

Medium Voltage Fuses



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Current-Limiting and Expulsion Fuses

Originally a Westinghouse Product



Medium Voltage Fuses

Product Description

Eaton medium voltage fuses 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 Eaton 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 to 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 this 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.

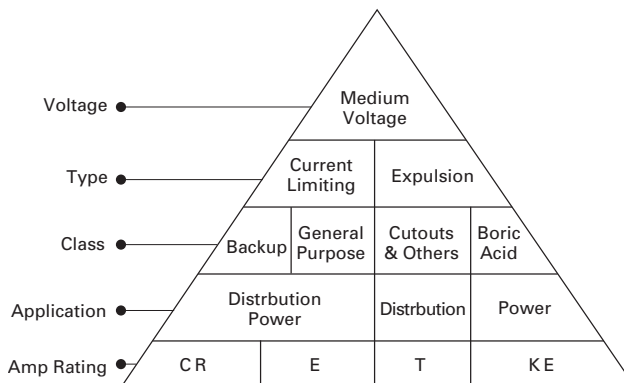
Eaton presently manufactures medium voltage fuses in Haina, DR.

Product History Time Line

Page	Product	1935	1940	1945	1950	1955	1960	1965	1970	1975	1980	1985	1990	2000	Present
	BAL ①														
	BAL-R ②														
V12-T18-4	CLE														
V12-T18-4	CLS														
V12-T18-4	CLPT														
V12-T18-4	CLT														
V12-T18-4	CX/CXN														
V12-T18-4	HLE														
	BA ③														
	DBA ④														
V12-T18-5	RBA														
V12-T18-5	RDB														
	DBS ⑤														
V12-T18-5	DBU														

General Information

Fuses in Perspective



Advantages

Medium Voltage Fuse Comparison

Expulsion	Current-Limiting
Vented	Sealed
Electromechanical	Static
Expels gases/noise	No gases/noise
Interrupts at natural current zero	Limits fault current
Generally higher voltage/current applications	Generally higher interrupting ratings
Differences in time/current characteristics	Differences in time/current characteristics

Notes

- 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.

Application Guide

Selection Guide

Type	Class	Use	Brand	Ratings kV, Ampere, kA	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
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									■		
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.

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 adequately define these ratings.

Current-Limiting Fuses**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****Product Description**

Current-limiting fuses are constructed with pure silver fuse elements, a 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 that, 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.

Eaton 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.

**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.

Expulsion Fuses



RBA—Refillable Boric Acid



RDB—Refillable Dropout Boric Acid



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

Product Description

Eaton 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 that is forced through the top of the fuse. The ejector pin releases a latch on the mounting and the fuseholder is kicked outward 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**Easy to Use, Easy to Order!**

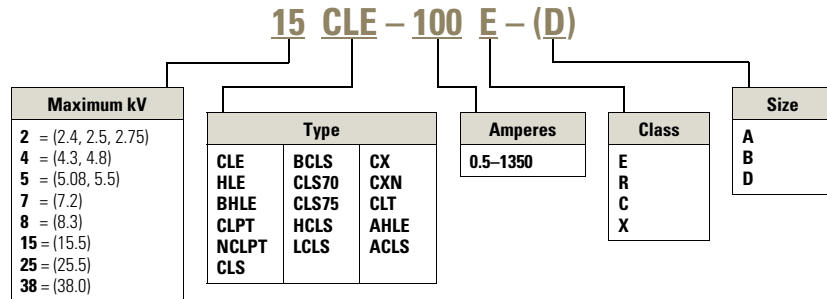
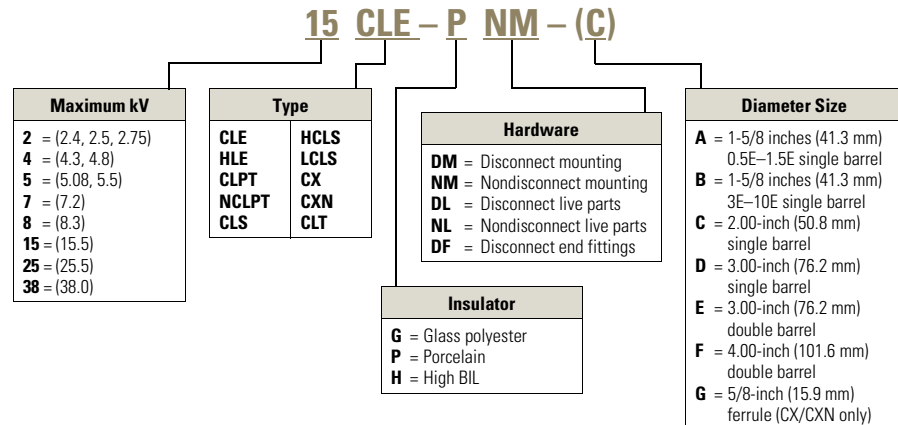
Eaton's fuse catalog numbering system makes it easy to order the right fuse. The catalog numbers are easy to remember, unique to each fuse, and are broken down in three descriptive segments: fuse type, voltage rating and current rating.

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

Catalog Numbering System**Current-Limiting Fuses****Current-Limiting Fuse Accessories**

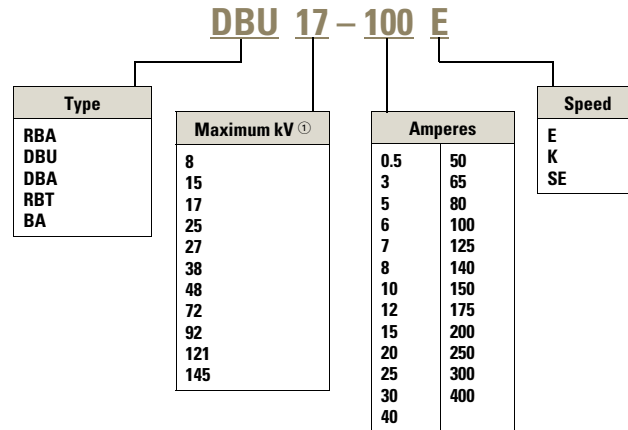
Product Selection

Expulsion Fuse Examples

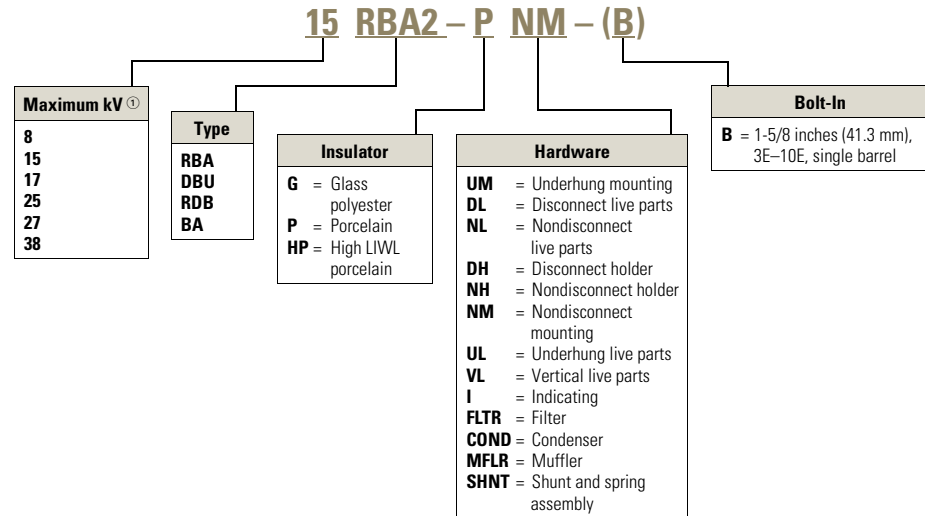
- **8RBA2-10E**
8.3 max. kV, RBA-200 refill, 10E amperes
- **DBU17-30K**
17.1 max. kV, DBU fuse unit, 30 amperes
- **15RBA8-INH**
15.5 max. kV, RBA-800, indicating nondisconnect holder
- **RBA4-FLTR**
RBA-400 filter

Catalog Numbering System

Expulsion Fuse Units



Expulsion Fuse Accessories



Note

^① Maximum kV occurs after DBU or before BA, DBA, RBA, RBT or RDB.

Further Information**Publication**

Number	Description
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Current-Limiting Fuses

CA08100016E	Fuse Catalog, Volume 14, Tab 3
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Expulsion Fuses

CA08100016E	Fuse Catalog, Volume 14, Tab 2
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General Information

CA08100016E	Fuse Catalog, Volume 14
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Pricing Information

Price and Availability Digest (PAD)

Vista/VISTALINE™ Discount Symbols Y1-F, Y1-FE, Y1-FH