
CATALOG

Hi-Tech®

Fuse Products



**Thomas & Betts is now ABB
Installation Products, but our long
legacy of quality products and
innovation remains the same. From
connectors that help wire buildings
on Earth to cable ties that help put
machines in space, we continue to
work every day to make, market,
design and sell products that
provide a smarter, safer and more
reliable flow of electricity, from
source to socket.**

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Elastimold® fuses

Overview

Capable of interrupting in elevated ambient temperature, Elastimold fuses are built tough to take the heat!

Elastimold fused products cover a wide range of applications and ratings. Fused elbows (FLR), molded current-limiting fuses (MCLF) and molded canister fuses (MCAN) provide full-range protection through 50 kA using Hi-Tech® full-range fuses. The fuses in these products can easily be replaced with minimal downtime. Fused load-break elbows provide low-cost, convenient protection for radial taps, junctions, transformers and other equipment. They combine the advantages of full-range current-limiting fusing with the convenience of 15/25 kV, 200 A hotstick-operable, loadbreak elbow switching. MCLF and MCAN are suitable for single-phase tap/load protection and can be used in vault, subsurface or padmount installations.

Elastimold fused products provide the benefits of current-limiting protection, with fault clearing occurring in less than one-half cycle, thereby limiting the let-through fault current and dramatically reducing stresses on equipment. They also provide both overload and fault current protection for distribution equipment in a single fuse body. As full-range fuses, they are capable of

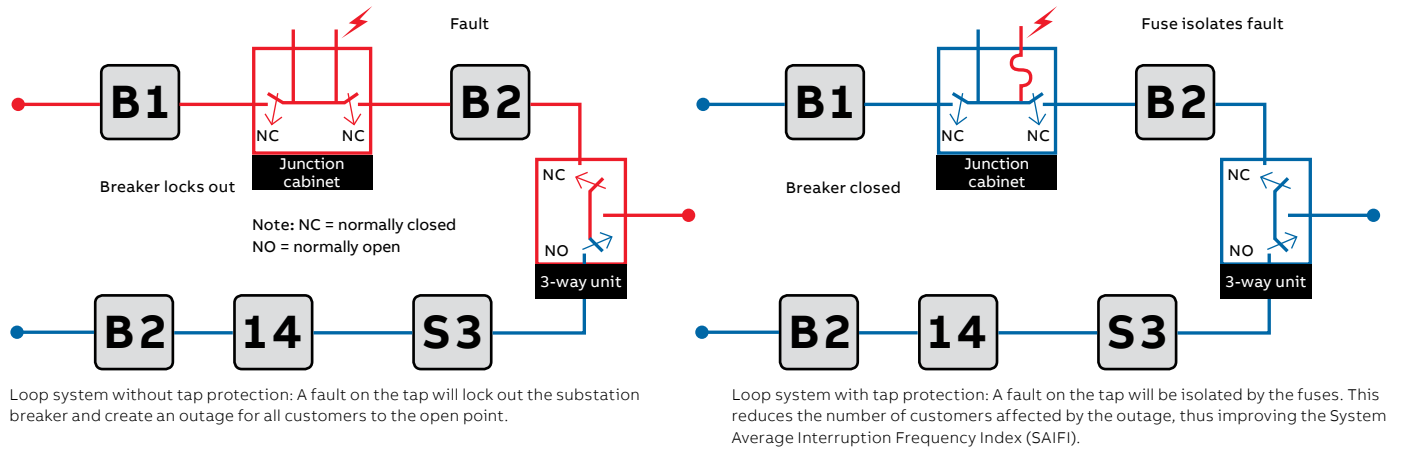
interrupting any continuous current between the minimum current that can cause melting of the elements and its rated maximum interrupting current (50,000 A). All fuses are capable of interrupting in elevated ambient temperatures. Hi-Tech fuse design features include:

- A patented damage sensor that significantly reduces the risk of fuse failure should the fuse be subjected to an element-damaging current surge (e.g. lightning).
- Hermetically sealed construction ensures that no gases escape from the fuse during current interruption.
- All fuses are helium mass spectrometer leak tested to ensure sealing system integrity.
- Rugged machined-brass end caps used for greater ferrule strength, resulting in less distortion and a more secure fuse attachment.

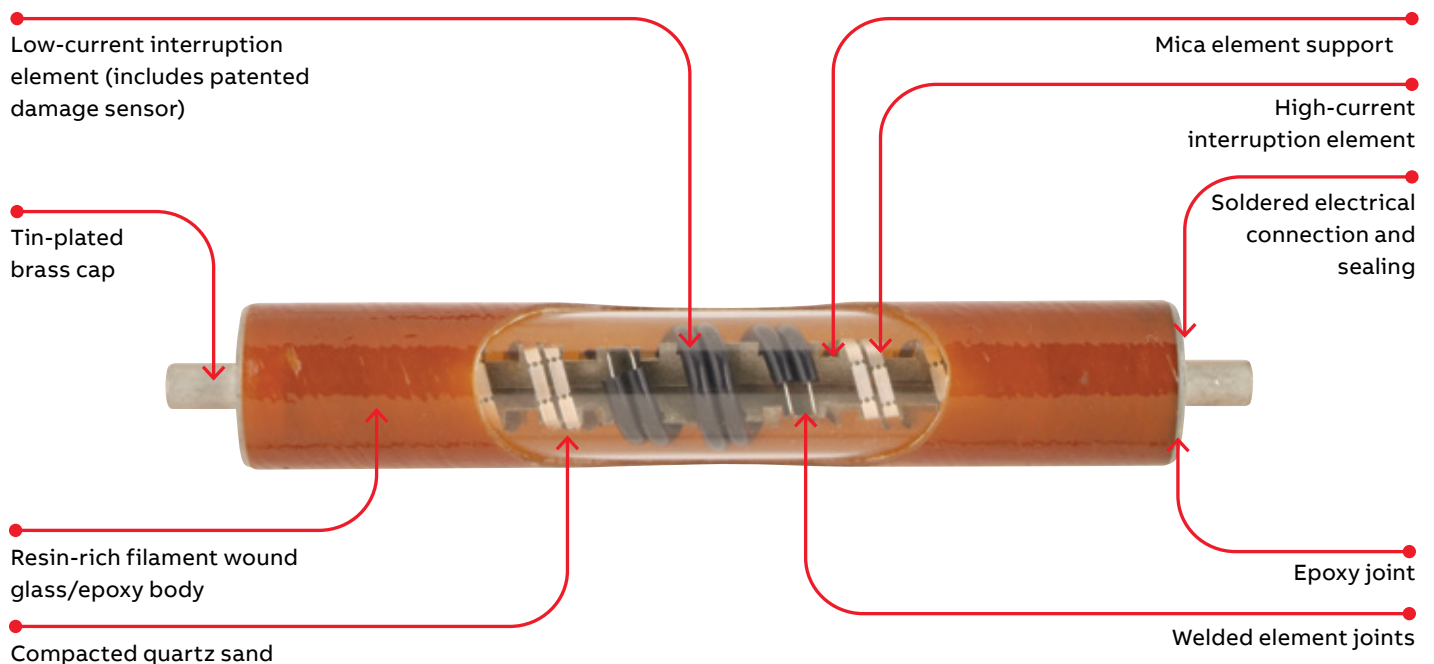
Elastimold FLR, MCLF and MCAN fused products constitute some of the fastest and easiest ways to improve system reliability.

Improve loop system reliability by adding protection to a tap.

Example: underground loop system



Full-range current-limiting fuse



Elastimold®

Fused loadbreak elbows

The fastest, most cost-effective way to improve a distribution system's reliability.

- Combined full-range current-limiting fusing 15/25 kV hotstick-operable, loadbreak elbow switching quickly improves the distribution system's reliability without the expense of adding a separate piece of switchgear or replacing existing sectionalizing cabinets
- Current-limiting fuses improve the fault close rating of the elbow (10 kA) to that of the fuse, thereby reducing the risk of component damage or personnel injury
- Neon voltage indicators (V2) attached to elbow test points to provide quick and convenient blown-fuse indication
- EPDM molded rubber deadfront construction enables elbows to be fully sealed and submersible, and they insulate, shield and eliminate exposed live parts
- Two-piece housing enables easy fuse replacement

Replace existing 200 A tap elbows with Elastimold fused elbows to protect light-duty underground distribution systems, including sub-loops, radial taps, junctions, transformers and other equipment.

Elastimold fused elbows provide full-range current-limiting fusing with 50 kA interrupting capability. They are rated for 5 kV ungrounded to 28 kV grounded Wye. Plus they provide 15/25 kV hotstick-operable, loadbreak elbow switching.



Ratings

System voltage class (kV)	15	25*	25/28*
Nominal fuse voltage (kV)	8.3	15.5	17.2
Rated maximum fuse voltage (kV)	8.8/10	15.5	17.2
Frequency (Hz)	50/60	50/60	50/60
BIL impulse withstand (kV)	95	125	140
One-minute AC withstand (kV)	34	40	45
Fifteen-minute DC withstand (kV)	53	78	78
Corona extinction (kV)	11	19	21.5
Symmetrical interrupting capability (A)	50,000	50,000	50,000
Current rating (A)	3–80	6–20	3–45

Application information

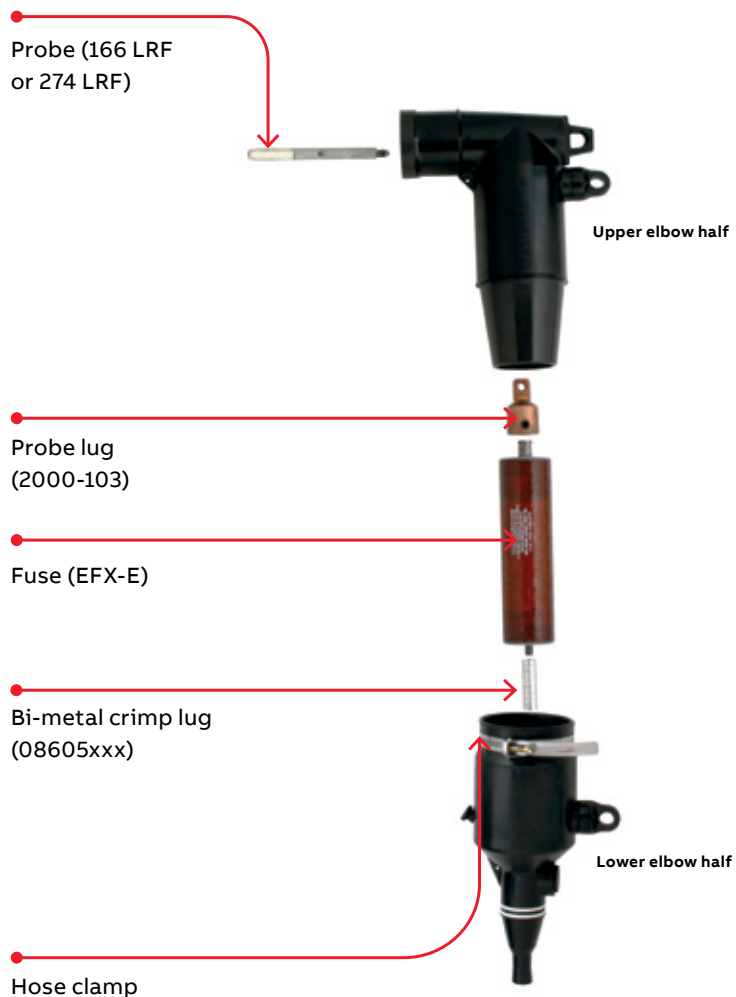
Construction: Submersible, non-venting, deadfront, corrosion resistant

Ambient temperature range: -30 °C to 65 °C

* The 15.5 kV L-G rated fuse requires 75% grounded load to be applied on a 25 kV system. The 17.2 kV L-G rated fuse requires at least 75% grounded load to be applied on a 28 kV system.

Note: Fuses are only suitable for the system voltage class shown if the recovery voltage across the fuse will not exceed its rated maximum voltage. For three-phase applications, this generally requires that protected transformers be gndY–gndY and have at least 50% grounded load. Fuse replacement requires the elbow to be de-energized.

For applications with Delta connections or less than 50% grounded load, the fuse maximum voltage must be greater than system line to line voltage, which may require using the next larger system class housing and fuse.



Certified tests

Elastimold fused elbows have been designed and tested per applicable portions of IEEE, ANSI and other industry standards, including:

ANSI C37.40 Standard for current-limiting fuse service conditions

ANSI C37.41 Standard for current-limiting fuse design and testing

ANSI C37.47 Standard for current-limiting fuse ratings and specifications

IEEE 386 Standard for separable connectors

Elastimold®

Fused loadbreak elbows

Electrical characteristics of Elastimold EFX-E elbow fuses

System voltage class (kV)	Nominal fuse voltage rating (kV)	Current rating (amps)	Fuse cat. no. (N1)	Rated maximum voltage (kV)	Maximum continuous current (A) (N2) (N6) (N7)			Peak arc voltage (kV) (N5)	Minimum melt I ² t (amp ² -sec)	Maximum total I ² t (amp ² -sec) (N3) (N4)	Fuse housing
					25 °C	40 °C	65 °C				
15	8.3	3	EFX083003-E	10.0	4.3	4.2	3.9	30	100	350	168FLR1
		6	EFX083006-E		9.5	9.0	8.5	32	620	2,700	
		8	EFX083008-E		11.5	11.0	10.5	28	800	4,000	
		10	EFX083010-E		14.0	13.5	13.0	28	800	4,000	
		12	EFX083012-E		19.0	18.5	17.5	26	920	8,000	
		18	EFX083018-E		21.0	20.0	19.0	26	1,310	9,500	
		20	EFX083020-E		26.0	25.0	24.0	26	1,620	11,000	
		25	EFX083025-E		34.0	33.0	31.0	26	3,660	22,000	
		30	EFX083030-E		37.5	36.5	34.5	26	5,250	30,000	
		40	EFX083040-E		43.0	42.0	40.0	26	8,700	50,000	
		45	EFX083045-E		49.0	47.0	45.0	26	12,800	70,000	
		65	EFX083065-E	8.8	70.0	68.0	64.5	23	34,000	200,000	168FLR3
		80	EFX083080-E		80.0	77.5	73.5	22	51,200	280,000	
25	15.5	6	EFX155006-E	15.5	8.5	8.0	7.7	52	620	3,000	274FLR1
		8	EFX155008-E		10.5	10.0	9.5	40	800	4,300	
		10	EFX155010-E		13.0	12.5	12.0	40	800	4,300	
		12	EFX155012-E		16.0	15.5	15.0	38	920	8,000	
		18	EFX155018-E		20.0	19.5	18.5	38	1,620	13,000	
		20	EFX155020-E		23.5	22.5	21.5	38	2,200	16,500	
25/28	17.2	3	EFX172003-E	17.2	4.3	4.2	3.9	51	100	510	274FLR3
		6	EFX172006-E		9.5	9.0	8.5	54	620	3,250	
		8	EFX172008-E		11.5	11.0	10.5	46	800	4,600	
		10	EFX172010-E		14.0	13.5	13.0	46	800	4,600	
		12	EFX172012-E		18.0	17.5	16.5	43	920	8,500	
		18	EFX172018-E		20.0	19.5	18.5	45	1,310	10,000	
		20	EFX172020-E		24.0	23.0	22.0	45	1,620	12,500	
		25	EFX172025-E		31.5	30.5	29.0	45	3,660	27,500	
		30	EFX172030-E		35.5	34.5	32.5	45	5,250	37,500	
		40	EFX172040-E		41.0	40.0	38.0	45	8,700	62,500	
		45	EFX172045-E		46.0	45.0	42.5	45	12,800	87,500	

Notes:

N1. Ratings have maximum interrupting capability of 50 kA, except 17.2 kV 3 A (EFX172003-E) which tested at 44 kA.

N2. Fuses have a rated maximum application temperature (RMAT) of 65 °C. RMAT is the maximum temperature of the air, in contact with the elbow housing, at which fuses have been shown to be suitable for use.

N3. Tabulated maximum total I²t values are for currents of 50,000 A at the nominal voltage of the fuse. Values for 8.3 kV fuses at 10 kV are approximately 30% higher. Values for 17.2 kV fuses at 15.5 kV are approximately 20% lower.

N4. Maximum total I²t values are reduced for currents below 50,000 A. For example, at 10,000 A, maximum total I²t values are approximately 15% less than the published values.

N5. Peak arc voltages listed are for 50,000 A currents at the rated maximum voltage listed. Reduced currents and voltages will reduce the peak arc voltage.

Consult the factory for further information.

N6. Maximum continuous currents at ambient temperatures other than those listed may be determined by derating the fuses by .2% per degree C over 25 °C.

For example: At 40 °C the derating would be 15 x .2 = 3%, making the maximum continuous current of a 17.2 kV, 25 A fuse 31.5 x .97 = 30.5 A.

N7. Time-current characteristic curves are published at 25 °C. Reduction in the long time melting current of the fuses (approximately one hour and longer) due to higher ambient temperatures is the same as described above for "Maximum continuous currents."

Elastimold®

Fused loadbreak elbows

Recommended Elastimold EFX-E elbow fuse at 40 °C ambient temperature (single-phase transformer)

Recommended fuse current ratings (amps)

Fuse voltage		8.3 kV										15.5 kV (17.2 kV)					
1-phase transformer kVA	Transformer 1-phase voltage rating (kV) phase-to-ground																
	2.4		4.16		4.8		7.2		7.62		12		14.4		16		
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	
10	–	6	–	6 ^a	–	3	–	3	–	3	–	6 ^a	–	6 ^a	–	(3 ^a)	
15	–	10	–	6	–	6 ^a	–	3	–	3	–	6 ^a	–	6 ^a	–	(3 ^a)	
25	12	20	–	8	–	8	–	6	–	6	–	6 ^a	–	6 ^a	–	(3)	
37.5	20	25	–	12	–	12	–	8	–	6	–	6	–	6 ^a	–	(6 ^a)	
50	25	40	18	20	12	20	10	12	–	10	–	6	–	6	–	(6 ^a)	
75	45	65	20	30	20	25	12	20	12	18	–	10	–	8	–	(8)	
100	65	80	30	45	25	40	18	25	18	25	12	18	10	12	–	(10)	
167	–	–	65	80	45	65	25	45	25	45	18	(25)	18	20	(12)	(20)	
250	–	–	80	–	80	–	45	65	45	65	(25)	(45)	20	(30)	(20)	(30)	
333	–	–	–	–	–	–	65	–	80	–	(40)	–	(30)	(45)	(25)	(45)	
500	–	–	–	–	–	–	–	–	–	–	–	–	(45)	–	(45)		

Recommended Elastimold EFX-E elbow fuse at 40 °C ambient temperature (3-phase GNDY-GNDY transformers)

Recommended fuse current ratings (amps)

Fuse voltage		8.3 kV												15.5 kV (17.2 kV)				
3-phase GNDY-GNDY transformer kVA	Transformer 3-phase voltage rating (kV), phase to phase																	
	2.4		4.16		4.8		7.2–7.96		8.32		12.47		13.2–14.4		20.8		22.9–24.9	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
15	–	6	–	3	–	3	–	3 ^a	–	3 ^a	–	6 ^a	–	6 ^a	–	6 ^a	–	(3 ^a)
22.5	–	8	–	6 ^a	–	6 ^a	–	3	–	3	–	6 ^a	–	6 ^a	–	6 ^a	–	(3 ^a)
30	10	12	–	6	–	6	–	6 ^a	–	3	–	6 ^a	–	6 ^a	–	6 ^a	–	(3 ^a)
45	12	20	–	10	–	8	–	6	–	6 ^a	–	6 ^a	–	6 ^a	–	6 ^a	–	(3 ^a)
75	20	30	12	20	–	12	–	8	–	8	–	6	–	6	–	6 ^a	–	(3)
100	30	45	18	25	18	20	–	12	–	10	–	8	–	8	–	6 ^a	–	(6 ^a)
112.5	40	65	20	25	18	25	–	12	–	12	–	8	–	8	–	6	–	(6 ^a)
150	45	80	25	40	20	30	18	20	12	20	10	12	10	12	–	6	–	(6)
200	65	80	40	65	30	45	20	25	18	25	12	18	12	18	8	10	–	(8)
225	80	–	45	65	40	65	20	30	20	25	12	20	12	18	8	10	–	(10)
300	–	–	65	80	45	80	30	45	25	40	18	25	18	25	12	18	–	(12)
500	–	–	–	–	80	–	65	80	45	80	30	45	30	45	18	(25)	(18)	(25)
750	–	–	–	–	–	–	80	–	80	–	45	65	45	–	(25)	(45)	(25)	(40)
1,000	–	–	–	–	–	–	–	–	–	–	80	–	–	–	(40)	–	(40)	

Notes:

1. Column A = 140–200% of transformer rating and Column B = 200–300% of transformer rating.

2. Ratings in parentheses are 17.2 kV fuses.

3. 8.3 kV, 3–45 A fuses and 15.5 kV, 6–20 A fuses are used in the small (size 1) elbow housing; 8.3 kV, 65–80 A fuses and 17.2 kV, 3–45 A fuses are used in the large (size 3) elbow fuse housing.

4. Recommended fuses meet inrush criteria of 12 times transformer full-load current for .1 second and 25 times transformer full-load current for .01 second. Fuses also meet cold-load pickup criteria of 6 times transformer full-load current for 1 second and 3 times transformer full-load current for 10 seconds.

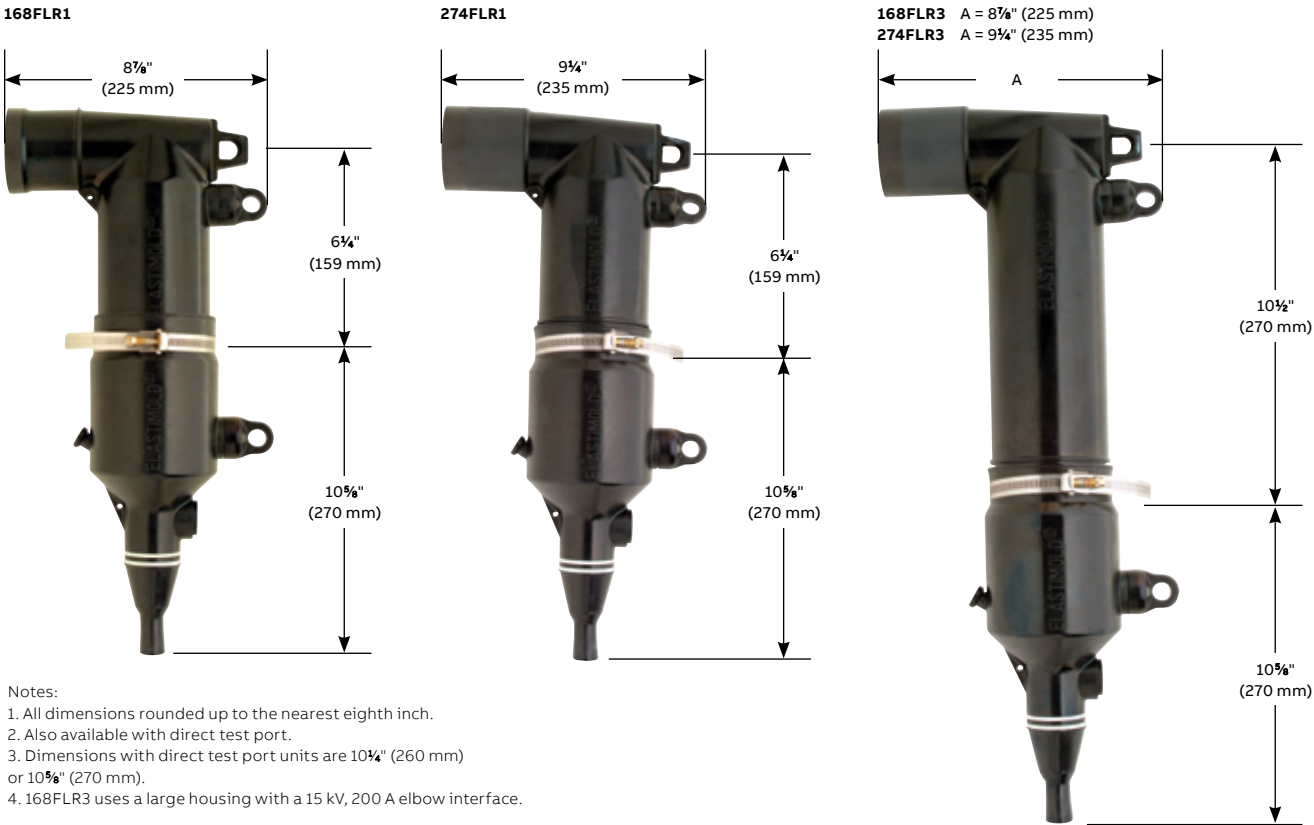
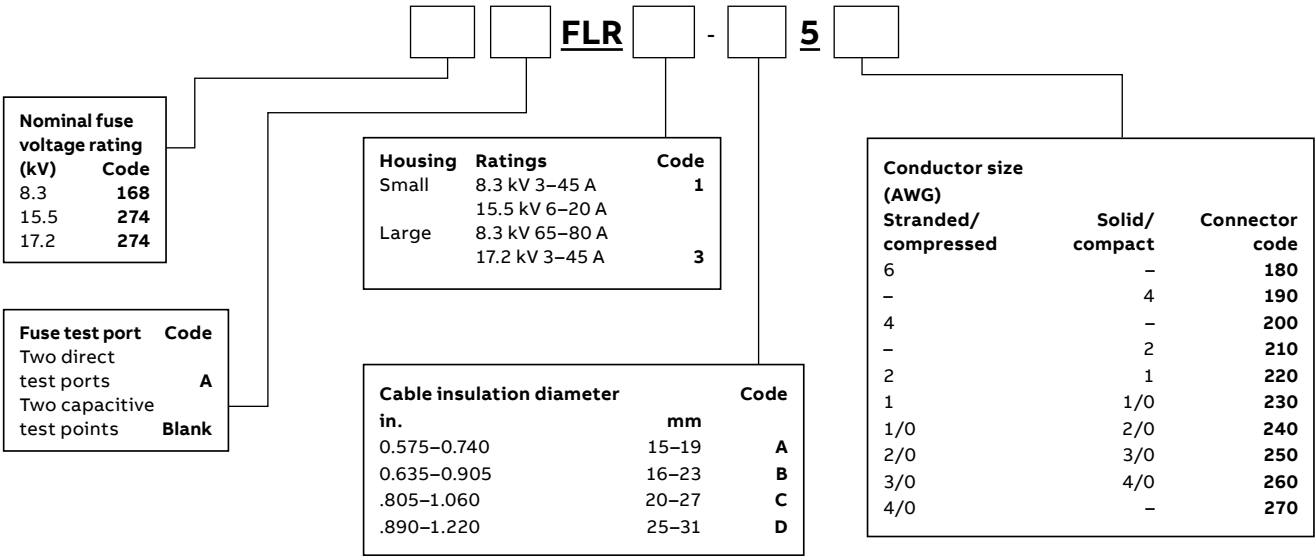
a. Fuse allows greater than 300% of transformer rating.

For applications with Delta connections or less than 50% grounded load, the fuse maximum voltage must be greater than system line to line voltage, which may require using the next larger system class housing and fuse.

Elastimold®
Fuse housings

The following diagram shows how to construct a catalog number for fuse housings.

Indicates field that must be filled in to complete order.



Elastimold®

Full-range current-limiting fuses

The following diagram shows how to construct a catalog number for full-range current-limiting fuses. Indicates field that must be filled in to complete order.

EFX

-

E

Voltage rating (kV)

8.3

15.5

17.2

Code

083

155

172

Amp rating

3

6

8

10

12

18

20

25

30

40

45

65

80

Applicable housing

8.3 kV

15.5 kV

17.2 kV

Code

003

006

008

010

012

018

020

025

030

040

045

065

080

8.3 kV (3–45 A)/15.5 kV (6–20 A) fuse

A side-view diagram of a smaller cylindrical fuse. A horizontal dimension line above the cylinder indicates a length of 9 1/4" (235 mm). A vertical dimension line to the right of the cylinder indicates a diameter of 2 1/4" (54 mm). The fuse has a dark brown, textured body and two brass-colored mounting pins at each end.

8.3 kV (65–80 A)/17.2 kV (3–45 A) fuse

A side-view diagram of a larger cylindrical fuse. A horizontal dimension line below the cylinder indicates a length of 13 1/2" (343 mm). A vertical dimension line to the right of the cylinder indicates a diameter of 2 1/4" (54 mm). The fuse has a dark brown, textured body and two brass-colored mounting pins at each end.

Note: All dimensions rounded up to the nearest eighth inch.

Elastimold®

Molded current-limiting fuses (MCLF)

You're covered. These fuses provide full-range protection through 50 kA interrupting current.

Molded current-limiting fuses

Molded current-limiting fuses feature modular construction with a center replaceable fuse section and interchangeable end fittings for elbow connection or direct attachment to equipment-mounted bushings. The various end fittings enable fuses to be applied throughout the system, including switchgear, junctions, transformers, cable runs and taps.

- EPDM molded rubber deadfront construction insulates, shields and eliminates exposed live parts
- Lightweight fuses are fully sealed and submersible
- Specially designed fuse elements with built-in low- and high-current interrupting capability provide full-range fault current protection through 50 kA
- Current-limiting protection limits the system available fault current and dramatically reduces stresses on equipment

- Internal fuse shield prevents corona and deterioration of the fuse element
- Modular construction with a center replaceable fuse section and interchangeable end fittings enables elbow connection or direct attachment to equipment-mounted bushings on junctions, transformers, cable runs and taps
- Compact – suitable for padmount, subsurface or vault installations
- 304 stainless steel brackets and hold-down straps available accommodate a wide variety of mounting arrangements

Elastimold® molded current-limiting fuses are available in:

- 80 A through 180 A ratings for applications on 5 kV systems
- 6 A through 115 A ratings for applications on 15 kV grounded Wye systems
- 6 A through 100 A ratings for applications on 25 kV grounded Wye systems
- 6 A through 50 A ratings for applications on 35 kV grounded Wye systems



Ratings

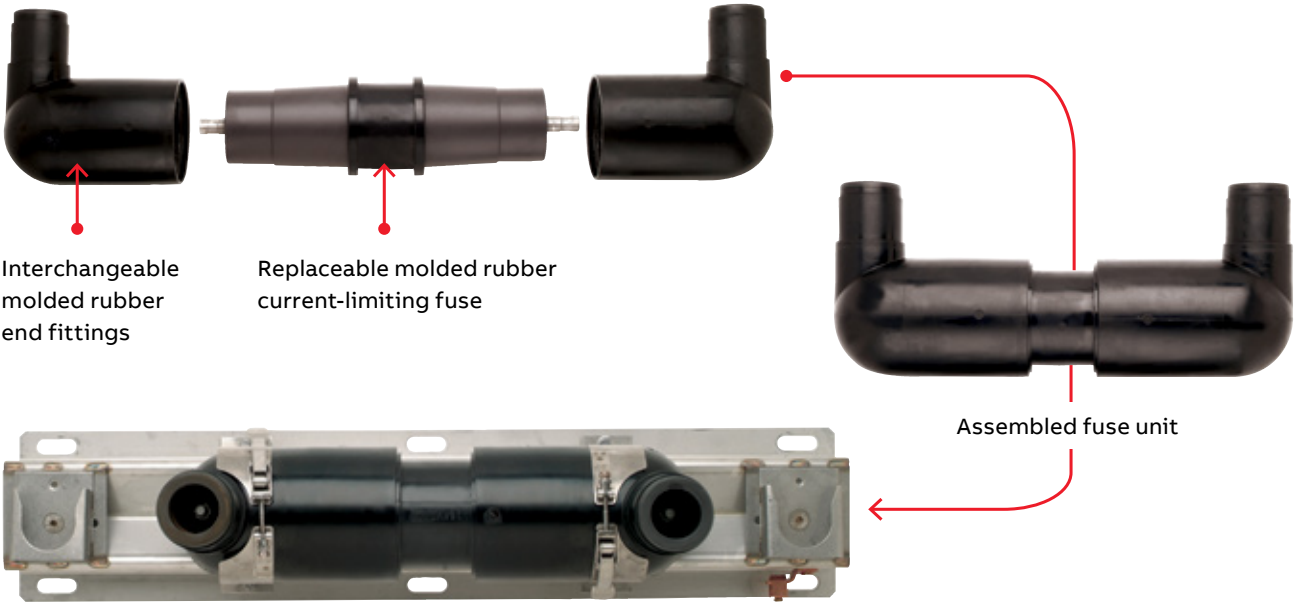
System voltage class (kV)	5	15	25/28*	35
Rated maximum fuse voltage (kV)	5.5	8.3/10**	15.5/17.2**	23
Frequency (Hz)	50/60	50/60	50/60	50/60
BIL impulse withstand (kV)	60	95	125/140	150
One-minute AC withstand (kV)	34	34	40–45	50
Fifteen-minute DC withstand (kV)	53	53	78	103
Corona extinction (kV)	11	11	19/21.5	26
Symmetrical interrupting capability (amp)	50,000	50,000	50,000	50,000
Current rating (amp)	80–180	10–115	10–100	10–50

Application information

Construction:	Submersible, non-venting, deadfront, corrosion resistant
Ambient temperature range:	-30 °C to 65 °C for 6–50 A fuses; -30 °C to 40 °C for > 50 A fuses.

* 15.5 kV L-G rated fuses require 75% grounded load to be applied on a 25 kV system.
** 17.2 kV L-G rated fuses require at least 75% grounded load to be applied on a 28 kV system.
Notes: Fuse replacement requires the MCLF to be de-energized. Fuses are only suitable for the system voltage class shown if the recovery voltage across the fuse will not exceed its rated maximum voltage. For three-phase applications, this generally requires that protected transformers be GNDY-GNDY and have at least 50% grounded load.

For applications with Delta connections or less than 50% grounded load, the fuse maximum voltage must be greater than system line to line voltage, which may require using the next larger system class housing and fuse.



Assembled fuse unit with optional wall-mounting bracket

Certified tests

Elastimold molded current-limiting fuses have been designed and tested per applicable portions of IEEE, ANSI, NEMA and other industry standards, including:
ANSI C37.40 Standard for current-limiting fuse service conditions
ANSI C37.41 Standard for current-limiting fuse design and testing

ANSI C37.47 Standard for current-limiting fuse ratings and specifications
ANSI/IEEE 386 Standard for separable connectors and bushing interfaces

Elastimold®

Molded current-limiting fuses (MCLF)

Electrical characteristics of encapsulated fuses used in MCLF

System voltage Class (kV)	Nominal fuse voltage rating (kV)	Current rating (amps)	Fuse cat. no. (N1)	Rated maximum voltage (kV)	Maximum continuous current (A) (N2) (N6)		Peak arc voltage (kV) (N5)	Minimum melt I ² t (amp ² -sec)	Maximum total I ² t (amp ² -sec) (N3) (N4)
					25 °C	40 °C			
5	5.5	80	M05CLF080	5.5	86	84	15	22,100	110,000
		100	M05CLF100		108	105	15	56,700	280,000
		125	M05CLF125		137	133	15	109,200	530,000
		150	M05CLF150		159	154	15	176,000	860,000
		180	M05CLF180		185	180	15	259,000	1,270,000
15	8.3	10	M15CLF010	10.0	14	13	28	800	4,000
		20	M15CLF020		23	22	26	1,620	11,000
		30	M15CLF030		35	33	26	5,250	30,000
		40	M15CLF040		43	41	26	8,700	50,000
		50	M15CLF050		51	47	26	12,800	70,000
	8.3	65	M15CLF065	8.3	73	71	25	25,200	100,000
		80	M15CLF080		87	84	25	47,000	185,000
		100	M15CLF100		106	103	25	78,300	330,000
		115	M15CLF115		120	116	25	115,150	480,000
25/28	15.5	10	M25CLF010	17.2	14	13	46	800	3,700
		20	M25CLF020		23	22	45	1,620	10,000
		30	M25CLF030		35	33	45	5,250	30,000
		40	M25CLF040		43	41	45	8,700	50,000
		50	M25CLF050	15.5	47	45	45	12,800	70,000
		65	M25CLF065		68	66	40	25,200	110,000
		80	M25CLF080		88	84	40	54,400	255,000
		100	M25CLF100		100	97	40	80,000	380,000
35	23.0	10	M35CLF010	23.0	14	13	61	800	4,800
		20	M35CLF020		23	22	60	1,620	13,000
		30	M35CLF030		35	33	60	5,250	38,000
		40	M35CLF040		41	40	60	8,700	61,000
		50	M35CLF050		47	46	60	12,800	82,000

Notes:

N1. Designs have a 50,000 A RMS symmetrical rating.

N2. 10–50 A fuses have a rated maximum application temperature of 65 °C, and 65–180 A fuses have a rated maximum application temperature of 40 °C. (RMAT is the maximum temperature of the air in contact with the MCLF housing at which the fuses have been shown suitable for use.)

N3. Tabulated maximum total I²t values are for currents of 50,000 A at the nominal voltage of the fuse. Fuses that have a rated maximum voltage higher than their nominal voltage rating will have a higher I²t let-through when applied at voltages up to these higher values. For example, maximum total I²t values are increased by approximately 30% when 8.3 kV fuses are applied at 10 kV and approximately 25% when 15.5 kV fuses are used at 17.2 kV.

N4. Maximum total I²t values are reduced for currents below 50,000 A. For example, at 10,000 A, I²t values are approximately 15% less than the published values.

N5. Peak arc voltages quoted are for 50,000 A currents at the rated maximum voltage listed. Reduced currents and voltages will reduce the peak arc voltage.

Consult the factory for further information.

N6. Maximum continuous currents at higher ambient temperatures may be determined by derating the fuses by .2% per degree C over 25 °C.

For example: At 40 °C, the derating would be 15 x .2 = 3%, making the maximum continuous current of a 20 A fuse 23.0 x .97 = 22 A.

Elastimold®

Molded current-limiting fuses (MCLF)

Recommended MCLF at 40 °C ambient temperature (single-phase transformer)

Recommended fuse current ratings (amps)																			
Fuse voltage										(5.5 kV) 8.3 kV		15.5 kV				23 kV			
1-phase transformer kVA	Transformer 1-phase voltage rating (kV) phase-to-ground																		
	2.4		4.16		4.8		7.2		7.62		12		14.4		16		19.9		
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	
10	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	
15	–	10	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	
25	–	20	–	10	–	10	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	
37.5	20	30	–	20	–	20	–	10	–	10	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	
50	30	40	20	30	–	20	–	10	–	10	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	
75	50	65	30	40	20	30	–	20	–	20	–	10	–	10	–	10	–	10 ^a	
100	65	(80)	40	50	30	50	20	30	20	30	–	20	–	10	–	10	–	10	
167	(100)	(150)	65	(80)	50	65	30	50	30	50	20	30	20	30	–	20	–	20	
250	(150)	–	(100)	(125)	(80)	(100)	50	65	50	65	30	50	30	40	20	30	20	30	
333	(180)	–	(125)	(180)	(100)	(150)	65	100	65	100	50	65	30	50	30	50	20	40	
500	–	–	(180)	–	(150)	–	115	–	115	–	65	100	65	80	50	–	40	–	
750	–	–	–	–	–	–	–	–	–	–	100	–	80	100	–	–	–	–	
1,000	–	–	–	–	–	–	–	–	–	–	–	–	100	–	–	–	–	–	

Recommended MCLF at 40 °C ambient temperature (3-phase transformer GNDY-GNDY)

Recommended fuse current ratings (amps)																				
Fuse voltage										(5.5 kV) 8.3 kV				15.5 kV				23 kV		
3-phase GNDY-GNDY transformer kVA	Transformer 3-phase voltage rating (kV), phase to phase																			
	2.4		4.16		4.8		7.2–7.96		8.32		12.47		13.2–14.4		20.8		22.9–24.9		34.5	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
15	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a
22.5	–	10	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a
30	–	10	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a
45	–	20	–	10	–	10	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a
75	30	40	–	20	–	20	–	10	–	10	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a
100	40	50	20	30	20	30	–	20	–	10	–	10	–	10	–	10 ^a	–	10 ^a	–	10 ^a
112.5	40	65	20	30	20	30	–	20	–	20	–	10	–	10	–	10 ^a	–	10 ^a	–	10 ^a
150	50	(80)	30	50	30	40	20	30	–	20	–	10	–	10	–	10 ^a	–	10 ^a	–	10 ^a
200	65	(100)	40	65	40	50	20	30	20	30	–	20	–	20	–	10	–	10	–	10 ^a
225	(80)	(125)	50	65	40	65	30	40	30	50	–	20	–	20	–	10	–	10	–	10 ^a
300	(100)	(150)	65	(100)	65	(80)	40	50	30	50	20	30	20	30	–	20	10	20	–	10
500	(180)	–	(100)	(150)	(100)	(125)	65	(80)	50	80	30	50	30	50	20	30	20	30	–	20
750	–	–	(180)	–	(125)	(180)	(80)	(125)	80	115	50	80	50	65	30	50	30	40	20	30
1,000	–	–	–	–	(180)	–	(125)	(180)	115	–	65	100	65	100	50	65	40	65	30	40
1,500	–	–	–	–	–	–	(180)	–	–	–	100	–	100	–	65	100	65	80	40	–
2,000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	100	–	80	–	50	–

Notes:

1.Column A = 140–200% of transformer rating and Column B = 200–300% of transformer rating.

2.Ratings in parentheses are 5.5 kV fuses.

3. Recommended fuses meet inrush criteria of 12 times transformer full-load current for .1 second and 25 times transformer full-load current for .01 second. Fuses also meet cold-load pickup criteria of 6 times transformer full-load current for 1 second and 3 times transformer full-load current for 10 seconds.

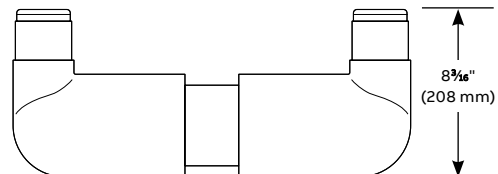
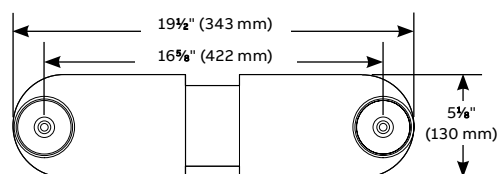
a. Fuse allows greater than 300% of transformer rating.

For applications with Delta connections or less than 50% grounded load, the fuse maximum voltage must be greater than system line to line voltage, which may require using the next larger system class housing and fuse.

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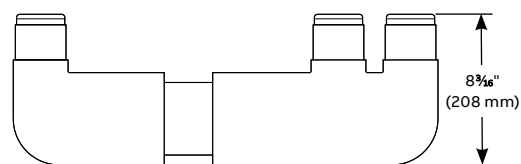
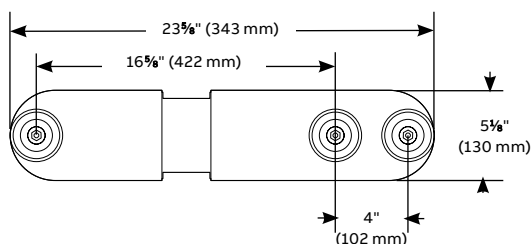
Molded current-limiting fuses (MCLF)

Model 22



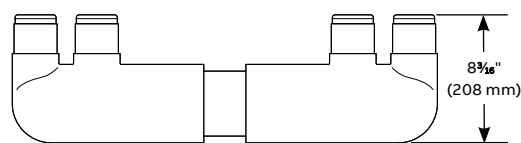
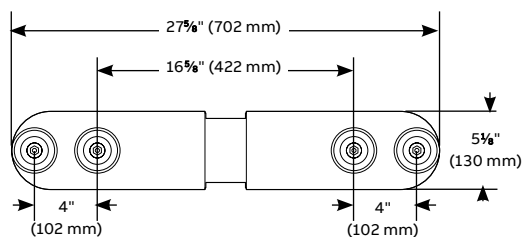
Approx. weight 30 lb. (13.6 kg)

Model 222



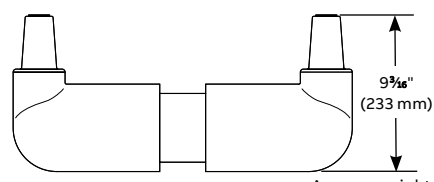
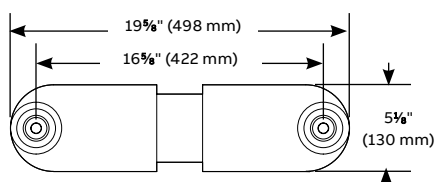
Approx. weight 35 lb. (15.9 kg)

Model 2222



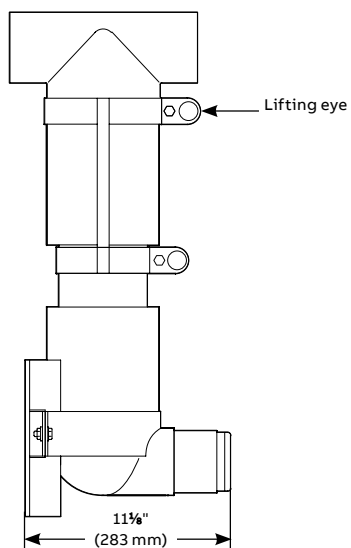
Approx. weight 40 lb. (18.1 kg)

Model 66

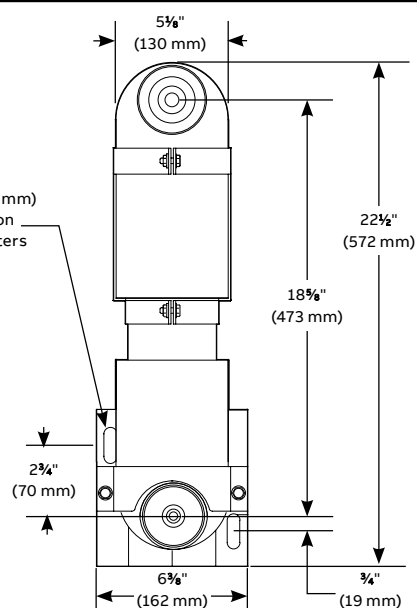


Approx. weight 40 lb. (18.1 kg)

Model 6E2



9/16" (14 mm) x 1" (25 mm)
mounting slots on
5 1/2" (140 mm) centers

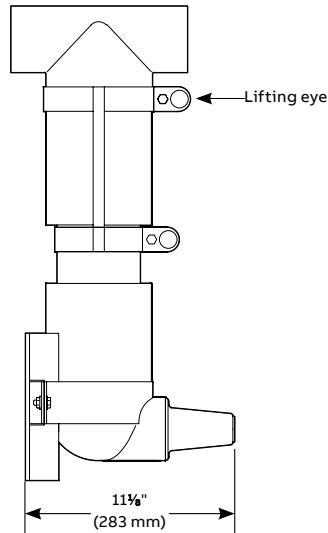


Approx. weight 30 lb. (13.6 kg)

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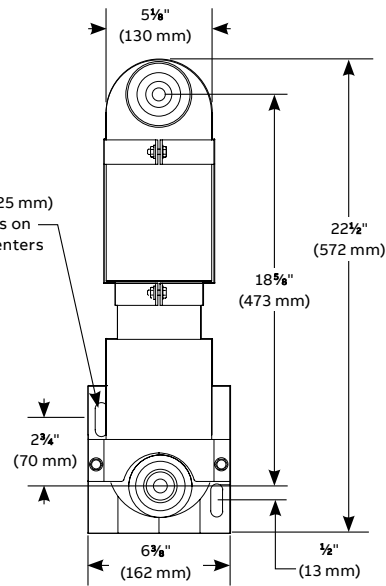
Molded current-limiting fuses (MCLF)

Model 6E6



Note: Other models are available such as 26.

1/4" (14 mm) x 1" (25 mm)
mounting slots on
5 1/2" (140 mm) centers



Approx. weight
30 lb. (13.6 kg)

The following diagram shows how to construct a catalog number for a molded current-limiting fuse:

Indicates field that must be filled in to complete order.

M **CLF** -

Voltage class (kV)	Code
5.0	05
15.0	15
25.0	25
35.0	35

See page 14 for additional information.

Amps				
Voltage class				Amp code
5 kV	15 kV	25 kV	35 kV	
-	10	10	10	010
-	20	20	20	020
-	30	30	30	030
-	40	40	40	040
-	50	50	50	050
-	65	65	-	065
80	80	80	-	080
100	100	100	-	100
-	115	-	-	115
125	-	-	-	125
150	-	-	-	150
185	-	-	-	185

See page 14 for additional information.

Bushings	Bushing code
200 A bushing wells both ends	22
200 A bushing well on one end and two 200 A bushing wells on the other end	222
Two 200 A bushing wells on both ends	2222
600 A bushings on both ends	66
600 A elbow connector on one end and 200 A bushing well on the other end (not available for 35 kV)	6E2
600 A elbow connector on one end and 600 A bushing on the other end (not available for 35 kV)	6E6

See outline drawings preceding this chart for additional details.

Optional mounting brackets/accessories	Bracket code
Wall mounting bracket with parking stands and bolted style hold down straps (HDS)	WMB
Wall mounting bracket with parking stands and quick release style hold down straps (QRS)	WMBQ
Tilt mounting adapter; requires either WMB or WMBQ to enable up to 60° angle	TMA
Support mounting bracket for use with models 6E2 or 6E6 end-fitting arrangements; includes bolted-style hold-down strap	SMB
Bolted-style hold-down strap (qty: 1 required per end fitting)	HDS
Quick-release style hold-down strap (qty: 1 required per end fitting)	QRS

*Options maybe purchased separately

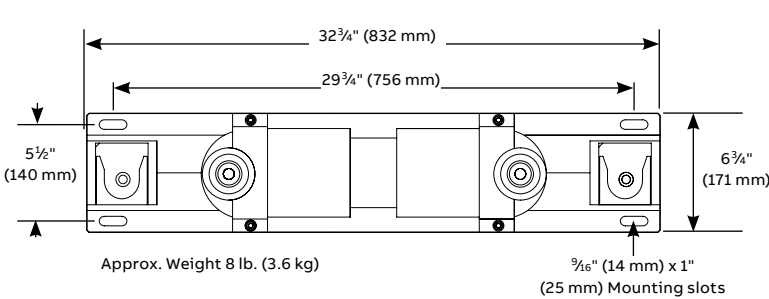


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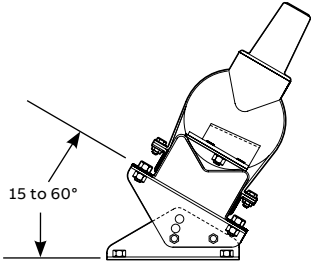
Molded current-limiting fuses (MCLF)



Mounting options



Optional WMB mounting bracket with adjustable parking stands for vertical mounting and fuse hold-down strips



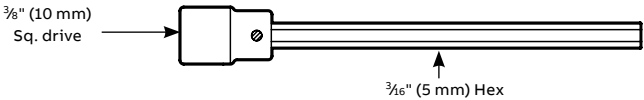
Optional – TMA universal tilt mounting



Optimal end fittings

Cat. no.	Description	System voltage class (kV)	IEEE 386-1995
			interface reference
EF2	200 A bushing well end fitting	5, 15, 25	Figure 3
EF22	Double 200 A bushing well end fitting	5, 15, 25	Figure 3
EF6	600 A bushing end fitting	5, 15, 25	Figures 11 and 13
EF6E	600 A elbow connector end fitting	5, 15, 25	Figure 11

Note: EF6E is equipped with a standard through-hole spade lug (Type 03700). Use this table only if end fittings are to be ordered and shipped separately from the fuse. See pages 16-17 for assembled units.



Other options

Cat. no.	Description
MCLF-ADT	Hex wrench for set screw removal and replacement when disassembling end fittings. Supplied as standard with replacement fuses.

Elastimold®

Molded canister fuses (MCAN)

Completely sealed and insulated for padmount, subsurface or vault applications through 28 kV GNDY–GNDY.

MCAN molded canister fuse

- EPDM molded rubber deadfront construction insulates, shields and eliminates live parts
- Fuses are fully sealed and submersible
- Modular construction enables elbow connection or direct attachment to equipment-mounted bushings
- Neon voltage indicators (V2) attached to elbow test points to provide quick and convenient blown-fuse indication
- Various end fittings and bushings make for flexible installation on switchgear, junctions, transformers, cable runs and taps
- Replaceable fuse enables easy fuse replacement without full removal from installation
- Current-limiting protection limits the system available fault current and dramatically reduces stresses on equipment
- 304 stainless steel mounting brackets and wall-mounted parking stands available to accommodate a wide variety of mounting arrangements



Elastimold®

Molded canister fuses (MCAN)

The MCAN molded canister fuse is a compact, lightweight EPDM molded rubber fuse enclosure package. MCAN fuse canisters are maintenance-free, completely sealed and submersible. Designs are deadfront, using molded rubber to insulate, shield and eliminate exposed live parts. Units are

ideally suited for padmount, subsurface or vault applications, for systems through 28 kV GNDY–GNDY. The MCAN molded canister fuse will accommodate and has been thoroughly tested with Hi-Tech® Trans-Guard® FX fuses. Contact ABB before using fuses from other manufacturers.

Fuse canister ratings

System voltage class (kV)	15	25/28
Maximum line-to-ground voltage (kV)	8.8/10.0	15.5/17.2
BIL impulse withstand (kV)	95	125/140
One-minute ac withstand (kV)	34	40–45
Fifteen-minute dc withstand (kV)	53	78
Corona extinction (kV)	11	19–21.5
Maximum continuous current (amps)	200*	200*
Momentary current (kA)	10*	10*

Fuse ratings

Nominal voltage rating (kV)	8.3	15.5
Rated maximum voltage (kV)	8.8/10.0	15.5/17.2**
Frequency (Hz)	50–60	50–60
Current rating (amps)	3–80	3–65
Rated maximum interrupting current (sym. amps)	50,000	50,000

Application information

Construction:	Submersible, corrosion resistant, fully shielded
Ambient temperature range:	-30 °C to 65 °C

* Without fuse.

** The 15.5 kV L-G rated fuses require at least 75% grounded load to be applied on a 25 kV system.

Note: Fuse replacement requires the MCAN to be de-energized.

For applications with Delta connections or less than 50% grounded load, the fuse maximum voltage must be greater than system line to line voltage, which may require using the next larger system class housing and fuse.

Certified tests

Elastimold molded canister fuses have been designed and tested per applicable portions of IEEE, ANSI, NEMA and other industry standards, including:

ANSI C37.40 Standard for current-limiting fuse service conditions

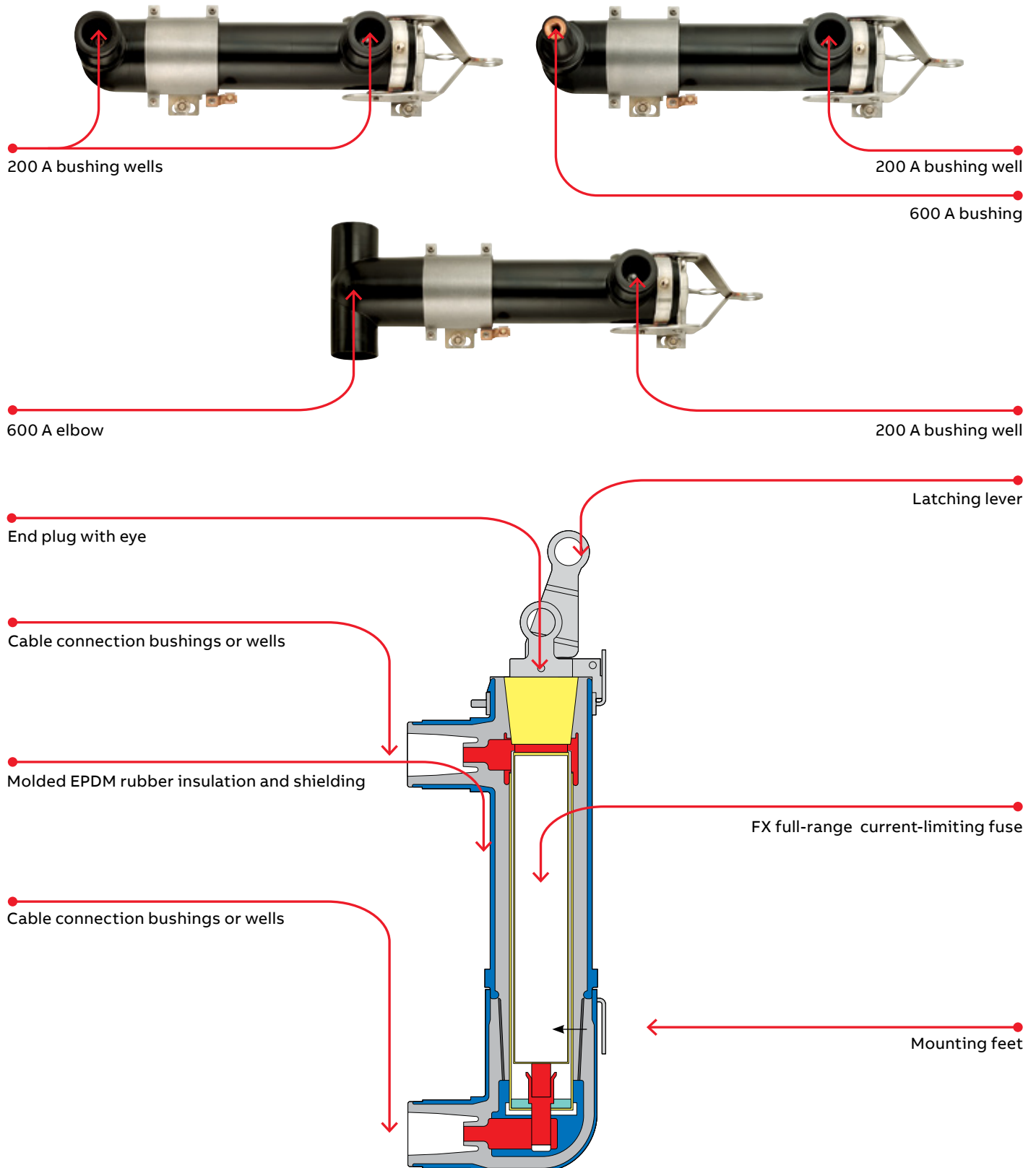
ANSI C37.41 Standard for current-limiting fuse design and testing

ANSI C37.47 Standard for current-limiting fuse ratings and specifications

ANSI/IEEE 386 Standard for separable connectors and bushing interfaces

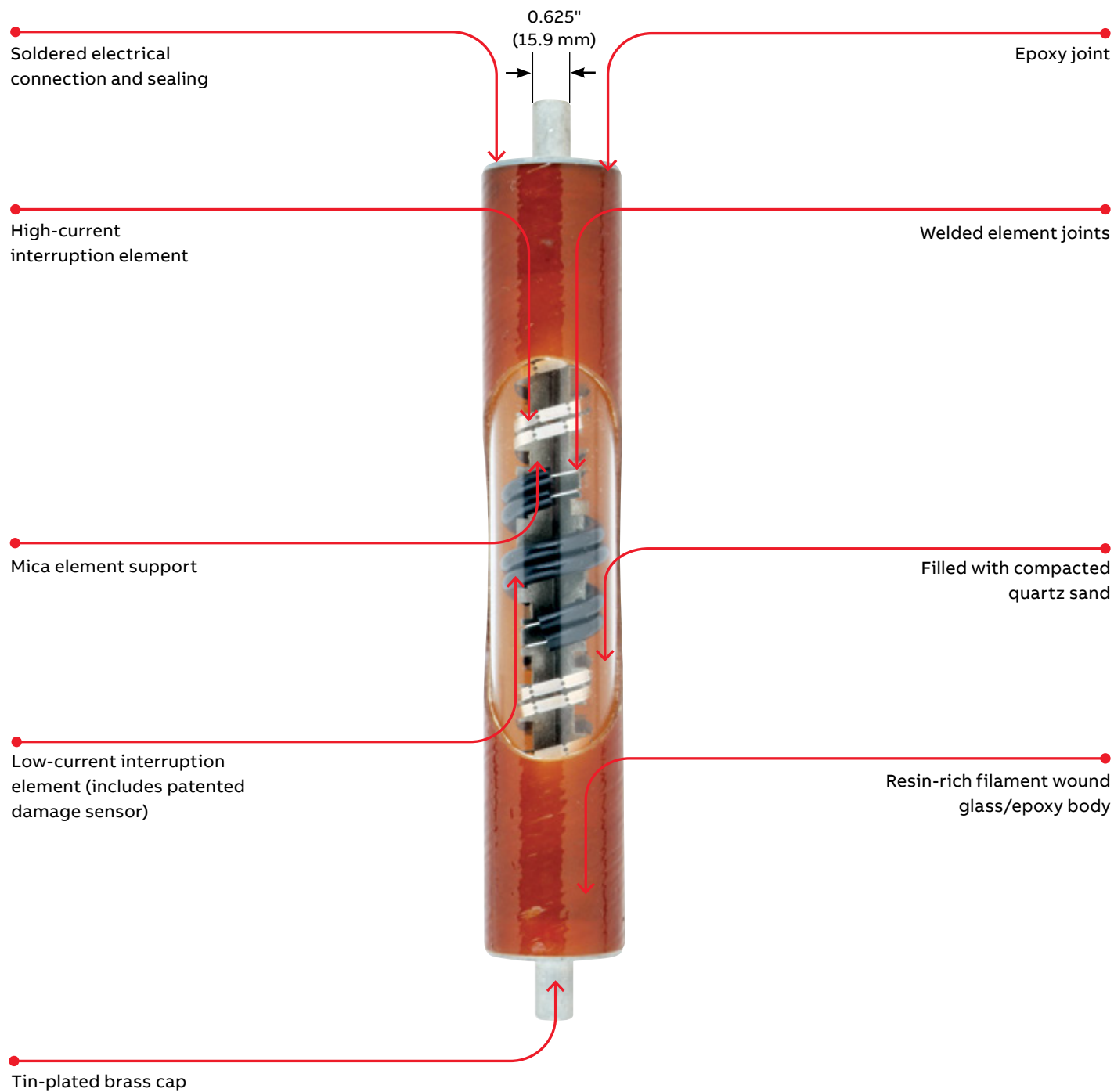
Elastimold®

Molded canister fuses (MCAN)



Elastimold®

FX current-limiting fuse for MCAN



Elastimold®

Molded canister fuses (MCAN)

Electrical characteristics of Hi-Tech® FX fuses inside MCAN canisters

System voltage class (kV)	Nominal fuse voltage rating (kV)	Current rating (amps)	Fuse cat. no. (N1)	Rated maximum voltage (kV)	Maximum continuous current (A) (N2) (N6)			Peak arc voltage (kV) (N5)	Minimum melt I ² t (amp ² -sec)	Maximum total I ² t (amp ² -sec) (N3) (N4)
					25 °C	40 °C	65 °C			
15	8.3	3	HTFX230003	10	4.3	4.2	3.9	30	100	350
		6	HTFX230006		9.5	9	8.5	32	620	2,700
		8	HTFX230008		11.5	11	10.5	28	800	4,000
		10	HTFX230010		13.5	13	12.5	28	800	4,000
		12	HTFX230012		17.5	17	16	26	920	8,000
		18	HTFX230018		19.5	19	18	26	1,310	9,500
		20	HTFX230020		24	23	21.5	26	1,620	11,000
		25	HTFX230025		29.5	28.5	27	26	3,660	22,000
		30	HTFX230030		34	33	31	26	5,250	30,000
		40	HTFX230040		40	39	36.5	26	8,700	50,000
		50	HTFX230050		45.5	44	42	26	12,800	70,000
		65	HTFX230065	8.8	70	68	64.5	23	34,000	200,000
		80	HTFX230080		80	77.5	73.5	22	51,200	280,000
25/28	15.5	3	HTFX240003	17.2	4.3	4.2	3.9	51	100	510
		6	HTFX240006		9.5	9	8.5	54	620	2,600
		8	HTFX240008		11.5	11	10.5	46	800	3,700
		10	HTFX240010		13.5	13	12.5	46	800	3,700
		12	HTFX240012		17.5	17	16	43	920	6,500
		18	HTFX240018		19.5	19	18	45	1,310	8,000
		20	HTFX240020		24	23	21.5	45	1,620	10,000
		25	HTFX240025		29.5	28.5	27	45	3,660	22,000
		30	HTFX240030		34	33	31	45	5,250	30,000
		40	HTFX240040		40	39	36.5	45	8,700	50,000
		50	HTFX240050		44.5	43	40	45	12,800	70,000
		65	HTFX240065	15.5	57.6	56	54.5	39	28,300	164,000

Notes:

N1. Ratings have maximum interrupting capability of 50 kA, except 17.2 kV 3 A (HTFX240003) which tested at 44 kA.

N2. Fuses have a rated maximum application temperature of 65 °C. (RMAT is the maximum temperature of the air in contact with the MCAN housing, at which fuses have been shown to be suitable for use.)

N3. Tabulated maximum total I²t values are for currents of 50,000 A at the nominal voltage of the fuse. Fuses that have a Rated Maximum Voltage higher than their Nominal Voltage Rating will have a higher I²t let-through when applied at voltages up to these higher values. For example, maximum total I²t values are increased by approximately 30% when 8.3 kV fuses are applied at 10 kV and approximately 25% when 15.5 kV fuses are used at 17.2 kV.

N4. Maximum total I²t values are reduced for currents below 50,000 A. For example, at 10,000 A, maximum total I²t values are approximately 15% less than the published values.

N5. Peak arc voltages quoted are for 50,000 A currents at the rated maximum voltage listed. Reduced currents and voltages will reduce the peak arc voltage. Consult the factory for further information.

N6. Maximum continuous currents at higher ambient temperatures may be determined by de-rating the fuses by .2% per degree C over 25 °C. For example: At 65 °C, the de-rating would be 40 x .2 = 8%, making the maximum continuous current of a 30 A fuse 34 x .92 = 31 A.

N7. Reduction in the long time melting current of the fuses (approximately one hour and longer) due to higher ambient temperatures is the same as described above in Note #6. See time-current characteristics for melting characteristics in this time region.

Elastimold®

Molded canister fuses (MCAN)

Recommended FX: in MCAN at 40 °C ambient temperature

Recommended fuse current ratings (amps)

Fuse voltage										8.3 kV				15.5 kV			
1-phase transformer kVA	Transformer 1-phase voltage rating (kV), phase to ground																
	2.4		4.16		4.8		7.2		7.62		12		14.4		16		
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	
10	–	6	–	6 ^a	–	3	–	3 ^a	–	3 ^a	–	3 ^a	–	3 ^a	–	3 ^a	
15	–	10	–	6	–	6 ^a	–	3	–	3	–	3 ^a	–	3 ^a	–	3 ^a	
25	12	20	8	10	–	8	–	6	–	6	–	3	–	3	–	3	
37.5	20	30	12	18	–	12	–	8	–	8	–	6 ^a	–	6 ^a	–	6 ^a	
50	25	50	18	25	12	20	10	12	–	10	–	6	–	6	–	6 ^a	
75	50	65	25	40	20	30	12	20	12	20	–	10	–	8	–	8	
100	65	80	30	50	25	50	18	25	18	25	–	12	10	12	–	10	
167	–	–	65	80	65	80	30	50	30	50	18	25	18	25	12	20	
250	–	–	–	–	80	–	65	80	50	65	25	50	25	40	20	30	
333	–	–	–	–	–	–	80	–	65	–	50	65	30	65	25	50	
500	–	–	–	–	–	–	–	–	–	–	65	–	65	–	50	–	

Recommended FX: in MCAN at 40 °C ambient temperature (3 phase transformer GNDY-GNDY)

Recommended fuse current ratings (amps)

Fuse voltage		8.3 kV														15.5 kV			
3-phase GNDY-GNDY Transformer kVA	Transformer 3-phase voltage rating (kV), phase to phase																		
	2.4		4.16		4.8		7.2–7.96		8.32		12.47		13.2–14.4		20.8		22.9–24.9		
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	
15	–	6	–	3	–	3	–	3 ^a	–	3 ^a	–	3 ^a	–	3 ^a	–	6 ^a	–	3 ^a	
22.5	–	8	–	6 ^a	–	6 ^a	–	3	–	3	–	3 ^a	–	3 ^a	–	6 ^a	–	3 ^a	
30	10	12	–	6	–	6	–	6 ^a	–	3	–	3 ^a	–	3	–	6 ^a	–	3 ^a	
45	12	20	–	10	–	8	–	6	–	6 ^a	–	3	–	3	–	6 ^a	–	3 ^a	
75	25	40	12	20	12	18	–	8	–	8	–	6	–	6	–	6 ^a	–	3	
100	30	50	18	25	18	25	–	12	–	10	–	8	–	8	–	6 ^a	–	6 ^a	
112.5	40	65	20	30	18	25	–	18	–	12	–	8	–	8	–	6 ^a	–	6 ^a	
150	65	80	25	50	25	40	12	25	12	18	–	10	–	10	–	6	–	6	
200	80	–	40	65	30	50	18	30	18	25	12	18	–	12	–	8	–	8	
225	–	–	50	65	40	65	20	40	20	30	12	20	12	20	–	10	–	8	
300	–	–	65	80	65	80	25	50	25	50	18	25	18	25	–	12	–	12	
500	–	–	–	–	–	–	30	80	65	80	30	50	30	50	18	25	18	25	
750	–	–	–	–	–	–	65	–	80	–	65	80	50	–	25	50	25	50	
1,000	–	–	–	–	–	–	–	–	–	–	80	–	–	–	40	65	40	–	
1,500	–	–	–	–	–	–	–	–	–	–	–	–	–	–	65	–	–	–	

Notes:

1. Column A = 140–200% of transformer rating and Column B = 200–300% of transformer rating.

2. 8.3 kV, 3–50 A fuses are used in mounting code 4 canisters; 8.3 kV 65–80 A fuses and 15.5 kV 3–50 A fuses are used in mounting code 5 canisters; 15.5 kV 65 A fuse is used in mounting code 6 canisters.

3. Recommended fuses meet inrush criteria of 12 times transformer full-load current for .1 second and 25 times transformer full-load current for .01 second. Fuses also meet cold-load pickup criteria of 6 times transformer full-load current for 1 second and 3 times transformer full-load current for 10 seconds.

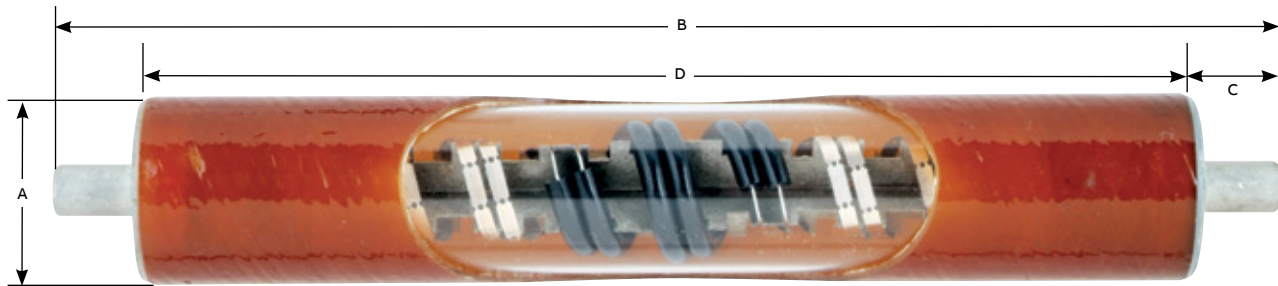
a. Fuse allows greater than 300% of transformer rating.

For applications with Delta connections or less than 50% grounded load, the fuse maximum voltage must be greater than system line to line voltage, which may require using the next larger system class housing and fuse.

Elastimold®

Molded canister fuses (MCAN)

Hi-Tech® FX fuses with MCAN



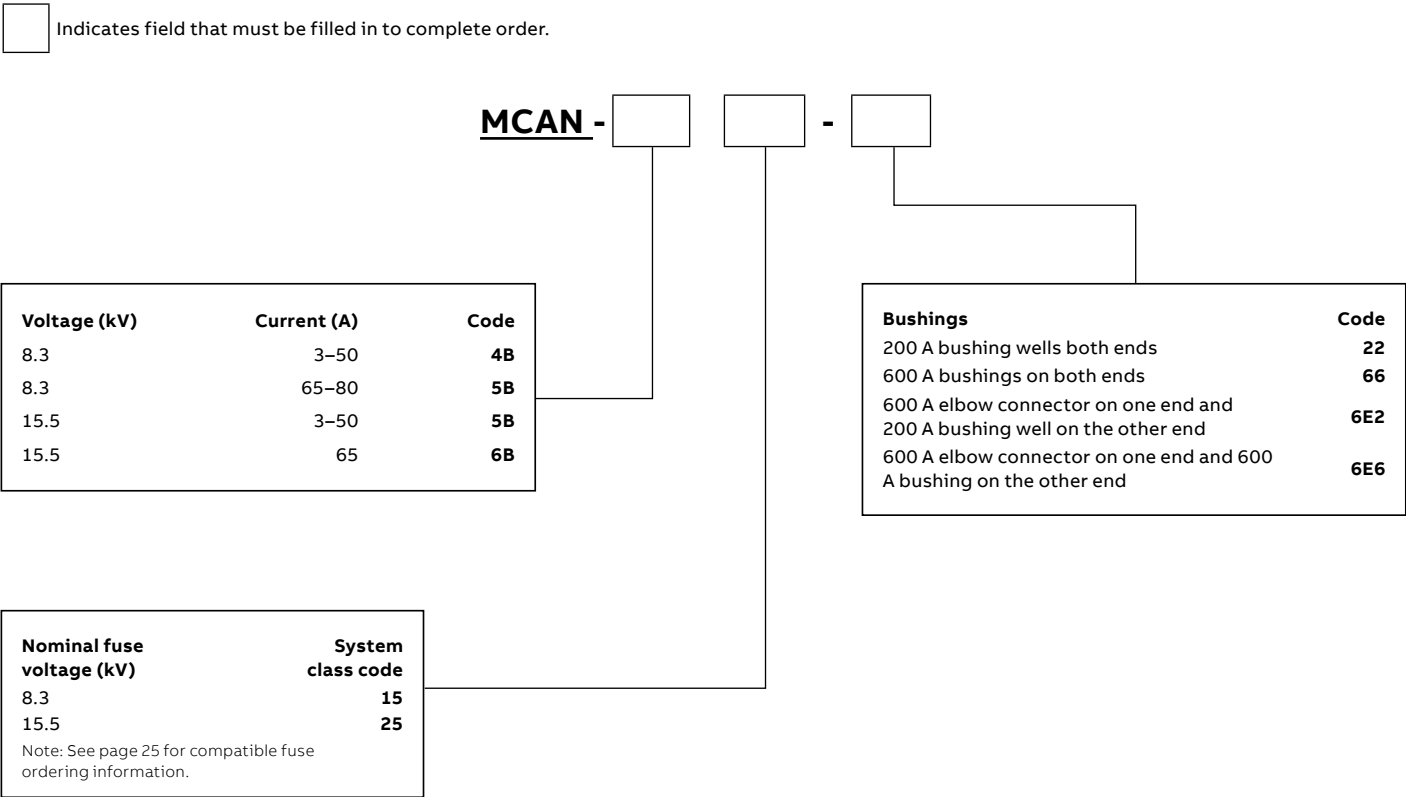
System voltage class (kV)	Nominal fuse voltage rating (kV)	Current rating (amps)	Fuse cat. no.	Rated maximum voltage (kV)	Mounting code	Diameter code	(A) Overall diameter in. (mm)	(B) Overall length in. (mm)	(C) Contact length in. (mm)	(D) Body length in. (mm)	Canister cat. no.	Fuse weight lb. (kg)
15	8.3	3	HTFX230003	10.0	4	B	2.25 (57)	10.0 (254)	1.02 (26)	7.96 (202)	MCAN-4B15-22	3.00 (1.3)
		6	HTFX230006								MCAN-4B15-66	
		8	HTFX230008								MCAN-4B15-6E2	
		10	HTFX230010								MCAN-4B15-6E6	
		12	HTFX230012									
		18	HTFX230018									
		20	HTFX230020									
		25	HTFX230025									
		30	HTFX230030									
		40	HTFX230040									
		50	HTFX230050									
		65	HTFX230065		5	B	2.25 (57)	14.31 (363)	1.02 (26)	12.27 (312)	MCAN-5B15-22	4.25 (1.9)
		80	HTFX230080								MCAN-5B15-66 MCAN-5B15-6E2 MCAN-5B15-6E6	
25/28	15.5	3	HTFX240003	17.2	5	B	2.25 (57)	14.31 (363)	1.02 (26)	12.27 (312)	MCAN-5B25-22	4.25 (1.9)
		6	HTFX240006								MCAN-5B25-66	
		8	HTFX240008								MCAN-5B25-6E2	
		10	HTFX240010								MCAN-5B25-6E6	
		12	HTFX240012									
		18	HTFX240018									
		20	HTFX240020									
		25	HTFX240025									
		30	HTFX240030									
		40	HTFX240040									
		50	HTFX240050									
		65	HTFX240065		6	B	2.25 (57)	17.12 (435)	1.02 (26)	15.09 (383)	MCAN-6B25-22	4.75 (2.2)

Note: For 5 kV systems, use the 8.3 kV rated fuses.

Elastimold®
Molded canister fuses (MCAN)

Ordering MCAN housing

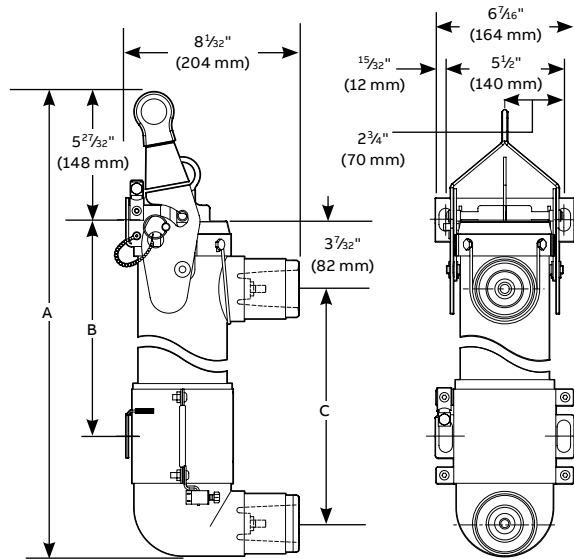
The following diagram shows how to construct an MCAN housing order:



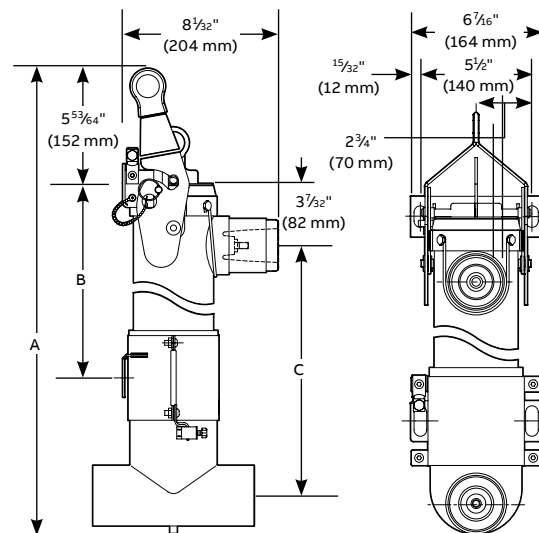
Elastimold®

Molded canister fuses (MCAN)

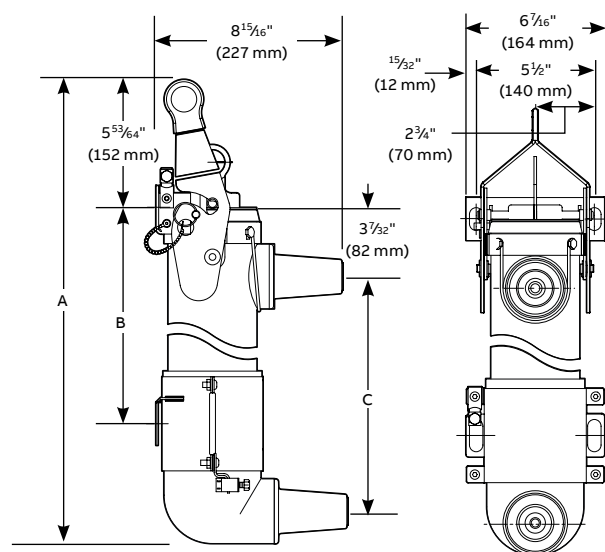
Model 22



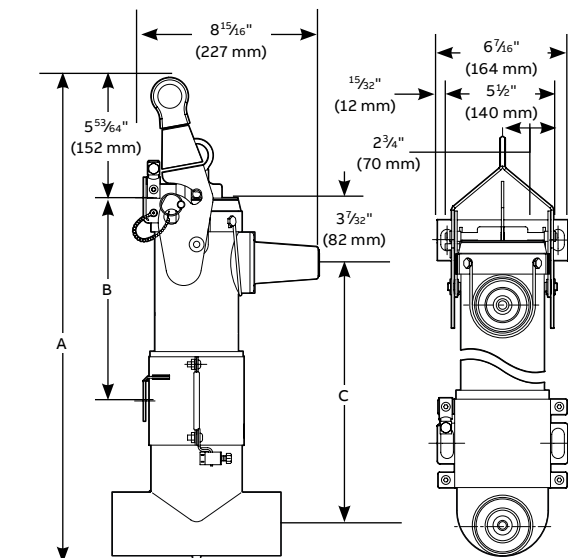
Model 6E2



Model 66



Model 6E6





Elastimold®
Molded canister fuses (MCAN)



Weights and dimensions

Cat. no.	Dimensions			Approx. weight	Bushings	
	A in. (mm)	B in. (mm)	C in. (mm)	lb. (kg)	End bushing	Main bushing
MCAN-4B15-22	21.49 (546)	10.06 (256)	10.91 (277)	19 (8.6)	200 A bushing well	200 A bushing well
MCAN-5B25-22	25.80 (655)	14.37 (365)	15.22 (387)	21 (9.5)	200 A bushing well	200 A bushing well
MCAN-5B15-22	25.80 (655)	14.37 (365)	15.22 (387)	21 (9.5)	200 A bushing well	200 A bushing well
MCAN-4B15-66	21.49 (546)	10.06 (256)	10.91 (277)	21 (9.5)	600 A bushing	600 A bushing
MCAN-5B25-66	25.80 (655)	14.37 (365)	15.22 (387)	23 (10.4)	600 A bushing	600 A bushing
MCAN-5B15-66	25.80 (655)	14.37 (365)	15.22 (387)	23 (10.4)	600 A bushing	600 A bushing
MCAN-4B15-6E2	23.90 (607)	10.06 (256)	12.91 (328)	20 (9)	600 A elbow connector	200 A bushing well
MCAN-5B25-6E2	28.21 (717)	14.37 (365)	17.22 (437)	22 (10)	600 A elbow connector	200 A bushing well
MCAN-5B15-6E2	28.21 (717)	14.37 (365)	17.22 (437)	22 (10)	600 A elbow connector	200 A bushing well
MCAN-4B15-6E6	23.90 (607)	10.06 (256)	12.91 (328)	20 (9)	600 A elbow connector	600 A bushing
MCAN-5B25-6E6	28.21 (717)	14.37 (365)	17.22 (437)	22 (10)	600 A elbow connector	600 A bushing
MCAN-5B15-6E6	28.21 (717)	14.37 (365)	17.22 (437)	22 (10)	600 A elbow connector	600 A bushing

Elastimold®
Molded canister fuses (MCAN)

MCAN molded canister fuse options and accessories



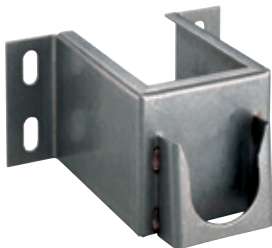
Voltage indicators
Neon voltage indicators provide quick and convenient indication of an energized circuit when they are mounted to the test-point provision on MCAN elbow connectors. The voltage indicator illuminates with a flashing neon light when the elbow connector is energized. If the fuse blows, the neon lights on the load-side elbows stop flashing.

Cat. no.	Description
V2	Capacitive test point, voltage indicator



Mounting code adapters
A mounting code adapter is used to extend the fuse end cap ferrule so that a shorter fuse may be installed in a higher-number coded canister. For example, a 4B size fuse can be used in a 5B canister when an MCAN 4-5 adapter is used.

Cat. no.	Description
MCAN 4-5	Code 4B size fuse to a Code 5B canister
MCAN 4-6	Code 4B size fuse to a Code 6B canister
MCAN 5-6	Code 5B size fuse to a Code 6B canister



Parking stands
Parking stands can be mounted adjacent to an MCAN fuse canister, enabling attachment of additional accessories to ground, isolate and test the elbow cable connectors.

Cat. no.	Description
160WMPS	Wall-mount parking stand
Suffix no.	Description
-PS	Parking stand between bushings



Switchgear assemblies
Elastimold multi-point junctions can be utilized to create custom switchgear lineups consisting of MVS switches, MVI fault interrupters, MCLF current-limiting fuses, MCAN fuse canisters, fused elbows, elbow arresters and other molded products. The junction enables easy assembly and interconnection of components into fully shielded, submersible, compact arrangements.

Hi-Tech®

Trans-Guard® OS Shorty backup CLF

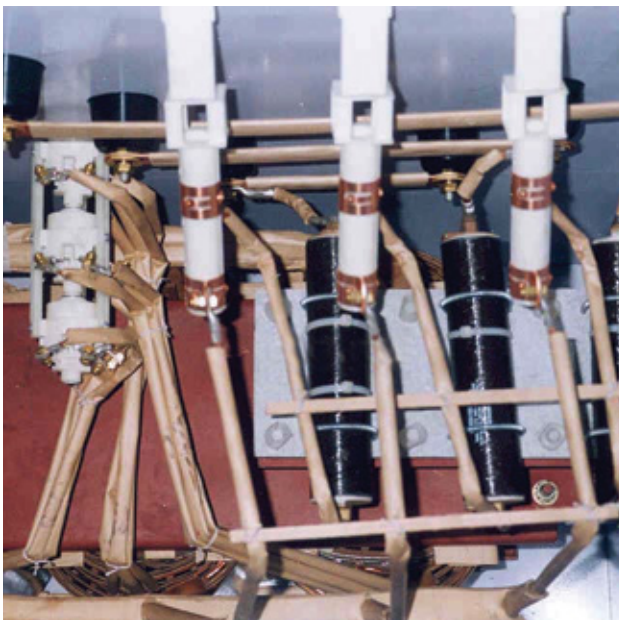
Trans-Guard OS Shorty fuse

ABB Hi-Tech OS Shorty is a back-up type current-limiting fuse designed for application within distribution transformers. Its ability to significantly reduce fault energy and its very high interrupting capabilities provide state-of-the-art protection against rising available fault currents.

As a back-up current-limiting fuse (refer to IEEE C37.40 for fuse definitions), the Trans-Guard OS Shorty must always be applied in series with a properly sized low-current protective device. This device is typically an under-oil expulsion fuse (i.e., bay-o-net or load sensing link, terminal board weak link, etc.). The expulsion and current-limiting fuse are each selected to provide fault protection over a certain range of currents. The expulsion fuse is chosen to clear the low-magnitude currents such as those caused by faults that occur external to the transformer, high-impedance faults within the transformer, and in the case of load sensing links, transformer overloads. Such currents are generally below the minimum interrupting current of the current-limiting fuse. The back-up current-limiting fuse is selected as to clear all other faults up to maximum interrupting capability.

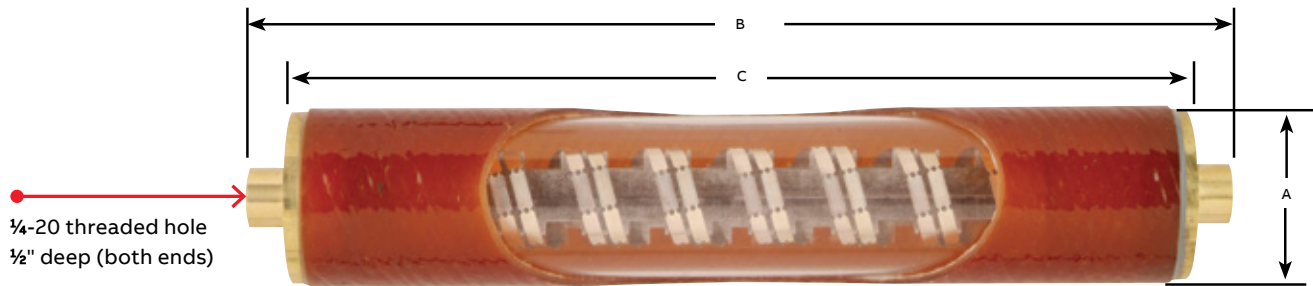
In addition to interrupting the fault currents resulting from low-impedance faults within the transformer, the back-up current-limiting fuse serves the very important function of limiting the amount of energy that is let through to the source of the fault to a value below the withstand capability of the transformer tank. By doing this the current-limiting fuse minimizes the likelihood of disruptive equipment failures (i.e. transformer tank ruptures, accessories being damaged or broken loose from their mountings, etc.). No other protective device is available to similarly reduce the risk of disruptive transformer failures.

OS Shorty fuses are manufactured in the United States and compact in size, which is especially critical in small single phase distribution transformers. Distribution transformers protected solely by an expulsion fuse have very low interrupting capacity, ranging between 600 and 3,500 A, and are subjected to higher risk of tank damage during an internal fault condition. These units also are subjected to large amounts of additional arcing and energy during an internal fault that may affect additional equipment on the distribution system. If a fault occurs that exceeds the expulsion fuse interrupting capability, the fault will continue to arc within the transformer until another protective device has time to react. This situation can increase the number of affected customers while extending the time required to restore service. The OS Shorty's high interrupting capabilities not only reduce the duration of arcing inside the transformer, but also isolate the fault to the transformer which minimizes the effects of the event.



Hi-Tech®

Trans-Guard® OS Shorty backup CLF

**Dimensional information**

Nominal fuse voltage rating (kV)	Current rating (amps)	Fuse cat. no. (N1)	Overall diameter A in. (mm)	Overall length B in. (mm)	Body length C in. (mm)	Fuse weight lb. (kg)
8.3	30	HTSS132030	1.5	6.24	5.2	0.90
	40	HTSS132040	(38.1)	(162.6)	(132.1)	0.14
	50	HTSS132050				
	65	HTSS232065	2.2	7.5	6.3	2.0
	80	HTSS232080	(55.9)	(190.5)	(160.0)	0.91
	100	HTSS232100				
	125	HTSS232125		11.0	9.9	3.25
	150	HTSS232150		(279.4)	(251.5)	1.45
	165	HTSS232165				
	200	HTSS232200				
17.2	30	HTSS142030	1.5	9.8	8.6	1.3
	40	HTSS142040	(38.1)	(248.9)	(218.4)	0.54
	50	HTSS242050	2.2"	9.0	7.8	2.5
			(55.9)	(228.6)	(198.12)	1.1
	65	HTSS242065		11.8	10.6	3.25
	80	HTSS242080		(299.7)	(269.2)	1.48
	100	HTSS242100				
	125	HTSS242125		16.6	15.5	4.75
15.5	150	HTSS242150		(421.6)	(393.7)	2.15
	165	HTSS242165				
23.0	30	HTSS152030	1.5	11.7	10.5	1.5
	40	HTSS152040	(38.1)	(297.2)	(266.7)	0.68
	50	HTSS252050	2.2	12.5	11.3	3.25
			(55.9)	(317.5)	(287.0)	1.48
	65	HTSS252065		16.1	15.25-15.33	4.75
	80	HTSS252080		(408.9)	(378.5)	2.15
38.0	100	HTSS252100				
	65	HTSS372065	3.3	19.4	18.3	12.0
	80	HTSS372080	(83.8)	(492.8)	(464.8)	5.4
	100	HTSS372100				
	125	HTSS372125				
	140	HTSS372140		22.1	21.0	13.5
	165	HTSS372165		(561.3)	(533.4)	6.1
	200	HTSS372200				

Note: N1. HTSS372200 is a parallel fuse application only and requires 2 HTSS372200 fuses connected in parallel per phase.

Hi-Tech®

Trans-Guard® OS Shorty backup CLF

Electrical characteristics (single fuses)

Nominal fuse voltage rating (kV)	Current rating (amps)	Fuse cat. no. (N1)	Rated maximum voltage (kV)	Rated maximum interrupting current (kA)	Peak arc voltage (kV) (N3)	Minimum I/C (amps)	Minimum melt I ² t (amp ² -sec)	Maximum total I ² t (amp ² -sec) (N1) (N2)
8.3	30	HTSS132030	8.3	50.0	25	250	1,300	7,100
	40	HTSS132040				340	2,550	8,000
	50	HTSS132050				400	3,500	13,200
	65	HTSS232065				350	3,700	18,000
	80	HTSS232080				430	6,300	31,000
	100	HTSS232100				570	12,800	66,000
	125	HTSS232125	8.3		26	850	39,000	120,000
	150	HTSS232150			24.5	900	23,000	110,000
	165	HTSS232165			24	1,020	39,500	175,000
	200	HTSS232200				1,120	54,500	225,000
17.2	30	HTSS142030	17.2	44.0	49	250	1,300	7,800
	40	HTSS142040				340	2,550	9,000
	50	HTSS242050				440	4,440	17,000
	65	HTSS242065		50.0		360	3,700	22,000
	80	HTSS242080				440	6,300	36,000
	100	HTSS242100				580	12,800	76,000
	125	HTSS242125				540	14,800	66,000
	150	HTSS242150				700	34,800	137,000
15.5	165	HTSS242165	15.5		48	780	51,200	195,000
23.0	30	HTSS152030	23.0	31.0	63	270	1,300	8,800
	40	HTSS152040			63	360	2,550	10,000
	50	HTSS252050	25.5	50.0	71	570	3,200	20,000
	65	HTSS252065			70	360	3,700	17,000
	80	HTSS252080				440	6,300	28,000
	100	HTSS252100				575	12,800	70,000
38.0	65	HTSS372065	38.0	50.0	110	390	2,600	12,100
	80	HTSS372080				490	5,600	23,500
	100	HTSS372100				675	13,900	55,000
	125	HTSS372125				785	19,300	70,000
	140	HTSS372140				715	25,000	99,000
	165	HTSS372165				1,200	43,500	155,000
	200	HTSS372200				1,180	51,000	180,000

Notes:

N1. HTSS372200 is a parallel fuse application only and requires 2 HTSS372200 fuses connected in parallel per phase.

N2. Tabulate maximum total I²t values are at the nominal voltage of the fuse. Values for 17.2 kV fuses at 15.5 kV are reduced by approximately 12%, while values for 8.3 kV and 23 kV fuses at 10 kV and 25.5 kV are increased by approximately 30% and 13% respectively.

N3. Maximum total I²t values are reduced for currents below bellow Max IC. For example, at 10,000 A, max I²t values are approximately 15% less than published values.

N4. Peak arc voltages quoted are for Max IC at the rated maximum voltage listed. Reduced voltage and currents will reduce the peak arc voltage. Consult the factory for information.

Hi-Tech®

Trans-Guard® OS Shorty backup CLF

Electrical characteristics (fuses tested for use in parallel)

Nominal fuse voltage rating (kV)	Current rating (amps) (N1)	Fuse cat. no. (Order two fuses)	Rated maximum voltage (kV)	Rated maximum interrupting current (kA)	Peak arc voltage (kV) (N4)	Minimum I/C (amps)	Minimum melt I ² t (amp ² -sec)	Maximum total I ² t (amp ² -sec) (N2) (N3)
8.3	130	HTSS232065	8.3	–	25	420	14,800	65,000
	160	HTSS232080				500	25,200	114,000
	200	HTSS232100				630	51,200	240,000
	300	HTSS232150				1,900	92,000	425,000
	330	HTSS232165				2,150	158,000	675,000
	400	HTSS232200				2,380	218,000	850,000
17.2	130	HTSS242065	17.2	50.0	49	420	14,800	92,000
	160	HTSS242080				500	25,200	162,000
	200	HTSS242100				630	51,200	310,000
	250	HTSS242125				1,130	59,200	265,000
15.5	300	HTSS242150	15.5	44.0		1,500	139,200	515,000
	330	HTSS242165		50.0		1,670	204,800	733,000
23.0	130	HTSS252065	25.5	50.0	69	360	14,800	68,000
	160	HTSS252080				450	25,200	115,000
	200	HTSS252100				560	51,200	280,000

Notes:

N1. Current ratings shown are achieved by using a parallel combination of two fuses (order two fuses). To facilitate equal sharing of the interrupting duty, the two fuses should be resistance matches (+/- 2%) and be mounted such that current paths to and from each fuse are symmetrical.

N2. Tabulate maximum total I²t values are at the nominal voltage of the fuse. Values for 17.2 kV fuses at 15.5 kV are reduced by approximately 12%, while values for 23 kV fuses at 25.5 kV are increased by approximately 13% respectively.

N3. Maximum total I²t values are reduced for currents below Max IC. For example, at 10,000 A, max I²t values are approximately 15% less than published values.

N4. Peak arc voltages quoted are for Max IC at the rated maximum voltage listed. Reduced voltage and currents will reduce the peak arc voltage. Consult the factory for information.

Fuse Selection:

For a detailed explanation on selecting the appropriate backup current-limiting fuse for a given application, please refer to Hi-Tech Fuses Application Bulletin FS-10.

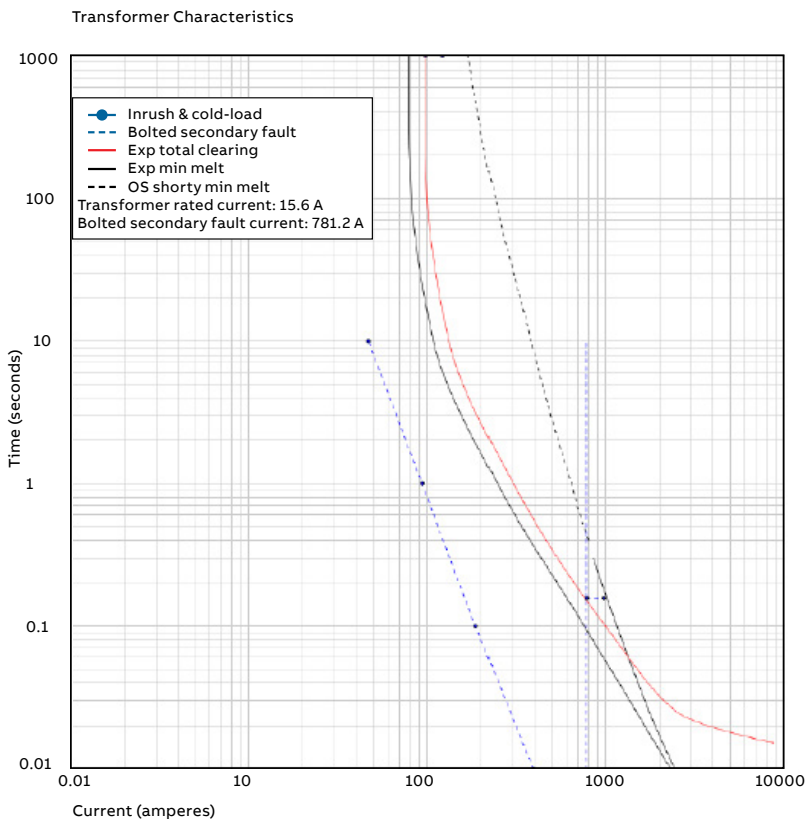
For a quick and convenient method of selecting the proper Trans-Guard OS Shorty fuse for coordination with under oil expulsion fuses, please visit Hi-Tech's fuse application coordination tool located at <http://www.tnb.com/Hi-TechFACT>.

Hi-Tech[®] FACT system

Hi-Tech fuse application coordination tool

Fuse selection made easier

The new Hi-Tech fuse application coordination tool, also known as Hi-Tech FACT, offers a simple, real-time solution to optimize backup current-limiting fuse selection based on the provided transformer configuration. FACT provides multiple types of expulsion fuses common in the industry allowing users to select a specific rating as needed when defined by industry or utility specifications. Whether it's a standard or custom application, FACT offers quick and easy generation of time current curves (TCC) and effortless sharing of the ideal fuse solution.



Service

- Real-time turnkey data
- Easy-to-use drop-down menus
- Dedicated support email and documents readily available

Flexibility

- Non-standard unit configuration options available
- Highest rated capability
- Quickly create multiple protection options with various expulsion fuses

Safety

- Fuse selection optimization minimizes catastrophic equipment failure
- Protective margins between fuses ensure proper coordination
- Backup CLF protection increases interrupting capability and improves fault isolation

To get started, visit www.tnb.com/Hi-TechFACT.

Hi-Tech® EXT backup current-limiting fuses

Trans-Guard® EXT current-limiting backup fuse

Minimize energy let-through – maximize equipment protection.

In addition to interrupting higher fault currents, the Trans-Guard EXT current-limiting backup fuse serves the very important function of limiting the amount of energy let-through to the source of the fault to a value below the withstand capability of the equipment being protected.

New and improved design offers you:

- Smaller size and lighter weight for easier handling
- Lowest energy let-through in the industry
- The most complete range of ratings available
- Lowest total I^2t let-throughs in the industry provide maximum protection for equipment by minimizing energy let-through during a fault
- Higher melt I^2t 's on smaller fuse ratings make fuses less susceptible to damage from current surges

- High fault interrupting capability – as high as 50 kA symmetrical
- Shorter, lighter weight design makes fuses easy to handle and install
- Integral pre-assembled hardware reduces installation time and likelihood of joint deterioration

Application

Designed to enhance protection on overhead distribution systems, the Trans-Guard EXT current-limiting backup fuse both significantly reduces energy let-through during a fault and offers very high interrupting capability to provide state-of-the-art protection against today's ever-increasing available fault currents.

01 The Trans-Guard EXT current-limiting backup fuse interrupts high-level currents and must be applied in series with another device capable of interrupting low- to mid-level currents. This is most commonly a cutout expulsion fuse. When properly coordinated, the Trans-Guard EXT current-limiting backup fuse always allows sufficient let-through current to cause the cutout fuse to melt and drop open, making it easy to visually pinpoint where the fault occurred.

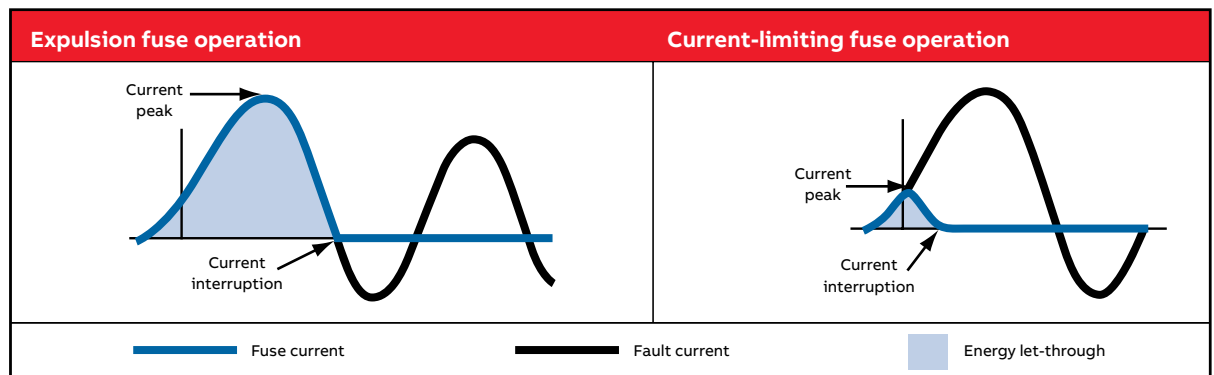


Hi-Tech® EXT backup current-limiting fuses

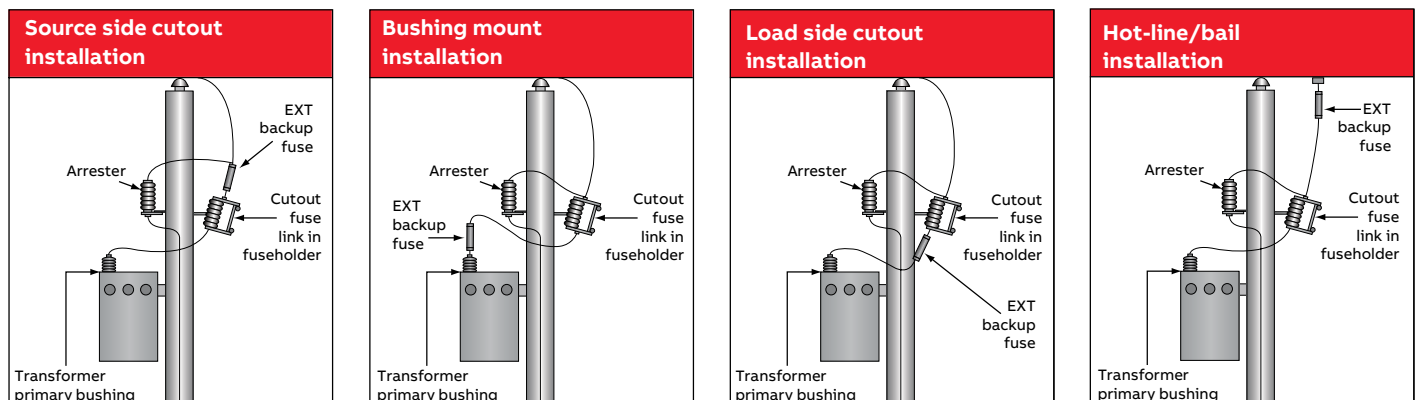
Trans-Guard® EXT current-limiting backup fuse



- Durable design features machined brass endcaps and filament-wound epoxy, centerless ground tubular bodies coated with oven-baked acrylic paint
- Broadest range of ratings available – up to 100 kA at 8.3 kV and 15.5 kV; up to 80 kA at 23 kV
- Current-limiting action improves power quality by reducing voltage dip time during a fault and reduces flame discharge and noise associated with the operation of the series-connected cutout fuse
- Wide variety of mounting and connection options for greater flexibility in installation
- 100% leak tested to ensure hermetic sealing
- Reduced energy let-through provides arc flash reduction

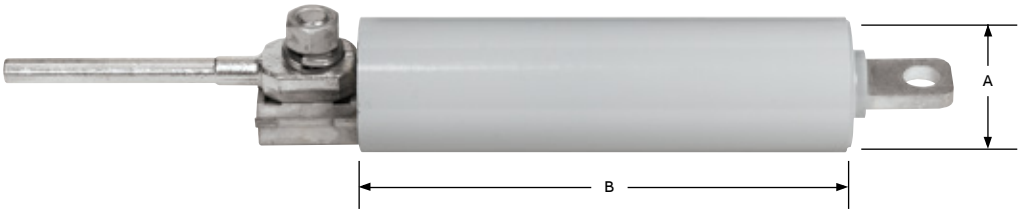


Type of Installations



Hi-Tech® EXT backup current-limiting fuses

Trans-Guard® EXT current-limiting backup fuse for 12 kA to 40 kA ratings



Ordering information

Base cat. no.*	Nominal voltage rating (kV)	Current rating (kA)	Dimension "A" (in.)	Dimension "B" (in.)	Weight (lbs.)
HTDE23 (X) 012	8.3	12	1.5	5.2	1.0
HTDE23 (X) 025		25	1.5	7.1	1.1
HTDE23 (X) 040		40	2.2	6.3	2.2
HTDE24 (X) 012	15.5	12	1.5	8.6	1.3
HTDE24 (X) 025		25	1.5	11.9	1.8
HTDE24 (X) 040		40	2.2	10.4	3.3
HTDE25 (X) 012	23.0	12	1.5	10.5	1.6
HTDE25 (X) 025		25	2.2	13.4	4.0
HTDE25 (X) 040		40	2.2	13.4	4.0

* When ordering, replace the (X) in the base catalog number with the appropriate hardware code from the chart below.

Hardware for 12 kA to 40 kA ratings

Eyebolt
(accepts #8 – 2/0)

Knurled stud

Parallel-groove
(accepts #6 – 2/0)

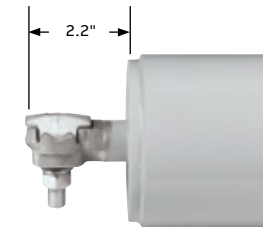
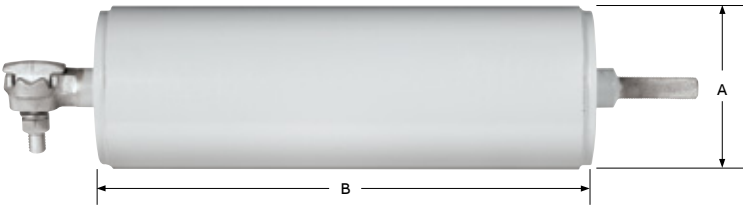
Spade

Universal adapter
rotatable through 180°

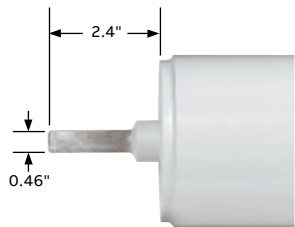
Hardware code		
Hardware code (X)	1st end hardware	2nd end hardware
1	Spade	Knurled stud
5	Parallel-groove	Knurled stud
6	Parallel-groove	Spade
8	Eyebolt	Knurled stud
9	Universal adapter	Spade
C	Universal adapter	Knurled stud
F	Eyebolt	Eyebolt
G	Parallel-groove	Eyebolt
H	Eyebolt	Spade
J	Eyebolt	Universal adapter
W	Parallel-groove	Parallel-groove
Z	Parallel-groove	Universal adapter

Hi-Tech® EXT backup current-limiting fuses

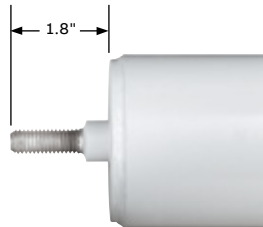
Trans-Guard® EXT current-limiting backup fuse for 65 kA to 80 kA ratings



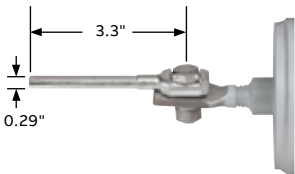
Eyebolt
(accepts #8 – 2/0)



Knurled stud



Threaded stud
(½"–13 threads)



Universal adapter
rotatable through 180°

Ordering information

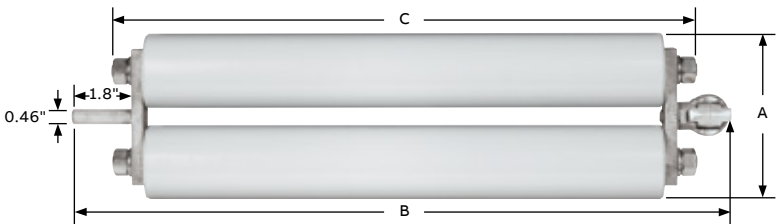
Base cat. no.*	Nominal voltage rating (kV)	Current rating (kA)	Dimensions (in.)		Weight (lbs.)
			"A"	"B"	
HTDE33 (X) 065	8.3	65	3.3	9.9	7.5
HTDE33 (X) 080		80			
HTDE34 (X) 065	15.5	65	3.3	15.5	10.5
HTDE34 (X) 080		80			
HTDE35 (X) 065	23.0	65	3.3	18.3	12.5
HTDE35 (X) 080		80			

* When ordering, replace the (X) in the base catalog number with the appropriate hardware code from the chart below.

Hardware code

Hardware code (X)	1st end hardware	2nd end hardware
A	Threaded stud	Threaded stud
E	Eyebolt	Knurled stud
F	Eyebolt	Eyebolt
U	Eyebolt	Universal adapter

Trans-Guard® EXT current-limiting backup fuse for 100 kA ratings



Eyebolt
(accepts #8 – 2/0)

Base cat. no.	Nominal voltage rating (kV)	Current rating (kA)	Dimensions (in.)			Weight (lbs)
			"A"	"B"	"C"	
HTDE23E100	8.3	100	4.9	14.0	11.9	7.5
HTDE24E100	15.5	100	4.9	19.4	17.5	10.5

Hi-Tech® EXT backup current-limiting fuses

Voltage Selection – Refer to first table below. Each Trans-Guard® EXT current-limiting backup fuse is suitable for use in both single-phase and three-phase applications where the system voltage does not exceed the Maximum System Voltage listed. For single-phase applications on delta systems, one fuse is needed in each line.

Current-Rating Selection – Refer to second table below. Each Trans-Guard EXT current-limiting backup fuse will coordinate with any link having a rating no greater than that listed. For types of links not listed in this table, please contact ABB for assistance.

Hardware Selection – Many different hardware options are available. Some options vary depending on the size of the Trans-Guard EXT current-limiting backup fuse required.

Electrical characteristics of Trans-Guard EXT current-limiting backup fuse

Nominal voltage rating (kV)	Current rating (kA)	Rated maximum interrupting current (kA)	Rated maximum voltage (kV)	Maximum system voltage (kV)	Peak arc voltage (kV)	Minimum melt I^2t (amp ² -sec)	Maximum total I^2t (amp ² -sec)
8.3	12	50	8.3	14.4	26	2,700	8,000
	25				26	11,000	29,000
	40				25	26,000	72,000
	65				22	67,000	230,000
	80				22	156,000	580,000
	100				24	218,000	850,000
15.5	12	44	17.2	27.6	47	2,700	9,000
	25				49	11,000	34,000
	40				47	26,000	85,000
	65	50	15.5	24.9	44	67,000	230,000
	80				44	156,000	580,000
	100				46	204,000	730,000
23.0	12	31	23.0	34.5	62	2,700	10,000
	25				60	11,000	37,000
	40				62	26,000	88,000
	65				65	67,000	220,000
	80				63	123,000	360,000

Trans-Guard EXT current-limiting backup fuse/expulsion fuse link coordination

Trans-Guard EXT fuse rating (kA)	Coordinates with links up through								
	Type K	Type T	Type N	Type S	Type H	Type D	Type X	Type QA	Type KS
12	12	8	20	5	8	3	2.5	15	3
25	25	15	30	7	8	20	10	30	7
40	40	20	50	15	8	20	15	50	15
65	65	30	60	25	8	20	15	75	15
80	80	50	85	40	8	20	15	100	15
100	100	65	85	50	8	20	15	125	15

Hi-Tech® EXT backup current-limiting fuses

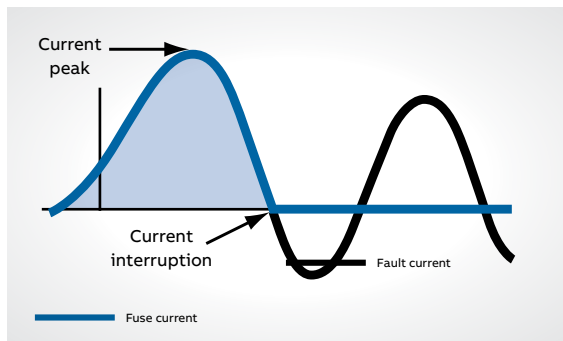
Trans-Guard® EXT current-limiting backup fuse for 46–138 kV systems

—
01 Expulsion fuse
operation
—
02 Current-limiting
fuse operation

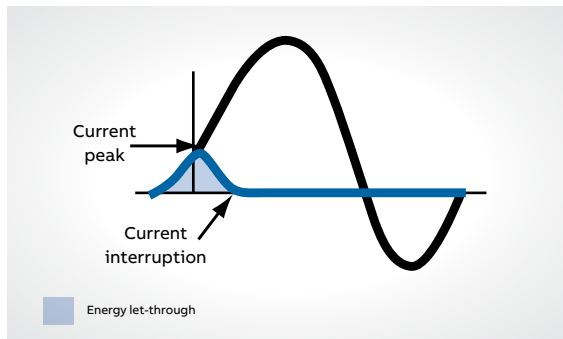


Minimize energy let-through. Maximize equipment protection.

Commonly used on 34.5 kV and lower systems to enhance protection, external current-limiting backup fuses coordinate with series expulsion fuse to offer very high interrupting capability and reduce energy let-through during a fault. The proven benefits of the two fuse approach widely used on distribution systems is now available for application up to 138 kV that traditionally only protected by a standard expulsion fuse.



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01



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02

Safety

- Offers a higher interrupting capability than a stand-alone expulsion fuse
- Significant reduction in energy let-through

Environmentally friendly

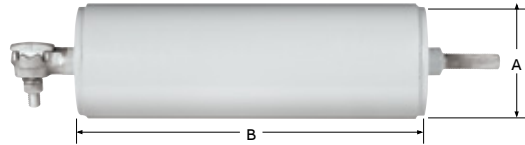
- Lessens the chance of an oil leakage by reducing the energy let-through during a short circuit fault condition
- Fully sealed design ensures that no contaminants are released into the environment during operation

Life cycle cost reduction

- Minimizes transformer damage during an internal fault condition, thus making repairs less costly
- Minimizes effects to transformer and surrounding infrastructure

Hi-Tech® EXT backup current-limiting fuses

Trans-Guard® EXT current-limiting backup fuse for 46 kV systems



Ordering 46 kV

46 kV catalog numbers

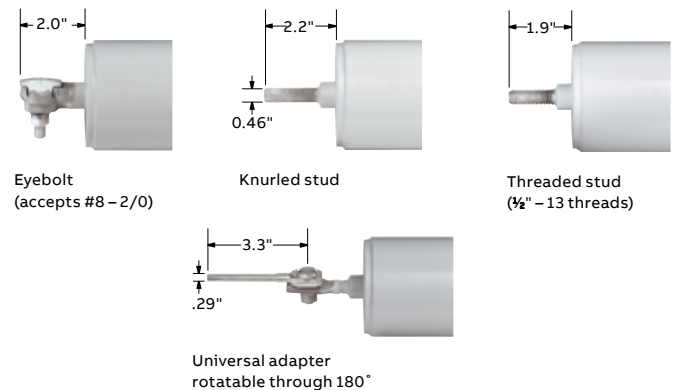
Base cat. no.*	Nominal voltage rating (kV)	Current rating (kA)	Dimension 'A' (inches)	Dimension 'B' (inches)	Weight (lbs)
HTDE37 (X) 010	38.0	10	3.3	18.3	12.5
HTDE37 (X) 015	38.0	15	3.3	18.3	12.5
HTDE37 (X) 025	38.0	25	3.3	18.3	12.5
HTDE37 (X) 030	38.0	30	3.3	18.3	12.5
HTDE37 (X) 050	38.0	50	3.3	21.0	13.5

*When ordering, replace (X) in the base catalog number with the appropriate hardware code from the chart below.

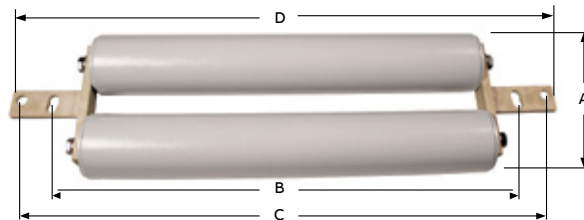
Hardware for 10 kA to 50 kA ratings

Hardware code: 10 kA to 50 kA

Hardware code (*)	1st end hardware	2nd end hardware
A	Threaded stud	Threaded stud
E	Eyebolt	Knurled stud
F	Eyebolt	Eyebolt
U	Eyebolt	Universal adapter



Trans-Guard EXT current-limiting backup fuse for 69–138 kV systems



Ordering 69 kV

For 69 kV application: 1x HTDE37X100 module

Base cat. no.	Nominal voltage rating (kV)	Current rating (kA)	Dimension 'A' (inches)	Dimension 'B' (inches)	Dimension 'C' (inches)	Dimension 'D' (inches)	Weight (lbs)
HTDE37X100	38.0	100	7.9	25.1	28.6	29.6	32

Ordering 115–138 kV

For 115 / 138 kV application: 2x HTDE37X100 modules in series required

For 115 / 138 kV applications, two (2) HTDE37X100 are required and ordered individually. The modules should be assembled in series during field installation. Reference the 69kV table above for individual dimensions of each module. The overall length will depend on installation.

Hi-Tech® EXT backup current-limiting fuses

Trans-Guard® EXT current-limiting backup fuse for 46–138 kV systems

EXT selection

Voltage selection

Each EXT current-limiting backup fuse is suitable for use in both single-phase and three-phase applications where the system voltage does not exceed the maximum system voltage listed. For single-phase applications on delta systems, one fuse is needed in each line.

Current-rating selection

Each EXT current-limiting backup fuse will coordinate with any link having a rating no greater

than that listed. For link types not listed in Table 2, please contact ABB for assistance. For additional coordination information, please consult application guide FS-10.

Hardware selection

Many different hardware options are available. Some options vary depending on the size of the current-limiting backup fuse required. Please refer to ordering information for available options.

Table 1: Electrical characteristics

Nominal voltage rating (kV)	Current rating (kA)	Rated max interrupting current (kA)	Rated max voltage (kV)	Max system voltage (kV)	Peak arc voltage (kV)	Min. melt I ² t (amp ² -sec)	Max total I ² t (amp ² -sec)
38.0	10	50	38.0	48.3	110	2,600	12,100
38.0	15	50	38.0	48.3	110	5,600	23,500
38.0	25	50	38.0	48.3	110	13,900	55,000
38.0	30	50	38.0	48.3	110	19,300	70,000
38.0	50	50	38.0	48.3	110	43,500	155,000
38.0	100	20	42.5	69.0*	106	172,000	830,000

*Maximum system voltage increased to 138 kV when two (2) 100 K modules are used in series.

Table 2: Expulsion fuse link coordination

Trans-Guard EXT fuse rating (kA)	S&C SMD standard speed (TCC 153-1)	S&C SMD slow speed (TCC 119-1)
10	10E	—
15	15E	15E
25	25E	25E
30	30E	30E
50	50E	40E
100	100E	80E

Hi-Tech® EXT backup current-limiting fuses

Trans-Guard® EXT current-limiting backup fuse

Application for 46–138 kV systems

Field tested and proven to reduce the energy let through during a fault, the Trans-Guard EXT current-limiting backup fuse family now includes options at 46 kV, 69 kV and 138 kV. All coordinate with existing power expulsion fuses to create an ideal two-fuse protection scheme.

In addition to increasing the interrupting capabilities of the standalone expulsion fuse, the Trans-Guard EXT drastically decreases the amount of energy let-through and peak currents during a high current fault condition. The two-fuse combination provides a safe and effective solution for protecting high-value infrastructure and personnel in proximity to a substation.

Features	Benefits/Descriptions
Superior performance	Clears high current faults by modifying the circuit conditions, resulting in clearing faults before the nature occurring zero crossing, results in tremendous reduction in I ² t let-through the system would have been subjected to otherwise.
High fault interrupting capability	As high as 50 kA symmetrical. (see Table 1)
Durable, robust design	Extends outdoor life and includes machined brass endcaps and filament-wound epoxy, centerless ground tubular bodies, ground and coated with oven-baked acrylic paint.
Current-limiting action	Improves power quality by reducing voltage dip time during a fault and reduces flame discharge and noise associated with the operation of the series-connected cutout fuse.
Hermetically sealed	100% leak tested to ensure hermetic sealing.
Minimal equipment damage	Current-limiting action minimizes the internal damage to the transformer during a primary fault condition; therefore, making equipment repair less expensive.
Matched-melt coordination	Ensures sufficient energy let-through to melt open series-connected expulsion fuse, providing visual indication of the fault.

01 138 kV EXT current-limiting backup fuse in series with power expulsion fuse offers state of the art protection. When properly coordinated, the Trans-Guard® EXT current-limiting backup fuse always allows sufficient let-through current to cause the power expulsion fuse to melt and drop open, making it easy to visually pinpoint where the fault occurred.



Hi-Tech® FX full-range current-limiting fuses

Trans-Guard® FX full-range current-limiting fuse

01 Figure 1

02 Figure 2

03 Figure 3

- Patented damage sensor significantly reduces the risk of fuse failure should the fuse be subjected to an element-damaging current surge
- Hermetically sealed construction ensures that no gases escape from the fuse during current interruption
- All Trans-Guard FX fuses are helium mass spectrometer leak tested to ensure sealing system integrity
- Rugged machined brass end caps used for greater ferrule strength, resulting in less distortion and more secure fuse attachment in dry-well canisters
- Tested in accordance with the most recent ANSI/IEEE standards including short circuit testing at the manufacturer's specified rated maximum application temperature (RMAT)
- Optional blown fuse indicator features a unique design that does not affect the fuse's arcing performance

This fuse provides both overload and fault current protection for distribution equipment in a single fuse body. As a full-range fuse, it is capable of interrupting any continuous current between the minimum current that can cause melting of its elements and its rated maximum interrupting current (50,000 A). The fuses are capable of interrupting in elevated ambient temperatures up to their rated maximum application temperature (RMAT).

The Trans-Guard FX fuse is hermetically sealed and thus discharges no gases during fuse operation. An additional design distinction is its patented damage sensor that significantly reduces the potential for fuse failure in the event of element-damaging current surges.



01



02



03

Applications:

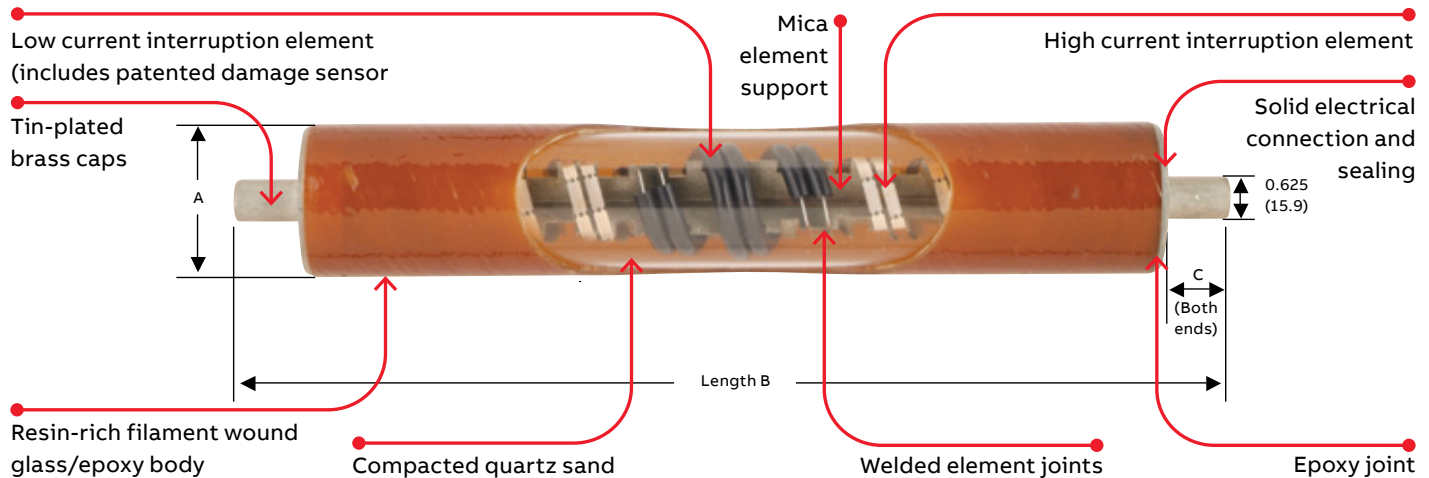
Trans-Guard FX fuses are available in a broad range of ratings. For ease of application, all designs are compatible with the industry-recognized standard mounting codes. Common applications include the Trans-Guard FX:

- Installed in drywell canisters for distribution transformer protection (see Figure 1)
- Clip mounted in live-front switchgear (see Figure 2)

- Externally mounted on overhead distribution systems, – contact factory for more information (see Figure 3)
- Installed in Elastimold® MCAN rubber molded canister for deadfront/submersible applications
- Installed directly in oil, Type 8 (contact factory for more information)

Hi-Tech® FX backup current-limiting fuses

Construction



Dimensional information for Trans-Guard® FX fuses

Nominal fuse voltage rating (kV)	Current rating (amps)	Dimensions in. (mm)			Standard mounting code
		A	B	C	
5.5	3-75	2.25-2.18 (57.0-55.3)	10.00-9.90 (254.0-251.5)	1.02-1.00 (25.9-25.4)	4
	80-200	3.32-3.25 (84.4-82.5)	17.51-17.35 (444.8-440.7)	1.21-1.17 (30.7-29.7)	6
8.3	3-50	2.25-2.18 (57.0-55.3)	10.00-9.90 (254.0-251.5)	1.02-1.00 (25.9-25.4)	4
	65-80	2.25-2.18 (57.0-55.3)	14.31-14.21 (363.5-360.9)	1.02-1.00 (25.9-25.4)	5
	65-125	3.32-3.25 (84.4-82.5)	14.70-14.54 (373.4-369.3)	1.21-1.17 (30.7-29.7)	5
15.5	3-50	2.25-2.18 (57.0-55.3)	14.31-14.21 (363.5-360.9)	1.02-1.00 (25.9-25.4)	5
	65	2.25-2.18 (57.0-55.3)	17.12-17.02 (434.8-432.3)	1.02-1.00 (25.9-25.4)	6
	65-100	3.32-3.25 (84.4-82.5)	17.51-17.35 (444.8-440.7)	1.21-1.17 (30.7-29.7)	6
23.0	6-50	2.25-2.18 (57.0-55.3)	17.12-17.02 (434.8-432.3)	1.02-1.00 (25.9-25.4)	6

Blown fuse indicator – Type 1

01 Before operation

02 After operation



01



02

Hi-Tech® FX full-range current-limiting fuses

Electrical characteristics

Electrical characteristics of Trans-Guard® FX fuses (single fuses)

Nominal fuse voltage rating (kV)	Fuse diameter (in.)	Current rating (amps)	Fuse cat. no. (N1)	Rated maximum voltage (kV)	Maximum continuous current (in air) (N6) (N7) (amps)			Peak arc voltage (N5) (kV)	Minimum melt I²t (amp²-sec)	Maximum melt I²t (N3) (N4) (amp²-sec)	RMAT (N8) (°C)
					25 °C	40 °C	55 °C				
5.5	2.2	3	HTFX220003	5.5	5.0	4.9	4.7	30	100	238	140
		6	HTFX220006		11.0	10.5	10.0	25	620	1,764	
		8	HTFX220008		13.5	13.0	12.5	23	800.0	2,560	
		10	HTFX220010		16.0	15.5	15.0	23	800.0	2,560	
		12	HTFX220012		20.5	19.5	19.0	21	920.0	4,814	
		18	HTFX220018		23.5	22.5	22.0	18	1,310	5,815	
		20	HTFX220020		27.5	26.5	25.5	18	1,620	6,779	
		25	HTFX220025		37.0	35.5	34.5	18	3,660	13,747	
		30	HTFX220030		41.0	39.5	38.5	18	5,250	18,863	
		40	HTFX220040		50.0	48.5	47.0	18	8,700	31,415	
		50	HTFX220050		57.0	55.0	53.5	18	12,800	44,260	
		65	HTFX220065		69.5	67.5	64.0	17	20,500	95,000	
		75	HTFX220075		78.5	76.0	72.0	17	30,200	129,000	
5.5	3.3	80	HTFX320080	5.5	99	96	94	15	22,100	110,000	71
		100	HTFX320100		126	122	118	15	56,700	280,000	
		125	HTFX320125		142	138	134	15	78,300	380,000	
		150	HTFX320150		184	178	173	15	176,000	860,000	
		200	HTFX320200		208	202	196	15	259,000	1,270,000	
8.3	2.2	3	HTFX230003	10.0	5.0	4.9	4.7	30	100	350	140
		6	HTFX230006		11.0	10.5	10.0	32	620	2,700	
		8	HTFX230008		13.5	13.0	12.5	28	800	4,000	
		10	HTFX230010		16.0	15.5	15.0	28	800	4,000	
		12	HTFX230012		20.5	19.5	19.0	26	920	8,000	
		18	HTFX230018		23.5	22.5	22.0	26	1,310	9,500	
		20	HTFX230020		27.5	26.5	25.5	26	1,620	11,000	
		25	HTFX230025		37.0	35.5	34.5	26	3,660	22,000	
		30	HTFX230030		41.0	39.5	38.5	26	5,250	30,000	
		40	HTFX230040		50.0	48.5	47.0	26	8,700	50,000	
		50	HTFX230050		57.0	55.0	53.5	26	12,800	70,000	
		65	HTFX230065	8.8	87.0	84.0	81.5	23	34,000	200,000	
		80	HTFX230080		100.0	98.0	95.0	22	51,200	280,000	
	3.3	65	HTFX330065	8.3	81.0	79.0	77.0	25	25,200	100,000	71
		80	HTFX330080		95.0	92.0	89.0	25	47,200	185,000	
		100	HTFX330100		120.0	117.0	113.0	25	78,300	330,000	
		125	HTFX330125		135.0	131.0	127.0	25	115,150	480,000	

Electrical characteristics of Trans-Guard® FX fuses (single fuses) (continued)

Nominal fuse voltage rating (kV)	Fuse diameter (in.)	Current rating (amps)	Fuse cat. no. (N1)	Rated maximum voltage (kV)	Maximum continuous current (in air) (N6) (N7) (amps)			Peak arc voltage (N5) (kV)	Minimum melt I ² t (amp ² -sec)	Maximum melt I ² t (N3) (N4) (amp ² -sec)	RMAT (N8) (°C)
					25 °C	40 °C	55 °C				
15.5	2.2	3	HTFX240003	17.2	5.0	4.9	4.7	51	100	510	140
		6	HTFX240006		11.0	10.5	10.0	54	620	2,600	
		8	HTFX240008		13.5	13.0	12.5	46	800	3,700	
		10	HTFX240010		16.0	15.5	15.0	46	800	3,700	
		12	HTFX240012		20.5	19.5	19.0	43	920	6,500	
		18	HTFX240018		23.5	22.5	22.0	45	1,310	8,000	
		20	HTFX240020		27.5	26.5	25.5	45	1,620	10,000	
		25	HTFX240025		37.0	35.5	34.5	45	3,660	22,000	
		30	HTFX240030		41.0	39.5	38.5	45	5,250	30,000	
		40	HTFX240040		50.0	48.5	47.0	45	8,700	50,000	
		50	HTFX240050		53.0	51.5	50.0	45	12,800	70,000	
		65	HTFX240065		72.0	70.0	68.0	39	28,300	164,000	
	3.3	65	HTFX340065	15.5	78.0	75.0	73.0	40	25,200	110,000	71
		80	HTFX340080		88.0	85.0	82.0	40	39,400	185,000	
		100	HTFX340100		114.0	110.0	107.0	40	80,000	380,000	
23.0	2.2	6	HTFX250006	23.0	11.0	10.5	10.0	67	620	3,100	140
		8	HTFX250008		13.5	13.0	12.5	61	800	4,800	
		10	HTFX250010		16.0	15.5	15.0	61	800	4,800	
		12	HTFX250012		20.5	19.5	19.0	60	920	8,300	
		18	HTFX250018		23.5	22.5	22.0	60	1,310	11,200	
		20	HTFX250020		27.5	26.5	25.5	60	1,620	13,000	
		25	HTFX250025		37.0	35.5	34.5	60	3,660	28,000	
		30	HTFX250030		41.0	39.5	38.5	60	5,250	38,000	
		40	HTFX250040		48.0	46.5	45.0	60	8,700	61,000	
		50	HTFX250050		55.0	53.0	51.5	60	12,800	82,000	

Notes:

N1. Ratings have maximum interrupting capability of 50 kA, except 17.2 kV 3A (HTFX240003) which tested at 44 kA.

N2. Current ratings shown in chart above are achieved by using a parallel combination of two fuses (order two fuses). To facilitate equal sharing of the interrupting duty, the two fuses should be resistance matched ($\pm 2\%$) and be mounted such that the current paths to and from each fuse are symmetrical.

N3. Tabulated Maximum Total I²t values are for currents of 50,000 A at the nominal voltage of the fuse (except for fuses having a rated maximum voltage of 8.8 kV, in which case the maximum total I²t values are at 8.8 kV). Fuses that have a rated maximum voltage higher than their nominal voltage rating will have a higher I²t let-through when applied at voltages up to these higher values. For example, maximum total I²t values are increased by approximately 30% when 8.3 kV fuses are applied at 10 kV and approximately 25% when 15.5 kV fuses are used at 17.2 kV.

N4. Maximum total I²t values are reduced for currents below 50,000 A. For example, at 10,000 A, maximum total I²t values are approximately 15% less than the published values.

N5. Peak arc voltages quoted are for 50,000 A currents at the rated maximum voltage listed. Reduced currents and voltages will reduce the peak arc voltage. Consult the factory for further information.

N6. Maximum continuous currents at higher ambient temperatures, and in confining enclosures:

• These may be determined by derating the fuses by .2% per °C over 25 °C (for example, at 85 °C the derating would be $60 \times .2 = 12\%$, making the maximum continuous current of a 30 A fuse $41 \times .88 = 36.1$ A).

• When fuses are applied in a confining enclosure, such as a drywell canister, additional derating of a fuse's maximum continuous current is necessary. Specifically, the maximum continuous current for fuses used in a dry-well canister, with the canister completely submerged in oil, will be reduced by an additional 2% (3% for fuses having a rated maximum voltage of 8.8kV). When calculating the derating for temperature, as described above, the temperature of the oil surrounding the canister should be used. For other types of enclosures, please consult the factory.

N7. Reduction in the long time melting current of the fuses (approximately one hour and longer) due to higher ambient temperatures and use in enclosures is the same as described above for "Maximum Continuous Current". See time-current characteristics for melting characteristics in this time region.

N8. The 2.2"-dia. 80 A and 160 A (paralleled 80 A) fuses have an RMAT of 140 °C at a reduced rated maximum voltage of 5.5 kV.

Hi-Tech® FX full-range current-limiting fuses

Electrical characteristics

Electrical characteristics of Trans-Guard® FX fuses (parallel fuses)

Nominal fuse voltage rating (kV)	Fuse diameter (in.)	Current rating (amps)	Fuse cat. no. (order two fuses) (N2)	Rated maximum voltage (kV)	Maximum continuous current (in air) (N6) (amps)			Peak arc voltage (N5) (kV)	Minimum melt I ² t (amp ² -sec)	Maximum melt I ² t (N3) (N4) (amp ² -sec)	RMAT (N8) (°C)
					25 °C	40 °C	55 °C				
8.3	2.2	60	HTFX230030	10.0	80.0	77.0	75.0	26	21,000	120,000	140
		80	HTFX230040		98.0	95.0	92.0	26	34,000	180,000	
		100	HTFX230050	8.3	111.0	108.0	105.0	24	51,200	250,000	40
		130	HTFX230065	8.8	170.0	165.0	160.0	22	136,000	670,000	
		160	HTFX230080		198.0	191.0	186.0	21	204,800	890,000	
	3.3	130	HTFX330065	8.3	158.0	154.0	151.0	24	100,800	400,000	71
		160	HTFX330080		186.0	180.0	175.0	24	189,000	740,000	
		200	HTFX330100		235.0	229.0	221.0	24	313,000	1,300,000	
		250	HTFX330125		265.0	256.0	249.0	24	460,500	1,800,000	
15.5	2.2	60	HTFX240030	17.2	80.0	77.0	75.0	45	21,000	110,000	140
		80	HTFX240040		98.0	95.0	92.0	45	34,800	170,000	
		100	HTFX240050		104.0	101.0	98.0	45	51,200	310,000	
	3.3	130	HTFX340065	15.5	152.0	147.0	143.0	39	100,800	440,000	71
		160	HTFX340080		172.0	167.0	160.0	39	157,500	740,000	
		200	HTFX340100		222.0	214.0	208.0	39	320,000	1,520,000	

Notes:

N1. Ratings have maximum interrupting capability of 50 kA, except 17.2 kV 3A (HTFX240003) which tested at 44 kA.

N2. Current ratings shown in chart above are achieved by using a parallel combination of two fuses (order two fuses). To facilitate equal sharing of the interrupting duty, the two fuses should be resistance matched ($\pm 2\%$) and be mounted such that the current paths to and from each fuse are symmetrical.

N3. Tabulated Maximum Total I²t values are for currents of 50,000 A at the nominal voltage of the fuse (except for fuses having a rated maximum voltage of 8.8 kV, in which case the maximum total I²t values are at 8.8 kV). Fuses that have a rated maximum voltage higher than their nominal voltage rating will have a higher I²t let-through when applied at voltages up to these higher values. For example, maximum total I²t values are increased by approximately 30% when 8.3 kV fuses are applied at 10 kV and approximately 25% when 15.5 kV fuses are used at 17.2 kV.

N4. Maximum total I²t values are reduced for currents below 50,000 A. For example, at 10,000 A, maximum total I²t values are approximately 15% less than the published values.

N5. Peak arc voltages quoted are for 50,000 A currents at the rated maximum voltage listed. Reduced currents and voltages will reduce the peak arc voltage. Consult the factory for further information.

N6. Maximum continuous currents at higher ambient temperatures, and in confining enclosures:

- These may be determined by derating the fuses by .2% per °C over 25 °C (for example, at 85 °C the derating would be $60 \times .2 = 12\%$, making the maximum continuous current of a 30 A fuse $41 \times .88 = 36.1$ A).

- When fuses are applied in a confining enclosure, such as a drywell canister, additional derating of a fuse's maximum continuous current is necessary. Specifically, the maximum continuous current for fuses used in a dry-well canister, with the canister completely submerged in oil, will be reduced by an additional 2% (3% for fuses having a rated maximum voltage of 8.8kV). When calculating the derating for temperature, as described above, the temperature of the oil surrounding the canister should be used. For other types of enclosures, please consult the factory.

N7. Reduction in the long time melting current of the fuses (approximately one hour and longer) due to higher ambient temperatures and use in enclosures is the same as described above for "Maximum Continuous Current". See time-current characteristics for melting characteristics in this time region.

N8. The 2.2"-dia. 80 A and 160 A (paralleled 80 A) fuses have an RMAT of 140 °C at a reduced rated maximum voltage of 5.5 kV.

Hi-Tech® FX full-range current-limiting fuses

Recommendations

Recommended Trans-Guard® FX mounted in a standard drywell canister in oil (at a max. oil temp. of 100 °C)

Recommended fuse current ratings (amps)																		
Fuse voltage		5.5 kV				8.3 kV				15.5 kV				23 kV				
1-phase transformer kVA	2.4		4.16		4.8		7.2		7.62		12		14.4		16		19.9	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
10	6 ^b	8	–	6 ^a	–	3	–	3 ^a	–	3 ^a	–	3 ^a	–	3 ^a	–	3 ^a	–	6 ^a
15	8	12	–	6	–	6	–	3	–	3	–	3 ^a	–	3 ^a	–	3 ^a	–	6 ^a
25	18	20	8	12	8 ^b	10	–	6	–	6	–	3	–	3	–	3	–	6 ^a
37.5	20	30	12	18	12 ^b	18	8	10	–	8	–	6	–	6 ^a	–	6 ^a	–	6 ^a
50	30	40	18	20	18	20	10	12	10	12	–	6	–	6	–	6	–	6 ^a
75	50	75	25	40	20	30	12	20	12	20	8	12	8	10	–	8	–	6
100	65	80*	30	50	25	40	20	25	20	25	12 ^b	18	10	12	10 ^b	12	–	8
167	100*	–	65	80*	50	65	30	50	30	50	20	25	18	25	18	20	12	18
250	–	–	80*	–	80*	–	50	60*	50	60*	25	40	20	40	20	30	18	25
333	–	–	–	–	100*	–	60*	100*	60*	100*	40	60*	30	50	25	40	20	30
500	–	–	–	–	–	–	–	–	–	–	60*	80*	50	80*	40	60*	40	50
750	–	–	–	–	–	–	–	–	–	–	80*	–	80*	–	60*	100*	–	–
1000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	100*	–	–	–

Recommended 8.3 kV Trans-Guard FX mounted in 15.5 kV drywell canister in oil (at a max. oil temp. of 100 °C)

Recommended fuse current ratings (amps)										
Fuse voltage		8.3 kV								
1-phase transformer KVA	2.4		4.16		4.8		7.2		7.62	
	A	B	A	B	A	B	A	B	A	B
75	–	80	–	–	–	–	–	–	–	–
100	65	80	–	–	–	–	–	–	–	–
167	X†	160*	65	80	–	80	–	–	–	–
250	160*	–	80	130*	80	130*	–	65	–	65
333	–	–	130*	160*	X†	160*	65	X†	65	X†
500	–	–	160*	–	160*	–	–	130*	–	130*

†X=Use an 8.3 kV Drywell Canister. See top chart for fuse recommendations.

Notes:

Column A = 140–200% of transformer rating and Column B = 200–300% of transformer rating.

Fuses recommended in bottom chart must be mounted in a 15.5kV mounting code 5 drywell canister.

Recommended fuses meet inrush criteria of 12 times transformer full load current for .1 second and 25 times transformer full load current for .01 second.

Fuses also meet cold load pickup criteria of six times transformer full load current for 1 second and three times transformer full load current for 10 seconds.

* Indicates parallel fuse applications.

a Fuse allows greater than 300% of transformer rating.

b Fuse allows greater than 200% of transformer rating.

Hi-Tech® FX full-range current-limiting fuses

Recommendations

Recommended Trans-Guard® FX mounted in a standard drywell canister in oil (at a max. oil temp. of 100 °C)

Recommended fuse current ratings (amps)

Fuse voltage	5.5 kV						8.3 kV				15.5 kV								23 kV	
3-phase transformer kVA	Transformer 3-phase voltage rating (kV) phase-to-phase																			
	2.4		4.16		4.8		7.2–7.96		8.32		12.47		13.2–14.4		20.8		22.9–24.9C		34.5C	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
15	–	6	–	3		3	–	3 ^a	–	3 ^a	–	3 ^a	–	3 ^a	–	6 ^a	–	6 ^a	–	6 ^a
22.5	8	10	–	6		6 ^a	–	3	–	3	–	3 ^a	–	3 ^a	–	6 ^a	–	6 ^a	–	6 ^a
30	10	18	–	6		6	–	6 ^a	–	3	–	3 ^a	–	3 ^a	–	6 ^a	–	6 ^a	–	6 ^a
45	18	20	8	12	8 ^b	10	–	6	–	6	–	3	–	3	–	6 ^a	–	6 ^a	–	6 ^a
75	25	40	18	20	12	18	8	12	8 ^b	10	–	6	–	6	–	6 ^a	–	6 ^a	–	6 ^a
100	40	50	20	25	18	20	12 ^b	18	10	12	–	8	6	8	–	6 ^a	–	6 ^a	–	6 ^a
112.5	40	65	20	30	20	25	12	18	12 ^b	18	8 ^b	10	–	8	–	6	–	6 ^a	–	6 ^a
150	50	80*	25	40	25	40	18	20	18	20	10	18	10 ^b	12	–	6	–	6	–	6 ^a
200	75	100*	40	65	30	50	20	30	20	25	12	20	12 ^b	18	8	10	–	8	–	6
225	80*		40	75	40	65	25	40	20	30	18	20	12	20	8	12	8	10	–	6
300	–		65	80*	50	80*	30	50	30	40	20	25	20	25	12	18	12 ^b	18	–	8
500	–		100*	–	80*	–	60*	80*	50	80*	30	50	30	40	20	25	18	25	12	18
750	–		–	–	–	–	80*	–	80*	–	50	80*	50	60*	25	40	25	40	18	25
1000	–		–	–	–	–	–	–	–	–	60*	100*	60*	80*	40	–	40	–	20	30
1500	–		–	–	–	–	–	–	–	–	–		100*	–	–	–	50	–	40	–
2000	–		–	–	–	–	–	–	–	–	–		–	–	–	–	–	–	50	–

Recommended 8.3 kV Trans-Guard FX mounted in 15.5 kV drywell canister in oil (at a max. oil temp. of 100 °C)

Recommended fuse current ratings (amps)

Fuse voltage	8.3 kV									
3-phase transformer kVA	Transformer 3-phase voltage rating (kV) phase-to-phase									
	2.4		4.16		4.8		7.2–7.96		8.32	
	A	B	A	B	A	B	A	B	A	B
112.5	–	65	–	–	–	–	–	–	–	–
150	–	80	–	–	–	–	–	–	–	–
200	80	X [†]	–	65	–	–	–	–	–	–
225	80	130*	–	65	–	65	–	–	–	–
300	130 ^{b*}	160*	65	80	–	80	–	–	–	–
500	160*	–	X [†]	160*	80	130*	65	80c	–	80 ^c
750	–	–	160*	–	130*	–	80 ^c	130*	80 ^c	130*
1000	–	–	–	–	160*	–	130*	160c*	130 ^{b*}	160 ^{c*}
1500	–	–	–	–	–	–	160 ^{c*}	–	130*	–

*X=Use an 8.3 kV drywell canister. See top chart for fuse recommendations.

Notes:

Column A = 140–200% of transformer rating and Column B = 200–300% of transformer rating.

Fuses recommended in bottom chart must be mounted in a 15.5 kV mounting code 5 drywell canister.

Recommended fuses meet inrush criteria of 12 times transformer full load current for .1 second and 25 times transformer full load current for .01 second. Fuses also meet cold load pickup criteria of 6 times transformer full load current for 1 second and 3 times transformer full load current for 10 seconds.

*Indicates parallel fuse applications.

a Fuse allows greater than 300% of transformer rating.

b Fuse allows greater than 200% of transformer rating.

c Recommendations limited to GNDY-GNDY transformers with no more than 50% delta connected secondary load. Phase-to-ground rated fuses are frequently recommended for GNDY-GNDY three phase transformers. In some cases, the fuses recommended in bottom chart may be suitable for use with transformers that are not GNDY-GNDY (contact the factory for further information).

Hi-Tech® FX full-range current-limiting fuses

Recommendations

Recommended Trans-Guard® FX mounted in air at 40 °C ambient temperature

Recommended fuse current ratings (amps)

Fuse voltage		5.5 kV					8.3 kV					15.5 kV								23 kV	
3-phase transformer kVA	Transformer 3-phase voltage rating (kV) phase-to-phase																				
	2.4		4.16		4.8		7.2–7.96		8.32		12.47		13.2–14.4		20.8		22.9–24.9C		34.5C		
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B			
15	–	6	–	3	–	3	–	3 ^a	–	3 ^a	–	3 ^a	–	3 ^a	–	6 ^a	–	6 ^a	–	6 ^a	
22.5	–	8	–	6 ^a	–	6 ^a	–	3 ^a	–	3 ^a	–	3 ^a	–	3 ^a	–	6 ^a	–	6 ^a	–	6 ^a	
30	10 ^b	12	–	6	–	6	–	6 ^a	–	3	–	3 ^a	–	3 ^a	–	6 ^a	–	6 ^a	–	6 ^a	
45	12	18	–	8	–	8	–	6 ^a	–	6 ^a	–	3	–	3	–	6 ^a	–	6 ^a	–	6 ^a	
75	20	40	12	18	12 ^b	18	–	8	–	8	–	6	–	6 ^a	–	6 ^a	–	6 ^a	–	6 ^a	
100	25	40	18	20	18	20	–	12	10 ^b	12	–	8	–	6	–	6 ^a	–	6 ^a	–	6 ^a	
112.5	30	50	20	25	18	20	12 ^b	18	–	12	–	8	–	8	–	6 ^a	–	6 ^a	–	6 ^a	
150	40	65	25	30	20	25	18	20	12	18	10 ^b	12	8 ^b	10	–	6	–	6	–	6 ^a	
200	65	80	30	50	25	40	20	25	18	20	12 ^b	18	12 ^b	18	–	8	–	8	–	6 ^a	
225	80	100	40	65	40	50	25	30	20	30	12	18	12 ^b	18	8	10	–	8	–	6	
300	80	125	50	80	40	75	25	40	25	30	18	20	18	20	–	12	10	12	–	8	
500	150	–	80	125	80	100	50	(65)	40	(65)	25	40	25	40	18	25	18	25	12 ^b	18	
750	–	–	125	200	125	150	(65)	100	(65)	(80)	40	(65)	40	(65)	25	40	20	40	18	25	
1000	–	–	200	–	150	–	100	(130)*	(80)	(130)*	(65)	100	(65)	80	30	50	30	50	20	25	
1500	–	–	–	–	–	–	(160)*	200*	(130)*	200 ^c *	100	130*	80	130*	50	–	50	–	25	50	
2000	–	–	–	–	–	–	200*	–	200 ^c *	250 ^c *	130*	200*	100	160*	–	–	–	–	40	–	
2500	–	–	–	–	–	–	–	–	–	–	160*	200*	130*	200*	–	–	–	–	50	–	
3000	–	–	–	–	–	–	–	–	–	–	200*	–	200*	–	–	–	–	–	–	–	

Notes:

Column A = 140–200% of transformer rating and Column B = 200–300% of transformer rating.

Recommended fuses meet inrush criteria of 12 times transformer full load current for .1 second and 25 times transformer full load current for .01 second.

Fuses also meet cold load pickup criteria of 6 times transformer full load current for 1 second and 3 times transformer full load current for 10 seconds.

* Indicates parallel fuse applications.

Ratings in parenthesis are 2.2"-dia. fuses (catalog numbers HTFX230065, HTFX230080 and HTFX240065).

a Fuse allows greater than 300% of transformer rating.

b Fuse allows greater than 200% of transformer rating.

c Recommendations limited to GNDY-GNDY transformers with no more than 50% delta connected secondary load. Phase-to-ground rated fuses are frequently recommended for GNDY-GNDY three phase transformers.

Hi-Tech® FX full-range current-limiting fuses

Fuse ordering information

To order the proper fuse for a particular application, first determine the correct fuse voltage and current rating using either the appropriate application table (pages 49-51)

or the published performance data (pages 46-48), the applicable TCCs and peak let-through characteristics. Then refer to the chart below to determine the appropriate catalog number.

Fuse catalog numbers

Current rating (amps)	Fuse diameter (in.)	Cat. no.			
		5.5 kV	8.3 kV	15.5 kV	23.0 kV
3	2.2	HTFX220003	HTFX230003	HTFX240003	—
6		HTFX220006	HTFX230006	HTFX240006	HTFX250006
8		HTFX220008	HTFX230008	HTFX240008	HTFX250008
10		HTFX220010	HTFX230010	HTFX240010	HTFX250010
12		HTFX220012	HTFX230012	HTFX240012	HTFX250012
18		HTFX220018	HTFX230018	HTFX240018	HTFX250018
20		HTFX220020	HTFX230020	HTFX240020	HTFX250020
25		HTFX220025	HTFX230025	HTFX240025	HTFX250025
30		HTFX220030	HTFX230030	HTFX240030	HTFX250030
40		HTFX220040	HTFX230040	HTFX240040	HTFX250040
50		HTFX220050	HTFX230050	HTFX240050	HTFX250050
60*		—	HTFX230030	HTFX240030	—
65		HTFX220065	HTFX230065	HTFX240065	—
75		HTFX220075	HTFX230075	—	—
80*		—	HTFX230080	—	—
80*		—	HTFX230040	HTFX240040	—
100*		—	HTFX230050	HTFX240050	—
130*		—	HTFX230065	—	—
160*		—	HTFX230080	—	—
65	3.3	—	HTFX330065	HTFX340065	—
80		HTFX320080	HTFX330080	HTFX340080	—
100		HTFX320100	HTFX330100	HTFX340100	—
125		HTFX320125	HTFX330125	—	—
130*		—	HTFX330065	HTFX340065	—
150		HTFX320150	—	—	—
160*		—	HTFX330080	HTFX340080	—
200		HTFX320200	—	—	—
200*		—	HTFX330100	HTFX340100	—
250*		—	HTFX330125	—	—

Notes: To order a fuse having a blown fuse indicator, replace the 7th character ("0") in the catalog number with a "1" (Example: HTFX241040).

Please note that indicator fuses are not suitable for use in drywell canister applications. Also, an indicator option is not available on 3 A fuses.

* Current ratings shown are achieved by using a parallel combination of two fuses (order two fuses).

Contact factory for ordering information concerning outdoor and under-oil fuse versions.

Hi-Tech® SX full-range current-limiting fuses

Trans-Guard® SX full-range current-limiting fuse

Provides both overload and fault current protection for distribution equipment in a single fuse body.

As a full-range fuse, this fuse is capable of interrupting any continuous current between the minimum current that can cause melting of its elements and its rated maximum interrupting current (50,000 A). The fuses are capable of interrupting in elevated ambient temperatures up to their rated maximum application temperature, which is 140 °C and 71 °C for the 2.2-inch and 3.3-inch diameter designs, respectively.

The Trans-Guard SX fuse is hermetically sealed and thus discharges no gases during fuse operation. An additional design distinction is its patented damage sensor that significantly reduces the potential for fuse failure in the event of element-damaging current surges.

- Patented damage sensor significantly reduces the risk of fuse failure should the fuse be subjected to an element damaging current surge
- Hermetically sealed construction ensures that no gases escape from the fuse during current interruption.
- All Trans-Guard SX fuses are helium mass spectrometer leak tested to ensure sealing system integrity
- Rugged machined brass end caps provide greater ferrule strength, resulting in less distortion and more secure fuse attachment in wet-well fuse holders
- Tested in accordance to ANSI/IEEE standards

Application:

Trans-Guard SX fuses are specifically designed to be installed in wet-well fuse holders for oil-filled padmounted switchgear and transformer applications (only 2.2-inch diameter designs are suitable for wet-well fuses holders mounted directly in transformers).



CAUTION: Trans-Guard SX fuses are NOT designed for any type of live switching operation.



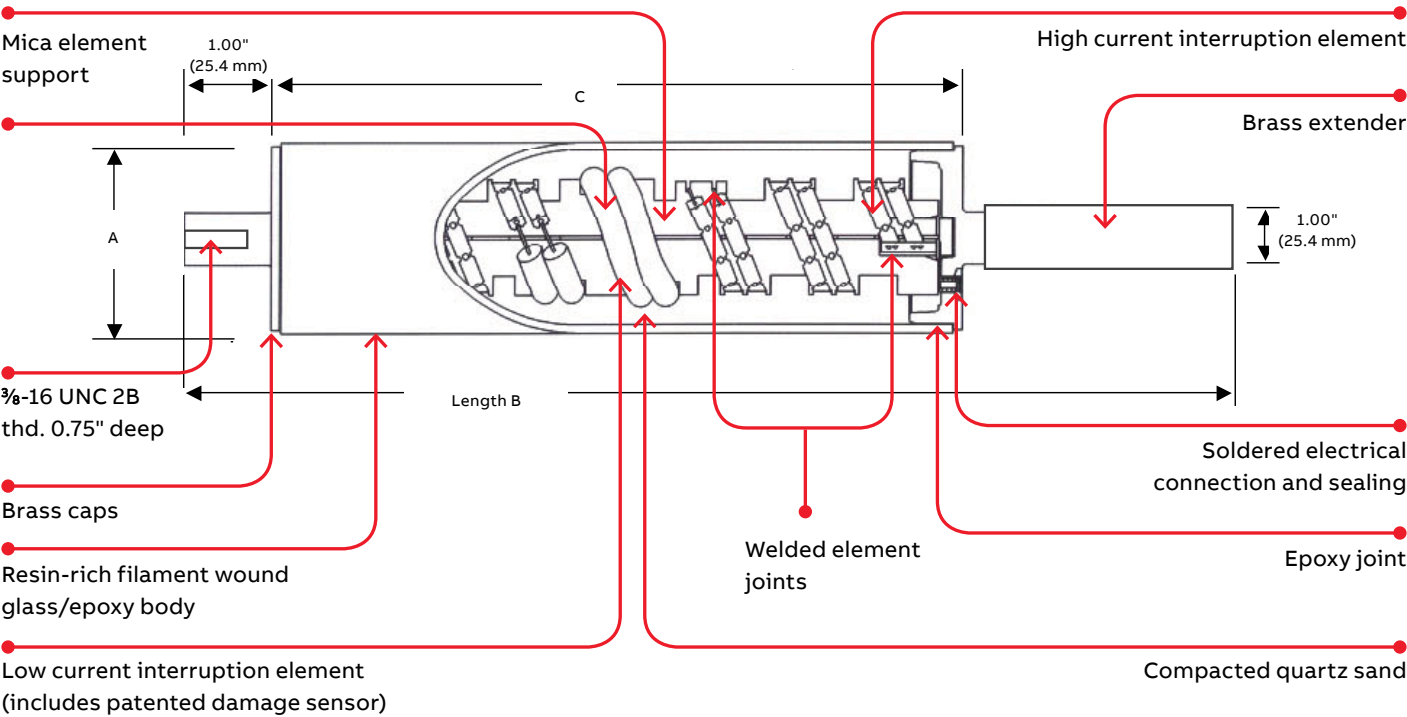
Hi-Tech® SX full-range current-limiting fuses

Construction

Dimensional information

Wet well holder (kV)	Nominal fuse voltage rating (kV)	Current rating (amps)	Dimensions in. (mm)		
			A	B	C
8.3	5.5	100–250	3.29 (83.6)	19.06 (484.1)	14.66 (372.4)
			2.22 (56.3)	19.06 (484.1)	7.93 (201.4)
		90–160	3.29 (83.6)	19.06 (484.1)	11.85 (300.1)
	15.5*	5–75	2.22 (56.3)	19.06 (484.1)	12.24 (310.9)
			3.29 (83.6)	19.06 (484.1)	14.66 (372.4)
		90–150	3.29 (83.6)	21.12 (536.4)	14.66 (372.4)
15.5	15.5	5–75	2.22 (56.3)	21.12 (536.4)	12.24 (310.9)
		90–150	3.29 (83.6)	21.12 (536.4)	14.66 (372.4)
23.0	23.0	10–65	2.22 (56.3)	21.12 (536.4)	15.05 (382.3)

* To order a 15.5 kV fuse that will fit in an 8.3 kV wet-well fuseholder, replace the 7th character ("0") in the catalog number with a "2" (example: HTSX242050). See page 57.



Hi-Tech® SX full-range current-limiting fuses

Electrical characteristics

Electrical characteristics of Trans-Guard® SX fuses

Nominal fuse voltage rating (kV)	Current rating (N2) (amps)	Fuse cat. no. (N1)	Rated maximum voltage (kV)	Maximum continuous current (in oil @ 60 °C) (N5)	Peak arc voltage (N6) (kV)	Minimum melt I ² t (amp ² -sec)	Maximum melt I ² t (N3) (N4) (amp ² -sec)
5.5	100	HTSX320100	5.5	114.0	15	22,100	110,000
	150	HTSX320150		147.0		56,700	280,000
	175	HTSX320175		172.0		78,300	380,000
	225	HTSX320225		230.0		176,000	860,000
	250	HTSX320250		253.0		259,000	1,270,000
8.3	5	HTSX230005	10.0	5.0	30	100	350
	10	HTSX230010		11.5	32	620	2,700
	12	HTSX230012		14.0	28	800	4,000
	15	HTSX230015		17.0	28	800	4,000
	20	HTSX230020		22.5	26	920	8,000
	25	HTSX230025		25.0	26	1,310	9,500
	30	HTSX230030		30.0	26	1,620	11,000
	40	HTSX230040		43.0	26	3,660	22,000
	50	HTSX230050		53.0	26	5,250	30,000
	65	HTSX230065		65.0	26	8,700	50,000
	75	HTSX230075		75.0	26	12,800	70,000
	90	HTSX330090	8.3	92.0	25	25,200	100,000
	100	HTSX330100		105.0		47,500	185,000
	150	HTSX330150		150.0		78,300	330,000
	160	HTSX330160		163.0		115,150	480,000
15.5	5	HTSX240005	17.2	5.0	51	100	510
	10	HTSX240010		11.5	54	620	2,600
	12	HTSX240012		14.0	46	800	3,700
	15	HTSX240015		17.0	46	800	3,700
	20	HTSX240020		22.5	43	920	6,500
	25	HTSX240025		25.0	45	1,310	8,000
	30	HTSX240030		30.0	45	1,620	10,000
	40	HTSX240040		43.0	45	3,660	22,000
	50	HTSX240050		53.0	45	5,250	30,000
	65	HTSX240065		65.0	45	8,700	50,000
	75	HTSX240075		75.0	45	12,800	70,000
	90	HTSX340090	15.5	98.0	40	25,200	110,000
	100	HTSX340100		117.0		39,400	185,000
	150	HTSX340150		150.0		80,000	380,000

Notes:

N1. Designs have maximum interrupting capability of 50 kA, except 17.2 kV 5A (HTSX24*005) which was tested at 44 kA.

N2. Fuses rated 75 A and below are 2.25" in diameter. Higher ratings are 3.3" in diameter.

N3. Tabulated maximum total I²t values are for currents of 50,000 A at the nominal voltage of the fuse. Fuses which have a rated maximum voltage higher than their Nominal Voltage Rating will have a higher I²t let-through when applied at voltages up to these higher values. For example, maximum total I²t values are increased by approximately 30% when 8.3 kV fuses are applied at 10 kV and approximately 25% when 15.5 kV fuses are used at 17.2 kV.

N4. Maximum total I²t values are reduced for currents below 50,000A. For example, at 10,000A, I²t values are approximately 15% less than the published values.

N5. Maximum continuous currents at different ambient temperatures: These may be determined by derating the fuses by 0.2% per degree C over 60 °C (for example at 80 °C the derating would be 20 x 0.2 = 4%, making the maximum continuous current of a 20 A fuse 22.5 x 0.96 = 21.6 A) or derating the fuses by 0.2% per degree C under 60 °C (for example, at 40 °C the derating would be 20 x 0.2 = 4%, making the maximum continuous current of a 20 A fuse 22.5 / 0.96 = 23.4 A). The long time melting current of the fuses (approximately one hour and longer) due to different ambient temperatures is the same as described above for "Maximum Continuous Currents". See time current characteristics for melting characteristics in this time region.

N6. Peak arc voltages quoted are for 50,000 A currents at the rated maximum voltage listed. Reduced currents and voltages will reduce the peak arc voltage.

Consult the factory for further information.

Hi-Tech® SX full-range current-limiting fuses

Electrical characteristics (continued)

Electrical characteristics of Trans-Guard® SX fuses (continued)

Nominal fuse voltage rating (kV)	Current rating (N2) (amps)	Fuse cat. no. (N1)	Rated maximum voltage (kV)	Maximum continuous current (in oil @ 60 °C) (N5)	Peak arc voltage (N6) (kV)	Minimum melt I ² t (amp ² -sec)	Maximum melt I ² t (N3) (N4) (amp ² -sec)
23.0	10	HTSX250010	23.0	11.5	67	620	3,100
	12	HTSX250012		14.0	61	800	4,800
	15	HTSX250015		17.0	61	800	4,800
	20	HTSX250020		22.5	60	920	8,300
	25	HTSX250025		25.0	60	1,310	11,200
	30	HTSX250030		30.0	60	1,620	13,000
	40	HTSX250040		42.0	60	3,660	28,000
	50	HTSX250050		51.0	60	5,250	38,000
	65	HTSX250065		65.0	60	8,700	61,000

Notes:

N1. Designs have maximum interrupting capability of 50 kA, except 17.2 kV 5A (HTSX24*005) which was tested at 44 kA.

N2. Fuses rated 75 A and below are 2.25" in diameter. Higher ratings are 3.3" in diameter.

N3. Tabulated maximum total I²t values are for currents of 50,000 A at the nominal voltage of the fuse. Fuses which have a rated maximum voltage higher than their Nominal Voltage Rating will have a higher I²t let-through when applied at voltages up to these higher values. For example, maximum total I²t values are increased by approximately 30% when 8.3 kV fuses are applied at 10 kV and approximately 25% when 15.5 kV fuses are used at 17.2 kV.

N4. Maximum total I²t values are reduced for currents below 50,000 A. For example, at 10,000 A, I²t values are approximately 15% less than the published values.

N5. Maximum continuous currents at different ambient temperatures: These may be determined by derating the fuses by .2% per degree C over 60 °C (for example at 80 °C the derating would be 20 x .2 = 4%, making the maximum continuous current of a 20 A fuse 22.5 x .96 = 21.6 A) or derating the fuses by .2% per degree C under 60 °C (for example, at 40 °C the derating would be 20 x .2 = 4%, making the maximum continuous current of a 20 A fuse 22.5 / .96 = 23.4 A). The long time melting current of the fuses (approximately one hour and longer) due to different ambient temperatures is the same as described above for "Maximum Continuous Currents". See time current characteristics for melting characteristics in this time region.

N6. Peak arc voltages quoted are for 50,000 A currents at the rated maximum voltage listed. Reduced currents and voltages will reduce the peak arc voltage.

Consult the factory for further information.

Hi-Tech® SX full-range current-limiting fuses

Recommendations

Recommended Trans-Guard® SX for switchgear (mounted in a wet-well fuseholder with a max. oil temp. of 60 °C)

Recommended fuse current ratings (amps)																					
Fuse voltage		(5.5 kV) 8.3 kV										15.5 kV								23 kV	
												Transformer 1-phase voltage rating (kV) phase-to-ground									
1-phase transformer kVA	2.4		4.16		4.8		7.2		7.62		12		14.4		16		19.9				
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B			
10	–	10	–	10 ^a	–	5	–	5 ^a	–	5 ^a	–	5 ^a	–	5 ^a	–	5 ^a	–	10 ^a			
15	–	12	–	10 ^a	–	10 ^a	–	5	–	5	–	5 ^a	–	5 ^a	–	5 ^a	–	10 ^a			
25	20 ^b	25	–	12	–	12	–	10 ^a	–	10 ^a	–	5	–	5 ^a	–	5 ^a	–	10 ^a			
37.5	30 ^b	40	–	20	–	20 ^a	–	12	–	12 ^a	–	10 ^a	–	10 ^a	–	10 ^a	–	10 ^a			
50	40 ^b	50	25 ^b	30	20 ^b	25	–	15	–	15	–	10	–	10 ^a	–	10 ^a	–	10 ^a			
75	50	65	30	40	30 ^b	40	20 ^b	25	–	20	–	15	–	12	–	12 ^a	–	10 ^a			
100	65	(100)	40	50	40 ^b	50	25	30	25	30	–	20	–	15	–	15	–	12			
167	(150) ^b	(175)	65	(100)	50	75	40	50	40 ^b	50	25	30	25 ^b	30	20 ^b	25	–	20			
250	(150)	(225)	(100)	(150)	75	(100)	50	75	50	65	40 ^b	50	30	40	30 ^b	40	25 ^b	30			
333	(225)	–	(150)	(175)	(150) ^b	(175)	75	90	65	90	50	65	40	50	40 ^b	50	30	40			
500	(250) ^c	–	(175)	(250)	(150)	(225)	100	150	100	150	65	90	50	75	50	65	40	50			
833	–	–	(250) ^c	–	(250)	–	160	–	160	–	100	150	90	100	75	–	65	–			
1000	–	–	–	–	(250) ^c	–	–	–	160 ^c	–	150	–	100	150	–	–	–	–			
1500	–	–	–	–	–	–	–	–	–	–	150 ^c	–	150	–	–	–	–	–			

Note: Column A = 140–200% of transformer rating and Column B = 200–300% of transformer rating. See additional notes on page 58.

Recommended Trans-Guard SX for switchgear: protecting delta connected transformers (mounted in a wet-well fuseholder with a max. oil temp. of 60 °C)

Recommended fuse current ratings (amps)																		
Fuse voltage		(5.5 kV) 8.3 kV										15.5 kV				23 kV		
		Transformer 3-phase voltage rating (kV) phase-to-phase																
3-phase transformer kVA	2.4		4.16		4.8		7.2–7.96		8.32		12.47		13.2–14.4		20.8			
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B		
15	–	10 ^a	–	5	–	5	–	5 ^a	–	5 ^a	–	5 ^a	–	5 ^a	–	10 ^a		
22.5	–	12	–	10 ^a	–	10 ^a	–	5	–	5 ^a	–	5 ^a	–	5 ^a	–	10 ^a		
30	–	15	–	10	–	10 ^a	–	10 ^a	–	5	–	5 ^a	–	5 ^a	–	10 ^a		
45	20 ^b	25	–	15	–	12	–	10	–	10 ^a	–	5	–	5	–	10 ^a		
75	30	40	20 ^b	25	–	20	–	12	–	12	–	10 ^a	–	10 ^a	–	10 ^a		
100	40	50	25	30	25 ^b	30	–	20	–	15	–	12 ^a	–	10 ^a	–	10 ^a		
112.5	40	65	30 ^b	40	25	30	–	20	–	20 ^a	–	12	–	12 ^a	–	10 ^a		
150	65	75	40 ^b	50	30	40	25 ^b	30	20 ^b	25	–	15	–	15	–	10		
200	75	(100)	50	65	40	50	30	40	25	30	–	20	–	20	–	12		
225	75	(100)	50	75	40	65	30	40	30 ^b	40	20 ^b	25	–	20	–	15		
300	(150) ^b	(175)	65	(100)	65	75	40	50	40 ^b	50	25	30	25	30	–	20		
500	(175)	(250)	(150) ^b	(175)	(100)	(150)	65	90	50	75	40	50	40 ^b	50	25	30		
750	(250)	–	(150)	(225)	(150)	(225)	90	150	75	100 ^d	50	75	50	65	40 ^b	50		
1000	–	–	(225)	–	(175)	(250)	150	160	100 ^d	150 ^d	75	90	65	90	50	65		
1500	–	–	(250) ^c	–	(250)	–	160	–	150 ^d	–	100	150	100	150	65	–		
2000	–	–	–	–	–	–	–	–	–	–	150	–	150	–	–	–		
2500	–	–	–	–	–	–	–	–	–	–	150 ^c	–	150	–	–	–		
3000	–	–	–	–	–	–	–	–	–	–	–	–	150 ^c	–	–	–		

Note: Column A = 140–200% of transformer rating and Column B = 200–300% of transformer rating. See additional notes on page 58.

Hi-Tech® SX full-range current-limiting fuses

Recommendations

Recommended Trans-Guard® SX for switchgear: Protecting GNDY-GNDY* connected transformers with less than 50% Delta connected secondary load (mounted in a wet-well fuseholder with a max. oil temp. of 60 °C)

Recommended fuse current ratings (amps)																				
Fuse voltage		(5.5 kV) 8.3 kV										15.5 kV				23 kV				
3-phase transformer kVA	Transformer 3-phase voltage rating (kV) phase-to-phase																			
	2.4		4.16		4.8		7.2–7.96		8.32		12.47		13.2–14.4		20.8		22.9–24.9		34.5	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
15	–	10 ^a	–	5	–	5	–	5 ^a	–	5 ^a	–	5 ^a	–	5 ^a	–	5 ^a		5 ^a	–	10 ^a
22.5	–	12	–	10 ^a	–	10 ^a	–	5	–	5 ^a	–	5 ^a	–	5 ^a	–	5 ^a		5 ^a	–	10 ^a
30	–	15	–	10	–	10 ^a	–	10 ^a	–	5	–	5 ^a	–	5 ^a	–	5 ^a		5 ^a	–	10 ^a
45	20 ^b	25	–	15	–	12	–	10	–	10 ^a	–	5	–	5	–	5 ^a		5 ^a	–	10 ^a
75	30	40	20 ^b	25	–	20	–	12	–	12	–	10 ^a	–	10 ^a	–	5		5	–	10 ^a
100	40	50	25	30	25 ^b	30	–	20	–	15	–	12 ^a	–	10 ^a	–	10 ^a		10 ^a	–	10 ^a
112.5	40	65	30 ^b	40	25	30	–	20	–	20 ^a	–	12	–	12 ^a	–	10 ^a		10 ^a	–	10 ^a
150	65	75	40 ^b	50	30	40	25 ^b	30	20 ^b	25	–	15	–	15	–	10		10 ^a	–	10 ^a
200	75	(100)	50	65	40	50	30	40	25	30	–	20	–	20	–	12		12	–	10 ^a
225	75	(100)	50	75	40	65	30	40	30 ^b	40	20 ^b	25	–	20	–	15		12	–	10 ^a
300	(150) ^b	(175)	65	(100)	65	75	40	50	40 ^b	50	25	30	25	30	–	20		20 ^a	–	12
500	(175)	(250)	(150) ^b	(175)	(100)	(150)	65	(100)	50	75	40	50	40 ^b	50	25	30	25 ^b	30	–	20
750	(250)	–	(150)	(225)	(150)	(225)	(100)	(150)	75	(100)	50	75	50	65	40 ^b	50	40 ^b	50	25 ^b	30
1000	–	–	(225)	–	(175)	(250)	(150)	(175)	(150) ^b	(175)	75	90	65	90 ^d	50	65	40	50	30	40
1500	–	–	(250) ^c	–	(250)	–	(175)	(250)	(150)	(225)	100	150	100 ^d	150 ^d	65	90	65	75	40	50
2000	–	–	–	–	–	–	(225)	–	(225)	–	150	–	150 ^d	–	75	100	75	90	50	–
2500	–	–	–	–	–	–	(250) ^c	–	(250)	–	160	–	150 ^d	–	100	150	90	150	65	–
3000	–	–	–	–	–	–	–	–	–	–	160 ^c	–	–	–	150		100	150	–	–

* Phase-to-ground rated fuses are commonly used for gndY/gndY connected transformers having no more than 50% delta connected secondary load.

Notes:

1. Column A = 140–200% of transformer rating and Column B = 200–300% of transformer rating.
2. Recommended fuses meet inrush criteria of 12 times transformer full load current for .1 second and 25 times transformer full load current for .01 second. Fuses also meet cold load pickup criteria of 6 times transformer full load current for 1 second and 3 times transformer full load current for 10 seconds.
3. Ratings in parentheses are 5.5 kV rated fuses.
- a Fuse allows more than 300% of transformer rating.
- b Fuse allows more than 200% of transformer rating.
- c Fuse allows at least 125% of transformer rating.
- d 15.5 kV fuse must be used for voltages over 8.32 kV for delta configurations or 13.8 kV gndY/8.32 kV.

Hi-Tech® SX full-range current-limiting fuses

Trans-Guard® SX fuse ordering information

To order the proper fuse for a particular application, first determine the correct fuse voltage and current rating using the published performance data (pages 55-56). Then refer to the

chart below to determine the appropriate catalog number. Alternatively, fuse selection can be determined using the accompanying charts on pages 57-58.

Ordering information for Trans-Guard SX fuses

Continuous current rating (amps)	Cat. no.			
	5.5 kV	8.3 kV	15.5 kV	23.0 kV
5	—	HTSX230005	HTSX240005	—
10	—	HTSX230010	HTSX240010	HTSX250010
12	—	HTSX230012	HTSX240012	HTSX250012
15	—	HTSX230015	HTSX240015	HTSX250015
20	—	HTSX230020	HTSX240020	HTSX250020
25	—	HTSX230025	HTSX240025	HTSX250025
30	—	HTSX230030	HTSX240030	HTSX250030
40	—	HTSX230040	HTSX240040	HTSX250040
50	—	HTSX230050	HTSX240050	HTSX250050
65	—	HTSX230065	HTSX240065	HTSX250065
75	—	HTSX230075	HTSX240075	—
90	—	HTSX330090	HTSX340090	—
100	HTSX320100	HTSX330100	HTSX340100	—
150	HTSX320150	HTSX330150	HTSX340150	—
160	—	HTSX330160	—	—
175	HTSX320175	—	—	—
225	HTSX320225	—	—	—
250	HTSX320250	—	—	—

Note: To order a 15.5 kV fuse that will fit in an 8.3 kV wet-well fuseholder, replace the 7th character ("0") in the catalog number with a "2" (example: HTSX242050).

Important notice when using Trans-Guard SX fuses

When replacing the obsolete AB Chance SL fuse with a Hi-Tech Trans-Guard SX fuse, it is important to recognize that the SX fuse designs should not be used on distribution systems where the primary line-to-line voltage exceeds the rated maximum voltage of the fuse as shown in the chart to the right:

This should be considered when choosing a proper replacement for the AB Chance SL fuse as they were, in some cases, used on systems having line-to-line voltages greater than that of the current-limiting fuse component of the assembly.

Again, when choosing the appropriate Hi-Tech SX fuse to replace the AB Chance SL fuse, care must be taken to ensure that the rated maximum voltage of the SX fuse exceeds the system line-to-line voltage.

The only exception to this requirement is when all the transformers that are downstream from the switches where the SX fuses are to be installed are GNDY-GNDY connected with less than 50% delta connected secondary load. In that case, a fuse having a rated maximum voltage exceeding the system line-to-neutral voltage may be used.

Trans-Guard SX

Nominal fuse voltage rating (kV)	Current rating (amps)	Rated maximum voltage (kV)
5.5	100–250	5.5
8.3	5–75	10.0
	90–160	8.3
15.5	5–75	17.2
	90–150	15.5
23.0	10–65	23.0

Hi-Tech® EX full-range current-limiting fuses

Trans-Guard® EX full-range current-limiting capacitor fuses

The Trans-Guard EX full-range current-limiting capacitor fuse provides both low and high current fault protection in a single, compact fuse body.

—
01 Outdoor use
—
02 Indoor use

- Lowest total I^2t let-throughs in the industry provide maximum protection for banks by minimizing energy let-through during a fault
- Higher melt I^2t 's make fuses less susceptible to damaging current surges
- Hermetically sealed design produces no expulsion products or noise during operation and has no flying parts, making it easy to mount the fuse in confined areas
- Blown fuse indicator makes it easy to see when a fuse has operated, helping to locate failed capacitor banks
- Patented damage sensor significantly reduces the potential for fuse failure in the event an element damaging current surge occurs
- Rigorous testing to meet ANSI/IEEE standards, including 100% physical inspection, resistance measurement and helium mass spectrometer leak testing
- High fault current interrupting capability – 50,000 A symmetrical
- Bushing and bus mount options available for indoor and outdoor applications



—
01

—
02

Hi-Tech® EX full-range current-limiting fuses

Blown fuse indicator

—

01 Before operation

—

02 After operation

As a full-range fuse, the Trans-Guard® EX is capable of interrupting any current that causes melting up to its rated maximum interrupting current of 50 kA. Its ability to significantly limit energy let-through during a fault greatly reduces the likelihood of disruptive equipment failures. The blown fuse indicator makes it easy to see when a fuse has operated, helping to locate failed capacitor banks.

The Indoor versions of the Trans-Guard EX current-limiting capacitor fuses are used in metal-enclosed capacitor banks, harmonic filter banks and padmounted capacitor banks. Outdoor versions are coated with an oven-baked UV acrylic paint and are used in open rack-mounted systems. All Trans-Guard EX fuses provide protection

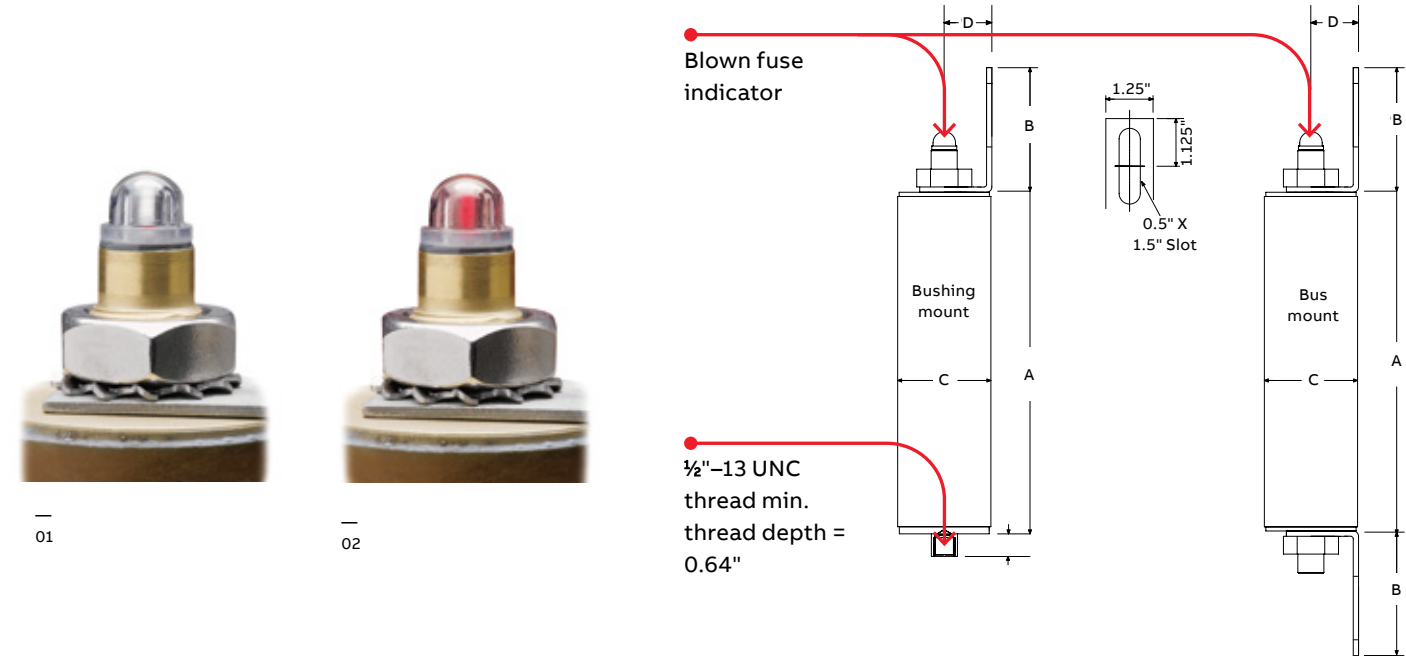
against disruptive equipment failures, such as a case rupture, when a dielectric or non-dielectric fault occurs within the capacitor. Fuses are sized to withstand transient inrush currents associated with back-to-back capacitor bank switching.

The Trans-Guard EX fuse is hermetically sealed so no external expulsion gases are produced during interruption and it has no moving parts. This makes it ideal for bus-mounting or bushing-mounting, and both indoor and outdoor versions are available. An additional design distinction is its patented damage sensor which significantly reduces the potential for fuse failure in the event of element-damaging current surges.

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Dimensional information

Rated maximum voltage (kV)	Current rating (amps)	Dimensions in. (mm)			
		Fuse length "A"	Tag length "B"	Fuse diameter "C"	Tag offset "D"
5.5	6–75	8.0 (203)	2.9 (74)	2.2 (56)	1.125 (29)
	80–200	14.7 (373)	2.5 (64)	3.3 (84)	1.75 (44)
8.3	6–50	8.0 (203)	2.9 (74)	2.2 (56)	1.125 (29)
	65–125	11.9 (302)	2.5 (64)	3.3 (84)	1.75 (44)
15.5	6–50	12.3 (312)	2.9 (74)	2.2 (56)	1.125 (29)
	65–100	14.7 (373)	2.5 (64)	3.3 (84)	1.75 (44)
23.0	6–50	15.1 (384)	2.9 (74)	2.2 (56)	1.125 (29)



Hi-Tech® EX full-range current-limiting fuses

Ordering information and electrical characteristics

Fuse ordering and electrical characteristic information

Rated maximum voltage (kV)	Current rating (amps)	Indoor cat. no.		Outdoor cat. no.		Minimum melt I ² t (A ² sec)	Maximum total I ² t (A ² sec)
		Bus mount	Bushing mount	Bus mount	Bushing mount		
5.5	6	HTEX22T006	HTEX22D006	HTEX22U006	HTEX22C006	620	2,700
	8	HTEX22T008	HTEX22D008	HTEX22U008	HTEX22C008	800	4,000
	10	HTEX22T010	HTEX22D010	HTEX22U010	HTEX22C010	800	4,000
	12	HTEX22T012	HTEX22D012	HTEX22U012	HTEX22C012	920	8,000
	18	HTEX22T018	HTEX22D018	HTEX22U018	HTEX22C018	1,310	9,500
	20	HTEX22T020	HTEX22D020	HTEX22U020	HTEX22C020	1,620	11,000
	25	HTEX22T025	HTEX22D025	HTEX22U025	HTEX22C025	3,660	22,000
	30	HTEX22T030	HTEX22D030	HTEX22U030	HTEX22C030	5,250	30,000
	40	HTEX22T040	HTEX22D040	HTEX22U040	HTEX22C040	8,700	50,000
	50	HTEX22T050	HTEX22D050	HTEX22U050	HTEX22C050	12,800	70,000
	65	HTEX22T065	HTEX22D065	HTEX22U065	HTEX22C065	20,500	95,000
	75	HTEX22T075	HTEX22D075	HTEX22U075	HTEX22C075	30,200	129,000
	80	HTEX32T080	HTEX32D080	HTEX32U080	HTEX32C080	22,100	110,000
	100	HTEX32T100	HTEX32D100	HTEX32U100	HTEX32C100	56,700	280,000
	125	HTEX32T125	HTEX32D125	HTEX32U125	HTEX32C125	78,300	380,000
	150	HTEX32T150	HTEX32D150	HTEX32U150	HTEX32C150	176,000	860,000
	200	HTEX32T200	HTEX32D200	HTEX32U200	HTEX32C200	259,000	1,270,000
8.3	6	HTEX23T006	HTEX23D006	HTEX23U006	HTEX23C006	620	2,700
	8	HTEX23T008	HTEX23D008	HTEX23U008	HTEX23C008	800	4,000
	10	HTEX23T010	HTEX23D010	HTEX23U010	HTEX23C010	800	4,000
	12	HTEX23T012	HTEX23D012	HTEX23U012	HTEX23C012	920	8,000
	18	HTEX23T018	HTEX23D018	HTEX23U018	HTEX23C018	1,310	9,500
	20	HTEX23T020	HTEX23D020	HTEX23U020	HTEX23C020	1,620	11,000
	25	HTEX23T025	HTEX23D025	HTEX23U025	HTEX23C025	3,660	22,000
	30	HTEX23T030	HTEX23D030	HTEX23U030	HTEX23C030	5,250	30,000
	40	HTEX23T040	HTEX23D040	HTEX23U040	HTEX23C040	8,700	50,000
	50	HTEX23T050	HTEX23D050	HTEX23U050	HTEX23C050	12,800	70,000
	65	HTEX33T065	HTEX33D065	HTEX33U065	HTEX33C065	25,200	100,000
	80	HTEX33T080	HTEX33D080	HTEX33U080	HTEX33C080	47,200	185,000
	100	HTEX33T100	HTEX33D100	HTEX33U100	HTEX33C100	78,300	330,000
	125	HTEX33T125	HTEX33D125	HTEX33U125	HTEX33C125	115,150	480,000

Hi-Tech® EX full-range current-limiting fuses

Ordering information, electrical characteristics and fuse selection

Fuse ordering and electrical characteristic information (continued)

Rated maximum voltage (kV)	Current rating (amps)	Indoor cat. no.		Outdoor cat. no.		Minimum melt I ² t (A ² sec)	Maximum total I ² t (A ² sec)
		Bus mount	Bushing mount	Bus mount	Bushing mount		
15.5	6	HTEX24T006	HTEX24D006	HTEX24U006	HTEX24C006	620	2,600
	8	HTEX24T008	HTEX24D008	HTEX24U008	HTEX24C008	800	3,700
	10	HTEX24T010	HTEX24D010	HTEX24U010	HTEX24C010	800	3,700
	12	HTEX24T012	HTEX24D012	HTEX24U012	HTEX24C012	920	6,500
	18	HTEX24T018	HTEX24D018	HTEX24U018	HTEX24C018	1,310	8,000
	20	HTEX24T020	HTEX24D020	HTEX24U020	HTEX24C020	1,620	10,000
	25	HTEX24T025	HTEX24D025	HTEX24U025	HTEX24C025	3,660	22,000
	30	HTEX24T030	HTEX24D030	HTEX24U030	HTEX24C030	5,250	30,000
	40	HTEX24T040	HTEX24D040	HTEX24U040	HTEX24C040	8,700	50,000
	50	HTEX24T050	HTEX24D050	HTEX24U050	HTEX24C050	12,800	70,000
	65	HTEX34T065	HTEX34D065	HTEX34U065	HTEX34C065	25,200	110,000
	80	HTEX34T080	HTEX34D080	HTEX34U080	HTEX34C080	39,400	185,000
	100	HTEX34T100	HTEX34D100	HTEX34U100	HTEX34C100	80,000	380,000
23	6	HTEX25T006	HTEX25D006	HTEX25U006	HTEX25C006	620	3,100
	8	HTEX25T008	HTEX25D008	HTEX25U008	HTEX25C008	800	4,800
	10	HTEX25T010	HTEX25D010	HTEX25U010	HTEX25C010	800	4,800
	12	HTEX25T012	HTEX25D012	HTEX25U012	HTEX25C012	920	8,300
	18	HTEX25T018	HTEX25D018	HTEX25U018	HTEX25C018	1,310	11,200
	20	HTEX25T020	HTEX25D020	HTEX25U020	HTEX25C020	1,620	13,000
	25	HTEX25T025	HTEX25D025	HTEX25U025	HTEX25C025	3,660	28,000
	30	HTEX25T030	HTEX25D030	HTEX25U030	HTEX25C030	5,250	38,000
	40	HTEX25T040	HTEX25D040	HTEX25U040	HTEX25C040	8,700	61,000
	50	HTEX25T050	HTEX25D050	HTEX25U050	HTEX25C050	12,800	82,000

Fuse selection

The fuse current rating should be greater than 1.5 x capacitor rated current. This 50% protective margin accounts for normal overvoltages, harmonics and capacitor tolerances.

Example: The rated current for a single-phase 150 kVAR 4.16 kV capacitor is 150 kVAR/4.16 kV = 36 A. Multiplying by the protective margin factor gives 36 A x 1.5 = 54 A. A 65 A fuse should therefore be used.

To select the proper fuse for a single-phase capacitor application, please refer to the table below.

Single-phase capacitor fuse recommendations

Fuse voltage rating (kV)	Capacitor voltage rating (V)	Fuse current rating						
		50 kVAR	100 kVAR	150 kVAR	200 kVAR	300 kVAR	400 kVAR	500 kVAR
5.5	2.4–2.77	30	65	100	125	200*	–	–
	4.16	18	40	65	75	125	150*	200*
	4.8	18	40	50	65	100	125	200*
8.3	6.64	12	25	40	50	80	100	125
	7.2	12	25	40	50	65	100	125
	7.62–7.96	10	20	30	40	65	80	100
	8.32	10	18	30	40	65	80	100
15.5	9.96	8	18	25	30	50	65	80
	12.47–14.4	6	12	18	25	40	50	65
23.0	19.9–21.6	6	8	12	18	25	30	40

Note: All fuses meet "safe zone" tank rupture curves for type EX or equivalent capacitors unless denoted *.

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