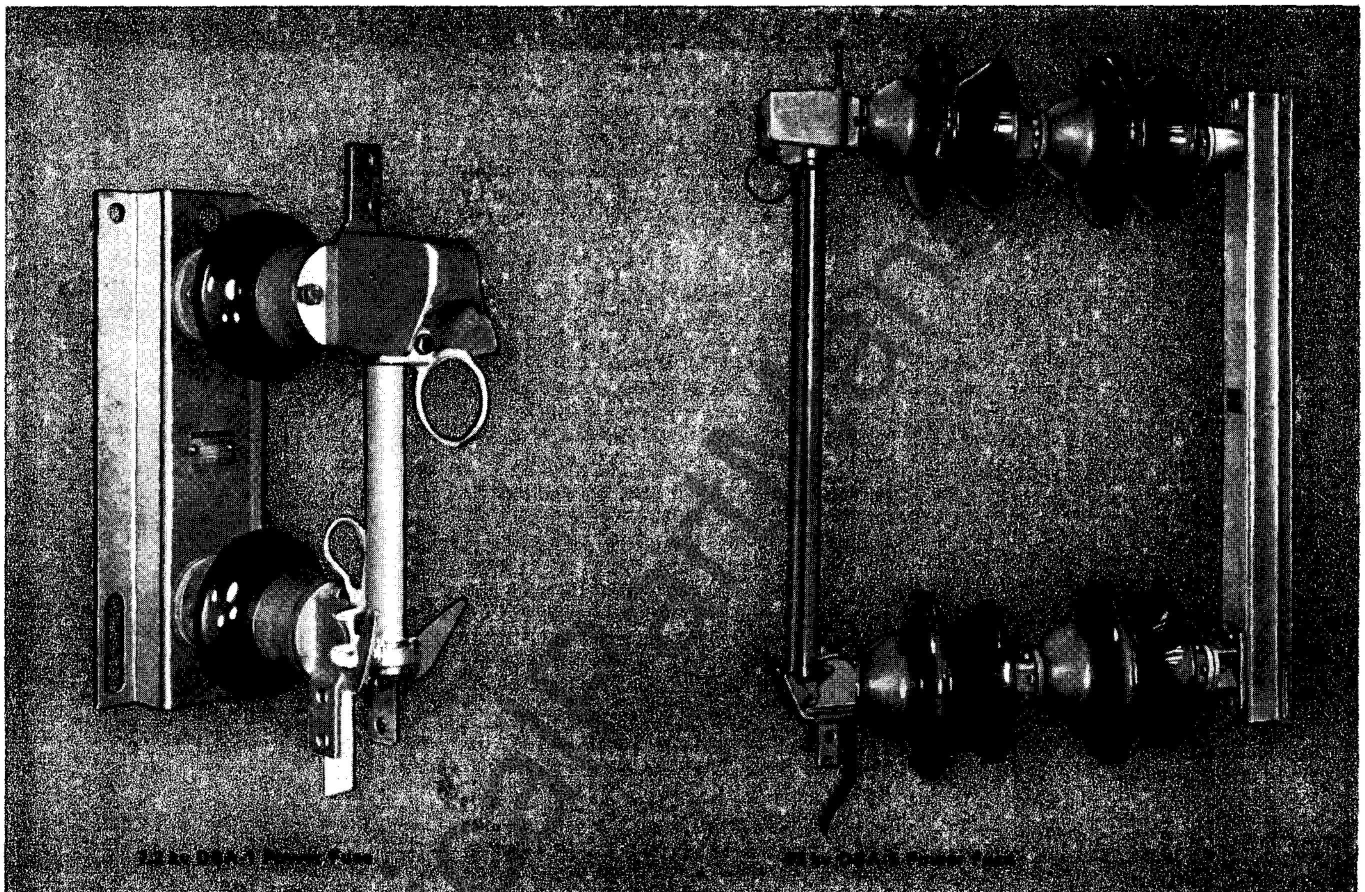
Westinghouse

High Voltage Power Fuses Type DBA Drop-out

Outdoor, Boric Acid, Hookstick Operated, 7.2 to 69.0 Kv
.5E to 200E Amps, 50/60 Cycle



Application

The Drop-Out Boric Acid Power Fuse provides double protection for circuits and equipment which operate on voltages from 7.2 to 69.0 Kv. The fuse has instant acting De-ion circuit interruption and almost simultaneously a mechanical drop-out action gives a 180° air break. The fuse unit is of the replaceable type rather than the renewable type, resulting in light weight for ease in handling. Westinghouse standard pin type apparatus insulators are supplied on all mountings; however, station post insulators can be supplied.

Ratings

Kv – 7.2 to 69.0

Amperes – .5E to 200E

Interrupting Ratings – See page 4

The DBA fuse is applicable in utility and industrial high voltage power systems for protecting:

Power transformers

Feeder circuit sectionalizing

Distribution transformers

Potential transformers

Advantages

Double Action

De-ion circuit interruption by boric acid fuse operation is followed almost simultaneously by a mechanical drop-out action. Contact breaking after circuit interruption avoids burned contacts.

Broad Application

De-ion arc quenching within ½ cycle after short circuit current occurs permits application of the fuse over a wide range of system voltages. Interrupting capacities are adequate to permit use on high voltage utility and industrial power systems.

Replaceable Unit

Quick, simple hookstick handling permits replacement of the fuse unit in minimum time. Fuse fittings are keyed to simplify replacement.

Weather Protected

The latch, kickout mechanism is sheltered against ice and snow to insure proper performance under all conditions. Heavy walled Micarta tube protects the fuse mechanism.

High Pressure Contacts

Positive electrical connections are maintained by compressed spring action. Bronze spring fingers at the hinged end and compressed ejector spring at the kickout end insure adequate contact.

Construction

De-ion arc interruption permits application of the Type DBA power fuse over a wide range of system voltages. This line of drop-out fuses carries the boric acid principle of circuit protection to higher voltage ratings, and at the same time provides at lower cost short circuit protection for systems of moderate capacity.

Principal parts of the DBA fuse unit are shown in the cross section Figure 1. Main operating parts are the fusible element, arcing rod, helical spring, and dry boric acid cylinder. To prevent warpage under outdoor conditions, a heavy Micarta tube encloses the entire assembly. This Micarta tube also

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assures adequate strength to contain the force of the arc interruption.

Within the fuse unit, the current path is maintained by tight electrical connections. From the top ferrule the path is to the copper tube spring shunt; then to the arcing rod collar and the arcing rod, on through the fusible element which is bridged by the

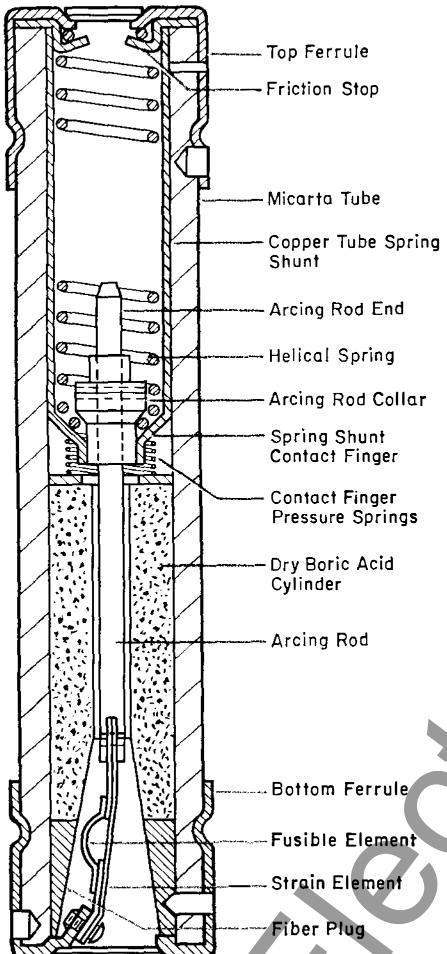

Figure 1

strain element, and into the bottom ferrule. The upper ferrule is securely pinned to the Micarta tube and soldered to the spring shunt. The copper spring shunt and the arcing rod collar are firmly held together by the contact finger pressure spring. This spring is forced against the tapered collar by pressure from the helical spring above it. When the fuse element is blown the arcing rod is pulled upward drawing the arc into the boric acid cylinder, the spring shunt contact fingers close in on the rod to maintain the electrical path. Intense heat from the arc, as it strikes, decomposes the dry boric acid. Decomposition of the dry boric acid forms water vapor and inert boric acid. The electrical interruption is caused by the steam de-ionizing the arc as it is drawn through the cylinder by action of the spring and rod.

The arcing rod is prevented from falling back into the fuse until after interruption by a friction stop as shown just inside the top ferrule.

Design Features

Replaceable Unit

The DBA type fuse unit is of the replaceable type rather than the renewable type. When fuse is blown and drop-out completed, the entire unit is removed with a hookstick. After replacement of the blown unit, it is closed back into place with the hookstick.

In replacing the blown fuse, the end fittings are removed and clamped on a new fuse. End fittings consist of an operating eye at the top and hinge lifting eye at the bottom. The two fittings have different shapes and are keyed with different projections, see Figures 2 and 3. Fittings are simple to remove or replace, and cannot be reversed since the keys insure quick, correct alignment.

Fuse unit nameplate is conspicuously located for ready reference when needed.

For each installation of DBA fuses, it is recommended that three spare fuse units with fittings attached be kept on hand so that replacement can be made with a minimum of delay.

Figure 2

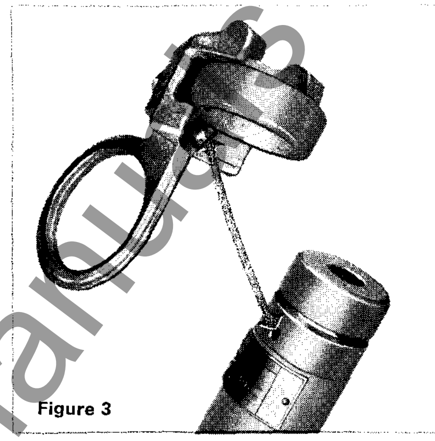

Figure 3

Drop-out Operation

1 Weather Protected

The drop-out, latch mechanism is sheltered against ice and snow to insure proper performance under all conditions. The sleet hood adequately protects the operating mechanism yet is small in size and requires

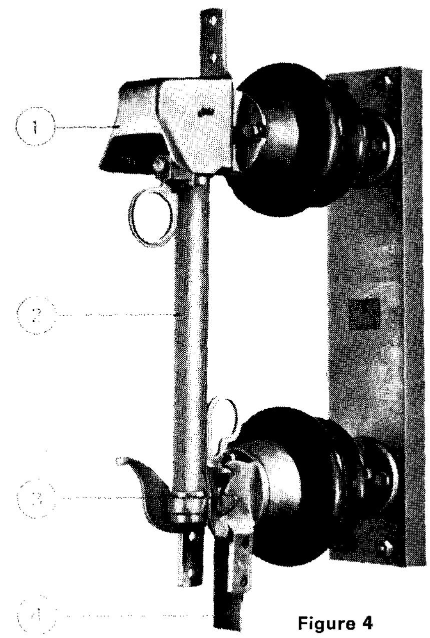

Figure 4

little additional space. Outdoor operating clearances are liberally maintained in all moving parts.

Electrical contact between the sleet hood shelter and the ejector casting is provided by a copper shunt bolted to both parts. The compressed ejector spring also creates points of high pressure contact.

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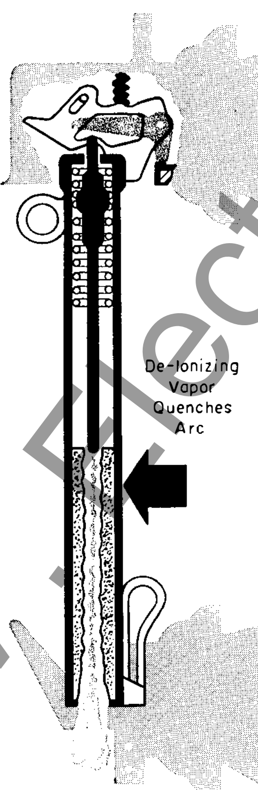
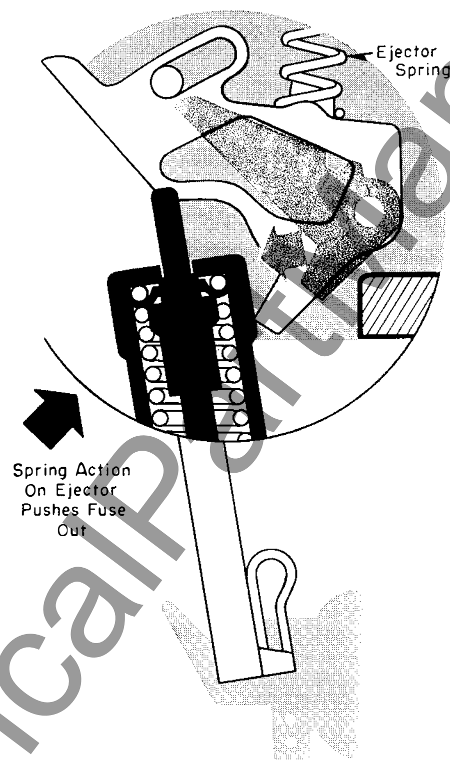
Sleet hood shelter, cable terminal, and drop-out mechanism are integrated into one unit that is bolted to the top of the insulator.

Double Action

De-ion circuit interruption by action of the boric acid fuse unit is followed simultaneously by a mechanical drop-out action. When closing the fuse unit with the hookstick, the ejector casting located under the sleet hood, compresses the ejector spring. Under fault conditions the fuse element melts, the helical spring pulls the arcing rod and arc through the cylinder. The upper end of the arcing rod drives through a small hole in the top of the ferrule of the fuse unit and strikes the trigger releasing ejector. The trigger operates and causes the ejector spring to force the ejector casting against the fuse assembly forcing it outward to swing through a 180° arc into a drop-out position. Drop-out action provides immediate visual indication that the particular circuit in which the fuse is connected has been interrupted. The additional drop-out break insulates the fault from the feeders with an air gap of at least 1 foot on lower voltage system and up to 6 feet on higher voltage systems.

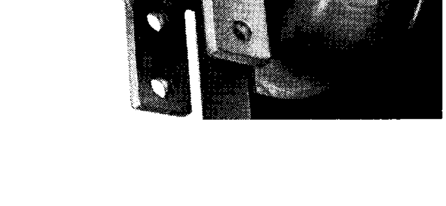


This air break eliminates any possibility of carbonized fuse parts breaking down to allow leakage or another fault. Since drop-out action takes place after current interruption within the boric acid cylinder, burning or arcing at the contact surfaces is eliminated.



Self-Aligning Hinge

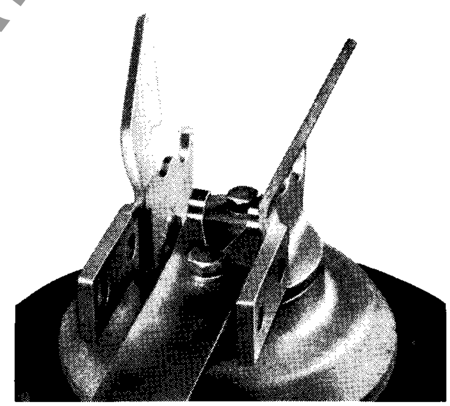
The self-aligning action of the trunnion in the hinge jaw prevents "wobble" when closing the fuse and makes "aiming" unnecessary. One swift motion with the hookstick closes the DBA fuse accurately and causes the latch jaw to engage securely.



High Pressure Contacts

Positive electrical connections are maintained at both ends of the DBA fuse by compressed spring action.

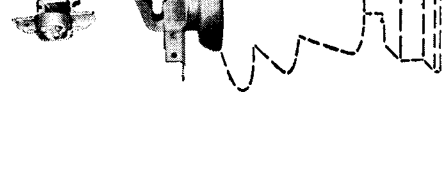
Shown below are the bronze spring fingers that assure firm contact at the hinged end of the fuse. These spring fingers are compressed on fuse closing; also, terminal pads are conveniently located for line connections at this point.



At the drop-out end of the DBA fuse, the ejector spring is compressed by the closing action. This provides both kick-out energy and a point of high pressure electrical contact.

Live Parts Above Insulators

For existing mountings, the live parts above the insulators are available. This includes hinge and break jaw assemblies and the fuse fittings, but not fuse tube or terminals. Availability of these parts insures maximum use of all mountings by permitting adaptability to various applications.



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Interrupting Ratings

The Power Fuse is an inherently fast circuit-interrupting device. This must be taken into account when determining the required short circuit interrupting rating of a fuse.

The boric acid power fuse will interrupt currents of short circuit magnitude in approximately ½ cycle measured from the instant of short circuit. During this ½ cycle, the short circuit current may be much higher than the sustained rms short circuit current of the system at that point. The fuse must be capable of safely interrupting this transient current which might exist at the instant the fuse operates.

In an alternating current circuit containing inductance, a sudden change in the ac current is accompanied by a transient dc component of current. The magnitude of this dc component is a function of the ac current before and after the change and the point on the cycle at which the change occurs. The decrement of the transient is a function of the inductance and resistance or losses of the circuit.

If a short is suddenly established on a circuit, the dc component can have a maximum peak value equal to the crest of the 60 cycle short circuit current of the system. This maximum transient is obtained if the fault occurs at voltage zero. Due to the system losses, this dc component will die out to a low value in a few cycles. However, a fuse normally interrupts a short circuit in ½ cycle, and this dc component of current must be taken into consideration in rating the fuse. If the decrement of the dc component in this half cycle is neglected, the rms value of current for the totally asymmetrical condition would be 1.73 times the rms symmetrical value of the 60 cycle component.

Experience has shown that there is some decrement in this first half cycle and also that the current is limited somewhat by the arc drop in the fuse. For this reason, a ratio of 1.6 has been selected between the rms asymmetrical current the fuse must be designed to interrupt and the rms short circuit current of the system on which the fuse is to be used.

This instantaneous rms asymmetrical value of short circuit current, which the fuse must be designed to interrupt, is often referred to as the rms symmetrical value including the dc component. The asymmetrical value is obtained by multiplying the symmetrical value by 1.6. The symmetrical value of short circuit current on a 3 phase system is determined by dividing the available 3 phase, short circuit kva by the product of the system voltage and $\sqrt{3}$.

Interrupting Ratings

Fuse Voltage Rating	Cycles	System Voltage	Total Rms Amperes Symmetrical	Total Amperes Asymmetrical	Maximum Three-Phase Kva ◉Symmetrical
DBA-1 – ½E to 200E					
7,200	50/60	2,400	6,300	10,000	26,000
		4,160	6,300	10,000	45,000
		6,900	6,300	10,000	75,000
14,400	50/60	13,200	6,300	10,000	140,000
		13,800	6,300	10,000	150,000
		14,400	6,300	10,000	160,000
23,000	50/60	23,000	6,300	10,000	250,000
34,500	50/60	34,500	5,000	8,000	300,000
46,000	50/60	46,000	4,000	6,400	320,000
69,000	50/60	69,000	2,500	4,000	300,000
DBA-2 – ½E to 200E					
34,500	50/60	34,500	12,500	20,000	746,000
46,000	50/60	46,000	12,500	20,000	1,000,000
69,000	50/60	69,000	10,000	16,000	1,200,000
DBA-5 – ½E to 200E					
34,500	50/60	34,500	8,000	12,800	480,000
46,000	50/60	46,000	6,300	10,000	500,000
69,000	50/60	69,000	5,000	8,000	600,000

◉ Equivalent 3-phase symmetrical kva at system voltage, calculated by kv x 1.73 x rated interrupting amperes.

Further Information

Price List 36-626

Westinghouse Electric Corporation
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