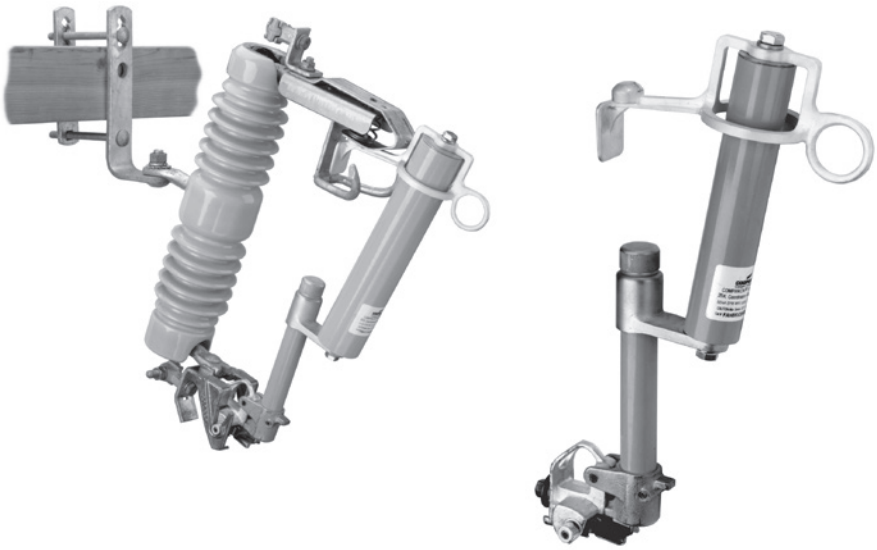
Fusing Equipment
Catalog Data
CA132028EN

Effective June 2019
Supersedes May 2019

COOPER POWER SERIES

Tandem ELF current-limiting dropout fuse



General

Eaton designs its Cooper Power™ series Tandem ELF™ current-limiting fuse for transformer protection. The Tandem ELF fuse can be applied for fusing single-phase transformers and for fusing three-phase transformers (or three-phase banks of single-phase transformers). This fuse combines the features of a series fuse link and a backup current-limiting fuse in one convenient package. The Tandem ELF fuse (left) includes a unique design for fast replacement of the backup current-limiting fuse after a high fault current operation. The fuse link holder is accessible for replacement of the fuse link after a low fault current operation or excessive transformer overload current.

The fuse link holder of the Tandem ELF is specifically designed to accommodate standard Eaton's Cooper Power series Type D (D-Link) and Eaton's Cooper Power series Kearney™ Type X (X-Link) high surge current fuse links. These fuse links make it possible to protect the transformer from damage due to overload, and at the same time gain increased surge current withstand capability over conventional fuse links to help eliminate nuisance fuse blowings.

The Tandem ELF fuse uses Eaton's Cooper Power series Companion™ II backup current-limiting fuse (reference CA132021EN for more detailed information) to interrupt high magnitude fault currents. The backup current-limiting fuse also limits the amount of energy let-through to the transformer, which prevents the possibility of a catastrophictank rupture.

Transformer overload protection

The Tandem ELF fuse offers the ability to protect the transformer from damaging overload currents. The availability of a wide range of ampere rated Type D and Type X fuse links allows for the selection of a fuse link that has a melting characteristic that closely matches the ANSI® safe loading curve for the respective transformer. This allows for proper transformer protection, even for smaller kVA rated transformers.

Powering Business Worldwide

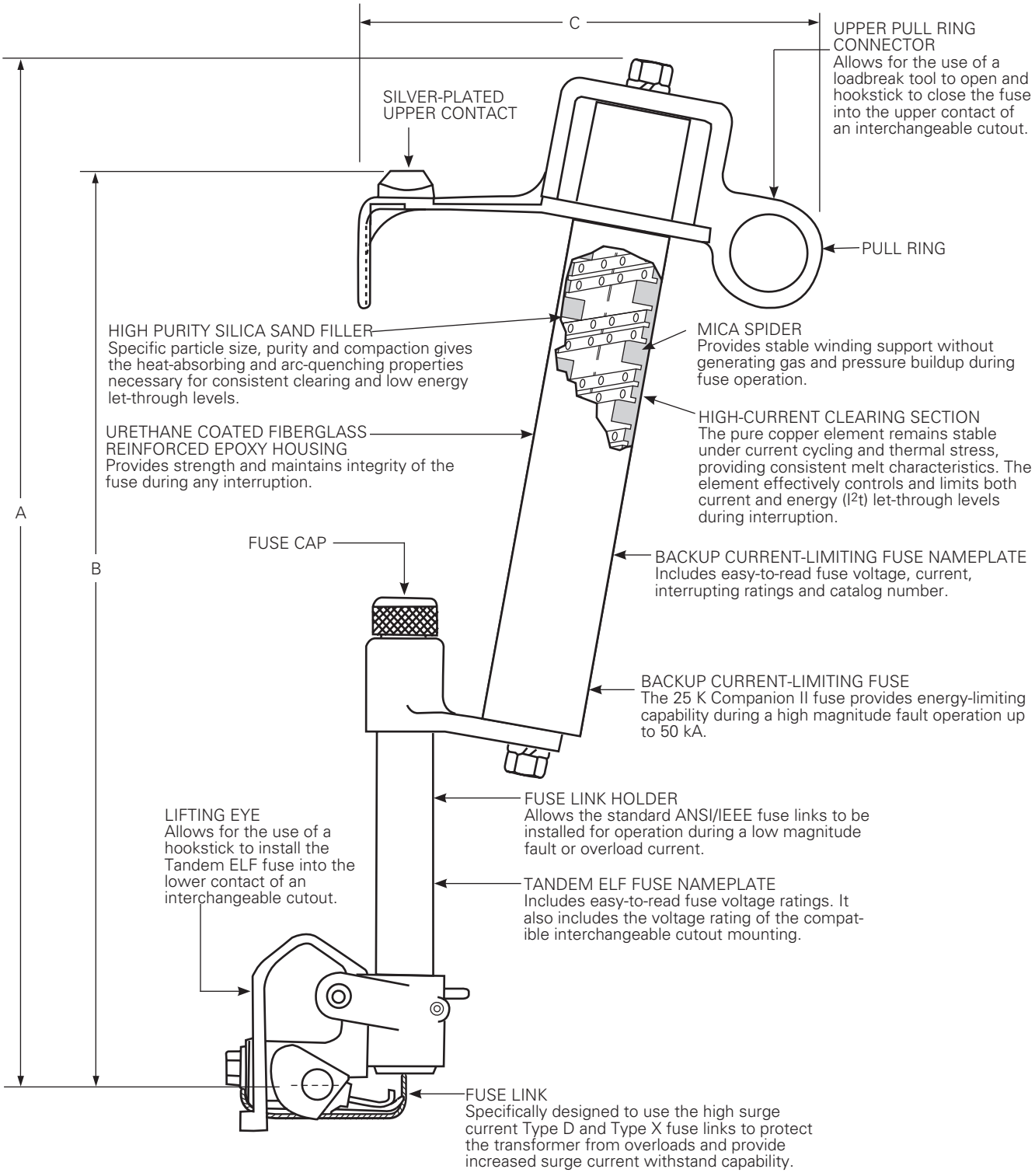


Figure 1. Line illustration of Tandem ELF fuse with dimensions. (Refer to Table 2.)

Surge durability and improved transformer protection

The Tandem ELF fuse is a surge durable transformer fuse particularly well suited for applications in high isokeraunic areas where there is a high probability of lightning surges. When it is used with the surge durable D-Link or Kearney X-Link, the unit can withstand high surge currents that might be discharged through a surge arrester. Therefore, the surge arrester can be connected on the load side of the fuse and closer to the transformer. This shortens the lead length to the arrester and provides the best overvoltage protection. In this configuration, the Tandem ELF fuse is actually protecting the arrester as well as the transformer. This would not be possible with similar ampere ratings of conventional type links because of the high probability of damage due to the lightning surge current passing through the link. The benefits of high surge current withstand capability of the D-Link and X-Link are achieved without sacrificing the ability of the fuse links to provide overload protection for the transformer.

Enhanced power quality and improved service continuity

The Tandem ELF current-limiting fuse will enhance power quality of the system and improve the service continuity during high magnitude faults due to operation of the backup current-limiting fuse. The duration of the voltage dip associated with system short circuits will be limited to the short melt time of the current-limiting section of the Tandem ELF fuse. Immediately after melting, the arc voltage generated by the current-limiting fuse will support system voltage until the fault is interrupted by the fuse. For high fault currents, the duration of the voltage dip associated with the melt time of the current-limiting fuse will be well within the allowable limits for sensitive electronic equipment as defined by CBEMA curves.

Minimizes equipment damage

The Tandem ELF's backup current-limiting fuse will interrupt high magnitude fault currents while also limiting the amount of current and energy let-through to the transformer. The backup current-limiting fuse will limit the let-through current to minimize the possibility of transformer tank rupture from high magnitude internal faults or to minimize damage to the tank or bushing that might result from bushing flashovers.

Installation

The Tandem ELF fuse is designed to be mounted in 15 kV rated 110 kV BIL or 27 kV rated 125 kV and 150 kV BIL interchangeable open distribution cutouts. The applicable interchangeable cutouts include Eaton's Type L, S&C Type XS™, Hubbell Power Systems Type C™, and ABB Type ICX™. The Tandem ELF fuse is easily single hotstick installed due to its small size. Refer to *MN132029EN Tandem ELF Current-Limiting Dropout Fuse Installation Instructions* for more information on the installation and refusing instructions.

Production tests

Tests are conducted on 100% of production Tandem ELF fuses in accordance with Eaton requirements.

- Physical Inspection
- I^2t Testing of Companion II Backup Current-limiting fuses
- Resistance Testing of Companion II Backup Current-limiting fuses
- Helium Mass Spectrometer Leak Testing of Companion II Backup Current-limiting fuses

Application

Voltage rating selection

The Tandem ELF fuse has voltage ratings compatible with most common distribution voltages. The most common distribution voltages for different transformer connections are shown in Table 3. For system voltages other than those listed, consult your Eaton representative.

Current rating selection

The current rating for the Tandem ELF fuse is dependent on the selected fuse link. Table 4 shows the recommendations for the selection of the Type D and Type X fuse link in single-phase and three-phase applications.

Table 1. Tandem ELF Fuse - Electrical characteristics

Voltage Class (kV)	Three-Phase Voltage Rating (kV)	Single-Phase Voltage Rating (kV)	Minimum Melt I2t (kA2sec)	Maximum Clear I2t (kA2sec)	Maximum Interrupting Current (kA rms Symmetrical)
15	15	8.3	8	45	50
27	29	17.2	8	45	43
27	34.5Y	23	8	45	31

Table 2. Tandem ELF Fuse - Dimensional data (Refer to Figure 1) in Inches (mm)

Cutout Rating Voltage/BIL Rating (kV)	Tandem ELF Voltage Class (kV)	A	B	C
15/95 & 110	15	12.93 (329)	11.40 (289)	7.47 (190)
27/125 & 150	15	16.43 (417)	14.90 (378)	7.47 (190)
27/125 & 150	27	16.43 (417)	14.90 (378)	7.47 (190)

Table 3. Tandem ELF Fuse voltage application

System Voltage (kV)		Recommended Tandem ELF Voltage Class Rating (kV)	
Nominal	Maximum	Wye	Delta
2.4	2.54	—	15
2.4/4.16	2.54/4.4	15	—
4.16	4.4	—	15
4.8	5.1	—	15
4.8/8.32	5.1/8.8	15	—
6.9	7.26	—	15
6.93/12.0	7.3/12.7	15	—
7.2	7.62	—	15
7.2/12.47	7.62/13.2	15	—
7.62	8.1	—	15
7.62/13.2	8.1/14.0	15	—
7.97	8.4	—	15
7.97/13.8	8.4/14.5	15	—
8.32	8.8	—	15
8.32/14.4	8.8/15.2	15	—
12/20.8	12.7/22.0	27	—
12.47	13.2	—	15*
13.2/22.9	14/24.2	27	—
13.2	13.9	—	15*
13.8	14.5	—	15*
14.4/24.9	15.2/26.4	27	—
14.4	15.2	—	15*
23.0	24.3	—	27*
14.4	15.2	—	15*
19.94/34.54	21.1/36.5	27	—
23.0	24.3	—	27*

* For single phase applications on delta systems, one Tandem ELF fuse of this rating is required in each phase.

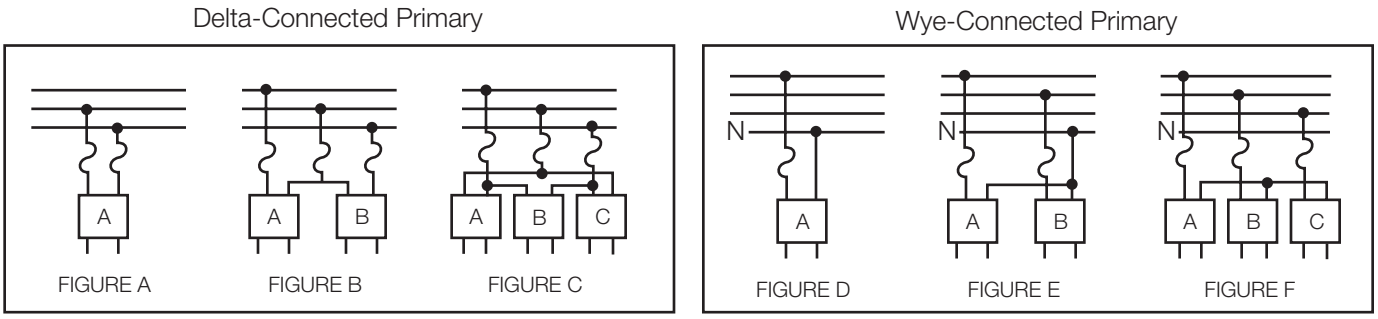


Figure 2. Schematic of primary voltage system connections.

Table 4. Type D and Type X Fuse Link* Recommendations for Distribution Transformers in Single-Phase and Three-Phase Applications (Refer to Figure 2 for primary voltage connections)

Transformer Size per phase (kVA)	2400 Δ				2400/4160Y		4800 Δ				4800/8320Y	
	Figs. A and B		Fig. C		Figs. D, E and F		Figs. A and B		Fig. C		Figs. D, E and F	
	Rated Amps	Link Rating	Rated Amps	Link Rating	Rated Amps	Link Rating	Rated Amps	Link Rating	Rated Amps	Link Rating	Rated Amps	Link Rating
5	2.08	3	3.61	5	2.08	3	1.04	1.25	1.80	3	1.04	1.25
10	4.17	5	7.22	10	4.17	5	2.08	3	3.61	5	2.08	3
15	6.25	7	10.83	15	6.25	7	3.13	4	5.41	7	3.13	4
25	10.42	15	18.04	20	10.42	15	5.21	7	9.02	10	5.21	7
37.5	15.63	20	27.06	—	15.63	20	7.81	10	13.53	15	7.81	10
50	20.83	—	36.08	—	20.83	—	10.42	15	18.04	20	10.42	15
75	31.25	—	54.13	—	31.25	—	15.63	20	27.06	—	15.63	20

Transformer Size per phase (kVA)	7200 Δ				7200/12470Y		7620/13200Y		7970/13800Y		12000 Δ			
	Figs. A and B		Fig. C		Figs. D, E and F		Figs. D, E and F		Figs. D, E and F		Figs. A and B		Fig. C	
	Rated Amps	Link Rating	Rated Amps	Link Rating	Rated Amps	Link Rating	Rated Amps	Link Rating	Rated Amps	Link Rating	Rated Amps	Link Rating	Rated Amps	Link Rating
5	.69	.75	1.20	1.5	.69	.75	.66	.75	.63	.75	.42	.5	.72	1
10	1.39	1.50	2.41	3	1.39	1.50	1.31	1.50	1.25	1.50	.83	1	1.44	2
15	2.08	3	3.61	5	2.08	3	1.97	3	1.88	3	1.25	1.5	2.17	3
25	3.47	5	6.01	7	3.47	5	3.28	4	3.14	4	2.08	3	3.61	5
37.5	5.21	7	9.02	10	5.21	7	4.92	5	4.71	5	3.13	4	5.41	7
50	6.94	10	12.03	15	6.94	10	6.56	7	6.27	7	4.17	5	7.22	10
75	10.42	15	18.04	20	10.42	15	9.84	10	9.41	10	6.25	7	10.83	15
100	13.89	20	24.06	—	13.89	20	13.12	15	12.55	15	8.33	10	14.43	20
167	23.19	—	40.17	—	23.19	—	21.91	—	20.95	—	13.92	20	24.10	—

Transformer Size per phase (kVA)	12000/20800Y				13200 Δ		14400 Δ				14400/24940Y		19.9/34.5Y	
	Figs. D, E and F		Figs. A and B		Fig. C		Figs. A and B		Fig. C		Figs. D, E and F		Figs. D, E and F	
	Rated Amps	Link Rating	Rated Amps	Link Rating	Rated Amps	Link Rating	Rated Amps	Link Rating	Rated Amps	Link Rating	Rated Amps	Link Rating	Rated Amps	Link Rating
5	.42	.5	.38	.50	.66	.75	.35	.50	.60	.75	.35	.50	.25	.5
10	.83	1	.76	1	1.31	1.50	.69	.75	1.50	1.50	.69	.75	.50	.75
15	1.25	1.5	1.14	1.25	1.97	3	1.04	1.25	1.80	3	1.04	1.25	1.26	1.5
25	2.08	3	1.89	3	3.28	4	1.74	3	3.01	4	1.74	3	1.88	3
37.5	3.13	4	2.84	4	4.92	5	2.60	4	4.51	5	2.60	4	2.51	4
50	4.17	5	3.79	5	6.56	7	3.47	5	6.01	7	3.47	5	3.77	5
75	6.25	7	5.68	7	9.84	10	5.21	7	9.02	10	5.21	7	5.03	7
100	8.33	10	7.58	10	13.12	15	6.94	10	12.03	15	6.94	10	8.39	10
167	13.92	20	12.65	15	21.91	—	11.60	15	20.09	—	11.60	15	—	—
250	20.83	—	18.94	20	—	—	17.36	20	—	—	—	—	—	—

Notes: Table shows recommended fuse ratings based on the use of Tandem ELF fuse time current characteristics defined in R240-91-46, June 2010. Recommendations provide overload protection (fusing ratio) between 200% and 300% rated load.

$$\text{Fusing Ratio} = \frac{\text{Fuse Min. Melt Current @ 300 sec.}}{\text{Transformer Full Load Current}} \times 100$$

*Kearney Type X fuse links for 1/3 through 2 A ratings and Type D fuse links for 3 through 20 A ratings.

Ordering information

Selecting a catalog number

To select a catalog number, determine the Tandem ELF fuse voltage and current rating from the APPLICATION SECTION on page 3.

For Tandem ELF fuse ordering (including fuse link), choose the base catalog number from Table 5 and complete the number by selecting the appropriate fuse link code from Table 6.

Example:

T4B25KD To select a 15 kV Class Tandem ELF fuse with a 5 A fuse link for a 95 kV or 110 kV BIL interchangeable cutout.

Table 5. Tandem ELF Fuse - Catalog Numbers (Includes all parts shown in Figure 3)

Cutout Rating Voltage/BIL Rating (kV)	Tandem ELF Voltage Class (kV)	Voltage Rating (kV)		Interrupting Rating (kA Sym.)	Tandem ELF Fuse Catalog Number		Weight lbs (kg)
		Three-Phase	Single-Phase		Base Catalog Number	Fuse Link Code Digits 6 and 7†	
15/95 & 110	15	15	8.3	50	T4B25	Refer to Table 6	3.58 (1.62)
27/125 & 150	15	15	8.3	50	T4C25	Refer to Table 6	3.65 (1.65)
27/125 & 150	27	27	17.2	43	T9C25	Refer to Table 6	5.19 (2.35)
27/125 & 150	27	27	23	31	T9D25	Refer to Table 6	5.19 (2.35)

† To order a Tandem ELF fuse without a Type D or Type X fuse link, leave digits 6 and 7 blank and order the base catalog number in Table 5.

Table 6. Tandem ELF Fuse - Fuse link Current Rating Selection

Current Rating (A)	Fuse Link Code†	Fuse Link Catalog Number ONLY
.33	AX	41033
.50	BX	41050
.75	CX	41075
1	DX	41100
1.25	EX	41125
1.5	FX	41150
2	GX	41200
3	HD	FL3D3
4	JD	FL3D4
5	KD	FL3D5
7	LD	FL3D7
10	MD	FL3D10
15	ND	FL3D15
20	PD	FL3D20

† Add the fuse link code to the end of the base catalog number in Table 5.

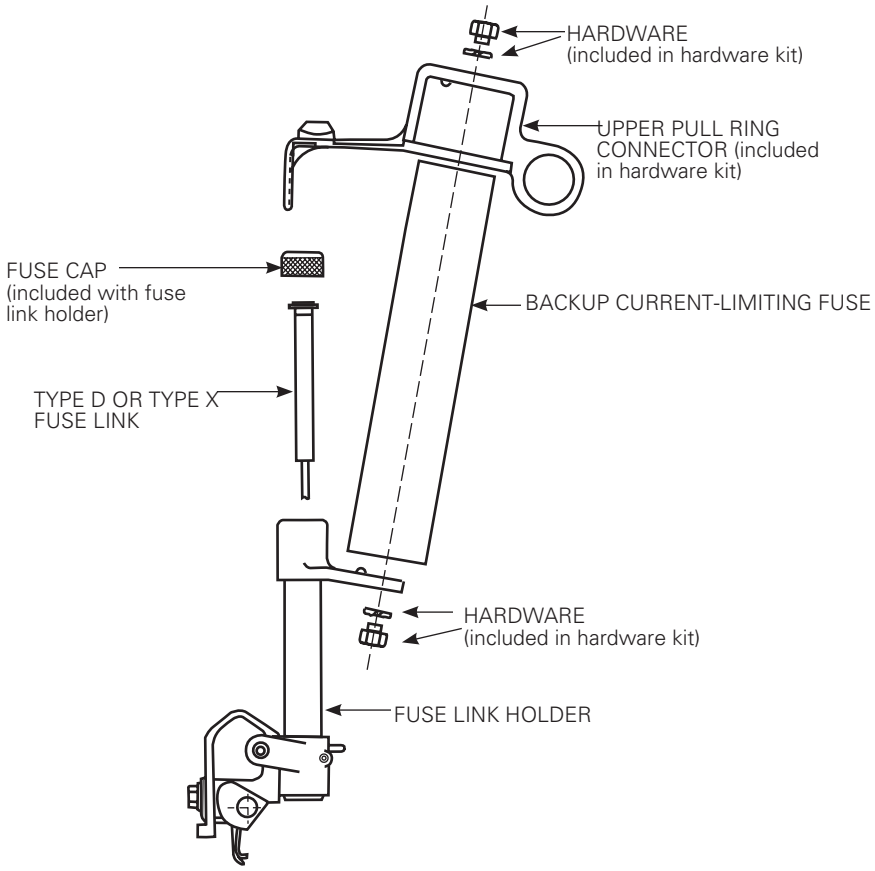


Figure 3. Tandem ELF fuse parts.

Table 7. Tandem ELF Fuse - Replacement parts only

Cutout Rating Voltage/BIL Rating (kV)	Tandem ELF Voltage Class (kV)	Fuse Link Holder Catalog Number	Backup Current-Limiting Fuse Catalog Number	Hardware Kit* Catalog Number
15/95 & 110	15	T4B00	FAH8KV25KR1	THWKIT
27/125 & 150	15	T4C00	FAH8KV25KR1	THWKIT
27/125 & 150	27	T9C00	FAH17KV25KR1	THWKIT
27/125 & 150	27	T9D00	FAH23kV12KR1	THWKIT

* Hardware kit includes one upper pull ring connector, two bolts and two lock washers for installing the backup current-limiting fuse.

New installations includes Type L cutout mounting and Tandem ELF fuse

To order Tandem ELF fuse and mounting: (1) Select base catalog number in accordance with desired cutout and Tandem ELF Fuse ratings using Table 8. (2) Complete the number by selecting the appropriate fuse link code from Table 9, and add it to the end of the chosen catalog number in Table 8.

Example: To select a 27 kV Class Tandem ELF in a 27 kV, 125 kV BIL Type L cutout with a 20 A fuse link, (1) Select base catalog number "L9CTP1A5" from Table 8 and (2) Select the fuse link code "P" from Table 9. Therefore order catalog number **L9CTP1A5P**.

Table 8. Tandem ELF Fuse catalog numbers

Type L Cutout Voltage/BIL Rating (kV)	Tandem ELF Voltage Class	Companion || voltage rating (kV, 1Ø)	Companion || current rating (A)	Interrupting Rating (kA Sym)	Base cutout part number		Digit 8 - Tandem ELF Code	Digit 9 - Fuse link current rating code
					Polymer	Porcelain		
15/110	15	8.3	25	50	S4BT___	L4BT___	2	See table 9
27/125*	15	8.3	25	50	—	L9CT___	2	See table 9
	27	15	25	43	—	L9CT___	5	See table 9
27/150	15	8.3	25	50	S9DT___	L9DT___	2	See table 9
	27	15	25	43	S9DT___	L9DT___	5	See table 9
27/150	27	23	25	31	S9DT___	L9DT___	6	See table 9

Table 9. Type L cutout with tandem ELF Fuse — Fuse link current ratings selection

Digit 9 — Fuse link code

NONE	.33A	.50A	.75A	1A	1.25A	1.5A	2A	3A	4A	5A	7A	10A	15A	20A
0	A	B	C	D	E	F	G	H	J	K	L	M	N	P

Note:
"0" in digit 9 defines no fuse link supplied with the Tandem ELF fuse.

Additional information

Refer to the following reference literature for application recommendations:

MN132029EN	Tandem ELF Fuse Installation Instruction
R240-91-46	Tandem ELF Fuse Time Current Characteristic Curves
CA132021EN	Companion II Backup Current-Limiting Fuse Catalog Section
R240-30-6	Recommended D-Link Primary Fusing for Distribution Transformers
CA132026EN	UltraSIL Polymer-Insulated and Porcelain Type L Open Distribution Cutout

Eaton
1000 Eaton Boulevard
Cleveland, OH 44122
United States
Eaton.com

Eaton's Power Systems Division
2300 Badger Drive
Waukesha, WI 53188
United States
Eaton.com/cooperpowerseries

Printed in USA
Publication No. CA132028EN
June 2019

For Eaton's Cooper Power series Tandem ELF fuse product information call 1-877-277-4636 or visit: www.eaton.com/cooperpowerseries.

Powering Business Worldwide