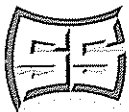


CATALOG SECTION 1000
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Southern States, Inc.

Primary Distribution Fuse Links



Southern
States, Inc.

The Quality Name In High Voltage Products

A Reliable Link For All Requirements . . .

The primary function of any fuse link is that it perform in accordance with established time-current curves and that it maintain complete accuracy after being repeatedly subjected to excessive currents short of its melting time. In addition, it must operate dependably in a range of current values from those just high enough to melt the link to values equal to the interrupting capacity of the cutout in which it is functioning.

Southern States' fuse links meet these requirements.

Another important design consideration incorporated in these links is the capacity to withstand current surges without damage. The current-responsive element employs high tensile strength, high melting temperature heater wires. They will not stretch or neck down from current values which do not actually cause them to melt. In addition, these links operate at temperatures safely below the "char zone" for fuse tube walls. Under long time, overload currents, the heat is conducted to the special alloy fusible joint which melts at a relatively low temperature.

Since a high percentage of faults on distribution systems are of relatively low magnitude, Southern States' links are designed to perform dependably under these troublesome, hard-to-clear, restricted fault conditions. This has been accomplished by the use of an arc-quenching material encased in an auxiliary tube surrounding the fuse element. This feature is fully discussed on Page 4.

The standardized construction of these links, incorporating such features as silver plating of all external fittings, high strength crimped joints, and extra-flexible pigtail cables contribute to Southern States links that are mechanically stronger, more resistant to corrosion, and more dependable than ever before.

Southern States' universal type distribution fuse links as described in this bulletin are manufactured in accordance with NEMA Publication SG2-1954, Paragraph SG24.11. All universal links described have the same general mechanical construction; however, electrical characteristics are offered in six classifications, distinguished by different melting speed ratios. They may be applied in any NEMA Standard distribution cutout.

All universal links (AF, AM, AX, AK, AT, and AH) are supplied assembled with button head ready for installation in single-vented, control-vented, or load

break cutouts. For double venting cutouts requiring cable on both ends of the link, an adaptor kit is available. Refer to the factory for this item.

Each link is stamped on the button head with the continuous current rating and the Southern States trademark.

TYPES AF, AM, AX

The three speed ratios: AF, slow; AM, medium; and AX, fast have the same time-current characteristics offered for many years, but their mechanical construction has been changed to that illustrated on Page 3.

TYPES AK AND AT

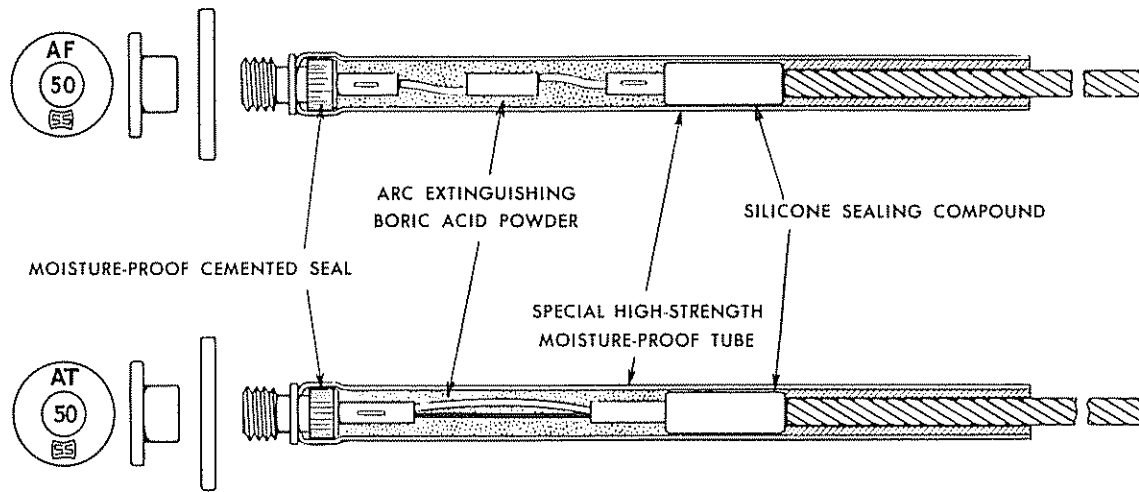
These two speed ratios conform to EEL-NEMA Standards as outlined in NEMA Publication SG2-1954. The mechanical construction is the same as that illustrated on Page 3 of this bulletin.

TYPE AH — HIGH SURGE LINK

The Type AH provides thermal protection for small transformers, at the same time affording surge protection to prevent needless blowing of fuse links. The time-current characteristics of this link are illustrated on Page 8. Its general construction is the same as for other Southern States links.

SPECIAL FUSE LINKS FOR TYPE HH-33-D EXTRA-HEAVY DUTY CUTOUT

The Types UF, UM, UX, UK, UT, and UH are special fuse links designed to be applied in Southern States' Type HH-33-D double-vented cutouts and the Type HMM-1 power fuses. Construction of these links varies from the universal link in that they are equipped with an integral umbrella cap as illustrated on Page 3. Time-current characteristic is indicated by the suffix of each type (F, M, X, K, T, or H) and is the same as for the universal links previously described.

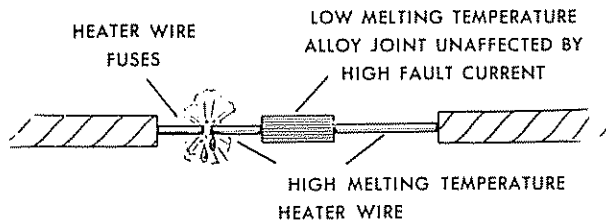


**GENERAL CONSTRUCTION OF SOUTHERN STATES LINKS
TYPES AF AND AT ILLUSTRATED ABOVE**

All Southern States distribution fuse links employ the same basic construction principles. They differ in button head and cable size, auxiliary tube diameter, ferrules, and in the materials employed in current responsive elements.

The current-responsive elements consist of high tensile strength, high melting temperature heater wires of chromel, copper, silver, or special alloys in conjunction with a joint that melts at low temperature.

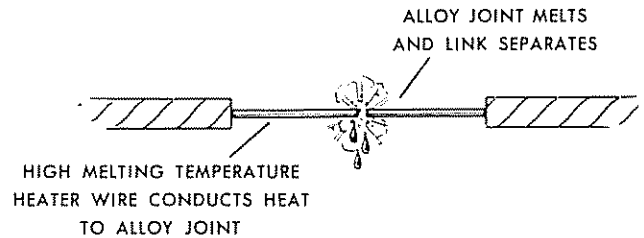
The primary consideration in the design of this element is to provide a link that will operate at temperatures below the "char zone" for fuse tube walls, and one that will withstand current surges without damage at any value which does not actually melt the link. This is accomplished as described by the following illustrations:



LINK SUBJECTED TO HIGH CURRENT FAULT

In the illustration above, the link has been subjected to a high current fault. The heater wire has reached a melting temperature before sufficient heat could be conducted through the wire to melt the low temperature joint.

The link is not damaged by any current surge which fails to melt the current-responsive element.



LINK MELTING FROM LONG TIME OVERLOAD CURRENT

In this illustration the link has been subjected to a long time overload current. Sufficient heat has been conducted from the element wires to melt the low temperature alloy joint. Temperature rise has been limited to a point well below the "char zone" for fuse tube walls.

**SPECIAL FUSE LINK FOR TYPE HH-33-D
EXTRA HEAVY DUTY CUTOUT**



The special fuse link, shown above, for the Type HH-33-D cutout is provided with an integral umbrella cap as part of its construction. These caps assure reliable link ejection and unlatching action and offer minimum interference to the high velocity gas escape associated with an extra-heavy duty cutout.

The problem of clearing restricted fault currents has long been a serious one. Under overload conditions the modern distribution cutout is sometimes incapable of generating sufficient expulsion action to quench the arc of a ruptured link.

In the past the problem has been partially solved by the use of an auxiliary fiber tube which confines the fusible element of the fuse link and provides the substance for the generation of gases to quench the arc. In addition, a spring as a component of the link, holds it under tension in order to separate the element rapidly when it ruptures.

This method of solving the problem has not been entirely satisfactory and led to the development of the type of link construction illustrated here.

New Construction – New Dependability

Dependability on low faults is accomplished through the use of boric acid powder located in intimate contact with the arc of the ruptured link. The mass of boric acid volatilizes, instantly building a vapor pressure high enough to quench the arc. In addition, the vapor pressure created expels the lower end of the fuse link at high velocity from the auxiliary tube.

The top of the auxiliary tube is cemented to the top ferrule, and the lower end is sealed by a special silicone compound that maintains a constant viscosity over a wide temperature range and will not creep or flow. In addition to sealing the tube against the entrance of moisture, the silicone compound serves to hold the lower end of a ruptured link in place until effective gas pressure has been built up to assure expulsion of the arc.

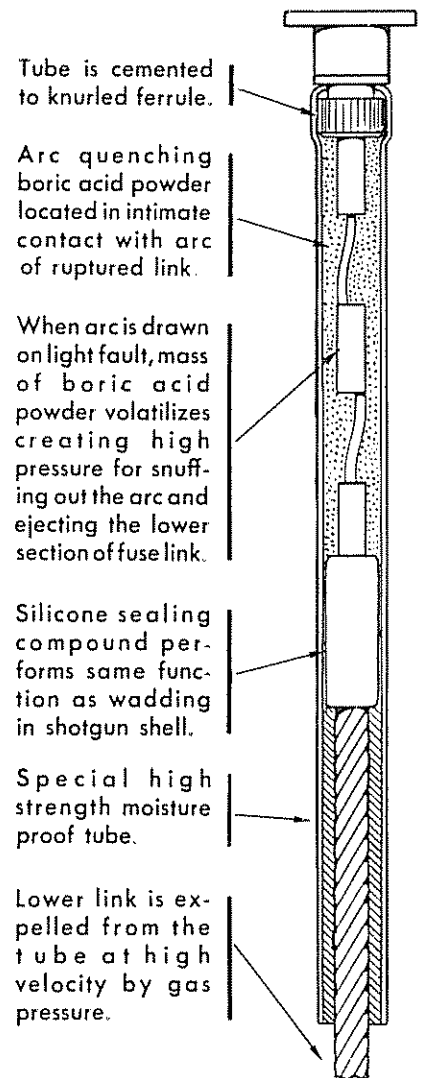
Comparative Tests on Low Faults Show Capabilities of New  Fuse Links

The boric acid powder used in these links for the purpose of providing new dependability in the low current range has proved to be highly satisfactory. Numerous tests have shown that the principle is entirely sound. When using these links, performance on restricted faults, even in a large bore, double-vented cutout, has been greatly improved.

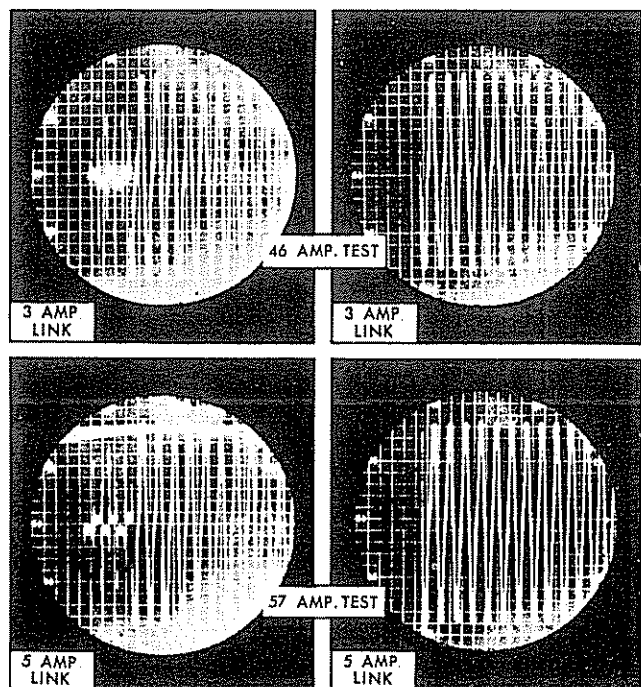
Further substantiation of the capabilities of these links was graphically illustrated when comparative tests on low current faults at 14.4 kv were made between links of conventional design and the new type links.

The oscillograms at the right show the time required in cycles for full line voltage recovery. In the case of the old type link, note that the line voltage did not fully recover for 2½ cycles on the 46 amp test and 3 cycles on the 57 amp test. The oscillograms of the new links show no measurable arcing time.

Since there is little or no arcing time, it is apparent that the boric acid powder is quenching the arc almost instantaneously. The result is excellent performance on restricted faults and improved performance throughout the entire range of operation.



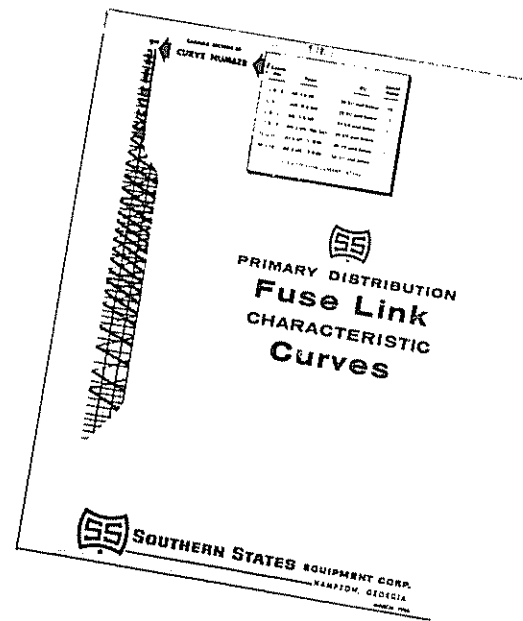
LINKS WITH FIBER AUXILIARY TUBE LINKS WITH BORIC ACID POWDER



TIME-CURRENT CHARACTERISTIC CURVES

Minimum Melting and Total Clearing

Curves on all fuse links covered by this bulletin are plotted on the basis of 25°C ambient and no initial load on the link. In order to account for the effect of such operating variables as load current preheating, inrush currents, and ambient temperatures, it is recommended that a coordination factor be applied to the minimum melting curves. As discussed in the Appendix to EEI-NEMA Standards Publication TDJ-110/108-1952 this factor may be 75% of the minimum melting time shown on the curves.



PACKAGING

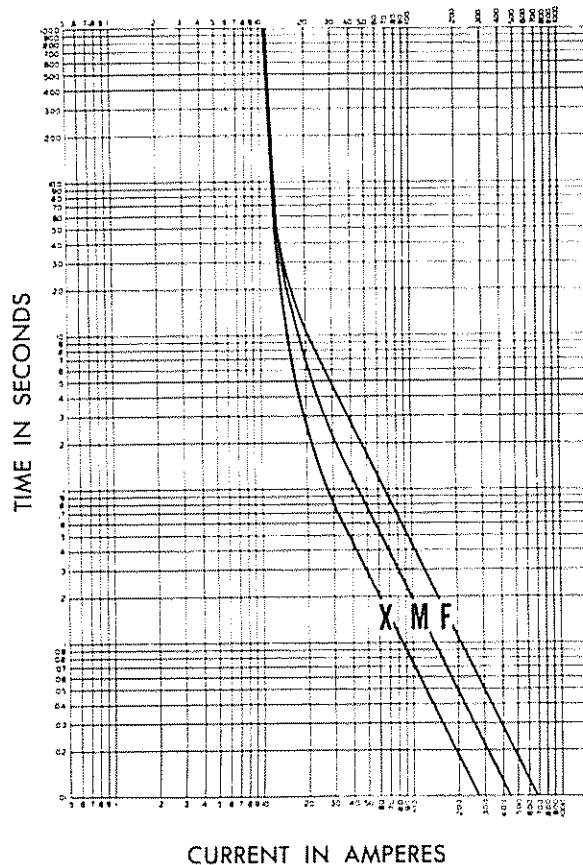
CLEAR MARKING FOR QUICK, EASY LINK IDENTIFICATION


Southern States' fuse links are packaged in heavy duty, moisture resistant cartons. They are plainly marked for quick, easy link identification.

The simplified time-current curve (right) illustrates the relative speeds of the F, M, and X fuse links for a given rating. The three families of links are designed to give the same measure of protection in the "overload", or low-current, long-time region, along with a choice of high current, short time characteristics. Such a choice is valuable in providing selective operation of fuses and other protective devices.

With "speed ratio" defined as the ratio of melting current at .1 second to that at 300 seconds, fuse links types F, M, and X have ratios of approximately 19, 12, and 6 respectively.

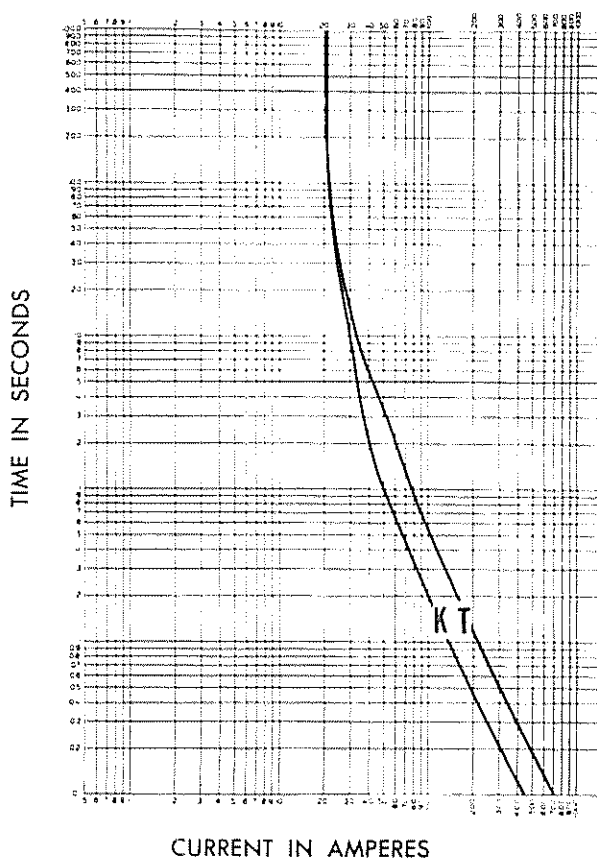
The general basis for rating of the Types F, M, and X "N" rated fuse links requires that they carry their rated current indefinitely without blowing, and that they blow in approximately 300 seconds at 120% of rating.



CURRENT IN AMPERES
Time-current characteristics of  Types AF, AM, AX, UF, UM, and UX.

FUSE LINK TYPES AND CATALOG NUMBERS


AMPS	Fuse links below are for cutouts 5.2KV through 27KV.			Fuse links below are for Southern States' Type HH-33-D Cutouts rated 5.2KV or 7.8KV.			Fuse links below are for Southern States Type HH-33-D Cutouts rated 15KV.		
	AF	AM	AX	UF	UM	UX	UF	UM	UX
5									
1	AF15001	AM15001		UF75001	UM75001		UF15001	UM15001	
2	AF15002	AM15002		UF75002	UM75002		UF15002	UM15002	
3	AF15003	AM15003	AX15003	UF75003	UM75003	UX75003	UF15003	UM15003	UX15003
5	AF15005	AM15005	AX15005	UF75005	UM75005	UX75005	UF15005	UM15005	UX15005
6									
7									
8	AF15008	AM15008	AX15008	UF75008	UM75008	UX75008	UF15008	UM15008	UX15008
10	AF15010	AM15010	AX15010	UF75010	UM75010	UX75010	UF15010	UM15010	UX15010
12									
12.5	AF15012.5	AM15012.5		UF75012.5	UM75012.5		UF15012.5	UM15012.5	
15	AF15015	AM15015	AX15015	UF75015	UM75015	UX75015	UF15015	UM15015	UX15015
20	AF15020	AM15020	AX15020	UF75020	UM75020	UX75020	UF15020	UM15020	UX15020
25	AF15025	AM15025	AX15025	UF75025	UM75025	UX75025	UF15025	UM15025	UX15025
30	AF15030	AM15030	AX15030	UF75030	UM75030	UX75030	UF15030	UM15030	UX15030
40	AF15040	AM15040	AX15040	UF75040	UM75040	UX75040	UF15040	UM15040	UX15040
50	AF15050	AM15050	AX15050	UF75050	UM75050	UX75050	UF15050	UM15050	UX15050
60	AF15060	AM15060	AX15060	UF75060	UM75060	UX75060	UF15060	UM15060	UX15060
65									
75	AF15075	AM15075	AX15075	UF75075	UM75075	UX75075	UF15075	UM15075	UX15075
80									
100	AF15100	AM15100	AX15100	UF75100	UM75100	UX75100	UF15100	UM15100	UX15100
125	AF15125	AM15125	AX15125	UF75125	UM75125	UX75125	UF15125	UM15125	UX15125
140									
150	AF15150	AM15150	AX15150	UF75150	UM75150	UX75150	UF15150	UM15150	UX15150
200	AF15200	AM15200	AX15200	UF75200	UM75200	UX75200	UF15200	UM15200	UX15200
250				UF75250	UM75250	UX75250	UF15250	UM15250	UX15250
300				UF75300	UM75300	UX75300	UF15300	UM15300	UX15300



The simplified time-current curve (left) illustrates the relative speed of the K and T fuse links. These two families of links are designed in accordance with the joint EEI-NEMA Standard outlined in NEMA Publication No. 108-1952 and EEI Publication No. TDJ-110. Each of the two types provides the same measure of protection in the “overload”, or low-current, long-time region, along with a choice of surge capacity or ability to withstand relatively high values of current for predictable lengths of time.

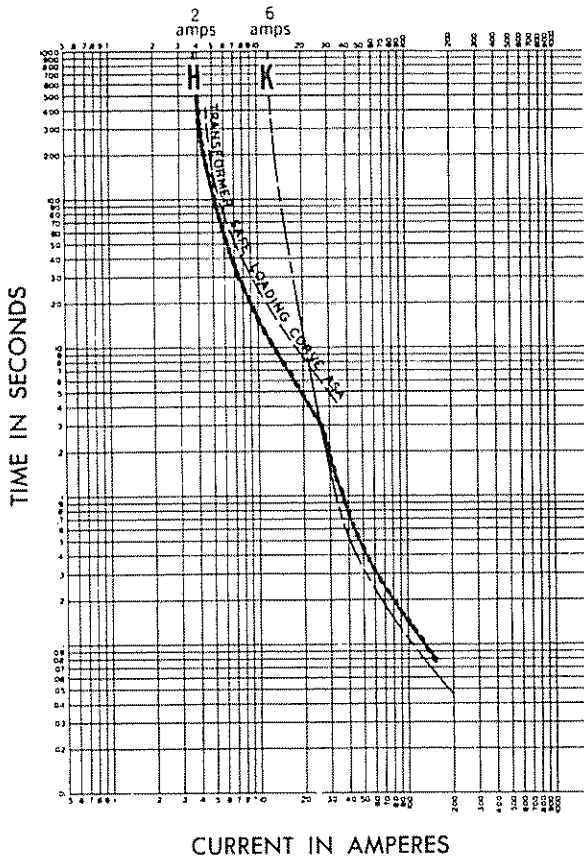
With “speed ratio” defined as the ratio of melting current at .1 second to that at 300 seconds, fuse links Types K and T have ratios of approximately 7 and 11 respectively.

The general basis for rating of the Types K and T fuse links requires that they carry their rated current indefinitely without blowing and that they blow in approximately 300 seconds at 220% of rating.

Time-current characteristics of  (EEI-NEMA) link Types AK, AT, UK, and UT.


EEI-NEMA FUSE LINK TYPES AND CATALOG NUMBERS

AMPS	Fuse links below are for cutouts rated 5.2KV through 27KV.		Fuse links below are for Southern States' Type HH-33-D Cutouts rated 5.2KV or 7.8KV.		Fuse links below are for Southern States' Type HH-33-D Cutouts rated 15KV.	
	AK	AT	UK	UT	UK	UT
1	AK15001	AT15001	UK75001	UT75001	UK15001	UT15001
2	AK15002	AT15002	UK75002	UT75002	UK15002	UT15002
3	AK15003	AT15003	UK75003	UT75003	UK15003	UT15003
5						
6	AK15006	AT15006	UK75006	UT75006	UK15006	UT15006
7						
8	AK15008	AT15008	UK75008	UT75008	UK15008	UT15008
10	AK15010	AT15010	UK75010	UT75010	UK15010	UT15010
12	AK15012	AT15012	UK75012	UT75012	UK15012	UT15012
12.5						
15	AK15015	AT15015	UK75015	UT75015	UK15015	UT15015
20	AK15020	AT15020	UK75020	UT75020	UK15020	UT15020
25	AK15025	AT15025	UK75025	UT75025	UK15025	UT15025
30	AK15030	AT15030	UK75030	UT75030	UK15030	UT15030
40	AK15040	AT15040	UK75040	UT75040	UK15040	UT15040
50	AK15050	AT15050	UK75050	UT75050	UK15050	UT15050
60						
65	AK15065	AT15065	UK75065	UT75065	UK15065	UT15065
75						
80	AK15080	AT15080	UK75080	UT75080	UK15080	UT15080
100	AK15100	AT15100	UK75100	UT75100	UK15100	UT15100
125						
140	AK15140	AT15140	UK75140	UT75140	UK15140	UT15140
150						
200	AK15200	AT15200	UK75200	UT75200	UK15200	UT15200
250						
300						



The simplified time-current curve (left) illustrates the high surge characteristics provided by Southern States' Types AH and UH fuse links. The high surge link permits fusing relatively small transformers for full protection while reducing the number of fuse operations from lightning, or system surges.

Note that the slope of the Type "H" characteristic curve conforms more closely to the transformer safe loading curve than that of the typical distribution fuse link curve "K". A link, such as the Type AH, provides proper protection in the "overload" or low-current region while utilizing the inherent ability of the transformer to withstand high current surges for relatively long periods of time. A Southern States high surge fuse link in the 2 ampere rating will give full protection to a 7200 volt, 10 kva transformer and at the same time provide resistance to surges equal to that of the standard 6 ampere link illustrated.

Time-current characteristics of  high surge fuse link Types AH and UH compared with safe loading curve of distribution transformer and EEI-NEMA Type AK.

HIGH SURGE FUSE LINK TYPES AND CATALOG NUMBERS

Fuse links below are for cutouts rated 5 2KV through 27KV.		Fuse links below are for Southern States' Type HH-33-D Cutouts rated 5 2KV or 7 8KV.		Fuse links below are for Southern States' Type HH-33-D Cutouts rated 15KV	
AMPS	AH	UH	UH	UH	UH
.5	AH1500.5	UH7500.5		UH1500.5	
1	AH15001	UH75001		UH15001	
2	AH15002	UH75002		UH15002	
3	AH15003	UH75003		UH15003	
5	AH15005	UH75005		UH15005	
7	AH15007	UH75007		UH15007	

