

THE TYPE BA DE-ION POWER FUSE provides effective protection of circuits and equipment which operate on voltages from 5000 to 34,500 volts inclusive. It is applicable in utility and industrial power plants for indoor and outdoor use. The fuse is designed for use on:

1. Power transformers
2. High-voltage motor control
3. Street lighting transformers
4. High-voltage capacitors
5. High-voltage d-c railroad circuits
6. Distribution transformers

7. Feeder circuit sectionalizing
8. Potential transformers

When used in combination with the Type LCB load break switch, an inexpensive, non-automatic load interrupter with high short circuit protection is provided.

In the various voltage ratings, fuse refills are available in standard current steps ranging from $\frac{1}{2}E$ to 200E amperes in the BA-100 and BA-200 classes. Standard refills for BA-400 go up to 400E ratings through 15 L or H kv. In the BA-400 class, refills for 23 kv and 34.5 kv go through 300E amperes. Time-lag refills for BA-100 and BA-200 are available from 15E through 200E for all ratings

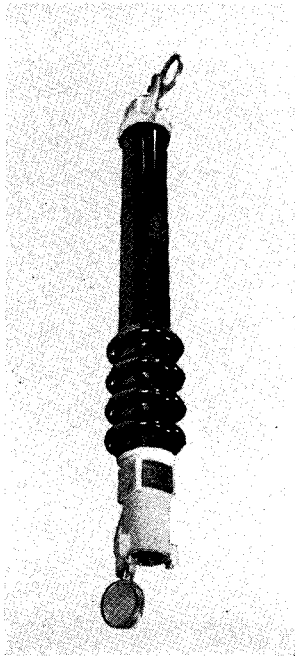
WESTINGHOUSE SPECIAL FEATURES

1 INTERRUPTING CAPACITY is ample for most applications. De-ion high speed operation permits application over a broad field.

2 CONDENSER OPERATION permits totally enclosed noiseless operation in cases of limited space installation.

3 ONLY NON-INFLAMMABLE AND NON-POISONOUS GASES are discharged. Dry type boric acid fuses with disconnecting, hookstick operation permit quick, simple replacement service.

4 B.I.L. INSULATORS to meet NEMA standard Basic Impulse Insulation Levels are incorporated into both indoor and outdoor units.



Above—Outdoor Vented Type Fuse Holder for 180° Opening.

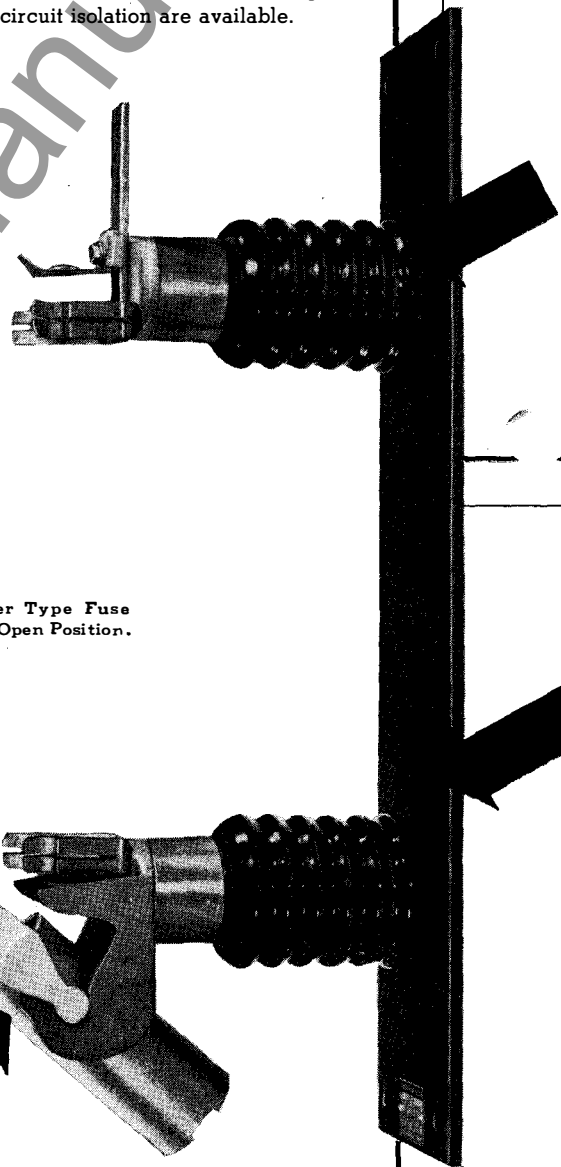
HOLDER

The outdoor fuse holder is a fibre-lined porcelain tube which encloses the refill element and the operating spring and shunt assembly. The fibre lining serves to withstand pressures developed within the fuse on operation. The porcelain tube is a weather-proof casing for the inner fibre lining. The indoor holder is of fibre construction.

The hinged jaw of the holder is self aligning which makes aiming in closing unnecessary. Hook-stick operation permits quick, simple replacement service. Fuse unit removal and replacement is a one minute function. In both indoor and outdoor applications, the fuse may be used as a disconnect switch. The non-disconnecting type fuse should be used only when other means of circuit isolation are available.

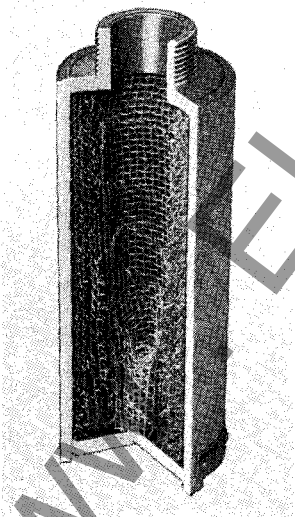
Outdoor vented type holders have gravity-operated cap which covers open hinge end of holder in disconnect position. The nameplate is conveniently located and data is readily readable for quick identification of holder rating and style.

Silver plated contacts minimize corrosion and keep contact resistance low.



Indoor Condenser Type Fuse Holder in Full 50° Open Position.

CONDENSER



Condenser Cutaway Shows Copper Screen Construction.

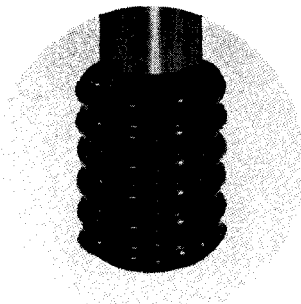
In cases where installation clearances are small, the attachment of a condenser will muffle the noise and contain the arc within the fuse. The condenser is a metallic container with copper screen constructed as shown in the photo to the left. The screen is sufficient to absorb and dissipate arc heat and to condense the steam to water. Use of the condenser assures noiseless and flameless operation of the fuse. The indoor vented type fuse, front and rear connected, opens 75°. The outdoor vented type opens 180°. With condenser the indoor and outdoor types open 50°. For the BA-200 and BA-400, condensers are available; however, the BA-200 condenser is smaller than the BA-400. The BA-100 does not use condensers.

INSULATORS

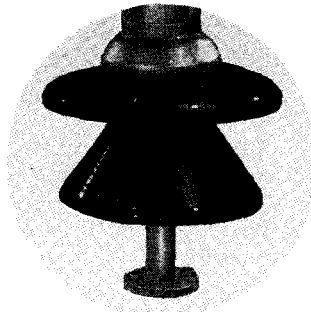
Both indoor and outdoor mountings are equipped with standard apparatus insulators. These insulators conform to both NEMA and A.I.E.E. standards. They meet NEMA Basic Impulse Insulation Levels (BIL).

Indoor and outdoor insulators are especially designed for their particular job to assure maximum protection under every operating condition.

Station post insulators can be supplied on all outdoor mountings upon request.



Indoor Type
Insulator



Outdoor Type
Insulator

MOUNTING

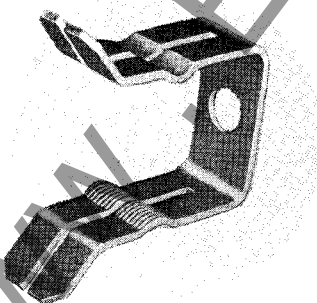
The standard mounting includes a base, two standard insulators, fittings and fuse clips.

Outdoor mounting bases are galvanized, bent plate steel which provides extra rigidity and insures a flat mounting surface.

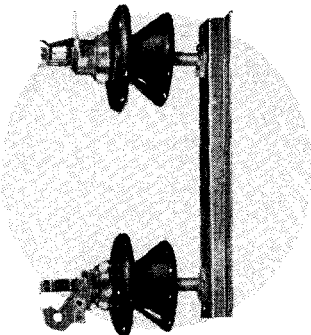
The indoor bases are of heavy flat sheet steel of sufficient thickness to insure adequate strength. On all mounting bases the nameplate is prominently attached for maximum readability.

Specially hinged jaws insure quick, unimpeded action in the movement of the fuse holder. Strong contact clips provide positive connections.

Mountings for 800 ampere are available. They provide for mounting two BA-400 holders on a common base and insulators. Refer to East Pittsburgh.

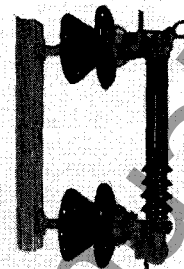


Improved Silver Plated Contact
Clip with Multiple Line Contacts.



Typical Mounting.

MOUNTINGS AND HOLDERS

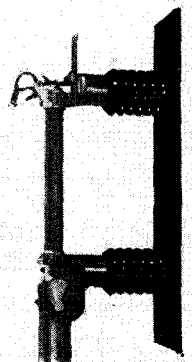


Outdoor vented
type holder and
mounting in
closed position.

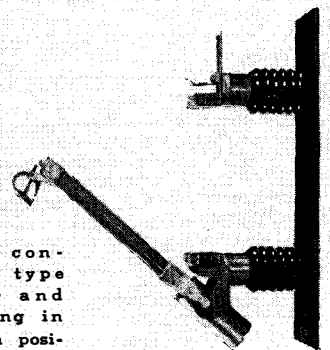


Outdoor vented
type holder and
mounting in
180° open posi-
tion.

Indoor con-
denser type
holder and
mounting in
closed position.



Indoor con-
denser type
holder and
mounting in
50° open posi-
tion.



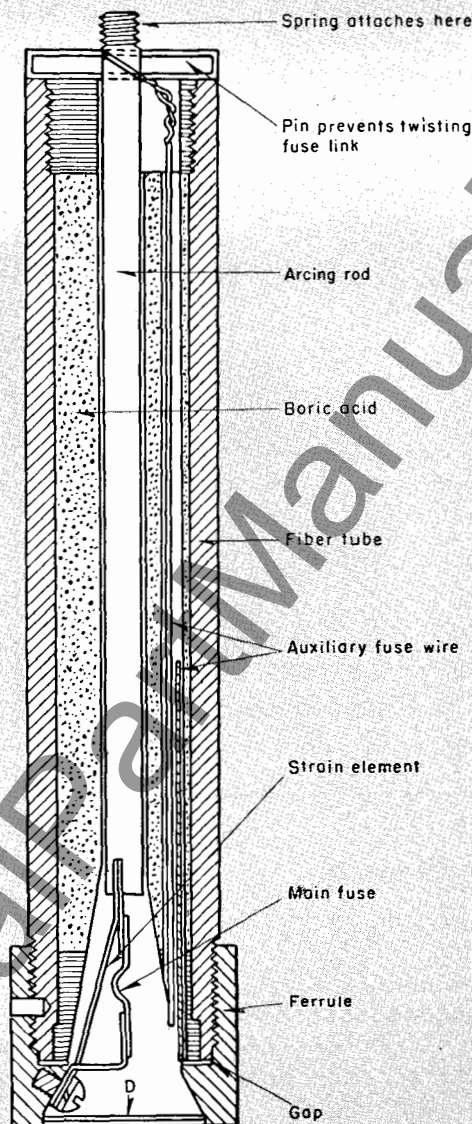
FUSE OPERATION

The Boric Acid power fuse, under currents of short circuit magnitude, will interrupt the circuit within $\frac{1}{2}$ cycle. Split-second action is achieved by use of a dry boric acid cylinder within which the fuse arc is drawn. Arc movement through the boric acid cylinder is achieved by a helical spring and arcing rod. Intense heat from the arc, as it strikes, decomposes the dry boric acid. On being decomposed, dry boric acid forms water vapor and inert boric oxide. 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 high particle turbulence of boric acid causes the rate of de-ionization in the cylinder to exceed the ionization rate of the electrical arc. This action prevents the arc from re-striking. The inorganic gas formed within the fuse has a very high dielectric strength and is much less likely to cause breakdowns between live parts than would organic gases.

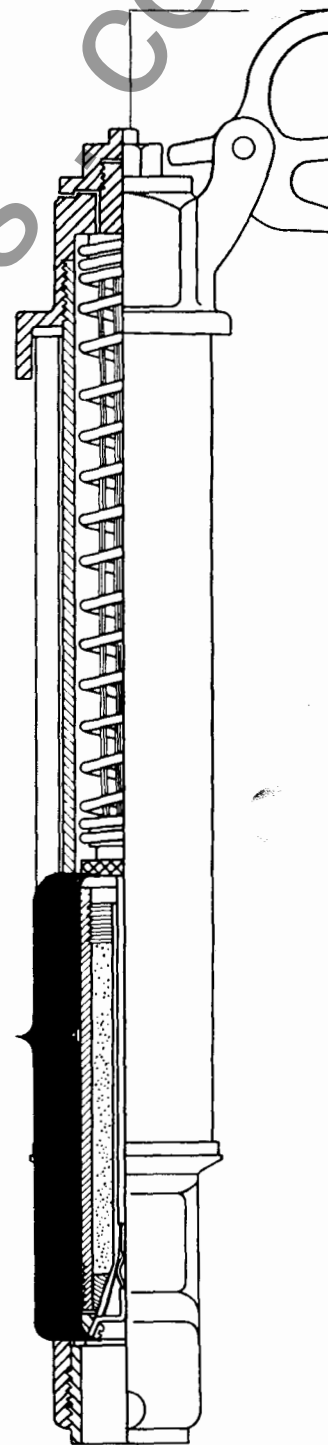
During the $\frac{1}{2}$ cycle within which the short circuit current may be flowing in the circuit, the magnitude of this current may be higher than the sustained rms short circuit current at this time. For this reason the power fuse applied on a system should have an interrupting capacity of 1.6 times the systems symmetrical short circuit current.

At right a complete fuse holder is pictured. Details show the fibre-lined porcelain holder enclosing the helical spring, flexible shunt within the spring, arcing rod, and boric acid fuse refill unit.

Details of the refill unit, pictured at right, show that there are two de-ionizing chambers in parallel, a large bore through which the arcing rod passes and a small bore for the auxiliary fuse wire. Through selective operation the small bore interrupts low-current faults and the large bore interrupts high-current faults.



Boric Acid Fuse Refill Unit
Details of Construction

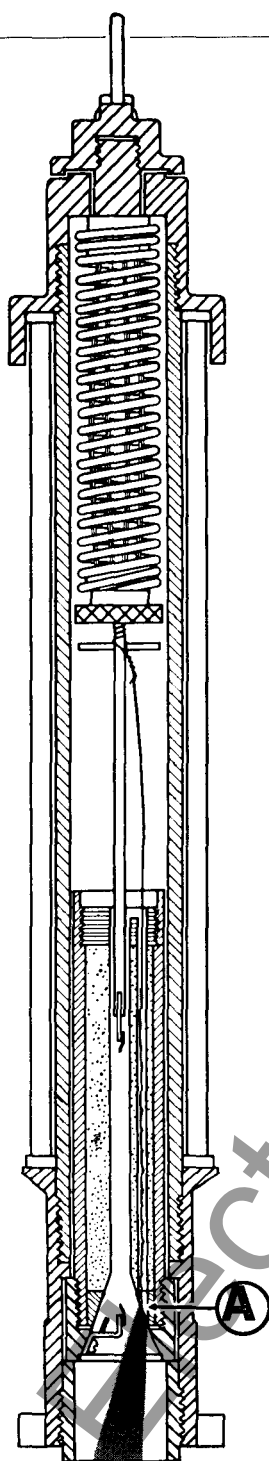


REFILL PACKAGING

Refill units for all voltages are available in moisture proof individual containers. Each container has a complete unit, ready for instant replacement in the fuse holder. A single replacement tool is packed with every unit and can be discarded after use. Refill unit style number and rating are clearly marked on both container and cylinder.

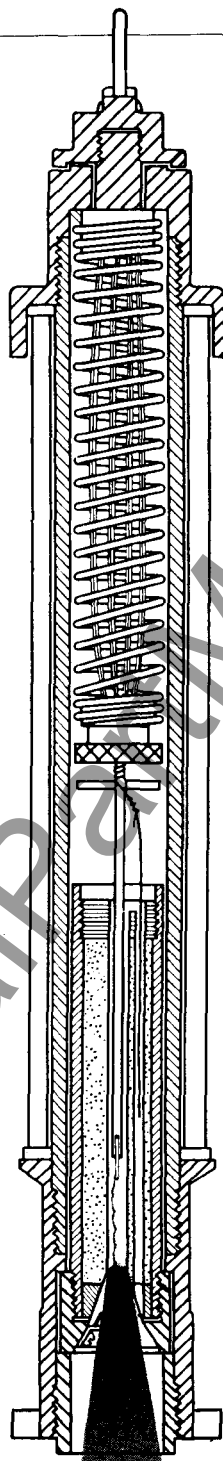
Note + shaped target on bottom of refill (visible when assembled in holder) that drops away on any current that melts main fuse. On heavy currents, expulsion of entire black Micarta disk provides indication.





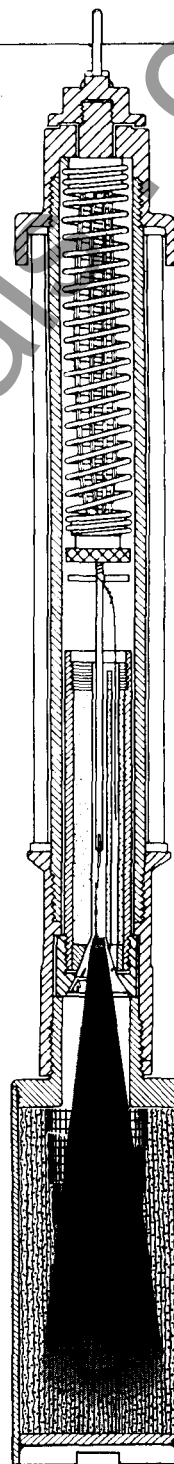
LOW-CURRENT FAULT

When an overload of low-current magnitude occurs, the main fuse link blows. The arc, thus made, bridges the gap of the small bore shown at (A). The auxiliary fuse wire shorts out the main fuse and the arc is extinguished in the small bore by a blast of water vapor evolved from the boric acid. The arcing rod, drawing no arc, moves to the open position by the spring action.



HIGH-CURRENT FAULT

An overload of heavy current magnitude blows the main fuse link and transfers to the auxiliary fuse. In the small bore the arc creates a high voltage so that it restrikes in the main bore. The arcing rod then draws the arc through the main bore where sufficient water vapor quickly extinguishes it.



TO ELIMINATE NOISE AND FLAME

Because the principal de-ionizing agent in the boric acid fuse is water vapor; the flame discharge is incandescent steam. A condensing device, consisting of copper screen so constructed that the entire condensing area is exposed to the discharge, will readily liquefy and silence the expulsion. With condenser, the fuse is positively noiseless and flameless.

INTERRUPTING CAPACITIES—VENTED

B.I.L. FUSE VOLTAGE RATING	MAX. AMP. REFILL	①AMPS ②KVA	50 OR 60 CYCLES						25 CYCLES					
			2400 V	4160 V.	6900 V.	13800 V.	22000 V.	33000 V.	2400 V.	4160 V.	6900 V.	13800 V.	22000 V.	33000 V.
BA-100														
5000-7500	100	AMPS KVA	25000 65000	25000 112800	25000 186500	.....	.....	.....	10000 26100	10000 45000	10000 74600	.....	.....	.....
15000 L or H	100	AMPS KVA	.....	.....	25000 186500	20000 300000	.....	.....	.....	.....	10000 74600	9500 141500	.....	.....
23000	100	AMPS KVA	.....	.....	.....	20000 300000	15000 357000	.....	.....	.....	.....	9500 141500	8000 190000	.....
BA-200														
5000-7500	200	AMPS KVA	27500 71500	27500 123700	25000 186500	.....	.....	.....	12500 32500	12500 56200	10000 74600	.....	.....	.....
15000 L or H	200	AMPS KVA	.....	.....	25000 186500	20000 300000	.....	.....	.....	.....	10000 74600	9500 141500	.....	.....
23000	200	AMPS KVA	.....	.....	.....	20000 300000	15000 357000	.....	.....	.....	.....	9500 141500	8000 190000	.....
34500	200	AMPS KVA	.....	.....	.....	20000 300000	15000 357000	10000 357000	.....	.....	.....	9500 141500	8000 190000	7000 250000
BA-400③														
5000-7500	400	AMPS KVA	40000 104000	40000 180000	35000 261000	.....	.....	.....	15000 38900	15000 67500	12500 93300	.....	.....	.....
15000 L or H	400	AMPS KVA	.....	.....	35000 261000	30000 448000	.....	.....	.....	.....	12500 93300	10000 150000	.....	.....
23000	300	AMPS KVA	.....	.....	.....	30000 448000	25000 595000	.....	.....	.....	.....	10000 150000	9000 214000	.....
34500	300	AMPS KVA	.....	.....	.....	30000 448000	25000 595000	20000 715000	.....	.....	.....	10000 150000	9000 214000	8000 286000

INTERRUPTING CAPACITIES—CONDENSER

B.I.L. FUSE VOLTAGE RATING	MAX. AMP. REFILL	① AMPS ② KVA	50 OR 60 CYCLES						25 CYCLES					
			2400 V.	4160 V.	6900 V.	13800 V.	22000 V.	33000 V.	2400 V.	4160 V.	6900 V.	13800 V.	22000 V.	33000 V.
BA-200														
5000-7500	200	AMPS KVA	17500 45400	17500 78700	15000 112000	.....	.....	.....	10000 26100	10000 45000	8000 60000	.....	.....	.....
15000 L or H	200	AMPS KVA	.....	.....	15000 112000	12500 187000	.....	.....	.....	.....	8000 60000	7000 104500	.....	.....
23000	200	AMPS KVA	.....	.....	.....	12500 187000	10000 238000	.....	.....	.....	.....	7000 104500	6000 143000	.....
34500	200	AMPS KVA	.....	.....	.....	12500 187000	10000 238000	7500 267600	.....	.....	.....	7000 104500	6000 143000	5000 178500
BA-400 ^③														
5000-7500	400	AMPS KVA	30000 78000	30000 135000	25000 186500	.....	.....	.....	12500 32500	12500 56200	10000 75600	.....	.....	.....
15000 L or H	400	AMPS KVA	.....	.....	25000 186500	20000 300000	.....	.....	.....	.....	10000 74600	8000 119500	.....	.....
23000	300	AMPS KVA	.....	.....	.....	20000 300000	17500 417000	.....	.....	.....	.....	8000 119500	77000 166500	.....
34500	300	AMPS KVA	.....	.....	.....	20000 300000	17500 417000	15000 536000	.....	.....	.....	8000 119500	7000 166500	6000 250000

- ① **ASYMMETRICAL RMS CURRENT (1.6 × SYMMETRICAL) AT SYSTEM VOLTAGE.** The interrupting current rating is given as the RMS instantaneous asymmetrical value which includes the D-C component. A fault occurring at or near the zero point on the voltage wave may reach, for the first half cycle, a value of 1.6 times that of the symmetrical current wave. Due to the fast operation of the BA fuse, the asymmetrical value may be interrupted and the fuses should be so applied.
- ② **EQUIVALENT 3 PHASE SYMMETRICAL KVA AT SYSTEM VOLTAGE.** Since system KVA calculations are usually based on RMS Symmetrical current the KVA ratings of the table have been obtained by dividing the asymmetrical KVA values by 1.6.
- ③ **BA-800 Fuses up to 15 kv are also available.** Interrupting rating is same as BA-400. Refer to East Pittsburgh for details.

RATINGS FOR SHORT CIRCUIT PROTECTION OF TRANSFORMERS

RECOMMENDED MINIMUM FUSE RATINGS FOR TRANSFORMER SHORT CIRCUIT PROTECTION*

KVA	2400 VOLTS		4160 VOLTS		6900 VOLTS		13800 VOLTS		22000 VOLTS		33000 VOLTS	
	AMPERES		AMPERES		AMPERES		AMPERES		AMPERES		AMPERES	
	FULL LOAD	FUSE # RATING	FULL LOAD	FUSE # RATING	FULL LOAD	FUSE # RATING	FULL LOAD	FUSE # RATING	FULL LOAD	FUSE # RATING	FULL LOAD	FUSE # RATING
SINGLE-PHASE TRANSFORMERS												
5	2.08	5	1.2	5	.73	5	.....	.....	.....	.....	.....	.....
10	4.16	10	2.4	5	1.45	5	.73	5	.....	.....	.....	.....
15	6.25	15	3.6	7	2.17	5	1.08	5	.....	.....	.....	.....
25	10.4	20	6.0	15	3.62	7	1.81	5	1.14	5	.76	5
37.5	15.6	30	9	20	5.44	10	2.72	5	1.70	5	1.14	5
50	20.8	50	12	25	7.25	15	3.62	7	2.28	5	1.52	5
75	31.2	65	18	40	10.9	25	5.45	10	3.41	7	2.27	5
100	41.7	100	24	50	14.5	30	7.25	15	4.55	10	3.03	7
150	62.5	125	36	80	21.7	50	10.8	25	6.8	15	4.55	10
200	83.5	200	48	100	29	65	14.5	30	9.1	20	6.07	15
250	104	200	60	125	36.2	80	18.1	40	11.4	25	7.6	15
333	139	300	80	200	48.4	100	24.2	50	15.2	30	10.1	20
400	168	400	96	200	58	125	28.9	65	18.2	40	12.1	25
500	208	400	120	250	72.5	150	36.2	80	22.8	50	15.2	30
THREE-PHASE TRANSFORMERS												
5	1.2	5	.69	5	.....	5	.....	.....	.....	.....	.....	.....
10	2.4	5	1.39	5	.83	5	.....	.....	.....	.....	.....	.....
15	3.6	7	2.08	5	1.25	5	.62	5	.....	.....	.....	.....
25	6.0	15	3.47	7	2.08	5	1.04	5	.65	5	.44	5
37.5	9.0	20	5.2	10	3.14	7	1.57	5	.99	5	.66	5
50	12.0	25	6.9	15	4.18	10	2.1	5	1.31	5	.87	5
75	18.0	40	10.4	20	6.26	15	3.14	7	1.97	5	1.31	5
100	24.0	50	13.9	30	8.36	20	4.19	10	2.63	5	1.75	5
150	36.0	80	20.8	50	12.5	25	6.21	15	3.93	10	2.62	5
200	48.0	100	27.8	65	16.7	40	8.35	20	5.25	10	3.5	7
300	72	150	41.6	100	26.1	50	12.5	25	7.85	15	5.2	10
450	108	200	62.5	125	37.7	80	18.8	40	11.8	25	7.87	15
500	120	250	69	150	41.8	100	21.0	50	13.1	30	8.73	20
600	144	300	83.2	200	50.2	100	25.2	50	15.8	30	10.5	20
750	180	400	104	200	62.6	125	31.4	65	19.7	40	13.1	30
1000	.....	.....	139	300	83.6	200	41.9	100	26.3	65	17.5	40
1500	.....	.....	208	400	125	250	62.1	125	39.3	80	29.5	65
2000	.....	.....	.....	.....	167	400	83.5	200	52.5	125	35	80
2500	.....	.....	.....	.....	208	400	104	200	65.5	125	43.7	100
3000	.....	.....	.....	.....	.....	.....	125	250	78.5	150	52.3	125
3750	.....	.....	.....	.....	.....	.....	157	300	98.5	200	65.7	125
5000	.....	.....	.....	.....	.....	.....	210	400	131	250	87.5	200
6000	.....	.....	.....	.....	.....	.....	.....	.....	158	300	105	200
7500	.....	.....	.....	.....	.....	.....	.....	.....	197	400	131	250
10000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	175	250

* For special applications and where coordination is required, refer to curves.

Ø For Open Delta Banks, use the following rules:

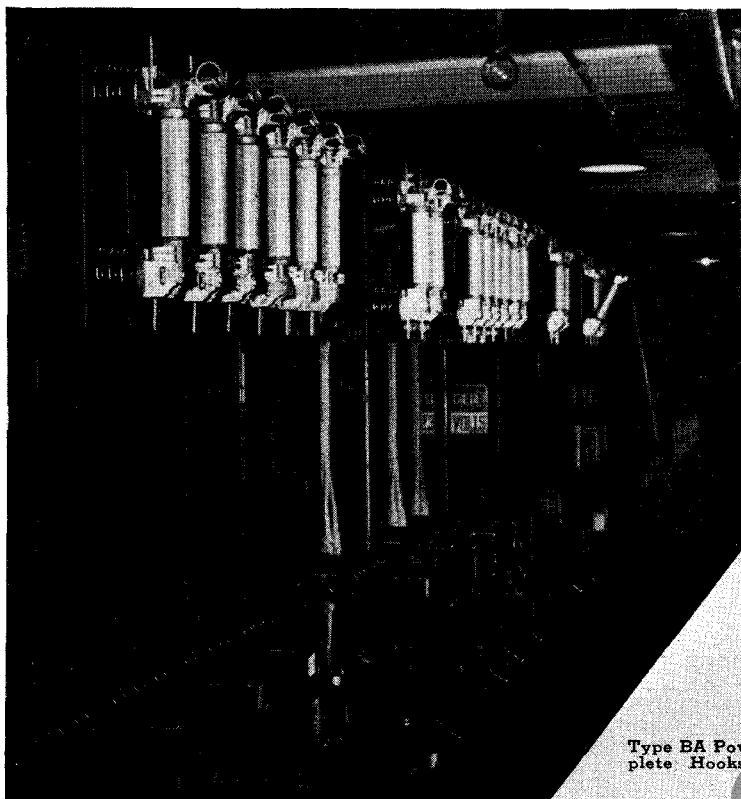
- Balanced Open Delta**—Fuse the common phase wire at the full 3-phase equivalent bank rating. Fuse the other 2-phase wires at one-half the 3-phase bank rating.
- Unbalanced Open Delta**—Fuse the common phase wire at the full 3-phase equivalent of the largest transformer. Fuse the outside legs at one-half the 3-phase equivalent of the transformer feeding that leg.

* "E" RATINGS

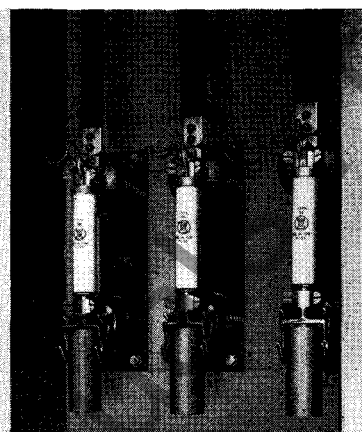
Current ratings of the BA fusible elements are based on the new NEMA "E" power fuse current rating standard.

These requirements specify that the fusible element rated 100 amperes or below, shall melt in 300 seconds at an rms current within the range of 200 to 240% of the continuous current rating of the fuse unit. The fusible elements rated above 100 amperes shall melt in 600 seconds at an rms current within the range of 220 to 264% of the continuous rating of the fuse unit.

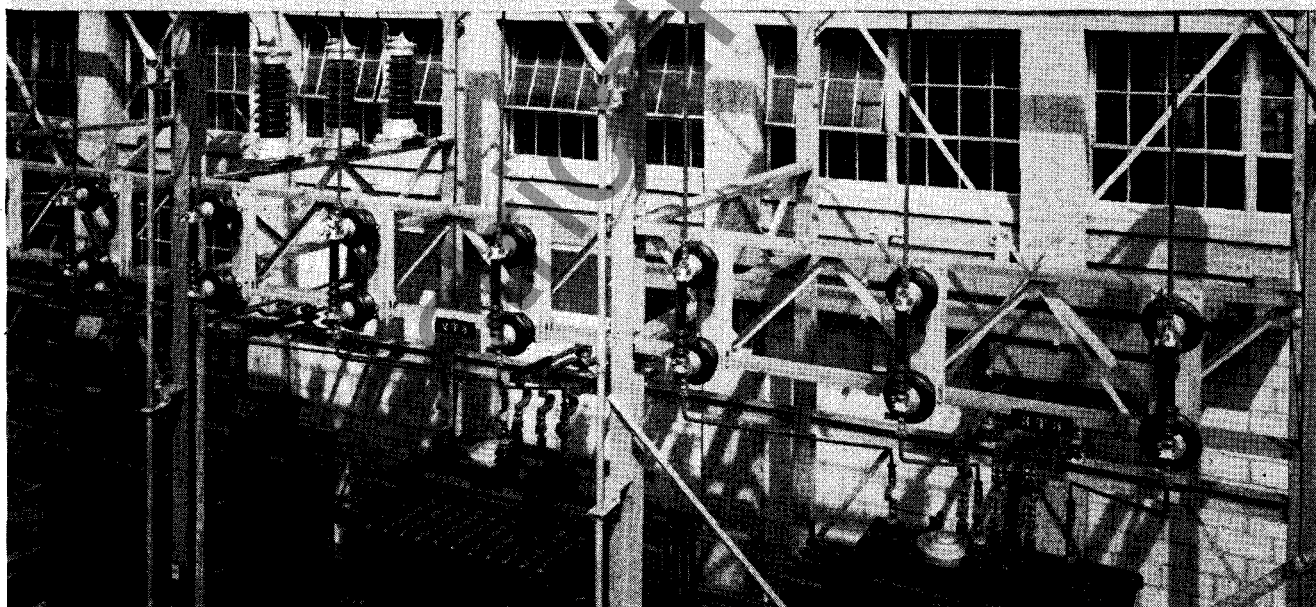
The "E" rating and the former "N" rating are based on the 100% current-carrying standard. Conforming to this standard, the BA fuse unit will carry its rated current continuously without exceeding permissible temperature rises. Curves attached to this page show the time-current characteristics of these fuse units for voltages from 5000 volts to 34.5 kv.



Type BA Power Fuses—With Complete Hookstick Operation



Type BA De-ion Power Fuses
—Indoor, Condenser, 7.5 Kv
—3-Phase Installation.



Type BA Power Fuses—Directly Connected for Protection of 3-Phase Transformer Bank.

LITERATURE REFERENCE

PRICES—See Price List 36-300.

APPLICATION—See Application Data 36-300.

DIMENSIONS—See Dimension Sheet 36-300.



WESTINGHOUSE ELECTRIC CORPORATION
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