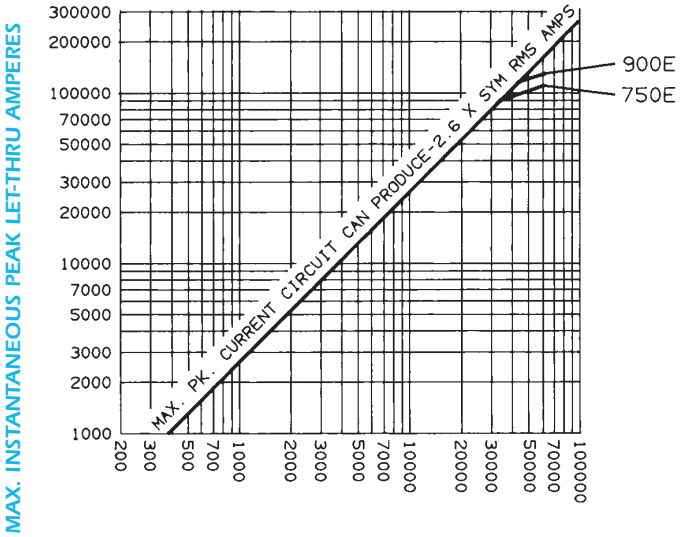


A055B3DORO – 750E to 900E
Total Clearing Time – Current Data, 5.5kV Fuses



A055B3DORO – 750E to 900E

PEAK LET-THRU CURRENT
DATA – 5.5KV BOLT-IN FUSES



American Fuses
E-Rated
5.5kV - 15.5kV CL-14 series

5kv and 15kV Clip-Lock Mounted Fuses

Amp-trap CL-14 E-rated 5kV and 15kV fuses have 3" diameter barrels and mount in unique cam-locking clips, for superior connections as well as easy installation and replacement. They are UL listed as "general purpose current-limiting fuses" and are for use indoors (or outdoors in a weatherproof enclosure). The unique time-current characteristic of Ferraz Shawmut E-rated fuses allows them to be closely sized to transformer full load rated current, as recommended by IEEE guidelines, without being affected by normal magnetizing inrush current. CL-14 fuses are typically sized at transformer rated current of 133%, thereby providing superior overall protection.

Features/Benefits

- **UL Listed** for compatibility with UL listed equipment
- **Clip-Lock mounting** for reliable high integrity connection into circuit
- **Current limiting** for superior equipment protection
- **Blown-fuse indicator** gives positive identification of open fuse
- **Non-venting** for silent operation
- **Metal Embossed Catalog Number** and manufacturing date for lasting identification

Ratings

A055C
AC: 10E to 600E
5.5kV, 63kA I.R. Sym.

A155C
AC: 10E TO 300E
15.5kV, 50kA I.R. Sym

Highlights

- E-Rated
- UL Listed 5.5kV
- Complies with ANSI C37.46

Applications

Protection for 5.5kV or 15.5kV transformers or distribution systems

Approvals

- UL Listed to JEEG, "Fuses Over 600 Volts"
- UL File # E143362

Definitions

E-rating
E-rated fuses operate as follows:
100E or less - must melt in 300 seconds (5 mins.) at 200 to 240% of E (ampere) rating.
Over 100E - must melt in 600 seconds (10 mins.) at 220 to 264% of E (ampere) rating.
Example - A 100E fuse must melt in 300 seconds with an applied current of 200 to 240 amperes.

General Purpose Current-Limiting Fuse

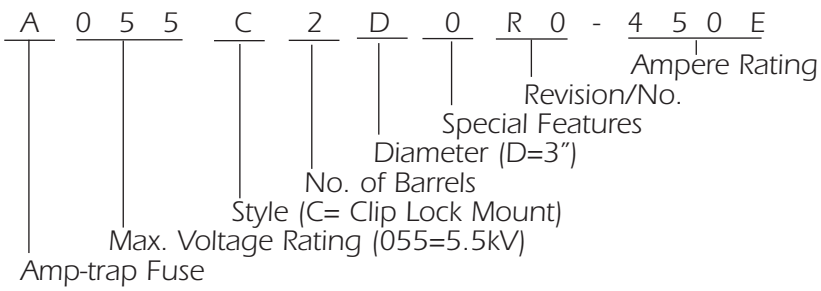
A general purpose current-limiting power fuse is one that is capable of interrupting all currents from its rated interrupting rating down to the current that causes melting of the fusible element in one hour.

Clip-Lock Clips for CL-14 Fuses:
228-700-520 (One pair of clips)

American Fuses
E-Rated
5.5kV - 15.5kV CL-14 series

5.5kV Clip-Lock Mounted

CATALOG NUMBERING SYSTEM



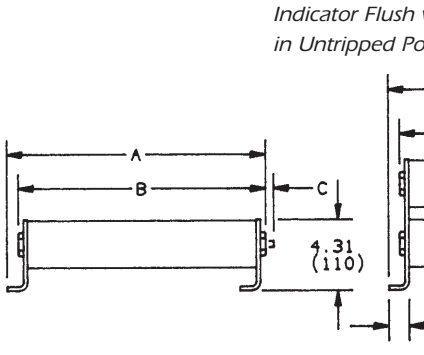


FIGURE A

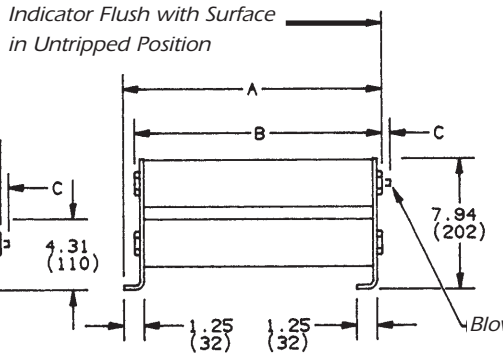


FIGURE B

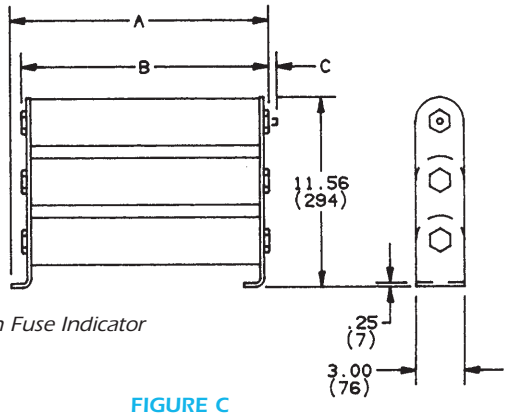


FIGURE C

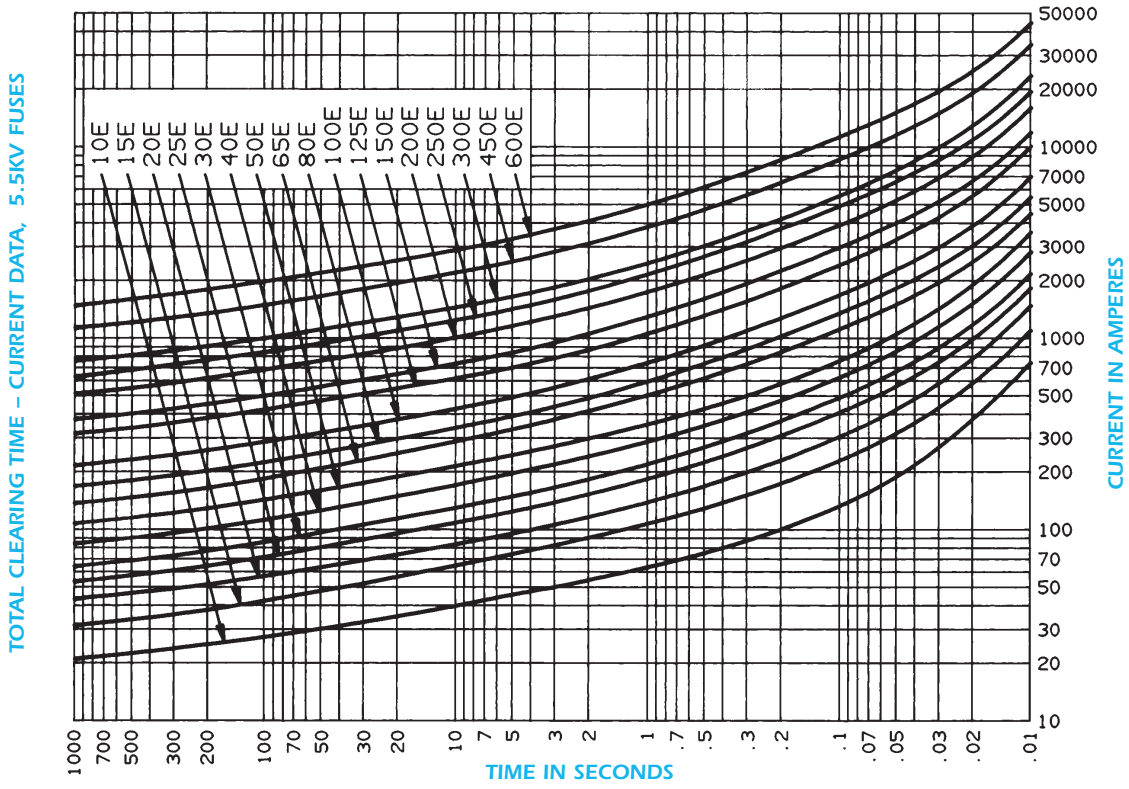
Catalog Numbers, Ratings, Dimensions, CL-14 Series, 5.5kV

New Catalog Number	Reference Number	Old catalog Number	Ampere Rating	Number of Barrels	Fig.	Dimensions Inches (mm) A	Dimensions Inches (mm) B	Dimensions Inches (mm) C	Interrupting Rating RMS SYM Amperes
5.5kV Max. – Clip-Lock Style – 15.25" (387mm) Clip Centers – 3" (76.2mm) Barrel Diameter									
A055C1DORO-10E	R213363	225-007-937	10E	1	A	16.81 (427)	16.12 (410)	0.5 (13) Tripped Force 2 lbs.	63,000
15E	Q214880	938	15E						
20E	X215898	939	20E						
25E	J216921	940	25E						
30E	D217951	941	30E						
40E	C218985	942	40E						
50E	V219507	943	50E						
65E	Q221964	944	65E						
80E	Z222708	945	80E						
100E	G212848	946	100E						
125E	G213860	947	125E						
150E	R214375	948	150E						
5.5kV Max. – Clip Lock Style – 21.25" (540mm) Clip Centers – 3" (76.2mm) Barrel Diameter									
A055C1DORO-200E	V215390	225-007-949	200E	1	A	22.81 (580)	22.12 (562)	0.5 (13) Tripped Force 2 lbs.	63,000
250E	B216408	950	250E						
300E	W217438	951	300E						
400E	J218462	952	400E						
A055C2DORO-450E	N223227	953	450E	2	B				
500E	D201046	954	500E						
600E	M201560	955	600E						

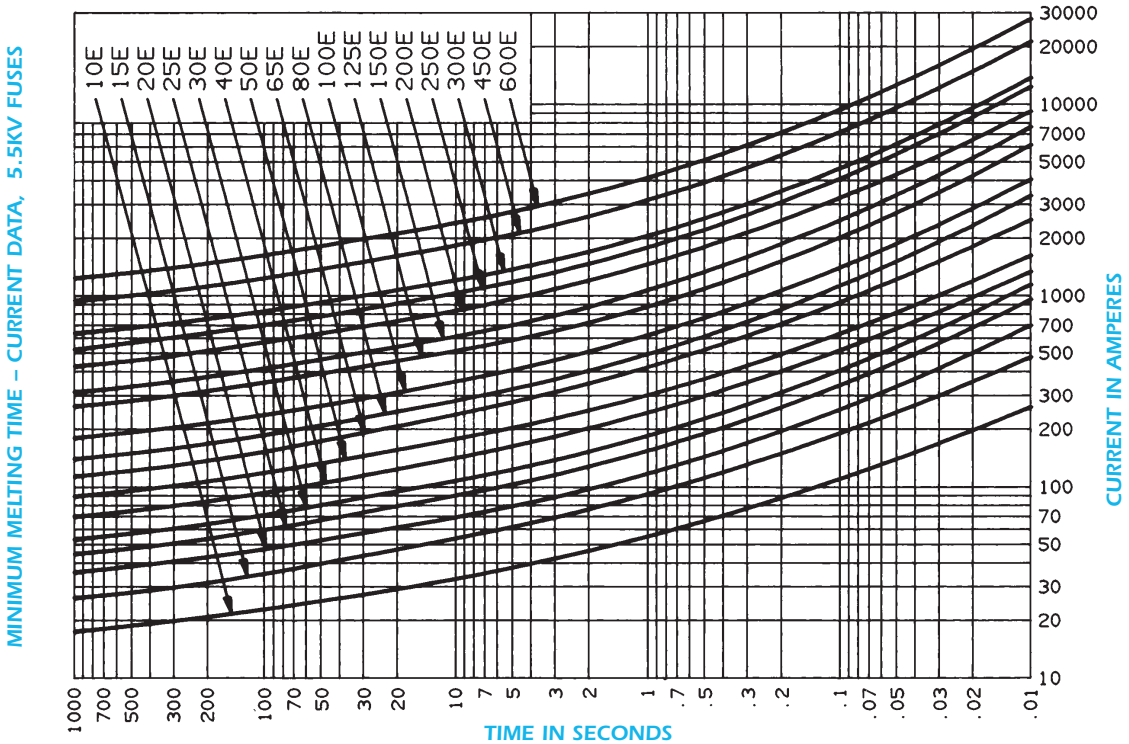
** RMS ASYM. Amperes = RMS SYM. Amperes x 1.6*

American Fuses
E-Rated
5.5kV - 15.5kV CL-14 series

A055C1DORO – 10E to 400E and A055C2DORO – 450E to 600E

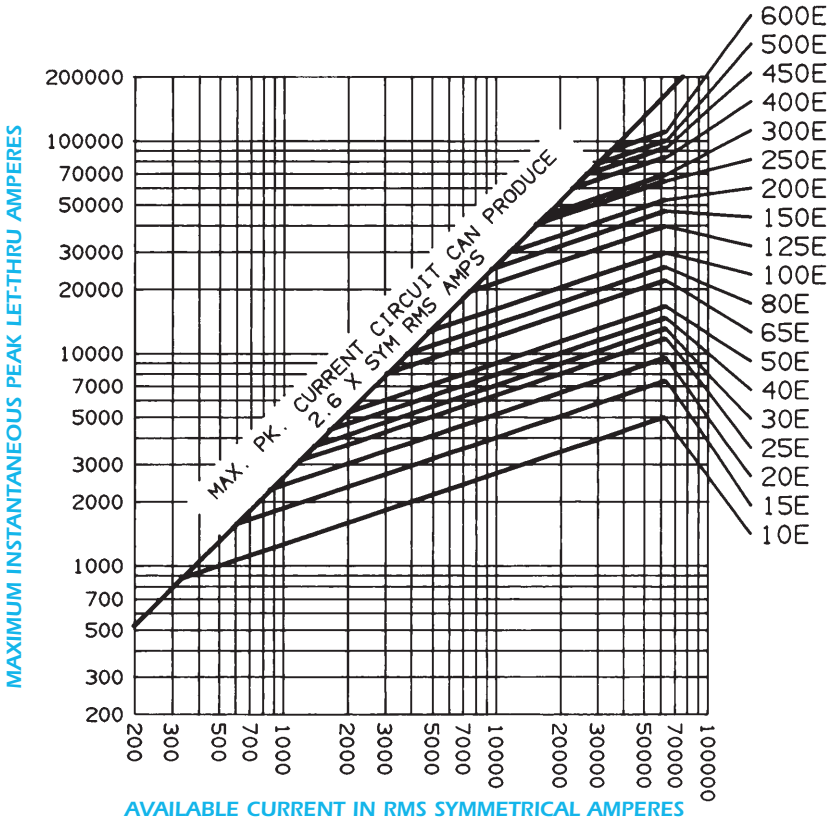


A055C1DORO – 10E to 400E and A055C2DORO – 450E to 600E



American Fuses
E-Rated
Bolt-in Series

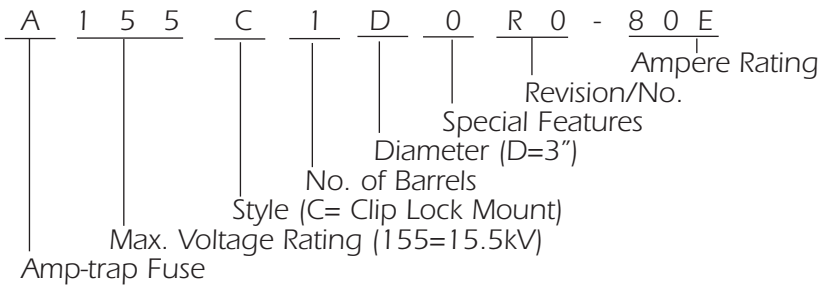
A055C1DORO – 10E to 400E and A055C2DORO – 450E to 600E
Peak Let-Thru Current Data, 5.5kV CL-14 Fuses



American Fuses
E-Rated
5.5kV - 15.5kV CL-14 series

15.5kV Clip-Lock Mounted

CATALOG NUMBERING SYSTEM



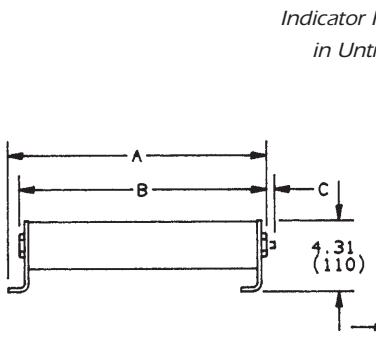


FIGURE A

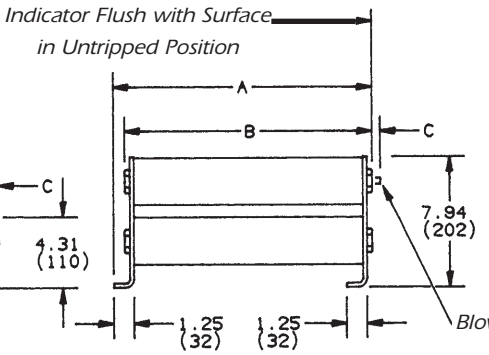


FIGURE B

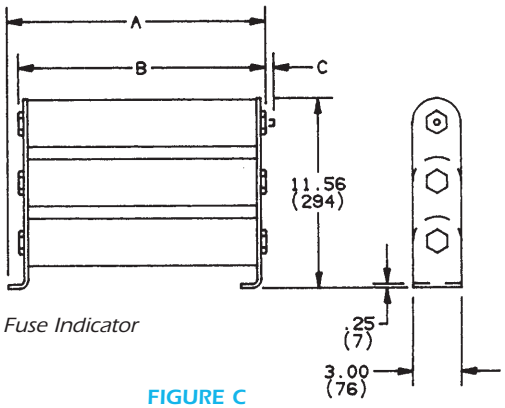


FIGURE C

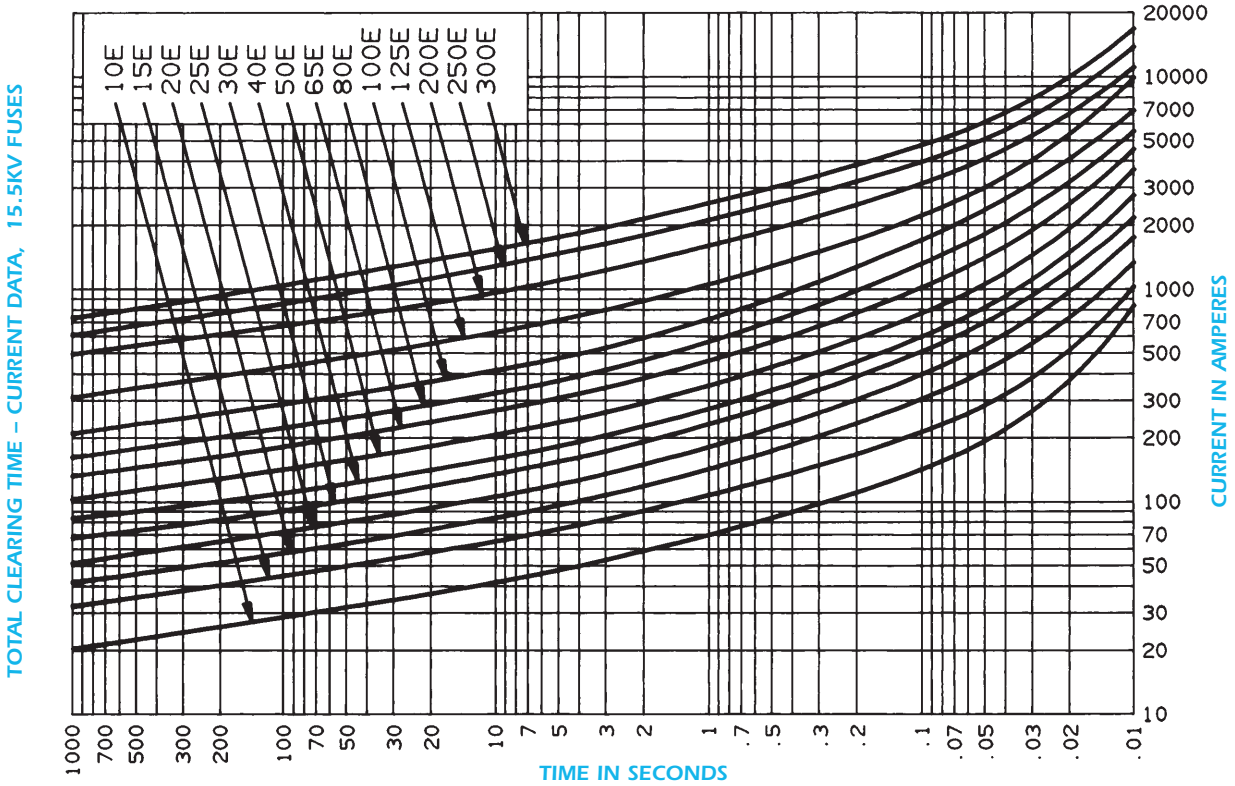
Reference and Catalog Numbers, Ratings, Dimensions, CL-14 Series, 15.5kV

New Catalog Number	Reference Number	Old catalog Number	Ampere Rating	Number of Barrels	Fig.	Dimensions Inches (mm) A	B	C	Interrupting Rating RMS SYM Amperes
15.5kV Max. – Clip-Lock Style – 18.25" (464mm) Clip Centers – 3" (76.2mm) Barrel Diameter									
A155C1DORO-10E	Z211300	225-007-967	10E						
15E	T212330	968	15E						
20E	H212849	969	20E			19.81	19.12	0.5	
25E	H213861	970	25E	1	A	(504)	(486)	(13)	50,000
30E	S214376	971	30E					Tripped	
40E	R214881	972	40E					Force	
50E	W215391	973	50E					2 lbs.	
15.5kV Max. – Clip-Lock Style – 21.25" (540mm) Clip Centers – 3" (76.2mm) Barrel Diameter									
A155C1DORO-65E	Y215899	225-007-974	65E						
80E	C216409	975	80E	1	A	22.81	22.12	0.5	50,000
100E	F203463	976	100E			(580)	(562)	(13)	
A155C2DORO-125E	K216922	977	125E	2	B				
A155C3DORO-150E	K218463	978	150E					Tripped	
200E	D218986	979	200E					Force .	
250E	W219508	980	250E	3	C			2 lbs	
300E	R221965	981	300E						

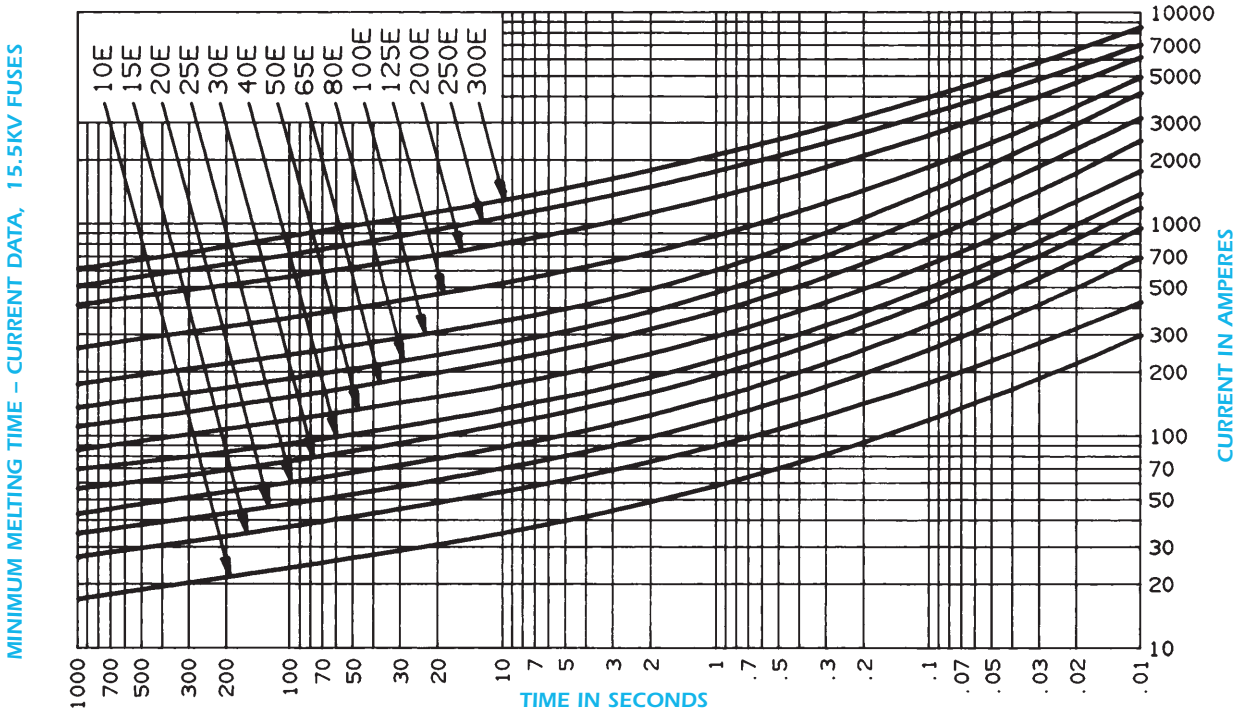
** RMS ASYM. Amperes = RMS SYM. Amperes x 1.6*

American Fuses
E-Rated
5.5kV - 15.5kV CL-14 series

A155C1DORO – 10E to 100E / A155C2DORO - 125E
A155C3DORO – 150E to 300E

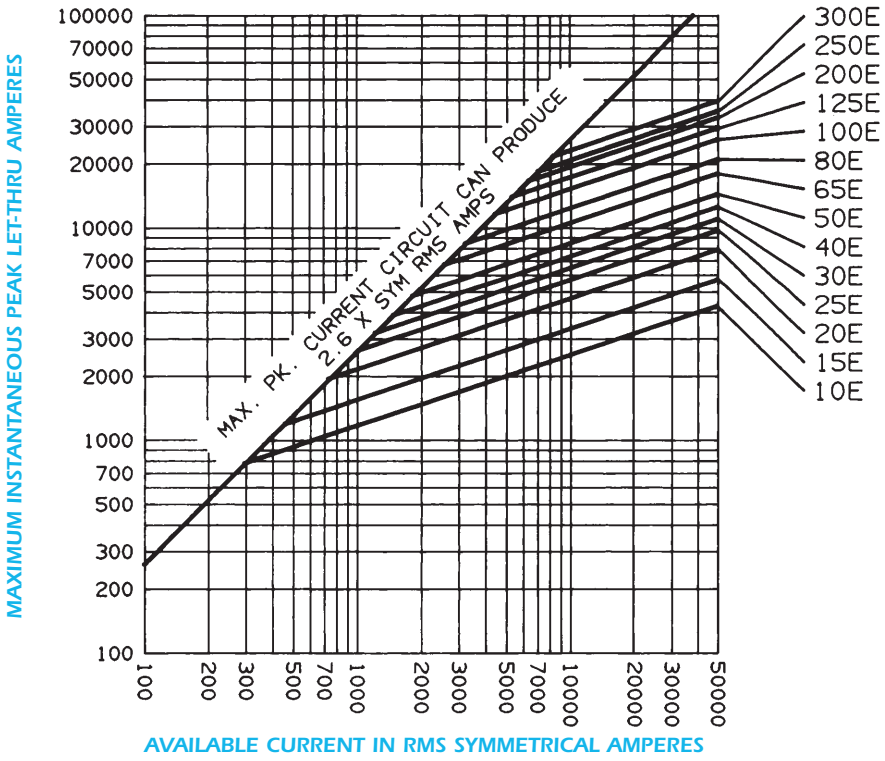


A155C1DORO – 10E to 100E / A155C2DORO - 125E
A155C3DORO – 150E to 300E



American Fuses
E-Rated
5.5kV - 15.5kV CL-14 series

A155C1DORO – 10E to 100E - A155C2DORO – 125E
A155C3DORO – 150E to 300E
Peak Let-Thru Current Data, 15.5kV CL-14 Fuses



American Fuses
R-Rated
2.4kV - 4.8kV/7.2kV - A 240R/A 480R/A 072F/A 072B

R-RATED MOTOR STARTER FUSES

Amp-trap® R-rated fuses are current-limiting, high interrupting rating fuses intended for the short-circuit protection of medium voltage motors and motor controllers. R-rated fuses have a minimum interrupting rating and must be coordinated with overload relays in combination motor starters. The motor starter manufacturer generally specifies the R-rated fuse size. Amp-trap R-rated fuses are-rated 2R to 36R, at 2.4, 4.8, and 7.2kV. 4.8 and 7.2kV fuses are UL Recognized. The 4.8kV (A480R) is available with hookeye tab. The 7.2kV (A072F) series has the same dimensions as the 4.8kV (A480R), allowing smaller 7.2kV equipment or 4.8kV upgrades. The A072B is a bolt-in 7.2kV fuse.

Features/Benefits

- **Ferrule mounting** for standard clips and interchangeability with other brands of fuses.
- **7.2kV** series has the same dimensions as 4.8kV fuses, allowing compact, higher voltage-rated equipment designs.
- **7,2kV** bolt-in design for improved design flexibility.
- Optional hookeye on 4.8 kV for non load-break isolation by hookstick.

Ratings

A240R

AC: 2R to 36R
2750V, 45kA I.R. Sym.

A480R

AC: 2R to 36R
5500V, 63kA I.R. Sym.

A072F - A072B

AC: 2R to 24R
7200V, 50kA I.R. Sym.

Back-up type Current-Limiting Fuse:

A current limiting fuse which can interrupt any current between it's rated minimum interrupting current and it's maximum interrupting current. Backup fuses are not designed or intended to open under overload conditions.

Highlights

- R-Rated
- UL Recognized in 4.8 and 7,2 kV ratings

Applications

Short circuit protection of medium voltage motors and motor controllers

Approvals

- Ferraz Shawmut certified
  - A240R @ 2750V, 45kA Sym.
- UL Recognized Component
  - A480R @ 5080V, 50kA, Sym.
  - A072F @ 7200V, 50kA, Sym.
  - A072B @ 7200V, 50kA, Sym.
- UL file # E93367

Spring-reinforced clips

- 228-700-530 (one pair of clips)For 3" diameter, 2 barrels max.

American Fuses
R-Rated
2.4kV - 4.8kV/7.2kV - A 240R/A 480R/A 072F/A 072B

A240R 2.4kV Ferrule Style

Indicator flush with surface
2 lb. Force (Tripped)

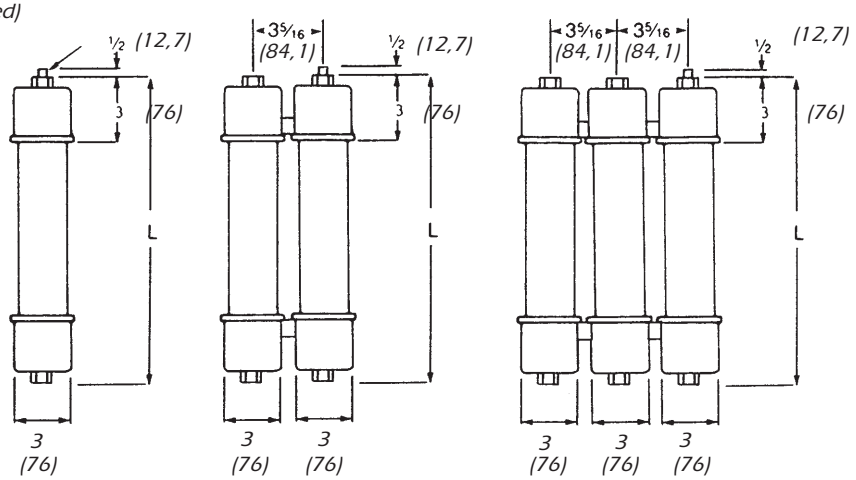


FIGURE A FIGURE B FIGURE C

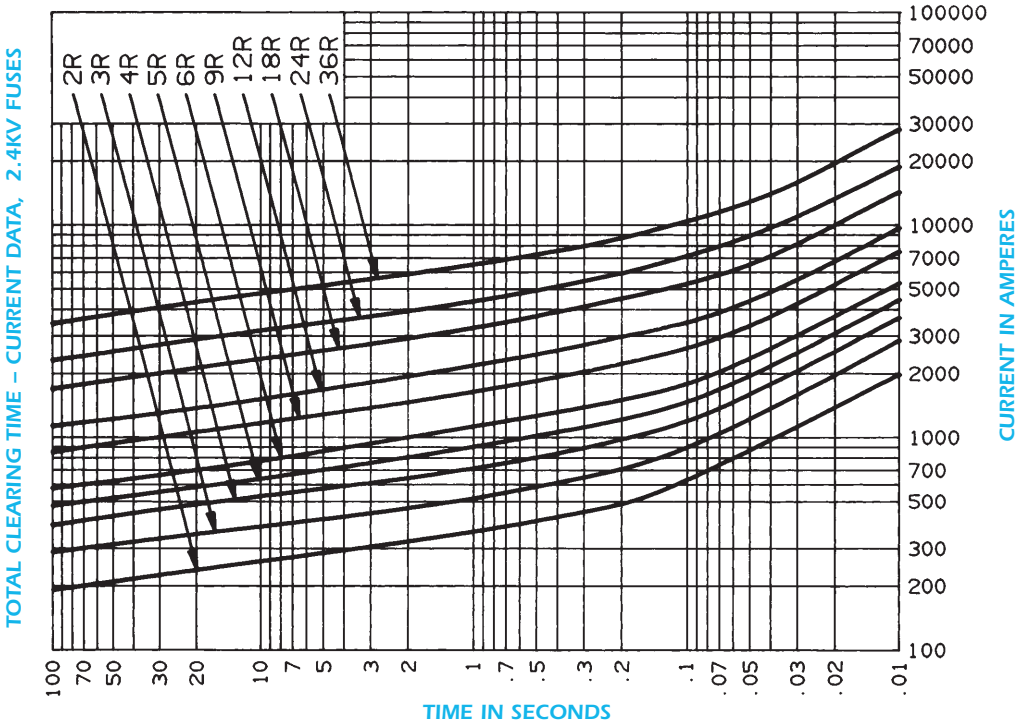
Catalog and Reference Numbers, Ratings, Dimensions, 2.4kV

Fig.	Catalog Number	Reference Number	Size	Continous Ampere Rating at 40˚	Dim. L	Minimum Interrupting Rating Rms Amperes	Maximum Tested	
	Standard						RMS Asym	RMS Sym
A240R								
	A240R2R	J201557	2R	70		170		
	A240R3R	F211812	3R	100		250		
A	A240R4R	E212846	4R	130		340		
	A240R6R	E213858	6R	170	10-7/8	500	70kA	45kA
	A240R9R	P214373	9R	200	(276mm)	760	@	@
	A24OR12R	R219504	12R	230		1000	2750V	2750V
B	A24OR18R	N221962	18R	390		1500		
	A240R24R	L223225	24R	450		1950		
C	A240R36R	W211297	36R**	650		2900		

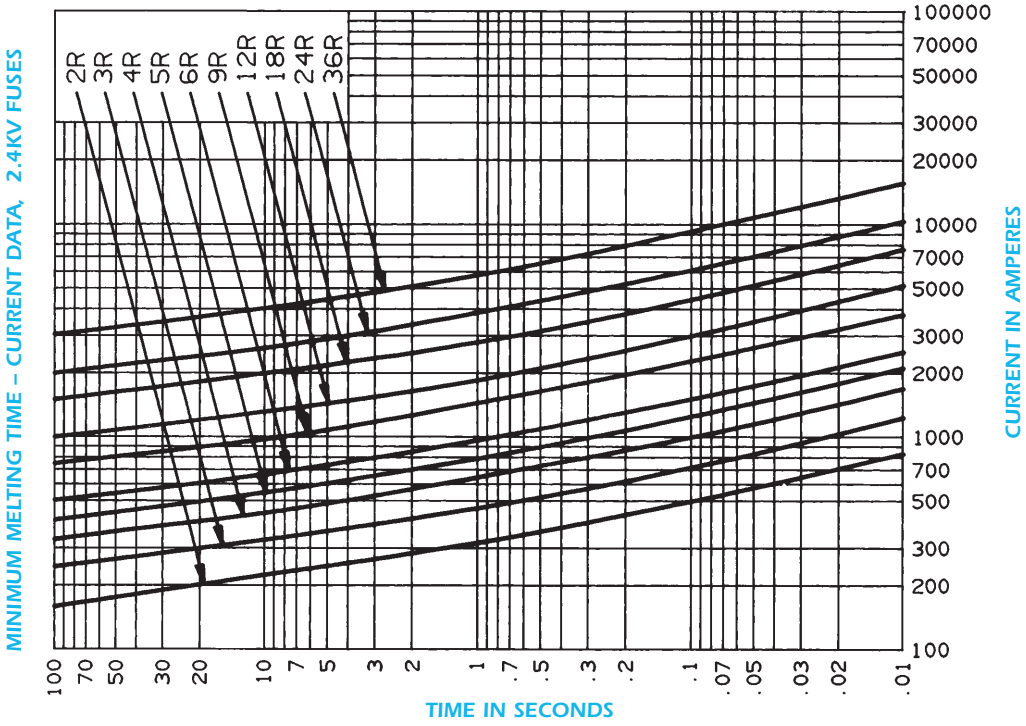
** This rating defines the fuse's long-term thermal capability per ANSI C37 46-1981 and should not be the sole factor for selecting a specific R-rating.*
*** Not recommended for use in fuse clips which grasp only one barrel.*

American Fuses
R-Rated
2.4kV - 4.8kV/7.2kV - A 240R/A 480R/A 072F/A 072B

A240R2R to 36R, 2400 Volts

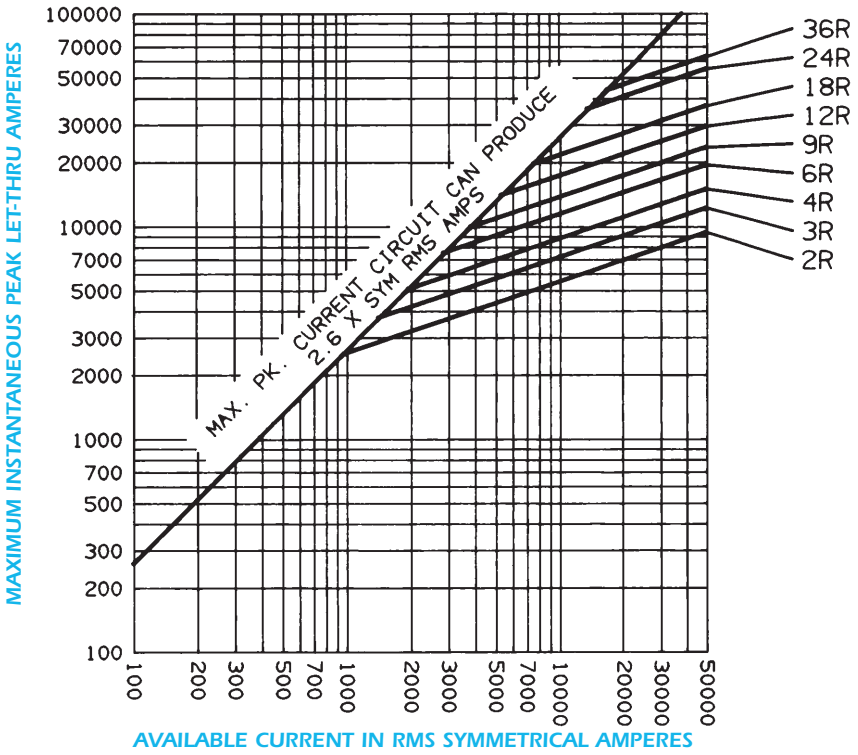


A240R2R to 36R, 2400 Volts



American Fuses
R-Rated
2.4kV - 4.8kV/7.2kV - A 240R/A 480R/A 072F/A 072B

A240R2R to 36R, 2400 Volts
Peak Let-Thru Current Data, R-Rated Fuses



American Fuses
R-Rated
2.4kV - 4.8kV/7.2kV - A 240R/A 480R/A 072F/A 072B

A480R 4.8kV Ferrule Style

Indicator flush with surface
2 lb. Force (Tripped)

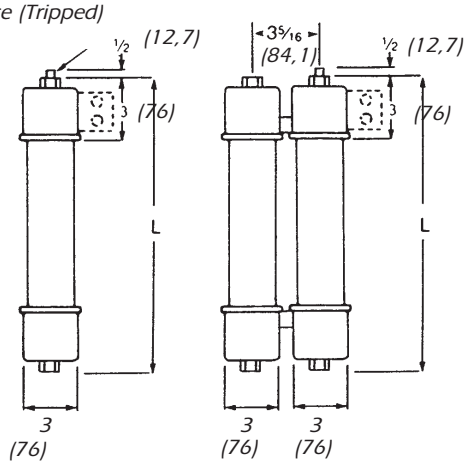
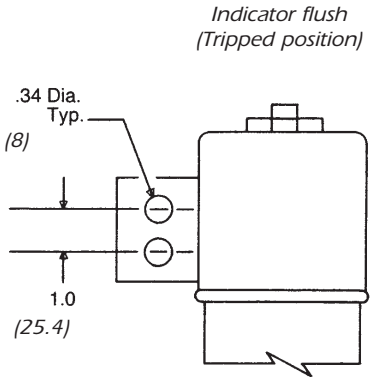


FIGURE A FIGURE B FIGURE C



Hookeye illustration

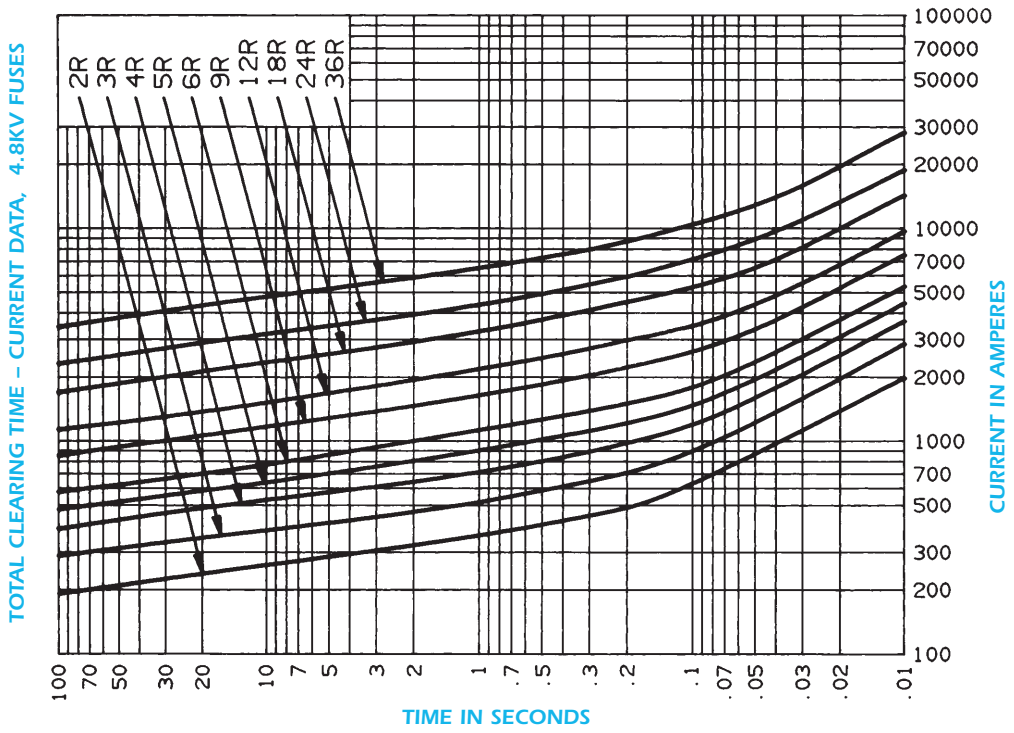
Catalog and Reference Numbers, Ratings, Dimensions, 4.8kV

Fig.	Catalog Number	Reference Number	Size	Continous Ampere Rating at 40˚	Dim. L	Minimum Interrupting Rating Rms Amperes	1 Phase Interrupting Rating			
	Standard						UL Component Recognition		Maximum Tested	
							RMS Asym	RMS Sym	RMS Asym	RMS Sym
A480R-1										
A	A480R2R-1	P221963	a2R	70	15-7/8 (403mm)	190	80kA @ 5080V	50kA @ 5080V	100kA @ 5500V	63kA @ 5500V
	A480R3R-1	K201558	3R	100		225				
	A480R4R-1	G211813	4R	130		330				
	A480R5R-1	Q213362	5R	150		400				
	A480R6R-1	Q214374	6R	170		500				
	A480R9R-1	W215897	9R	200		740				
	A480R12R-1	N214878	12R	230		955				
B	A480R18R-1	Z216406	18R	390		1440				
	A480R24R-1	H218461	24R	450		1910				
C	A480R36R-1	C201045	36R**	650		2810				
A480R-1HE with hookeye										
A	A480R2R-1HE	X222706	2R	70	16-1/8 (410mm)	190	80kA @ 5080V	50kA @ 5080V	100kA @ 5500V	63kA @ 5500V
	A480R3R-1HE	S203428	3R	100		225				
	A480R4R-1HE	R212328	4R	130		330				
	A480R5R-1HE	F213859	5R	150		400				
	A480R6R-1HE	P214879	6R	170		500				
	A480R9R-1HE	A216407	9R	200		740				
	A480R12R-1HE	S215388	12R	230		955				
B	A480R18R-1HE	G216919	18R	390		1440				
	A480R24R-1HE	A218983	24R	450		1910				

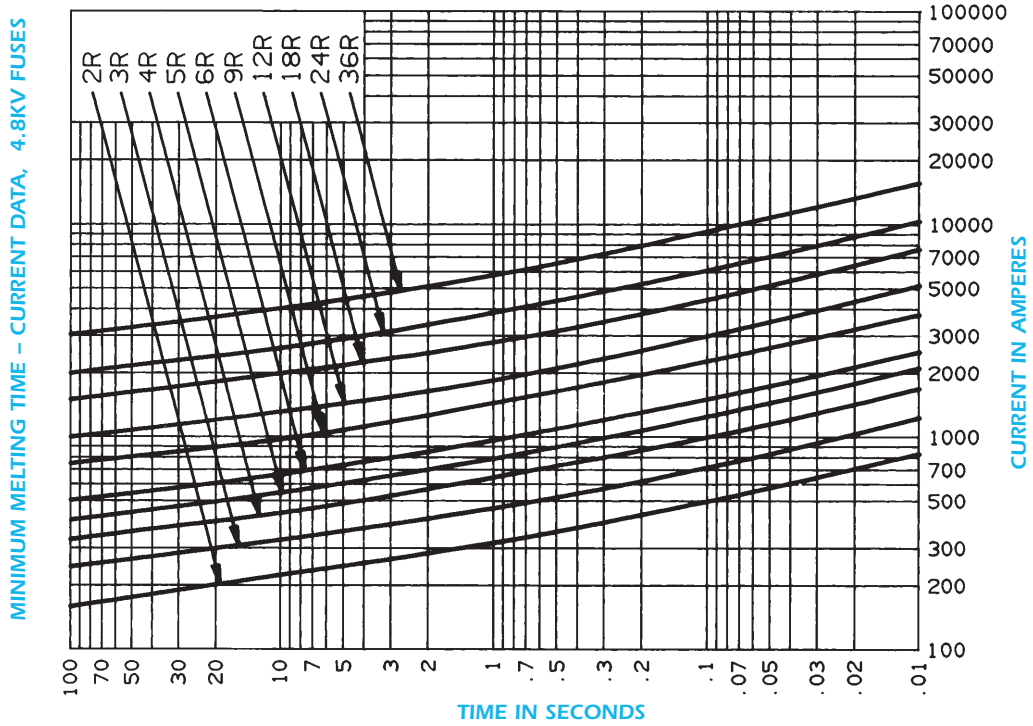
** This rating defines the fuse's long-term thermal capability per ANSI C37 46-1981 and should not be the sole factor for selecting a specific R-rating.*
*** Not recommended for use in fuse clips which grasp only one barrel.*

American Fuses
R-Rated
2.4kV - 4.8kV/7.2kV - A 240R/A 480R/A 072F/A 072B

A480R-1, and A480R-1HE, 4800 Volts

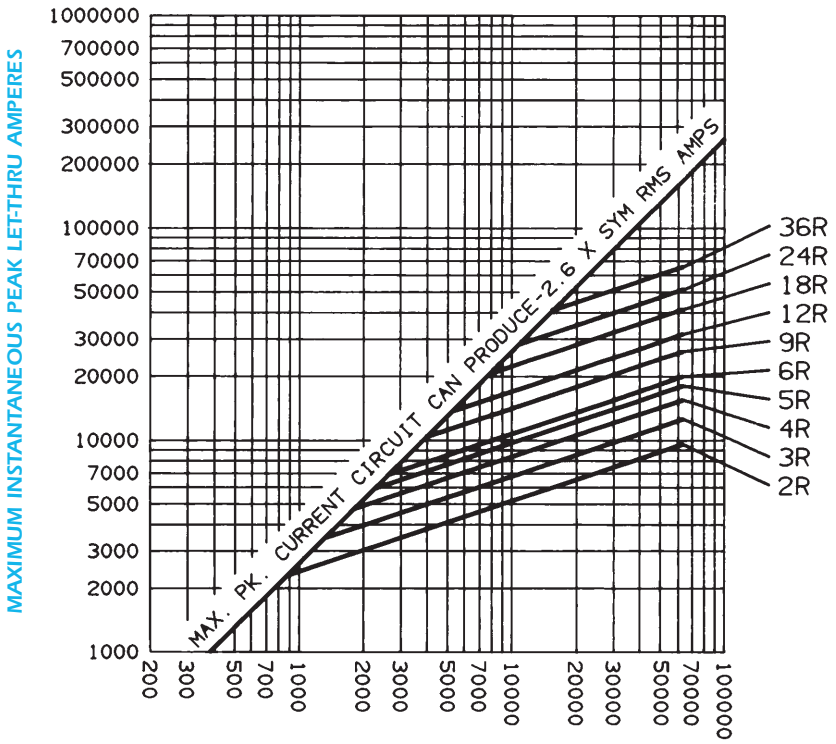


A480R-1, and A480R-1HE, 4800 Volts



American Fuses
R-Rated
2.4kV - 4.8kV/7.2kV - A 240R/A 480R/A 072F/A 072B

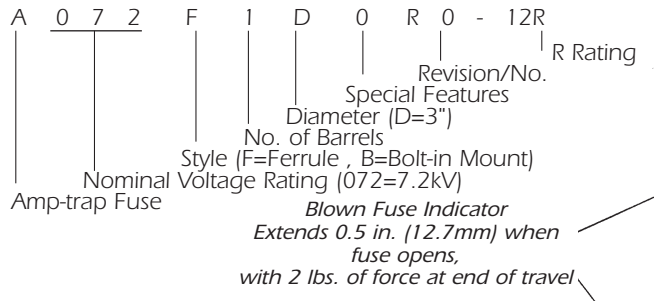
A480R-1 and A480R-1HE, 4800 Volts
Peak Let-Thru Current Data, R-Rated Fuses



American Fuses
R-Rated
2.4kV - 4.8kV/7.2kV - A 240R/A 480R/A 072F/A 072B

7.2kV Ferrule & Bolt-in Types

CATALOG NUMBERING SYSTEM



Blown Fuse Indicator Extends 0.5 in. (12.7mm) when fuse opens, with 2 lbs. of force at end of travel

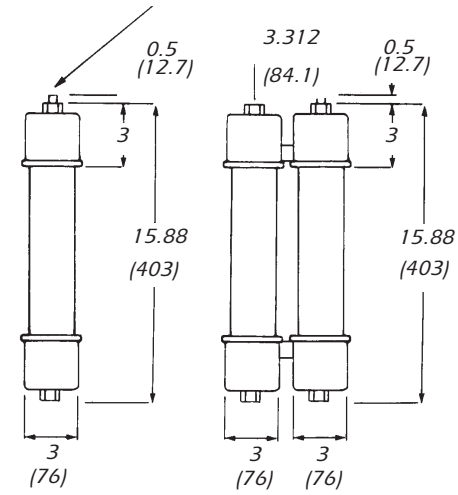


FIGURE A FIGURE B

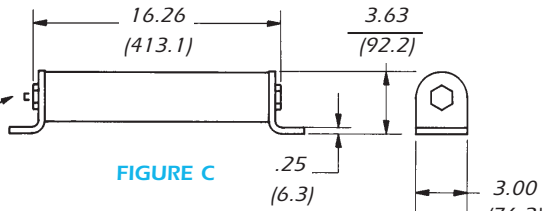


FIGURE C

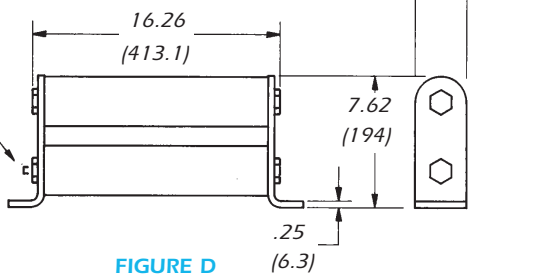
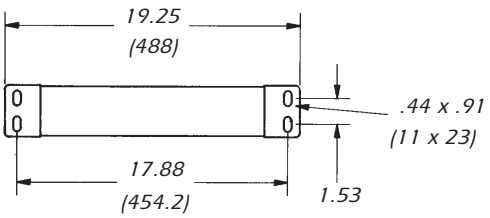


FIGURE D

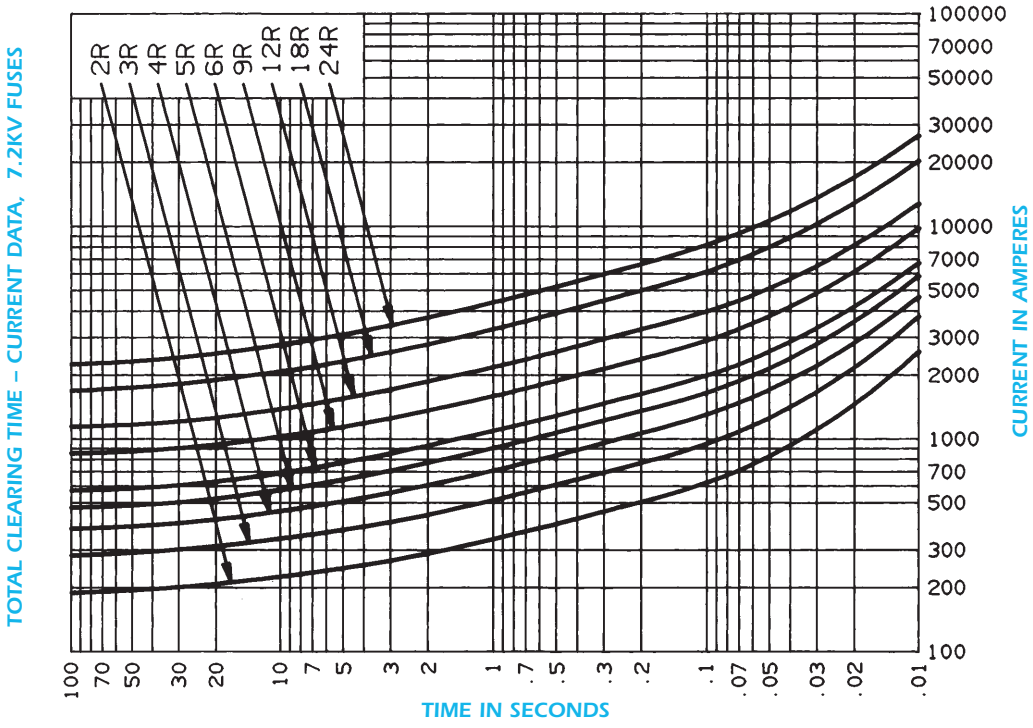


Reference and Catalog Numbers, Ratings, Dimensions, 7.2kV

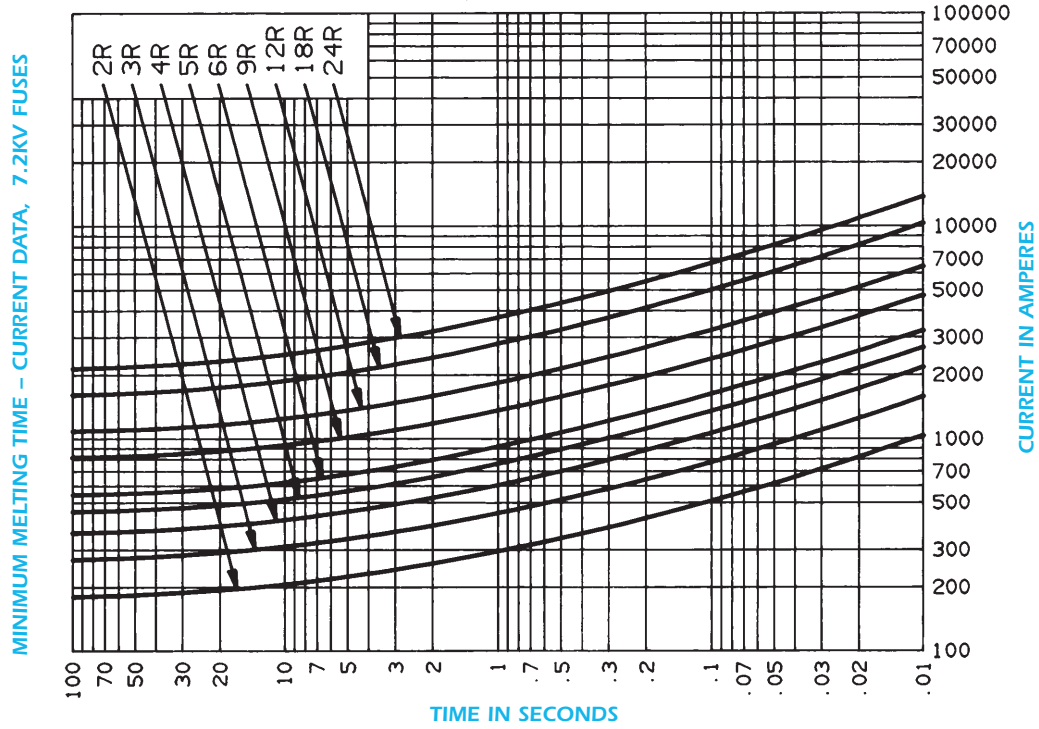
Figure	Catalog Number	Reference Number	Rating	Allowable Continuous Ampere Rating at 40˚C	Minimum Interrupting Rating RMS Amperes	1 Phase Interrupting Rating UL Component Recognition	
						RMS Asym.	RMS Sym.
Ferrule Type							
A	A072F1DORO-2R	M214877	2R	70	190	80kA @ 7200V	50kA @ 7200V
	A072F1DORO-3R	R215387	3R	100	225		
	A072F1DORO-4R	T215895	4R	130	330		
	A072F1DORO-5R	Y216405	5R	150	400		
	A072F1DORO-6R	F216918	6R	170	500		
	A072F1DORO-9R	T217436	9R	200	740		
	A072F1DORO-12R	N214372	12R	230	955		
B	A072F2DORO-18R	G218460	18R	390	1440		
	A072F2DORO-24R	Z218982	24R	450	1910		
Bolt-in Type							
C	A072B1DARO-2R	H201556	2R	70	190	80kA @ 7200V	50kA @ 7200V
	A072B1DARO-3R	R203427	3R	100	225		
	A072B1DARO-4R	V211296	4R	130	330		
	A072B1DARO-5R	E211811	5R	150	400		
	A072B1DARO-6R	P212326	6R	170	500		
	A072B1DARO-9R	D212845	9R	200	740		
	A072B1DARO-12R	B201044	12R	230	955		
D	A072B2DARO-18R	N213360	18R	390	1440		
	A072B2DARO-24R	D213857	24R	450	1910		

American Fuses
R-Rated
2.4kV - 4.8kV/7.2kV - A 240R/A 480R/A 072F/A 072B

A072F and A072B, 7200 Volts

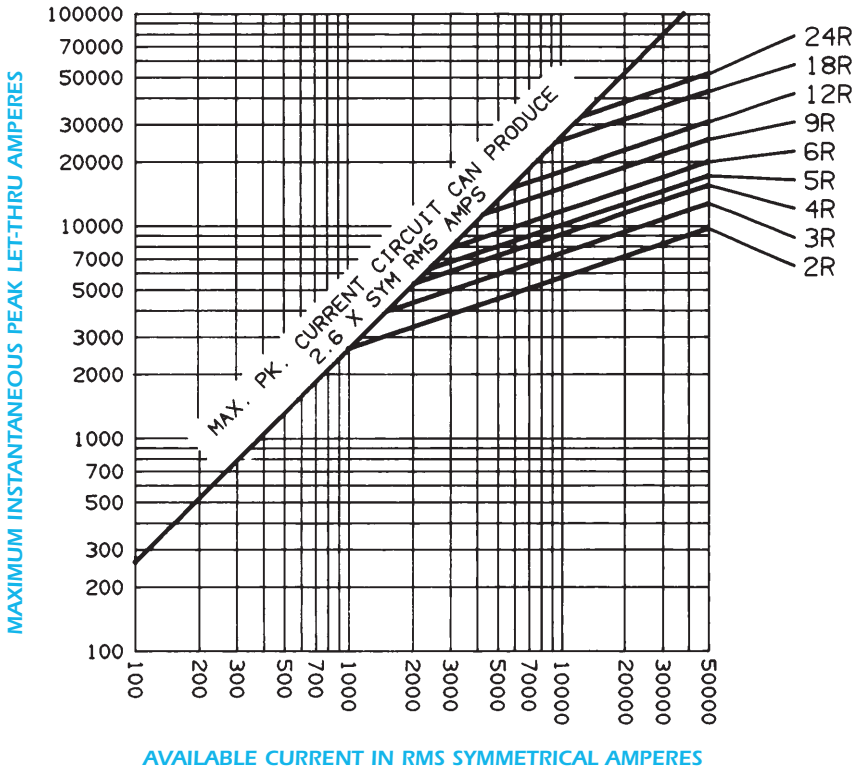


A072F2 and A072B, 7200 Volts



American Fuses
R-Rated
2.4kV - 4.8kV/7.2kV - A 240R/A 480R/A 072F/A 072B

AO72F and A072B2, 7200 Volts
Peak Let-Thru Current Data, R-Rated Fuses



American Fuses
R-Rated
3.3kV/5.3kV/7.2kV - A 033D1/A055D1/A072D1

R-RATED IEC DIN Style MV FUSES

Amp-trap R-rated DIN style fuses are current limiting, high interrupting rating fuses, intended for the short circuit protection of medium voltage motors and motor controllers. This product range offers North American R-rated performance in the IEC 282-1 DIN mounting configuration of 442mm. R-rated fuses are applied as back up fuses that have a minimum interrupting rating, and must be coordinated with overload relays in combination motor starters. Amp-trap R-rated, DIN type fuses are offered in voltage ratings of 3.3kV, 5.3kV and 7.2kV in ratings from 2R to 19R. All fuses within this product group are ULcomponent recognized.

Features/Benefits

- **Clip Mount DIN 45:** R-rated fuses with North American ANSI characteristics in a standard DIN 442mm size.

Ratings

A033D1

AC: 2R to 19R*
3300V max, 65kA I.R. Sym.

A055D1

AC: 2R to 19R*
5300V max, 65kA I.R. Sym.

A072D1

AC: 2R to 19R*
7200V max, 65kA I.R. Sym.

Back-up type Current-Limiting Fuse:

A current limiting fuse which can interrupt any current between it's rated minimum interrupting current and it's maximum interrupting current. Backup fuses are not designed or intended to open under overload conditions.

Highlights

- R-Rated
- UL Recognized

* **Note:** *Ratings above 19R may be achieved by paralleling fuses. Please consult factory for details.*

Applications

Short circuit protection of medium voltage motors and motor controllers

Approvals

- UL Recognized Component
- UL file # E93367

Spring-reinforced clips

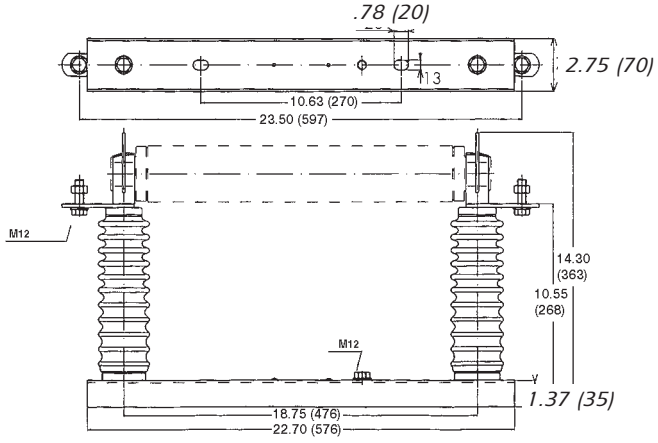
- MR45 & Spring ref.# L096472

Fuse-Holder

- SI 24/442 Ref # K209425
  In compliance with IEC 282-1, DIN standard 43625.

Definitions

R-Rating:
An "R" rated fuse will melt in the range of 15 to 35 seconds at a value of current equal to 100 times the "R" rating.



American Fuses
R-Rated
3.3kV/5.3kV/7.2kV - A 033D1/A055D1/A072D1

Indicator flush with surface before fuse opens.
Indicator extends 1.0"(25.4mm) after fuse opens.
Indicator exerts 4.5 LB force at end of travel.

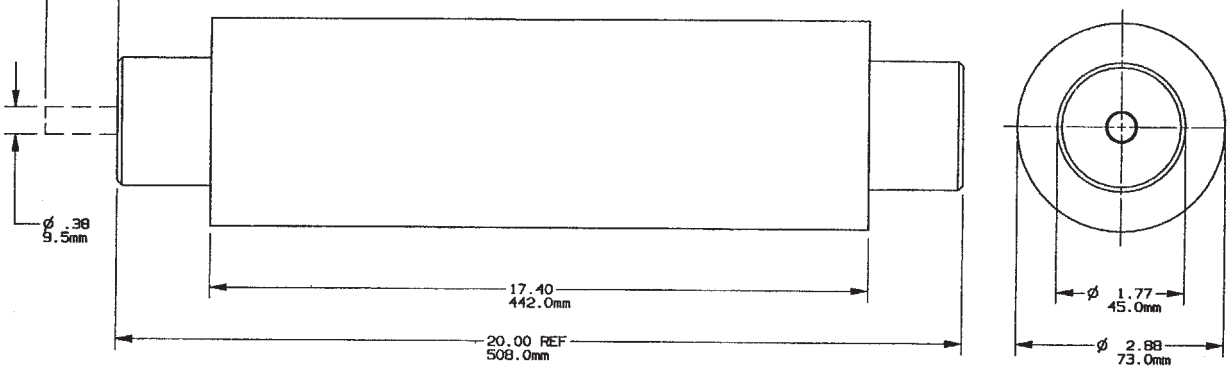


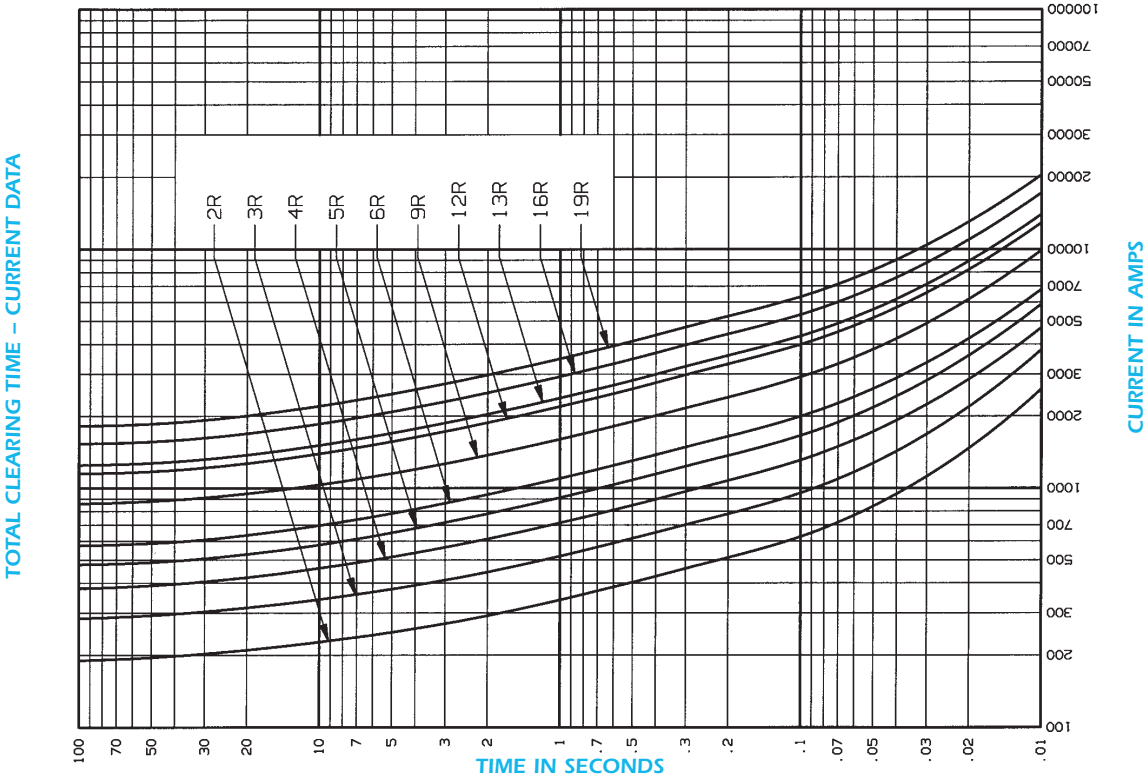
FIGURE A

Fig.	Designation	Reference Number	Size	Continuous Amp Rating at 55°C**	Continuous Amp Rating at 40°C**	Minimum Inter. Rating RMS Amperes	1 Phase InterRupting Rating Maximum Tested	
							RMS Asym	RMS sym
3.3kV Max. DIN IEC Style 442 mm								
	A033D1DSRO-2R		2R	63	70	180		
	A033D1DSRO-3R		3R	90	100	270		
	A033D1DSRO-4R		4R	115	130	355		
	A033D1DSRO-5R		5R	135	150	450		
A	A033D1DSRO-6R		6R	150	170	550	100kA	65kA
	A033D1DSRO-9R		9R	180	200	710	@	@
	A033D1DSRO-12R		12R	210	230	1100	3300V	3300V
	A033D1DSRO-13R		13R*	230	260	1200		
	A033D1DSRO-16R		16R*	270	300	1500		
	A033D1DSRO-19R		19R*	280	310	1700		
5.5kV Max. DIN IEC Style 442 mm								
	A055D1DSRO-2R		2R	63	70	180		
	A055D1DSRO-3R		3R	90	100	270		
	A055D1DSRO-4R		4R	115	130	355		
	A055D1DSRO-5R		5R	135	150	450		
A	A055D1DSRO-6R		6R	150	170	550	100kA	65kA
	A055D1DSRO-9R		9R	180	200	710	@	@
	A055D1DSRO-12R		12R	210	230	1100	5500V	5500V
	A055D1DSRO-13R		13R*	230	260	1200		
	A055D1DSRO-16R		16R*	270	300	1500		
	A055D1DSRO-19R		19R*	280	310	1700		
7.2kV Max. DIN IEC Style 442 mm								
	A072D1DSRO-2R		2R	63	70	180		
	A072D1DSRO-3R		3R	90	100	270		
	A072D1DSRO-4R		4R	115	130	355		
	A072D1DSRO-5R		5R	135	150	450		
A	A072D1DSRO-6R		6R	150	170	550	100kA	65kA
	A072D1DSRO-9R		9R	180	200	710	@	@
	A072D1DSRO-12R		12R	210	230	1100	7200V	7200V
	A072D1DSRO-13R		13R*	230	260	1200		
	A072D1DSRO-16R		16R*	270	300	1500		
	A072D1DSRO-19R		19R*	280	310	1700		

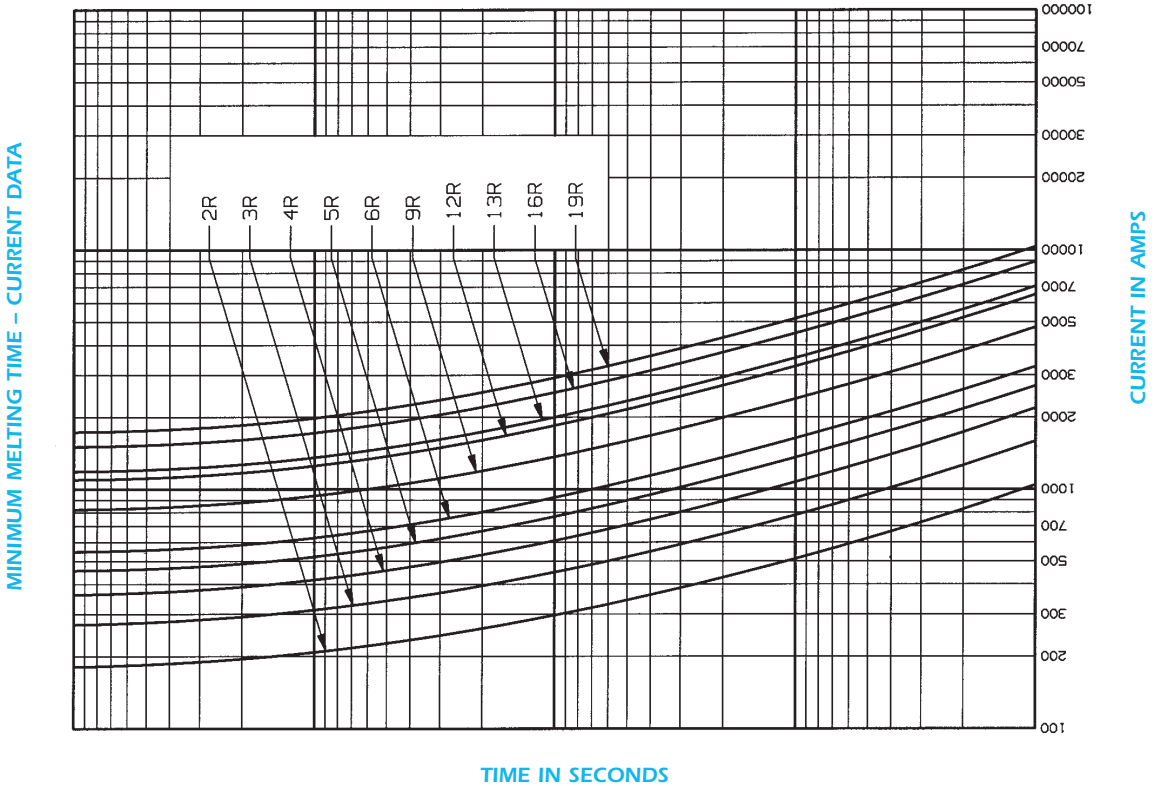
** 13R, 16R and 19R are not standard ratings defined in ANSI C37.46.*
*** This rating defines the thermal capability of the fuse per ANSI 37.46 and should not be the sole factor in fuse selection.*

American Fuses
R-Rated
3.3kV/5.3kV/7.2kV - A 033D1/A055D1/A072D1

A033D1, 3300 Volts - A055D1, 5300 Volts - A072D1, 7200 Volts

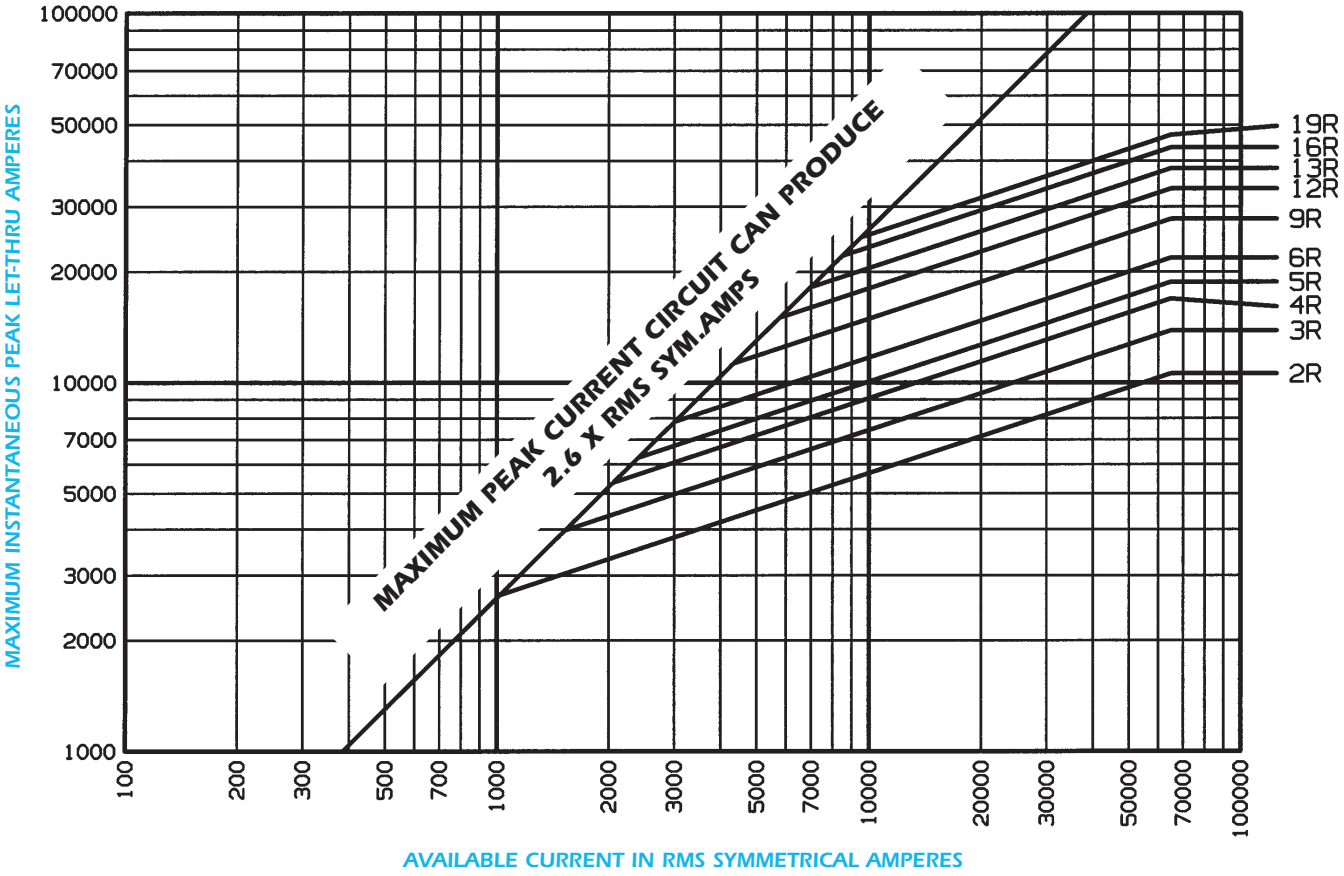


A033D1, 3300 Volts - A055D1, 5300 Volts - A072D1, 7200 Volts



American Fuses
R-Rated
3.3kV/5.3kV/7.2kV - A 033D1/A055D1/A072D1

A033D1, 3300 Volts - A055D1, 5300 Volts - A072D1, 7200 Volts
Peak Let-Thru Current Data, R-Rated Fuses



American Fuses
Potential Transformer Fuses (E-Rated)
2.4kV to 7.2 kV - A240T / A480T / A500 / A072T

POTENTIAL TRANSFORMER FUSES

Ferraz Shawmut E-rated PT fuses are current limiting fuses with high interrupting rating, used for primary winding-protection of potential transformers. They are small dimension, ferrule-type fuses and mounted in standard clips. Ratings are 1/2E to 5E at 2.4, 4.8, and 5.0 kV at 7,2kV rating are 1/2E to 3E

Features/Benefits

- Current limiting protection for transformers
- Ferrule mounting for ease of installation in standard clips
- Compact size saves valuable mounting space
- Fiberglass body provides dimensional stability in harsh industrial environments
- Metal embossed catalog number for lasting identification

Highlights

- E-Rated
- Current-Limiting

Applications

Primary protection for 2.4, 4.8, 5.0 or 7.2kV potential transformer

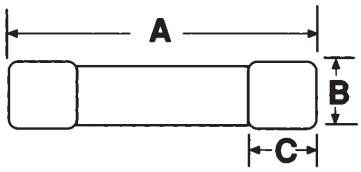
Ratings

A240T
AC: 1/2E to 5E
2400VAC, 50kA I.R. Sym.

A480T
AC: 1/2E to 5E
4800VAC, 50kA I.R. Sym.

A500T
AC: 1/2E to 5E
5000VAC, 50kA I.R. Sym.

A720T
AC: 1E to 3E
7200VAC, 50kA I.R. Sym.



Dimensions

Catalog Number Prefix	Dimensions - inches			Fuse Clips*	
	A	B	C	Centers	Cat. NO.
A240T	4-5/8	13/16	5/8	4.0"	CO8917P
A480T	5-5/8	13/16	5/8	5.0"	CO8917P
A500T	5-5/8	1	9/16	5.0"	-
A720T	9-1/2	13/16	5/8	8.88"	CO8917P

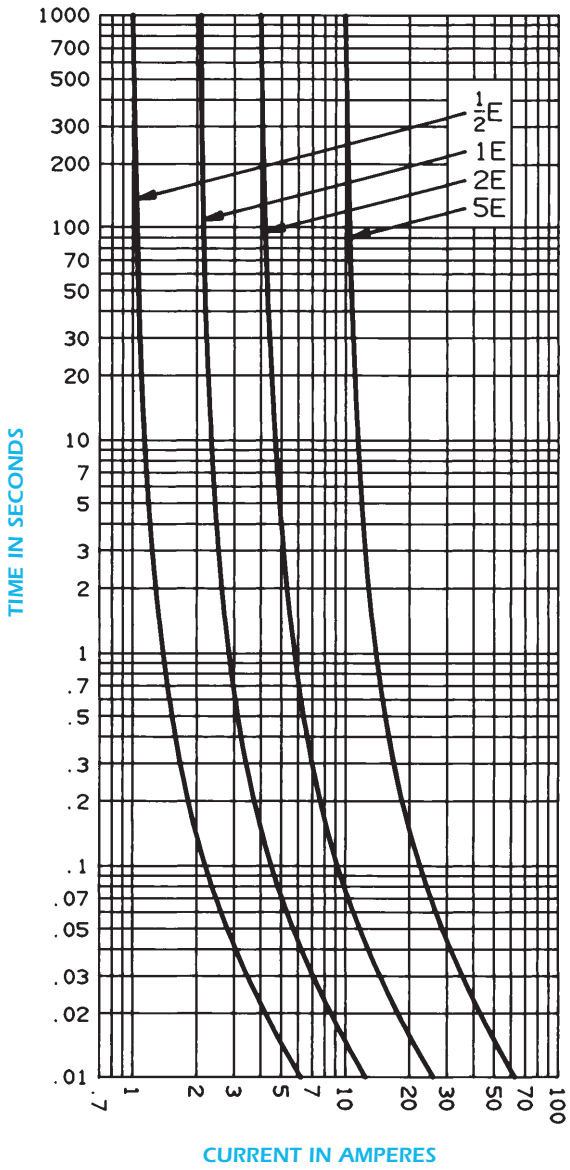
Standard Fuse Ampere Ratings, Catalog and Reference Numbers

E-Rating	Catalog Number				Reference Number			
	2400V	4800V	5000V	7200V	2400V	4800V	5000V	7200V
1/2E	A240T1/2E	A480T1/2E	A500T1/2E-1	A720T1/2E-1	P212855	C215397	S218470	Z203710
1E	A240T1E	A480T1E	A500T1E-1	A720T1E-1	P213867	D215904	D219515	E211305
2E	A240T2E	A480T2E	A500T2E-1	A720T2E-1	A214383	H216414	X221970	P211820
3E	-	A480T3E	A500T3E-1	A720T3E-1	-	Q216927	G222715	C212338
4E	-	A480T4E	A500T4E-1	-	-	C217444	W223234	-
5E	A240T5E	A480T5E	A500T5E-1	-	Y214887	M217959	W201568	-

American Fuses
Potential Transformer Fuses (E-Rated)
2.4kV to 7.2 kV - A240T / A480T / A500 / A072T

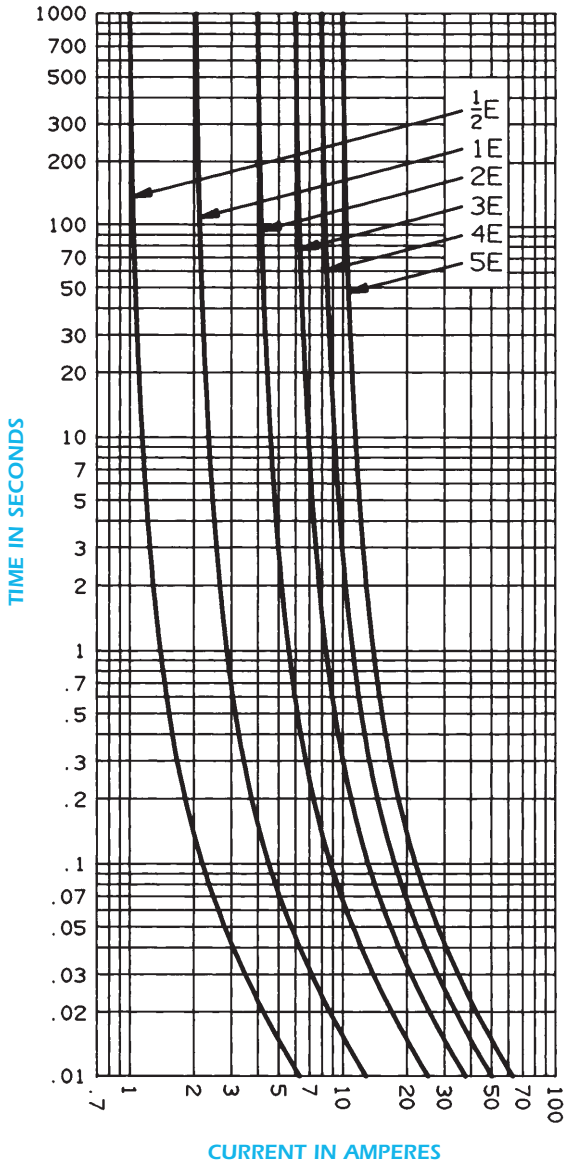
A240T1/2E to 5E

MELTING TIME – CURRENT DATA - PT FUSES - 2400V



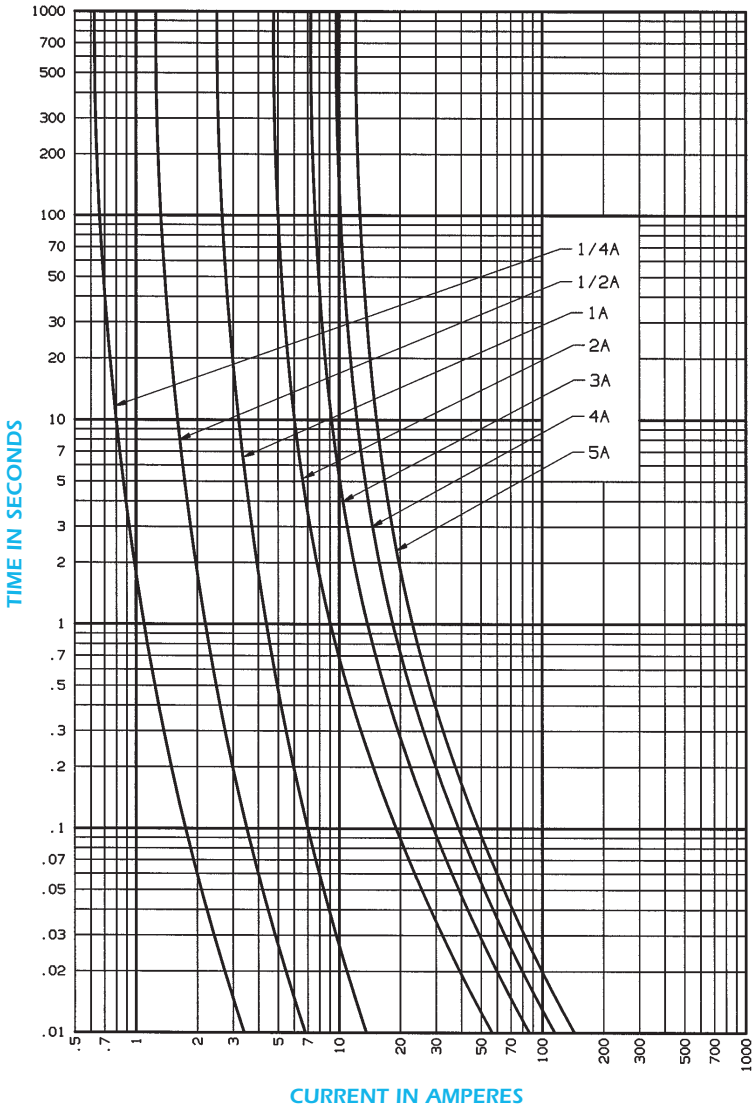
A480T1/2E to 5E

MELTING TIME – CURRENT DATA - PT FUSES - 4800V

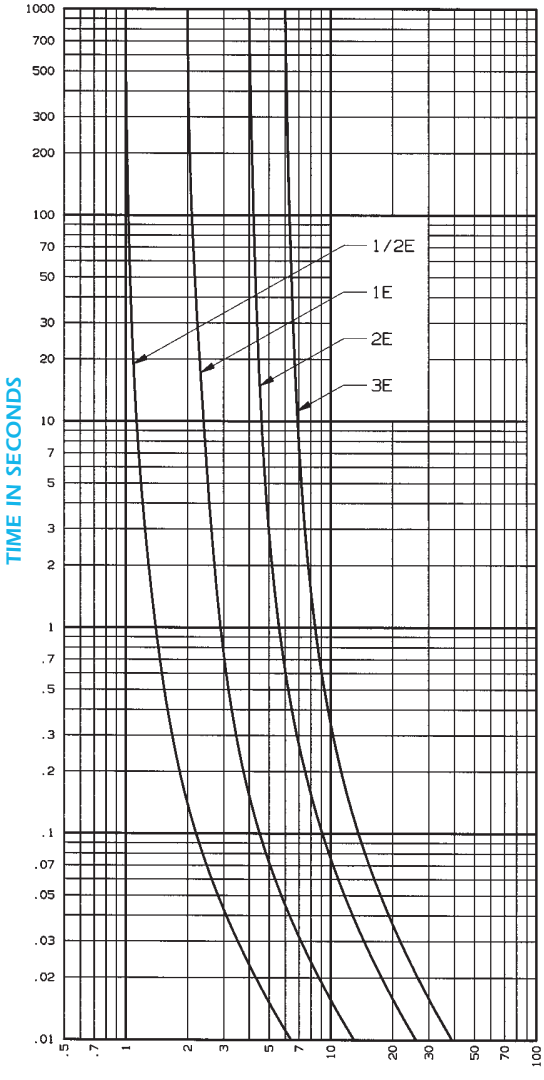


American Fuses
Potential Transformer Fuses (E-Rated)
2.4kV to 7.2 kV - A240T / A480T / A500 / A072T

A500T1/2E-1 to 5E-1 Melting Time Current Data - PT Fuses - 5000V



A720T1E-1 and A720T2E-1 Melting Time – Current Data PT Fuses - 7200V



American Fuses Capacitor

As a complement to the wide variety of fuse lines developed by Ferraz Shawmut for every market and application type, we also offer a line of capacitor fuses ranging from 600 VAC to 5500 VAC. The Ferraz Shawmut capacitor fuse range offers many models with the same electrical ratings but with various blade, studs, or end-contact designs in order to satisfy specific customer needs.

Features/Benefits

- Cartridge type
- Full range operation
- Indicator for most types
- Direct mounting on capacitor
- Prevent rupture of failed capacitor
- Special mounting brackets available

Ratings

600VAC to 5500VAC
6A to 300A

Ratings Table

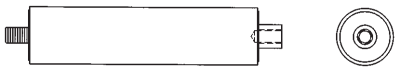
Ampere Rating	Voltage Rating Range					
	600V	1500V	2400V	3000V	4300V	5500V
6 to 25 Amps	■				■	■
30 to 50 Amps	■			■	■	■
60 to 95 Amps	■	■	■	■	■	■
100 to 150 Amps	■	■	■	■	■	
160 to 300 Amps	■	■	■	■		

Mounting Configurations

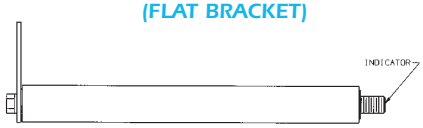
Please consult factory for mounting configurations availability

TYPE 10 - INNER THREAD TO SCREW

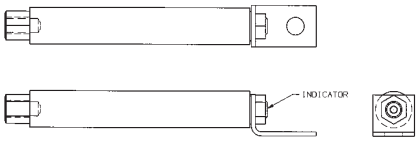
TYPE 15 - EXTERNAL FEMALE TO BOLT



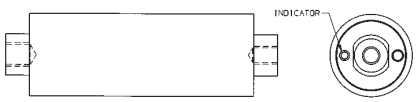
TYPE 20 - SCREW TO BOLT (FLAT BRACKET)



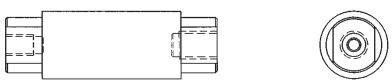
TYPE 30 - EXTERNAL FEMALE TO BOLT (L BRACKET)



TYPE 40 - EXTERNAL FEMALE TO EXTERNAL FEMALE

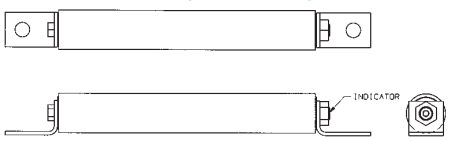


TYPE 121 - EXTERNAL FEMALE TO EXTERNAL FEMALE

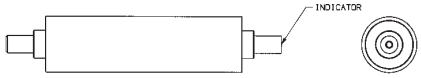


TYPE 50 - SCREW TO BOLT (L BRACKET)

TYPE 60 - BOLT (L BRACKET) TO BOLT (L BRACKET)



TYPE 70 TUBE TO TUBE



MV Fault Indicator IDT10 and IDT20

Type IDT 10 FOR HIGH VOLTAGE OVERHEAD NETWORKS

INDICATES INSULATION FAULTS BY DETECTION OF CURRENTS IN GROUND CIRCUITS
USABLE ON ALL HIGH VOLTAGE DISTRIBUTION NETWORKS REGARDLESS OF NEUTRAL RATES
CONNECTS DIRECTLY TO THE GROUNDCABLE OF THE POLES
MAY BE RESET AFTER OPERATION
OPERATES AUTONOMOUSLY, WITHOUT BATTERIES
RESISTANT TO TOUGH WEATHER CONDITIONS
INSENSITIVE TO LIGHTNING AND OPERATING CURRENTS
DETECTS DAMAGE TO LIGHTNING ARRESTERS, TRANSFORMERS AND INSULATORS

Presentation

The insulation fault indicator is presented in the form of a compact case made of a highly sturdy synthetic material. A window on the front enables the viewing of a red warning light in case of operation. This signal may be seen from 10 meters away, across a 120 ° sector.
The IDT20 Comp counts current pulses due to lightning - A6- digits electromechanical meter indicate the number of lightning strikes.

Two conductive contacts on the front allow the indicator to be reset.

The case contains a 16 mm diameter hole for the passage of a ground cable. The indicator is delivered with an 80 cm cable section and two crimping sleeves to prevent the ground circuit from being cut during installation. Two openings on the back enable the device to be attached to the pole by metal strip.

Operation

Ground currents caused by insulation faults are measured by an integrated current transformer. An electronic panel processes the transformer output signal and controls the operation of the warning light in the event it exceeds a preset threshold. The signal is maintained even after power on the line has been disconnected, enabling the operator to quickly detect the fault location.

Resetting and testing of the indicator are ensured by an IDT 101 type reset device.

Before fault

After fault

MV Fault Indicator
IDT 10 and IDT 20

Technical characteristics

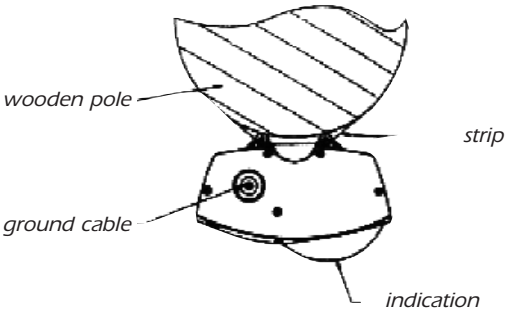
	IDT 10	IDT 20	IDT 20 Com
Reference numbers	D210223	W229099	V225970
- Detection currents: 50 Hz	15A / 500ms	15A / 100ms	15A / 100ms
50 Hz	10A / 143ms	10A / 110ms	10A / 110ms
- Minimum detection currents:	9A	4A	4A
- Sensitivity to 3 waves 5ms (EDF specification)	50A	no	no
- Non detection current: 2ms rectangular wave	150A	250A	250A
- Non detection current: wave 4/10µs	100kA	100kA	100kA
- Resetting unit	E210753	F229867	F229867
- Weight	0.950kg	1kg	1.2kg
- Counting lightning current pulses	No counter		
- Minimum operating current for the counter. Ipeak:			400A wave 8/20µs
- Maximum operating current for the counter. Ipeak:			100kA wave 4/10µs
- Insensitivity of the counter: - 1/2 sinusoid wave Ipeak:			300A / for 3.1ms
- 50Hz, Ipeak:			300A / for ≤700 ms
- Power supply	Completely independent power supply		
- Isolated from pole @	(no batteries) 2kV 50Hz and 5kV wave 1.2/50µs		
- Climatic conditions	-25 to +70°C / Relative humidity 100%		
- Protection rating / impact withstand	IP 56 / IK 07		

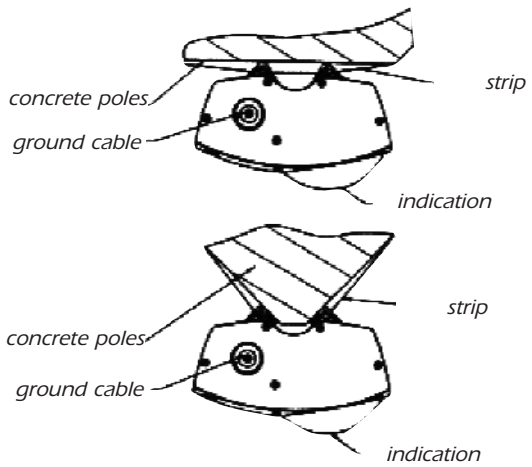
A/ Fixing indicator to electric pole

- The indicator is installed in a horizontal position, facing in either direction.
- The indicator may be attached to a wooden or concrete pole.
- On concrete poles, the indicator may be placed either on flat side or in a corner.

The different configurations are described below.

- Two openings located at the back of the case are designed to accommodate a stainless steel strip, 20 mm wide and 0.4 mm thick, in order to fix the indicator to the post by hooping.
- The hole in the indicator case must be positioned as closely as possible to the ground cable.
  WARNING: During attachment, the strip must pass between the ground cable and the post in order to prevent the cable from being tightened against the post during hooping.



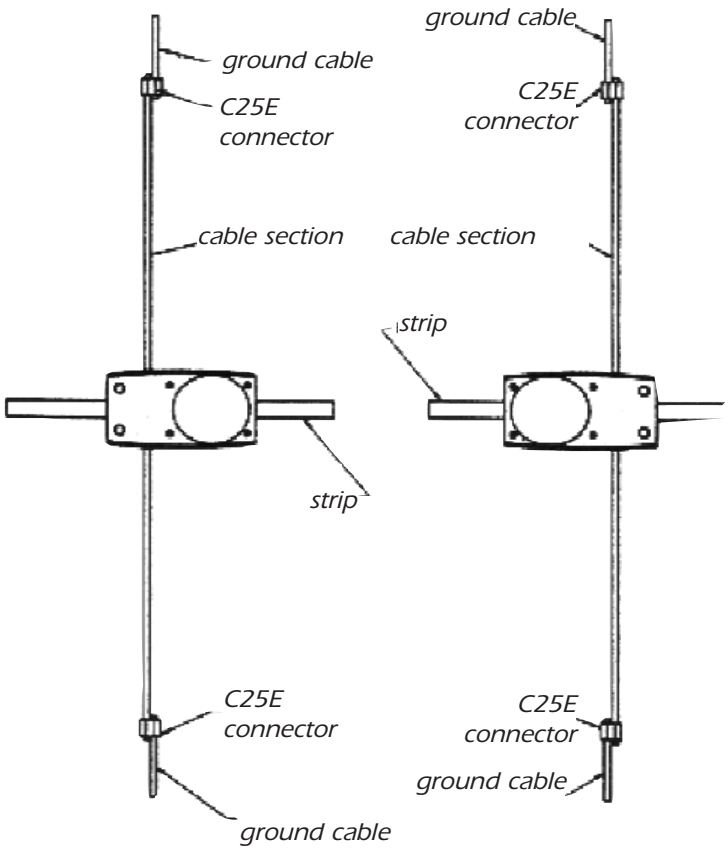


MV Fault Indicator
IDT10 and IDT20

B/ Connecting the ground cable

Once the indicator is attached to the pole:

- Introduce the cable section into the case via the 16 mm hole
- Approximately center the cable section within the case
- Place and crimp a C25 E connector to attach the upper end of the cable section to the ground cable
- Place and crimp the second C25 E connector to attach
- Ensure that both connections are properly completed
- Cut the ground cable just below the upper connector and just above the lower connector
- Remove the piece of ground cable shunted by the cable section



MV Fault Indicator Cabletroll 2500

EARTH FAULT CURRENT SENSING SYSTEM

FAULT SENSING IN FAULTY SECTIONS OF
underground NETWORKS
FOR INDOOR OR OUTDOOR CABLES
UP TO 36KV
PROGRAMMABLE trip level
increased visibility through high intensity led
or optional xenon flash unit
easy-to-install
uv-stabilized POLYCARBONATE housing

Designation	Reference Number	Ground fault signalling	Light sensitivity reset	Indication		Catalog Number
Cabletroll 2500/2510	J208641	Fixed levels of 40, 80, 120 A or continuously adjustable from 5-120 A	1/ Timer reset temporisation (off, 2, 4, 8, 16 or 32 hours) 2/ 15 seconds after a successful repowering	A pair of relay contacts (N. O.) 120 V DC/ 1A gives a 1-second impulse	LED and (or optional Xénon flash unit	CT2500-2510

Cabletroll 2500 fault detectors have been designed for use outdoors or in sheltered areas.

Normal operating conditions:

- Ambient temperature from – 40°C to + 70°C
- Lithium battery lifetime: 10 years for LED application at 20°C ambient or 2,500 hour operation.
- Weight: 750 g

MV Fault Indicator Cabletroll 2500

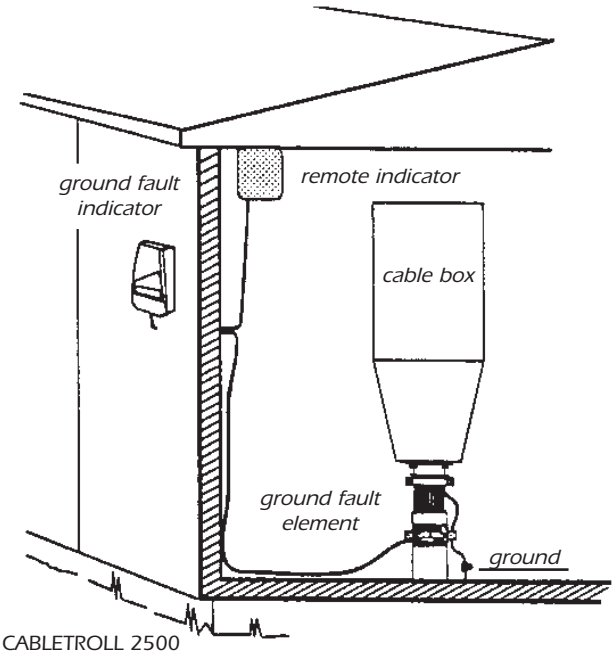
Overview

Cabletroll 2500 is a ground fault sensing system. It consists of a Ground Fault Element and Ground Fault Indicator. It can be mounted in high voltage underground cable distribution networks with system voltage from 6 to 36 kV.

The sealed Ground Fault Element mounts on most widely used cable types, while the weatherproof indicator is well suited for outdoor mounting (See fig. 1).

The indicator is fitted with a high intensity LED for local indication and an optional Xenon flash unit. It is also equipped with a pair of relay contacts for connection to remote indicators, which communicate via cable and/or radio.

The trip level for ground fault can be set on-site to fixed values of 40A, 80A or 120A. It is factory set to 40A. In addition, the trip level can be continuously adjusted in the ranges 5-40A, 8-80A or 12-120A.



CABLETROLL 2500

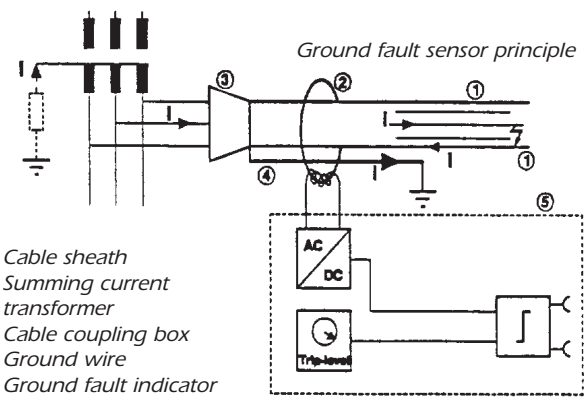
Functional description

Ground faults in general

In networks with directly earthed zero-point, a ground fault is equivalent to a phase-to-ground short circuit. In that case the current magnitude will be somewhat less than in the case of a phase-to-phase short circuit. For networks that do not have directly earthed zero-point, the magnitude of the singular ground fault current is ruled by the size of the galvanically interconnected network, voltage level, type of cable and the zero-point equipment.

Ground Fault Element

The Ground Fault Element is a summing current transformer (CT) which generates a current when the vectorial sum of the 3 phase currents becomes different from zero, i.e. during ground fault. With no ground fault, the vectorial sum is approximately zero.



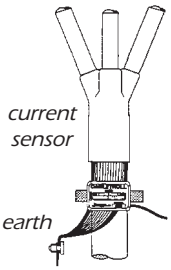
Ground fault sensor principle

1 Cable sheath
2 Summing current transformer
3 Cable coupling box
4 Ground wire
5 Ground fault indicator

Mounting

Ground faults in Element

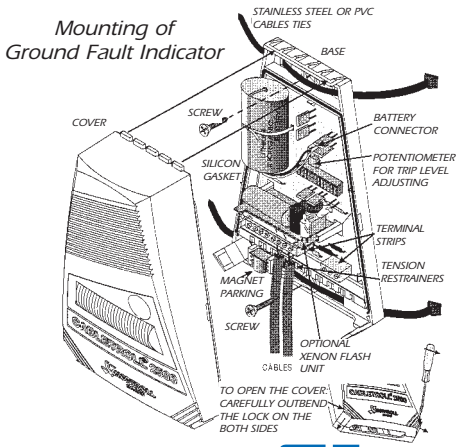
The element connects to the indicator via its ready-mounted cable (2.0 m). Multi-core cable: The element is mounted on the screened part of the cable, below the stripback point, according to the mounting instructions. The screen is turned back underneath the flexible CT-core and terminated at the ground point. The principle is shown in figure opposite.



Ground Fault Element: Screen turnback

Ground faults Indicator

The Indicator should be mounted in a readily visible location. It can be mounted on a pole or a wall with the two enclosed self-threading screws. The Indicator is also suited for mounting with stainless steel or PVC cable ties. Both options are illustrated in figure above. Remove the front cover of the indicator to access holes for screws/ties. See figure for further details.



MV Fault Indicator Cabletroll 2700

Save time and money!
Let CABLETROLL 2700 track down your faulty sections and save you the guess work and time involved in traditional methods of switching during faults

Microcontroller based indicator
Programmable function in software
Separate indication of ground fault and shorT circuit faults
Indication of phase and fault type remote signaling outputs
Multiple power supply alternatives
Multi-reset function: Manually, programmable, timer, remote and by voltage return
Response time adaptable to relay protection

System description

Cabletroll 2700 is a complete system for indication of earth-fault and short circuit faults in an underground 6-36V cable network.

The system consist of three different modules:

- Ground fault element with a split core for sensing the imbalance during ground faults
- 2 (or3) sensors for detecting short-circuits
- Processing unit including power supply and indication unit with flashing LED's for local indication and relay contacts for remote signalling, controlled by a microcontroller.

Trip level for ground fault is continuously adjustable within the range of 5-240A. Short circuit trip level is adjustable within the range of 300-1000A.

The system has separate indicators for ground fault and short-circuit faults.
Three LED's show which phases are involved in the short circuit.

For remote signaling, two pairs of relay contacts are available; ground fault and short circuit.

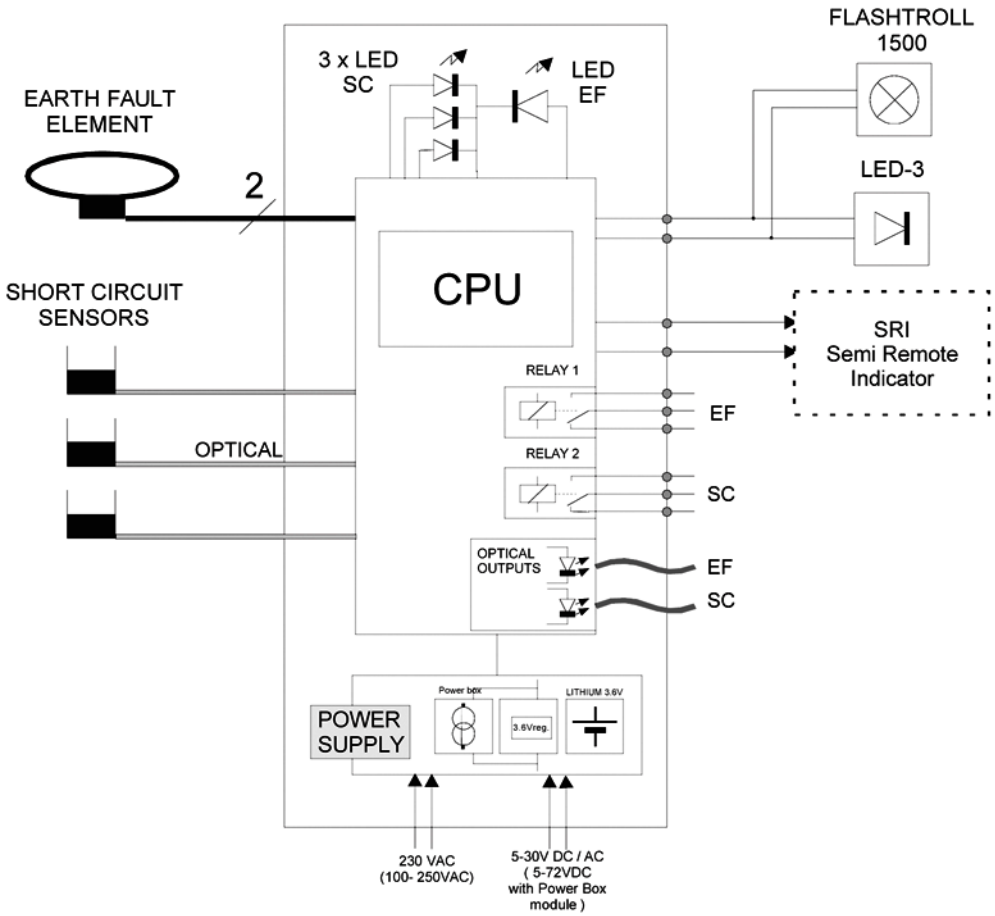
Operating mode

Functions are controlled by a microprocessor and all time delays and operation of the indication unit are programmed in software, making it very easy to adapt to different requirements.

Different operating modes are available:

- Immediate indication of both permanent and transient faults
- Immediate local and remote indication of both permanent and transient faults causing circuit breaker tripping
- Postponed operation of relay contacts, allowing closing-cycles to finish before remote-indication is activated Indication of permanent faults only
- Both timer and voltage reset can be enabled or disabled independently

MV Fault Indicator
Cabletroll 2700



Technical specifications

Trip levels

- Ground fault: 40, 80,105, 120, 1601 210 and 240A (fixed levels) or continuously adjustable from 5-240A.
- Short Circuit: Adjustable in the range 300 - 1000 A

Response time

- Independant adjustable time delays for ground fault and short circuit faults.

Indication

- Visual by 4 internal LED's
- External LED / Xenon flash (optional)
- 0utputs for remote indication

Inputs

- Ground Fault Element
- 3 x Short-Circuit Element (AMP fiber optic connector)
- External power 230V AC
- External 5-30 (72V) DC/AC -power
- External reset

Outputs

- LED-3 / FlashTroll 1500 (for indication outside the kiosk by LED or Xenon-flash)
- Relay 1: Volt free NO / NC for ground fault indication
- Relay 2: Volt free NO / NC for short-circuit indication
- Signal output to communication module
- Optical output (AMP) ground fault indication (Optional)
- Optical output (AMP) for short-circuit indication(Optional)

MV Fault Indicator Cabletroll 2700

Test/reset

- Magnet contacts for activating test/reset without opening housing.
- Internal push-button for test/reset.
- Remote reset (closed contact)
- External reset 230V AC
- Reset from internal timer: 2, 4, 8, 12, 16, 24 and 32 hours.

Power supply alternatives

- Internal lithium battery
- Internal sealed lead rechargable battery (giving 50 hrs back-up)
- External 230 VAC
- External 5 - 30 V DC / AC
- By using a Power Box-DC/DC-converter, external power can be in the range of 5-72 V DC/ AC, and the CT 2700 will be galvanic insulated from power source.

Power consumption

Surveillance mode: < 50 mA (minimum 7 years operation with Lithium-battery providing 2hrs activation 10 times year).
Alarm mode:< 50 mA depending on external indication.
Temperature range: -40 / +70 deg.

Function:-

Function can easily be adpated to different conditions by setting parameters in software, such as response time, reset timing, operation of relays etc.

Basic modes

Mode 0:	Immediate local and remote indication. Voltage reset enabled. Timer reset disabled. Indication of both permanent and transient fault.
Mode 1:	Immediate local and remote indication. Voltage reset disabled. Timer reset enabled. Indication of both permanent and transient fault.
Mode 2:	Immediate local and remote indication Voltage reset enabled. Timer reset enabled. Indication of both permanent and transient fault causing circuit breaker tripping.
Mode 3:	Postponed operation of relay contacts, allowing reclosing-cycles to finish before remote-indication is activated. Reset functions as for Mode 2. Indication of permanent faults only.
Battery : change	Every 2500 hours of indication, normally every 7 years.
EMC:	The indicator is designed according to current EMC-standards for immunity and emission.

MV Fault Indicator Cabletroll 3600

Directional fault current indicator for underground systems

Presentation

CABLETROLL 3600 directional Fault Current Indicators (FCI) are designed to help the operator locate faults on underground lines. They detect both single phase-to-ground (PTG) and phase-to-phase (PTP) faults in systems with 300A impedance or compensated neutral grounding. And they use a brand-new detection technique that offers significant advantages over the conventional technique of existing detectors working on current thresholds. That new technology means that unlike conventional detectors, they can operate on systems with high capacitive current (combined overhead/underground networks with a high proportion of cable, very long underground networks).

The CABLETROLL 3600 FCI is capable of discriminating between PTP and PTG faults, and indicating the direction of the latter type.

It can be used on networks from 6 to 36 kV for the following applications:

CABLETROLL 3600 LDAC:

installed on strategic points in the network (switching points, branching points), it assists the operator by visually signaling the passage of a PTG or PTP fault current.

CABLETROLL 3600 LDAC LV:

when used in combination with remote-controlled switchgear, it assists the operator in remote control by providing contacts that alert the remote control system to the passage of a PTG or PTP fault current.

CABLETROLL 3600 LDAU:

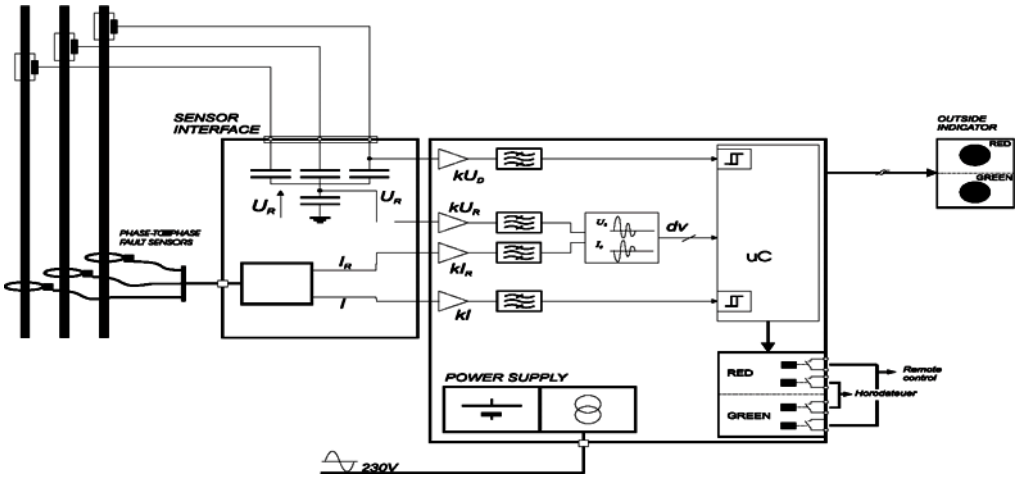
installed temporarily on a disturbed network, it identifies what sections are responsible for faults and gives a time and date system the data required to analyze faults, whether persistent or transient.

MV Fault Indicator Cabletroll 3600

Description and working principle

The CABLETROLL 3600 works on the principle of directional fault indication described in EDF patent 9209549.

The following block diagram shows the CABLETROLL 3600 indicator's main circuits.



In the initial milliseconds after a PTG fault, voltage and current transients are generated on the system. Using a microprocessor to interpret the phase displacement between residual voltage and residual current, the circuit can indicate in which direction the PTG fault is located (up-line or down-line of the indicator's pick-up coils).

For PTP faults the working principle is that of an ammeter (current threshold).

There are 6 standard models:

Function	Power supply	Outside connections	Designations	References number	Catalog number
Assistance in autonomous operation	Batteries (power for 4 years in operation)	None	CABLETROLL 3600 LDAC	S 210765	CT3600LDAC
Assistance in autonomous operation with counter Requires remote control unit COMTROLL 3600 W210768	Batteries (power for 4 years in operation)	None	CABLETROLL 3600 LDAC counter	W 210998	CT3600LDAC-CP
Assistance in operation with LV power supply	230 VAC	Outside contacts provided to transmit indicator light data	CABLETROLL 3600 LDAC BT	T 210766	CT3600LDACBT
Assistance in autonomous operation with counter Requires remote control unit COMTROLL 3600 W210768	230 VAC	Outside contacts provided to transmit indicator light data	CABLETROLL 3600 LDAC BT Counter	X 210999	CT3600LDACBT-CP
Autonomous diagnosis Requires remote control unit COMTROLL 3600 W210768	Batteries (power for 4 years in operation)	Connection to a time and date system provided	CABLETROLL 3600 LDAU	Y 211000	CT3600LDAU
Diagnosis with LV power supplyRequires remote control unit COMTROLL 3600 W210768	230 VAC	Connection to a time and date system provided	CABLETROLL 3600 LDAU BT	V 210767	CT3600LDAUBT

MV Fault Indicator Cabletroll 3600

Application of a CABLETROLL 3600 FCI

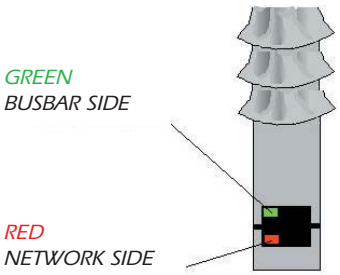
General

When a CABLETROLL 3600 detects a fault current, it alerts the operator either visually with a signal light or through contacts (CABLETROLL 3600 AC LV or AU).
As soon as the existence of a fault is confirmed, the signal light on the CABLETROLL 3600 lights up and stays lit until one of the following events occurs:

- Forward voltage returns to the HV line (voltage reset).
- The internal 2 hour time delay ends (timer reset).
- The indicator is reset by the operator using either the reset button on the front of the main box or the COMTROLL infrared remote control unit (manual reset).

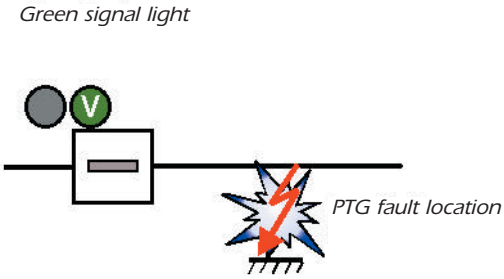
PTG fault indication

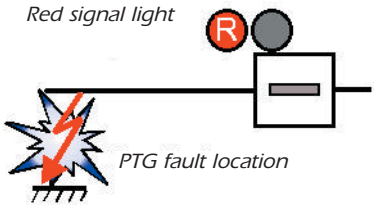
The principle of directional PTG fault indication is to locate what part of the line is the origin of a PTG fault. To do this each pick-up coil has a GREEN signal and a RED signal. The coils must be mounted in such a way that the GREEN signal is on the BUSBAR side and the RED signal is on the NETWORK side.



If the GREEN signal light is lit up, the fault is on the GREEN side, i.e. the BUSBAR side.

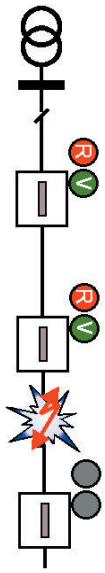
If the RED signal light is lit up, the fault is on the RED side, i.e. the NETWORK side.





PTP fault indication

In this case the CABLETROLL 3600 FCI works like a conventional fault indicator and no direction is indicated. All the fault indicators between the feeding substation and the fault flash the green signal light and the red signal light alternately (once every second).



MV Fault Indicator Cabletroll 3600

Fault indication characteristics

PTG faults

Any PTG fault characterized by a residual current over 60A peak + 10A and a residual voltage of 9kV + 2kV is detected.

Once those thresholds are exceeded, the fault indicator waits 40 ms to detect a residual voltage Vr greater than 3.5kV ± 0.5kV before indicating that there is indeed a fault.

Double PTG faults

A fault considered as a "double PTG fault" consists of a simultaneous PTG fault on two different phases in a system powered by the same HV transformer but grounded at two geographically distant points.

The two faults may be located on the same feeder or on two different feeders. In this case any fault characterized by a residual current over 250Arms ± 50A is detected.

PTP faults

Any PTP fault characterized by a current over 450Arms + 80A is detected.

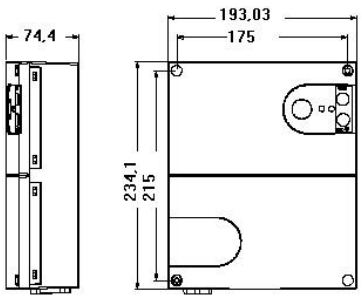
Return of forward voltage

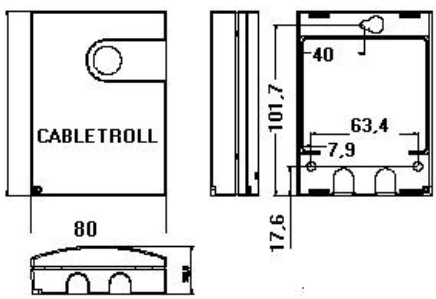
The return of forward HV voltage (resetting the FCI) is accepted when voltage on the system is at least 10kVrms + 2kV.

FCI construction

The CABLETROLL 3600 FCI consists of six parts:

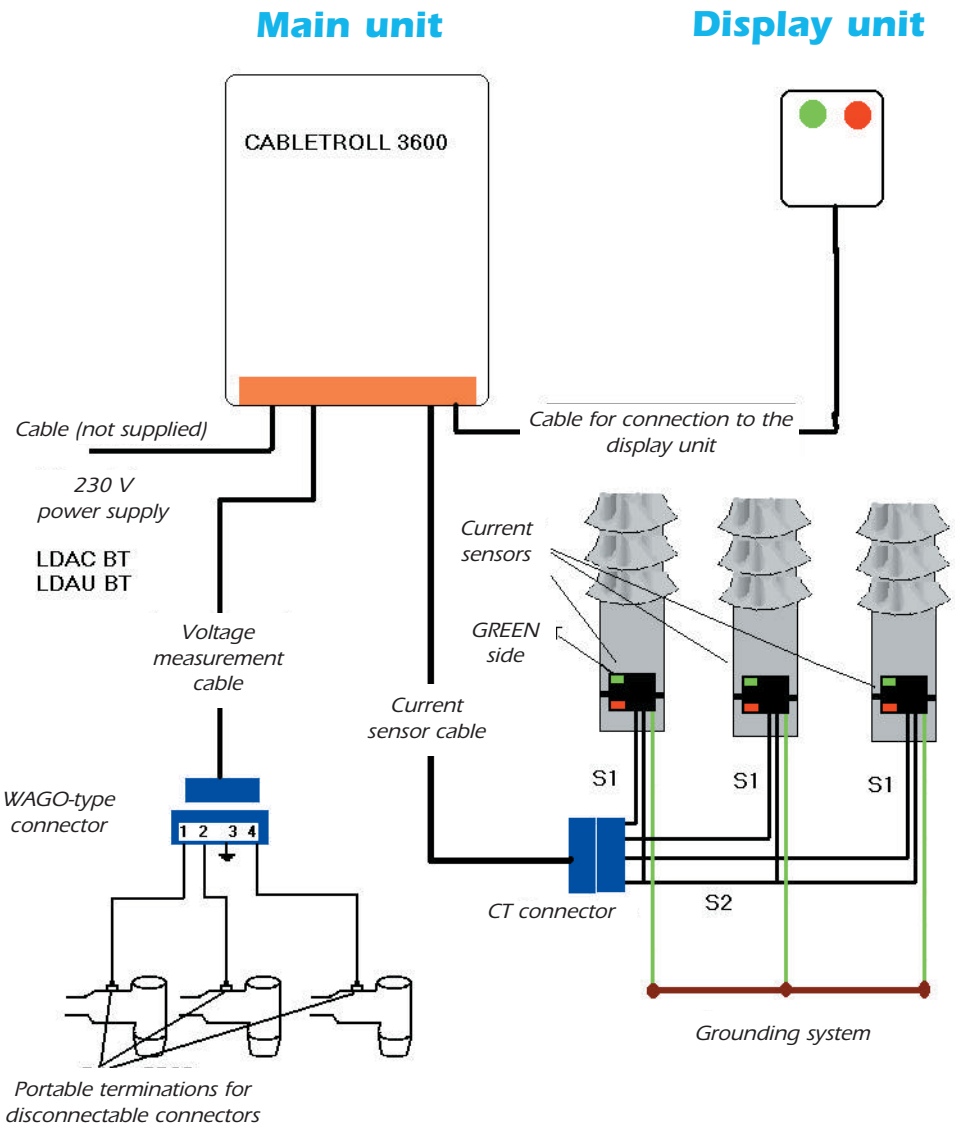
- **Voltage measurement:**
  subassembly consisting of a male WAGO-type termination ref. 723-604/000-042 (see connection diagram) connected to a 7 m (or optional 12 m) cable. This cable is then connected to the terminal block on the main unit of the FCI. The male connector is connected to a female part (not supplied with the FCI) that leads to the portable terminations for disconnectable connectors (not supplied with the indicator).
- **Current measurement:**
  subassembly consisting of three current sensors, each with a detection element with its own cable and a collar to fasten the sensor on the HV cables. The three cables running out from the sensors are fitted with a current transformer (CT) connector (see connection diagram) that must be connected to the current sensor cable (see hereafter).
- **Current sensor cable:**
  7 m (or optional 12 m) cable connected to a connector. One end of this cable must be connected via CT connectors to the current sensors and the other to the terminal block of the main FCI unit.
- **Multi-core cable:**
  7 m (or optional 12 m) cable to connect the display unit to the main FCI unit.
- **Main unit containing:**
  the electronic board, the power supply, the TEST and RESET buttons and the terminal blocks for connection to outside elements.





- Display unit consisting of a weatherproof and impact resistant casing containing the green and red signal lights. This unit must be installed outside the substation or the cubicle.

MV Fault Indicator
Cabletroll 3600



MV Fault Indicator Linetroll 111K

POLE-MOUNTED FAULT INDICATORS

Fault sensing in faulty sections of overhead networks
OUTDOOR use for 6 to 66 kV networks
Programmable and fitted to any configuration
Easy-to-install
Increased visibility through Xenon flash indication

Main characteristics

Catalog Number	Reference Number	Maximum sensitivity		Recommended distance between link and indicator	Indication		Catalog Number
		Ground fault	Short-circuit fault		Permanent fault	Transient fault	
Linetroll 111K	Z208126	ISET ≥ 4A Adjustable on 7 15 or 50 A	ISC > 2 times I load line	3 to 5 m	Programmable Xenon Flash 1,5 - 12 H	LED Diode Storage up to 24 h	LT111K

Linetroll 111K indicators are designed for outdoor installation.

Normal operating conditions:

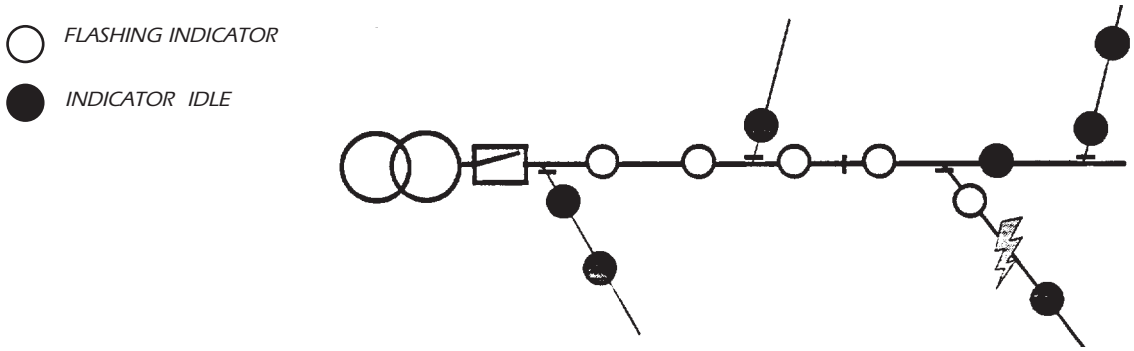
- Ambient temperature between – 40°C and + 70°C
- Lithium battery lifespan: 5 to 10 years depending on ambient temperature or every 500 hours of operations
- Weight: 750 g

MV Fault Indicator Linetroll 111K

Overview

Linetroll® 111K indicators are used to locate short-circuit and earth faults in overhead power distribution networks. Linetroll 111K is a 3-phase unit fully covering the different types of potential fault configurations.

Indicators are placed at strategic locations along the line, such as after branching points and sectionalisers. The indicator may be pole-mounted, 3-5 meters below the conductors, by means of screws or wrapping-bands. Live line mounting is done safely, easily and rapidly.

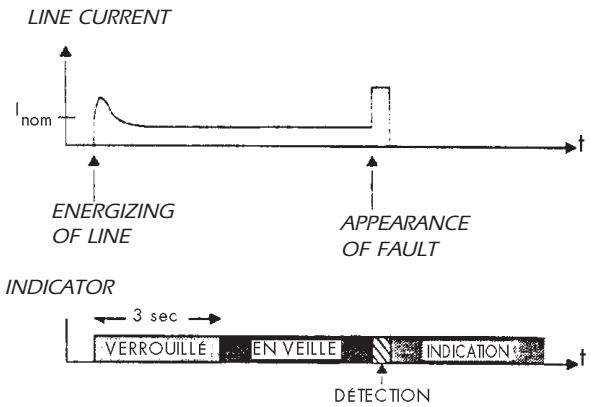


Upon detection of a line fault, the indicator gives off an intermittant Xenon gas flash. This flash can be seen at up to 200 - 300 metres distance in full daylight and 2 - 3 km at night. The indicator lens allows for uniform 360 degree monitoring. Upon fault sensing, all indicators installed between the feeding substation and the fault will operate. Indicators place behind the fault remain idle.

Functional description

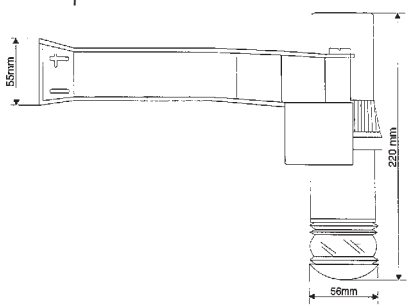
Linetroll® 111Ks fault sensing is based on detection of the electromagnetic field below the conductors. The unit is fully self-contained; no external transformers or connections of any kind is required.
To determine whether or not the line is faulted, the indicator looks for a specific sequence in the line conditions before it starts flashing. The general sequence is as follows.

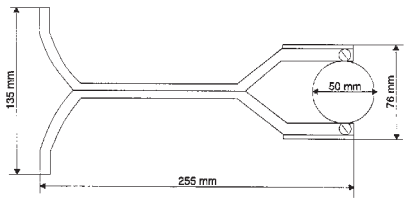
1. The line should be energized for at least 3 seconds.
2. The line current should increase rapidly above the value set by the user (the nominal trip level).
3. The line should be de-energized.However, the user may program the operating criteria to suit local requirements by manipulating a bank of microswitches inside the indicator.



Mounting

Linetroll 111K mounts with screws (included) or wrapping bands. This enables installation on either wood or concrete poles.





MV Fault Indicator Linetroll 3500

DIRECTIONAL FAULT CURRENT INDICATOR FOR OVERHEAD LINES

Presentation

LINETROLL® 3500 is a pole-mounted intelligent Fault Current Indicator (FCI) for use in electrical power networks. It uses brand-new detection technology that provides major benefits over previous FCI technology. LT3500 aims at tracking down the fault site rather than monitoring the exact fault current level.

FCIs contribute to improving the quality of supply in electrical distribution networks by providing instant information about fault sites. Based on this information, power rerouting and repair work can commence quickly. Outage duration and the use of manpower for fault-searching can be reduced by as much as 75%, a substantial saving potential for any utility.

For Distribution Automation (DA) purposes, or in combination with remote-controlled switchgear, FCIs used as in-formation sources represent a good alternative to automatic reclosers and sectionalisers. Reconnection of faulted lines as well as disconnection of healthy lines is avoided. Wear and tear of personnel and equipment is reduced.

Strategic application (large numbers) of FCIs represents an important tool in the search for optimum electrical energy supply quality and price. For any utility, the use of FCIs translates to increased earnings and improved goodwill and credibility among customers.

LINETROLL® 3500 is designed for application on 1- or 3-phase overhead distribution lines at voltages from 6-132 kV. It is able to discriminate between phase-to-phase (PTP) faults and phase-to-ground (PTG) faults and offers direc-tional capabilities on PTG faults, pointing towards the fault site.

LT 3500 represents a breakthrough in FCI performance and is applicable in networks of any neutral earthing method. The basic version of the unit exhibits 1 out of 2 available factory default characteristics, exclusively tailored for service in the following types of network: solid earthing versus impedance earthing or isolated networks.

It is designed to flawlessly meet the challenges of networks that undergo extensions and/or modifications, power re-routing and heavy load variations. All of this without the need for time-consuming network capacitance and fault current magnitude calculations, saving a lot of expensive time. The trick is that, contrary to earlier fault indicator generations, LT3500's performance remains uninfluenced by capacitive discharge currents when applied in isolated or impedance earthed networks.

Unmatched application flexibility and product lifetime is achieved through modular hardware design and software upgradeability.

Several methods of fault detection can be utilised simultaneously, offering many possibilities for adapting the function of the unit to some of the protection relay characteristics.

Maintenance requirements are very low thanks to sophisticated power management and a selection of power supply packs of adequate capacity.

MV Fault Indicator Linetroll 3500

APPLICATION OF LINETROLL® 3500

When LT3500 detects a fault current, it will indicate this by flashing lights or by other means (optional). The unit is able to discriminate between PTG and PTP faults on any kind of network with regard to the earthing method in use.

The fault indicator light will keep flashing until a pre-determined automatic reset condition is fulfilled. Such an automatic reset condition can be the return of voltage to the line (voltage reset), time lapsed since fault occurred (timer reset) or other.

Manual reset can be carried out on-site by rotating the display unit to the RESET position, either by hand or by use of a special TEST/RESET TOOL. The test/reset tool must be used when the indicator cannot be reached from the ground.

Performance in coil- (Petersen), coil+ resistor-, resistor earthed networks and isolated networks.

PTG faults

All LT3500s mounted in the network supplied from the same feeder will indicate, flashing a single-color light, red or green. The color determines the relative direction to the fault site.

When approaching the front of the indicator, i.e. when you see the indicator in front of the pole:

a) if the indication color is red; turn back along the line, the fault site is in the opposite direction
b) if the indication color is green; continue forward along the line, the fault site lies ahead

PTP faults

LT3500s mounted along the fault current path between the feeder and the fault site will indicate, flashing alternating red and green lights.

Bi-colored alternating indication means that a PTP fault has occurred downstream from the indicator.

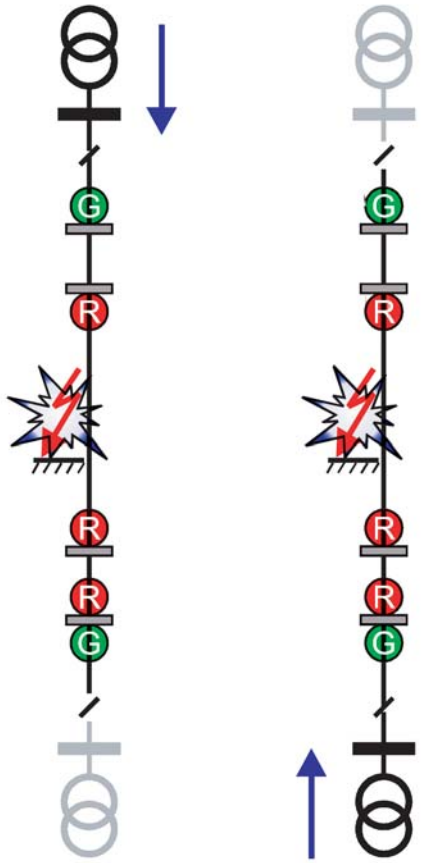


Figure 0-1.

LT3500 delivers directional performance on PTG faults. Different feeding directions do not affect the indication pattern.

Figure 0-2.

How to interpret network diagrams:
Bird's eye view of pole with indicator, indication alternatives and fault site(s).

MV Fault Indicator Linetroll 3500

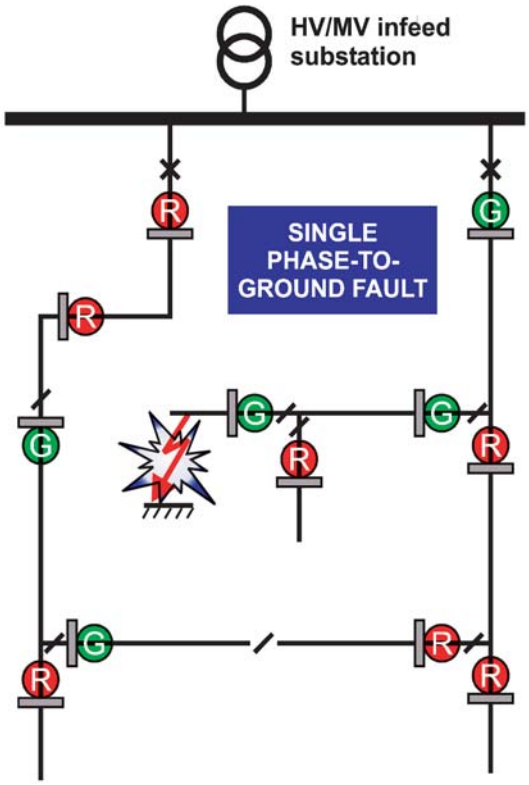


Figure 0-3.

Single PTG fault results in uncomplicated indication pattern and fault site tracking.

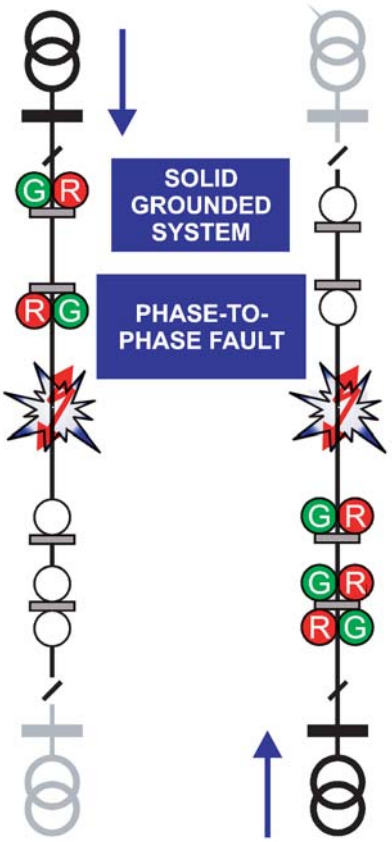


Figure 0-4.

LT3500 performance on PTP faults. Different feeding directions give different indication patterns.

Performance in solid earthed networks

PTG faults and PTP faults are indicated equally.

The criteria for detection and indication of PTG and PTP faults can be programmed individually, comprising a combination of di/dt and overcurrent techniques.

Only LT3500s mounted along a fault current path between a feeder and the fault site will indicate by flashing lights.

Inversely, a fault site should be located downstream from a flashing FCI. More precisely, the fault site should be located between the last flashing FCI and the first idle FCI.

MV Fault Indicator
Linetroll 3500

Operation

LT3500 is the result of several years of research, development and testing aimed at setting new standards for re-liability and functionality of FCIs.

A few hints

The unit continuously monitors the electromagnetic field on site. It looks for particular sequences of field changes to take place. Upon recognition of such a sequence, the unit samples and stores information in memory for immediate analysis. Based on analysis, the unit either indicates a faulted line or resumes trivial surveillance. The exact sensitivity to fault current magnitude is not critical for correct operation.

Fault category display

Phase-to-Ground and Phase-to-Phase faults can be indicated individually, as can transient faults versus permanent faults. For on-site monitoring, faults are indicated by flashing lamps in the display unit. The flashing pattern defines what kind of fault the unit has detected. The display unit can be rotated horizontally to allow easy monitoring from any position.

Directionality

A great advantage to LT3500 is its directional capability. In impedance earthed or isolated networks the unit is able to tell its relative position to a phase-to-ground fault site.

Maintenance

Maintenance of FCIs normally involves replacing the batteries. A range of battery packs is available for LT3500, allowing some flexibility with respect to service intervals.

Optional extras

IR programming unit

RTU interface and/or
external power supply connector card

Solar power pack

VHF radio + solar power pack

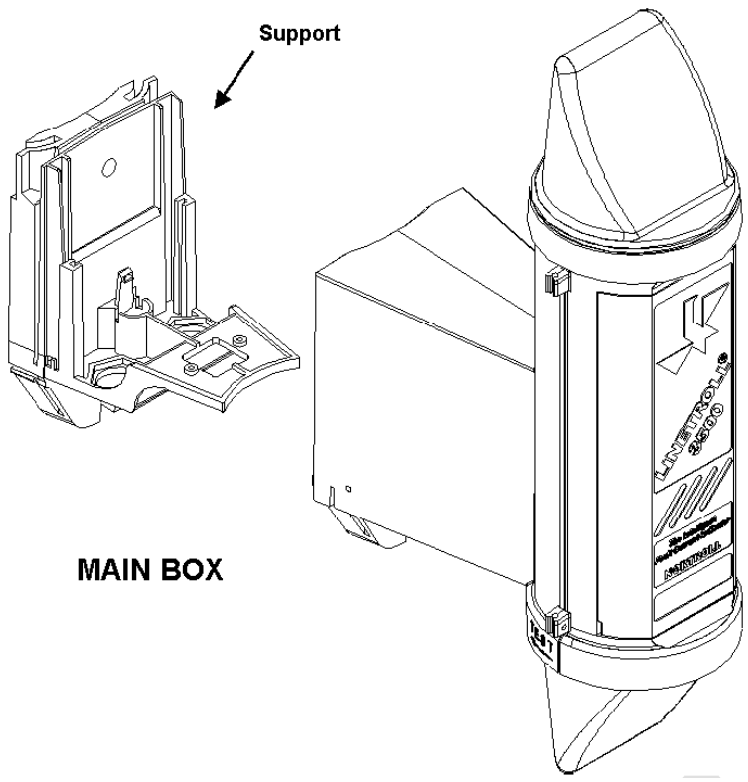
UHF radio + solar power pack

Xenon display unit

Test/reset tool

Battery packs

Mounting



MV Fault Indicator Linetroll 3600

Directional fault current indicator for overhead lines

Présentation

LINETROLL 3600 directional Fault Current Indicators (FCI) are designed to help the operator locate faults on overhead lines. They detect both single phase-to-ground (PTG) and phase-to-phase (PTP) faults in systems with 300A impedance or compensated neutral grounding. And they use a brand-new detection technique that offers significant advantages over the conventional technique of existing detectors working on current thresholds. That new technology means that unlike conventional detectors, they can operate on systems with high capacitive current (combined overhead/underground networks with a high proportion of cable).

The LINETROLL 3600 FCI is capable of discriminating between PTP and PTG faults, and indicating the direction of the latter type.

It can be used on networks from 6 to 132 kV for the following applications:

LINETROLL 3600 PDAC: installed on strategic points in the network (switching points, branching points), it assists the operator by visually signaling the passage of a single- or multi-phase fault current.

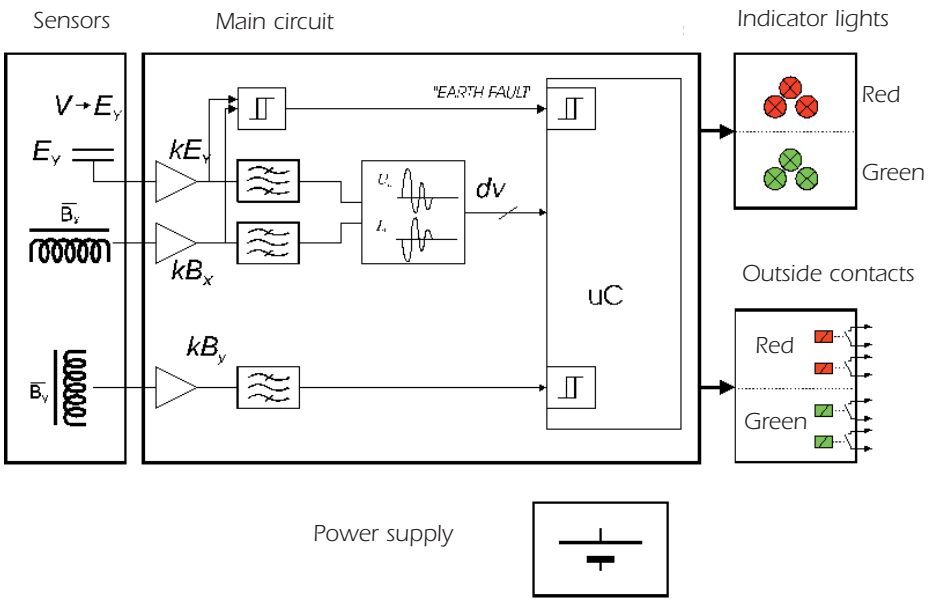
LINETROLL 3600 PDAT: when used in combination with remote-controlled switchgear, it assists the operator in remote control by providing contacts that alert the remote control system to the passage of a PTG or PTP fault current.

LINETROLL 3600 PDAU: installed temporarily on a disturbed network, it identifies what sections are responsible for faults and gives a time and date system the data required to analyze faults, whether persistent or transient.

MV Fault Indicator Linetroll 3600

Description and working principle

The LINETROLL 3600 works on the principle of directional fault indication described in EDF patent 9209549. The following block diagram shows the LINETROLL 3600 indicator's main circuits.



In the initial milliseconds after a PTG fault, voltage and current transients are generated on the system. Using a microprocessor to interpret the phase displacement between residual voltage and residual current, the circuit can indicate in which direction the PTG fault is located (up-line or down-line of the support the pole is strapped to).
For PTP faults the working principle is that of an ammeter (current threshold).

There are 5 standard models:

Function	Power supply	Outside connections	Designations	References number	Catalog number
Assistance in operation	Batteries (power for 4 years in operation)	None	LINETROLL 3600 PDAC	P 210762	LT3600PDAC
Assistance in operation with counter Requires remote control unit COMTROLL 360 W210768	Batteries (power for 4 years in operation)	None	LINETROLL 3600 PDAC counter	V 210997	LT3600PDAC-CP
Assistance in remote operation	12 VDC	Outside contacts provided to transmit indicator light data	LINETROLL 3600 PDAT	Q 210763	LT3600PDAT
Assistance in operation with counter Requires remote control unit COMTROLL 360 W210768	12 VDC	Outside contacts provided to transmit indicator light data	LINETROLL 3600 PDAT Counter	T 210996	LT3600PDAT-CP
Diagnosis Requires remote control unit COMTROLL 360 W210768	Batteries (power for 4 years in operation)	Connection to a time and date system provided	CABLETROLL 3600 PDAU	R 210764	LT3600PDAU

MV Fault Indicator Linetroll 3600

Application of a LINETROLL 3600 FCI

General

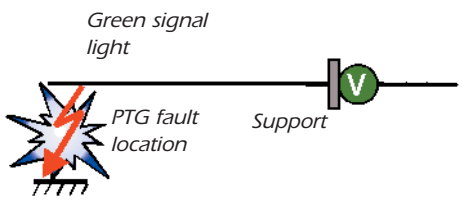
When a LINETROLL 3600 detects a fault current, it alerts the operator either visually with a signal light or through contacts (LINETROLL 3600 AT or AU).
As soon as the existence of a fault is confirmed, the signal light on the LINETROLL 3600 lights up and stays lit until one of the following events occurs:

- Forward voltage returns to the HV line (voltage reset).
- The internal 2 hour time delay ends (timer reset).
- The operator resets the fault indicator using either the "manual" system on the box or the COMTROLL infrared remote control unit (manual reset). The device can be reset manually by turning the display unit to the signal light reset position and then turning it back to its original position.

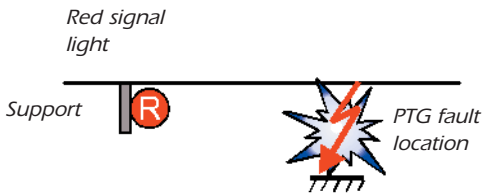
PTG fault indication

The principle of directional PTG fault indication is to locate what part of the line is the origin of a PTG fault. To do this, the LINETROLL 3600 PTG fault indicator has two signal lights:
- A Red light on the front of the box
- A Green light on the back, on the side where the device is supported.

If the GREEN signal light is lit up, the fault is on the GREEN side, i.e. the side of the support.

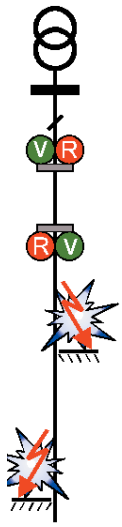


If the RED signal light is lit up, the fault is on the RED side, i.e. the side opposite the support.



PTP fault indication

In this case the LINETROLL 3600 FCI works like a conventional fault indicator and no direction is indicated. All the fault indicators between the feeding substation and the fault flash the green signal light and the red signal light alternately (once every second).



MV Fault Indicator Linetroll 3600

Fault indication characteristics

Sensitivities are defined in the reference set-up shown below. Please inquire for any other set-up desired.

PTG faults

Any PTG fault characterized by a residual current over 60A peak + 10A and a residual voltage of 9kV + 2kV is detected.Once those thresholds are exceeded, the fault indicator waits 40 ms to detect a residual voltage Vr greater than 3.5kV + 0.5kV before indicating that there is indeed a fault.

PTP faults

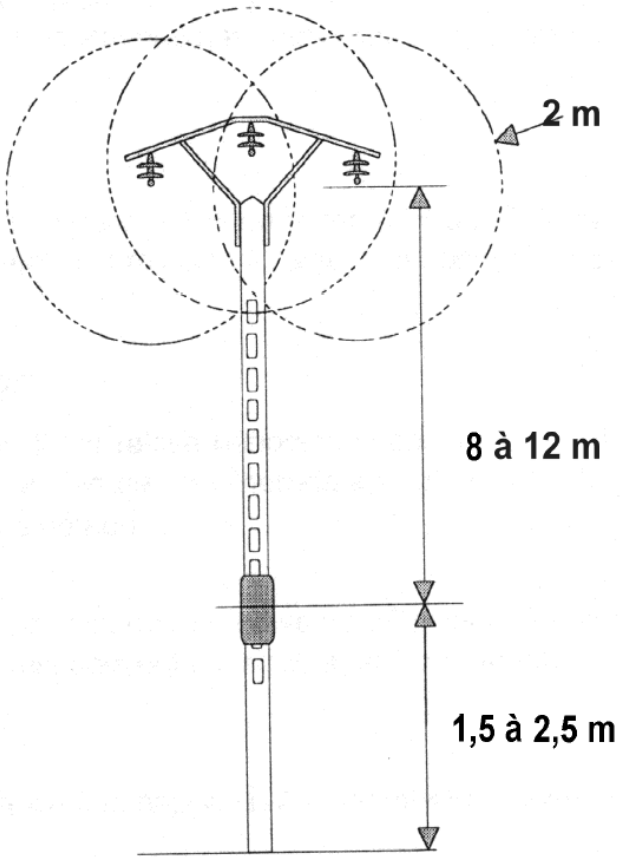
Any PTP fault characterized by a current over 450Arms + 80A is detected.

Double PTG faults

A fault considered as a "double PTG fault" consists of a simultaneous PTG fault on two different phases in a system powered by the same HV transformer but grounded at two geographically distant points. The two faults may be located on the same feeder or on two different feeders. In this case any fault characterized by a residual current over 250Arms + 50A is detected.

Return of forward voltage

The return of forward HV voltage (resetting the FCI) is accepted when voltage on the system is at least 10kVrms + 2kV.



FCI construction

The LINETROLL 3600 FCI consists of four parts:

- A support to be strapped on the pole with a metal strip. That support may have openings for wiring to connect the device to other equipment and a connection to a time and date system.
- A main box containing the sensors, the electronic boards and the batteries.
- A display unit on the bottom of the box. That display unit may be rotated 90° to improve visibility if required. It is also used to reset and test the fault indicator.
- A top cap screwed onto the main box. That cap may be equipped with an optional solar panel to power the FCI.