



Westinghouse Electric Corporation
Distribution and Control Business Unit
Pittsburgh, Pennsylvania, U.S.A. 15220

Descriptive Bulletin
36-642

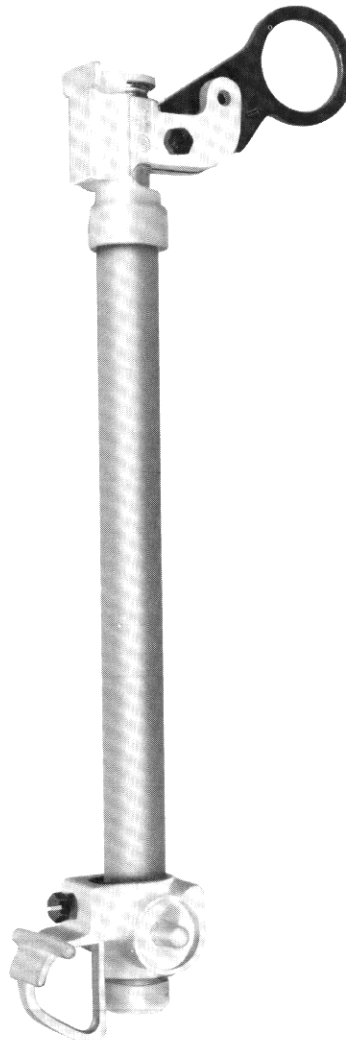
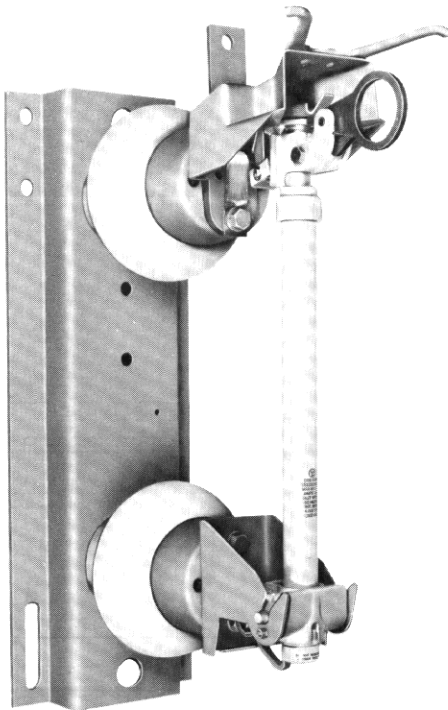
Page 1

June, 1988
Supersedes Descriptive Bulletin 36-642,
pages 1-8, dated October, 1980
Mailed to: E, D, C/36-600B

Outdoor - 17.1 kV - 38 kV
Indoor - 17.1 kV - 27 kV

DBU Power Fuse

The "DBU" fuse type supersedes the "DBS" type. See page 8 for style/ratings.



- Dropout Action
- Positive Blown Fuse Identification
- High Interrupting Capabilities
- Mild Exhaust
- Complete Interchangeability with Competitors Fuses
- Wide Variety of "E" and "K" Ampere Fuse Rating Availability
- Excellent Low Current Interrupting Capabilities
- Stock Shipments
- Lightweight Hookstick Operation



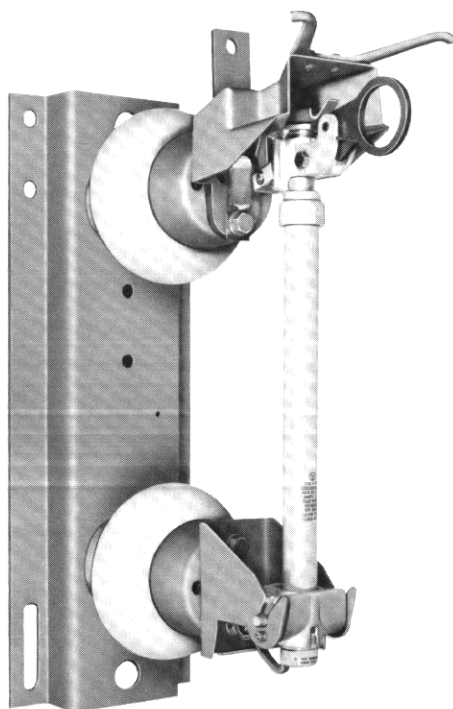
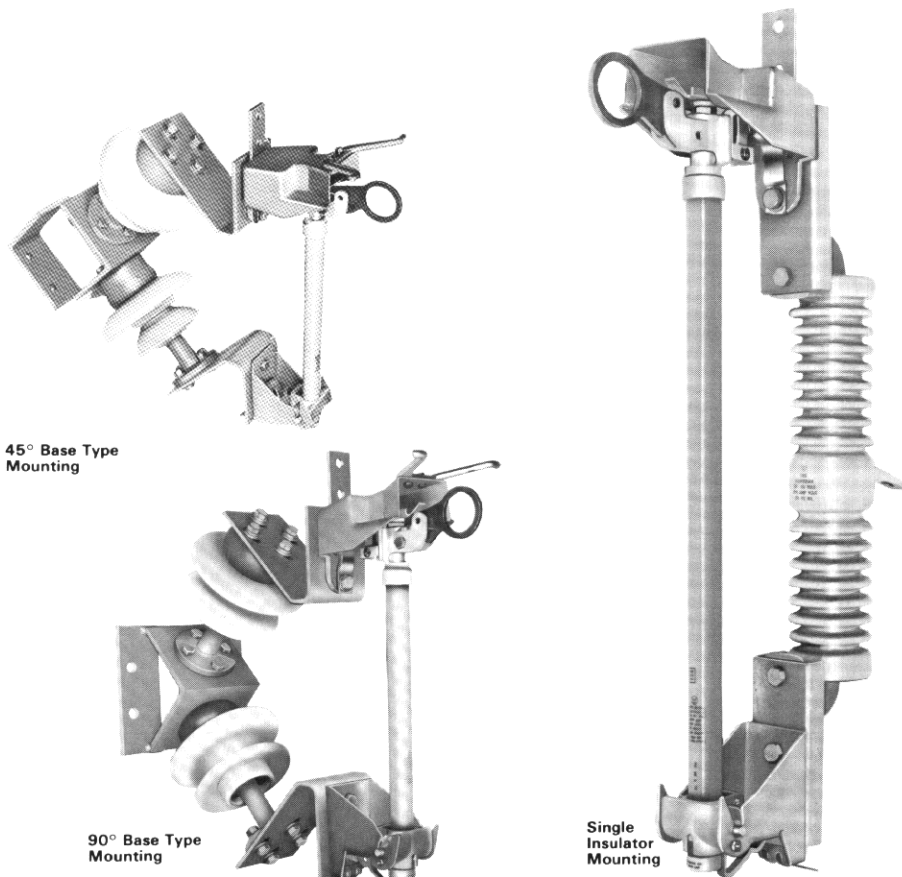
Application

Type DBU Power Fuses provide effective protection for circuits and equipment which operate on voltages from 2400 to 34,500 volts inclusive. They can be used on both electric utility and industrial distribution systems and all fuses are designed for use on:

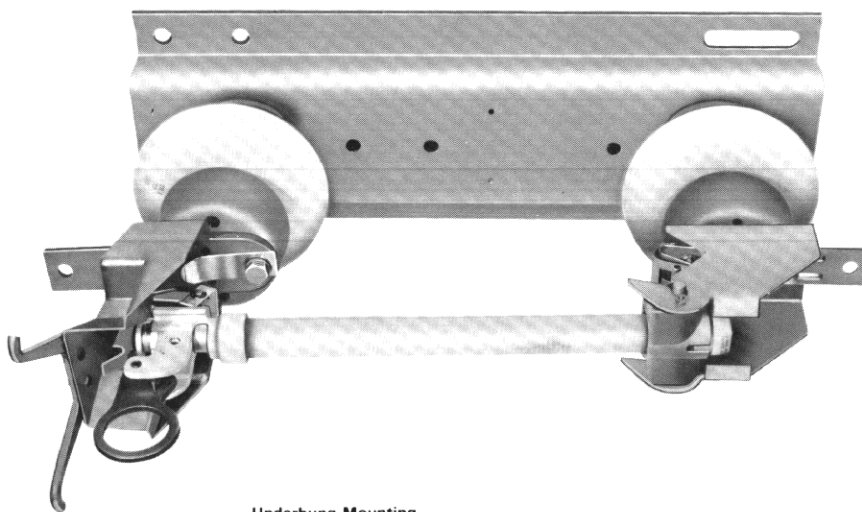
- Power Transformers
- Feeder circuit sectionalizing points
- Distribution transformers
- Potential transformers
- Station service transformers
- Fused switches

The DBU Power Fuse is specifically designed to interrupt faults on distribution systems that have short circuit capabilities above the conventional link type cutouts but not high enough to warrant the need of the more sophisticated and higher cost power fuse types.

Furthermore, it was also designed to be mechanically and electrically interchangeable with the SMD-20 fuse at all voltages and ampere ratings. (The SMU-20 at 17.1 kV and 27 kV.)



Vertical Mounting



Underhung Mounting

Construction

The De-ion arc interruption using the boric acid and fusible element principle of short circuit protection along with the construction of the complete fuse and associated assembly are illustrated and described on pages 3 through 6. This proven principle and complete construction make the fusible element completely dependable assuring service continuity, close fuse coordination with transformer full load current and published time current characteristics plus positive blown fuse identification.

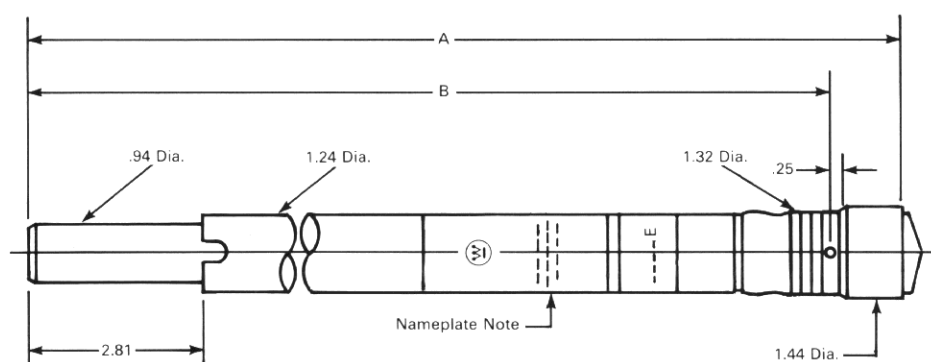
Basically, in terms of application, the complete fuse consists of two main components, the replaceable fuse unit and the mounting.

Fuse Unit

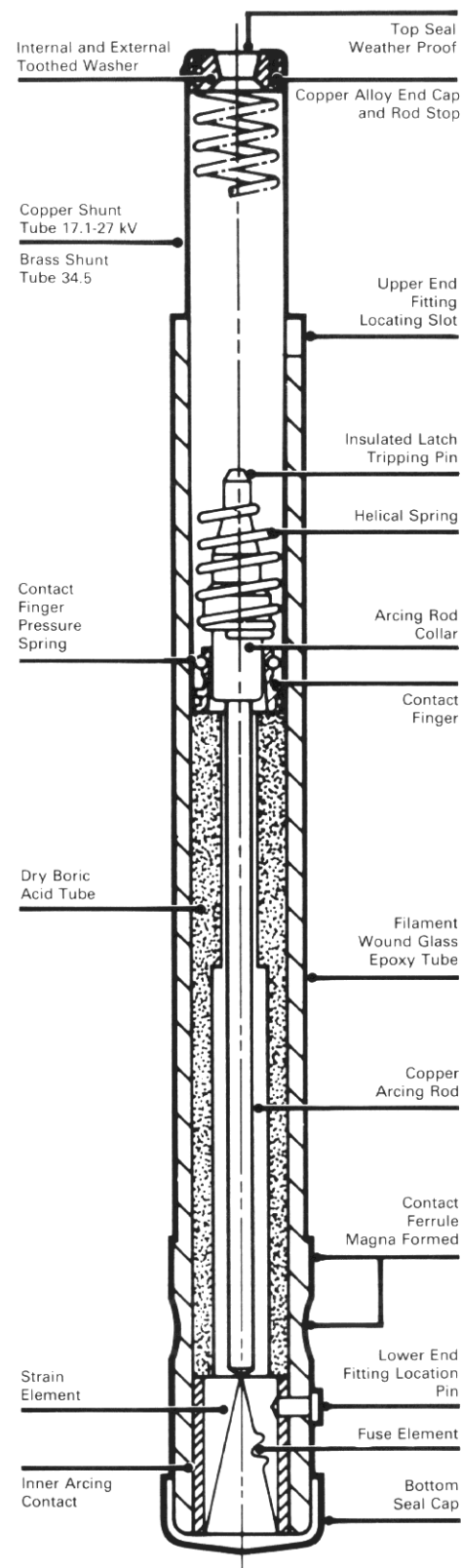
Principle parts of the replaceable DBU Fuse Unit are shown in cross section. Main operating parts are the fusible element, arcing rod, helical spring, and dry boric acid cylinder. To prevent warpage under outdoor conditions and assure adequate strength to contain the force of the arc interruption, a filament wound glass epoxy tube encloses the assembly.

Within the fuse unit, the current path is maintained by tight electrical connections. From the top of the fuse the path is to the copper tube shunt, then to the arcing rod, on through the fusible element which is bridged by the strain element, and into the bottom ferrule. The copper tube at the top of the fuse is magnaformed to a copper alloy end cap which also holds the spring. The copper spring shunt assembly and the arcing rod collar are firmly held together by the multi-finger contact and the contact finger pressure spring to assure constant electrical contact.

Dimensions



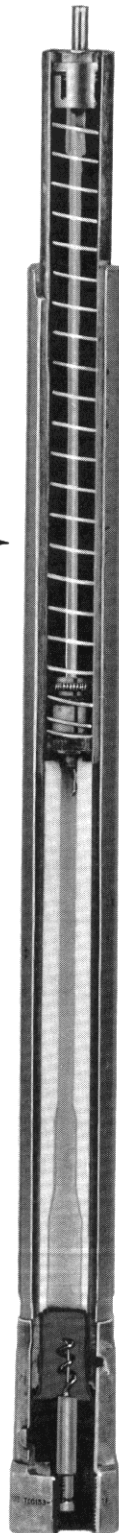
Max. kV	A	B	Eng'r Ref.
17.1	19.14	17.88	5978C92
27.0	22.61	21.40	5978C93
38.0	28.55	27.36	5978C94





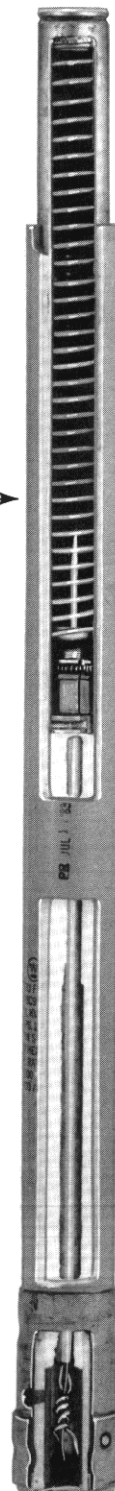
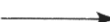
Comparison Cutaway Views

Fuse as shown
has interrupted

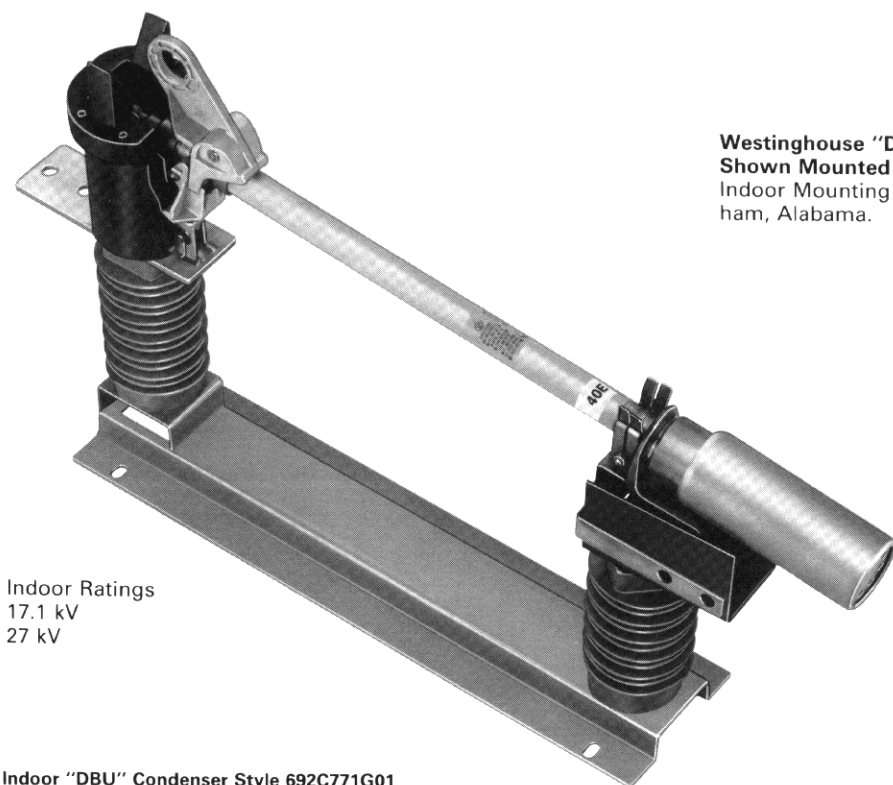


S&C's "SMD-20"

Westinghouse
fuse as shown
is ready to
protect & perform.



Westinghouse "DBU"



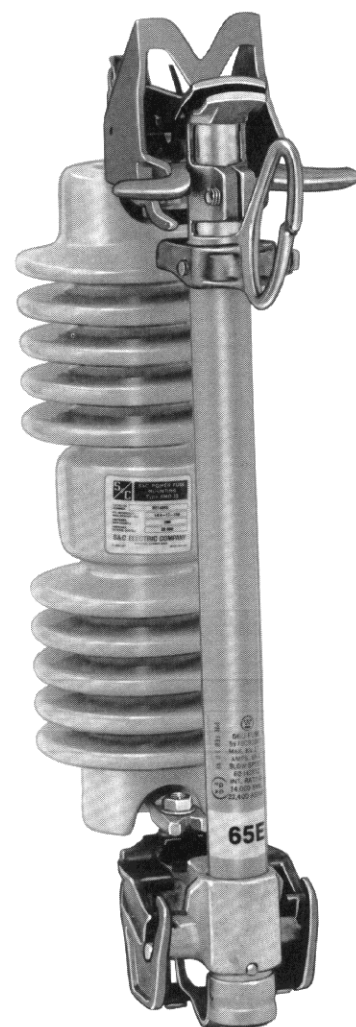
**Westinghouse "DBU" Fuse with Condenser
Shown Mounted**
Indoor Mounting Supplied by EEI, Birmingham, Alabama.

Indoor Ratings
17.1 kV
27 kV

Indoor "DBU" Condenser Style 692C771G01

**Westinghouse "DBU" Fuse Shown
Mounted.**
Outdoor Mounting Supplied by S&C.

Outdoor Ratings
17.1 kV
27 kV
38 kV





Outdoor Operation

Fault interruption is achieved after the fuse element melts by the elongation of the arc through the boric acid cylinder by the helical spring and rod. The electrical path is maintained during this action by the multi finger contact closely surrounding the arcing rod. Intense heat from the arc, as it moves along the interior of the cylinder decomposes the boric acid forming a water vapor and inert boric acid.

The electrical interruption is caused by steam deionizing the arc, as the arc is being elongated through the cylinder.

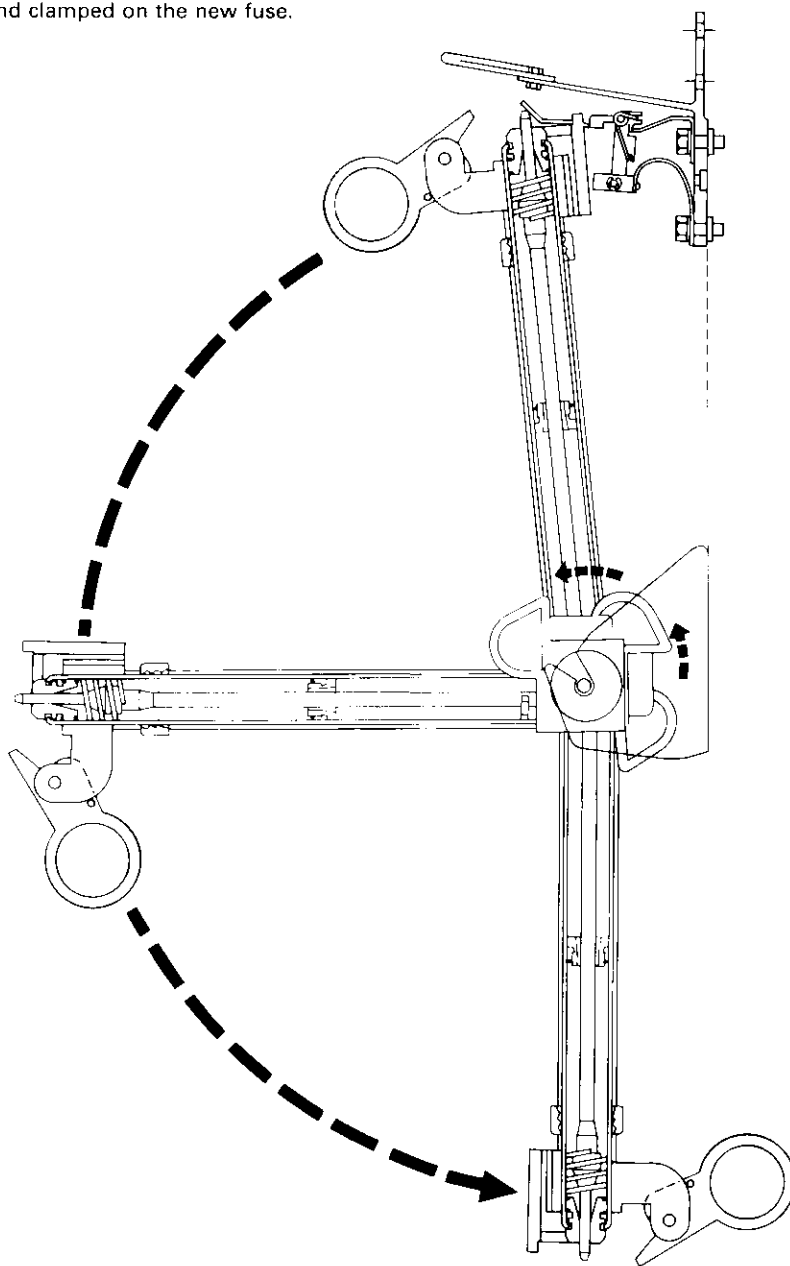
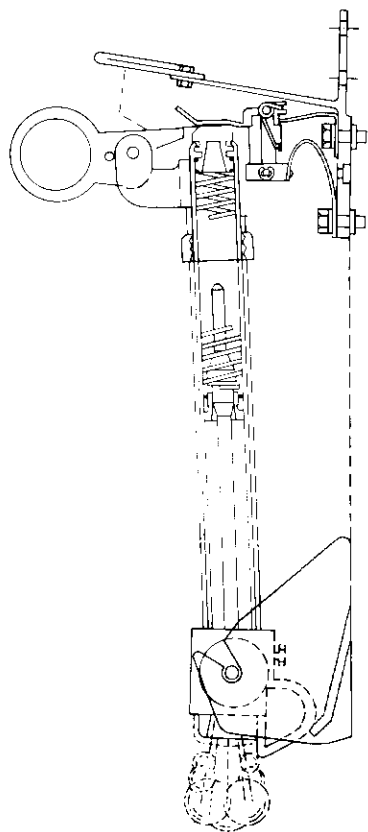
Higher particle turbulence of the boric acid causes the rate of deionization in the cylin-

der to exceed the ionization of the electrical arc. This action prevents the arc from re-striking. Both high and low current faults are interrupted in the same manner, no foreign material other than the boric acid is required to interrupt low current faults.

The arcing rod is prevented from falling back into its original position by a friction stop at the top of the fuse unit. The DBU type of fuse is of the replaceable type rather than the renewable type. When the fuse is blown and the dropout action completed, the entire unit is removed with a hookstick. When replacing the blown fuse the end fittings should be removed from the blown fuse and clamped on the new fuse.

Dropout Action

When the fuse element melts, the helical spring located in the fuse unit pulls the arcing rod and arc through the cylinder. The upward motion of the spring forces the top of the arcing rod to penetrate the upper seal striking the latch mechanism. The latch releases the fuse unit causing the charger ejector spring to move the ejector assembly against the fuse unit forcing it outward to swing through a 180° arc into a dropout position. This dropout action provides immediate visual indication that the fuse has operated.





Complete Utilization

In comparison with the conventional distribution cutout that utilizes the fiber tube and fuse link design for fault interruption, the DBU far exceeds the cutout in interrupting rating, and considerably reduces the hazards and noise to the violent exhaust common to cutouts under fault interrupting conditions. The DBU fuse employing the use of the special silver elements, boric acid for its interrupting media and the mechanical utilization of the spring and rod mechanism creates a technique which gives a low arc and mild exhaust fault interruption.

The use of a pure silver element and Nichrome wire strain element makes the DBU less susceptible to outages caused by vibration, corona corrosion and aging of the fuse elements, nor is it damaged by transient faults or overloads which approach the minimum melt point.

E rated fuses, 15E and above, 6K and above, utilize the silver element and nichrome strain wire, while those ratings below these values use the Nichrome wire as the main fuse element.

The DBU fuse with a nominal voltage range up to 34.5 KV continuous current rating up to 200 amperes plus its high interrupting rating can perform many duties, from installation on the primary of a transformer to protection against faults on sectionalizing points, distribution transformers, station service transformers, potential transformers, dip poles and underground circuits.

On application where complete coordination with line, secondary or with other power fuses is required, the DBU has available both the ANSI "K" fast speed and the "E" rated standard or so called "slow speed" fuse units. The "K" fast speed units range from 3K to 200K, while the "E" rated from 15E to 200E.

Further Information

Price List 36-609
AD 36-643

Table 1 DBU Power Fuse Short-Circuit Interrupting Ratings

kV, Nominal		Amperes, Interrupting		MVA, Interrupting (Three-Phase Symmetrical)
DBU	System	Symmetrical based on $\frac{X}{R} = 15$	Asymmetrical	Where $\frac{X}{R} = 15$
14.4	7.2	14000	22400	175
	4.8/8.32Y			200
	7.2/12.47Y			300
	7.62/13.2Y			320
	13.8			335
	14.4			350
25	16.5	12500	20000	400
	7.2/12.47Y			270
	7.62/13.2Y			285
	13.8			300
	14.4			310
	16.5			355
34.5	23.0	10000	16000	500
	14.4/24.9Y			540
	20/34.5Y §			...
	23.0			...
	14.4/24.9Y			...
	27.6			475
	20/34.5Y			600
	34.5			600

§ Applies to 23-kV Single-Insulator Style only, for Protection of single-phase-to-neutral circuits (line or transformers) and three-phase transformers or banks with solidly grounded neutral connections.

Table 2 TRV Characteristics

Fuse Rating, kV Nom.	Primary Faults			Secondary Faults		
	Test Circuit—Normal-Frequency Recovery Voltage, kV rms	TRV Natural Frequency, Kc	TRV Amplitude Factor	Test Circuit—Normal-Frequency Recovery Voltage, kV rms	TRV Natural Frequency, Kc	TRV Amplitude Factor
14.4	17.1	5.5	1.6	14.4	17	1.7
25	27	5.5	1.6	27	13	1.7
34.5	38	3.9	1.6	38	8.5	1.7



DBU Expulsion Fuse Competitive Interchangeability Chart

Cont. Curr. Rating	Max. Voltage Design	Westinghouse DBU "E" Slow Speed	S&C SMD-20 Slow Speed TCC #156 & 119-1	S&C SMU-20 Slow Speed TCC #156 & 119-1	Cont. Curr. Rating	Max. Voltage Design	Westinghouse DBU "K" Fast Speed	S&C SMD-20 "K" Fast TCC #165-1	S&C SMU-20 "K" Fast TCC #165-1
"E"	kV	Style No.	Style No.	Style No.	"K"	kV	Style No.	Style No.	Style No.
15E	17.1	5978C92G01	552015R2	712015	1	17.1	5978C92G14	542001R2	702001
20E	17.1	5978C92G02	552020R2	712020	3K	17.1	5978C92G15	542003R2	702003
25E	17.1	5978C92G03	552025R2	712025	6K	17.1	5978C92G16	542006R2	702006
30E	17.1	5978C92G04	552030R2	712030	8K	17.1	5978C92G17	542008R2	702008
40E	17.1	5978C92G05	552040R2	712040	10K	17.1	5978C92G18	542010R2	702010
50E	17.1	5978C92G06	552050R2	712050	12K	17.1	5978C92G19	542012R2	702012
65E	17.1	5978C92G07	552065R2	712065	15K	17.1	5978C92G20	542015R2	702015
80E	17.1	5978C92G08	552080R2	712080	20K	17.1	5978C92G21	542020R2	702020
100E	17.1	5978C92G09	552100R2	712100	25K	17.1	5978C92G22	542025R2	702025
125E	17.1	5978C92G10	552125R2	712125	30K	17.1	5978C92G23	542030R2	702030
150E	17.1	5978C92G11	552150R2	712150	40K	17.1	5978C92G24	542040R2	702040
175E	17.1	5978C92G12	552175R2	712175	50K	17.1	5978C92G25	542050R2	702050
200E	17.1	5978C92G13	552200R2	712200	65K	17.1	5978C92G26	542065R2	702065
					80K	17.1	5978C92G27	542080R2	702080
					100K	17.1	5978C92G28	542100R2	702100
					140K	17.1	5978C92G29	542140R2	702140
					200K	17.1	5978C92G30	542200R2	702200
15E	27	5978C93G01	553015R2	713015	1	27	5978C93G14	543001R2	703001
20E	27	5978C93G02	553020R2	713020	3K	27	5978C93G15	543003R2	703003
25E	27	5978C93G03	553025R2	713025	6K	27	5978C93G16	543006R2	703006
30E	27	5978C93G04	553030R2	713030	8K	27	5978C93G17	543008R2	703008
40E	27	5978C93G05	553040R2	713040	10K	27	5978C93G18	543010R2	703010
50E	27	5978C93G06	553050R2	713050	12K	27	5978C93G19	543012R2	703012
65E	27	5978C93G07	553065R2	713065	15K	27	5978C93G20	543015R2	703015
80E	27	5978C93G08	553080R2	713080	20K	27	5978C93G21	543020R2	703020
100E	27	5978C93G09	553100R2	713100	25K	27	5978C93G22	543025R2	703025
125E	27	5978C93G10	553125R2	713125	30K	27	5978C93G23	543030R2	703030
150E	27	5978C93G11	553150R2	713150	40K	27	5978C93G24	543040R2	703040
175E	27	5978C93G12	553175R2	713175	50K	27	5978C93G25	543050R2	703050
200E	27	5978C93G13	553200R2	713200	65K	27	5978C93G26	543065R2	703065
					80K	27	5978C93G27	543080R2	703080
					100K	27	5978C93G28	543100R2	703100
					140K	27	5978C93G29	543140R2	703140
					200K	27	5978C93G30	543200R2	703200
15E	38	5978C94G01	734015R2	714015	1	38	5978C94G14	724001R2	704001
20E	38	5978C94G02	734020R2	714020	3K	38	5978C94G15	724003R2	704003
25E	38	5978C94G03	734025R2	714025	6K	38	5978C94G16	724006R2	704006
30E	38	5978C94G04	734030R2	714030	8K	38	5978C94G17	724008R2	704008
40E	38	5978C94G05	734040R2	714040	10K	38	5978C94G18	724010R2	704010
50E	38	5978C94G06	734050R2	714050	12K	38	5978C94G19	724012R2	704012
65E	38	5978C94G07	734065R2	714065	15K	38	5978C94G20	724015R2	704015
80E	38	5978C94G08	734080R2	714080	20K	38	5978C94G21	724020R2	704020
100E	38	5978C94G09	734100R2	714100	25K	38	5978C94G22	724025R2	704025
125E	38	5978C94G10	734125R2	714125	30K	38	5978C94G23	724030R2	704030
150E	38	5978C94G11	734150R2	714150	40K	38	5978C94G24	724040R2	704040
175E	38	5978C94G12	734175R2	714175	50K	38	5978C94G25	724050R2	704050
200E	38	5978C94G13	734200R2	714200	65K	38	5978C94G26	724065R2	704065
					80K	38	5978C94G27	724080R2	704080
					100K	38	5978C94G28	724100R2	704100
					140K	38	5978C94G29	724140R2	704140
					200K	38	5978C94G30	724200R2	704200

The concept of interchangeability refers to the juxtaposition of fuse units only. The end fittings are designed to stay with the mounting and are considered a part of the mounting. The words "© MTG ONLY" are cast in our top and bottom end fittings to insure the concept of interchangeability is adhered to.

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