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Medium Voltage Fuses

Contents

Description *Page*

Medium Voltage Fuses

Product Description **18-2**
Product History **18-2**
Product History Time Line **18-2**
Product Application and Naming **18-3**
Current Limiting Fuses **18-4**
Expulsion Fuses **18-5**
Product Selection **18-6**
Further Information **18-8**
Pricing Information **18-8**

Medium Voltage Fuses

Originally a Westinghouse Product

Medium Voltage Fuses

Product Description

Cutler-Hammer® Medium Voltage Fuses from Eaton's electrical business offer such a range of characteristics that almost any fuse application, within the practical range of such interrupting devices, may be satisfied. This range of characteristics is offered in part by the production of both expulsion and current-limiting power fuses.

Expulsion and current-limiting fuses provide such diverse characteristics by employing different areas of fuse technology. These differences in technology, along with the diverse characteristics, require that different questions be answered when applying expulsion and current-limiting fuses.

Product History

The Cutler-Hammer Power Fuse product line was introduced in the 1930s by Westinghouse Electric Corporation. As power systems grew in size, the need to sectionalize utility feeders and protect equipment became apparent. The initial fuse development efforts resulted in the creation of Non-Current Limiting, Expulsion Type Fuses. As the available fault currents grew, the need for a current limiting fuse was apparent and resulted in new interruption techniques.

While basic fuse technology has not changed greatly over the years, gradual improvements have been made to make the fuses more current limiting and easier to manufacture and install. Because standards for fuses (ANSI C37) detail only test methods and basic performance requirements, many different varieties of fuses (length, diameter, short circuit interruption curves) have been introduced over the years.

Eaton presently manufactures medium voltage fuses in Cabo Rojo, PR, where production was moved from East Pittsburgh, PA in 1972.

Product History Time Line

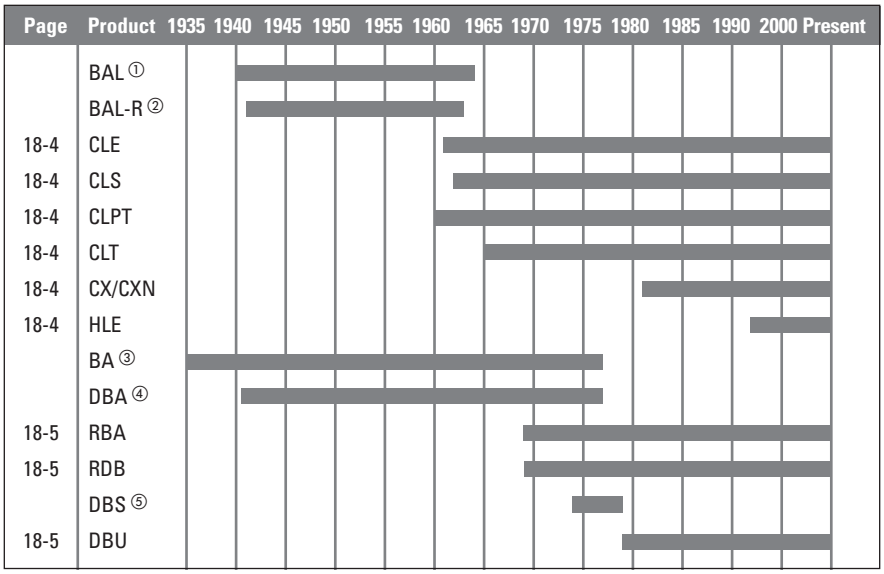

Figure 18-1. Product History Time Line

① BAL superseded by CLE.
② BAL-R superseded by CLS.
③ BA — Refills and holders only, new installations use RBA.
④ DBA — Refills only.
⑤ DBS — Superseded by DBU.

General Information

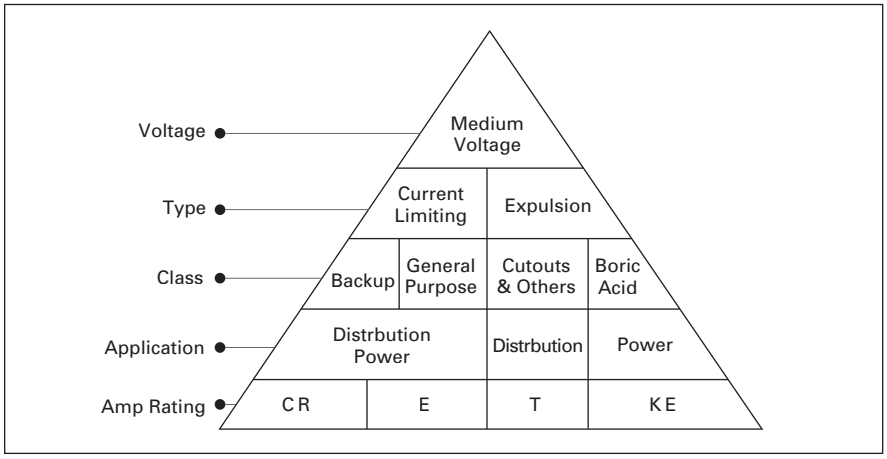

Figure 18-2. Fuses in Perspective

Advantages

Table 18-1. Medium Voltage Fuse Comparison

Expulsion	Current Limiting
Vented Electromechanical Expels Gases/Noise	Sealed Static No Gases/Noise
Interrupts at Natural Current Zero Generally Higher Voltage/Current Applications Differences in Time/Current Characteristics	Limits Fault Current Generally Higher Interrupting Ratings Differences in Time/Current Characteristics

Application Guide

Table 18-2. Application Guide

Selection Guide				Ratings	Feeder Circuit Section-alizing	Fused Switches	Power Trans-formers	Substation Service Trans-formers	DIP Pole	Underground Distribution Transformers	Pole Mounted Trans-formers	Pad-Mounted Distribution Transformers	Motor Starters	Potential Trans-formers	Sub-station Capacitor Banks
Type	Class	Use	Brand	kV, Amp, kA											
Current Limiting	General Purpose	Power	BHLE/ CLE/ HLE/ HCL	2.4 – 15.5 kV 10E – 1350A to 85 kA	●	●	●		●						●
		Dist.	CX/ CXN	4.3 – 15.5 kV 3.5C – 300C 50 kA				●				●			
			CLT	2.4 – 15.5 kV 4A – 150A 25 kA								●			
	Backup	Power	CLPT	2.4 – 38 kV 0.25E – 10E to 80 kA										●	
		Power	BCLS/ CLS	2.4 – 8.3 kV 2R – 36R 50 kA									●		
	Full Range	Dist.	CXF/ BCXF/ TCXF	8.3 – 23.5 kV 3A – 250A 50 kA				●		●	●	●			
Expulsion	Boric Acid	Power	RBA	4.8 – 34.5 kV 0.5E - 720E	●	●	●								●
			RDB	4.8 – 34.5 kV 0.5E – 720E	●		●	●	●					●	●
			DBU	14.4 – 38 kV 5E – 200E 15SE – 200SE 3K – 200K	●	●	●	●	●					●	

Guide to Names

BCLS — Bolt-in version of CLS fuse.

BHLE — Bolt-in version of HLE fuse.

CLE — Current Limiting E-Rated.

HLE/HCL — Current Limiting, E-Rated, Interchangeable with General Electric® and Gould® Shawmut.

CX/CXN — Current Limiting Interchangeable with McGraw-Edison's® NX Brand Fuses, C-Rated.

CLT — Current Limiting Transformer Fuse.

CLPT — Current Limiting E-Rated for Potential Transformers.

CLS — Current Limiting for Motor Starters, R-Rated.

CXF/BCXF/TCXF — Current Limiting Full Range Fuses that provide internal short circuit protection of distribution transformers on high fault networks.

RBA — Refillable Boric Acid Expulsion Fuse (Indoor Use).

RDB — Refillable Dropout Boric Acid Expulsion Fuse (Outdoor Use).

DBU — Dropout Boric Acid Fuse Interchangeable with S&C's SMU-20 Refill.

Guide to Ampere Ratings

"E" Designation

Fuse rated 100E or below will melt in 300 seconds at a current value between 2.0 and 2.4 times the E number.

Fuse rated above 100E will melt in 600 seconds at a current value between 2.2 and 2.64 times the E number.

If the current is higher than 2.4 or 2.64 times the E number, the user must consult the time-current curves for that particular fuse.

"R" Designation

The fuse will melt in 15 to 35 seconds when the current equals 100 times the R number.

If the current is higher than 100 times the R number, the user must consult the time-current curves for that fuse.

"C" Designation

The fuse will melt in 1000 seconds at a current value, between 1.7 and 2.4 times the C number.

If the current is higher than 2.4 times the C number, the user must consult the time-current curves for that particular fuse.

"A" Designation

Fuses that do not comply with "E", "R", or "C" designations.

Expulsion fuses can also be E-rated, K-rated and T-rated, and are also covered in the ANSI standards. The K and T ratings refer, respectively, to relatively "fast" and "slow" melting expulsion fuses. Detailed time-current tables would be needed to adequately define the ratings.

Current Limiting Fuses

Product Description

CLE and HLE Current Limiting — E-Rated

CLPT Current Limiting E-Rated for Potential Transformer Protection

CLS Current Limiting for Motor Starter

CX Current Limiting — Interchangeable with McGraw Edison's NX Type

CLT Current Limiting for Transformer Protection

Current limiting fuses are constructed with pure silver fuse elements, high-purity silica sand filler, a specially designed core and a glass resin outer casing.

A high fault current melts the silver element almost instantly and loses energy to the surrounding sand. The sand melts and forms fulgurite, a glass-like substance.

The arc voltage rapidly increases to nearly three times the fuse voltage rating and forces the current to zero. Low fault current melts a solder drop on the silver fuse element which, in turn, melts the silver.

The element burns back until there is a sufficient internal gap to interrupt the current. This is known as the M-effect.

Cutler-Hammer Current Limiting Fuses are offered in two basic types: backup and general purpose. Backup fuses have a published minimum interrupting current and require a series device for breaking the circuit for currents below this minimum level. General purpose fuses have improved low current interruption capability and are designed to interrupt low fault currents that cause the fuse to melt in one hour or less.

General Information

Applications

Current limiting technologies can be used to meet almost every fuse application. Typical applications for utility, industrial, construction and OEM customers include:

- Feeder circuit sectionalizing.
- Power transformers.
- Substation service transformers.
- Underground distribution transformers.
- Pole-mounted transformers.
- Pad-mounted distribution transformers.
- Fused switches.
- DIP poles.
- Motor starters.
- Potential transformers.
- Substation capacitor banks.

Accessories

A wide assortment of mountings, live parts and end fittings are available to facilitate power fuse installation.

Mountings include a base, porcelain or glass polyester insulators and live parts. They help enable the fuse to be safely attached to the gear. Mountings can be either disconnect or nondisconnect.

Live Parts attach the fuse to the mountings and are considered part of the mounting. All parts above the insulators are live parts.

End Fittings are metal parts that attach to each end of the fuse at the ferrules. They are used only on disconnect fuses or when converting a nondisconnect to a disconnect fuse.

Live Parts

Expulsion Fuses

Product Description

RBA — Refillable Boric Acid

RDB — Refillable Dropout Boric Acid

DBU — Dropout Boric Acid — Interchangeable with S&C's SMU - 20

Cutler-Hammer Expulsion Fuses use boric acid as the interrupting medium. Under a fault condition, arc heat decomposes the boric acid which produces gases and boric anhydride. The water vapor blast extinguishes the arc in a deionizing action and exits from the bottom of the fuse.

Type RBA indoor expulsion fuses are fitted with a filter or condenser that moderates the discharge exhaust. The discharge filter limits the exhaust to a small and relatively inert amount of gas and lowers the noise level without affecting the fuse interrupting rating. Steam discharge, that can affect the interrupting, is fully restricted by the condenser.

Each type RDB outdoor dropout fuse includes an ejector pin which is forced through the top of the fuse. The ejector pin releases a latch on the mounting and the fuseholder is kicked outwards and swings into the dropout position, through 180° with a vertical mounting, or 90° with an underslug mounting.

Refill units can be field installed into RBA and RDB expulsion fuses. Once the old unit has been removed, the separately purchased unit can be easily installed into the fuse holder.

General Information

Applications

Expulsion technologies can be used to meet a number of fuse applications. Typical applications for utility, industrial construction and OEM customers include:

- Feeder circuit sectionalizing.
- Fused switches.
- Power transformers.
- Substation service transformers.
- DIP poles.
- Potential transformers.
- Substation capacitor banks.

Accessories

The following accessories are available for expulsion fuses:

Mountings include a base, porcelain or glass polyester insulators and live parts. They help enable the fuse to be safely attached to the gear. Mountings can be either disconnect, nondisconnect, or dropout. Fuses may be vertical or underhung.

Live Parts attach the fuse to the mountings and are considered part of the mounting. All parts above the insulators are live parts.

End Fittings must be mounted on DBU fuse units to enable them to be fitted into the mounting.

Filters and Condensers are for indoor applications of RBA expulsion fuses. They confine the arc within the fuse and substantially reduce the noise and exhaust when the fuse interrupts.

Mufflers are used with DBU fuses in indoor applications to virtually eliminate offensive noise and exhaust gases when the fuse interrupts.

Product Selection

Current Limiting and Expulsion Fuses

Easy to Use, Easy to Order!

Eaton's Cutler-Hammer fuse catalog numbering system makes it easy to order the right fuse. The catalog numbers are easy to remember, unique to each fuse, and are broken down in three descriptive segments: Fuse Type, Voltage Rating and Current Rating.

These Catalog Numbers can be entered directly and easily:

- No change in order processing will occur if you use either a style number or its corresponding catalog number. You will get the same fuse.
- In the back of this ordering guide is a style number to catalog number cross reference chart.

Current Limiting Fuse Examples:

5CLE-30E	5.5 max. kV, CLE fuse unit, 30E amperes
15CXN-45C	15.5 max. kV, CXN fuse unit, 45C amperes
5CLS-GDM-E	5.5 max. kV, CLS fuse unit, Glass Polyester Nondisconnect Mounting
CLE-DL-D	CLE, Disconnect Live Parts Size D

Table 18-3. Current Limiting Fuses Catalog Numbering System

15 CLE – 100 E – D

Maximum kV	Type		Amperes	Class	Size
2 = (2.4, 2.5, 2.75)	**CLE**	**HCLS**	**0.5 – 1350**	**E**	**A**
4 = (4.3, 4.8)	**HLE**	**LCLS**		**R**	**D**
5 = (5.08, 5.5)	**BHLE**	**CX**		**C**	
7 = (7.2)	**CLPT**	**CXN**		**X**	
8 = (8.3)	**NCLPT**	**CLT**			
15 = (15.5)	**CLS**	**AHLE**			
25 = (25.5)	**BCLS**	**CXF**			
38 = (38.0)	**CLS70**	**ACLS**			
	CLS75				

Table 18-4. Current Limiting Fuse Accessories Catalog Numbering System

15 CLE – P NM – C

Maximum kV	Type		Hardware	Diameter Size
2 = (2.4, 2.5, 2.75)	**CLE**	**HCLS**	**DM** = Disconnect Mounting	**A** = 1-5/8 inches (41.3 mm) 0.53E – 1.5E Single Barrel
4 = (4.3, 4.8)	**HLE**	**LCLS**	**NM** = Nondisconnect Mounting	**B** = 1-5/8 inches (41.3 mm) 3E – 10E Single Barrel
5 = (5.08, 5.5)	**CLPT**	**CX**	**DL** = Disconnect Live Parts	**C** = 2-inch (50.8 mm) Single Barrel
7 = (7.2)	**NCLPT**	**CXN**	**NL** = Nondisconnect Live Parts	**D** = 3-inch (76.2 mm) Single Barrel
8 = (8.3)	**CLS**	**CLT**	**DF** = Disconnect End Fittings	**E** = 3-inch (76.2 mm) Double Barrel
15 = (15.5)	**CLS75**			**F** = 4-inch (101.6 mm) Double Barrel
25 = (25.5)				**G** = 5/8-inch (15.9 mm) Ferrule (CX/CXN Only)
38 = (38.0)				

Insulator
G = Glass Polyester
P = Porcelain
H = High BIL

Product Selection (Continued)

Expulsion Fuse Examples:

8RBA2-10E	8.3 max. kV, RBA-200 refill, 10E amperes
DBU17-30K	17.1 max. kV, DBU fuse unit, 30 amperes
15RBA8-INH	15.5 max. kV, RBA-800, indicating nondisconnect holder
RBA4-FLTR	RBA-400 filter

Table 18-5. Expulsion Fuse Units Catalog Numbering System

DBU 17 - 100 E

Type	Maximum kV	Amperes		Speed
RBA	8	.5	50	E
DBU	15	3	65	K
DBA	17	5	80	SE
RDB	25	7	100	
RBT	27	10	125	
BA	38	15	150	
	48	20	200	
	72	25	250	
	92	30	300	
	121	40	400	
	145			

Table 18-6. Expulsion Fuse Accessories Catalog Numbering System

15 RBA2 - P NM C

Maximum kV
8
15
17
25
27
38
48
72
92
121
145

Type
RBA
DBU
DBA
RDB
RBT
BA

Insulator
G = Glass Polyester
P = Porcelain
H = High BIL

Diameter Size
A = 1-5/8 Inch 0.5E – 1.5E, Single Barrel
B = 1-5/8 Inch 3E – 10E, Single Barrel
C = 2-Inch Single Barrel
D = 3-Inch Single Barrel
E = 3-Inch Double Barrel
F = 4-Inch Double Barrel
G = 5/8 Inch Ferrule

Hardware	
UM	= Underhung Mounting
VM	= Vertical Mounting
DL	= Disconnect Live Parts
NL	= Nondisconnect Live Parts
DH	= Disconnect Holder
NH	= Nondisconnect Holder
NM	= Nondisconnect Mounting
UL	= Underhung Live Parts
VL	= Vertical Live Parts
I	= Indicating
O	= Outdoor
V	= Vented
M	= Muffled
VO	= Vented Outdoor
MO	= Muffled Outdoor
FLTR	= Filter
COND	= Condenser
MFLR	= Muffler
SHNT	= Shunt and Spring Assembly

Further Information

Publication Number	Description
Current-Limiting Fuses	
PG01303001E	Medium Voltage Current Limiting Fuses Product Focus — Includes Technical Data, Application Information and Curves for CLE, HLE, HCL, CLS, CLPT, CX and CLT Fuses
Expulsion Fuses	
CA01303001E	Medium Voltage Expulsion Fuses Product Focus — Includes Technical Data, Application Information and Curves for RBA, RDB, DBU, DBA Fuses
General Information	
CA08101001E	*Electrical Distribution Products and Services Catalog*, Section 13

Pricing Information

Electrical Distribution Products and Services Catalog, Section 13 — CA08101001E
Price and Availability Digest (PAD)
Vista/VISTALINE™ Discount Symbols Y1-F, Y1-FE, Y1-FH

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