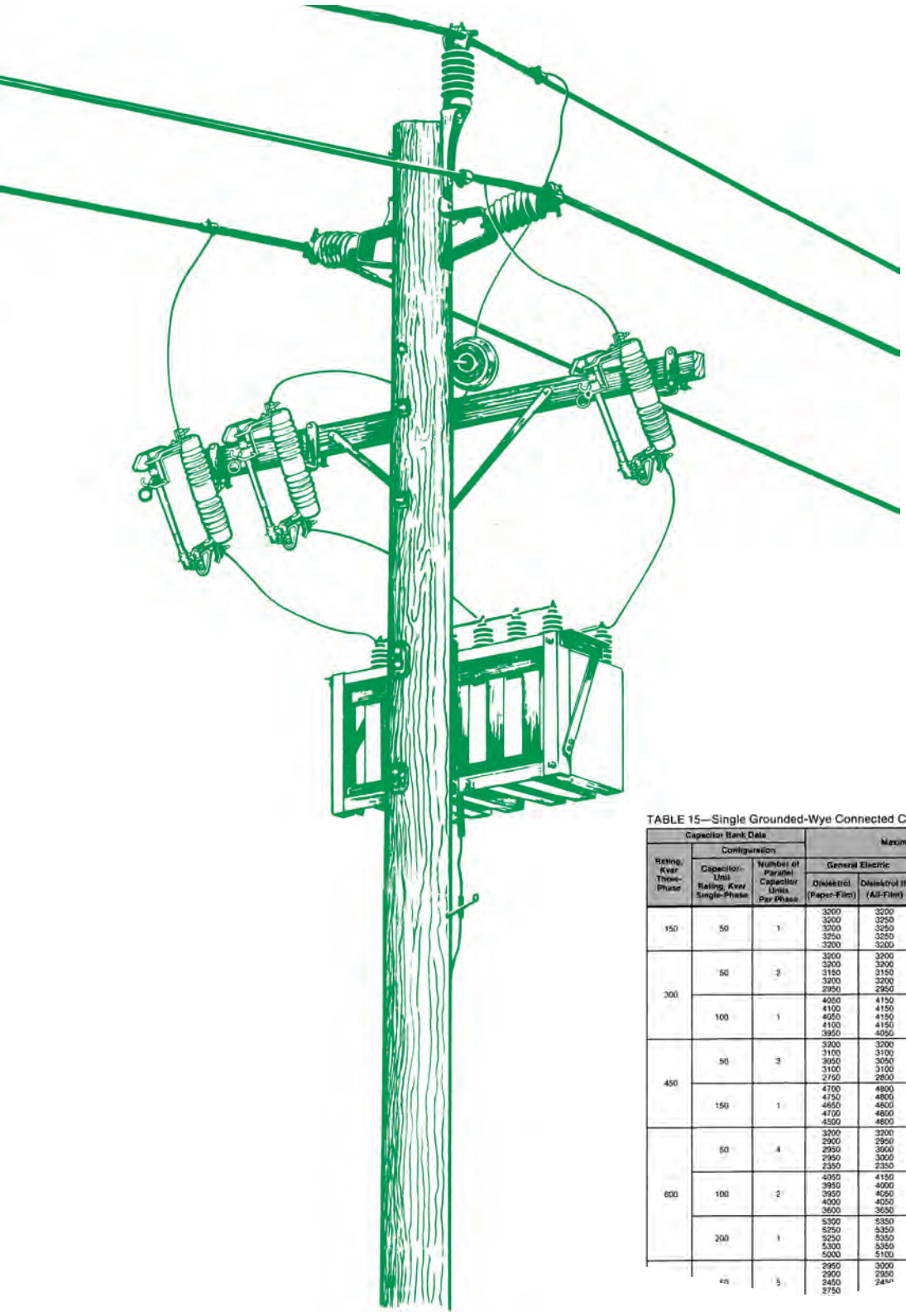

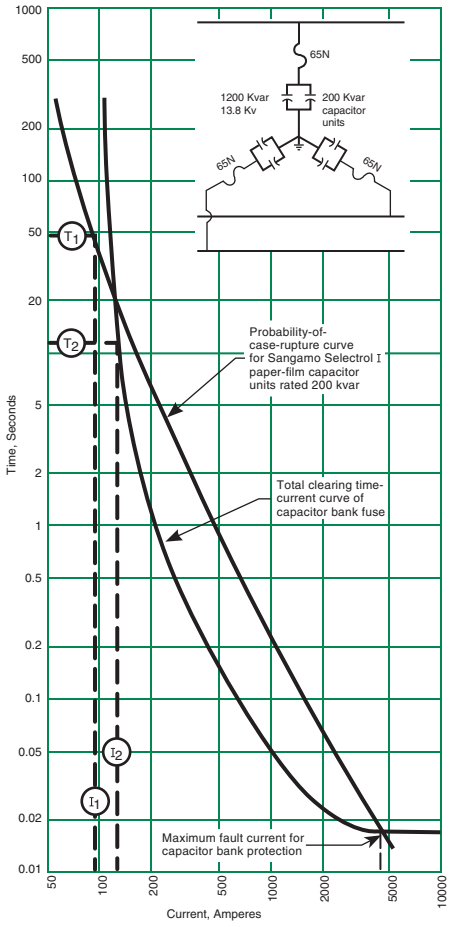

TABLE 15—Single Grounded-Wye Connected Capacitor Banks Rated 13.8 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	General Electric		McGraw-Edison		Sangamo		AEIB (Westinghouse)		
			Dielektrol (Paper-Film)	Dielektrol II (All-Film)	Type EB (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
150	50	1	3200 3200 3250 3250 3200	3200 3250 3250 3250 3200	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 3050 3100 3050	3150 3200 3200 3200 3200	2250 2300 2300 2300 2250	3950 4000 4000 4050 4000	10N 10QR 7 Std. 8K 8T
300	50	2	3200 3200 3150 3200 2950	3200 3200 3150 3200 2950	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 2950 3050 2750	3150 3200 3100 3200 2950	2250 2200 2100 2250 1850	3950 4000 3950 4000 3850	15N 20QR 15 Std. 12K 15T
	100	1	4050 4150 4050 4100 3950	4150 4150 4150 4150 4050	2950 3000 2900 3000 2800	10000 10000 10000 10000 10000	5000 5000 5000 5000 5000	5000 5000 5000 5000 5000	3800 3900 3800 3850 3600	5000 5000 5000 5000 4950	15N 20QR 15 Std. 12K 15T
450	50	3	3200 3100 3050 3100 2750	3200 3100 3050 3100 2800	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2950 2850 2900 2800	3150 3100 3100 3100 2800	2250 2100 2000 2050 1400	3950 4000 3900 3950 3750	20N 25QR 20 Std. 20K 20T
	150	1	4700 4750 4650 4700 4500	4800 4800 4800 4800 4600	6000 6050 6000 6050 5900	10000 10000 10000 10000 10000	5150 5200 5100 5200 4900	5250 5250 5250 5250 5100	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	20N 25QR 20 Std. 20K 20T
600	50	4	3200 2900 2950 2950 2350	3200 2950 3050 3000 2350	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2750 2800 2800 2100	3150 2950 3000 3000 2450	2150 1700 1900 1850 690	3950 3850 3850 3900 3550	30N 40QR 25 Std. 25K 25T
	100	2	4050 3950 3950 4000 3600	4150 4000 4050 4050 3650	2950 2750 2800 2800 2300	10000 10000 10000 10000 10000	5000 5000 5000 5000 4800	5000 5000 5000 5000 5000	3800 3550 3600 3650 2800	5000 4900 4950 4950 4700	30N 40QR 25 Std. 25K 25T
	200	1	5300 5250 5250 5300 5000	5350 5350 5350 5350 5100	6000 5950 5950 6000 5800	10000 10000 10000 10000 10000	5100 5050 5050 5100	5450 5400 5400 5450	6600 6600 6600 6600	6000 6000 6000 6000 6000	30N 40QR 25 Std. 25K 25T
			2950 2900 2450 2750	3000 2950 2450	‡						

Price $7.50

SELECTION GUIDE FOR THE PROTECTION OF OVERHEAD DISTRIBUTION CAPACITOR BANKS

S&C Positrol® Fuse Links
Outdoor Distribution

Supersedes Data Bulletin 350-130 dated 4-30-84

DATA BULLETIN 350-130

S&C ELECTRIC COMPANY• Chicago
S&C ELECTRIC CANADA LTD. • Toronto

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GENERAL

This data bulletin is a guide for the selection and application of S&C Positrol Fuse Links for the protection of overhead distribution, pole-top capacitor banks. Specifically, this guide will assist the user in selecting the optimal fuse-link ampere rating and speed characteristic for grounded-wye, ungrounded-wye, and delta connected shunt capacitor banks rated 150 kvar through 3600 kvar three-phase, and applied on systems having voltage ratings from 2.4 kv through 34.5 kv. The capacitor banks covered in this publication are those configured with a single series group of parallel-connected single-phase capacitor units in each phase. Capacitor banks having multiple series groups of capacitor units in each phase are not usually applied in overhead distribution systems, and thus have not been considered in this publication.

The function of a capacitor bank fuse is, in general, to provide system protection as well as capacitor bank protection. With respect to *system* protection, the capacitor bank fuse should detect a potentially damaging overcurrent condition and operate promptly to isolate the phase leg containing the faulted capacitor unit, thereby avoiding an unnecessary outage of the entire feeder. For *capacitor bank* protection, the fuse should operate promptly to remove the phase leg containing the faulted capacitor unit from the circuit before the unit's case ruptures, spilling dielectric fluid which may ignite and burn, and possibly damaging adjacent capacitor units or other equipment. To best achieve these objectives, the capacitor bank fuse should operate as promptly as possible in response to an evolving capacitor-unit failure within the capacitor bank, while avoiding needless operation in response to transient inrush and outrush currents.

Capacitor-Unit Failure Mode

Capacitor units employed in overhead distribution capacitor banks typically consist of a number of series groups of parallel-connected packs. Regardless of the internal construction and dielectric materials used (i.e., paper-film or all-film), capacitor-unit failure usually begins with the dielectric breakdown of one pack, which

in effect shorts out that series group of packs (see Figure 1). As a result of shorting this one series group, the voltage across each of the remaining series groups of packs increases by a factor related to the total number of series groups of packs in the capacitor unit and to the capacitor bank connection. The capacitor-unit current increases by this same factor. The increased voltage across each of the remaining series groups of packs will eventually lead to failure of another pack, shorting out another series group of packs and causing a new step-wise increase in voltage across each of the remaining groups, and an increase in the current through them. If left to continue, this process will result in all of the series groups of packs being shorted, at which time the faulted capacitor-unit current will escalate to the available phase-to-ground fault-current level in a grounded-wye connected capacitor bank, to three times the pre-failure phase current in an ungrounded-wye connected capacitor bank, or to the available phase-to-phase fault-current level in a delta connected capacitor bank. The faulted capacitor unit's case may or may not rupture before the last series group fails, but certainly the probability of case rupture increases with the number of series groups of packs shorted.

The actual probability of case rupture, however, cannot be determined in absolute terms because the case-rupture phenomenon is, of itself, extremely difficult to quantify—particularly in the early stages of the failure process when the faulted capacitor-unit current is relatively low. Moreover, capacitor units of different manufacture and of different types respond differently to evolving series group failures. For example, the older paper-film dielectric capacitors tend to arc and produce gas when a pack is shorted. If allowed to persist long enough, this arcing may produce sufficient pressure to rupture the faulted units case. Good field experience with bank fusing of these units, however, tends to suggest that case ruptures due to this cause do not occur very often. It has been suggested that, because of arcing, the failure of subsequent series groups of packs occurs fairly quickly, resulting in sufficient phase current escalation to operate the bank fuse before the gas buildup actually ruptures the faulted unit's case.

The newer all-film dielectric capacitors, by comparison, do not arc and gas nearly as much as paper-film capacitors when a series group of packs is shorted, since a puncture in the polypropylene dielectric film

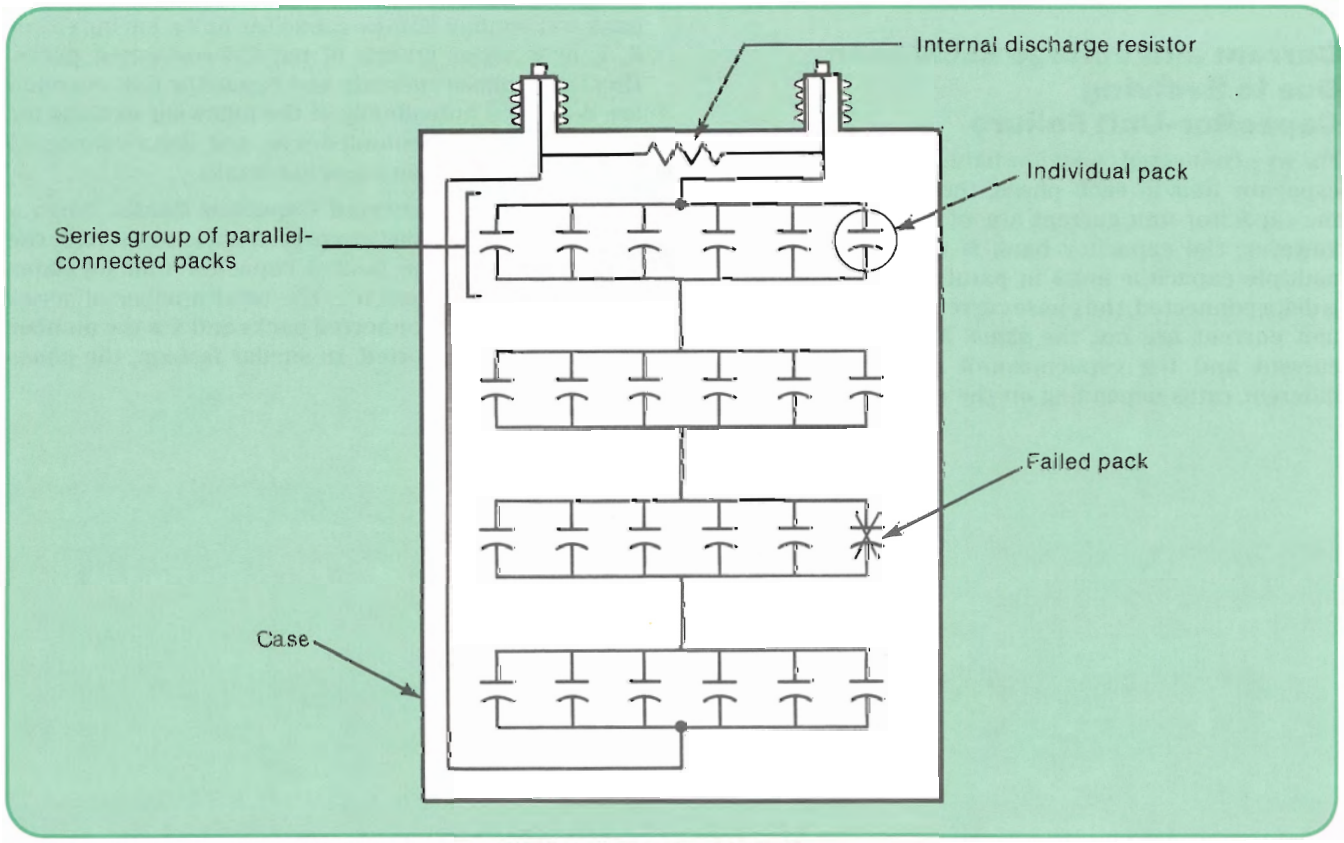


Figure 1. Schematic representation of a typical high-voltage capacitor unit.

tends to result in a nonarcing contact between the shorted foils. While case ruptures due to internal gassing are thus unlikely, ruptures can nevertheless occur due to other causes. Because of the reduced arcing and gassing, the escalating failure process takes place much more slowly than for paper-film capacitors, with the result that the increased current flow can lead to increased temperature and pressure inside the faulted unit's case, which can ultimately increase to the point where the case ruptures. Such ruptures, however, are usually nonviolent in nature, with damage typically limited to a cracked seam or bushing seal.

As will be discussed later, the ampere rating and speed characteristic of the capacitor bank fuse should be selected to isolate the phase containing the failing capacitor unit as promptly as possible, that is, with the fewest series groups of packs shorted. In making this selection, the capacitor bank fuse time-current characteristics should be compared with capacitor-unit case-rupture curves, which are published by the various capacitor manufacturers, and which illustrate the probability of case rupture for various time and current relationships. In so doing, it is necessary to consider that the capacitor bank fuse responds to phase current, which may or may not be the same as the current flowing in the capacitor units themselves, depending on the capacitor bank connection and configuration.

Current and Voltage Escalation Due to Evolving Capacitor-Unit Failure

For wye-connected capacitor banks having only a single capacitor unit in each phase, the phase current and the capacitor-unit current are, of course, the same. If, however, the capacitor bank is wye connected with multiple capacitor units in parallel in each phase or is delta connected, the phase current and the capacitor-unit current are not the same. Moreover, the phase current and the capacitor-unit current escalate at different rates depending on the number of capacitor units in parallel in each phase and on the capacitor bank connection. In order to determine how well the capacitor bank fuse protects the individual capacitor units against case rupture, the escalating phase currents and capacitor-unit currents must be known.

One of the parameters used in calculating the escalating phase currents and capacitor-units currents is the number of series groups of parallel-connected packs in the capacitor units under consideration. Unfortunately, the number of series groups of packs in high-voltage capacitor units is not published and varies from manufacturer to manufacturer. However, it is generally the case that capacitor units are designed with the fewest number of series groups of packs possible, and that the voltage across any given series group (in a fully functional capacitor unit) is limited to between 1 kv and 2.5 kv. Accordingly, in the discussion which follows, a total of three different numbers of series groups of packs will be assumed for purposes of illustration, on the basis that the voltage across any individual series group is within the voltage limits specified above. For example, a 13.8-kv wye connected capacitor bank will employ 7.97-kv capacitor units, having either 4, 5, or 6 series groups of parallel-connected packs, with 1.99 kv, 1.59 kv, or 1.33 kv respectively, normally impressed across each series group. Similarly, a 13.8-kv delta connected capacitor bank will employ 13.8-kv capacitor units, having either 6, 7, or 8 series groups of parallel-connected packs. Escalating phase currents and capacitor-unit currents are described individually in the following sections for grounded-wye, ungrounded-wye, and delta connected overhead distribution capacitor banks.

Grounded-Wye Connected Capacitor Banks. When a series group of parallel-connected packs is shorted, the current through the faulted capacitor unit escalates to $\frac{n}{n-x}$ per unit, where n is the total number of series groups of parallel-connected packs and x is the number of series groups shorted. In similar fashion, the *phase*

current escalates to $\left[\frac{n}{n-x}-1\right]\frac{1}{m}+1$ per unit, where m is the number of capacitor units connected in parallel in each phase. Using the above formulas, the current escalation in the faulted capacitor unit and in the bank fuse can be calculated as a function of the number of series-connected groups and of the number of groups shorted. Per-unit current escalation values are shown in Table 1 for a typical grounded-wye connected overhead distribution capacitor bank utilizing two capacitor units connected in parallel per phase. As noted earlier, when all of the series groups of packs are shorted, the currents escalate to the available phase-to-ground fault-current level, as is indicated by the symbol $I_{\phi\text{-}g}$ in Table 1.

TABLE 1—Currents in Faulted Capacitor Unit and Bank Fuse for an Evolving Series-Group Failure—1200-Kvar Grounded-Wye Connected Capacitor Bank Rated 13.8 Kv Three-Phase, with Two 7.97-Kv, 200-Kvar Capacitor Units Per Phase

Number of Series Groups of Packs Shorted	Current, Per Unit①					
	4 Series Groups of Packs		5 Series Groups of Packs		6 Series Groups of Packs	
	Faulted Capacitor Unit	Bank Fuse (Phase Current)	Faulted Capacitor Unit	Bank Fuse (Phase Current)	Faulted Capacitor Unit	Bank Fuse (Phase Current)
1	1.33	1.17	1.25	1.13	1.2	1.1
2	2.0	1.5	1.67	1.33	1.5	1.25
3	4.0	2.5	2.5	1.75	2.0	1.5
4	$I_{\phi\text{-}g}$	$I_{\phi\text{-}g}$	5.0	3.0	3.0	2.0
5	—	—	$I_{\phi\text{-}g}$	$I_{\phi\text{-}g}$	6.0	3.5
6	—	—	—	—	$I_{\phi\text{-}g}$	$I_{\phi\text{-}g}$

① One per-unit nominal capacitor current is 25.1 amperes; one per-unit nominal phase current is 50.2 amperes.

Note that the per unit phase current is less in each case than the per-unit capacitor current, until the faulted unit is fully shorted. The "diluting" effect becomes more pronounced with increasing numbers of capacitor units connected in parallel per phase, as is clearly shown in Table 2. For this reason, capacitor bank fusing is generally most effective when the smallest number of capacitor units per phase are used—a very practical concept today with the availability of 200- and 300-kvar (single-phase) capacitor units.

TABLE 2—Phase Currents for 1200-Kvar Grounded-Wye Connected Capacitor Banks Rated 13.8 Kv Three-Phase, Using 7.97-Kv, Capacitor Units

Number of Series Groups of Packs Shorted	Phase Current, Per Unit		
	200-Kvar Units (2 per phase)①	100-Kvar Units (4 per phase)①	50-Kvar Units (8 per phase)①
1	1.13	1.06	1.03
2	1.33	1.17	1.08
3	1.75	1.38	1.19
4	3.0	2.0	1.5
5	$I_{\phi\text{-}g}$	$I_{\phi\text{-}g}$	$I_{\phi\text{-}g}$

① Based on capacitor units having 5 series groups of packs.

Ungrounded-Wye Connected Capacitor Banks. In ungrounded-wye connected capacitor banks, both the faulted capacitor-unit current and the phase current escalate step-wise as increasing numbers of series groups of packs become shorted, just as happens in grounded-wye connected capacitor banks. Unlike the situation with grounded banks, however, the voltages and currents in the *unfaulted* phases of an ungrounded-wye connected bank also increase as series-group failure steps occur. Table 3 on page 6 shows escalating per-unit current values in the faulted capacitor unit and in the bank fuse, and escalating per-unit voltage values in the unfaulted phases for a typical ungrounded-wye connected overhead distribution capacitor bank utilizing two capacitor units connected in parallel per phase.

GENERAL — Continued

TABLE 3—Currents in Faulted Capacitor Unit and Bank Fuse, and Voltage in Unfaulted Phases, for an Evolving Series-Group Failure—1200-Kvar Ungrounded-Wye Connected Capacitor Bank Rated 13.8 Kv Three-Phase, with Two 7.97-Kv, 200-Kvar Capacitor Units Per Phase

Number of Series Groups of Packs Shorted	Current and Voltage, Per Unit①								
	4 Series Groups of Packs			5 Series Groups of Packs			6 Series Groups of Packs		
	Current		Voltage, Unfaulted Phases	Current		Voltage, Unfaulted Phases	Current		Voltage, Unfaulted Phases
	Faulted Capacitor Unit	Bank Fuse (Phase Current)		Faulted Capacitor Unit	Bank Fuse (Phase Current)		Faulted Capacitor Unit	Bank Fuse (Phase Current)	
1	1.26	1.11	1.03	1.2	1.08	1.02	1.16	1.06	1.02
2	1.72	1.29	1.08	1.5	1.2	1.05	1.39	1.16	1.04
3	2.67	1.67	1.2	2.0	1.4	1.11	1.72	1.29	1.08
4	6.0	3.0	1.73	3.0	1.8	1.25	2.25	1.5	1.15
5				6.0	3.0	1.73	3.28	1.91	1.29
6							6.0	3.0	1.73

① One per-unit nominal capacitor current is 25.1 amperes; one per-unit nominal phase current is 50.2 amperes, and one per-unit voltage is 7.97 kv.

A comparison between Tables 1 and 3 shows that the step-wise current escalation in ungrounded banks is less than that in grounded banks with an equal number of series groups of packs shorted. Table 3 also indicates that when all of the series groups in a capacitor unit are shorted, the phase current escalates to only three times the prefailure phase current, but the voltages across each unfaulted phase escalates to 1.73 times normal. This overvoltage can lead to capacitor-unit failures in the unfaulted phases of the bank if allowed to persist for a time duration greater than that permitted. A curve illustrating the relationship between permissible capacitor-unit overvoltage and time is shown in Figure 2.

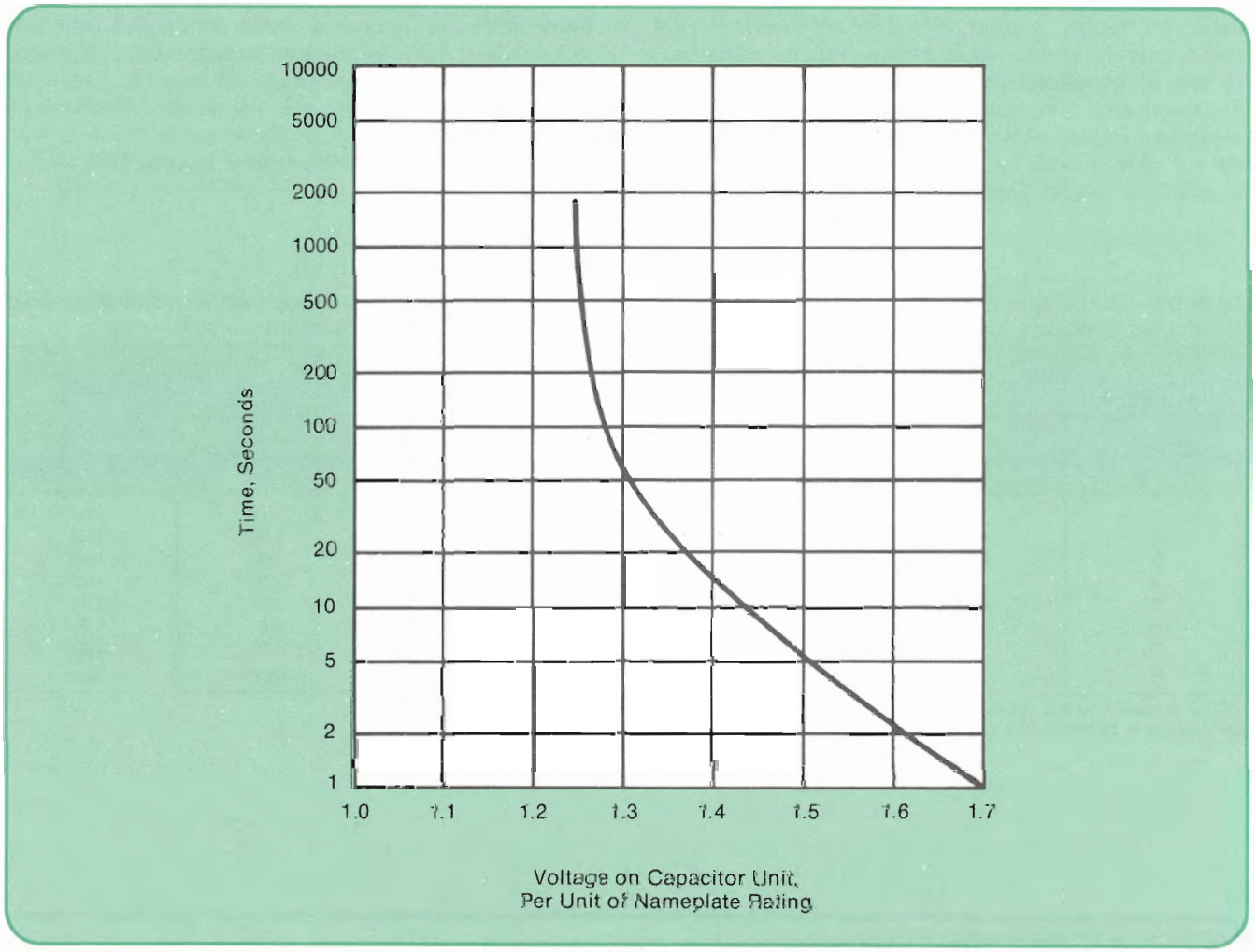


Figure 2. Capacitor-unit power-frequency overvoltage versus time in seconds permitted in ANSI/IEEE Std. 18, IEEE Standard for Shunt Power Capacitors. Note: This curve applies for up to 300 applications of power-frequency overvoltages of the magnitudes and durations illustrated. Capacitor manufacturers may publish a different curve applicable to their particular units.

Because of the relatively small phase current escalation, capacitor bank fuses may not always operate fast enough to prevent overvoltage-induced damage to capacitor units in the unfaulted phases of an ungrounded-wye connected capacitor bank. Protection against such damage, however, can be provided by means of a relay scheme employed to detect the voltage increase at the capacitor bank neutral (with respect to ground) that results during the capacitor-unit failure process, and initiate isolation of the bank. The S&C Bankgard™ Relay—Type LUC in combination with an S&C Outdoor Voltage Sensor is particularly appropriate for this application. The Bankgard relay detects the neutral-to-ground voltage caused by a failing capacitor unit and, when a predetermined voltage is exceeded, signals a switching device to disconnect the entire bank, thus minimizing the probability of rupturing the failing capacitor unit's case and protecting the surviving capacitor units in the bank against cascading voltage overstress.

GENERAL — Continued

Delta Connected Capacitor Banks. In delta connected capacitor banks, faulted capacitor-unit current and phase current escalation is similar (but not identical) to that in grounded-wye connected capacitor banks. Furthermore, the voltages and currents in the *unfaulted* phases of a delta connected capacitor bank do not change with an evolving capacitor-unit failure in another phase. Table 4 shows escalating per-unit current values in the faulted capacitor unit and in the bank fuses for a typical delta connected overhead distribution capacitor bank utilizing two capacitor units connected in parallel per phase. As noted earlier, when all of the series groups of packs are shorted, the currents escalate to the available phase-to-phase fault-current level, as is indicated by the symbol $I_{\phi\text{-}\phi}$ in Table 4.

TABLE 4—Currents in Faulted Capacitor Unit and Bank Fuses for an Evolving Series-Group Failure—1200-Kvar Delta Connected Capacitor Bank Rated 13.8 Kv Three-Phase, with Two 13.8-Kv, 200-Kvar Capacitor Units Per Phase

Number of Series Groups of Packs Shorted	Current, Per Unit①					
	6 Series Groups of Packs		7 Series Groups of Packs		8 Series Groups of Packs	
	Faulted Capacitor Unit	Bank Fuse (Phase Currents)	Faulted Capacitor Unit	Bank Fuse (Phase Currents)	Faulted Capacitor Unit	Bank Fuse (Phase Currents)
1	1.2	1.05	1.17	1.04	1.14	1.04
2	1.5	1.13	1.4	1.1	1.33	1.09
3	2.0	1.26	1.75	1.19	1.6	1.15
4	3.0	1.53	2.33	1.35	2.0	1.26
5	6.0	2.36	3.5	1.67	2.67	1.44
6	$I_{\phi\text{-}\phi}$	$I_{\phi\text{-}\phi}$	7.0	2.65	4.0	1.8
7	—	—	$I_{\phi\text{-}\phi}$	$I_{\phi\text{-}\phi}$	8.0	2.93
8	—	—	—	—	$I_{\phi\text{-}\phi}$	$I_{\phi\text{-}\phi}$

① One per-unit nominal capacitor current is 14.5 amperes; one per-unit nominal phase current is 50.2 amperes.

APPLICATION PRINCIPLES

Select the Capacitor Bank Fuse Rating

A capacitor bank fuse (consisting of a fuse cutout and a fuse link) must be selected for the voltage rating, the available fault current, and the continuous current-carrying requirements of the capacitor bank on which it is to be applied. Since there are a number of voltage, short-circuit interrupting, and maximum ampere ratings available, you should choose the fuse cutout that will meet both your present and your future requirements. In addition, from the wide variety of ampere ratings and speeds available, you should select the fuse-link ampere rating and speed characteristic providing the optimum protection for the system as well as for the capacitor units in the bank.

Voltage rating. In general, the maximum voltage rating of the capacitor bank fuse should equal or exceed the maximum line-to-line operating voltage level of the system. In the case of grounded-wye connected capacitor banks on solidly-grounded-neutral (multi-grounded) systems, however, the maximum voltage rating of the fuse need only equal the maximum system line-to-neutral voltage level, provided that the BIL rating and the leakage distance to ground of the cutout mounting are sufficient for the application.

Short-circuit interrupting rating. The symmetrical short-circuit interrupting rating of the capacitor bank fuse should equal or exceed the maximum available fault current at the capacitor bank fuse location. When

determining the interrupting rating of the fuse cutout, it may be desirable to consider the X/R ratio of the system at the capacitor bank location, since fuse cutouts may have *higher-than-nominal* symmetrical interrupting ratings for those applications where the X/R ratio is *less* than the value of 8 or 12 (depending on the fuse cutout voltage rating and interrupting current rating) specified by ANSI Standards.◆ For applications where the available fault current exceeds fuse cutout short-circuit interrupting ratings, an Overhead—Pole-Top Style S&C Type SMD-20 Power Fuse may be used.

Ampere rating and speed characteristic. The ampere rating and speed characteristic of the capacitor bank fuse should be selected to:

(1) withstand the normal transient inrush current associated with energizing an isolated capacitor bank;

(2) carry continuously the highest anticipated capacitor bank current, including any increases above the nominal bank current due to capacitor-unit manufacturing tolerances, harmonic currents, or system operating voltage levels higher than the nominal voltage rating of the capacitor bank;

(3) operate as promptly as possible in response to an evolving capacitor-unit failure;

(4) protect the individual capacitor units in the bank against case rupture in accordance with the applicable case-rupture curves; and

(5) withstand the transient outrush current from the capacitor bank that results when a nearby capacitor bank is energized or when a fault occurs nearby.

These principles are examined in greater detail in the following sections.

Withstand Energizing Inrush Currents

When a single capacitor bank is energized, there will be a transient inrush of charging current which the capacitor bank fuse must be capable of withstanding without operating or, in the case of tin- or lap-joint-element fuse links, without sustaining damage to the fusible element. The magnitude and frequency of this charging current depend upon the total inductance and capacitance of the circuit, as well as the magnitude of the source voltage at the instant the bank is energized. When evaluating transient inrush currents, it is generally assumed that the bank is energized at a voltage peak, thereby producing the maximum inrush current value. While the resistance of the circuit determines the rate at which the transient inrush current decays—and hence its I^2t—it has only a negligible effect on the initial magnitude and frequency of the inrush current. To determine whether the capacitor bank fuse will withstand these transient inrush currents, a comparison must be made between the high-frequency surge-withstand I^2t capability of the fuse and the I^2t of the inrush current.

In making such a comparison, however, it should be noted that the high-frequency surge-withstand I^2t capability that should be used in evaluating a capacitor bank fuse is not the same as its minimum melting I^2t derived from the published minimum melting time-current characteristic curve, which is based on a frequency of 60 hz. Transient inrush currents have frequencies much higher than 60 hz, and these high frequencies result in nonuniform current distribution in the fusible element (skin effect), plus mechanical stresses resulting from the increased electro-magnetic forces involved. High-frequency surge-withstand I^2t capability values for distribution fuse links have been the subject of a number of papers in the literature. In general, these values are determined through multiple applications of high-frequency transient currents, such as a distribution fuse link might experience when a switched capacitor bank is energized repeatedly. Available data also indicates that the high-frequency surge-withstand I^2t capability decreases as frequency increases. Moreover, this withstand capability is dependent on the fusible-element material and construction. For example, the range of high-frequency surge-withstand I^2t capability values for S&C Positrol Fuse Links employing silver or silver-copper eutectic fusible elements is from 15% to 60% of the 60-hz minimum melting I^2t value. Similarly, the range of high-frequency surge-withstand I^2t capability values for S&C Positrol Fuse Links employing nickel-chrome or silver-tin fusible elements is from 15% to 35% of the 60-hz minimum melting I^2t value. In either case, the values

◆ ANSI Standard C37.41, Design Tests for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories.

cited above are appropriate for repetitive applications of transient currents with frequencies through 8 khz, which is well above those normally encountered when energizing a single capacitor bank.

From published technical papers, the following equation can be derived for the I^2t of the high-frequency transient current:

Equation 1

$$I^2t = \frac{kE^2\sqrt{C^3}}{\sqrt{L}} \text{ Ampere-squared seconds } (A^2s)$$

in which E is the peak value of the line-to-ground voltage in volts when the capacitor bank is energized, C is the equivalent capacitance of the oscillatory circuit in farads, and L is the inductance of the oscillatory circuit in henrys. The constant k in Equation 1 is equal to 3.7 and represents an inrush-current damping factor of 0.81—the ratio of two consecutive opposite-polarity current amplitudes, with the smaller amplitude in the numerator. Use of a 0.81 damping factor is considered appropriate for overhead distribution systems, since the resistance of the circuit typically limits the magnitude of the first peak of transient current to 90 percent or less of the peak of the undamped inrush current.

Because of the impedance of the system between the source and the capacitor bank, the I^2t of the energizing inrush current is typically limited to a value well below the high-frequency surge-withstand I^2t capability of the capacitor bank fuse. For example, consider the energization of a single 1200-kvar grounded-wye connected capacitor bank rated 13.8 kv three-phase, with two 200-kvar capacitor units per phase. For an available fault-current level of 5000 amperes rms symmetrical (a representative value for distribution, pole-top capacitor bank fusing applications), the I^2t of the transient inrush current, calculated using Equation 1, will be on the order of 630 ampere-squared seconds. By comparison, the unpreloaded high-frequency surge-withstand I^2t capability of the capacitor bank fuse will range from 5,550 to over 15,700 ampere-squared seconds, depending on the ampere rating, speed characteristic, and element material of the particular fuse link employed. Accordingly, it is generally accepted that transient inrush currents associated with energizing an isolated capacitor bank are not responsible for nuisance meltings of capacitor bank fuses.

Accommodate Anticipated Capacitor Bank Current

In general, the capacitor bank fuse should be selected based on the highest anticipated capacitor bank current. Specifically, the fuse selected should have a maximum continuous current-carrying capability, as differentiated from its nominal ampere rating, greater than this highest anticipated current level. It follows, then, that the capacitor bank current must be accurately known. However, this current is not simply derived from the capacitor bank voltage and kvar ratings. The maximum system operating voltage can be as much as 6% higher than the nominal voltage rating of the capacitor bank. The capacitor units themselves are permitted by the Standards to have manufacturing tolerances of +15% in capacitance, and the presence of harmonics can add as much as 10% to the rms value of the current. These factors, taken together, would require that the nominal capacitor bank current, calculated based on rated voltage and kvar, be increased by an allowance as high as 34% ($1.06 \times 1.15 \times 1.1 = 1.34$), although an allowance of 35% is more commonly used.

In practice, however, the operating variables described above rarely attain the maximum values listed, and it is likely that they will not all be at their maximum values at the same time. For example, the effect of capacitor-unit tolerance, is usually accepted to be 8% or less. In addition, harmonic currents are generally less than the value of 10% cited above—particularly for ungrounded-wye or delta connected capacitor banks, since there is no path for the flow of third-harmonic currents, or currents at multiples

of the third harmonic. Accordingly, somewhat lower allowances can generally be used. The values contained in Table 5 based on a reasonable mix of these variables and will be used for all capacitor bank current calculations herein.

TABLE 5—Practical Allowances for Operating Variables

Operating Variable	Allowance, Based on Capacitor Bank Connection	
	Grounded Wye	Ungrounded Wye or Delta
System Voltage Level①	6%	6%
Capacitor-Unit Tolerance	8	8
Harmonic Currents	7	2
Total Allowances	22%	17%

① ANSI Standard C84.1, Voltage Ratings for Electric Power Systems and Equipment.

Operate as Promptly as Possible in Response to an Evolving Capacitor-Unit Failure

To ensure the earliest possible operation in response to an evolving capacitor-unit failure, the capacitor bank fuse must have a low ratio of 300-second maximum clearing current to normal capacitor bank current because, as was shown earlier, the increases in capacitor-unit current and phase current are relatively small in the initial steps of the capacitor-unit failure process. Additionally, the capacitor bank fuse should have a steep time-current characteristic in the low-current region. A fuse having such a time-current characteristic will operate faster for a given value of phase current than will a fuse having a slower (less steep) time-current characteristic.

To illustrate the importance of evaluating fuse link time-current characteristics when selecting a capacitor bank fuse, consider, for example, a 1200-kvar grounded-wye connected capacitor bank rated 13.8 kv three-phase, with two 200-kvar capacitor units per phase. Table 6 lists a number of fuse links having different ampere ratings and speed characteristics that would be considered for application as the capacitor bank fuse. In each case, the ampere ratings represent the fuse link manufacturer's recommendation. For purposes of comparison, Table 6 also lists, for each ampere rating and speed characteristic, the fusing ratio, along with the more significant parameters of maximum continuous current-carrying capability and maximum clearing current at 300 seconds. Total clearing time-current characteristic curves for the fuse links listed in Table 6 are shown in Figure 3 on page 12. The curves in Figure 3 illustrate graphically the wide variations in clearing times for the various fuse links in the low-current region.

TABLE 6—Characteristics of Various Capacitor Bank Fuse Links—1200-Kvar Grounded-Wye Connected Capacitor Bank Rated 13.8 Kv Three-Phase, with Two 7.97-Kv, 200-Kvar Capacitor Units Per Phase①

Fuse Link Rating and Element Material②	Fusing Ratio③	Maximum Continuous Current-Carrying Capability, Amperes①④	Maximum Clearing Current at 300 Sec., Amperes
50K-Sn	1.0	75	125
50T-Sn	1.0	75	122
50K-Ag	1.0	66	117
50T-Ag-Cu	1.0	63	120
60QR-Ag-Cu	1.2	66	101
65N-Ag	1.3	66	106
65 Std.-Ag	1.3	80	143
75H-Cu	1.5	75	132

① Nominal capacitor bank current is 50.2 amperes. With allowance factor of 22%, capacitor bank current is assumed to be as high as 50.2×1.22, or 61.2 amperes.

② Fuse-link element materials are identified by means of chemical symbols: Sn for tin elements; Ag for silver elements; Ag-Cu for silver-copper eutectic elements; and Cu for copper elements.

③ Ratio of capacitor bank fuse ampere rating to nominal capacitor bank current.

④ Manufacturers' published values based on 25°C ambient temperature.

APPLICATION PRINCIPLES — Continued

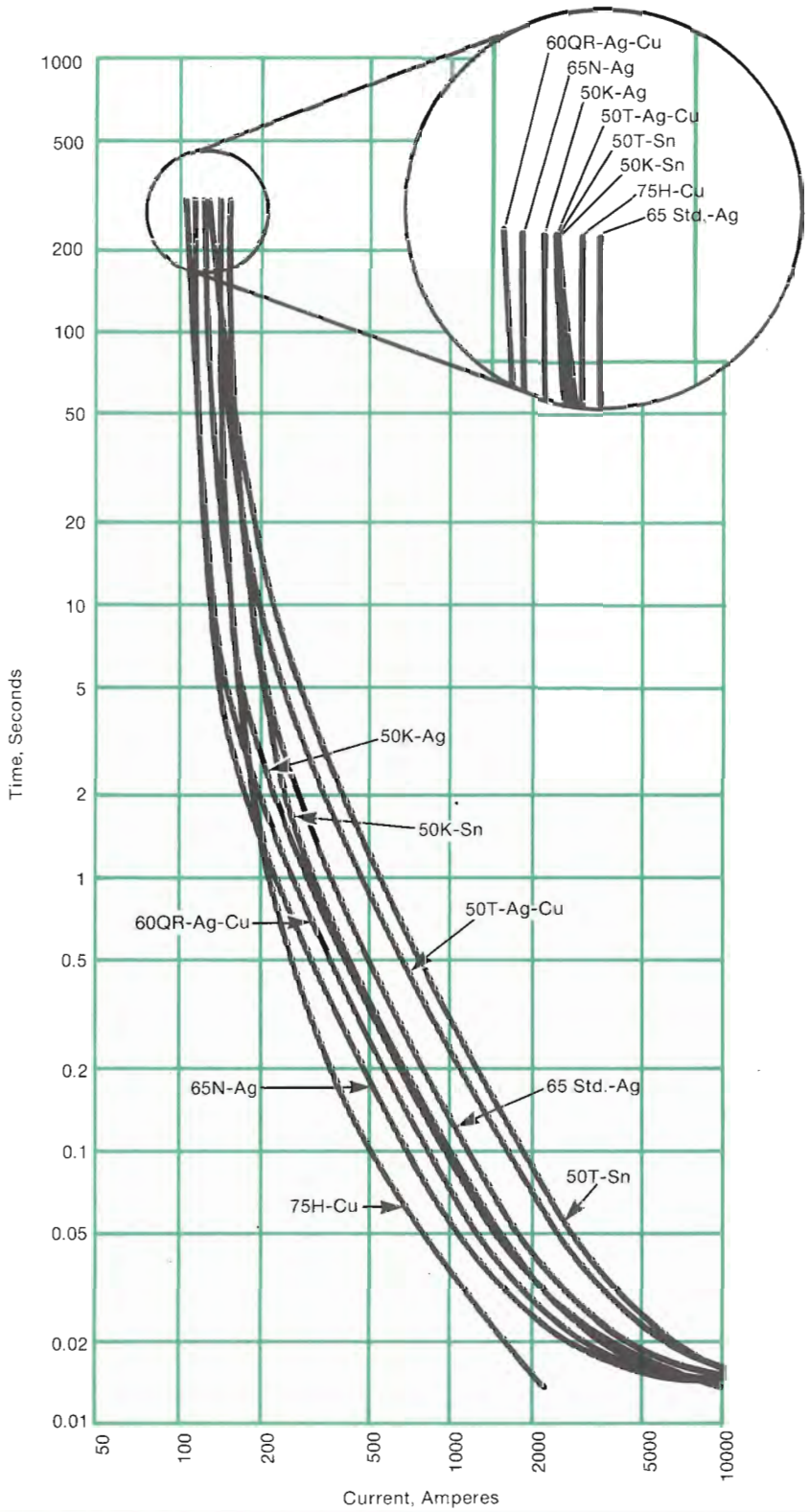


Figure 3. Total clearing time-current characteristic curves for fuse links recommended for a 1200-kvar grounded-wye connected capacitor bank rated 13.8 kv three-phase, with two 7.97-kv, 200-kvar capacitor units per phase.

In order to determine which fuse link ampere rating and speed characteristic listed in Table 6 provides the best protection for the capacitor bank, it is necessary to consider each fuse link's response for an evolving series-group failure of an individual capacitor unit. Clearly, the fuse link that operates with the smallest number of series groups of packs shorted will provide better overall protection for the capacitor units in the bank. If more than one of the fuse links listed operates with the same number of series groups shorted, the fuse link operating in the shortest time and thus having the lowest let-through I^2t would be preferred.

The relative effectiveness of the various fuse links is illustrated in Table 7 on page 14. In the column headed "4 Series Groups of Packs," note that all of the fuse links under consideration operate when the third series group (of four) is shorted. The 65N-Ag fuse link clearly provides better protection for the capacitor units in the bank since its operating time is the shortest: only 0.94 second. In the column headed "5 Series Groups of Packs," note that the 65N-Ag fuse link operates when only three out of five series groups are shorted, while the remaining fuse links do not operate until four series groups are shorted. Finally, in the column headed "6 Series Groups of Packs," although a number of fuse links operate when four series groups are shorted, the 65N-Ag fuse link, once again, provides a higher degree of protection for the capacitor units in the bank since its operating time of 3.5 seconds is considerably less than that of the other fuse links.

Another conclusion that can be drawn from Table 7 is that silver- or silver-copper-eutectic-element fuse links will operate faster at a given value of current than will tin-element fuse links of the same ampere rating and speed characteristic. This is due, in part, to the smaller tolerances in melting current that can be achieved with silver- or silver-copper-eutectic-element fuse links (10% in terms of current) as compared with the tolerances in melting current normally associated with tin-element fuse links (20% in terms of current).

APPLICATION PRINCIPLES — Continued

TABLE 7—Performance Characteristics of Various Capacitor Bank Fuse Links—1200-Kvar Grounded-Wye Connected Capacitor Bank Rated 13.8 Kv Three-Phase, with Two 7.97-Kv, 200-Kvar Capacitor Units Per Phase①

Number of Series Groups of Packs Shorted	Fuse Link Rating and Element Material②	4 Series Groups of Pack			5 Series Groups of Pack			6 Series Groups of Pack		
		Phase Current, Amperes	Maximum Clearing Time, Seconds③	Let-Through A^2s X10³③④	Phase Current, Amperes	Maximum Clearing Time, Seconds③	Let-Through A^2s X10³③④	Phase Current, Amperes	Maximum Clearing Time, Seconds③	Let-Through A^2s X10³③④
1	50K-Sn 50T-Sn 50K-Ag 50T-Ag-Cu 60QR-Ag-Cu 65N-Ag 65 Std.-Ag 75H-Cu	71.6	★ ★ ★ ★ ★ ★ ★ ★	★ ★ ★ ★ ★ ★ ★ ★	69.2	★ ★ ★ ★ ★ ★ ★ ★	★ ★ ★ ★ ★ ★ ★ ★	67.3	★ ★ ★ ★ ★ ★ ★ ★	★ ★ ★ ★ ★ ★ ★ ★
2	50K-Sn 50T-Sn 50K-Ag 50T-Ag-Cu 60QR-Ag-Cu 65N-Ag 65 Std.-Ag 75H-Cu	91.8	★ ★ ★ ★ ★ ★ ★ ★	★ ★ ★ ★ ★ ★ ★ ★	81.4	★ ★ ★ ★ ★ ★ ★ ★	★ ★ ★ ★ ★ ★ ★ ★	76.5	★ ★ ★ ★ ★ ★ ★ ★	★ ★ ★ ★ ★ ★ ★ ★
3	50K-Sn 50T-Sn 50K-Ag 50T-Ag-Cu 60QR-Ag-Cu 65N-Ag 65 Std.-Ag 75H-Cu	153.0	20 27 2.9 17 1.6 0.94 22 4.0	300 405 43 255 24 14 330 60	107.1	★ ★ ★ ★ ★ 125 ★ ★	★ ★ ★ ★ ★ 732 ★ ★	91.8	★ ★ ★ ★ ★ ★ ★ ★	★ ★ ★ ★ ★ ★ ★ ★
4	50K-Sn 50T-Sn 50K-Ag 50T-Ag-Cu 60QR-Ag-Cu 65N-Ag 65 Std.-Ag 75H-Cu	I_ϕ-g			183.6	3.1 7.2 0.79 4.3 0.59 ■ 3.9 0.83	73 169 18 101 14 ■ 91 19	122.4	137 145 25 140 5.8 3.5 ★ ★	1154 1221 211 1179 49 30 ★ ★
5	50K-Sn 50T-Sn 50K-Ag 50T-Ag-Cu 60QR-Ag-Cu 65N-Ag 65 Std.-Ag 75H-Cu				I_ϕ-g			214.2	■ ■ ■ ■ ■ ■ 1.4 0.35	■ ■ ■ ■ ■ ■ 47 12

① Nominal capacitor bank current is 50.2 amperes. With allowance factor of 22%, capacitor bank current is assumed to be as high as 50.2×1.22, or 61.2 amperes.

② Fuse link element materials are identified by means of chemical symbols: Sn for tin elements; Ag for silver elements; Ag-Cu for silver-copper eutectic elements; and Cu for copper elements.

③ Fuse link time-current characteristics have been adjusted to reflect preloading by the prior-step escalated current. While such preloading reduces the total clearing time (and consequently the I^2t in the faulted capacitor unit) for a given number of series groups shorted, it does not cause the fuse link to respond at an earlier step in the series-group failure process.

④ Let-through A^2s in faulted capacitor, beginning with the particular series-group failure which results in enough current to operate the fuse link.

★ Fuse link does not operate.

■ Fuse link operated one step earlier in the series-group failure process.

The reason for the effectiveness of the silver-element "N" Speed fuse link, as compared with the other fuse link speeds evaluated, can be seen by studying their total clearing time-current characteristic curves in the relevant range of currents. Figure 4 on page 16 shows the fuse link total clearing curves and the currents associated with various numbers of series groups of packs shorted for the example from Table 7 involving six series groups of packs. As can be seen from Figure 4, the 65N-Ag fuse link's lower 300-second maximum clearing current and relatively steep time-current characteristic result in its having the shortest response time for an evolving series-group failure.♦ A similar analysis of all of the capacitor bank ratings and configurations listed in the selection tables showed that, of the fuse links recommended, the "N" Speed fuse link provides superior protection in 70% of the cases. Accordingly, standardization on the "N" Speed fuse link for distribution pole-top capacitor bank protection will result in excellent protection against case rupture for the capacitor units in the bank.

♦ The total clearing time-current characteristic curves illustrated in Figure 4 have not been adjusted (reduced) to reflect preloading by the prior-step escalated current. Accordingly, clearing times obtained by inspection from Figure 4, for any given number of series groups of packs shorted, will be greater than the clearing times listed in Table 7, which reflect the effects of preloading.

APPLICATION PRINCIPLES — Continued

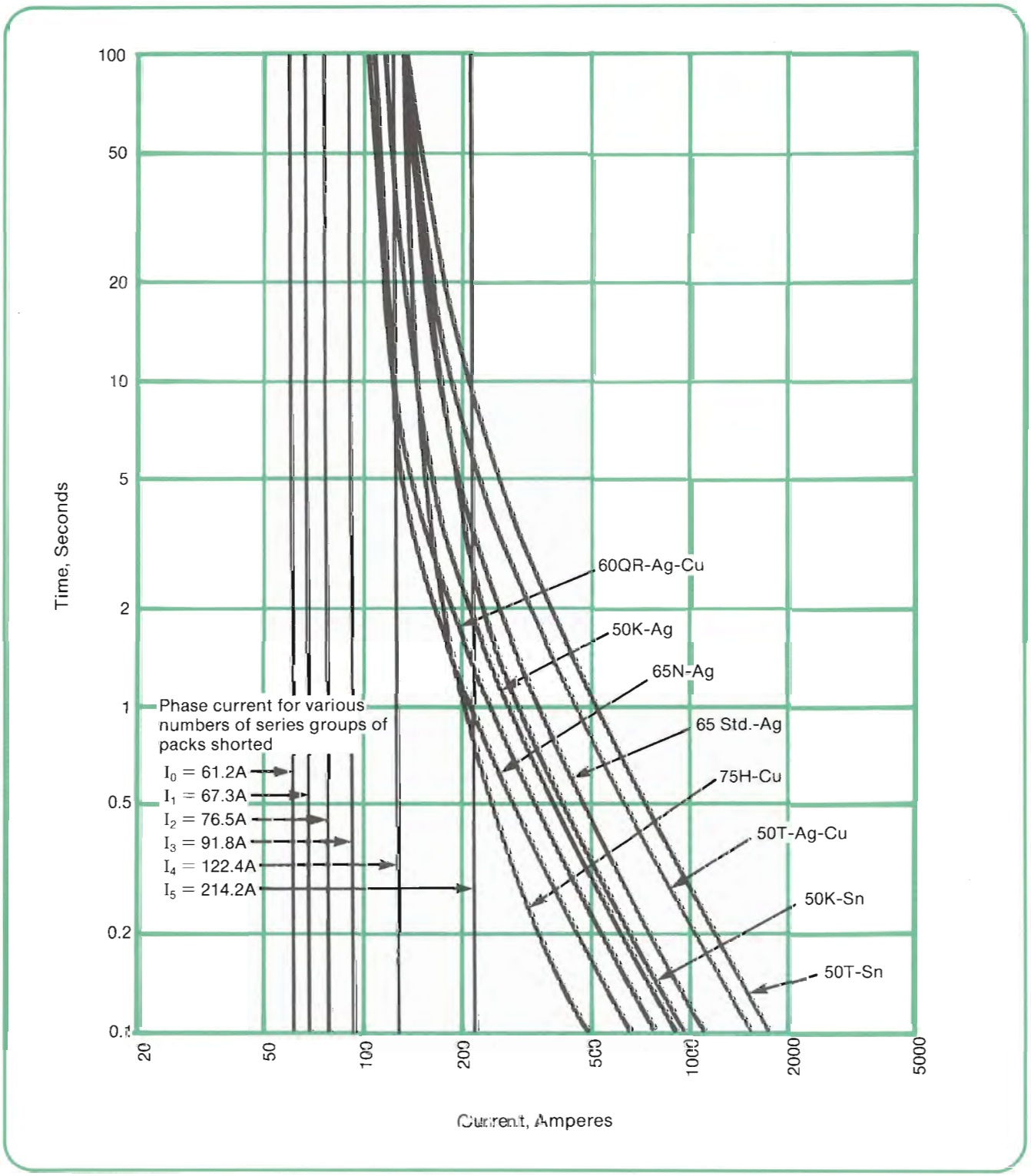


Figure 4. Total clearing time-current characteristic curves for fuse links shown in Table 7. Because of its low 300-second maximum clearing current and relatively steep time-current characteristic, the 65N-Ag fuse link has the shortest response time for an evolving series group failure of an individual capacitor unit having six series groups of packs.

Protect Capacitor Units Against Case Rupture

The next step in the selection process is to verify that the capacitor bank fuse ampere rating and speed characteristic determined as described earlier will protect the individual capacitor units in the bank against case rupture. This is done by comparing the total clearing time-current characteristic curve of the fuse with the case-rupture curve appropriate for the capacitor units employed. Case-rupture curves are published by the various capacitor manufacturers and illustrate the probability of case rupture for various time and current relationships. A case rupture is generally defined as *any* opening of the faulted capacitor unit's case—from a cracked seam or bushing seal to a violent bursting of the case. For a brief history of the case-rupture curves, see the box below.

In comparing the total clearing curve of the capacitor bank fuse with the appropriate case-rupture curve, you will notice that they intersect at some high value of current, and that they may or may not also intersect at some lower value of current, depending on the capacitor bank connection, its configuration, and on the particular type of capacitor units employed (i.e., paper-film or all-film). Because capacitor-unit case rupture can result from low-magnitude faults persisting for an extended period of time, as well as from high-magnitude faults, the low-current and high-current intersections should be evaluated separately.

Low-current faults. The presence (or absence) of a low-current intersection between the total clearing curve of the capacitor bank fuse and the case-rupture curve has largely been ignored in the past when selecting a bank fuse for *other than* ungrounded-wye connected capacitor banks, for which the faulted capacitor-unit current is limited to three times the actual capacitor bank current. For ungrounded-wye connected banks, it was usually recommended that the capacitor bank fuse simply be selected to clear three-times normal phase current in 300 seconds or less, and that a fuse

History of Case-Rupture Curves

Historically, the case-rupture curves that were available in the Standards◆ and from the capacitor manufacturers illustrated selected probabilities of case rupture, that is, the curves showed the time-current relationships for a 10-percent probability of case rupture, a 50-percent probability of case rupture, and a 90-percent probability of case rupture. These curves further delineated regions or zones with different relative degrees of protection provided to the capacitor units in the bank by the capacitor bank fuse. For example, if the total clearing time-current curve of the capacitor bank fuse lay to the left of the 10-percent probability-of-case-rupture curve, the resulting protection level was referred to as "safe zone" protection, and within the safe zone, usually no greater damage than a slight swelling of the case would have been expected. "Zone 1" protection, bounded by the 10- and 50-percent probability curves, was considered suitable for locations where case rupture and/or fluid leakage would present no hazard. "Zone 2" protection, bounded by the 50- and 90-percent probability curves, was considered suitable for locations which were chosen after careful consideration of the possible consequences associated with violent rupture of the case. Finally, "Hazardous Zone" protection was considered unsafe for most applications since the case could be expected to rupture with sufficient violence to damage adjacent capacitor units and other equipment.

Because overhead distribution pole-top capacitor banks are installed in locations accessible to the public, protection against capacitor-unit case rupture is even more important than if the bank were installed in a more controlled environment, such as in a distribution substation. For this reason, it is now widely recognized that the capacitor bank fuse should be selected by reference to the 10-percent probability-of-case-rupture curve. In fact, the National Electrical Code■ requires that the fuse be so selected, for capacitor bank installations within Code jurisdiction. Furthermore, manufacturers of high-voltage capacitor units are increasingly supplying only a single probability-of-case-rupture curve to their customers, which in many cases is even more conservative than the 10-percent probability-of-case-rupture curve described above.

◆ USA Standard C55.1-1968, "Shunt Power Capacitors," contained generalized case-rupture curves, as described above, for 25-kvar, 50-kvar, and 100-kvar capacitor units. This standard was superseded by ANSI/IEEE Standard 18-1980, "IEEE Standard for Shunt Power Capacitors," at which time the case-rupture curves were removed. A working group has been formed to develop new case-rupture curves which may be included in future revisions of this standard.

■ Article 460-25(d), 1990.

APPLICATION PRINCIPLES — Continued

so selected should thereby prevent the faulted capacitor unit's case from rupturing. Analysis of recent field experience, however, has shown that capacitor-unit case ruptures can indeed occur under low-fault conditions, *regardless of the capacitor bank connection*—including ungrounded-wye connected capacitor banks protected by a fuse link selected using the "rule-of-thumb" method described above. Accordingly, the presence (or absence) of a low-current intersection between the total clearing curve of the capacitor bank fuse and the case-rupture curve should be evaluated for each capacitor bank fusing application.

When comparing the total clearing curve of the capacitor bank fuse with the case-rupture curve in the low-current region, recall that if the capacitor bank is wye connected with multiple capacitor units in parallel in each phase or is delta connected, the faulted phase current and the faulted capacitor-unit current are not equal until the last series group of packs is shorted. As a consequence, the total clearing time of the capacitor bank fuse (which responds to faulted *phase* current) should be compared to the time permitted on the capacitor unit's case-rupture curve for the faulted *capacitor-unit* current. This is illustrated in Figure 5 based on capacitor units having a total of six series groups of packs with the faulted unit having four series groups shorted. As a general rule, capacitor-unit case rupture will be avoided if, *for all number of series groups of packs shorted*, the total clearing time of the fuse is *less* than the time permitted on the case-rupture curve, at their respective current values.

Because the total number of series groups of packs in high-voltage capacitor units is not published and varies from manufacturer to manufacturer, the results illustrated in Figure 5 should be considered somewhat tentative until the same comparison can be made for other possible numbers of series groups of packs. As noted earlier in this publication, it is always good practice to evaluate various numbers of series groups of packs, based on the assumption that the voltage across any individual series group is between the generally accepted values of 1 kv and 2.5 kv.

If the total clearing time of the capacitor bank fuse is *greater* than the time indicated on the case-rupture curve, for one or more numbers of series groups of packs shorted, then there is a possibility that the faulted capacitor unit's case may rupture. The actual probability of case rupture, however, cannot be determined in absolute terms for a number of reasons. Of particular significance is the fact that there is no way to know how long it will take for the evolving series-group failure process to advance from one shorted series group of packs to the next. As described beginning on page 3, paper-film dielectric capacitor units tend to fail quickly, usually resulting in sufficient phase-current escalation to operate the bank fuse before the faulted unit's case actually ruptures. Series-group failures in all-film dielectric capacitor units, however, tend to develop over a much longer period of time, with the result that the faulted unit's case can rupture simply due to the increase in internal temperature and pressure resulting from the increased current flow. For these reasons, evaluating the probability of case rupture when selecting a capacitor bank fuse requires careful consideration. You may wish to consult the capacitor-unit manufacturer for guidance.

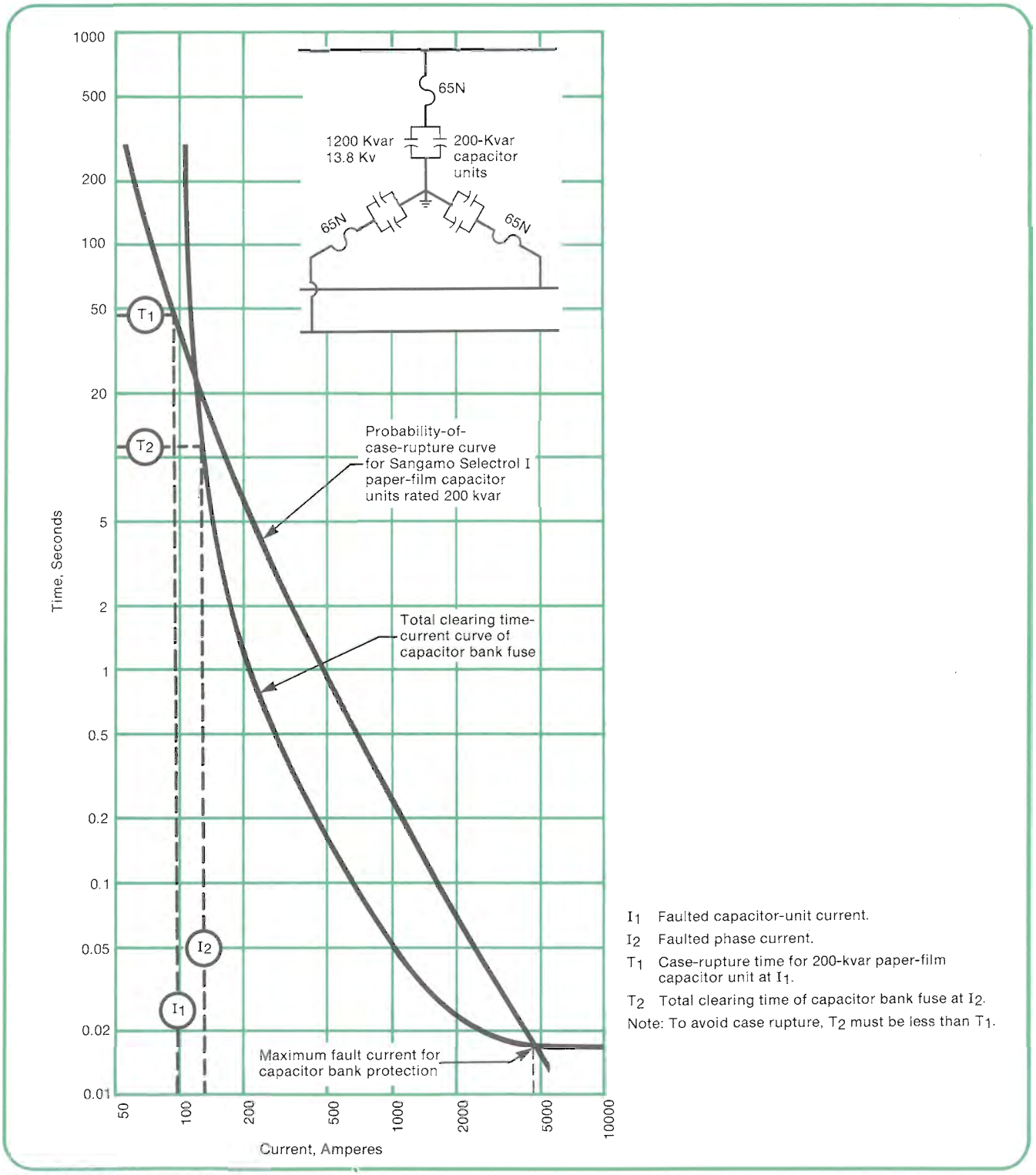
High-current in grounded-wye and delta connected capacitor banks. Although most capacitor-unit ruptures in these banks begin as slowly evolving series-group failures, as described above, there are a number of conditions which can occur wherein the faulted capacitor unit will be exposed to extremely high currents—on the order of the available fault-current level:

(1) one or more series groups of packs may fault directly to the capacitor unit's case (either alone or by first promoting pack failure in adjacent series groups);

(2) the capacitor unit's case may bulge as a result of the gas generated by previously shorted series groups of packs, such that the dielectric fluid level drops below the bushing terminal connections, resulting in an internal flashover; and

(3) the evolving series-group failure process may continue to the point where the last series group of packs is shorted before the capacitor bank fuse operates.

For any of the conditions described above, the faulted phase current and the faulted capacitor-unit current will be the same, and will equal the available phase-to-ground fault-current level in a grounded-wye connected capacitor bank, and the available phase-to-phase fault-current level in a delta connected capacitor bank. Therefore, to protect the capacitor units in these banks against case rupture, they should be applied only where the maximum phase-to-ground and phase-to-phase fault-current levels, respectively, are *lower* than the fault-current value at which the total clearing time-current characteristic curve of the bank fuse and the case-rupture curve intersect. See Figure 5.



I_1 Faulted capacitor-unit current.

I_2 Faulted phase current.

T_1 Case-rupture time for 200-kvar paper-film capacitor unit at I_1.

T_2 Total clearing time of capacitor bank fuse at I_2.

Note: To avoid case rupture, T_2 must be less than T_1.

Figure 5. Procedure used to verify that the capacitor bank fuse will protect capacitor units in the bank against rupture in accordance with the case-rupture curve. (Example is based on capacitor units having six series groups of packs with four shorted.)

APPLICATION PRINCIPLES — Continued

If the available fault-current level is greater than the maximum fault-current level for capacitor bank protection (for a properly selected capacitor bank fuse), the capacitor bank, as configured, cannot be adequately protected by fuse cutouts. For this situation, you may wish to consider either one or both of the following alternatives: (1) use larger individual capacitor units in the bank, or units of a different construction type or from a different manufacturer, which may yield a higher maximum fault-current value for capacitor bank protection; or (2) use partial-range (backup) current-limiting fuses in series with the fuse cutouts. More expensive full-range current-limiting fuses may also be considered for the capacitor bank fuse. The use of full-range current-limiting fuses has some significant drawbacks, however, since their time-current characteristics normally require that such a large ampere rating be used that they provide virtually no protection against evolving series-group failure. In addition, if current-limiting fuses are employed, either partial-range or full-range, the available fault current must be of sufficient magnitude to melt the current-limiting fuse in one-half cycle or less for the fuse to be effective.

Withstand Transient Outrush Currents

As discussed earlier, to achieve prompt isolation of a failing capacitor unit, and thus minimize the probability of case rupture, the smallest practicable capacitor bank fuse ampere rating should be selected. A capacitor bank fuse so selected, however may nuisance-melt when exposed to the transient outrush currents which occur under the following situations: (1) when a nearby distribution capacitor bank is energized repeatedly (commonly referred to as back-to-back switching); and (2) when there is a system disturbance such as a nearby fault.

These two situations are analyzed individually in the following sections for grounded-wye connected capacitor banks, using a technique similar to that described on page 10 for evaluating energizing inrush currents. It should further be noted that the duty imposed on bank fuses applied on ungrounded-wye and delta connected capacitor banks is equal to (in one phase) or less than that associated with grounded-wye connected banks. Accordingly, the procedures and concepts which follow are appropriate for all capacitor bank connections.

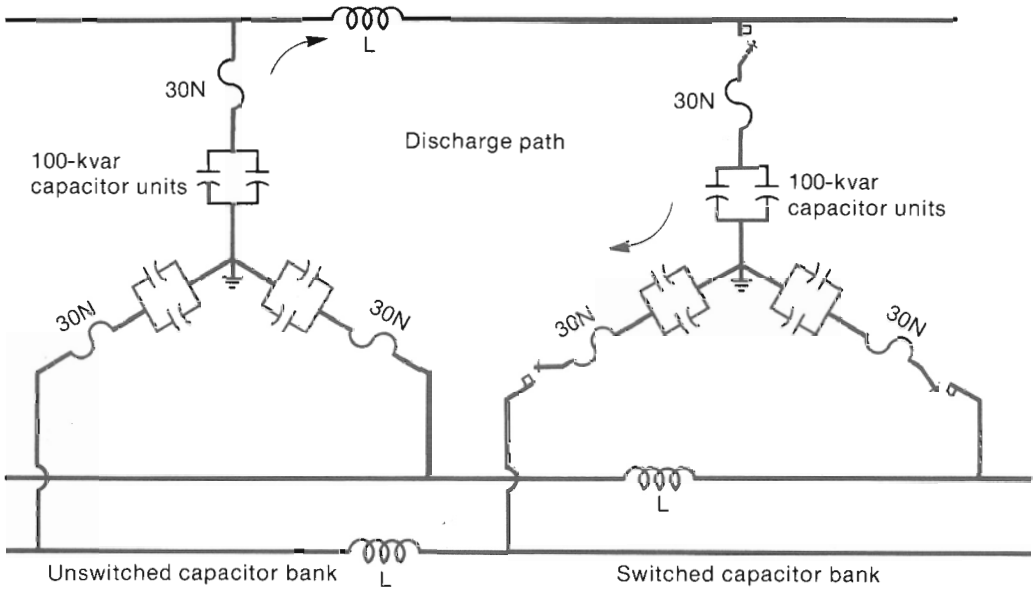
1. **Capacitor bank outrush upon energizing a nearby capacitor bank (back-to-back switching).** When a capacitor bank is energized in parallel with an already energized capacitor bank, the capacitors in the energized bank will discharge, through the preloaded bank fuse, into the newly energized bank. While the inrush current from the system is limited by the impedance (primarily inductive reactance) between the source and the newly energized bank, the high-frequency transient outrush current from the first (already energized) bank is dependent only upon the surge impedance of the discharge path. Thus, it is a function of the equivalent capacitance of the two banks, the total inductance of the discharge path (i.e., the inductance of the conductors between the two banks and the inductance of the capacitor banks themselves) and, as noted earlier, the magnitude of the voltage at the instant the second bank is energized.

   If the high-frequency surge-withstand I^2t capability of the capacitor bank fuse is known, along with the equivalent capacitance of the circuit, and the line-to-ground voltage, the minimum equivalent circuit inductance L required between the two capacitor banks to avoid nuisance operation of the fuse protecting the first bank can be calculated using Equation 1, but expressed in the following form:

$$\text{Equation 2} \quad L = \frac{13.7\ E^4\ C^3}{(I^2t)^2} \quad \text{Henrys}$$

   Then, for a specific conductor size and configuration, with a known inductance per foot, the corresponding *minimum* line length between the two capacitor banks can be calculated.

   Figure 6 illustrates the use of Equation 2 for calculating the minimum distance between two 600-kvar grounded-wye connected capacitor banks rated 13.8 kv. According to the calculation, the two capacitor banks can be located as close as 69 feet from each other, and not result in a nuisance operation of the fuse protecting the first bank, when the second bank is energized. Since overhead distribution capacitor banks are generally separated by considerably more than 69 feet of conductor—two or more pole-spans of conductor being typical—nuisance operation of capacitor bank fuses due to switching of distribution pole-top capacitor banks is not considered to be a major problem. It is, nevertheless, a factor that should be considered for each application.



DATA

Capacitor Bank: 600 Kvar Three-Phase, 13.8 Kv Three-Phase
Self-Inductance: 2.0×10^{-6} Henrys Per Phase
Assumed Bank Tolerances: plus 6% in voltage, plus 8% in capacitance

Capacitor Bank Fuse: Minimum Melting I^2t (60 hz) = 4860 A^2 Sec
Preload Adjustment Factor: 0.677 (See Note 1)
High-Frequency Surge-Withstand I^2t Adjustment Factor: 0.33 (See Note 2)

Conductor: Inductance: 0.256×10^{-6} Henrys/Foot typical for 336 through 795 kc mil ACSR, with phase spacing 2 through 4 ft.

$$C_{EQ} = \frac{C}{2} = \frac{1}{2}\left[\frac{2.65\ (\text{kvar}\phi)}{(V_{l\text{-}g})^2}\right] = \frac{2.65\ (200)}{2(7967)^2} = 4.18\times10^{-6}\ \text{Farads (See Note 3)}$$

$$I^2tHF = (60\ \text{hz}\ I^2t)\ (\text{Preload Adjustment Factor})\ (\text{High-Frequency Surge-Withstand}\ I^2t\ \text{Adjustment Factor})$$

$$= (4860)\ (0.677)\ (0.33) = 1086\ A^2\ \text{Sec}$$

$$L = \frac{13.7(E)^4(C_{EQ})^3}{(I^2tHF)^2} = \frac{13.7\left[\sqrt{2}\ (1.06)\ (7967)\right]^4\left[(1.08)\ (4.18\times10^{-6})\right]^3}{(1086)^2} = 21.74\times10^{-6}\ \text{Henrys}$$

$$\text{Distance} = \frac{\text{Inductance of Discharge Path — Self-Inductance of Banks}}{\text{Conductor Inductance Per Foot}}$$

$$= \frac{(21.74\times10^{-6}\text{H}) - (4.0\times10^{-6}\text{H})}{0.256\times10^{-6}\text{H/Ft.}} = 69\ \text{Feet}$$

NOTES

1. The preload adjustment factor is used to reduce the high-frequency surge-withstand I^2t capability value of the capacitor bank fuse to reflect its carrying phase current prior to the energization of the parallel bank.
2. The high-frequency surge-withstand I^2t adjustment factor is used to reduce the 60-hz minimum melting I^2t of the capacitor bank fuse to reflect the nonuniform current distribution in the fusible element (skin effect), plus mechanical stresses resulting from the increased electro-magnetic forces that occur when the frequency of the transient outrush current is significantly higher than 60 hz. As noted on page 10, the high-frequency surge-withstand I^2t capabilities of distribution fuse links are generally applicable to frequencies through 8 khz. For back-to-back switching applications, however, the frequency of the outrush current can sometimes be greater than 8 khz, which requires that the I^2t capability of the fuse be reduced even further. Such an adjustment was made in this example based on a frequency of 16.7 khz.
3. C_{EQ} is the equivalent capacitance of the discharge path, recognizing that the capacitor units (in each phase) in each bank are connected in series when the two banks are paralleled.

Figure 6. Application of Equation 2 for calculating the minimum required distance between the two grounded-wye connected capacitor banks illustrated, to prevent nuisance operation of the fuses protecting the unswitched bank.

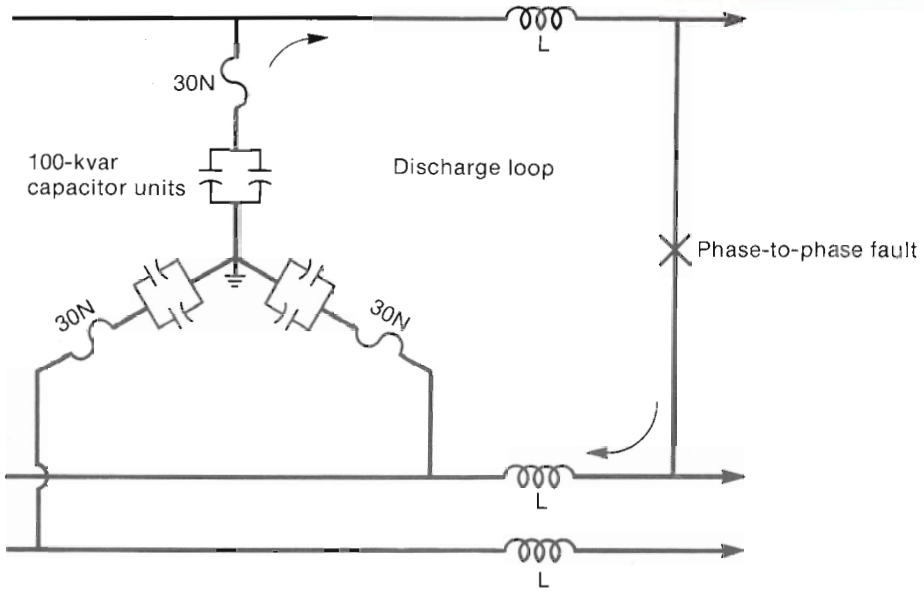
APPLICATION PRINCIPLES — Continued

If a capacitor bank is energized by a switching device that is not multiple-prestrike-free, or de-energized by a switching device that is not restrike-free, the voltage E in Equation 2 can be two (or more) times that normally encountered when energizing a discharged capacitor bank. This results in a 4-times higher I^2t value and a 16-times greater minimum required distance between the two capacitor banks. Therefore, where close capacitor bank spacing is required, it is very important that only multiple-prestrike-free and restrike-free switches be applied as capacitor bank switches and that restrike-free operation be maintained by proper servicing.

2. **Capacitor bank outrush into a nearby fault.** When a fault occurs on the system near an overhead distribution capacitor bank, the capacitor bank will discharge through the preloaded bank fuse into the fault. For this situation, the I^2t of the outrush current from the capacitor bank is dependent upon the equivalent impedance of the circuit conductors between the capacitor bank and the fault, the type of fault, and the magnitude of the voltage at the instant the fault occurs. For the purpose of this discussion, a line-to-line fault will be assumed since the result is a higher outrush I^2t through the bank fuse than would be obtained based on a line-to-ground fault.

The minimum required distance between the capacitor bank and the fault to avoid nuisance operation of the bank fuse can be calculated using Equation 2. Note, however, that when calculating the distance to a line-to-line fault, the line-to-line voltage must be used rather than the line-to-ground, which was used to calculate the distance between two adjacent capacitor banks. Also, the distance calculated is based on the total loop inductance, which includes in this case, the inductance of the return conductor. Hence, the distance to the fault is actually one-half of the total distance calculated. Figure 7 illustrates the use of Equation 2 for calculating the minimum distance between a 600-kvar grounded-wye connected capacitor bank rated 13.8 kv and a nearby line-to-line fault. As noted, a line-to-line fault can occur as close as 166 feet from the capacitor bank, and not result in a nuisance operation of the capacitor bank fuse.

Because it is impossible to predict the location and frequency of occurrence of line faults, a certain probability of nuisance operations must be accepted when fusing overhead distribution capacitor banks. This risk is actually fairly small, since line faults are relatively infrequent, and those that do occur must be within a certain distance from the capacitor bank to result in sufficient I^2t to operate the bank fuse.



DATA

Capacitor Bank: 600 Kvar Three-Phase, 13.8 Kv Three-Phase
Self-Inductance: 2.0×10^{-6} Henrys Per Phase
Assumed Bank Tolerances: plus 6% in voltage, plus 8% in capacitance

Capacitor Bank Fuse: Minimum Melting I^2t (60 hz) = 4860 A^2 Sec
Preload Adjustment Factor: 0.677 (See Note 1)
High-Frequency Surge-Withstand I^2t Adjustment Factor: 0.49 (See Note 2)

Conductor: Inductance: 0.256×10^{-6} Henrys/Foot typical for 336 through 795 kc mil ACSR, with phase spacing 2 through 4 ft.

$$C_{EQ} = \frac{C}{2} = \frac{1}{2}\left[\frac{2.65\ (\text{kvar}\phi)}{(V_{l\text{-}g})^2}\right] = \frac{2.65\ (200)}{2(7967)^2} = 4.18\times10^{-6}\ \text{Farads (See Note 3)}$$

$$I^2tHF = (60\ \text{hz}\ I^2t)\ (\text{Preload Adjustment Factor})\ (\text{High-Frequency Surge-Withstand}\ I^2t\ \text{Adjustment Factor})$$

$$= (4860)\ (0.677)\ (0.49) = 1612\ A^2\ \text{Sec}$$

$$L = \frac{13.7(E)^4(C_{EQ})^3}{(I^2tHF)^2} = \frac{13.7\left[\sqrt{2}\ (1.06)\ (13{,}800)\right]^4\left[(1.08)\ (4.18\times10^{-6})\right]^3}{(1612)^2} = 88.8\times10^{-6}\ \text{Henrys}$$

$$\text{Distance} = \frac{\text{Inductance of Discharge Path — Self-Inductance of Bank}}{2\ (\text{Conductor Inductance Per Foot})}$$

$$= \frac{(88.8\times10^{-6}\text{H}) - (4.0\times10^{-6}\text{H})}{2\ (0.256\times10^{-6}\text{H/Ft.})} = 166\ \text{Feet (See Note 4)}$$

NOTES

1. The preload adjustment factor is used to reduce the high-frequency surge-withstand I^2t capability value of the capacitor bank fuse to reflect its carrying phase current prior to the phase-to-phase fault.
2. The high-frequency surge-withstand I^2t adjustment factor is used to reduce the 60-hz minimum melting I^2t of the capacitor bank fuse to reflect the nonuniform current distribution in the fusible element (skin effect), plus mechanical stresses resulting from the increased electro-magnetic forces that occur when the frequency of the transient outrush current is significantly higher than 60 hz. As noted on page 10, the high-frequency surge-withstand I^2t capabilities of distribution fuse links are generally applicable to frequencies through 8 khz. However, the frequency of the transient outrush current into a nearby fault can sometimes be greater than 8 khz, which requires that the I^2t capability of the fuse be reduced even further. Such an adjustment was made in this example based on a frequency of 8.3 khz.
3. C_{EQ} is the equivalent capacitance of the discharge loop, recognizing that the capacitor units (in the affected phases) are connected in series when the phase-to-phase fault occurs.
4. The distance calculated is based on the inductance of the discharge loop, which includes the return path from the fault location; therefore, the distance must be divided by 2.

Figure 7. Application of Equation 2 for calculating the minimum required distance between a grounded-wye connected capacitor bank and a nearby phase-to-phase fault.

THE FUSE SELECTION TABLES

Introduction of the Fuse Selection Tables

As described in the foregoing text, the selection of a capacitor bank fuse ampere rating and speed characteristic involves consideration of all of the following factors:

(1) The normal transient inrush current associated with energizing an isolated capacitor bank;

(2) The highest anticipated capacitor bank current, including any increases above the nominal bank current due to capacitor-unit manufacturing tolerances, harmonic currents, or system operating voltage levels higher than the rated capacitor bank voltage;

(3) The ability to operate as promptly as possible in response to an evolving capacitor-unit failure;

(4) The degree of protection provided to the individual capacitor units in the bank against case rupture in accordance with the applicable case-rupture curves; and

(5) The transient outrush current from the capacitor bank that results when a nearby capacitor bank is energized or when a fault occurs nearby.

The fuse selection tables presented in this publication reflect consideration of all of these factors, and permit the direct selection of the capacitor bank fuse, thereby *eliminating the need to perform complex calculations or graphical studies.* The tables list, for each capacitor bank kvar rating and configuration, a choice of fuse link ampere ratings and speed characteristics that will withstand the transient energizing inrush current associated with the capacitor banks shown, and that will carry continuously the anticipated capacitor bank current, including any increases above nominal bank current due to capacitor-unit tolerances, harmonic currents, or system operating voltage levels higher than the rated capacitor bank voltage. In addition, the fuse links listed will operate as promptly as possible in response to an evolving capacitor-unit failure, and will protect the individual capacitor units in the bank against case rupture in accordance with the appropriate probability-of-case-rupture curve. Finally, the fuse links listed will withstand the transient outrush current from the capacitor bank that results when a nearby capacitor bank (of the same kvar rating and configuration) is energized.

S&C Positrol Fuse Links possess the performance characteristics and quality that make them especially suited for the simultaneous satisfaction of all of the selection criteria. These time-proven fuse links are available in a wide variety of ampere ratings and speeds, permitting close fusing for maximum capacitor bank protection. And their time-current characteristics are precise, with only 10% total tolerance in melting *current*, compared to the 20% (or greater) tolerance of other fuse links (20% and 40% respectively, in terms of *time*). Because of these narrow tolerances, Positrol Fuse Links can be counted on to respond faster than other fuse links of comparable ampere rating and speed, resulting in better and more reliable protection for the capacitor bank.

Exceptional care in the design and manufacture of S&C Positrol Fuse Links guarantees that they are accurate with respect to their published minimum melting time-current characteristics, not only initially, but also on a sustained basis. This permanent accuracy is achieved principally through the design and construction of the fusible element. The fusible elements in S&C Positrol Fuse Links are drawn through precision dies to very accurate diameters. And Positrol Fuse Links feature solderless construction—terminals are swaged on to produce a permanent connection that is unaffected by vibration, corrosion, or aging.

S&C Positrol Fuse Links have been demonstrated through exhaustive testing to possess superior high-frequency surge-withstand I^2t capabilities and to be nondamageable when subjected repeatedly to power-frequency current surges that heat the element nearly to the severing point—characteristics which make them particularly well suited for application on overhead distribution capacitor banks. Unlike tin- or lap-joint-element fuse links, Positrol Fuse Links will not "sneak out," that is, operate for no apparent reason due to otherwise harmless inrush or outrush currents, because of the cumulative effects of surge currents, load cycling, vibration, and aging. Such sneakouts impose the inconvenience of needless capacitor bank outages, with the attendant drop in power factor and line voltage in the vicinity of the isolated capacitor bank, as well as the cost associate with locating and replacing the fuse link. In addition, the proven nondamageability of Positrol Fuse Links provides operating economies because there is no need to replace unblown companion fuse links on suspicion of damage following a fuse link operation.

Once the capacitor bank fuse link has been selected as outlined in the section entitled "How to Use the Fuse Selection Tables" on page 88, it is necessary only to determine that appropriate fuse cutout type based on the voltage rating, short-circuit interrupting rating (considering the maximum anticipated available fault current at the capacitor bank location), and maximum ampere rating required. As can be seen from Table 45 on page 86, S&C Type XS Fuse Cutouts are offered in a number of voltage, short-circuit interrupting, and maximum ampere ratings, allowing you to economically match the fuse cutout to the load- and fault-current levels of your particular applications. The symmetrical short-circuit interrupting ratings listed in Table 45 are based on an X/R ratio of 8 or 12 (depending on the voltage rating and interrupting current rating of the fuse cutout) as specified by ANSI Standards.♦ Higher symmetrical interrupting ratings apply, of course, at locations where the X/R ratio is lower. The curves in Figure 8 on page 87 indicate the symmetrical ratings of Type XS Fuse Cutouts at other X/R ratios.

Basis for Listings in the Fuse Selection Tables

The fuse selection tables presented in this publication were developed in accordance with the application principles previously discussed. In applying these principles as described, it was, of course, necessary to make certain decisions and assumptions, all of which are outlined in detail below. For easy access to this information, it is arranged in the following sections in the same order as the subjects appear in the fuse selection tables.

Capacitor Bank Kvar Ratings. The table on page 89 serves as an index to the fuse selection tables applicable to grounded-wye, ungrounded-wye, and delta connected shunt capacitor banks rated 150 kvar through 3600 kvar three-phase, and applied to systems having voltage ratings from 2.4 kv through 34.5 kv. Only capacitor banks using a single series group of no more than six parallel-connected single-phase capacitor units in each phase are covered in this publication. Capacitor banks having multiple series groups of capacitor units are not usually applied in overhead distribution systems, and hence have not been considered. The capacitor banks covered in this publication have been configured using individual capacitor units having different construction types (i.e., paper-film or all-film) and from a variety of different manufacturers. Specifically, the following capacitor units were considered in developing the fuse selection tables: General Electric Dielektrol™ (paper-film construction) dated October, 1977 and Dielektrol III™ (all-film construction) dated September, 1978; McGraw-Edison Type ES (all-film construction) dated January, 1977 and Type EX (all-film construction) dated March, 1988; Sangamo Selectrol I (paper-film construction) and Selectrol II (all-film construction); and ABB (Westinghouse) Wemcol (paper-film construction) dated November, 1981 and Film-Var (all-film construction) dated August, 1985. It is assumed that capacitor units employed in wye connected banks (either grounded or ungrounded) have voltage ratings *equal* to the nominal line-to-neutral voltage rating of the system. Similarly, it is assumed that capacitor units employed in delta connected capacitor banks have voltage ratings *equal* to the nominal line-to-line voltage rating of the system.

Possibility of Case Rupture Due to Low-Current Faults. In order to verify that the capacitor bank fuse will protect the individual capacitor units in the bank against case rupture as a result of low-current faults, the total clearing time-current characteristic curve of each bank fuse shown was compared to the probability-of-case-rupture curve appropriate to the capacitor units employed. As noted earlier, however, the capacitor-unit failure process leading to case rupture is extremely difficult to quantify—particularly in the low-current region. For this reason, among others, there is very little, if any, similarity in the way capacitor manufacturers illustrate probability-of-case-rupture curves for their units. For example, one manufacturer may publish a case-rupture curve for a particular unit that stops at a current value corresponding to a time value of 200 seconds. Another manufacturer, by comparison, may publish a case-rupture curve for a unit of the same kvar rating that stops at lower current value, corresponding to a time value of 300 or even 1000 seconds. Hence, a fuse link ampere rating selected as providing full protection in accordance with the case-rupture curve for the former unit may not be judged to provide comprehensive protection against case rupture for the latter unit.

♦ ANSI Standard C37.41, Design Tests for High-Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Accessories.

THE FUSE SELECTION TABLES — Continued

To eliminate variations in the fuse selection tables resulting from these differences in the way case-rupture curves are published, it was decided to consider only those portions of the case-rupture curves below a certain common time value. Specifically, it was assumed that case-rupture curves for paper-film dielectric capacitor units extend only to 100 seconds. This assumption is valid since, as noted earlier, the series-group failure process in these units tends to develop very rapidly. Since faults in all-film units escalate much more slowly, by comparison with paper-film units, a greater maximum time value for the case-rupture curve is appropriate. Accordingly, it was assumed that case-rupture curves for all-film dielectric capacitor units extend to 300 seconds.

In making the above comparison, it was recognized that for wye connected capacitor banks having multiple capacitor units in parallel in each phase, or for delta connected capacitor banks, the faulted phase current and the faulted capacitor-unit current are not directly comparable until the last series group of packs is shorted. Accordingly, it was necessary to compare the total clearing time of the capacitor bank fuse (which responds to faulted phase current) with the time permitted on the capacitor unit's case-rupture curve (at the corresponding faulted capacitor-unit current) for *all* possible numbers of series groups of packs shorted. In addition, capacitor units having various total numbers of series groups of packs were considered, based on the assumption that the voltage across any individual series group was within the limits described before, i.e., between 1 kv and 2.5 kv.

If the total clearing time of the capacitor bank fuse was found to be greater than the time indicated on the case-rupture curve, for any possible number of series groups of packs shorted, then there is a possibility that the faulted capacitor unit's case may rupture in the event of a low-current evolving fault. Such instances are indicated in the fuse selection tables in the following manner. For grounded-wye and delta connected capacitor banks, the maximum fault current value for capacitor bank protection is marked with a "▲" symbol to indicate the particular capacitor-unit manufacturer and construction type for which a possibility of low-current case rupture exists. For ungrounded-wye connected capacitor banks, similar information is provided by means of special application-condition tables for paper-film and all-film capacitor units, respectively. In either situation, the presence of the "▲" symbol for grounded-wye and delta connected capacitor banks or the presence of an application-condition letter code for ungrounded-wye connected capacitor banks indicates only that there is a *possibility* of case rupture, since the actual probability of case rupture, as explained earlier, cannot to determined in absolute terms.

Good field experience with bank fusing of paper-film dielectric capacitor units tends to suggest that case ruptures do not occur very often. This may be due to a tendency for faults to evolve fairly quickly in paper-film capacitor units, resulting in sufficient phase current escalation to operate the bank fuse before the gas buildup actually ruptures the faulted unit's case. As a consequence, a fuse link entry in the selection tables, even though subject to an application condition, can likely still be used with good success. The possibility of case rupture for all-film dielectric capacitor units, on the other hand, appears to be more of a problem, since the unit may remain in a partially faulted condition for an extended period of time. The increased current flow due to the shorted series group(s) can lead to increased temperature and pressure inside the faulted unit's case, which can ultimately lead to the point where the unit ruptures. Accordingly, fuse links listed for all-film units, when subject to an application condition, should only be used following careful consideration of the application. You may wish to consult with the manufacturer of the capacitor units employed.

Maximum Fault Current for Capacitor Bank Protection. Although most capacitor-unit failures begin as slowly evolving series-group failures, a number of conditions can occur (see page 18), wherein the faulted capacitor unit will be exposed to extremely high currents, in a very short period of time. These extremely high currents are on the order of the available phase-to-ground fault-current level for a grounded-wye connected capacitor bank, and the available phase-to-phase fault-current level for a delta connected capacitor bank. Therefore, to protect the capacitor units in these banks against case rupture, they should be applied where the system available phase-to-ground and phase-to-phase fault-current levels, respectively, are *lower* than the maximum fault-current values for capacitor bank protection listed in the fuse selection tables.

The current values in the tables are expressed in amperes, rms, symmetrical. The effects of asymmetry have not been considered, since pole-top capacitor banks are typically located well out on the distribution system where the X/R ratio (and hence the dc offset) is low.

Certain capacitor bank kvar ratings configured with a large number of smaller capacitor units in parallel in each phase cannot be adequately protected by bank fuse links. For such banks, the total clearing time-current characteristic curve of the fuse link—regardless of its speed characteristic—lies entirely to the right of the case-rupture curve appropriate for the capacitor units employed. For simplicity, these "unprotectable" banks have not been included in the fuse selection tables. Instead they have been summarized in Table 8, below. If the capacitor bank kvar rating and configuration under consideration is listed in Table 8, you may wish to consider one or more of the following alternatives to obtain protection against capacitor-unit case rupture: (1) reconfigure the bank using larger individual capacitor units; (2) individually fuse the capacitor units in the bank; or (3) use partial-range (backup) current-limiting fuses in series with the fuse cutouts. If partial-range current-limiting fuses are employed, the available fault current must be of sufficient magnitude to melt the current-limiting fuse in one-half cycle or less for the fuse to be effective.

Ampere Rating and Speed Characteristic. For each capacitor bank kvar rating and configuration, the fuse selection tables list a choice of fuse link ampere ratings in each of five speed characteristics: S&C "N" Speed, TCC No. 167; S&C "QR" Speed, TCC No. 172; S&C Standard Speed, TCC No. 123; S&C "K" Speed, TCC No. 165; and S&C "T" Speed, TCC No. 170. The specific ampere rating recommendations were determined such that each fuse link's continuous peak-load capability value (as differentiated from its nominal ampere rating)

TABLE 8—Capacitor Banks That Cannot Be Adequately Protected Against Case Rupture by Bank Fuse Links①②

Capacitor Bank Connection	Capacitor Bank Rating				
	Kv, Three-Phase ↓	Kvar, Three-Phase			
	Capacitor-Unit Rating, Kvar → Single-Phase	50	100	150	200
Grounded-Wye	4.16	600 thru 900			
	4.8	750, 900	1800	1800	1800
	7.2			2700	
Delta	2.4	450 thru 900			
	4.16	750, 900			
	4.8	750, 900			

① Only applicable to capacitor banks using a single series group of no more than six parallel-connected single-phase capacitor units in each phase.

② Capacitor banks were not listed if the maximum anticipated capacitor bank current exceeds the continuous peak-load capability value of all possible capacitor bank fuse links.

THE FUSE SELECTION TABLES — Continued

exceeds the maximum anticipated capacitor bank current. As described earlier in the text, the actual capacitor bank current was determined by multiplying the nominal capacitor bank current, as calculated based on the rated voltage and kvar, by an appropriate factor to allow for such variables as capacitor-unit tolerance, harmonic currents, and system operating voltage level. The specific allowance factors used in developing the fuse selection tables are listed in Table 5 on page 11. If the capacitor bank is located in areas where harmonic currents are known to exceed the assumed values, such as near rectifiers, consult the nearest S&C Sales Office.

Elevated Ambient Temperature. In arriving at the specific ampere rating recommendations as described above, the fuse link peak-load capability values were adjusted (reduced) to reflect a 40°C ambient temperature. This temperature was used recognizing that the power factor correction and voltage regulation provided by distribution shunt capacitor banks is most crucial on those days when the load is highest—a condition usually coincident with summer peak loads and/or heat storms. Moreover, the 40°C ambient temperature is consistent with the maximum 24-hour average ambient air temperature permitted by the Standards◆ for capacitor units, when mounted in a single row.

Energizing Inrush Currents. When a single capacitor bank is first energized, there will be a transient inrush of charging current which the capacitor bank fuse must be capable of withstanding without operating. As described beginning on page 9, the ability of the bank fuse to withstand these energizing inrush currents can be determined by comparing the unpreloaded high-frequency surge-withstand I^2t capability of the fuse with the I^2t of the transient inrush current. Such a comparison has been made for each of the fuse link entries listed in the fuse selection tables. In all cases, the fuse links listed will withstand the energizing inrush currents associated with the capacitor banks for which they are recommended. In making this comparison, the following range of high-frequency surge-withstand I^2t capability values were used for each fuse link: 15% to 60% of the unpreloaded 60-hz minimum melting I^2t for silver- and silver-copper-eutectic-element fuse links, and 15% to 35% of the unpreloaded 60-hz minimum melting I^2t for nickel-chrome- and silver-tin-element fuse links. These high-frequency surge-withstand I^2t capability values are applicable for frequencies through 8 khz, which is well in excess of frequencies normally encountered when energizing single capacitor banks.

In order to determine the I^2t of the energizing inrush current, it was first necessary to calculate the source inductance (L), used in Equation 1, based on an assumed level of available fault current. Specifically, for grounded-wye and delta connected capacitor banks, it was assumed that the available fault-current level was equal to the *highest* "Maximum Fault Current for Capacitor-Bank Protection, Amperes" listed in the selection tables for each fuse link entry shown. For ungrounded-wye connected capacitor banks, the available fault-current level was assumed to be 10,000 amperes rm symmetrical. The results of this investigation are conservative in that, by assuming the highest practicable available fault-current level, a low value of source inductance (L) results which, because it is in the denominator of Equation 1, yields the highest possible high-frequency transient inrush current. Also, in making this calculation, a system operating voltage level allowance of 6% and a capacitor-unit tolerance of 8% were assumed.

◆ ANSI/IEEE Standard 18, "IEEE Standard for Shunt Power Capacitors."

Transient Outrush Currents. When a capacitor bank is connected in parallel with an already energized capacitor bank, the capacitors in the energized bank will discharge through the preloaded bank fuses into the newly energized bank. As described on page 20, to ensure against nuisance operation of the bank fuse due to this high-frequency transient current, the two capacitor banks should be separated by a certain minimum distance. This minimum distance has been determined for each of the capacitor bank kvar ratings listed in the fuse selection tables. It is assumed that the two capacitor banks are of equal kvar ratings and of the same configuration, and that the two banks are separated by at least two pole-spans of conductor. For purposes of this publication, *one* pole-span of conductor is assumed to be 150 feet. Capacitor bank kvar ratings for which the minimum separation distance exceeds two pole-spans are identified in the table on page 89.

The minimum permitted distance between adjacent banks was calculated using the method outlined beginning on page 20, and illustrated in Figure 6. It is assumed that each capacitor bank has a minimum self-inductance of 2.0 microhenrys, and that the inductance of the conductor between the two banks is 0.256 microhenry per foot, a value typical for 336 through 795 kc mil ACSR conductors with a phase spacing of 2 through 4 feet.

If a smaller diameter conductor with a higher inductance per foot is employed, the minimum separation distance between the two banks will, of course, be reduced. This results in a corresponding reduction in the duty imposed on the preloaded fuse link in the already energized bank (when the second bank is energized). The use of a smaller diameter conductor *may* also permit the two capacitor banks to be located one pole-span closer together. If a minimum separation distance greater than two pole-spans applies to the capacitor bank under consideration and if smaller diameter conductor is being used, you may wish to use the method outline on page 20 and illustrated in Figure 6 to recalculate the actual required separation distance, based on the inductance per foot of the specific conductor employed.

THE FUSE SELECTION TABLES — Continued

TABLE 9—Single Grounded-Wye Connected Capacitor Banks Rated 4.16 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemcol (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
150	50	1	3200 3100 2950 3100 2350	3200 3100 3000 3100 2350	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2950 2800▲ 2900 2100▲	3150 3100 3000 3100 2450	2200 2100 1900 2050 690	3950 4000 3850 3950 3550	25N 25QR 25 Std. 20K 25T
300	50	2	2550 2250 1750 1700 —	2550 2250 1700 1650 325	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2350▲ 2000▲ 590▲ 890▲ —	2650 2400 2050 2000 520	1050▲ 560▲ 360▲ 365▲ —	3600 3550 3250 3250 480	65N 60QR 50 Std. 50K 50T
	100	1	3700 3550 3300 3300 770	3700 3600 3350 3300 870	3850 3750 3550 3550 1600	10000 10000 10000 10000 10000	4800▲ 4800▲ 4550▲ 4650▲ 2550▲	5000 5000 4850 4950 2500	3050▲ 2650▲ 1000▲ 1100▲ —	4750 4700 4500 4600 3250	65N 60QR 50 Std. 50K 50T
450	50	3	810 — — 810 —	730 — 355▲ 720 —	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	— — — — —	1300 550 680 1300 270	— — — — —	2850 1350 1700 2750 —	85N 100QR 80 Std. 65K 65T
	150	1	3750▲ 2750▲ 2900▲ 3650▲ 465▲	3950 2900▲ 3050▲ 3750 740▲	7850 7600 7500 7800 6750	10000 10000 10000 10000 10000	4050▲ 2750▲ 2900▲ 3950▲ —	4300▲ 3000▲ 3150▲ 4200▲ 750▲	6600▲ 6600▲ 6600▲ 6600▲ 305▲	5600 5000 5100 5550 3650	85N 100QR 80 Std. 65K 65T
600	100	2	— — — — —	— — — — —	— — — — —	10000 10000 10000 10000 10000	— — — — —	— — — — —	— — — — —	2250▲ — 2000 2150▲ —	100N 125QR 100 Std. 100K 100T
	200	1	2950▲ 2100▲ 2650▲ 2700▲ —	2900▲ 1900▲ 2650▲ 2650▲ —	7100 6700 7000 7000 3900	10000 10000 10000 10000 10000	— — — — —	2400▲ 1350▲ 2000▲ 2200▲ —	6600▲ 6600▲ 6600▲ 6600▲ 6600▲	4950 4500 4800 4750 710	100N 125QR 100 Std. 100K 100T
900	100	3	— — — — —	— — — — —	— — — — —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	— — — — —	125N 150QR 125 Std. 140K 140T
	150	2	— — — — —	— — — — —	5700 5800 5650 3700▲ —	10000 10000 10000 9350▲ 3000▲	— — — — —	— — — — —	— — — — —	— 720 — — —	125N 150QR 125 Std. 140K 140T
	300	1	— 1250▲ — — —	1100▲ 1400▲ 940▲ — —	5700 5800 5650 3700▲ —	10000▲ 10000 10000▲ 9350▲ 3000▲	6000▲ 6000▲ 6000▲ — —	6000▲ 6000▲ 6000▲ — —	6600▲ 6600▲ 6600▲ 6600▲ —	4200 4450 4150 — —	125N 150QR 125 Std. 140K 140T
1200	100	4	— —	— —	— —	9250 9250	— —	— —	— —	— —	150N 150 Std.
	200	2	— —	— —	— —	9250▲ 9250▲	— —	— —	6600▲ 6600▲	— —	150N 150 Std.
1350	150	3	—	—	—	7250▲	—	—	—	—	200 Std.
1500	100	5	—	—	—	7250	—	—	—	—	200 Std.

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 10—Single Grounded-Wye Connected Capacitor Banks Rated 4.8 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
150	50	1	3200 3100 3050 3100 2750	3200 3100 3050 3100 2800	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2950 2850 2900 2600	3150 3100 3100 3100 2800	2250 2100 2000 2050 1400	3950 4000 3900 3950 3750	20N 25QR 20 Std. 20K 20T
300	50	2	2850 2700 1750 2400 470	2900 2750 1700 2450 540	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2700▲ 2500▲ 590▲ 2150▲ —	2900 2750 2050 2550 930	1550 1200 360▲ 780 —	3800 3700 3250 3650 2400	50N 50QR 50 Std. 40K 40T
	100	1	3900 3800 3300 3700 2300	3950 3800 3350 3750 2150	4000 3900 3550 3850 2750	10000 10000 10000 10000 10000	5000▲ 4850▲ 4550▲ 4850▲ 3800▲	5000 5000 4850 5000 4100	3500▲ 3250▲ 1000▲ 2950▲ 265▲	4900 4800 4500 4750 3950	50N 50QR 50 Std. 40K 40T
450	50	3	2200 700 820 810 —	2200 680 720 720 —	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	1850▲ — — — —	2350 1200 1300 1300 270	460▲ — — — —	3500 2800 2800 2750 —	75N 75QR 65 Std. 65K 65T
	150	1	4300 3700 3650 3650 465▲	4400 3850 3800▲ 3750▲ 740▲	8000 7750 7800 7800 6750	10000 10000 10000 10000 10000	4700▲ 3950▲ 3950▲ 3950▲ —	4900 4200 4200▲ 4200▲ 750▲	6600▲ 6600▲ 6600▲ 6600▲ 305▲	5850 5450 5500 5550 3650	75N 75QR 65 Std. 65K 65T
600	50	4	— — — —	— — 355 —	‡ ‡ ‡ ‡	‡ ‡ ‡ ‡	— — — —	445 550 680 480	— — — —	— 1350 1700 —	95N 100QR 80 Std. 80K
	100	2	1300▲ 1500▲ 1600▲ 1100▲ —	1200▲ 1300▲ 1500 1050▲ —	2050 2250 2350 1850 —	10000 10000 10000 10000 10000	3050▲ 3150▲ 3300▲ 2800▲ —	3100▲ 3300▲ 3550 2800▲ —	— — — — —	3400 3500 3600 3250 —	95N 100QR 80 Std. 80K 80T
	200	1	3800▲ 3850▲ 3950▲ 3700▲ —	3950▲ 4000▲ 4150 3800▲ 870▲	7550 7600 7500 7500 5850	10000 10000 10000 10000 10000	2950▲ 3150▲ 3300▲ 2650▲ —	3800▲ 3900▲ 4000▲ 3650▲ 710▲	6600▲ 6600▲ 6600▲ 6600▲ 6600▲	5600 5650 5700 5500 2950	95N 100QR 80 Std. 80K 80T
900	100	3	— — — — —	— — — — —	— — — — —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	— — — — —	125N 150QR 125 Std. 140K 140T
	150	2	— — — — —	— — — — —	5700 5800 5650 3700 —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	— 720 — — —	125N 150QR 125 Std. 140K 140T
	300	1	— 1250▲ — — —	1100▲ 1400▲ 940▲ — —	5700 5800 5650 3700▲ —	10000▲ 10000 10000▲ 9350▲ 3000▲	6000▲ 6000▲ 6000▲ — —	6000▲ 6000▲ 6000▲ — —	6600▲ 6600▲ 6600▲ 6600▲ —	4200 4450 4150 — —	125N 150QR 125 Std. 140K 140T
1200	100	4	— — — — —	— — — — —	— — — — —	10000 8400 10000 9350 3000	— — — — —	— — — — —	— — — — —	— — — — —	125N 200QR 125 Std. 140K 140T
	200	2	— — — — —	— — — — —	5700 920 5650 3700▲ —	10000 8400 10000 9350▲ 3000▲	— — — — —	— — — — —	6600▲ — 6600▲ 6600▲ —	2800▲ — 2600▲ — —	125N 200QR 125 Std. 140K 140T
1350	150	3	— —	— —	3700 3700	9250 9250	— —	— —	— —	— —	150N 150 Std.
1500	100	5	—	—	—	7250	—	—	—	—	200 Std.
1800	300	2	—	—	—	—	—	—	6600▲	—	200K

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 11—Single Grounded-Wye Connected Capacitor Banks Rated 7.2 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
150	50	1	3200 3200 3150 3200 3050	3200 3200 3150 3200 3100	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 2950 3050 2900	3150 3200 3100 3200 3100	2250 2200 2100 2250 2050	3950 4000 3950 4000 3950	15N 20QR 15 Std. 12K 12T
300	50	2	3200 3000 2950 2950 2350	3200 3050 3000 3000 2350	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2850 2800 2800 2100	3150 3000 3000 3000 2450	2150 1950 1900 1850 690	3950 3900 3850 3900 3550	30N 30QR 25 Std. 25K 25T
	100	1	4050 4000 3950 4000 3600	4150 4050 4050 4050 3650	4000 4000 4000 4000 3800	10000 10000 10000 10000 10000	5000 5000 5000 5000 4800	5000 5000 5000 5000 5000	3800 3650 3600 3650 2800	5000 4950 4900 4950 4700	30N 30QR 25 Std. 25K 25T
450	50	3	2850 2700 1750 2400 470	2900 2750 1700 2450 540	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2700▲ 2500▲ 590▲ 2150▲ —	2900 2750 2050 2550 930	1550 1200 360 780 —	3800 3700 3250 3650 2400	50N 50QR 50 Std. 40K 40T
	150	1	4550 4400 4100 4400 3300	4650 4500 4200 4450 3450	8100 8050 7900 8050 7650	10000 10000 10000 10000 10000	4950▲ 4800▲ 4450▲ 4800▲ 3450▲	5150 5000 4700 4950 3750	6600 6600 6600 6600 6600	6000 5950 5750 5900 5300	50N 50QR 50 Std. 40K 40T
600	50	4	2550 2250 820 1700 —	2550 2250 720 1650 325	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2350▲ 2000▲ — 890▲ —	2650 2400 1300 2000 520	1050 560 — 365 —	3600 3550 2800 3250 480	65N 60QR 65 Std. 50K 50T
	100	2	3700 3550 2700 3300 770	3700 3600 2700 3300 870	3850 3750 3100 3550 1600	10000 10000 10000 10000 10000	4800 4800 4150▲ 4650▲ 2550▲	5000 5000 4400 4950 2500	3050 2650 265▲ 1100▲ —	4750 4700 4200 4600 3250	65N 60QR 65 Std. 50K 50T
	200	1	5050 5000 4500 4950 3650	5200 5100 4700 5050 3750	8050 8000 7800 7950 7350	10000 10000 10000 10000 10000	4750▲ 4700▲ 4100▲ 4600▲ 2150▲	5200 5150 4650 5050 3550	6600 6600 6600 6600 6600	6000 6000 6000 6000 5450	65N 60QR 65 Std. 50K 50T
750	50	5	2200 700 820 810 —	2200 680 720 720 —	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	1850▲ — — — —	2350 1200 1300 1300 270	460 — — — —	3500 2800 2800 2750 —	75N 75QR 65 Std. 65K 65T
900	50	6	— — — —	— — 355 —	‡ ‡ ‡ ‡	‡ ‡ ‡ ‡	— — — —	445 550 680 480	— — — —	— 1350 1700 —	95N 100QR 80 Std. 80K
	100	3	1300 1500 1600 1100 —	1200 1300 1500 1050 —	2050 2250 2350 1850 —	10000 10000 10000 10000 10000	3050▲ 3150▲ 3300▲ 2800▲ —	3100 3300 3550 2800 —	— — — — —	3400 3500 3600 3250 —	95N 100QR 80 Std. 80K 80T
	150	2	2600▲ 2750 2900 2450 —	2750▲ 2900 3050 2600▲ 340▲	7550 7600 7500 7500 5850	10000 10000 10000 10000 10000	2450▲ 2750▲ 2900▲ 2050▲ —	2850▲ 3000 3150 2550▲ —	6600▲ 6600▲ 6600▲ 6600▲ —	4950 5000 5100 4800 1050	95N 100QR 80 Std. 80K 80T
	300	1	4700▲ 4750▲ 4950▲ 4550▲ 1400▲	4750▲ 4800 4900 4600▲ 1450▲	7550 7600 7500 7500 5850	10000 10000 10000 10000 10000	6000▲ 6000▲ 6000▲ 6000▲ 6000▲	6000▲ 6000▲ 6000 6000▲ 6000▲	6600▲ 6600▲ 6600▲ 6600▲ 6600▲	6000 6000 6000 6000 4550	95N 100QR 80 Std. 80K 80T

TABLE CONTINUED ➔

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 11—Single Grounded-Wye Connected Capacitor Banks Rated 7.2 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemcol (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
1200	100	4	— — — — —	— — — — —	— — — — —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	2250 — — — —	100N 150QR 125 Std. 140K 140T
	200	2	2950▲ — — — —	2900▲ 750‡▲ — — —	7100 5800 5650 3700 —	10000 10000 10000 9350 3000	— — — — —	2400▲ 590‡▲ — — —	6600▲ 6600▲ 6600▲ 6600▲ —	4950 3000 2600 — —	100N 150QR 125 Std. 140K 140T
1350	150	3	— — — — —	— — — — —	5700 5800 5650 3700 —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	— 720 — — —	125N 150QR 125 Std. 140K 140T
1500	100	5	— — — — —	— — — — —	— — — — —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	— — — — —	125N 150QR 125 Std. 140K 140T
1800	100	6	— — — — —	— — — — —	— — — — —	10000 8400 10000 9350 3000	— — — — —	— — — — —	— — — — —	— — — — —	125N 200QR 125 Std. 140K 140T
	150	4	— — — — —	— — — — —	5700 920 5650 3700 —	10000 8400 10000 9350 3000	— — — — —	— — — — —	— — — — —	— — — — —	125N 200QR 125 Std. 140K 140T
	200	3	— — — — —	— — — — —	5700 920 5650 3700 —	10000 8400 10000 9350 3000	— — — — —	— — — — —	6600▲ — 6600▲ 6600▲ —	2800 — 2600 — —	125N 200QR 125 Std. 140K 140T
	300	2	— — — — —	1100▲ — 940▲ — —	5700 920 5650 3700▲ —	10000 8400 10000 9350▲ 3000▲	6000▲ — 6000▲ — —	6000▲ — 6000▲ — —	6600▲ 6600 6600▲ 6600 —	4200 — 4150 — —	125N 200QR 125 Std. 140K 140T
2250	150	5	—	—	—	7250	—	—	—	—	200 Std.
2400	200	4	—	—	—	7250	—	—	—	—	200 Std.
2700	300	3	—	—	—		—	—	6600▲	—	200K

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 12—Single Grounded-Wye Connected Capacitor Banks Rated 8.32 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
150	50	1	3200 3200 3200 3250 3050	3200 3250 3200 3250 3100	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 3050 3100 2900	3150 3200 3200 3200 3100	2250 2300 2250 2300 2050	3950 4000 4000 4050 3950	15N 15QR 10 Std. 10K 12T
300	50	2	3200 3100 2950 3100 2350	3200 3100 3000 3100 2350	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000▲ 2950 2800 2900 2100	3150 3100 3000 3100 2450	2200 2100 1900 2050 690	3950 4000 3850 3950 3550	25N 25QR 25 Std. 20K 25T
	100	1	4050 4050 3950 4050 3600	4150 4150 4050 4100 3650	4000 4000 4000 4000 3800	10000 10000 10000 10000 10000	5000 5000 5000 5000 4800	5000 5000 5000 5000 5000	3800 3800 3600 3750 2800	5000 5000 4900 5000 4700	25N 25QR 25 Std. 20K 25T
450	50	3	2950 2900 2450 2750 1600	3000 2950 2450 2800 1450	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2800▲ 2750 2200▲ 2600 —	3000 2950 2550 2850 1950	1850 1700 770 1450 330	3850 3850 3550 3750 3150	45N 40QR 40 Std. 30K 30T
	150	1	4650 4600 4300 4500 4000	4750 4700 4400 4600 4100	8150 8150 8000 8100 7900	10000 10000 10000 10000 10000	5050▲ 5000 4700▲ 4900 4250▲	5200 5200 4900 5100 4500	6600 6600 6600 6600 6600	6000 6000 5850 6000 5700	45N 40QR 40 Std. 30K 30T
600	50	4	2550 2250 1750 1700 —	2550 2250 1700 1650 325	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2350▲ 2000▲ 590▲ 890▲ —	2650 2400 2050 2000 520	1050 560 360 365 —	3600 3550 3250 3250 480	65N 60QR 50 Std. 50K 50T
	100	2	3700 3550 3300 3300 770	3700 3600 3350 3300 870	3850 3750 3550 3550 1600	10000 10000 10000 10000 10000	4800▲ 4800▲ 4550▲ 4650▲ 2550▲	5000 5000 4850 4950 2500	3050 2650 1000 1100 —	4750 4700 4500 4600 3250	65N 60QR 50 Std. 50K 50T
	200	1	5050 5000 4900 4950 3650	5200 5100 5000 5050 3750	8050 8000 7900 7950 7350	10000 10000 10000 10000 10000	4750▲ 4700▲ 4550▲ 4600▲ 2150▲	5200 5150 5000 5050 3550	6600 6600 6600 6600 6600	6000 6000 6000 6000 5450	65N 60QR 50 Std. 50K 50T
750	50	5	2200 700 820 810 —	2200 680 720 720 —	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	1850▲ — — — —	2350 1200 1300 1300 270	460 — — — —	3500 2800 2800 2750 —	75N 75QR 65 Std. 65K 65T
900	50	6	810 — — 810 —	730 — 355 720 —	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	— — — — —	1300 550 680 1300 270	— — — — —	2850 1350 1700 2750 —	85N 100QR 80 Std. 65K 65T
	100	3	2800 1500 1600 2700 —	2750 1300 1500 2700 430	3100 2250 2350 3050 405	10000 10000 10000 10000 10000	4300▲ 3150▲ 3300▲ 4150▲ —	4550 3300 3550 4400 455	265▲ — — — —	4250 3500 3600 4200 1300	85N 100QR 80 Std. 65K 65T
	150	2	3750 2750▲ 2900 3650 465	3950 2900 3050 3750 740	7850 7600 7500 7800 6750	10000 10000 10000 10000 10000	4050▲ 2750▲ 2900▲ 3950▲ —	4300 3000 3150 4200 750	6600▲ 6600▲ 6600▲ 6600▲ 305▲	5600 5000 5100 5550 3650	85N 100QR 80 Std. 65K 65T
	300	1	5400 4750 4950 5300 3400	5450 4800 4900 5400 3350	7850 7600 7500 7800 6750	10000 10000 10000 10000 10000	6000▲ 6000▲ 6000▲ 6000▲ 6000▲	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	85N 100QR 80 Std. 65K 65T

TABLE CONTINUED ➔

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 12—Single Grounded-Wye Connected Capacitor Banks Rated 8.32 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemcol (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
1200	100	4	— — — — —	— — — — —	— — — — —	10000 10000 10000 10000 10000	— — — — —	— — — — —	— — — — —	2250 — 2000 2150 —	100N 125QR 100 Std. 100K 100T
	200	2	2950▲ 2100▲ 2650 2700▲ —	2900▲ 1900▲ 2650▲ 2650▲ —	7100 6700 7000 7000 3900	10000 10000 10000 10000 10000	— — — — —	2400▲ 1350▲ 2000▲ 2200▲ —	6600▲ 6600▲ 6600▲ 6600▲ 6600▲	4950 4500 4800 4750 710	100N 125QR 100 Std. 100K 100T
1350	150	3	— — — — —	900▲ 560▲ — — —	7100 6700 5650 3700 —	10000 10000 10000 9350 3000	— — — — —	1000▲ 480▲ — — —	6500▲ — — — —	4150 3550 — — —	100N 125QR 125 Std. 140K 140T
1500	100	5	— — — — —	— — — — —	— — — — —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	— — — — —	125N 150QR 125 Std. 140K 140T
1800	100	6	— — — — —	— — — — —	— — — — —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	— — — — —	125N 150QR 125 Std. 140K 140T
	150	4	— — — — —	— — — — —	5700 5800 5650 3700 —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	— 720 — — —	125N 150QR 125 Std. 140K 140T
	200	3	— — — — —	— 750▲ — — —	5700 5800 5650 3700 —	10000 10000 10000 9350 3000	— — — — —	— 590▲ — — —	6600▲ 6600▲ 6600▲ 6600▲ —	2800 3000 2600 — —	125N 150QR 125 Std. 140K 140T
	300	2	— 1250▲ — — —	1100▲ 1400 940▲ — —	5700 5800 5650 3700▲ —	10000 10000 10000 9350▲ 3000▲	6000▲ 6000▲ 6000▲ — —	6000▲ 6000 6000▲ — —	6600▲ 6600 6600▲ 6600▲ —	4200 4450 4150 — —	125N 150QR 125 Std. 140K 140T
2250	150	5	— — — — —	— — — — —	3700 3700 3700 — —	9250 9250 9350 3000 —	— — — — —	— — — — —	— — — — —	— — — — —	150N 150 Std. 140K 140T
2400	200	4	— —	— —	— —	9250 9250	— —	— —	6600▲ 6600▲	— —	150N 150 Std.
2700	150	6	—	—	—	7250	—	—	—	—	200 Std.
	300	3	— —	— —	— —	7250▲ —	— —	— —	6600▲ 6600▲	— —	200 Std. 200K
3000	200	5	—	—	—	7250	—	—	—	—	200 Std.

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 13—Single Grounded-Wye Connected Capacitor Banks Rated 12.47 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemcol (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
150	50	1	3200 3200 3200 3250 3200	3200 3250 3250 3250 3200	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 3050 3100 3050	3150 3200 3200 3200 3200	2250 2300 2300 2300 2250	3950 4000 4000 4050 4000	10N 10QR 7 Std. 6K 8T
300	50	2	3200 3200 3150 3200 2950	3200 3200 3150 3200 2950	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 2950 3050 2750	3150 3200 3100 3200 2950	2250 2200 2100 2250 1850	3950 4000 3950 4000 3850	20N 20QR 15 Std. 12K 15T
	100	1	4050 4100 4050 4100 3950	4150 4150 4150 4150 4050	2950 3000 2900 3000 2800	10000 10000 10000 10000 10000	5000 5000 5000 5000 5000	5000 5000 5000 5000 5000	3800 3900 3800 3850 3600	5000 5000 5000 5000 4950	20N 20QR 15 Std. 12K 15T
450	50	3	3200 3100 2950 3100 2350	3200 3100 3000 3100 2350	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2950 2800 2900 2100	3150 3100 3000 3100 2450	2200 2100 1900 2050 690	3950 4000 3850 3950 3550	25N 25QR 25 Std. 20K 25T
	150	1	4700 4750 4600 4700 4300	4800 4800 4700 4800 4400	6000 6050 5950 6050 5800	10000 10000 10000 10000 10000	5150 5200 5050 5200 4700	5250 5250 5200 5250 4900	6600 6600 6600 6600 6600	6000 6000 6000 6000 5850	25N 25QR 25 Std. 20K 25T
600	50	4	3200 2900 2850 2950 1600	3200 2950 2850 3000 1450	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2750 2650 2800 —	3150 2950 2900 3000 1950	2150 1700 1550 1850 330	3950 3850 3800 3900 3150	30N 40QR 30 Std. 25K 30T
	100	2	4050 3950 3900 4000 3150	4150 4000 3900 4050 3100	2950 2750 2700 2800 1750	10000 10000 10000 10000 10000	5000 5000 4950 5000 4450	5000 5000 5000 5000 4750	3800 3550 3450 3650 630	5000 4900 4850 4950 4400	30N 40QR 30 Std. 25K 30T
	200	1	5300 5250 5150 5300 4800	5350 5350 5300 5350 4900	6000 5950 5900 6000 5650	10000 10000 10000 10000 10000	5100 5050 4950 5100 4400▲	5450 5400 5300 5450 4850	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	30N 40QR 30 Std. 25K 30T
750	50	5	2950 2700 2450 2400 470	3000 2750 2450 2450 540	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2800 2500 2200 2150 —	3000 2750 2550 2550 930	1850 1200 770 780 —	3850 3700 3550 3650 2400	45N 50QR 40 Std. 40K 40T
900	50	6	2550 2250 1750 1700 —	2550 2250 1700 1650 325	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2350 2000 590 890 —	2650 2400 2050 2000 520	1050 560 360 365 —	3600 3550 3250 3250 480	65N 60QR 50 Std. 50K 50T
	100	3	3700 3550 3300 3300 770	3700 3600 3350 3300 870	2500 2250 1850 1850 310	10000 10000 10000 10000 10000	4800 4800 4550 4650▲ 2550▲	5000 5000 4850 4950 2500	3050 2650 1000 1100▲ —	4750 4700 4500 4600 3250	65N 60QR 50 Std. 50K 50T
	150	2	4350 4300 4100 4100 2250	4450 4400 4200 4250 2300	5850 5800 5700 5750 4950	10000 10000 10000 10000 10000	4750▲ 4700▲ 4450▲ 4550▲ 600▲	4950 4900 4700 4750 2250	6600 6600 6600 6600 6600▲	5900 5850 5750 5800 4750	65N 60QR 50 Std. 50K 50T
	300	1	5700 5650 5500 5600 4500	5800 5750 5600 5700 4550	5850 5800 5700 5750 4950	10000 10000 10000 10000 10000	6000 6000 6000 6000 6000▲	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	65N 60QR 50 Std. 50K 50T
1200	100	4	3550 2750 2700 2700 —	3600 2700 2700 2700 430	2200 910 1100 1100 130	10000 10000 10000 10000 10000	4800 4150 4150▲ 4150▲ —	5000 4400 4400 4400 455	2600 365 265▲ — —	4700 4200 4200 4200 1300	75N 75QR 65 Std. 65K 65T
	200	2	5000 4500 4500 4550 2300	5100 4650 4700 4700 2200	5800 5500 5550 5550 4050	10000 10000 10000 10000 10000	4700▲ 4150▲ 4100▲ 4150▲ —	5100 4650 4650 4700 1450	6600 6600 6600 6600 6600	6000 6000 6000 6000 4550	75N 75QR 65 Std. 65K 65T

TABLE CONTINUED ➔

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 13—Single Grounded-Wye Connected Capacitor Banks Rated 12.47 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
1350	150	3	3750 2750 2900 3650 465	3950 2900 3050 3750 740	5650 5150 5200 5550 4050	10000 10000 10000 10000 10000	4050▲ 2750▲ 2900▲ 3950▲ —	4300 3000 3150 4200 750	6600▲ 6600▲ 6600▲ 6600▲ 305▲	5600 5000 5100 5550 3650	85N 100QR 80 Std. 65K 65T
1500	100	5	2800 1500 1600 1100 —	2750 1300 1500 1050 —	1100 — 330 — —	10000 10000 10000 10000 10000	4300▲ 3150▲ 3300▲ 2800▲ —	4550 3300 3550 2800 —	265▲ — — — —	4250 3500 3600 3250 —	85N 100QR 80 Std. 80K 80T
1800	100	6	— — — — —	— — — — —	— — — — —	10000 10000 10000 10000 10000	— — — — —	— — — — —	— — — — —	2250 — 2000 2150 —	100N 125QR 100 Std. 100K 100T
	150	4	— — — — —	900 560 890 920 —	4450 3950 4300 4250 630	10000 10000 10000 10000 10000	— — — — —	1000 480 910 1000 —	6500▲ — — — —	4150 3550 3900 3900 —	100N 125QR 100 Std. 100K 100T
	200	3	2950▲ 2100▲ 2650 2700▲ —	2900▲ 1900 2650 2650 —	4450 3950 4300 4250 630	10000 10000 10000 10000 10000	— — — — —	2400▲ 1350 2000 2200 —	6600▲ 6600▲ 6600▲ 6600▲ 6600▲	4950 4500 4800 4750 710	100N 125QR 100 Std. 100K 100T
	300	2	3900▲ 3300 3750 3700 —	3900 3250 3700 3650 710	4450 3950 4300 4250 630	10000 10000 10000 10000 10000	6000▲ 6000▲ 6000▲ 6000▲ —	6000▲ 6000 6000 6000 1750▲	6600▲ 6600 6600 6600 6600▲	6000 5950 6000 6000 1500	100N 125QR 100 Std. 100K 100T
2250	150	5	— — — — —	— — — — —	810 1250 610 — —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	— 720 — — —	125N 150QR 125 Std. 140K 140T
2400	200	4	— — — — —	— 750▲ — — —	810 1250 610 — —	10000 10000 10000 9350 3000	— — — — —	— 590▲ — — —	6600▲ 6600▲ 6600▲ 6600▲ —	2800 3000 2600 — —	125N 150QR 125 Std. 140K 140T
2700	150	6	— — — — —	— — — — —	810 1250 610 — —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	— 720 — — —	125N 150QR 125 Std. 140K 140T
	300	3	— 1250 — — —	1100▲ 1400 940▲ — —	810 1250 610 — —	10000 10000 10000 9350 3000	6000▲ 6000▲ 6000▲ — —	6000▲ 6000 6000▲ — —	6600▲ 6600 6600▲ 6600▲ —	4200 4450 4150 — —	125N 150QR 125 Std. 140K 140T
3000	200	5	— — — — —	— — — — —	810 — 610 — —	10000 8400 10000 9350 3000	— — — — —	— — — — —	6600▲ — 6600▲ 6600▲ —	2800 — 2600 — —	125N 200QR 125 Std. 140K 140T
3600	200	6	— —	— —	— —	9250 9250	— —	— —	6600▲ 6600▲	— —	150N 150 Std.
	300	4	— — —	— — —	— — —	9250 9250 —	— — —	— — —	6600▲ 6600▲ 6600▲	— — —	150N 150 Std. 200K

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 14—Single Grounded-Wye Connected Capacitor Banks Rated 13.2 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol i (Paper-Film)	Selectrol ii (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
150	50	1	3200 3200 3200 3250 3200	3200 3250 3250 3250 3200	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 3050 3100 3050	3150 3200 3200 3200 3200	2250 2300 2300 2300 2250	3950 4000 4000 4050 4000	10N 10QR 7 Std. 6K 8T
300	50	2	3200 3200 3150 3200 2950	3200 3200 3150 3200 2950	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 2950 3050 2750	3150 3200 3100 3200 2950	2250 2200 2100 2250 1850	3950 4000 3950 4000 3850	20N 20QR 15 Std. 12K 15T
	100	1	4050 4100 4050 4100 3950	4150 4150 4150 4150 4050	2950 3000 2900 3000 2800	10000 10000 10000 10000 10000	5000 5000 5000 5000 5000	5000 5000 5000 5000 5000	3800 3900 3800 3850 3600	5000 5000 5000 5000 4950	20N 20QR 15 Std. 12K 15T
450	50	3	3200 3100 3050 3100 2750	3200 3100 3050 3100 2800	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2950 2850 2900 2600	3150 3100 3100 3100 2800	2250 2100 2000 2050 1400	3950 4000 3900 3950 3750	20N 25QR 20 Std. 20K 20T
	150	1	4700 4750 4650 4700 4500	4800 4800 4800 4800 4600	6000 6050 6000 6050 5900	10000 10000 10000 10000 10000	5150 5200 5100 5200 4900	5250 5250 5250 5250 5100	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	20N 25QR 20 Std. 20K 20T
600	50	4	3200 2900 2850 2950 2350	3200 2950 2850 3000 2350	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2750 2650 2800 2100	3150 2950 2900 3000 2450	2150 1700 1550 1850 690	3950 3850 3800 3900 3550	30N 40QR 30 Std. 25K 25T
	100	2	4050 3950 3900 4000 3600	4150 4000 3900 4050 3650	2950 2750 2700 2800 2300	10000 10000 10000 10000 10000	5000 5000 4950 5000 4800	5000 5000 5000 5000 5000	3800 3550 3450 3650 2800	5000 4900 4850 4950 4700	30N 40QR 30 Std. 25K 25T
	200	1	5300 5250 5150 5300 5000	5350 5350 5300 5350 5100	6000 5950 5900 6000 5800	10000 10000 10000 10000 10000	5100 5050 4950 5100 4750	5450 5400 5300 5450 5150	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	30N 40QR 30 Std. 25K 25T
750	50	5	2950 2700 2450 2400 470	3000 2750 2450 2450 540	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2800▲ 2500▲ 2200▲ 2150▲ —	3000 2750 2550 2550 930	1850 1200 770 780 —	3850 3700 3550 3650 2400	45N 50QR 40 Std. 40K 40T
900	50	6	2850 2700 1750 1700 470	2900 2750 1700 1650 540	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2700▲ 2500▲ 590▲ 890▲ —	2900 2750 2050 2000 930	1550 1200 360 365 —	3800 3700 3250 3250 2400	50N 50QR 50 Std. 50K 40T
	100	3	3900 3800 3300 3300 2300	3950 3800 3350 3300 2150	2700 2600 1850 1850 610	10000 10000 10000 10000 10000	5000 4850 4550▲ 4650▲ 3800	5000 5000 4850 4950 4100	3500 3250 1000▲ 1100▲ 265	4900 4800 4500 4600 3950	50N 50QR 50 Std. 50K 40T
	150	2	4550 4400 4100 4100 3300	4650 4500 4200 4250 3450	5950 5850 5700 5750 5400	10000 10000 10000 10000 10000	4950 4800 4450 4550▲ 3450	5150 5000 4700 4750 3750	6600 6600 6600 6600 6600	6000 5950 5750 5800 5300	50N 50QR 50 Std. 50K 40T
	300	1	5850 5750 5500 5600 5100	5950 5850 5600 5700 5150	5950 5850 5700 5750 5400	10000 10000 10000 10000 10000	6000 6000 6000 6000 6000	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	50N 50QR 50 Std. 50K 40T
1200	100	4	3550 2750 2700 2700 —	3600 2700 2700 2700 430	2200 910 1100 1100 130	10000 10000 10000 10000 10000	4800▲ 4150▲ 4150▲ 4150▲ —	5000 4400 4400 4400 455	2600▲ 365 265▲ — —	4700 4200 4200 4200 1300	75N 75QR 65 Std. 65K 65T
	200	2	5000 4500 4500 4550 2300	5100 4650 4700 4700 2200	5800 5500 5550 5550 4050	10000 10000 10000 10000 10000	4700▲ 4150▲ 4100▲ 4150▲ —	5100 4650 4650 4700 1450	6600 6600 6600 6600 6600	6000 6000 6000 6000 4550	75N 75QR 65 Std. 65K 65T

TABLE CONTINUED ➡

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 14—Single Grounded-Wye Connected Capacitor Banks Rated 13.2 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
1350	150	3	4300 3700 3650 3650 465	4400 3850 3800 3750 740	5800 5500 5550 5550 4050	10000 10000 10000 10000 10000	4700 3950 3950▲ 3950▲ —	4900 4200 4200 4200 750	6600 6600 6600 6600 305▲	5850 5450 5500 5550 3650	75N 75QR 65 Std. 65K 65T
1500	100	5	2800 1500 1600 1100 —	2750 1300 1500 1050 430	1100 — 330 — 130	10000 10000 10000 10000 10000	4300▲ 3150▲ 3300▲ 2800▲ —	4550 3300 3550 2800 455	265▲ — — — —	4250 3500 3600 3250 1300	85N 100QR 80 Std. 80K 65T
1800	100	6	1300 1500 — 1100 —	1200 1300 — 1050 —	— — — — —	10000 10000 10000 10000 10000	3050▲ 3150▲ — 2800▲ —	3100 3300 — 2800 —	— — — — —	3400 3500 2000 3250 —	95N 100QR 100 Std. 80K 80T
	150	4	2600 2750 — 2450 —	2750 2900 890▲ 2600 340	5100 5150 4300 5000 1550	10000 10000 10000 10000 10000	2450▲ 2750▲ — 2050▲ —	2850 3000 910▲ 2550 —	6600▲ 6600▲ — 6600▲ —	4950 5000 3900 4800 1050	95N 100QR 100 Std. 80K 80T
	200	3	3800 3850 2650▲ 3700 —	3950 4000 2650 3800 870	5100 5150 4300 5000 1550	10000 10000 10000 10000 10000	2950▲ 3150▲ — 2650▲ —	3800 3900 2000 3650 710	6600 6600 6600▲ 6600 6600	5600 5650 4800 5500 2950	95N 100QR 100 Std. 80K 80T
	300	2	4700 4750 3750 4550 1400	4750 4800 3700 4600 1450	5100 5150 4300 5000 1550	10000 10000 10000 10000 10000	6000▲ 6000▲ 6000▲ 6000▲ 6000▲	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 4550	95N 100QR 100 Std. 80K 80T
2250	150	5	— — — — —	900▲ — — — —	4450 1250 610 — —	10000 10000 10000 9350 3000	— — — — —	1000▲ — — — —	6500▲ — — — —	4150 720 — — —	100N 150QR 125 Std. 140K 140T
2400	200	4	— — — — —	— 750▲ — — —	810 1250 610 — —	10000 10000 10000 9350 3000	— — — — —	— 590▲ — — —	6600▲ 6600▲ 6600▲ 6600▲ —	2800 3000 2600 — —	125N 150QR 125 Std. 140K 140T
2700	150	6	— — — — —	— — — — —	810 1250 610 — —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	— 720 — — —	125N 150QR 125 Std. 140K 140T
	300	3	— 1250▲ — — —	1100▲ 1400 940▲ — —	810 1250 610 — —	10000 10000 10000 9350▲ 3000▲	6000▲ 6000▲ 6000▲ — —	6000▲ 6000 6000▲ — —	6600▲ 6600▲ 6600▲ 6600▲ —	4200 4450 4150 — —	125N 150QR 125 Std. 140K 140T
3000	200	5	— — — — —	— — — — —	810 570 610 — —	10000 9400 10000 9350 3000	— — — — —	— — — — —	6600▲ 6600▲ 6600▲ 6600▲ —	2800 540 2600 — —	125N 175QR 125 Std. 140K 140T
3600	200	6	— — — — —	— — — — —	— — — — —	9250 9250 9350 3000	— — — — —	— — — — —	6600▲ 6600▲ 6600▲ — —	— — — — —	150N 150 Std. 140K 140T
	300	4	— — — — —	— — — — —	— — — — —	9250 9250 9350 3000	— — — — —	— — — — —	6600▲ 6600▲ 6600▲ — —	— — — — —	150N 150 Std. 140K 140T

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 15—Single Grounded-Wye Connected Capacitor Banks Rated 13.8 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemcol (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
150	50	1	3200	3200	‡	‡	3000	3150	2250	3950	10N
			3200	3250	‡	‡	3050	3200	2300	4000	10QR
			3200	3250	‡	‡	3050	3200	2300	4000	7 Std.
			3250	3250	‡	‡	3100	3200	2300	4050	6K
			3200	3200	‡	‡	3050	3200	2250	4000	8T
300	50	2	3200	3200	‡	‡	3000	3150	2250	3950	15N
			3200	3200	‡	‡	3050	3200	2200	4000	20QR
			3150	3150	‡	‡	2950	3100	2100	3950	15 Std.
			3200	3200	‡	‡	3050	3200	2250	4000	12K
			2950	2950	‡	‡	2750	2950	1850	3850	15T
	100	1	4050	4150	2950	10000	5000	5000	3800	5000	15N
			4100	4150	3000	10000	5000	5000	3900	5000	20QR
			4050	4150	2900	10000	5000	5000	3800	5000	15 Std.
			4100	4150	3000	10000	5000	5000	3850	5000	12K
			3950	4050	2800	10000	5000	5000	3600	4950	15T
450	50	3	3200	3200	‡	‡	3000	3150	2250	3950	20N
			3100	3100	‡	‡	2950	3100	2100	4000	25QR
			3050	3050	‡	‡	2850	3100	2000	3900	20 Std.
			3100	3100	‡	‡	2900	3100	2050	3950	20K
			2750	2800	‡	‡	2600	2800	1400	3750	20T
	150	1	4700	4800	6000	10000	5150	5250	6600	6000	20N
			4750	4800	6050	10000	5200	5250	6600	6000	25QR
			4650	4800	6000	10000	5100	5250	6600	6000	20 Std.
			4700	4800	6050	10000	5200	5250	6600	6000	20K
			4500	4600	5900	10000	4900	5100	6600	6000	20T
600	50	4	3200	3200	‡	‡	3000	3150	2150	3950	30N
			2900	2950	‡	‡	2750	2950	1700	3850	40QR
			2950	3000	‡	‡	2800	3000	1900	3850	25 Std.
			2950	3000	‡	‡	2800	3000	1850	3900	25K
			2350	2350	‡	‡	2100	2450	690	3550	25T
	100	2	4050	4150	2950	10000	5000	5000	3800	5000	30N
			3950	4000	2750	10000	5000	5000	3550	4900	40QR
			3950	4050	2800	10000	5000	5000	3600	4900	25 Std.
			4000	4050	2800	10000	5000	5000	3650	4950	25K
			3600	3650	2300	10000	4800	5000	2800	4700	25T
	200	1	5300	5350	6000	10000	5100	5450	6600	6000	30N
			5250	5350	5950	10000	5050	5400	6600	6000	40QR
			5250	5350	5950	10000	5050	5400	6600	6000	25 Std.
			5300	5350	6000	10000	5100	5450	6600	6000	25K
			5000	5100	5800	10000	4750	5150	6600	6000	25T
750	50	5	2950	3000	‡	‡	2800▲	3000	1850	3850	45N
			2900	2950	‡	‡	2750	2950	1700	3850	40QR
			2450	2450	‡	‡	2200▲	2550	770	3550	40 Std.
			2750	2800	‡	‡	2600	2850	1450	3750	30K
			1600	1450	‡	‡	—	1950	330	3150	30T
900	50	6	2850	2900	‡	‡	2700▲	2900	1550	3800	50N
			2700	2750	‡	‡	2500▲	2750	1200	3700	50QR
			1750	1700	‡	‡	590▲	2050	360	3250	50 Std.
			2400	2450	‡	‡	2150▲	2550	780	3650	40K
			470	540	‡	‡	—	930	—	2400	40T
	100	3	3900	3950	2700	10000	5000	5000	3500	4900	50N
			3800	3800	2600	10000	4850	5000	3250	4800	50QR
			3300	3350	1850	10000	4550▲	4850	1000	4500	50 Std.
			3700	3750	2350	10000	4850	5000	2950	4750	40K
			2300	2150	610	10000	3800	4100	265	3950	40T
	150	2	4550	4650	5950	10000	4950	5150	6600	6000	50N
			4400	4500	5850	10000	4800	5000	6600	5950	50QR
			4100	4200	5700	10000	4450▲	4700	6600	5750	50 Std.
			4400	4450	5850	10000	4800	4950	6600	5900	40K
			3300	3450	5400	10000	3450	3750	6600	5300	40T
	300	1	5850	5950	5950	10000	6000	6000	6600	6000	50N
			5750	5850	5850	10000	6000	6000	6600	6000	50QR
			5500	5600	5700	10000	6000	6000	6600	6000	50 Std.
			5700	5800	5850	10000	6000	6000	6600	6000	40K
			5100	5150	5400	10000	6000	6000	6600	6000	40T
1200	100	4	3700	3700	2500	10000	4800	5000	3050	4750	65N
			3550	3600	2250	10000	4800	5000	2650	4700	60QR
			2700	2700	1100	10000	4150▲	4400	265▲	4200	65 Std.
			3300	3300	1850	10000	4650	4950	1100	4600	50K
			—	430	130	10000	—	455	—	1300	65T
	200	2	5050	5200	5850	10000	4750▲	5200	6600	6000	65N
			5000	5100	5800	10000	4700▲	5150	6600	6000	60QR
			4500	4700	5550	10000	4100▲	4650	6600	6000	65 Std.
			4950	5050	5750	10000	4600▲	5050	6600	6000	50K
			2300	2200	4050	10000	—	1450	6600	4550	65T

TABLE CONTINUED ➔

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 15—Single Grounded-Wye Connected Capacitor Banks Rated 13.8 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
1350	150	3	4300 3700 3650 3650 465	4400 3850 3800 3750 740	5800 5500 5550 5550 4050	10000 10000 10000 10000 10000	4700 3950 3950▲ 3950▲ —	4900 4200 4200 4200 750	6600 6600 6600 6600 305	5850 5450 5500 5550 3650	75N 75QR 65 Std. 65K 65T
1500	100	5	2800 1500 1600 2700 —	2750 1300 1500 2700 430	1100 — 330 1100 130	10000 10000 10000 10000 10000	4300▲ 3150▲ 3300▲ 4150▲ —	4550 3300 3550 4400 455	265▲ — — — —	4250 3500 3600 4200 1300	85N 100QR 80 Std. 65K 65T
1800	100	6	1300 1500 1600 1100 —	1200 1300 1500 1050 —	— — 330 — —	10000 10000 10000 10000 10000	3050▲ 3150▲ 3300▲ 2800▲ —	3100 3300 3550 2800 —	— — — — —	3400 3500 3600 3250 —	95N 100QR 80 Std. 80K 80T
	150	4	2600▲ 2750 2900 2450 —	2750 2900 3050 2600 340	5100 5150 5200 5000 1550	10000 10000 10000 10000 10000	2450▲ 2750▲ 2900▲ 2050▲ —	2850 3000 3150 2550 —	6600▲ 6600▲ 6600 6600▲ —	4950 5000 5100 4800 1050	95N 100QR 80 Std. 80K 80T
	200	3	3800 3850 3950 3700 —	3950 4000 4150 3800 870	5100 5150 5200 5000 1550	10000 10000 10000 10000 10000	2950▲ 3150▲ 3300▲ 2650▲ —	3800 3900 4000 3650 710	6600▲ 6600 6600 6600 6600	5600 5650 5700 5500 2950	95N 100QR 80 Std. 80K 80T
	300	2	4700 4750 4950 4550 1400	4750 4800 4900 4600 1450	5100 5150 5200 5000 1550	10000 10000 10000 10000 10000	6000▲ 6000▲ 6000 6000▲ 6000▲	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 4550	95N 100QR 80 Std. 80K 80T
2250	150	5	— — — — —	900▲ 560 — — —	4450 3950 610 — —	10000 10000 10000 9350 3000	— — — — —	1000▲ 480 — — —	6500▲ — — — —	4150 3550 — — —	100N 125QR 125 Std. 140K 140T
2400	200	4	— — — — —	— 750▲ — — —	810 1250 610 — —	10000 10000 10000 9350 3000	— — — — —	— 590▲ — — —	6600▲ 6600▲ 6600▲ 6600▲ —	2800 3000 2600 — —	125N 150QR 125 Std. 140K 140T
2700	150	6	— — — — —	— — — — —	810 1250 610 — —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	— 720 — — —	125N 150QR 125 Std. 140K 140T
	300	3	— 1250▲ — — —	1100▲ 1400 940▲ — —	810 1250 610 — —	10000 10000 10000 9350▲ 3000▲	6000▲ 6000▲ 6000▲ — —	6000▲ 6000▲ 6000▲ — —	6600▲ 6600▲ 6600▲ 6600▲ —	4200 4450 4150 — —	125N 150QR 125 Std. 140K 140T
3000	200	5	— — — — —	— 750 — — —	810 1250 610 — —	10000 10000 10000 9350 3000	— — — — —	— 590 — — —	6600▲ 6600▲ 6600▲ 6600▲ —	2800 3000 2600 — —	125N 150QR 125 Std. 140K 140T
3600	200	6	— — — — —	— — — — —	— — — — —	9250 8400 9250 9350 3000	— — — — —	— — — — —	6600▲ — 6600▲ 6600▲ —	— — — — —	150N 200QR 150 Std. 140K 140T
	300	4	— — — — —	— — — — —	— — — — —	9250 8400 9250 9350 3000	— — — — —	— — — — —	6600▲ 6600▲ 6600▲ 3600▲ —	— — — — —	150N 200QR 150 Std. 140K 140T

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 16—Single Grounded-Wye Connected Capacitor Banks Rated 14.4 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
150	50	1	3200	3200	‡	‡	3000	3150	2250	4000	8N
			3200	3250	‡	‡	3050	3200	2300	4000	10QR
			3200	3250	‡	‡	3050	3200	2300	4000	7 Std.
			3250	3250	‡	‡	3100	3200	2300	4050	6K
			3200	3200	‡	‡	3050	3200	2250	4000	8T
300	50	2	3200	3200	‡	‡	3000	3150	2250	3950	15N
			3200	3200	‡	‡	3050	3200	2200	4000	20QR
			3150	3150	‡	‡	2950	3100	2100	3950	15 Std.
			3200	3200	‡	‡	3050	3200	2250	4000	12K
			3050	3100	‡	‡	2900	3100	2050	3950	12T
	100	1	4050	4150	2950	10000	5000	5000	3800	5000	15N
			4100	4150	3000	10000	5000	5000	3900	5000	20QR
			4050	4150	2900	10000	5000	5000	3800	5000	15 Std.
			4100	4150	3000	10000	5000	5000	3850	5000	12K
			4050	4100	2900	10000	5000	5000	3750	5000	12T
450	50	3	3200	3200	‡	‡	3000	3150	2250	3950	20N
			3100	3100	‡	‡	2950	3100	2100	4000	25QR
			3050	3050	‡	‡	2850	3100	2000	3900	20 Std.
			3100	3100	‡	‡	2900	3100	2050	3950	20K
			2750	2800	‡	‡	2600	2800	1400	3750	20T
	150	1	4700	4800	6000	10000	5150	5250	6600	6000	20N
			4750	4800	6050	10000	5200	5250	6600	6000	25QR
			4650	4800	6000	10000	5100	5250	6600	6000	20 Std.
			4700	4800	6050	10000	5200	5250	6600	6000	20K
			4500	4600	5900	10000	4900	5100	6600	6000	20T
600	50	4	3200	3200	‡	‡	3000	3150	2150	3950	30N
			3000	3050	‡	‡	2850	3000	1950	3900	30QR
			2950	3000	‡	‡	2800	3000	1900	3850	25 Std.
			2950	3000	‡	‡	2800	3000	1850	3900	25K
			2350	2350	‡	‡	2100	2450	690	3550	25T
	100	2	4050	4150	2950	10000	5000	5000	3800	5000	30N
			4000	4050	2850	10000	5000	5000	3650	4950	30QR
			3950	4050	2800	10000	5000	5000	3600	4900	25 Std.
			4000	4050	2800	10000	5000	5000	3650	4950	25K
			3600	3650	2300	10000	4800	5000	2800	4700	25T
	200	1	5300	5350	6000	10000	5100	5450	6600	6000	30N
			5300	5350	6000	10000	5100	5450	6600	6000	30QR
			5250	5350	5950	10000	5050	5400	6600	6000	25 Std.
			5300	5350	6000	10000	5100	5450	6600	6000	25K
			5000	5100	5800	10000	4750	5150	6600	6000	25T
750	50	5	3150	3150	‡	‡	2950	3150	2100	3950	40N
			2900	2950	‡	‡	2750	2950	1700	3850	40QR
			2850	2850	‡	‡	2650	2900	1550	3800	30 Std.
			2750	2800	‡	‡	2600	2850	1450	3750	30K
			1600	1450	‡	‡	—	1950	330	3150	30T
900	50	6	2850	2900	‡	‡	2700	2900	1550	3800	50N
			2700	2750	‡	‡	2500	2750	1200	3700	50QR
			1750	1700	‡	‡	590	2050	360	3250	50 Std.
			2400	2450	‡	‡	2150	2550	780	3650	40K
			470	540	‡	‡	—	930	—	2400	40T
	100	3	3900	3950	2700	10000	5000	5000	3500	4900	50N
			3800	3800	2600	10000	4850	5000	3250	4800	50QR
			3300	3350	1850	10000	4550	4850	1000	4500	50 Std.
			3700	3750	2350	10000	4850	5000	2950	4750	40K
			2300	2150	610	10000	3800	4100	265	3950	40T
	150	2	4550	4650	5950	10000	4950	5150	6600	6000	50N
			4400	4500	5850	10000	4800	5000	6600	5950	50QR
			4100	4200	5700	10000	4450▲	4700	6600	5750	50 Std.
			4400	4450	5850	10000	4800	4950	6600	5900	40K
			3300	3450	5400	10000	3450	3750	6600	5300	40T
	300	1	5850	5950	5950	10000	6000	6000	6600	6000	50N
			5750	5850	5850	10000	6000	6000	6600	6000	50QR
			5500	5600	5700	10000	6000	6000	6600	6000	50 Std.
			5700	5800	5850	10000	6000	6000	6600	6000	40K
			5100	5150	5400	10000	6000	6000	6600	6000	40T
1200	100	4	3700	3700	2500	10000	4800	5000	3050	4750	65N
			3550	3600	2250	10000	4800	5000	2650	4700	60QR
			2700	2700	1100	10000	4150▲	4400	265▲	4200	65 Std.
			3300	3300	1850	10000	4650	4950	1100	4600	50K
			770	870	310	10000	2550	2500	—	3250	50T
	200	2	5050	5200	5850	10000	4750	5200	6600	6000	65N
			5000	5100	5800	10000	4700	5150	6600	6000	60QR
			4500	4700	5550	10000	4100▲	4650	6600	6000	65 Std.
			4950	5050	5750	10000	4600▲	5050	6600	6000	50K
			3650	3750	4950	10000	2150▲	3550	6600	5450	50T

TABLE CONTINUED ➔

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 16—Single Grounded-Wye Connected Capacitor Banks Rated 14.4 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemcol (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
1350	150	3	4300 3700 3650 3650 465	4400 3850 3800 3750 740	5800 5500 5550 5550 4050	10000 10000 10000 10000 10000	4700▲ 3950 3950▲ 3950▲ —	4900 4200 4200 4200 750	6600 6600 6600 6600 305▲	5850 5450 5500 5550 3650	75N 75QR 65 Std. 65K 65T
1500	100	5	3550 2750 2700 2700 —	3600 2700 2700 2700 430	2200 910 1100 1100 130	10000 10000 10000 10000 10000	4800 4150 4150▲ 4150▲ —	5000 4400 4400 4400 455	2600 365 265 — —	4700 4200 4200 4200 1300	75N 75QR 65 Std. 65K 65T
1800	100	6	1300 1500 1600 1100 —	1200 1300 1500 1050 —	— — 330 — —	10000 10000 10000 10000 10000	3050▲ 3150▲ 3300▲ 2800▲ —	3100 3300 3550 2800 —	— — — — —	3400 3500 3600 3250 —	95N 100QR 80 Std. 80K 80T
	150	4	2600 2750 2900 2450 —	2750▲ 2900 3050 2600 340	5100 5150 5200 5000 1550	10000 10000 10000 10000 10000	2450▲ 2750▲ 2900▲ 2050▲ —	2850▲ 3000 3150 2550 —	6600▲ 6600▲ 6600▲ 6600▲ —	4950 5000 5100 4800 1050	95N 100QR 80 Std. 80K 80T
	200	3	3800 3850 3950 3700 —	3950 4000 4150 3800 870	5100 5150 5200 5000 1550	10000 10000 10000 10000 10000	2950▲ 3150▲ 3300▲ 2650▲ —	3800 3900 4000 3650 710	6600▲ 6600 6600 6600 6600▲	5600 5650 5700 5500 2950	95N 100QR 80 Std. 80K 80T
	300	2	4700 4750 4950 4550 1400	4750 4800 4900 4600 1450	5100 5150 5200 5000 1550	10000 10000 10000 10000 10000	6000▲ 6000▲ 6000▲ 6000▲ 6000▲	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 4550	95N 100QR 80 Std. 80K 80T
2250	150	5	— — — — —	900▲ 560▲ — — —	4450 3950 610 — 630	10000 10000 10000 9350 10000	— — — — —	1000▲ 480▲ — — —	6500▲ — — — —	4150 3550 — — —	100N 125QR 125 Std. 140K 100T
2400	200	4	2950▲ — — — —	2900 750▲ — — —	4450 1250 610 — —	10000 10000 10000 9350 3000	— — — — —	2400▲ 590▲ — — —	6600▲ 6600▲ 6600▲ 6600▲ —	4950 3000 2600 — —	100N 150QR 125 Std. 140K 140T
2700	150	6	— — — — —	— — — — —	810 1250 610 — —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	— 720 — — —	125N 150QR 125 Std. 140K 140T
	300	3	— 1250▲ — — —	1100▲ 1400▲ 940▲ — —	810 1250 610 — —	10000 10000 10000 9350 3000	6000▲ 6000▲ 6000▲ — —	6000▲ 6000▲ 6000▲ — —	6600▲ 6600▲ 6600▲ 6600▲ —	4200 4450 4150 — —	125N 150QR 125 Std. 140K 140T
3000	200	5	— — — — —	— 750 — — —	810 1250 610 — —	10000 10000 10000 9350 3000	— — — — —	— 590▲ — — —	6600▲ 6600▲ 6600▲ 6600▲ —	2800 3000 2600 — —	125N 150QR 125 Std. 140K 140T
3600	200	6	— — — — —	— — — — —	810 — 610 — —	10000 8400 10000 9350 3000	— — — — —	— — — — —	6600▲ — 6600▲ 6600▲ —	2800 — 2600 — —	125N 200QR 125 Std. 140K 140T
	300	4	— — — — —	1100 — 940 — —	810 — 610 — —	10000 8400 10000 9350 3000	6000▲ — 6000▲ — —	6000▲ — 6000▲ — —	6600▲ 6600▲ 6600▲ 6600▲ —	4200 — 4150 — —	125N 200QR 125 Std. 140K 140T

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs stacked, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the failed unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 17—Single Grounded-Wye Connected Capacitor Banks Rated 20.8 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
150	50	1	3200	3200	‡	‡	3000	3150	2250	4000	8N
			3200	3250	‡	‡	3050	3200	2300	4000	7QR
			3200	3250	‡	‡	3050	3200	2300	4000	5 Std.
			3250	3250	‡	‡	3100	3200	2300	4050	6K
			3200	3200	‡	‡	3050	3200	2250	4000	6T
300	50	2	3200	3200	‡	‡	3000	3150	2250	3950	10N
			3200	3250	‡	‡	3050	3200	2300	4000	15QR
			3200	3200	‡	‡	3050	3200	2250	4000	10 Std.
			3250	3250	‡	‡	3100	3200	2300	4050	8K
			3150	3150	‡	‡	2950	3150	2150	3950	10T
	100	1	4050	4150	2950	10000	5000	5000	3800	5000	10N
			4100	4150	3000	10000	5000	5000	3900	5000	15QR
			4100	4150	3000	10000	5000	5000	3850	5000	10 Std.
			4100	4150	3000	10000	5000	5000	3900	5050	8K
			4050	4150	2950	10000	5000	5000	3800	5000	10T
450	50	3	3200	3200	‡	‡	3000	3150	2250	3950	15N
			3200	3200	‡	‡	3050	3200	2200	4000	20QR
			3150	3150	‡	‡	2950	3100	2100	3950	15 Std.
			3200	3200	‡	‡	3050	3200	2250	4000	12K
			2950	2950	‡	‡	2750	2950	1850	3850	15T
	150	1	4700	4800	6000	10000	5150	5250	6600	6000	15N
			4750	4800	6050	10000	5200	5250	6600	6000	20QR
			4700	4800	6000	10000	5150	5250	6600	6000	15 Std.
			4750	4800	6050	10000	5200	5250	6600	6000	12K
			4600	4750	6000	10000	5050	5200	6600	6000	15T
600	50	4	3200	3200	‡	‡	3000	3150	2250	3950	20N
			3100	3100	‡	‡	2950	3100	2100	4000	25QR
			3050	3050	‡	‡	2850	3100	2000	3900	20 Std.
			3150	3200	‡	‡	3000	3150	2150	4000	15K
			2950	2950	‡	‡	2750	2950	1850	3850	15T
	100	2	4050	4150	2950	10000	5000	5000	3800	5000	20N
			4050	4150	2900	10000	5000	5000	3800	5000	25QR
			4000	4100	2850	10000	5000	5000	3700	4950	20 Std.
			4100	4150	2950	10000	5000	5000	3850	5000	15K
			3950	4050	2800	10000	5000	5000	3600	4950	15T
	200	1	5300	5350	6000	10000	5100	5450	6600	6000	20N
			5350	5350	6050	10000	5150	5450	6600	6000	25QR
			5300	5350	6000	10000	5100	5450	6600	6000	20 Std.
			5350	5350	6050	10000	5150	5450	6600	6000	15K
			5250	5350	6000	10000	5050	5400	6600	6000	15T
750	50	5	3200	3200	‡	‡	3000	3150	2200	3950	25N
			3100	3100	‡	‡	2950	3100	2100	4000	25QR
			2950	3000	‡	‡	2800	3000	1900	3850	25 Std.
			3100	3100	‡	‡	2900	3100	2050	3950	20K
			2350	2350	‡	‡	2100	2450	690	3550	25T
900	50	6	3200	3200	‡	‡	3000	3150	2150	3950	30N
			2900	2950	‡	‡	2750	2950	1700	3850	40QR
			2950	3000	‡	‡	2800	3000	1900	3850	25 Std.
			2950	3000	‡	‡	2800	3000	1850	3900	25K
			2350	2350	‡	‡	2100	2450	690	3550	25T
	100	3	4050	4150	2950	10000	5000	5000	3800	5000	30N
			3950	4000	2750	10000	5000	5000	3550	4900	40QR
			3950	4050	2800	10000	5000	5000	3600	4900	25 Std.
			4000	4050	2800	10000	5000	5000	3650	4950	25K
			3600	3650	2300	10000	4800	5000	2800	4700	25T
	150	2	4700	4800	6000	10000	5150	5250	6600	6000	30N
			4600	4700	5950	10000	5000	5200	6600	6000	40QR
			4600	4700	5950	10000	5050	5200	6600	6000	25 Std.
			4650	4750	6000	10000	5100	5250	6600	6000	25K
			4300	4400	5800	10000	4700	4900	6600	5850	25T
	300	1	5950	5950	6000	10000	6000	6000	6600	6000	30N
			5900	5950	5950	10000	6000	6000	6600	6000	40QR
			5900	5950	5950	10000	6000	6000	6600	6000	25 Std.
			5950	5950	6000	10000	6000	6000	6600	6000	25K
			5650	5750	5800	10000	6000	6000	6600	6000	25T
1200	100	4	3950	4050	2800	10000	5000	5000	3600	4950	45N
			3800	3800	2600	10000	4850	5000	3250	4800	50QR
			3600	3650	2350	10000	4800	5000	2900	4700	40 Std.
			3700	3750	2350	10000	4850	5000	2950	4750	40K
			2300	2150	610	10000	3800	4100	265	3950	40T
	200	2	5250	5350	6000	10000	5050	5450	6600	6000	45N
			5050	5200	5850	10000	4850	5250	6600	6000	50QR
			5000	5100	5800	10000	4750	5150	6600	6000	40 Std.
			5050	5200	5850	10000	4800	5200	6600	6000	40K
			4350	4450	5400	10000	3750	4400	6600	5900	40T

TABLE CONTINUED ➔

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 17—Single Grounded-Wye Connected Capacitor Banks Rated 20.8 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
1350	150	3	4550 4400 4100 4400 3300	4650 4500 4200 4450 3450	5950 5850 5700 5850 5400	10000 10000 10000 10000 10000	4950 4800 4450▲ 4800 3450	5150 5000 4700 4950 3750	6600 6600 6600 6600 6600	6000 5950 5750 5900 5300	50N 50QR 50 Std. 40K 40T
1500	100	5	3700 3550 3300 3300 770	3700 3600 3350 3300 870	2500 2250 1850 1850 310	10000 10000 10000 10000 10000	4800 4800 4550 4650 2550	5000 5000 4850 4950 2500	3050 2650 1000 1100 —	4750 4700 4500 4600 3250	65N 60QR 50 Std. 50K 50T
1800	100	6	3700 3550 2700 3300 —	3700 3600 2700 3300 430	2500 2250 1100 1850 130	10000 10000 10000 10000 10000	4800 4800 4150 4650 —	5000 5000 4400 4950 455	3050 2650 265 1100 —	4750 4700 4200 4600 1300	65N 60QR 65 Std. 50K 65T
	150	4	4350 4300 3650 4100 465	4450 4400 3800 4250 740	5850 5800 5550 5750 4050	10000 10000 10000 10000 10000	4750 4700 3950▲ 4550 —	4950 4900 4200 4750 750	6600 6600 6600 6600 305	5900 5850 5500 5800 3650	65N 60QR 65 Std. 50K 65T
	200	3	5050 5000 4500 4950 2300	5200 5100 4700 5050 2200	5850 5800 5550 5750 4050	10000 10000 10000 10000 10000	4750 4700 4100▲ 4600 —	5200 5150 4650 5050 1450	6600 6600 6600 6600 6600	6000 6000 6000 6000 4550	65N 60QR 65 Std. 50K 65T
	300	2	5700 5650 5300 5600 3400	5800 5750 5350 5700 3350	5850 5800 5550 5750 4050	10000 10000 10000 10000 10000	6000 6000 6000 6000 6000	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	65N 60QR 65 Std. 50K 65T
2250	150	5	3750 2750 2900 3650 465	3950 2900 3050 3750 740	5650 5150 5200 5550 4050	10000 10000 10000 10000 10000	4050▲ 2750▲ 2900▲ 3950▲ —	4300 3000 3150 4200 750	6600 6600▲ 6600▲ 6600 305▲	5600 5000 5100 5550 3650	85N 100QR 80 Std. 65K 65T
2400	200	4	4650 3850 3950 3700 2300	4800 4000 4150 3800 2200	5650 5150 5200 5000 4050	10000 10000 10000 10000 10000	4250 3150▲ 3300▲ 2650▲ —	4750 3900 4000 3650 1450	6600 6600 6600 6600 6600	6000 5650 5700 5500 4550	85N 100QR 80 Std. 80K 65T
2700	150	6	2600 2750 2900 2450 —	2750 2900 3050 2600 340	5100 5150 5200 5000 1550	10000 10000 10000 10000 10000	2450▲ 2750▲ 2900▲ 2050▲ —	2850 3000 3150 2550 —	6600▲ 6600▲ 6600 6600▲ —	4950 5000 5100 4800 1050	95N 100QR 80 Std. 80K 80T
	300	3	4700 4750 4950 4550 1400	4750 4800 4900 4600 1450	5100 5150 5200 5000 1550	10000 10000 10000 10000 10000	6000▲ 6000 6000 6000 6000▲	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 4550	95N 100QR 80 Std. 80K 80T
3000	200	5	2950 2100 2650 2700 —	2900 1900 2650 2650 —	4450 3950 4300 4250 630	10000 10000 10000 10000 10000	— — — — —	2400▲ 1350 2000 2200▲ —	6600▲ 6600▲ 6600▲ 6600▲ 6600▲	4950 4500 4800 4750 710	100N 125QR 100 Std. 100K 100T
3600	200	6	— — — — —	— 750 — — —	810 1250 610 — —	10000 10000 10000 9350 3000	— — — — —	— 590 — — —	6600▲ 6600▲ 6600▲ 6600▲ —	2800 3000 2600 — —	125N 150QR 125 Std. 140K 140T
	300	4	— 1250▲ — — —	1100▲ 1400 940▲ — —	810 1250 610 — —	10000 10000 10000 9350 3000	6000▲ 6000▲ 6000▲ — —	6000▲ 6000▲ 6000▲ — —	6600▲ 6600▲ 6600▲ 6600▲ —	4200 4450 4150 — —	125N 150QR 125 Std. 140K 140T

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 18—Single Grounded-Wye Connected Capacitor Banks Rated 22.9 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemcol (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
150	50	1	3200	3200	‡	‡	3050	3200	2300	4000	5N
			3250	3250	‡	‡	3100	3200	2300	4050	5QR
			3200	3250	‡	‡	3050	3200	2300	4000	5 Std.
			3250	3250	‡	‡	3100	3200	2300	4050	6K
			3200	3200	‡	‡	3050	3200	2250	4000	6T
300	50	2	3200	3200	‡	‡	3000	3150	2250	3950	10N
			3200	3250	‡	‡	3050	3200	2300	4000	10QR
			3200	3250	‡	‡	3050	3200	2300	4000	7 Std.
			3250	3250	‡	‡	3100	3200	2300	4050	8K
			3200	3200	‡	‡	3050	3200	2250	4000	8T
	100	1	4050	4150	2950	10000	5000	5000	3800	5000	10N
			4100	4150	3000	10000	5000	5000	3900	5000	10QR
			4100	4150	3000	10000	5000	5000	3900	5000	7 Std.
			4100	4150	3000	10000	5000	5000	3900	5050	8K
			4100	4150	3000	10000	5000	5000	3850	5000	8T
450	50	3	3200	3200	‡	‡	3000	3150	2250	3950	15N
			3200	3250	‡	‡	3050	3200	2300	4000	15QR
			3150	3150	‡	‡	2950	3100	2100	3950	15 Std.
			3250	3250	‡	‡	3100	3200	2300	4050	10K
			3050	3100	‡	‡	2900	3100	2050	3950	12T
	150	1	4700	4800	6000	10000	5150	5250	6600	6000	15N
			4750	4800	6050	10000	5200	5250	6600	6000	15QR
			4700	4800	6000	10000	5150	5250	6600	6000	15 Std.
			4750	4800	6050	10000	5200	5250	6600	6000	10K
			4700	4800	6000	10000	5150	5250	6600	6000	12T
600	50	4	3200	3200	‡	‡	3000	3150	2250	3950	20N
			3200	3200	‡	‡	3050	3200	2200	4000	20QR
			3150	3150	‡	‡	2950	3100	2100	3950	15 Std.
			3200	3200	‡	‡	3050	3200	2250	4000	12K
			2950	2950	‡	‡	2750	2950	1850	3850	15T
	100	2	4050	4150	2950	10000	5000	5000	3800	5000	20N
			4100	4150	3000	10000	5000	5000	3900	5000	20QR
			4050	4150	2900	10000	5000	5000	3800	5000	15 Std.
			4100	4150	3000	10000	5000	5000	3850	5000	12K
			3950	4050	2800	10000	5000	5000	3600	4950	15T
	200	1	5300	5350	6000	10000	5100	5450	6600	6000	20N
			5350	5350	6050	10000	5150	5450	6600	6000	20QR
			5300	5350	6000	10000	5100	5450	6600	6000	15 Std.
			5350	5350	6050	10000	5150	5450	6600	6000	12K
			5250	5350	6000	10000	5050	5400	6600	6000	15T
750	50	5	3200	3200	‡	‡	3000	3150	2250	3950	20N
			3100	3100	‡	‡	2950	3100	2100	4000	25QR
			3050	3050	‡	‡	2850	3100	2000	3900	20 Std.
			3100	3100	‡	‡	2900	3100	2050	3950	20K
			2750	2800	‡	‡	2600	2800	1400	3750	20T
900	50	6	3200	3200	‡	‡	3000	3150	2200	3950	25N
			3000	3050	‡	‡	2850	3000	1950	3900	30QR
			2950	3000	‡	‡	2800	3000	1900	3850	25 Std.
			3100	3100	‡	‡	2900	3100	2050	3950	20K
			2350	2350	‡	‡	2100	2450	690	3550	25T
	100	3	4050	4150	2950	10000	5000	5000	3800	5000	25N
			4000	4050	2850	10000	5000	5000	3650	4950	30QR
			3950	4050	2800	10000	5000	5000	3600	4900	25 Std.
			4050	4100	2900	10000	5000	5000	3750	5000	20K
			3600	3650	2300	10000	4800	5000	2800	4700	25T
	150	2	4700	4800	6000	10000	5150	5250	6600	6000	25N
			4650	4750	6000	10000	5100	5250	6600	6000	30QR
			4600	4700	5950	10000	5050	5200	6600	6000	25 Std.
			4700	4800	6050	10000	5200	5250	6600	6000	20K
			4300	4400	5800	10000	4700	4900	6600	5850	25T
	300	1	5950	5950	6000	10000	6000	6000	6600	6000	25N
			5950	5950	6000	10000	6000	6000	6600	6000	30QR
			5900	5950	5950	10000	6000	6000	6600	6000	25 Std.
			6000	5950	6050	10000	6000	6000	6600	6000	20K
			5650	5750	5800	10000	6000	6000	6600	6000	25T
1200	100	4	4050	4150	2950	10000	5000	5000	3800	5000	40N
			3950	4000	2750	10000	5000	5000	3550	4900	40QR
			3600	3650	2350	10000	4800	5000	2900	4700	40 Std.
			3850	3900	2650	10000	4950	5000	3400	4850	30K
			3150	3100	1750	10000	4450	4750	630	4400	30T
	200	2	5300	5350	6000	10000	5100	5450	6600	6000	40N
			5250	5350	5950	10000	5050	5400	6600	6000	40QR
			5000	5100	5800	10000	4750	5150	6600	6000	40 Std.
			5150	5300	5950	10000	4950	5350	6600	6000	30K
			4800	4900	5650	10000	4400	4850	6600	6000	30T

TABLE CONTINUED ➡

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 18—Single Grounded-Wye Connected Capacitor Banks Rated 22.9 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
1350	150	3	4650 4400 4300 4400 3300	4750 4500 4400 4450 3450	6000 5850 5800 5850 5400	10000 10000 10000 10000 10000	5050 4800 4700 4800 3450	5200 5000 4900 4950 3750	6600 6600 6600 6600 6600	6000 5950 5850 5900 5300	45N 50QR 40 Std. 40K 40T
1500	100	5	3900 3800 3300 3700 2300	3950 3800 3350 3750 2150	2700 2600 1850 2350 610	10000 10000 10000 10000 10000	5000 4850 4550 4850 3800	5000 5000 4850 5000 4100	3500 3250 1000 2950 265	4900 4800 4500 4750 3950	50N 50QR 50 Std. 40K 40T
1800	100	6	3700 3550 2700 3300 770	3700 3600 2700 3300 870	2500 2250 1100 1850 310	10000 10000 10000 10000 10000	4800 4800 4150 4650 2550	5000 5000 4400 4950 2500	3050 2650 265 1100 —	4750 4700 4200 4600 3250	65N 60QR 65 Std. 50K 50T
	150	4	4350 4300 3650 4100 2250	4450 4400 3800 4250 2300	5850 5800 5550 5750 4950	10000 10000 10000 10000 10000	4750 4700 3950▲ 4550 600▲	4950 4900 4200 4750 2250	6600 6600 6600 6600 6600	5900 5850 5500 5800 4750	65N 60QR 65 Std. 50K 50T
	200	3	5050 5000 4500 4950 3650	5200 5100 4700 5050 3750	5850 5800 5550 5750 4950	10000 10000 10000 10000 10000	4750 4700 4100▲ 4600▲ 2150▲	5200 5150 4650 5050 3550	6600 6600 6600 6600 6600	6000 6000 6000 6000 5450	65N 60QR 65 Std. 50K 50T
	300	2	5700 5650 5300 5600 4500	5800 5750 5350 5700 4550	5850 5800 5550 5750 4950	10000 10000 10000 10000 10000	6000 6000 6000 6000 6000	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	65N 60QR 65 Std. 50K 50T
2250	150	5	4300 3700 3650 3650 465	4400 3850 3800 3750 740	5800 5500 5550 5550 4050	10000 10000 10000 10000 10000	4700 3950 3950▲ 3950▲ —	4900 4200 4200 4200 750	6600 6600 6600 6600 305▲	5850 5450 5500 5550 3650	75N 75QR 65 Std. 65K 65T
2400	200	4	5000 4500 4500 4550 2300	5100 4650 4700 4700 2200	5800 5500 5550 5550 4050	10000 10000 10000 10000 10000	4700▲ 4150 4100▲ 4150▲ —	5100 4650 4650 4700 1450	6600 6600 6600 6600 6600	6000 6000 6000 6000 4550	75N 75QR 65 Std. 65K 65T
2700	150	6	3750 2750 2900 2450 —	3950 2900 3050 2600 340	5650 5150 5200 5000 1550	10000 10000 10000 10000 10000	4050▲ 2750▲ 2900▲ 2050▲ —	4300 3000 3150 2550 —	6600 6600▲ 6600 6600▲ —	5600 5000 5100 4800 1050	85N 100QR 80 Std. 80K 80T
	300	3	5400 4750 4950 4550 1400	5450 4800 4900 4600 1450	5650 5150 5200 5000 1550	10000 10000 10000 10000 10000	6000 6000 6000 6000 6000▲	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 4550	85N 100QR 80 Std. 80K 80T
3000	200	5	3800 3850 3950 3700 —	3950 4000 4150 3800 870	5100 5150 5200 5000 1550	10000 10000 10000 10000 10000	2950▲ 3150▲ 3300▲ 2650▲ —	3800 3900 4000 3650 710	6600 6600 6600 6600 6600	5600 5650 5700 5500 2950	95N 100QR 80 Std. 80K 80T
3600	200	6	2950 2100 — — —	2900 1900 — — —	4450 3950 610 — 630	10000 10000 10000 9350 10000	— — — — —	2400▲ 1350 — — —	6600▲ 6600▲ 6600▲ 6600▲ 6600▲	4950 4500 2600 — 710	100N 125QR 125 Std. 140K 100T
	300	4	3900 3300 — — —	3900 3250 940▲ — 710	4450 3950 610 — 630	10000 10000 10000 9350 10000	6000▲ 6000▲ 6000▲ — —	6000 6000 6000▲ — 1750	6600▲ 6600 6600▲ 6600▲ 6600▲	6000 5950 4150 — 1500	100N 125QR 125 Std. 140K 100T

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 19—Single Grounded-Wye Connected Capacitor Banks Rated 23.9 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemcol (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
150	50	1	3200	3200	‡	‡	3050	3200	2300	4000	5N
			3250	3250	‡	‡	3100	3200	2300	4050	5QR
			3200	3250	‡	‡	3050	3200	2300	4000	5 Std.
			3250	3250	‡	‡	3100	3200	2300	4050	6K
			3200	3200	‡	‡	3050	3200	2250	4000	6T
300	50	2	3200	3200	‡	‡	3000	3150	2250	3950	10N
			3200	3250	‡	‡	3050	3200	2300	4000	10QR
			3200	3250	‡	‡	3050	3200	2300	4000	7 Std.
			3250	3250	‡	‡	3100	3200	2300	4050	6K
			3200	3200	‡	‡	3050	3200	2250	4000	8T
	100	1	4050	4150	2950	10000	5000	5000	3800	5000	10N
			4100	4150	3000	10000	5000	5000	3900	5000	10QR
			4100	4150	3000	10000	5000	5000	3900	5000	7 Std.
			4100	4150	3000	10000	5000	5000	3900	5050	6K
			4100	4150	3000	10000	5000	5000	3850	5000	8T
450	50	3	3200	3200	‡	‡	3000	3150	2250	3950	15N
			3200	3250	‡	‡	3050	3200	2300	4000	15QR
			3150	3150	‡	‡	2950	3100	2100	3950	15 Std.
			3250	3250	‡	‡	3100	3200	2300	4050	10K
			3050	3100	‡	‡	2900	3100	2050	3950	12T
	150	1	4700	4800	6000	10000	5150	5250	6600	6000	15N
			4750	4800	6050	10000	5200	5250	6600	6000	15QR
			4700	4800	6000	10000	5150	5250	6600	6000	15 Std.
			4750	4800	6050	10000	5200	5250	6600	6000	10K
			4700	4800	6000	10000	5150	5250	6600	6000	12T
600	50	4	3200	3200	‡	‡	3000	3150	2250	3950	20N
			3200	3200	‡	‡	3050	3200	2200	4000	20QR
			3150	3150	‡	‡	2950	3100	2100	3950	15 Std.
			3200	3200	‡	‡	3050	3200	2250	4000	12K
			2950	2950	‡	‡	2750	2950	1850	3850	15T
	100	2	4050	4150	2950	10000	5000	5000	3800	5000	20N
			4100	4150	3000	10000	5000	5000	3900	5000	20QR
			4050	4150	2900	10000	5000	5000	3800	5000	15 Std.
			4100	4150	3000	10000	5000	5000	3850	5000	12K
			3950	4050	2800	10000	5000	5000	3600	4950	15T
	200	1	5300	5350	6000	10000	5100	5450	6600	6000	20N
			5350	5350	6050	10000	5150	5450	6600	6000	20QR
			5300	5350	6000	10000	5100	5450	6600	6000	15 Std.
			5350	5350	6050	10000	5150	5450	6600	6000	12K
			5250	5350	6000	10000	5050	5400	6600	6000	15T
750	50	5	3200	3200	‡	‡	3000	3150	2250	3950	20N
			3100	3100	‡	‡	2950	3100	2100	4000	25QR
			3050	3050	‡	‡	2850	3100	2000	3900	20 Std.
			3100	3100	‡	‡	2900	3100	2050	3950	20K
			2750	2800	‡	‡	2600	2800	1400	3750	20T
900	50	6	3200	3200	‡	‡	3000	3150	2200	3950	25N
			3000	3050	‡	‡	2850	3000	1950	3900	30QR
			2950	3000	‡	‡	2800	3000	1900	3850	25 Std.
			3100	3100	‡	‡	2900	3100	2050	3950	20K
			2350	2350	‡	‡	2100	2450	690	3550	25T
	100	3	4050	4150	2950	10000	5000	5000	3800	5000	25N
			4000	4050	2850	10000	5000	5000	3650	4950	30QR
			3950	4050	2800	10000	5000	5000	3600	4900	25 Std.
			4050	4100	2900	10000	5000	5000	3750	5000	20K
			3600	3650	2300	10000	4800	5000	2800	4700	25T
	150	2	4700	4800	6000	10000	5150	5250	6600	6000	25N
			4650	4750	6000	10000	5100	5250	6600	6000	30QR
			4600	4700	5950	10000	5050	5200	6600	6000	25 Std.
			4700	4800	6050	10000	5200	5250	6600	6000	20K
			4300	4400	5800	10000	4700	4900	6600	5850	25T
	300	1	5950	5950	6000	10000	6000	6000	6600	6000	25N
			5950	5950	6000	10000	6000	6000	6600	6000	30QR
			5900	5950	5950	10000	6000	6000	6600	6000	25 Std.
			6000	5950	6050	10000	6000	6000	6600	6000	20K
			5650	5750	5800	10000	6000	6000	6600	6000	25T
1200	100	4	4050	4150	2950	10000	5000	5000	3800	5000	30N
			3950	4000	2750	10000	5000	5000	3550	4900	40QR
			3900	3900	2700	10000	4950	5000	3450	4850	30 Std.
			3850	3900	2650	10000	4950	5000	3400	4850	30K
			3150	3100	1750	10000	4450	4750	630	4400	30T
	200	2	5300	5350	6000	10000	5100	5450	6600	6000	30N
			5250	5350	5950	10000	5050	5400	6600	6000	40QR
			5150	5300	5900	10000	4950	5300	6600	6000	30 Std.
			5150	5300	5950	10000	4950	5350	6600	6000	30K
			4800	4900	5650	10000	4400	4850	6600	6000	30T

TABLE CONTINUED ➔

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 19—Single Grounded-Wye Connected Capacitor Banks Rated 23.9 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemcol (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
1350	150	3	4650	4750	6000	10000	5050	5200	6600	6000	45N
			4400	4500	5850	10000	4800	5000	6600	5950	50QR
			4300	4400	5800	10000	4700	4900	6600	5850	40 Std.
			4400	4450	5850	10000	4800	4950	6600	5900	40K
			3300	3450	5400	10000	3450	3750	6600	5300	40T
1500	100	5	3900	3950	2700	10000	5000	5000	3500	4900	50N
			3800	3800	2600	10000	4850	5000	3250	4800	50QR
			3300	3350	1850	10000	4550	4850	1000	4500	50 Std.
			3700	3750	2350	10000	4850	5000	2950	4750	40K
			2300	2150	610	10000	3800	4100	265	3950	40T
1800	100	6	3700	3700	2500	10000	4800	5000	3050	4750	65N
			3550	3600	2250	10000	4800	5000	2650	4700	60QR
			3300	3350	1850	10000	4550	4850	1000	4500	50 Std.
			3300	3300	1850	10000	4650	4950	1100	4600	50K
			770	870	310	10000	2550	2500	—	3250	50T
	150	4	4350	4450	5850	10000	4750	4950	6600	5900	65N
			4300	4400	5800	10000	4700	4900	6600	5850	60QR
			4100	4200	5700	10000	4450	4700	6600	5750	50 Std.
			4100	4250	5750	10000	4550▲	4750	6600	5800	50K
			2250	2300	4950	10000	600▲	2250	6600	4750	50T
	200	3	5050	5200	5850	10000	4750	5200	6600	6000	65N
			5000	5100	5800	10000	4700	5150	6600	6000	60QR
			4900	5000	5700	10000	4550	5000	6600	6000	50 Std.
			4950	5050	5750	10000	4600	5050	6600	6000	50K
			3650	3750	4950	10000	2150▲	3550	6600	5450	50T
	300	2	5700	5800	5850	10000	6000	6000	6600	6000	65N
			5650	5750	5800	10000	6000	6000	6600	6000	60QR
			5500	5600	5700	10000	6000	6000	6600	6000	50 Std.
			5600	5700	5750	10000	6000	6000	6600	6000	50K
			4500	4550	4950	10000	6000	6000	6600	6000	50T
2250	150	5	4300	4400	5800	10000	4700	4900	6600	5850	75N
			3700	3850	5500	10000	3950	4200	6600	5450	75QR
			3650	3800	5550	10000	3950▲	4200	6600	5500	65 Std.
			3650	3750	5550	10000	3950▲	4200	6600	5550	65K
			465	740	4050	10000	—	750	305▲	3650	65T
2400	200	4	5000	5100	5800	10000	4700	5100	6600	6000	75N
			4500	4650	5500	10000	4150	4650	6600	6000	75QR
			4500	4700	5550	10000	4100	4650	6600	6000	65 Std.
			4550	4700	5550	10000	4150▲	4700	6600	6000	65K
			2300	2200	4050	10000	—	1450	6600	4550	65T
2700	150	6	3750	3950	5650	10000	4050▲	4300	6600	5600	85N
			2750	2900	5150	10000	2750▲	3000	6600▲	5000	100QR
			2900	3050	5200	10000	2900▲	3150	6600▲	5100	80 Std.
			2450	2600	5000	10000	2050▲	2550	6600▲	4800	80K
			465	740	4050	10000	—	750	305	3650	65T
	300	3	5400	5450	5650	10000	6000	6000	6600	6000	85N
			4750	4800	5150	10000	6000	6000	6600	6000	100QR
			4950	4900	5200	10000	6000	6000	6600	6000	80 Std.
			4550	4600	5000	10000	6000	6000	6600	6000	80K
			3400	3350	4050	10000	6000	6000	6600	6000	65T
3000	200	5	3800	3950	5100	10000	2950▲	3800	6600▲	5600	95N
			3850	4000	5150	10000	3150▲	3900	6600	5650	100QR
			3950	4150	5200	10000	3300▲	4000	6600	5700	80 Std.
			3700	3800	5000	10000	2650▲	3650	6600	5500	80K
			—	870	1550	10000	—	710	6600	2950	80T
3600	200	6	2950	2900	4450	10000	—	2400▲	6600▲	4950	100N
			2100	1900	3950	10000	—	1350	6600▲	4500	125QR
			2650	2650	4300	10000	—	2000	6600▲	4800	100 Std.
			2700	2650	4250	10000	—	2200▲	6600▲	4750	100K
			—	—	630	10000	—	—	6600▲	710	100T
	300	4	3900	3900	4450	10000	6000▲	6000▲	6600	6000	100N
			3300	3250	3950	10000	6000▲	6000	6600	5950	125QR
			3750	3700	4300	10000	6000▲	6000	6600	6000	100 Std.
			3700	3650	4250	10000	6000▲	6000	6600	6000	100K
			—	710	630	10000	—	1750	6600	1500	100T

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 20—Single Grounded-Wye Connected Capacitor Banks Rated 24.9 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
150	50	1	3200 3250 3200 3250 3200	3200 3250 3250 3250 3200	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3050 3100 3050 3100 3050	3200 3200 3200 3200 3200	2300 2300 2300 2300 2250	4000 4050 4000 4050 4000	5N 5QR 5 Std. 6K 6T
300	50	2	3200 3200 3200 3250 3200	3200 3250 3250 3250 3200	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 3050 3100 3050	3150 3200 3200 3200 3200	2250 2300 2300 2300 2250	3950 4000 4000 4050 4000	10N 10QR 7 Std. 6K 8T
	100	1	4050 4100 4100 4100 4100	4150 4150 4150 4150 4150	2950 3000 3000 3000 3000	10000 10000 10000 10000 10000	5000 5000 5000 5000 5000	5000 5000 5000 5000 5000	3800 3900 3900 3900 3850	5000 5000 5000 5050 5000	10N 10QR 7 Std. 6K 8T
450	50	3	3200 3200 3200 3250 3050	3200 3250 3200 3250 3100	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 3050 3100 2900	3150 3200 3200 3200 3100	2250 2300 2250 2300 2050	3950 4000 4000 4050 3950	15N 15QR 10 Std. 10K 12T
	150	1	4700 4750 4750 4750 4700	4800 4800 4800 4800 4800	6000 6050 6000 6050 6000	10000 10000 10000 10000 10000	5150 5200 5150 5200 5150	5250 5250 5250 5250 5250	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	15N 15QR 10 Std. 10K 12T
600	50	4	3200 3200 3150 3200 2950	3200 3200 3150 3200 2950	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 2950 3050 2750	3150 3200 3100 3200 2950	2250 2200 2100 2250 1850	3950 4000 3950 4000 3850	20N 20QR 15 Std. 12K 15T
	100	2	4050 4100 4050 4100 3950	4150 4150 4150 4150 4050	2950 3000 2900 3000 2800	10000 10000 10000 10000 10000	5000 5000 5000 5000 5000	5000 5000 5000 5000 5000	3800 3900 3800 3850 3600	5000 5000 5000 5000 4950	20N 20QR 15 Std. 12K 15T
	200	1	5300 5350 5300 5350 5250	5350 5350 5350 5350 5350	6000 6050 6000 6050 6000	10000 10000 10000 10000 10000	5100 5150 5100 5150 5050	5450 5450 5450 5450 5400	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	20N 20QR 15 Std. 12K 15T
750	50	5	3200 3100 3050 3150 2750	3200 3100 3050 3200 2800	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2950 2850 3000 2600	3150 3100 3100 3150 2800	2250 2100 2000 2150 1400	3950 4000 3900 4000 3750	20N 25QR 20 Std. 15K 20T
900	50	6	3200 3100 2950 3100 2350	3200 3100 3000 3100 2350	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2950 2800 2900 2100	3150 3100 3000 3100 2450	2200 2100 1900 2050 690	3950 4000 3850 3950 3550	25N 25QR 25 Std. 20K 25T
	100	3	4050 4050 3950 4050 3600	4150 4150 4050 4100 3650	2950 2900 2800 2900 2300	10000 10000 10000 10000 10000	5000 5000 5000 5000 4800	5000 5000 5000 5000 5000	3800 3800 3600 3750 2800	5000 5000 4900 5000 4700	25N 25QR 25 Std. 20K 25T
	150	2	4700 4750 4600 4700 4300	4800 4800 4700 4800 4400	6000 6050 5950 6050 5800	10000 10000 10000 10000 10000	5150 5200 5050 5200 4700	5250 5250 5200 5250 4900	6600 6600 6600 6600 6600	6000 6000 6000 6000 5850	25N 25QR 25 Std. 20K 25T
	300	1	5950 6000 5900 6000 5650	5950 5950 5950 5950 5750	6000 6050 5950 6050 5800	10000 10000 10000 10000 10000	6000 6000 6000 6000 6000	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	25N 25QR 25 Std. 20K 25T
1200	100	4	4050 3950 3900 4000 3150	4150 4000 3900 4050 3100	2950 2750 2700 2800 1750	10000 10000 10000 10000 10000	5000 5000 4950 5000 4450	5000 5000 5000 5000 4750	3800 3550 3450 3650 630	5000 4900 4850 4950 4400	30N 40QR 30 Std. 25K 30T
	200	2	5300 5250 5150 5300 4800	5350 5350 5300 5350 4900	6000 5950 5900 6000 5650	10000 10000 10000 10000 10000	5100 5050 4950 5100 4400	5450 5400 5300 5450 4850	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	30N 40QR 30 Std. 25K 30T

TABLE CONTINUED ➔

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 20—Single Grounded-Wye Connected Capacitor Banks Rated 24.9 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
			Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
1350	150	3	4650	4750	6000	10000	5050	5200	6600	6000	45N
			4600	4700	5950	10000	5000	5200	6600	6000	40QR
			4300	4400	5800	10000	4700	4900	6600	5850	40 Std.
			4500	4600	5950	10000	4900	5100	6600	6000	30K
			4000	4100	5650	10000	4250	4500	6600	5700	30T
1500	100	5	3950	4050	2800	10000	5000	5000	3600	4950	45N
			3800	3800	2600	10000	4850	5000	3250	4800	50QR
			3600	3650	2350	10000	4800	5000	2900	4700	40 Std.
			3700	3750	2350	10000	4850	5000	2950	4750	40K
			2300	2150	610	10000	3800	4100	265	3950	40T
1800	100	6	3700	3700	2500	10000	4800	5000	3050	4750	65N
			3550	3600	2250	10000	4800	5000	2650	4700	60QR
			3300	3350	1850	10000	4550	4850	1000	4500	50 Std.
			3300	3300	1850	10000	4650	4950	1100	4600	50K
			770	870	310	10000	2550	2500	—	3250	50T
	150	4	4350	4450	5850	10000	4750	4950	6600	5900	65N
			4300	4400	5800	10000	4700	4900	6600	5850	60QR
			4100	4200	5700	10000	4450	4700	6600	5750	50 Std.
			4100	4250	5750	10000	4550▲	4750	6600	5800	50K
			2250	2300	4950	10000	600▲	2250	6600	4750	50T
	200	3	5050	5200	5850	10000	4750	5200	6600	6000	65N
			5000	5100	5800	10000	4700	5150	6600	6000	60QR
			4900	5000	5700	10000	4550	5000	6600	6000	50 Std.
			4950	5050	5750	10000	4600	5050	6600	6000	50K
			3650	3750	4950	10000	2150▲	3550	6600	5450	50T
	300	2	5700	5800	5850	10000	6000	6000	6600	6000	65N
			5650	5750	5800	10000	6000	6000	6600	6000	60QR
			5500	5600	5700	10000	6000	6000	6600	6000	50 Std.
			5600	5700	5750	10000	6000	6000	6600	6000	50K
			4500	4550	4950	10000	6000	6000	6600	6000	50T
2250	150	5	4300	4400	5800	10000	4700▲	4900	6600	5850	75N
			3700	3850	5500	10000	3950	4200	6600	5450	75QR
			3650	3800	5550	10000	3950▲	4200	6600	5500	65 Std.
			3650	3750	5550	10000	3950▲	4200	6600▲	5550	65K
			465	740	4050	10000	—	750	305▲	3650	65T
2400	200	4	5000	5100	5800	10000	4700	5100	6600	6000	75N
			4500	4650	5500	10000	4150	4650	6600	6000	75QR
			4500	4700	5550	10000	4100	4650	6600	6000	65 Std.
			4550	4700	5550	10000	4150▲	4700	6600	6000	65K
			2300	2200	4050	10000	—	1450	6600	4550	65T
2700	150	6	3750	3950	5650	10000	4050▲	4300	6600	5600	85N
			2750	2900	5150	10000	2750	3000	6600▲	5000	100QR
			2900	3050	5200	10000	2900▲	3150	6600▲	5100	80 Std.
			3650	3750	5550	10000	3950▲	4200	6600	5550	65K
			465	740	4050	10000	—	750	305▲	3650	65T
	300	3	5400	5450	5650	10000	6000	6000	6600	6000	85N
			4750	4800	5150	10000	6000	6000	6600	6000	100QR
			4950	4900	5200	10000	6000	6000	6600	6000	80 Std.
			5300	5400	5550	10000	6000	6000	6600	6000	65K
			3400	3350	4050	10000	6000	6000	6600	6000	65T
3000	200	5	4650	4800	5650	10000	4250	4750	6600	6000	85N
			3850	4000	5150	10000	3150▲	3900	6600	5650	100QR
			3950	4150	5200	10000	3300▲	4000	6600	5700	80 Std.
			3700	3800	5000	10000	2650▲	3650	6600	5500	80K
			—	870	1550	10000	—	710	6600▲	2950	80T
3600	200	6	2950	2900	4450	10000	—	2400	6600▲	4950	100N
			2100	1900	3950	10000	—	1350	6600▲	4500	125QR
			2650	2650	4300	10000	—	2000	6600▲	4800	100 Std.
			2700	2650	4250	10000	—	2200	6600▲	4750	100K
			—	—	630	10000	—	—	6600▲	710	100T
	300	4	3900▲	3900	4450	10000	6000▲	6000	6600▲	6000	100N
			3300	3250	3950	10000	6000▲	6000	6600▲	5950	125QR
			3750	3700	4300	10000	6000▲	6000	6600	6000	100 Std.
			3700	3650	4250	10000	6000▲	6000	6600	6000	100K
			—	710	630	10000	—	1750	6600▲	1500	100T

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 21—Single Grounded-Wye Connected Capacitor Banks Rated 26.4 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
150	50	1	3200	3200	‡	‡	3050	3200	2300	4000	5N
			3250	3250	‡	‡	3100	3200	2300	4050	5QR
			3200	3250	‡	‡	3050	3200	2300	4000	5 Std.
			3250	3250	‡	‡	3100	3200	2300	4050	6K
			3200	3200	‡	‡	3050	3200	2250	4000	6T
300	50	2	3200	3200	‡	‡	3000	3150	2250	3950	10N
			3200	3250	‡	‡	3050	3200	2300	4000	10QR
			3200	3250	‡	‡	3050	3200	2300	4000	7 Std.
			3250	3250	‡	‡	3100	3200	2300	4050	6K
			3200	3200	‡	‡	3050	3200	2250	4000	8T
	100	1	4050	4150	2950	10000	5000	5000	3800	5000	10N
			4100	4150	3000	10000	5000	5000	3900	5000	10QR
			4100	4100	3000	10000	5000	5000	3900	5000	7 Std.
			4100	4150	3000	10000	5000	5000	3900	5050	6K
			4100	4150	3000	10000	5000	5000	3850	5000	8T
450	50	3	3200	3200	‡	‡	3000	3150	2250	3950	10N
			3200	3250	‡	‡	3050	3200	2300	4000	15QR
			3200	3200	‡	‡	3050	3200	2250	4000	10 Std.
			3250	3250	‡	‡	3100	3200	2300	4050	8K
			3150	3150	‡	‡	2950	3150	2150	3950	10T
	150	1	4700	4800	6000	10000	5150	5250	6600	6000	10N
			4750	4800	6050	10000	5200	5250	6600	6000	15QR
			4750	4800	6000	10000	5150	5250	6600	6000	10 Std.
			4750	4800	6050	10000	5200	5250	6600	6000	8K
			4700	4800	6000	10000	5150	5250	6600	6000	10T
600	50	4	3200	3200	‡	‡	3000	3150	2250	3950	20N
			3200	3200	‡	‡	3050	3200	2200	4000	20QR
			3150	3150	‡	‡	2950	3100	2100	3950	15 Std.
			3200	3200	‡	‡	3050	3200	2250	4000	12K
			2950	2950	‡	‡	2750	2950	1850	3850	15T
	100	2	4050	4150	2950	10000	5000	5000	3800	5000	20N
			4100	4150	3000	10000	5000	5000	3900	5000	20QR
			4050	4150	2900	10000	5000	5000	3800	5000	15 Std.
			4100	4150	3000	10000	5000	5000	3850	5000	12K
			3950	4050	2800	10000	5000	5000	3600	4950	15T
	200	1	5300	5350	6000	10000	5100	5450	6600	6000	20N
			5350	5350	6050	10000	5150	5450	6600	6000	20QR
			5300	5350	6000	10000	5100	5450	6600	6000	15 Std.
			5350	5350	6050	10000	5150	5450	6600	6000	12K
			5250	5350	6000	10000	5050	5400	6600	6000	15T
750	50	5	3200	3200	‡	‡	3000	3150	2250	3950	20N
			3100	3100	‡	‡	2950	3100	2100	4000	25QR
			3050	3050	‡	‡	2850	3100	2000	3900	20 Std.
			3150	3200	‡	‡	3000	3150	2150	4000	15K
			2950	2950	‡	‡	2750	2950	1850	3850	15T
900	50	6	3200	3200	‡	‡	3000	3150	2250	3950	20N
			3100	3100	‡	‡	2950	3100	2100	4000	25QR
			3050	3050	‡	‡	2850	3100	2000	3900	20 Std.
			3100	3100	‡	‡	2900	3100	2050	3950	20K
			2750	2800	‡	‡	2600	2800	1400	3750	20T
	100	3	4050	4150	2950	10000	5000	5000	3800	5000	20N
			4050	4150	2900	10000	5000	5000	3800	5000	25QR
			4000	4100	2850	10000	5000	5000	3700	4950	20 Std.
			4050	4100	2900	10000	5000	5000	3750	5000	20K
			3850	3900	2650	10000	4950	5000	3350	4850	20T
	150	2	4700	4800	6000	10000	5150	5250	6600	6000	20N
			4750	4800	6050	10000	5200	5250	6600	6000	25QR
			4650	4800	6000	10000	5100	5250	6600	6000	20 Std.
			4700	4800	6050	10000	5200	5250	6600	6000	20K
			4500	4600	5900	10000	4900	5100	6600	6000	20T
	300	1	5950	5950	6000	10000	6000	6000	6600	6000	20N
			6000	5950	6050	10000	6000	6000	6600	6000	25QR
			5900	5950	6000	10000	6000	6000	6600	6000	20 Std.
			6000	5950	6050	10000	6000	6000	6600	6000	20K
			5800	5900	5900	10000	6000	6000	6600	6000	20T
1200	100	4	4050	4150	2950	10000	5000	5000	3800	5000	30N
			3950	4000	2750	10000	5000	5000	3550	4900	40QR
			3900	3900	2700	10000	4950	5000	3450	4850	30 Std.
			4000	4050	2800	10000	5000	5000	3650	4950	25K
			3600	3650	2300	10000	4800	5000	2800	4700	25T
	200	2	5300	5350	6000	10000	5100	5450	6600	6000	30N
			5250	5350	5950	10000	5050	5400	6600	6000	40QR
			5150	5300	5900	10000	4950	5300	6600	6000	30 Std.
			5300	5350	6000	10000	5100	5450	6600	6000	25K
			5000	5100	5800	10000	4750	5150	6600	6000	25T

TABLE CONTINUED ➔

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 21—Single Grounded-Wye Connected Capacitor Banks Rated 26.4 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
1350	150	3	4700 4600 4500 4500 4000	4800 4700 4600 4600 4100	6000 5950 5900 5950 5650	10000 10000 10000 10000 10000	5150 5000 4900 4900 4250	5250 5200 5100 5100 4500	6600 6600 6600 6600 6600	6000 6000 6000 6000 5700	40N 40QR 30 Std. 30K 30T
1500	100	5	3950 3800 3600 3700 2300	4050 3800 3650 3750 2150	2800 2600 2350 2350 610	10000 10000 10000 10000 10000	5000 4850 4800 4850 3800	5000 5000 5000 5000 4100	3600 3250 2900 2950 265	4950 4800 4700 4750 3950	45N 50QR 40 Std. 40K 40T
1800	100	6	3900 3800 3300 3300 2300	3950 3800 3350 3300 2150	2700 2600 1850 1850 610	10000 10000 10000 10000 10000	5000 4850 4550 4650 3800	5000 5000 4850 4950 4100	3500 3250 1000 1100 265	4900 4800 4500 4600 3950	50N 50QR 50 Std. 50K 40T
	150	4	4550 4400 4100 4100 3300	4650 4500 4200 4250 3450	5950 5850 5700 5750 5400	10000 10000 10000 10000 10000	4950 4800 4450 4550▲ 3450	5150 5000 4700 4750 3750	6600 6600 6600 6600 6600	6000 5950 5750 5800 5300	50N 50QR 50 Std. 50K 40T
	200	3	5200 5050 4900 4950 4350	5300 5200 5000 5050 4450	5950 5850 5700 5750 5400	10000 10000 10000 10000 10000	5000 4850 4550 4600 3750	5350 5250 5000 5050 4400	6600 6600 6600 6600 6600	6000 6000 6000 6000 5900	50N 50QR 50 Std. 50K 40T
	300	2	5850 5750 5500 5600 5100	5950 5850 5600 5700 5150	5950 5850 5700 5750 5400	10000 10000 10000 10000 10000	6000 6000 6000 6000 6000	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	50N 50QR 50 Std. 50K 40T
2250	150	5	4350 4300 3650 4100 465	4450 4400 3800 4250 740	5850 5800 5550 5750 4050	10000 10000 10000 10000 10000	4750 4700 3950▲ 4550 —	4950 4900 4200 4750 750	6600 6600 6600 6600 305▲	5900 5850 5500 5800 3650	65N 60QR 65 Std. 50K 65T
2400	200	4	5000 4500 4500 4550 2300	5100 4650 4700 4700 2200	5800 5500 5550 5550 4050	10000 10000 10000 10000 10000	4700 4150 4100 4150▲ —	5100 4650 4650 4700 1450	6600 6600 6600 6600 6600	6000 6000 6000 6000 4550	75N 75QR 65 Std. 65K 65T
2700	150	6	4300 3700 3650 3650 465	4400 3850 3800 3750 740	5800 5500 5550 5550 4050	10000 10000 10000 10000 10000	4700 3950 3950▲ 3950▲ —	4900 4200 4200 4200 750	6600 6600 6600 6600 305▲	5850 5450 5500 5550 3650	75N 75QR 65 Std. 65K 65T
	300	3	5650 5250 5300 5300 3400	5700 5300 5350 5400 3350	5800 5500 5550 5550 4050	10000 10000 10000 10000 10000	6000 6000 6000 6000 6000	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	75N 75QR 65 Std. 65K 65T
3000	200	5	4650 3850 3950 3700 2300	4800 4000 4150 3800 2200	5650 5150 5200 5000 4050	10000 10000 10000 10000 10000	4250 3150▲ 3300▲ 2650▲ —	4750 3900 4000 3650 1450	6600 6600 6600 6600 6600	6000 5650 5700 5500 4550	85N 100QR 80 Std. 80K 65T
3600	200	6	3800 3850 2650 3700 —	3950 4000 2650 3800 870	5100 5150 4300 5000 1550	10000 10000 10000 10000 10000	2950▲ 3150▲ — 2650▲ —	3800 3900 2000 3650 710	6600 6600 6600▲ 6600 6600	5600 5650 4800 5500 2950	95N 100QR 100 Std. 80K 80T
	300	4	4700 4750 3750 4550 1400	4750 4800 3700 4600 1450	5100 5150 4300 5000 1550	10000 10000 10000 10000 10000	6000 6000 6000▲ 6000 6000	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 4550	95N 100QR 100 Std. 80K 80T

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 22—Single Grounded-Wye Connected Capacitor Banks Rated 27.6 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
150	50	1	3200 3250 3200 3250 3200	3200 3250 3250 3250 3200	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3050 3100 3050 3100 3050	3200 3200 3200 3200 3200	2300 2300 2300 2300 2250	4000 4050 4000 4050 4000	5N 5QR 5 Std. 6K 6T
300	50	2	3200 3200 3200 3250 3200	3200 3250 3250 3250 3200	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 3050 3100 3050	3150 3200 3200 3200 3200	2250 2300 2300 2300 2250	3950 4000 4000 4050 4000	10N 10QR 7 Std. 6K 8T
	100	1	4050 4100 4100 4100 4100	4150 4150 4150 4150 4150	2950 3000 3000 3000 3000	10000 10000 10000 10000 10000	5000 5000 5000 5000 5000	5000 5000 5000 5000 5000	3800 3900 3900 3900 3850	5000 5000 5000 5050 5000	10N 10QR 7 Std. 6K 8T
450	50	3	3200 3200 3200 3250 3150	3200 3250 3200 3250 3150	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 3050 3100 2950	3150 3200 3200 3200 3150	2250 2300 2250 2300 2150	3950 4000 4000 4050 3950	10N 15QR 10 Std. 8K 10T
	150	1	4700 4750 4750 4750 4700	4800 4800 4800 4800 4800	6000 6050 6000 6050 6000	10000 10000 10000 10000 10000	5150 5200 5150 5200 5150	5250 5250 5250 5250 5250	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	10N 15QR 10 Std. 8K 10T
600	50	4	3200 3200 3150 3200 2950	3200 3200 3150 3200 2950	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 2950 3050 2750	3150 3200 3100 3200 2950	2250 2200 2100 2250 1850	3950 4000 3950 4000 3850	15N 20QR 15 Std. 12K 15T
	100	2	4050 4100 4050 4100 3950	4150 4150 4150 4150 4050	2950 3000 2900 3000 2800	10000 10000 10000 10000 10000	5000 5000 5000 5000 5000	5000 5000 5000 5000 5000	3800 3900 3800 3850 3600	5000 5000 5000 5000 4950	15N 20QR 15 Std. 12K 15T
	200	1	5300 5350 5300 5350 5250	5350 5350 5350 5350 5350	6000 6050 6000 6050 6000	10000 10000 10000 10000 10000	5100 5150 5100 5150 5050	5450 5450 5450 5450 5400	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	15N 20QR 15 Std. 12K 15T
750	50	5	3200 3100 3050 3150 2950	3200 3100 3050 3200 2950	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2950 2850 3000 2750	3150 3100 3100 3150 2950	2250 2100 2000 2150 1850	3950 4000 3900 4000 3850	20N 25QR 20 Std. 15K 15T
900	50	6	3200 3100 3050 3100 2750	3200 3100 3050 3100 2800	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2950 2850 2900 2600	3150 3100 3100 3100 2800	2250 2100 2000 2050 1400	3950 4000 3900 3950 3750	20N 25QR 20 Std. 20K 20T
	100	3	4050 4050 4000 4050 3850	4150 4150 4100 4100 3900	2950 2900 2850 2900 2650	10000 10000 10000 10000 10000	5000 5000 5000 5000 4950	5000 5000 5000 5000 5000	3800 3800 3700 3750 3350	5000 5000 4950 5000 4850	20N 25QR 20 Std. 20K 20T
	150	2	4700 4750 4650 4700 4500	4800 4800 4800 4800 4600	6000 6050 6000 6050 5900	10000 10000 10000 10000 10000	5150 5200 5100 5200 4900	5250 5250 5250 5250 5100	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	20N 25QR 20 Std. 20K 20T
	300	1	5950 6000 5900 6000 5800	5950 5950 5950 5950 5900	6000 6050 6000 6050 5900	10000 10000 10000 10000 10000	6000 6000 6000 6000 6000	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	20N 25QR 20 Std. 20K 20T
1200	100	4	4050 3950 3950 4000 3600	4150 4000 4050 4050 3650	2950 2750 2800 2800 2300	10000 10000 10000 10000 10000	5000 5000 5000 5000 4800	5000 5000 5000 5000 5000	3800 3550 3600 3650 2800	5000 4900 4900 4950 4700	30N 40QR 25 Std. 25K 25T
	200	2	5300 5250 5250 5300 5000	5350 5350 5350 5350 5100	6000 5950 5950 6000 5800	10000 10000 10000 10000 10000	5100 5050 5050 5100 4750	5450 5400 5400 5450 5150	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	30N 40QR 25 Std. 25K 25T

TABLE CONTINUED ➡

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 22—Single Grounded-Wye Connected Capacitor Banks Rated 27.6 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemcol (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
1350	150	3	4700 4600 4500 4650 4000	4800 4700 4600 4750 4100	6000 5950 5900 6000 5650	10000 10000 10000 10000 10000	5150 5000 4900 5100 4250	5250 5200 5100 5250 4500	6600 6600 6600 6600 6600	6000 6000 6000 6000 5700	30N 40QR 30 Std. 25K 30T
1500	100	5	3950 3950 3600 3850 3150	4050 4000 3650 3900 3100	2800 2750 2350 2650 1750	10000 10000 10000 10000 10000	5000 5000 4800 4950 4450	5000 5000 5000 5000 4750	3600 3550 2900 3400 630	4950 4900 4700 4850 4400	45N 40QR 40 Std. 30K 30T
1800	100	6	3900 3800 3300 3700 2300	3950 3800 3350 3750 2150	2700 2600 1850 2350 610	10000 10000 10000 10000 10000	5000 4850 4550 4850 3800	5000 5000 4850 5000 4100	3500 3250 1000 2950 265	4900 4800 4500 4750 3950	50N 50QR 50 Std. 40K 40T
	150	4	4550 4400 4100 4400 3300	4650 4500 4200 4450 3450	5950 5850 5700 5850 5400	10000 10000 10000 10000 10000	4950 4800 4450 4800 3450	5150 5000 4700 4950 3750	6600 6600 6600 6600 6600	6000 5950 5750 5900 5300	50N 50QR 50 Std. 40K 40T
	200	3	5200 5050 4900 5050 4350	5300 5200 5000 5200 4450	5950 5850 5700 5850 5400	10000 10000 10000 10000 10000	5000 4850 4550 4800 3750	5350 5250 5000 5200 4400	6600 6600 6600 6600 6600	6000 6000 6000 6000 5900	50N 50QR 50 Std. 40K 40T
	300	2	5850 5750 5500 5700 5100	5950 5850 5600 5800 5150	5950 5850 5700 5850 5400	10000 10000 10000 10000 10000	6000 6000 6000 6000 6000	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	50N 50QR 50 Std. 40K 40T
2250	150	5	4350 4300 3650 4100 2250	4450 4400 3800 4250 2300	5850 5800 5550 5750 4950	10000 10000 10000 10000 10000	4750 4700 3950▲ 4550 600▲	4950 4900 4200 4750 2250	6600 6600 6600 6600 6600	5900 5850 5500 5800 4750	65N 60QR 65 Std. 50K 50T
2400	200	4	5050 5000 4500 4950 2300	5200 5100 4700 5050 2200	5850 5800 5550 5750 4050	10000 10000 10000 10000 10000	4750 4700 4100 4600 —	5200 5150 4650 5050 1450	6600 6600 6600 6600 6600	6000 6000 6000 6000 4550	65N 60QR 65 Std. 50K 65T
2700	150	6	4300 3700 3650 3650 465	4400 3850 3800 3750 740	5800 5500 5550 5550 4050	10000 10000 10000 10000 10000	4700 3950 3950▲ 3950▲ —	4900 4200 4200 4200 750	6600 6600 6600 6600 305▲	5850 5450 5500 5550 3650	75N 75QR 65 Std. 65K 65T
	300	3	5650 5250 5300 5300 3400	5700 5300 5350 5400 3350	5800 5500 5550 5550 4050	10000 10000 10000 10000 10000	6000 6000 6000 6000 6000	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	75N 75QR 65 Std. 65K 65T
3000	200	5	4650 3850 3950 4550 2300	4800 4000 4150 4700 2200	5650 5150 5200 5550 4050	10000 10000 10000 10000 10000	4250 3150▲ 3300▲ 4150 —	4750 3900 4000 4700 1450	6600 6600 6600 6600 6600	6000 5650 5700 6000 4550	85N 100QR 80 Std. 65K 65T
3600	200	6	3800 3850 3950 3700 —	3950 4000 4150 3800 870	5100 5150 5200 5000 1550	10000 10000 10000 10000 10000	2950▲ 3150▲ 3300▲ 2650▲ —	3800 3900 4000 3650 710	6600 6600 6600 6600 6600	5600 5650 5700 5500 2950	95N 100QR 80 Std. 80K 80T
	300	4	4700 4750 4950 4550 1400	4750 4800 4900 4600 1450	5100 5150 5200 5000 1550	10000 10000 10000 10000 10000	6000 6000 6000 6000 6000	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 4550	95N 100QR 80 Std. 80K 80T

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 23—Single Grounded-Wye Connected Capacitor Banks Rated 34.5 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
150	50	1	3200 3250 3250 3250 3200	3200 3250 3250 3250 3200	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3050 3100 3100 3100 3050	3200 3200 3200 3200 3200	2300 2300 2300 2300 2250	4000 4050 4050 4050 4000	5N 3QR 3 Std. 6K 6T
300	50	2	3200 3200 3200 3250 3200	3200 3250 3250 3250 3200	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 3050 3100 3050	3150 3200 3200 3200 3200	2250 2300 2300 2300 2250	4000 4000 4000 4050 4000	8N 7QR 7 Std. 6K 6T
	100	1	4050 4100 4100 4100 4100	4150 4150 4150 4150 4150	3000 3000 3000 3000 3000	10000 10000 10000 10000 10000	5000 5000 5000 5000 5000	5000 5000 5000 5000 5000	3850 3900 3900 3900 3850	5000 5000 5000 5050 5000	8N 7QR 7 Std. 6K 6T
450	50	3	3200 3200 3200 3250 3200	3200 3250 3250 3250 3200	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 3050 3100 3050	3150 3200 3200 3200 3200	2250 2300 2300 2300 2250	3950 4000 4000 4050 4000	10N 10QR 7 Std. 8K 8T
	150	1	4700 4750 4750 4750 4750	4800 4800 4800 4800 4800	6000 6050 6050 6050 6050	10000 10000 10000 10000 10000	5150 5200 5200 5200 5200	5250 5250 5250 5250 5250	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	10N 10QR 7 Std. 8K 8T
600	50	4	3200 3200 3200 3250 3050	3200 3250 3200 3250 3100	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 3050 3100 2900	3150 3200 3200 3200 3100	2250 2300 2250 2300 2050	3950 4000 4000 4050 3950	15N 15QR 10 Std. 10K 12T
	100	2	4050 4100 4100 4100 4050	4150 4150 4150 4150 4100	2950 3000 3000 3000 2900	10000 10000 10000 10000 10000	5000 5000 5000 5000 5000	5000 5000 5000 5000 5000	3800 3900 3850 3900 3750	5000 5000 5000 5050 5000	15N 15QR 10 Std. 10K 12T
	200	1	5300 5350 5350 5400 5300	5350 5350 5350 5350 5350	6000 6050 6000 6050 6000	10000 10000 10000 10000 10000	5100 5150 5150 5200 5100	5450 5450 5450 5450 5450	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	15N 15QR 10 Std. 10K 12T
750	50	5	3200 3200 3150 3200 2950	3200 3200 3150 3200 2950	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 2950 3050 2750	3150 3200 3100 3200 2950	2250 2200 2100 2250 1850	3950 4000 3950 4000 3850	15N 20QR 15 Std. 12K 15T
900	50	6	3200 3200 3150 3200 2950	3200 3200 3150 3200 2950	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 2950 3050 2750	3150 3200 3100 3200 2950	2250 2200 2100 2250 1850	3950 4000 3950 4000 3850	20N 20QR 15 Std. 12K 15T
	100	3	4050 4100 4050 4100 3950	4150 4150 4150 4150 4050	2950 3000 2900 3000 2800	10000 10000 10000 10000 10000	5000 5000 5000 5000 5000	5000 5000 5000 5000 5000	3800 3900 3800 3850 3600	5000 5000 5000 5000 4950	20N 20QR 15 Std. 12K 15T
	150	2	4700 4750 4700 4750 4600	4800 4800 4800 4800 4750	6000 6050 6000 6050 6000	10000 10000 10000 10000 10000	5150 5200 5150 5200 5050	5250 5250 5250 5250 5200	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	20N 20QR 15 Std. 12K 15T
	300	1	5950 6000 5950 6000 5950	5950 5950 5950 5950 5950	6000 6050 6000 6050 6000	10000 10000 10000 10000 10000	6000 6000 6000 6000 6000	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	20N 20QR 15 Std. 12K 15T
1200	100	4	4050 4050 4000 4050 3850	4150 4150 4100 4100 3900	2950 2900 2850 2900 2650	10000 10000 10000 10000 10000	5000 5000 5000 5000 4950	5000 5000 5000 5000 5000	3800 3800 3700 3750 3350	5000 5000 4950 5000 4850	20N 25QR 20 Std. 20K 20T
	200	2	5300 5350 5300 5350 5150	5350 5350 5350 5350 5300	6000 6050 6000 6050 5900	10000 10000 10000 10000 10000	5100 5150 5100 5150 4950	5450 5450 5450 5450 5300	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	20N 25QR 20 Std. 20K 20T

TABLE CONTINUED ➔

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 23—Single Grounded-Wye Connected Capacitor Banks Rated 34.5 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
1350	150	3	4700	4800	6000	10000	5150	5250	6600	6000	25N
			4650	4750	6000	10000	5100	5250	6600	6000	30QR
			4600	4700	5950	10000	5050	5200	6600	6000	25 Std.
			4700	4800	6050	10000	5200	5250	6600	6000	20K
			4300	4400	5800	10000	4700	4900	6600	5850	25T
1500	100	5	4050	4150	2950	10000	5000	5000	3800	5000	30N
			3950	4000	2750	10000	5000	5000	3550	4900	40QR
			3950	4050	2800	10000	5000	5000	3600	4900	25 Std.
			4000	4050	2800	10000	5000	5000	3650	4950	25K
			3600	3650	2300	10000	4800	5000	2800	4700	25T
1800	100	6	4050	4150	2950	10000	5000	5000	3800	5000	40N
			3950	4000	2750	10000	5000	5000	3550	4900	40QR
			3900	3900	2700	10000	4950	5000	3450	4850	30 Std.
			3850	3900	2650	10000	4950	5000	3400	4850	30K
			3150	3100	1750	10000	4450	4750	630	4400	30T
	150	4	4700	4800	6000	10000	5150	5250	6600	6000	40N
			4600	4700	5950	10000	5000	5200	6600	6000	40QR
			4500	4600	5900	10000	4900	5100	6600	6000	30 Std.
			4500	4600	5950	10000	4900	5100	6600	6000	30K
			4000	4100	5650	10000	4250	4500	6600	5700	30T
	200	3	5300	5350	6000	10000	5100	5450	6600	6000	40N
			5250	5350	5950	10000	5050	5400	6600	6000	40QR
			5150	5300	5900	10000	4950	5300	6600	6000	30 Std.
			5150	5300	5950	10000	4950	5350	6600	6000	30K
			4800	4900	5650	10000	4400	4850	6600	6000	30T
	300	2	5950	5950	6000	10000	6000	6000	6600	6000	40N
			5900	5950	5950	10000	6000	6000	6600	6000	40QR
			5800	5900	5900	10000	6000	6000	6600	6000	30 Std.
			5850	5900	5950	10000	6000	6000	6600	6000	30K
			5450	5550	5650	10000	6000	6000	6600	6000	30T
2250	150	5	4550	4650	5950	10000	4950	5150	6600	6000	50N
			4400	4500	5850	10000	4800	5000	6600	5950	50QR
			4100	4200	5700	10000	4450	4700	6600	5750	50 Std.
			4400	4450	5850	10000	4800	4950	6600	5900	40K
			3300	3450	5400	10000	3450	3750	6600	5300	40T
2400	200	4	5200	5300	5950	10000	5000	5350	6600	6000	50N
			5000	5100	5800	10000	4700	5150	6600	6000	60QR
			4900	5000	5700	10000	4550	5000	6600	6000	50 Std.
			4950	5050	5750	10000	4600	5050	6600	6000	50K
			3650	3750	4950	10000	2150▲	3550	6600	5450	50T
2700	150	6	4350	4450	5850	10000	4750	4950	6600	5900	65N
			4300	4400	5800	10000	4700	4900	6600	5850	60QR
			3650	3800	5550	10000	3950▲	4200	6600	5500	65 Std.
			4100	4250	5750	10000	4550	4750	6600	5800	50K
			2250	2300	4950	10000	600▲	2250	6600	4750	50T
	300	3	5700	5800	5850	10000	6000	6000	6600	6000	65N
			5650	5750	5800	10000	6000	6000	6600	6000	60QR
			5300	5350	5550	10000	6000	6000	6600	6000	65 Std.
			5600	5700	5750	10000	6000	6000	6600	6000	50K
			4500	4550	4950	10000	6000	6000	6600	6000	50T
3000	200	5	5050	5200	5850	10000	4750	5200	6600	6000	65N
			5000	5100	5800	10000	4700	5150	6600	6000	60QR
			4500	4700	5550	10000	4100▲	4650	6600	6000	65 Std.
			4950	5050	5750	10000	4600	5050	6600	6000	50K
			2300	2200	4050	10000	—	1450	6600	4550	65T
3600	200	6	5000	5100	5800	10000	4700	5100	6600	6000	75N
			4500	4650	5500	10000	4150	4650	6600	6000	75QR
			4500	4700	5550	10000	4100	4650	6600	6000	65 Std.
			4550	4700	5550	10000	4150▲	4700	6600	6000	65K
			2300	2200	4050	10000	—	1450	6600	4550	65T
	300	4	5650	5700	5800	10000	6000	6000	6600	6000	75N
			5250	5300	5500	10000	6000	6000	6600	6000	75QR
			5300	5350	5550	10000	6000	6000	6600	6000	65 Std.
			5300	5400	5550	10000	6000	6000	6600	6000	65K
			3400	3350	4050	10000	6000	6000	6600	6000	65T

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 24—Single Delta Connected Capacitor Banks Rated 2.4 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
150	50	1	2950 2700 2450 2400 470	3000 2750 2450 2450 540	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2800▲ 2500▲ 2200▲ 2150▲ —	3000 2750 2550 2550 930	1850 1200▲ 770▲ 780▲ —	3850 3700 3550 3650 2400	45N 50QR 40 Std. 40K 40T
300	50	2	810 — — —	730 — 355 —	‡ ‡ ‡ ‡	‡ ‡ ‡ ‡	— — — —	1300 550 680 480	— — — —	2850 1350 1700 —	85N 100QR 80 Std. 80K
	100	1	2800 1500▲ 1600▲ 1100▲ —	2750 1300▲ 1500▲ 1050▲ —	3100 2250 2350 1850 —	10000 10000 10000 10000 10000	4300▲ 3150▲ 3300▲ 2800▲ —	4550 3300▲ 3550▲ 2800▲ —	265▲ — — — —	4250 3500 3600 3250 —	85N 100QR 80 Std. 80K 80T
450	150	1	— — — — —	— — — — —	5700 5800 5650 3700 —	10000 10000 10000 9350▲ 3000▲	— — — — —	— — — — —	— — — — —	— 720▲ — — —	125N 150QR 125 Std. 140K 140T
600	100	2	— — — — —	— — — — —	— — — — —	10000 9400 10000 9350 3000	— — — — —	— — — — —	— — — — —	— — — — —	125N 175QR 125 Std. 140K 140T
	200	1	— — — — —	— — — — —	5700 4300 5650 3700▲ —	10000 9400 10000 9350▲ 3000▲	— — — — —	— — — — —	6600▲ 6600▲ 6600▲ 6600▲ —	2800▲ 540▲ 2600▲ — —	125N 175QR 125 Std. 140K 140T
900	100	3	—	—	—	7250	—	—	—	—	200 Std.
	150	2	—	—	—	7250▲	—	—	—	—	200 Std.
	300	1	— —	— —	— —	7250▲ —	— —	— —	6600▲ 6600▲	— —	200 Std. 200K

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 25—Single Delta Connected Capacitor Banks Rated 4.16 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemcol (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
150	50	1	3200	3200	‡	‡	3000	3150	2250	3950	20N
			3100	3100	‡	‡	2950	3100	2100	4000	25QR
			3050	3050	‡	‡	2850	3100	2000	3900	20 Std.
			3100	3100	‡	‡	2900	3100	2050	3950	20K
			2750	2800	‡	‡	2600	2800	1400	3750	20T
300	50	2	2850	2900	‡	‡	2700▲	2900	1550	3800	50N
			2700	2750	‡	‡	2500▲	2750	1200	3700	50QR
			1750	1700	‡	‡	590▲	2050	360	3250	50 Std.
			1700	1650	‡	‡	890▲	2000	365	3250	50K
			470	540	‡	‡	—	930	—	2400	40T
	100	1	3900	3950	4000	10000	5000	5000	3500	4900	50N
			3800	3800	3900	10000	4850	5000	3250	4800	50QR
			3300	3350	3550	10000	4550▲	4850	1000▲	4500	50 Std.
			3300	3300	3550	10000	4650▲	4950	1100▲	4600	50K
			2300	2150	2750	10000	3800▲	4100	265▲	3950	40T
450	50	3	2200	2200	‡	‡	1850▲	2350	460	3500	75N
			700	680	‡	‡	—	1200	—	2800	75QR
			820	720	‡	‡	—	1300	—	2800	65 Std.
			810	720	‡	‡	—	1300	—	2750	65K
			—	—	‡	‡	—	270	—	—	65T
	150	1	4300	4400	8000	10000	4700▲	4900	6600	5850	75N
			3700	3850	7750	10000	3950▲	4200	6600	5450	75QR
			3650	3800	7800	10000	3950▲	4200	6600	5500	65 Std.
			3650	3750	7800	10000	3950▲	4200	6600▲	5550	65K
			465	740	6750	10000	—	750	305▲	3650	65T
600	50	4	—	—	‡	‡	—	445	—	—	95N
			—	—	‡	‡	—	550	—	1350	100QR
			—	—	‡	‡	—	480	—	—	80K
	100	2	1300	1200	2050	10000	3050▲	3100	—	3400	95N
			1500	1300	2250	10000	3150▲	3300	—	3500	100QR
			—	—	—	10000	—	—	—	2000	100 Std.
			1100	1050	1850	10000	2800▲	2800	—	3250	80K
			—	—	—	10000	—	—	—	—	80T
	200	1	3800▲	3950▲	7550	10000	2950▲	3800	6600▲	5600	95N
			3850	4000	7600	10000	3150▲	3900	6600	5650	100QR
			2650▲	2650▲	7000	10000	—	2000▲	6600▲	4800	100 Std.
			3700	3800	7500	10000	2650▲	3650	6600	5500	80K
			—	870	5850	10000	—	710	6600▲	2950	80T
900	100	3	—	—	—	10000	—	—	—	—	125N
			—	—	—	10000	—	—	—	—	150QR
			—	—	—	10000	—	—	—	—	125 Std.
			—	—	—	9350	—	—	—	—	140K
			—	—	—	3000	—	—	—	—	140T
	150	2	—	—	5700	10000	—	—	—	—	125N
			—	—	5800	10000	—	—	—	720	150QR
			—	—	5650	10000	—	—	—	—	125 Std.
			—	—	3700	9350	—	—	—	—	140K
			—	—	—	3000	—	—	—	—	140T
	300	1	—	1100▲	5700	10000	6000▲	6000▲	6600▲	4200	125N
			1250▲	1400▲	5800	10000	6000▲	6000▲	6600▲	4450	150QR
			—	940▲	5650	10000	6000▲	6000▲	6600▲	4150	125 Std.
			—	—	3700▲	9350▲	—	—	6600▲	—	140K
			—	—	—	3000▲	—	—	—	—	140T
1200	100	4	—	—	—	9250	—	—	—	—	150N
			—	—	—	9250	—	—	—	—	150 Std.
			—	—	—	9350	—	—	—	—	140K
			—	—	—	3000	—	—	—	—	140T
	200	2	—	—	3700	9250	—	—	6600▲	—	150N
			—	—	3700	9250	—	—	6600▲	—	150 Std.
			—	—	3700	9350	—	—	6600▲	—	140K
			—	—	—	3000	—	—	—	—	140T
1350	150	3	—	—	—	7250	—	—	—	—	200 Std.
1500	100	5	—	—	—	7250	—	—	—	—	200 Std.

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 26—Single Delta Connected Capacitor Banks Rated 4.8 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemcol (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
150	50	1	3200	3200	‡	‡	3000	3150	2250	3950	20N
			3100	3100	‡	‡	2950	3100	2100	4000	25QR
			3050	3050	‡	‡	2850	3100	2000	3900	20 Std.
			3150	3200	‡	‡	3000	3150	2150	4000	15K
			2750	2800	‡	‡	2600	2800	1400	3750	20T
300	50	2	2950	3000	‡	‡	2800	3000	1850	3850	45N
			2700	2750	‡	‡	2500	2750	1200	3700	50QR
			2450	2450	‡	‡	2200	2550	770	3550	40 Std.
			2400	2450	‡	‡	2150	2550	780	3650	40K
			470	540	‡	‡	—	930	—	2400	40T
	100	1	3950	4050	4000	10000	5000	5000	3600	4950	45N
			3800	3800	3900	10000	4850	5000	3250	4800	50QR
			3600	3650	3800	10000	4800	5000	2900	4700	40 Std.
			3700	3750	3850	10000	4850	5000	2950	4750	40K
			2300	2150	2750	10000	3800▲	4100	265▲	3950	40T
450	50	3	2200	2200	‡	‡	1850▲	2350	460	3500	75N
			700	680	‡	‡	—	1200	—	2800	75QR
			820	720	‡	‡	—	1300	—	2800	65 Std.
			810	720	‡	‡	—	1300	—	2750	65K
			—	—	‡	‡	—	270	—	—	65T
	150	1	4300	4400	8000	10000	4700▲	4900	6600▲	5850	75N
			3700	3850	7750	10000	3950▲	4200	6600	5450	75QR
			3650	3800	7800	10000	3950▲	4200	6600▲	5500	65 Std.
			3650	3750	7800	10000	3950▲	4200	6600▲	5550	65K
			465▲	740	6750	10000	—	750	305▲	3650	65T
600	50	4	810	730	‡	‡	—	1300	—	2850	85N
			—	—	‡	‡	—	550	—	1350	100QR
			—	355	‡	‡	—	680	—	1700	80 Std.
			—	—	‡	‡	—	480	—	—	80K
	100	2	2800	2750	3100	10000	4300▲	4550	265▲	4250	85N
			1500	1300	2250	10000	3150▲	3300	—	3500	100QR
			1600	1500	2350	10000	3300▲	3550	—	3600	80 Std.
			1100	1050	1850	10000	2800▲	2800	—	3250	80K
			—	—	—	10000	—	—	—	—	80T
	200	1	4650	4800	7850	10000	4250▲	4750	6600	6000	85N
			3850	4000	7600	10000	3150▲	3900▲	6600▲	5650	100QR
			3950	4150	7500	10000	3300▲	4000	6600▲	5700	80 Std.
			3700	3800	7500	10000	2650▲	3650▲	6600▲	5500	80K
			—	870	5850	10000	—	710▲	6600▲	2950	80T
900	100	3	—	—	—	10000	—	—	—	—	125N
			—	—	—	10000	—	—	—	—	150QR
			—	—	—	10000	—	—	—	—	125 Std.
			—	—	—	9350	—	—	—	—	140K
			—	—	—	3000	—	—	—	—	140T
	150	2	—	—	5700	10000	—	—	—	—	125N
			—	—	5800	10000	—	—	—	720	150QR
			—	—	5650	10000	—	—	—	—	125 Std.
			—	—	3700	9350	—	—	—	—	140K
			—	—	—	3000	—	—	—	—	140T
	300	1	—	1100▲	5700	10000	6000▲	6000▲	6600▲	4200	125N
			1250▲	1400▲	5800	10000	6000▲	6000▲	6600▲	4450	150QR
			—	940▲	5650	10000	6000▲	6000▲	6600▲	4150	125 Std.
			—	—	3700	9350▲	—	—	6600▲	—	140K
			—	—	—	3000▲	—	—	—	—	140T

TABLE CONTINUED ➜

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 26—Single Delta Connected Capacitor Banks Rated 4.8 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
1200	100	4	—	—	—	10000	—	—	—	—	125N
			—	—	—	9400	—	—	—	—	175QR
			—	—	—	10000	—	—	—	—	125 Std.
			—	—	—	9350	—	—	—	—	140K
			—	—	—	3000	—	—	—	—	140T
	200	2	—	—	5700	10000	—	—	6600▲	2800	125N
			—	—	4300	9400	—	—	6600▲	540	175QR
			—	—	5650	10000	—	—	6600▲	2600	125 Std.
			—	—	3700	9350	—	—	6600▲	—	140K
			—	—	—	3000	—	—	—	—	140T
1350	150	3	—	—	—	9250	—	—	—	—	150N
			—	—	—	9250	—	—	—	—	150 Std.
			—	—	—	9350	—	—	—	—	140K
			—	—	—	3000	—	—	—	—	140T
1500	100	5	—	—	—	9250	—	—	—	—	150N
			—	—	—	9250	—	—	—	—	150 Std.
1800	100	6	—	—	—	7250	—	—	—	—	200 Std.
	150	4	—	—	—	7250	—	—	—	—	200 Std.
	200	3	—	—	—	7250	—	—	—	—	200 Std.
	300	2	—	—	—	7250▲	—	—	6600▲	—	200 Std.
			—	—	—	—	—	—	6600▲	—	200K

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 27—Single Delta Connected Capacitor Banks Rated 7.2 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
150	50	1	3200 3200 3150 3250 3050	3200 3250 3150 3250 3100	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 2950 3100 2900	3150 3200 3100 3200 3100	2250 2300 2100 2300 2050	3950 4000 3950 4050 3950	15N 15QR 15 Std. 10K 12T
300	50	2	3200 3000 2950 3100 2350	3200 3050 3000 3100 2350	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2850 2800 2900 2100	3150 3000 3000 3100 2450	2200 1950 1900 2050 690	3950 3900 3850 3950 3550	25N 30QR 25 Std. 20K 25T
	100	1	4050 4000 3950 4050 3600	4150 4050 4050 4100 3650	4000 4000 4000 4000 3800	10000 10000 10000 10000 10000	5000 5000 5000 5000 4800	5000 5000 5000 5000 5000	3800 3650 3600 3750 2800	5000 4950 4900 5000 4700	25N 30QR 25 Std. 20K 25T
450	50	3	2950 2700 2450 2400 470	3000 2750 2450 2450 540	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2800 2500 2200 2150 —	3000 2750 2550 2550 930	1850 1200 770 780 —	3850 3700 3550 3650 2400	45N 50QR 40 Std. 40K 40T
	150	1	4650 4400 4300 4400 3300	4750 4500 4400 4450 3450	8150 8050 8000 8050 7650	10000 10000 10000 10000 10000	5050 4800 4700 4800 3450▲	5200 5000 4900 4950 3750	6600 6600 6600 6600 6600	6000 5950 5850 5900 5300	45N 50QR 40 Std. 40K 40T
600	50	4	2550 2250 820 1700 —	2550 2250 720 1650 325	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2350 2000 — 890 —	2650 2400 1300 2000 520	1050 560 — 365 —	3600 3550 2800 3250 480	65N 60QR 65 Std. 50K 50T
	100	2	3700 3550 2700 3300 770	3700 3600 2700 3300 870	3850 3750 3100 3550 1600	10000 10000 10000 10000 10000	4800 4800 4150▲ 4650▲ 2550▲	5000 5000 4400 4950 2500	3050 2650 265▲ 1100▲ —	4750 4700 4200 4600 3250	65N 60QR 65 Std. 50K 50T
	200	1	5050 5000 4500 4950 3650	5200 5100 4700 5050 3750	8050 8000 7800 7950 7350	10000 10000 10000 10000 10000	4750▲ 4700▲ 4100▲ 4600▲ 2150▲	5200 5150 4650 5050 3550	6600 6600 6600 6600 6600	6000 6000 6000 6000 5450	65N 60QR 65 Std. 50K 50T
750	50	5	2200 700 820 810 —	2200 680 720 720 —	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	1850 — — — —	2350 1200 1300 1300 270	460 — — — —	3500 2800 2800 2750 —	75N 75QR 65 Std. 65K 65T
900	50	6	810 — — —	730 — 355 —	‡ ‡ ‡ ‡	‡ ‡ ‡ ‡	— — — —	1300 550 680 480	— — — —	2850 1350 1700 —	85N 100QR 80 Std. 80K
	100	3	2800 1500 1600 1100 —	2750 1300 1500 1050 —	3100 2250 2350 1850 —	10000 10000 10000 10000 10000	4300▲ 3150▲ 3300▲ 2800▲ —	4550 3300 3550 2800 —	265▲ — — — —	4250 3500 3600 3250 —	85N 100QR 80 Std. 80K 80T
	150	2	3750 2750 2900 2450 —	3950 2900 3050 2600 340	7850 7600 7500 7500 5850	10000 10000 10000 10000 10000	4050▲ 2750▲ 2900▲ 2050▲ —	4300 3000 3150 2550 —	6600 6600▲ 6600▲ 6600▲ —	5600 5000 5100 4800 1050	85N 100QR 80 Std. 80K 80T
	300	1	5400 4750 4950 4550 1400	5450 4800 4900 4600 1450	7850 7600 7500 7500 5850	10000 10000 10000 10000 10000	6000▲ 6000▲ 6000▲ 6000▲ 8000▲	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 4550	85N 100QR 80 Std. 80K 80T

TABLE CONTINUED ➔

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 27—Single Delta Connected Capacitor Banks Rated 7.2 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
1200	100	4	— — — — —	— — — — —	— — — — —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	2250 — — — —	100N 125QR 125 Std. 140K 140T
	200	2	2950▲ 2100▲ — — —	2900▲ 1900 — — —	7100 6700 5650 3700 3900	10000 10000 10000 9350 10000	— — — — —	2400▲ 1350 — — —	6600▲ 6600▲ 6600▲ 6600▲ 6600▲	4950 4500 2600 — 710	100N 125QR 125 Std. 140K 100T
1350	150	3	— — — — —	— — — — —	5700 5800 5650 3700 —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	— 720 — — —	125N 150QR 125 Std. 140K 140T
1500	100	5	— — — — —	— — — — —	— — — — —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	— — — — —	125N 150QR 125 Std. 140K 140T
1800	100	6	— — — — —	— — — — —	— — — — —	10000 9400 10000 9350 3000	— — — — —	— — — — —	— — — — —	— — — — —	125N 175QR 125 Std. 140K 140T
	150	4	— — — — —	— — — — —	5700 4300 5650 3700 —	10000 9400 10000 9350 3000	— — — — —	— — — — —	— — — — —	— — — — —	125N 175QR 125 Std. 140K 140T
	200	3	— — — — —	— — — — —	5700 4300 5650 3700 —	10000 9400 10000 9350 3000	— — — — —	— — — — —	6600▲ 6600▲ 6600▲ 6600▲ —	2800 540 2600 — —	125N 175QR 125 Std. 140K 140T
	300	2	— — — — —	1100▲ 610▲ 940▲ — —	5700 4300 5650 3700 —	10000 9400 10000 9350 3000	6000▲ — 6000▲ — —	6000▲ 1600▲ 6000▲ — —	6600▲ 6600▲ 6600▲ 6600▲ —	4200 1450 4150 — —	125N 175QR 125 Std. 140K 140T
2250	150	5	— —	— —	— —	9250 9250	— —	— —	— —	— —	150N 150 Std.
2400	200	4	—	—	—	7250	—	—	—	—	200 Std.
2700	150	6	—	—	—	7250	—	—	—	—	200 Std.
	300	3	— —	— —	— —	7250 —	— —	— —	6600▲ 6600▲	— —	200 Std. 200K

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 28—Single Delta Connected Capacitor Banks Rated 8.32 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemcol (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
150	50	1	3200 3200 3200 3250 3150	3200 3250 3200 3250 3150	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 3050 3100 2950	3150 3200 3200 3200 3150	2250 2300 2250 2300 2150	3950 4000 4000 4050 3950	10N 15QR 10 Std. 8K 10T
300	50	2	3200 3100 3050 3100 2750	3200 3100 3050 3100 2800	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2950 2850 2900 2600	3150 3100 3100 3100 2800	2250 2100 2000 2050 1400	3950 4000 3900 3950 3750	20N 25QR 20 Std. 20K 20T
	100	1	4050 4050 4000 4050 3850	4150 4150 4100 4100 3900	4000 4000 4000 4000 3950	10000 10000 10000 10000 10000	5000 5000 5000 5000 4950	5000 5000 5000 5000 5000	3800 3800 3700 3750 3350	5000 5000 4950 5000 4850	20N 25QR 20 Std. 20K 20T
450	50	3	3150 2900 2850 2750 1600	3150 2950 2850 2800 1450	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2950 2750 2650 2600 —	3150 2950 2900 2850 1950	2100 1700 1550 1450 330	3950 3850 3800 3750 3150	40N 40QR 30 Std. 30K 30T
	150	1	4700 4600 4500 4500 4000	4800 4700 4600 4600 4100	8150 8150 8100 8100 7900	10000 10000 10000 10000 10000	5150 5000 4900 4900 4250	5250 5200 5100 5100 4500	6600 6600 6600 6600 6600	6000 6000 6000 6000 5700	40N 40QR 30 Std. 30K 30T
600	50	4	2850 2700 1750 1700 470	2900 2750 1700 1650 540	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2700 2500 590 890 —	2900 2750 2050 2000 930	1550 1200 360 365 —	3800 3700 3250 3250 2400	50N 50QR 50 Std. 50K 40T
	100	2	3900 3800 3300 3300 2300	3950 3800 3350 3300 2150	4000 3900 3550 3550 2750	10000 10000 10000 10000 10000	5000 4850 4550▲ 4650▲ 3800	5000 5000 4850 4950 4100	3500 3250 1000▲ 1100▲ 265	4900 4800 4500 4600 3950	50N 50QR 50 Std. 50K 40T
	200	1	5200 5050 4900 4950 4350	5300 5200 5000 5050 4450	8100 8050 7900 7950 7650	10000 10000 10000 10000 10000	5000 4850 4550▲ 4600▲ 3750▲	5350 5250 5000 5050 4400	6600 6600 6600 6600 6600	6000 6000 6000 6000 5900	50N 50QR 50 Std. 50K 40T
750	50	5	2550 2250 820 1700 —	2550 2250 720 1650 —	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2350 2000 — 890 —	2650 2400 1300 2000 270	1050 560 — 365 —	3600 3550 2800 3250 —	65N 60QR 65 Std. 50K 65T
900	50	6	2200 700 820 810 —	2200 680 720 720 —	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	1850 — — — —	2350 1200 1300 1300 270	460 — — — —	3500 2800 2800 2750 —	75N 75QR 65 Std. 65K 65T
	100	3	3550 2750 2700 2700 —	3600 2700 2700 2700 430	3750 3100 3100 3050 405	10000 10000 10000 10000 10000	4800 4150 4150▲ 4150▲ —	5000 4400 4400 4400 455	2600 365 265▲ — —	4700 4200 4200 4200 1300	75N 75QR 65 Std. 65K 65T
	150	2	4300 3700 3650 3650 465	4400 3850 3800 3750 740	8000 7750 7800 7800 6750	10000 10000 10000 10000 10000	4700▲ 3950 3950▲ 3950▲ —	4900 4200 4200 4200 750	6600 6600 6600 6600▲ 305▲	5850 5450 5500 5550 3650	75N 75QR 65 Std. 65K 65T
	300	1	5650 5250 5300 5300 3400	5700 5300 5350 5400 3350	8000 7750 7800 7800 6750	10000 10000 10000 10000 10000	6000 6000 6000 6000▲ 6000▲	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	75N 75QR 65 Std. 65K 65T

TABLE CONTINUED ➡

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 28—Single Delta Connected Capacitor Banks Rated 8.32 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
1200	100	4	1300	1200	2050	10000	3050▲	3100	—	3400	95N
			1500	1300	2250	10000	3150▲	3300	—	3500	100QR
			—	—	—	10000	—	—	—	2000	100 Std.
			1100	1050	1850	10000	2800▲	2800	—	3250	80K
			—	—	—	10000	—	—	—	—	80T
	200	2	3800	3950	7550	10000	2950▲	3800	6600▲	5600	95N
			3850	4000	7600	10000	3150▲	3900	6600	5650	100QR
			2650▲	2650	7000	10000	—	2000	6600▲	4800	100 Std.
			3700	3800	7500	10000	2650▲	3650	6600	5500	80K
			—	870	5850	10000	—	710	6600▲	2950	80T
1350	150	3	—	900	7100	10000	—	1000	6500▲	4150	100N
			—	560	6700	10000	—	480	—	3550	125QR
			—	—	5650	10000	—	—	—	—	125 Std.
			—	—	3700	9350	—	—	—	—	140K
			—	—	3900	10000	—	—	—	—	100T
1500	100	5	—	—	—	10000	—	—	—	2250	100N
			—	—	—	10000	—	—	—	—	150QR
			—	—	—	10000	—	—	—	—	125 Std.
			—	—	—	9350	—	—	—	—	140K
			—	—	—	3000	—	—	—	—	140T
1800	100	6	—	—	—	10000	—	—	—	—	125N
			—	—	—	10000	—	—	—	—	150QR
			—	—	—	10000	—	—	—	—	125 Std.
			—	—	—	9350	—	—	—	—	140K
			—	—	—	3000	—	—	—	—	140T
	150	4	—	—	5700	10000	—	—	—	—	125N
			—	—	5800	10000	—	—	—	720	150QR
			—	—	5650	10000	—	—	—	—	125 Std.
			—	—	3700	9350	—	—	—	—	140K
			—	—	—	3000	—	—	—	—	140T
	200	3	—	—	5700	10000	—	—	6600▲	2800	125N
			—	750	5800	10000	—	590▲	6600▲	3000	150QR
			—	—	5650	10000	—	—	6600▲	2600	125 Std.
			—	—	3700	9350	—	—	6600▲	—	140K
			—	—	—	3000	—	—	—	—	140T
	300	2	—	1100▲	5700	10000	6000▲	6000▲	6600▲	4200	125N
			1250	1400▲	5800	10000	6000▲	6000▲	6600▲	4450	150QR
			—	940▲	5650	10000	6000▲	6000▲	6600▲	4150	125 Std.
			—	—	3700	9350	—	—	6600▲	—	140K
			—	—	—	3000	—	—	—	—	140T
2250	150	5	—	—	3700	9250	—	—	—	—	150N
			—	—	920	8400	—	—	—	—	200QR
			—	—	3700	9250	—	—	—	—	150 Std.
			—	—	3700	9350	—	—	—	—	140K
			—	—	—	3000	—	—	—	—	140T
2400	200	4	—	—	—	9250	—	—	6600▲	—	150N
			—	—	—	9250	—	—	6600▲	—	150 Std.
			—	—	—	9350	—	—	6600▲	—	140K
			—	—	—	3000	—	—	—	—	140T
2700	150	6	—	—	—	7250	—	—	—	—	200 Std.
	300	3	—	—	—	7250	—	—	6600▲	—	200 Std.
			—	—	—	—	—	—	6600▲	—	200K
3000	200	5	—	—	—	7250	—	—	—	—	200 Std.

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 29—Single Delta Connected Capacitor Banks Rated 12.47 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemcol (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
150	50	1	3200 3200 3200 3250 3200	3200 3250 3250 3250 3200	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 3050 3100 3050	3150 3200 3200 3200 3200	2250 2300 2300 2300 2250	3950 4000 4000 4050 4000	10N 10QR 7 Std. 6K 8T
300	50	2	3200 3200 3150 3200 2950	3200 3200 3150 3200 2950	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 2950 3050 2750	3150 3200 3100 3200 2950	2250 2200 2100 2250 1850	3950 4000 3950 4000 3850	20N 20QR 15 Std. 12K 15T
	100	1	4050 4100 4050 4100 3950	4150 4150 4150 4150 4050	2950 3000 2900 3000 2800	10000 10000 10000 10000 10000	5000 5000 5000 5000 5000	5000 5000 5000 5000 5000	3800 3900 3800 3850 3600	5000 5000 5000 5000 4950	20N 20QR 15 Std. 12K 15T
450	50	3	3200 3100 3050 3100 2750	3200 3100 3050 3100 2800	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2950 2850 2900 2600	3150 3100 3100 3100 2800	2250 2100 2000 2050 1400	3950 4000 3900 3950 3750	20N 25QR 20 Std. 20K 20T
	150	1	4700 4750 4650 4700 4500	4800 4800 4800 4800 4600	6000 6050 6000 6050 5900	10000 10000 10000 10000 10000	5150 5200 5100 5200 4900	5250 5250 5250 5250 5100	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	20N 25QR 20 Std. 20K 20T
600	50	4	3200 2900 2850 2950 2350	3200 2950 2850 3000 2350	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2750 2650 2800 2100	3150 2950 2900 3000 2450	2150 1700 1550 1850 690	3950 3850 3800 3900 3550	30N 40QR 30 Std. 25K 25T
	100	2	4050 3950 3900 4000 3600	4150 4000 3900 4050 3650	2950 2750 2700 2800 2300	10000 10000 10000 10000 10000	5000 5000 4950 5000 4800	5000 5000 5000 5000 5000	3800 3550 3450 3650 2800	5000 4900 4850 4950 4700	30N 40QR 30 Std. 25K 25T
	200	1	5300 5250 5150 5300 5000	5350 5350 5300 5350 5100	6000 5950 5900 6000 5800	10000 10000 10000 10000 10000	5100 5050 4950 5100 4750	5450 5400 5300 5450 5150	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	30N 40QR 30 Std. 25K 25T
750	50	5	2950 2700 2450 2400 470	3000 2750 2450 2450 540	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2800 2500 2200 2150 —	3000 2750 2550 2550 930	1850 1200 770 780 —	3850 3700 3550 3650 2400	45N 50QR 40 Std. 40K 40T
900	50	6	2850 2700 1750 1700 470	2900 2750 1700 1650 540	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2700 2500 590 890 —	2900 2750 2050 2000 930	1550 1200 360 365 —	3800 3700 3250 3250 2400	50N 50QR 50 Std. 50K 40T
	100	3	3900 3800 3300 3300 2300	3950 3800 3350 3300 2150	2700 2600 1850 1850 610	10000 10000 10000 10000 10000	5000 4850 4550 4650 3800	5000 5000 4850 4950 4100	3500 3250 1000 1100 265	4900 4800 4500 4600 3950	50N 50QR 50 Std. 50K 40T
	150	2	4550 4400 4100 4100 3300	4650 4500 4200 4250 3450	5950 5850 5700 5750 5400	10000 10000 10000 10000 10000	4950 4800 4450▲ 4550▲ 3450	5150 5000 4700 4750 3750	6600 6600 6600 6600 6600	6000 5950 5750 5800 5300	50N 50QR 50 Std. 50K 40T
	300	1	5850 5750 5500 5600 5100	5950 5850 5600 5700 5150	5950 5850 5700 5750 5400	10000 10000 10000 10000 10000	6000 6000 6000 6000 6000	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	50N 50QR 50 Std. 50K 40T
1200	100	4	3550 2750 2700 2700 —	3600 2700 2700 2700 430	2200 910 1100 1100 130	10000 10000 10000 10000 10000	4800 4150 4150 4150 —	5000 4400 4400 4400 455	2600 365 265 — —	4700 4200 4200 4200 1300	75N 75QR 65 Std. 65K 65T
	200	2	5000 4500 4500 4550 2300	5100 4650 4700 4700 2200	5800 5500 5550 5550 4050	10000 10000 10000 10000 10000	4700 4150 4100▲ 4150▲ —	5100 4650 4650 4700 1450	6600 6600 6600 6600 6600	6000 6000 6000 6000 4550	75N 75QR 65 Std. 65K 65T

TABLE CONTINUED ➔

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 29—Single Delta Connected Capacitor Banks Rated 12.47 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemco (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
1350	150	3	4300	4400	5800	10000	4700	4900	6600	5850	75N
			3700	3850	5500	10000	3950	4200	6600	5450	75QR
			3650	3800	5550	10000	3950▲	4200	6600	5500	65 Std.
			3650	3750	5550	10000	3950▲	4200	6600	5550	65K
			465	740	4050	10000	—	750	305	3650	65T
1500	100	5	2800	2750	1100	10000	4300	4550	265	4250	85N
			1500	1300	—	10000	3150	3300	—	3500	100QR
			1600	1500	330	10000	3300	3550	—	3600	80 Std.
			1100	1050	—	10000	2800	2800	—	3250	80K
			—	430	130	10000	—	455	—	1300	65T
1800	100	6	1300	1200	—	10000	3050	3100	—	3400	95N
			1500	1300	—	10000	3150	3300	—	3500	100QR
			—	—	—	10000	—	—	—	2000	100 Std.
			1100	1050	—	10000	2800	2800	—	3250	80K
			—	—	—	10000	—	—	—	—	80T
	150	4	2600	2750	5100	10000	2450▲	2850	6600	4950	95N
			2750	2900	5150	10000	2750▲	3000	6600	5000	100QR
			—	890	4300	10000	—	910	—	3900	100 Std.
			2450	2600	5000	10000	2050▲	2550	6600	4800	80K
			—	340	1550	10000	—	—	—	1050	80T
	200	3	3800	3950	5100	10000	2950▲	3800	6600	5600	95N
			3850	4000	5150	10000	3150▲	3900	6600	5650	100QR
			2650	2650	4300	10000	—	2000	6600	4800	100 Std.
			3700	3800	5000	10000	2650▲	3650	6600	5500	80K
			—	870	1550	10000	—	710	6600	2950	80T
	300	2	4700	4750	5100	10000	6000▲	6000	6600	6000	95N
			4750	4800	5150	10000	6000	6000	6600▲	6000	100QR
			3750	3700	4300	10000	6000▲	6000	6600▲	6000	100 Std.
			4550	4600	5000	10000	6000	6000	6600	6000	80K
			1400	1450	1550	10000	6000▲	6000	6600	4550	80T
2250	150	5	—	900	4450	10000	—	1000	6500	4150	100N
			—	—	1250	10000	—	—	—	720	150QR
			—	—	610	10000	—	—	—	—	125 Std.
			—	—	—	9350	—	—	—	—	140K
			—	—	—	3000	—	—	—	—	140T
2400	200	4	—	—	810	10000	—	—	6600	2800	125N
			—	750	1250	10000	—	590	6600	3000	150QR
			—	—	610	10000	—	—	6600	2600	125 Std.
			—	—	—	9350	—	—	6600	—	140K
			—	—	—	3000	—	—	—	—	140T
2700	150	6	—	—	810	10000	—	—	—	—	125N
			—	—	1250	10000	—	—	—	720	150QR
			—	—	610	10000	—	—	—	—	125 Std.
			—	—	—	9350	—	—	—	—	140K
			—	—	—	3000	—	—	—	—	140T
	300	3	—	1100▲	810	10000	6000▲	6000▲	6600▲	4200	125N
			1250	1400	1250	10000	6000▲	6000	6600▲	4450	150QR
			—	940▲	610	10000	6000▲	6000▲	6600▲	4150	125 Std.
			—	—	—	9350	—	—	6600▲	—	140K
			—	—	—	3000	—	—	—	—	140T
3000	200	5	—	—	810	10000	—	—	6600	2800	125N
			—	—	570	9400	—	—	6600	540	175QR
			—	—	610	10000	—	—	6600	2600	125 Std.
			—	—	—	9350	—	—	6600	—	140K
			—	—	—	3000	—	—	—	—	140T
3600	200	6	—	—	—	9250	—	—	6600	—	150N
			—	—	—	9250	—	—	6600	—	150 Std.
			—	—	—	9350	—	—	6600	—	140K
			—	—	—	3000	—	—	—	—	140T
	300	4	—	—	—	9250	—	—	6600▲	—	150N
			—	—	—	9250	—	—	6600▲	—	150 Std.
			—	—	—	9350	—	—	6600▲	—	140K
			—	—	—	3000	—	—	—	—	140T

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 30—Single Delta Connected Capacitor Banks Rated 13.2 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemcol (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
150	50	1	3200 3200 3200 3250 3200	3200 3250 3250 3250 3200	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 3050 3100 3050	3150 3200 3200 3200 3200	2250 2300 2300 2300 2250	3950 4000 4000 4050 4000	10N 10QR 7 Std. 6K 8T
300	50	2	3200 3200 3150 3200 2950	3200 3200 3150 3200 2950	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 3050 2950 3050 2750	3150 3200 3100 3200 2950	2250 2200 2100 2250 1850	3950 4000 3950 4000 3850	15N 20QR 15 Std. 12K 15T
	100	1	4050 4100 4050 4100 3950	4150 4150 4150 4150 4050	2950 3000 2900 3000 2800	10000 10000 10000 10000 10000	5000 5000 5000 5000 5000	5000 5000 5000 5000 5000	3800 3900 3800 3850 3600	5000 5000 5000 5000 4950	15N 20QR 15 Std. 12K 15T
450	50	3	3200 3100 3050 3100 2750	3200 3100 3050 3100 2800	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2950 2850 2900 2600	3150 3100 3100 3100 2800	2250 2100 2000 2050 1400	3950 4000 3900 3950 3750	20N 25QR 20 Std. 20K 20T
	150	1	4700 4750 4650 4700 4500	4800 4800 4800 4800 4600	6000 6050 6000 6050 5900	10000 10000 10000 10000 10000	5150 5200 5100 5200 4900	5250 5250 5250 5250 5100	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	20N 25QR 20 Std. 20K 20T
600	50	4	3200 2900 2950 2950 2350	3200 2950 3000 3000 2350	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	3000 2750 2800 2800 2100	3150 2950 3000 3000 2450	2150 1700 1900 1850 690	3950 3850 3850 3900 3550	30N 40QR 25 Std. 25K 25T
	100	2	4050 3950 3950 4000 3600	4150 4000 4050 4050 3650	2950 2750 2800 2800 2300	10000 10000 10000 10000 10000	5000 5000 5000 5000 4800	5000 5000 5000 5000 5000	3800 3550 3600 3650 2800	5000 4900 4900 4950 4700	30N 40QR 25 Std. 25K 25T
	200	1	5300 5250 5250 5300 5000	5350 5350 5350 5350 5100	6000 5950 5950 6000 5800	10000 10000 10000 10000 10000	5100 5050 5050 5100 4750	5450 5400 5400 5450 5150	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	30N 40QR 25 Std. 25K 25T
750	50	5	2950 2900 2450 2750 1600	3000 2950 2450 2800 1450	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2800 2750 2200 2600 —	3000 2950 2550 2850 1950	1850 1700 770 1450 330	3850 3850 3550 3750 3150	45N 40QR 40 Std. 30K 30T
900	50	6	2850 2700 1750 2400 470	2900 2750 1700 2450 540	‡ ‡ ‡ ‡ ‡	‡ ‡ ‡ ‡ ‡	2700 2500 590 2150 —	2900 2750 2050 2550 930	1550 1200 360 780 —	3800 3700 3250 3650 2400	50N 50QR 50 Std. 40K 40T
	100	3	3900 3800 3300 3700 2300	3950 3800 3350 3750 2150	2700 2600 1850 2350 610	10000 10000 10000 10000 10000	5000 4850 4550 4850 3800	5000 5000 4850 5000 4100	3500 3250 1000 2950 265	4900 4800 4500 4750 3950	50N 50QR 50 Std. 40K 40T
	150	2	4550 4400 4100 4400 3300	4650 4500 4200 4450 3450	5950 5850 5700 5850 5400	10000 10000 10000 10000 10000	4950 4800 4450▲ 4800 3450	5150 5000 4700 4950 3750	6600 6600 6600 6600 6600	6000 5950 5750 5900 5300	50N 50QR 50 Std. 40K 40T
	300	1	5850 5750 5500 5700 5100	5950 5850 5600 5800 5150	5950 5850 5700 5850 5400	10000 10000 10000 10000 10000	6000 6000 6000 6000 6000	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 6000	50N 50QR 50 Std. 40K 40T
1200	100	4	3700 3550 2700 3300 —	3700 3600 2700 3300 430	2500 2250 1100 1850 130	10000 10000 10000 10000 10000	4800 4800 4150 4650 —	5000 5000 4400 4950 455	3050 2650 265 1100 —	4750 4700 4200 4600 1300	65N 60QR 65 Std. 50K 65T
	200	2	5050 5000 4500 4950 2300	5200 5100 4700 5050 2200	5850 5800 5550 5750 4050	10000 10000 10000 10000 10000	4750 4700 4100▲ 4600 —	5200 5150 4650 5050 1450	6600 6600 6600 6600 6600	6000 6000 6000 6000 4550	65N 60QR 65 Std. 50K 65T

TABLE CONTINUED

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 30—Single Delta Connected Capacitor Banks Rated 13.2 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemcol (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
1350	150	3	4300 3700 3650 3650 465	4400 3850 3800 3750 740	5800 5500 5550 5550 4050	10000 10000 10000 10000 10000	4700▲ 3950 3950▲ 3950▲ —	4900 4200 4200 4200 750	6600 6600 6600 6600 305▲	5850 5450 5500 5500 3650	75N 75QR 65 Std. 65K 65T
1500	100	5	2800 1500 1600 2700 —	2750 1300 1500 2700 430	1100 — 330 1100 130	10000 10000 10000 10000 10000	4300 3150 3300 4150 —	4550 3300 3550 4400 455	265 — — — —	4250 3500 3600 4200 1300	85N 100QR 80 Std. 65K 65T
1800	100	6	1300 1500 1600 1100 —	1200 1300 1500 1050 —	— — 330 — —	10000 10000 10000 10000 10000	3050 3150 3300 2800 —	3100 3300 3550 2800 —	— — — — —	3400 3500 3600 3250 —	95N 100QR 80 Std. 80K 80T
	150	4	2600 2750 2900 2450 —	2750 2900 3050 2600 340	5100 5150 5200 5000 1550	10000 10000 10000 10000 10000	2450▲ 2750▲ 2900▲ 2050▲ —	2850 3000 3150 2550 —	6600▲ 6600▲ 6600▲ 6600▲ —	4950 5000 5100 4800 1050	95N 100QR 80 Std. 80K 80T
	200	3	3800 3850 3950 3700 —	3950 4000 4150 3800 870	5100 5150 5200 5000 1550	10000 10000 10000 10000 10000	2950▲ 3150▲ 3300▲ 2650▲ —	3800 3900 4000 3650 710	6600▲ 6600 6600 6600 6600▲	5600 5650 5700 5500 2950	95N 100QR 80 Std. 80K 80T
	300	2	4700 4750 4950 4550 1400	4750 4800 4900 4600 1450	5100 5150 5200 5000 1550	10000 10000 10000 10000 10000	6000▲ 6000 6000 6000 6000▲	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 4550	95N 100QR 80 Std. 80K 80T
2250	150	5	— — — — —	900 560 — — —	4450 3950 610 — —	10000 10000 10000 9350 3000	— — — — —	1000 480 — — —	6500▲ — — — —	4150 3550 — — —	100N 125QR 125 Std. 140K 140T
2400	200	4	— — — — —	— 750 — — —	810 1250 610 — —	10000 10000 10000 9350 3000	— — — — —	— 590 — — —	6600▲ 6600▲ 6600▲ 6600▲ —	2800 3000 2600 — —	125N 150QR 125 Std. 140K 140T
2700	150	6	— — — — —	— — — — —	810 1250 610 — —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	— 720 — — —	125N 150QR 125 Std. 140K 140T
	300	3	— 1250▲ — — —	1100▲ 1400 940▲ — —	810 1250 610 — —	10000 10000 10000 9350 3000	6000▲ 6000▲ 6000▲ — —	6000▲ 6000▲ 6000▲ — —	6600▲ 6600▲ 6600▲ 6600▲ —	4200 4450 4150 — —	125N 150QR 125 Std. 140K 140T
3000	200	5	— — — — —	— 750 — — —	810 1250 610 — —	10000 10000 10000 9350 3000	— — — — —	— 590 — — —	6600▲ 6600▲ 6600▲ 6600▲ —	2800 3000 2600 — —	125N 150QR 125 Std. 140K 140T
3600	200	6	— — — — —	— — — — —	— — — — —	9250 8400 9250 9350 3000	— — — — —	— — — — —	6600▲ — 6600▲ 6600▲ —	— — — — —	150N 200QR 150 Std. 140K 140T
	300	4	— — — — —	— — — — —	— — — — —	9250 8400 9250 9350 3000	— — — — —	— — — — —	6600▲ 6600▲ 6600▲ 6600▲ —	— — — — —	150N 200QR 150 Std. 140K 140T

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 31—Single Delta Connected Capacitor Banks Rated 13.8 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemcol (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
150	50	1	3200	3200	‡	‡	3000	3150	2250	4000	8N
			3200	3250	‡	‡	3050	3200	2300	4000	10QR
			3200	3250	‡	‡	3050	3200	2300	4000	7 Std.
			3250	3250	‡	‡	3100	3200	2300	4050	6K
			3200	3200	‡	‡	3050	3200	2250	4000	8T
300	50	2	3200	3200	‡	‡	3000	3150	2250	3950	15N
			3200	3200	‡	‡	3050	3200	2200	4000	20QR
			3150	3150	‡	‡	2950	3100	2100	3950	15 Std.
			3200	3200	‡	‡	3050	3200	2250	4000	12K
			3050	3100	‡	‡	2900	3100	2050	3950	12T
	100	1	4050	4150	2950	10000	5000	5000	3800	5000	15N
			4100	4150	3000	10000	5000	5000	3900	5000	20QR
			4050	4150	2900	10000	5000	5000	3800	5000	15 Std.
			4100	4150	3000	10000	5000	5000	3850	5000	12K
			4050	4100	2900	10000	5000	5000	3750	5000	12T
450	50	3	3200	3200	‡	‡	3000	3150	2250	3950	20N
			3100	3100	‡	‡	2950	3100	2100	4000	25QR
			3050	3050	‡	‡	2850	3100	2000	3900	20 Std.
			3100	3100	‡	‡	2900	3100	2050	3950	20K
			2750	2800	‡	‡	2600	2800	1400	3750	20T
	150	1	4700	4800	6000	10000	5150	5250	6600	6000	20N
			4750	4800	6050	10000	5200	5250	6600	6000	25QR
			4650	4800	6000	10000	5100	5250	6600	6000	20 Std.
			4700	4800	6050	10000	5200	5250	6600	6000	20K
			4500	4600	5900	10000	4900	5100	6600	6000	20T
600	50	4	3200	3200	‡	‡	3000	3150	2150	3950	30N
			3000	3050	‡	‡	2850	3000	1950	3900	30QR
			2950	3000	‡	‡	2800	3000	1900	3850	25 Std.
			2950	3000	‡	‡	2800	3000	1850	3900	25K
			2350	2350	‡	‡	2100	2450	690	3550	25T
	100	2	4050	4150	2950	10000	5000	5000	3800	5000	30N
			4000	4050	2850	10000	5000	5000	3650	4950	30QR
			3950	4050	2800	10000	5000	5000	3600	4900	25 Std.
			4000	4050	2800	10000	5000	5000	3650	4950	25K
			3600	3650	2300	10000	4800	5000	2800	4700	25T
	200	1	5300	5350	6000	10000	5100	5450	6600	6000	30N
			5300	5350	6000	10000	5100	5450	6600	6000	30QR
			5250	5350	5950	10000	5050	5400	6600	6000	25 Std.
			5300	5350	6000	10000	5100	5450	6600	6000	25K
			5000	5100	5800	10000	4750	5150	6600	6000	25T
750	50	5	3150	3150	‡	‡	2950	3150	2100	3950	40N
			2900	2950	‡	‡	2750	2950	1700	3850	40QR
			2850	2850	‡	‡	2650	2900	1550	3800	30 Std.
			2750	2800	‡	‡	2600	2850	1450	3750	30K
			1600	1450	‡	‡	—	1950	330	3150	30T
900	50	6	2850	2900	‡	‡	2700	2900	1550	3800	50N
			2700	2750	‡	‡	2500	2750	1200	3700	50QR
			2450	2450	‡	‡	2200	2550	770	3550	40 Std.
			2400	2450	‡	‡	2150	2550	780	3650	40K
			470	540	‡	‡	—	930	—	2400	40T
	100	3	3900	3950	2700	10000	5000	5000	3500	4950	50N
			3800	3800	2600	10000	4850	5000	3250	4800	50QR
			3600	3650	2350	10000	4800	5000	2900	4700	40 Std.
			3700	3750	2350	10000	4850	5000	2950	4750	40K
			2300	2150	610	10000	3800	4100	265	3950	40T
	150	2	4550	4650	5950	10000	4950	5150	6600	6000	50N
			4400	4500	5850	10000	4800	5000	6600	5950	50QR
			4300	4400	5800	10000	4700	4900	6600	5850	40 Std.
			4400	4450	5850	10000	4800	4950	6600	5900	40K
			3300	3450	5400	10000	3450▲	3750	6600	5300	40T
	300	1	5850	5950	5950	10000	6000	6000	6600	6000	50N
			5750	5850	5850	10000	6000	6000	6600	6000	50QR
			5650	5750	5800	10000	6000	6000	6600	6000	40 Std.
			5700	5800	5850	10000	6000	6000	6600	6000	40K
			5100	5150	5400	10000	6000	6000	6600	6000	40T
1200	100	4	3700	3700	2500	10000	4900	5000	3050	4750	65N
			3550	3600	2250	10000	4850	5000	2650	4700	65QR
			2700	2700	1100	10000	4150	4400	265	4200	65 Std.
			3300	3300	1850	10000	4650	4950	1100	4800	50K
			770	870	310	10000	2550	2500	—	3250	50T
	200	2	5050	5200	5850	10000	4750	5200	6600	6000	65N
			5000	5100	5800	10000	4700▲	5150	6600	6000	65QR
			4500	4700	5550	10000	4300▲	4850	6600	6000	65 Std.
			4950	5050	5750	10000	4600	5050	6600	6000	50K
			3650	3750	4950	10000	2150▲	3550	6600	5450	50T

TABLE CONTINUED ➔

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 31—Single Delta Connected Capacitor Banks Rated 13.8 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration: Capacitor-Unit Rating, Kvar Single-Phase	Configuration: Number of Parallel Capacitor Units Per Phase	General Electric: Dielektrol (Paper-Film)	General Electric: Dielektrol III (All-Film)	McGraw-Edison: Type ES (All-Film)	McGraw-Edison: Type EX (All-Film)	Sangamo: Selectrol I (Paper-Film)	Sangamo: Selectrol II (All-Film)	ABB (Westinghouse): Wemcol (Paper-Film)	ABB (Westinghouse): Film-Var (All-Film)	
1350	150	3	4300 3700 3650 3650 465	4400 3850 3800 3750 740	5800 5500 5550 5550 4050	10000 10000 10000 10000 10000	4700▲ 3950▲ 3950▲ 3950▲ —	4900 4200 4200 4200 750	6600 6600 6600 6600 305	5850 5450 5500 5550 3650	75N 75QR 65 Std. 65K 65T
1500	100	5	3550 2750 2700 2700 —	3600 2700 2700 2700 430	2200 910 1100 1100 130	10000 10000 10000 10000 10000	4800 4150 4150 4150 —	5000 4400 4400 4400 455	2600 365 265 — —	4700 4200 4200 4200 1300	75N 75QR 65 Std. 65K 65T
1800	100	6	2800 1500 1600 1100 —	2750 1300 1500 1050 —	1100 — 330 — —	10000 10000 10000 10000 10000	4300 3150 3300 2800 —	4550 3300 3550 2800 —	265 — — — —	4250 3500 3600 3250 —	85N 100QR 80 Std. 80K 80T
	150	4	3750 2750 2900 2450 —	3950 2900 3050 2600 340	5650 5150 5200 5000 1550	10000 10000 10000 10000 10000	4050▲ 2750▲ 2900▲ 2050▲ —	4300 3000 3150 2550 —	6600 6600▲ 6600▲ 6600▲ —	5600 5000 5100 4800 1050	85N 100QR 80 Std. 80K 80T
	200	3	4650 3850 3950 3700 —	4800 4000 4150 3800 870	5650 5150 5200 5000 1550	10000 10000 10000 10000 10000	4250 3150▲ 3300▲ 2650▲ —	4750 3900 4000 3650 710	6600 6600 6600 6600 6600▲	6000 5650 5700 5500 2950	85N 100QR 80 Std. 80K 80T
	300	2	5400 4750 4950 4550 1400	5450 4800 4900 4600 1450	5650 5150 5200 5000 1550	10000 10000 10000 10000 10000	6000 6000 6000 6000 6000▲	6000 6000 6000 6000 6000	6600 6600 6600 6600 6600	6000 6000 6000 6000 4550	85N 100QR 80 Std. 80K 80T
2250	150	5	— — — — —	900 560 — — —	4450 3950 610 — 630	10000 10000 10000 9350 10000	— — — — —	1000 480 — — —	6500▲ — — — —	4150 3550 — — —	100N 125QR 125 Std. 140K 100T
2400	200	4	2950 2100 — — —	2900 1900 — — —	4450 3950 610 — —	10000 10000 10000 9350 3000	— — — — —	2400 1350 — — —	6600▲ 6600▲ 6600▲ 6600▲ —	4950 4500 2600 — —	100N 125QR 125 Std. 140K 140T
2700	150	6	— — — — —	— — — — —	810 1250 610 — —	10000 10000 10000 9350 3000	— — — — —	— — — — —	— — — — —	— 720 — — —	125N 150QR 125 Std. 140K 140T
	300	3	— 1250▲ — — —	1100▲ 1400 940▲ — —	810 1250 610 — —	10000 10000 10000 9350 3000	6000▲ 6000▲ 6000▲ — —	6000▲ 6000▲ 6000▲ — —	6600▲ 6600▲ 6600▲ 6600 —	4200 4450 4150 — —	125N 150QR 125 Std. 140K 140T
3000	200	5	— — — — —	— 750 — — —	810 1250 610 — —	10000 10000 10000 9350 3000	— — — — —	— 590 — — —	6600▲ 6600▲ 6600▲ 6600▲ —	2800 3000 2600 — —	125N 150QR 125 Std. 140K 140T
3600	200	6	— — — — —	— — — — —	810 — 610 — —	10000 8400 10000 9350 3000	— — — — —	— — — — —	6600▲ — 6600▲ 6600▲ —	2800 — 2600 — —	125N 200QR 125 Std. 140K 140T
	300	4	— — — — —	1100 — 940 — —	810 — 610 — —	10000 8400 10000 9350 3000	6000▲ — 6000▲ — —	6000▲ — 6000▲ — —	6600▲ 6600▲ 6600▲ 6600▲ —	4200 — 4150 — —	125N 200QR 125 Std. 140K 140T

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 32—Single Delta Connected Capacitor Banks Rated 14.4 Kv Three-Phase

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
150	50	1	3200	3200	‡	‡	3000	3150	2250	4000	8N
			3200	3250	‡	‡	3050	3200	2300	4000	10QR
			3200	3250	‡	‡	3050	3200	2300	4000	7 Std.
			3250	3250	‡	‡	3100	3200	2300	4050	6K
			3200	3200	‡	‡	3050	3200	2250	4000	6T
300	50	2	3200	3200	‡	‡	3000	3150	2250	3950	15N
			3200	3250	‡	‡	3050	3200	2300	4000	15QR
			3150	3150	‡	‡	2950	3100	2100	3950	15 Std.
			3250	3250	‡	‡	3100	3200	2300	4050	10K
			3050	3100	‡	‡	2900	3100	2050	3950	12T
	100	1	4050	4150	2950	10000	5000	5000	3800	5000	15N
			4100	4150	3000	10000	5000	5000	3900	5000	15QR
			4050	4150	2900	10000	5000	5000	3800	5000	15 Std.
			4100	4150	3000	10000	5000	5000	3900	5050	10K
			4050	4100	2900	10000	5000	5000	3750	5000	12T
450	50	3	3200	3200	‡	‡	3000	3150	2250	3950	20N
			3100	3100	‡	‡	2950	3100	2100	4000	25QR
			3050	3050	‡	‡	2850	3100	2000	3900	20 Std.
			3150	3200	‡	‡	3000	3150	2150	4000	15K
			2750	2800	‡	‡	2600	2800	1400	3750	20T
	150	1	4700	4800	6000	10000	5150	5250	6600	6000	20N
			4750	4800	6050	10000	5200	5250	6600	6000	25QR
			4650	4800	6000	10000	5100	5250	6600	6000	20 Std.
			4750	4800	6050	10000	5200	5250	6600	6000	15K
			4500	4600	5900	10000	4900	5100	6600	6000	20T
600	50	4	3200	3200	‡	‡	3000	3150	2200	3950	25N
			3000	3050	‡	‡	2850	3000	1950	3900	30QR
			2950	3000	‡	‡	2800	3000	1900	3850	25 Std.
			3100	3100	‡	‡	2900	3100	2050	3950	20K
			2350	2350	‡	‡	2100	2450	690	3550	25T
	100	2	4050	4150	2950	10000	5000	5000	3800	5000	25N
			4000	4050	2850	10000	5000	5000	3650	4950	30QR
			3950	4050	2800	10000	5000	5000	3600	4900	25 Std.
			4050	4100	2900	10000	5000	5000	3750	5000	20K
			3600	3650	2300	10000	4800	5000	2800	4700	25T
	200	1	5300	5350	6000	10000	5100	5450	6600	6000	25N
			5300	5350	6000	10000	5100	5450	6600	6000	30QR
			5250	5350	5950	10000	5050	5400	6600	6000	25 Std.
			5350	5350	6050	10000	5150	5450	6600	6000	20K
			5000	5100	5800	10000	4750	5150	6600	6000	25T
750	50	5	3200	3200	‡	‡	3000	3150	2150	3950	30N
			2900	2950	‡	‡	2750	2950	1700	3850	40QR
			2850	2850	‡	‡	2650	2900	1550	3800	30 Std.
			2750	2800	‡	‡	2600	2850	1450	3750	30K
			1600	1450	‡	‡	—	1950	330	3150	30T
900	50	6	2950	3000	‡	‡	2800	3000	1850	3850	45N
			2700	2750	‡	‡	2500	2750	1200	3700	50QR
			2450	2450	‡	‡	2200	2550	770	3550	40 Std.
			2400	2450	‡	‡	2150	2550	780	3650	40K
			470	540	‡	‡	—	930	—	2400	40T
	100	3	3950	4050	2800	10000	5000	5000	3600	4950	45N
			3800	3800	2600	10000	4850	5000	3250	4800	50QR
			3600	3650	2350	10000	4800	5000	2900	4700	40 Std.
			3700	3750	2350	10000	4850	5000	2950	4750	40K
			2300	2150	610	10000	3800	4100	265	3950	40T
	150	2	4650	4750	6000	10000	5050	5200	6600	6000	45N
			4400	4500	5850	10000	4800	5000	6600	5950	50QR
			4300	4400	5800	10000	4700	4900	6600	5850	40 Std.
			4400	4450	5850	10000	4800	4950	6600	5900	40K
			3300	3450	5400	10000	3450	3750	6600	5300	40T
	300	1	5950	5950	6000	10000	6000	6000	6600	6000	45N
			5750	5850	5850	10000	6000	6000	6600	6000	50QR
			5650	5750	5800	10000	6000	6000	6600	6000	40 Std.
			5700	5800	5850	10000	6000	6000	6600	6000	40K
			5100	5150	5400	10000	6000	6000	6600	6000	40T
1200	100	4	3700	3700	2500	10000	4800	5000	3050	4750	65N
			3550	3600	2250	10000	4800	5000	2650	4700	60QR
			2700	2700	1100	10000	4150	4400	265	4200	65 Std.
			3300	3300	1850	10000	4650	4950	1100	4600	50K
			770	870	310	10000	2550	2500	—	3250	50T
	200	2	5050	5200	5850	10000	4750	5200	6600	6000	65N
			5000	5100	5800	10000	4700	5150	6600	6000	60QR
			4500	4700	5550	10000	4100▲	4650	6600	6000	65 Std.
			4950	5050	5750	10000	4600	5050	6600	6000	50K
			3650	3750	4950	10000	2150▲	3550	6600	5450	50T

TABLE CONTINUED ➔

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 32—Single Delta Connected Capacitor Banks Rated 14.4 Kv Three-Phase—Continued

Capacitor Bank Data			Maximum Fault Current for Capacitor Bank Protection, Amperes, Rms								S&C Positrol Fuse Link Rating, Amperes
Rating, Kvar Three-Phase	Configuration		General Electric		McGraw-Edison		Sangamo		ABB (Westinghouse)		
	Capacitor-Unit Rating, Kvar Single-Phase	Number of Parallel Capacitor Units Per Phase	Dielektrol (Paper-Film)	Dielektrol III (All-Film)	Type ES (All-Film)	Type EX (All-Film)	Selectrol I (Paper-Film)	Selectrol II (All-Film)	Wemcol (Paper-Film)	Film-Var (All-Film)	
1350	150	3	4300	4400	5800	10000	4700▲	4900	6600	5850	75N
			3700	3850	5500	10000	3950	4200	6600	5450	75QR
			3650	3800	5550	10000	3950▲	4200	6600	5500	65 Std.
			3650	3750	5550	10000	3950▲	4200	6600	5550	65K
			465	740	4050	10000	—	750	305	3650	65T
1500	100	5	3550	3600	2200	10000	4800	5000	2600	4700	75N
			2750	2700	910	10000	4150	4400	365	4200	75QR
			2700	2700	1100	10000	4150	4400	265	4200	65 Std.
			2700	2700	1100	10000	4150	4400	—	4200	65K
			—	430	130	10000	—	455	—	1300	65T
1800	100	6	2800	2750	1100	10000	4300	4550	265	4250	85N
			1500	1300	—	10000	3150	3300	—	3500	100QR
			1600	1500	330	10000	3300	3550	—	3600	80 Std.
			1100	1050	—	10000	2800	2800	—	3250	80K
			—	—	—	10000	—	—	—	—	80T
	150	4	3750	3950	5650	10000	4050▲	4300	6600	5600	85N
			2750	2900	5150	10000	2750▲	3000	6600	5000	100QR
			2900	3050	5200	10000	2900▲	3150	6600	5100	80 Std.
			2450	2600	5000	10000	2050▲	2550	6600	4800	80K
			—	340	1550	10000	—	—	—	1050	80T
	200	3	4650	4800	5650	10000	4250	4750	6600	6000	85N
			3850	4000	5150	10000	3150▲	3900	6600	5650	100QR
			3950	4150	5200	10000	3300▲	4000	6600	5700	80 Std.
			3700	3800	5000	10000	2650▲	3650	6600	5500	80K
			—	870	1550	10000	—	710	6600	2950	80T
	300	2	5400	5450	5650	10000	6000	6000	6600	6000	85N
			4750	4800	5150	10000	6000▲	6000	6600	6000	100QR
			4950	4900	5200	10000	6000	6000	6600	6000	80 Std.
			4550	4600	5000	10000	6000▲	6000	6600	6000	80K
			1400	1450	1550	10000	6000▲	6000	6600	4550	80T
2250	150	5	—	900	4450	10000	—	1000	6500	4150	100N
			—	560	3950	10000	—	480	—	3550	125QR
			—	890	4300	10000	—	910	—	3900	100 Std.
			—	920	4250	10000	—	1000	—	3900	100K
			—	—	630	10000	—	—	—	—	100T
2400	200	4	2950	2900	4450	10000	—	2400	6600	4950	100N
			2100	1900	3950	10000	—	1350	6600	4500	125QR
			—	—	610	10000	—	—	6600	2600	125 Std.
			—	—	—	9350	—	—	6600	—	140K
			—	—	630	10000	—	—	6600	710	100T
2700	150	6	—	—	810	10000	—	—	—	—	125N
			—	—	1250	10000	—	—	—	720	150QR
			—	—	610	10000	—	—	—	—	125 Std.
			—	—	—	9350	—	—	—	—	140K
			—	—	—	3000	—	—	—	—	140T
	300	3	—	1100▲	810	10000	6000▲	6000▲	6600▲	4200	125N
			1250▲	1400▲	1250	10000	6000▲	6000▲	6600▲	4450	150QR
			—	940▲	610	10000	6000▲	6000▲	6600▲	4150	125 Std.
			—	—	—	9350	—	—	6600▲	—	140K
			—	—	—	3000	—	—	—	—	140T
3000	200	5	—	—	810	10000	—	—	6600	2800	125N
			—	750	1250	10000	—	590	6600	3000	150QR
			—	—	610	10000	—	—	6600	2600	125 Std.
			—	—	—	9350	—	—	6600	—	140K
			—	—	—	3000	—	—	—	—	140T
3600	200	6	—	—	810	10000	—	—	6600	2800	125N
			—	—	570	9400	—	—	6600	540	175QR
			—	—	610	10000	—	—	6600	2600	125 Std.
			—	—	—	9350	—	—	6600	—	140K
			—	—	—	3000	—	—	—	—	140T
	300	4	—	1100	810	10000	6000▲	6000▲	6600▲	4200	125N
			—	610	570	9400	—	1600▲	6600▲	1450	175QR
			—	940	610	10000	6000▲	6000▲	6600▲	4150	125 Std.
			—	—	—	9350	—	—	6600▲	—	140K
			—	—	—	3000	—	—	—	—	140T

▲ For certain combinations of numbers of series groups of packs in the capacitor unit and groups of packs shorted, the total clearing time of the fuse link exceeds the time permitted on the capacitor unit's case-rupture curve, thus indicating a possibility that the faulted unit's case may rupture in the event of a low-current evolving fault. Refer to Step 3 in the section entitled "How to Use the Fuse Selection Tables," on page 88.

‡ Data for McGraw-Edison capacitor units rated 50 kvar single-phase are not available.

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 33—Single Ungrounded-Wye Connected Capacitor Banks Rated 4.16 Kv Three-Phase

Capacitor Bank Rating, Kvar, Three-Phase ↓	Application Condition										S&C Positrol Fuse Link Rating, Amperes
Capacitor-Unit Rating, Kvar, Single-Phase →	Paper-Film Construction					All-Film Construction					
	50	100	150	200	300	50	100	150	200	300	
150	A										20N 25QR 20 Std. 20K 20T
300	A A D D D	D D D D D									50N 50QR 50 Std. 50K 40T
450	D D D D E		D D E E E			L		G H H			75N 75QR 65 Std. 65K 65T
600	E E E E E	E E E E E		E E E E E		L I L I L	H H N H N		H H H H		95N 100QR 100 Std. 80K 80T
750	E E E E E					L L L L L					100N 150QR 125 Std. 140K 140T
900	E E E E E	E E E E E	E E E E E		E E E E E	L L L L L	N N N P P	L H L P P		K H K P P	125N 150QR 125 Std. 140K 140T
1200		E E E E		E E E E			P P P P		P P P P		150N 150 Std. 140K 140T
1350			E E E E					P P P P			200N 200 Std. 200K 200T
1500		E E E E					P P P P				200N 200 Std. 200K 200T

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 34—Single Ungrounded-Wye Connected Capacitor Banks Rated 4.8 Kv Three-Phase

Capacitor Bank Rating, Kvar, Three-Phase ↓	Application Condition										S&C Positrol Fuse Link Rating, Amperes
Capacitor-Unit Rating, Kvar, Single-Phase →	Paper-Film Construction					All-Film Construction					
	50	100	150	200	300	50	100	150	200	300	
150											20N 25QR 20 Std. 15K 20T
300	A A A A D	D D D D D									45N 50QR 40 Std. 40K 40T
450	A D D D E		D D D D E			L					75N 75QR 65 Std. 65K 65T
600	D E E E E	D E D E E		D E E E E		I I L	N		G H H H H		85N 100QR 80 Std. 80K 80T
750	E E E E E					L L L L L					100N 125QR 100 Std. 100K 100T
900	E E E E E	E E E E E	E E E E E		E E E E E	L L L L L	P N P P P	O H O P P		K H K P P	125N 150QR 125 Std. 140K 140T
1200		E E E E E		E E E E E			N N N P P		L L L P P		125N 175QR 125 Std. 140K 140T
1350			E E E E					P P P P			150N 150 Std. 140K 140T
1500		E E E E					P P P P				150N 150 Std. 200K 200T
1800		E E E E	E E E E	E E E E			P P P P	P P P P	P P P P		200N 200 Std. 200K 200T

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 35—Single Ungrounded-Wye Connected Capacitor Banks Rated 7.2 Kv Three-Phase

Capacitor Bank Rating, Kvar, Three-Phase ↓	Application Condition										S&C Positrol Fuse Link Rating, Amperes
Capacitor-Unit Rating, Kvar, Single-Phase →	Paper-Film Construction					All-Film Construction					
	50	100	150	200	300	50	100	150	200	300	
150											15N 15QR 15 Std. 10K 12T
300											25N 30QR 25 Std. 20K 25T
450	E		AAAAA								45N 50QR 40 Std. 40K 40T
600	AADAE	D D		AAAAA							65N 60QR 65 Std. 50K 50T
750	ADDDE					L					75N 75QR 65 Std. 65K 65T
900	DEEEE	DEDEE	DDDDE		ADDDD	I I L	N	G		H H H	85N 100QR 80 Std. 80K 80T
1200		EEEEE		EDEEE			NNPPN		HHOPH		100N 125QR 125 Std. 140K 100T
1350			EEEEE					OHOPP			125N 150QR 125 Std. 140K 140T
1500		EEEEE					NNNPP				125N 150QR 125 Std. 140K 140T
1800		EEEEE	EEEEE	EEEEE	EEEEE		NNNPP	LLLPP	LLLPP	HHHPP	125N 175QR 125 Std. 140K 140T
2250			EEEEE					PPPP			150N 150 Std. 200K 200T
2400				EEEE					PPPP		200N 200 Std. 200K 200T
2700			EEEE		EEEE			PPPP		PPPP	200N 200 Std. 200K 200T

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 36—Single Ungrounded-Wye Connected Capacitor Banks Rated 8.32 Kv Three-Phase

Capacitor Bank Rating, Kvar, Three-Phase ↓	Application Condition										S&C Positrol Fuse Link Rating, Amperes
Capacitor-Unit Rating, Kvar, Single-Phase →	Paper-Film Construction					All-Film Construction					
	50	100	150	200	300	50	100	150	200	300	
150											10N 15QR 10 Std. 8K 10T
300											20N 25QR 20 Std. 20K 20T
450	A										40N 40QR 30 Std. 30K 30T
600	D D D			A A A A A							50N 50QR 50 Std. 50K 40T
750	D A E					L					65N 60QR 65 Std. 50K 65T
900	A D D D E	B B E	A A A A D		A A A A	L					75N 75QR 65 Std. 65K 65T
1200		E D E D E		A A A A D			N N				95N 100QR 100 Std. 80K 80T
1350			E E E E E					H G O P L			100N 125QR 125 Std. 140K 140T
1500		E E E E E					N N P P P				100N 150QR 125 Std. 140K 140T
1800		E E E E E	E E E E E	E E E E E	E E E E E		N N N P P	L H L P P	L G L P P	H H H P P	125N 150QR 125 Std. 140K 140T
2250			E E E E E					P L P P P			150N 200QR 150 Std. 140K 140T
2400				E E E E					P P P P		150N 150 Std. 140K 140T
2700			E E E E		E E E E			P P P P		P P P P	200N 200 Std. 200K 200T
3000				E E E E					P P P P		200N 200 Std. 200K 200T

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 37—Single Ungrounded-Wye Connected Capacitor Banks Rated 12.47 Kv Three-Phase

Capacitor Bank Rating, Kvar, Three-Phase ↓	Application Condition										S&C Positrol Fuse Link Rating, Amperes
Capacitor-Unit Rating, Kvar, Single-Phase →	Paper-Film Construction					All-Film Construction					
	50	100	150	200	300	50	100	150	200	300	
150											10N 10QR 7 Std. 6K 8T
300											20N 20QR 15 Std. 12K 15T
450											20N 25QR 20 Std. 20K 20T
600											30N 40QR 30 Std. 25K 25T
750	D										45N 50QR 40 Std. 40K 40T
900	D D D										50N 50QR 50 Std. 50K 40T
1200		B B E		A A A A A			F				75N 75QR 65 Std. 65K 65T
1350			A A A A D								75N 75QR 65 Std. 65K 65T
1500		B E B E E					F F F				85N 100QR 80 Std. 80K 65T
1800		E D E D E	D A E A E	A A A A C	A A A A A		F F N F N	G G			95N 100QR 100 Std. 80K 80T
2250			E E E E E					G L P P P			100N 150QR 125 Std. 140K 140T
2400				E C E E E					P P P P		125N 150QR 125 Std. 140K 140T
2700			E E E E E		E D E E E			N H L P P		J H H P P	125N 150QR 125 Std. 140K 140T
3000				E E E E E					L L L P P		125N 175QR 125 Std. 140K 140T
3600				E E E E E	E E E E E				P P P P P	P P P P P	150N 150 Std. 140K 140T

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 38—Single Ungrounded-Wye Connected Capacitor Banks Rated 13.20 Kv Three-Phase

Capacitor Bank Rating, Kvar, Three-Phase ↓	Application Condition										S&C Positrol Fuse Link Rating, Amperes
Capacitor-Unit Rating, Kvar, Single-Phase →	Paper-Film Construction					All-Film Construction					
	50	100	150	200	300	50	100	150	200	300	
150											10N 10QR 7 Std. 6K 8T
300											15N 20QR 15 Std. 12K 15T
450											20N 25QR 20 Std. 20K 20T
600											30N 40QR 25 Std. 25K 25T
750	A A										45N 40QR 40 Std. 30K 30T
900	D D		A A A A								50N 50QR 50 Std. 40K 40T
1200		B E		A A A A A			F				65N 60QR 65 Std. 50K 65T
1350			A A A A E								75N 75QR 65 Std. 65K 65T
1500		B E D B E					F F				85N 100QR 80 Std. 65K 65T
1800		E E B E E	E A A A E	A A A A C	A A A A A		F F F N	G			95N 100QR 80 Std. 80K 80T
2250			E E E E E					H G P P P			100N 125QR 125 Std. 140K 140T
2400				E C E E E					P P P P		125N 150QR 125 Std. 140K 140T
2700			E E E E E		E E E E E			N H P P P		J H M P P	125N 150QR 125 Std. 140K 140T
3000				E E E E E					L L P P		125N 150QR 125 Std. 140K 140T
3600				E E E E E	E E E E E				P N P P P	P N P P P	150N 200QR 150 Std. 140K 140T

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 39—Single Ungrounded-Wye Connected Capacitor Banks Rated 13.80 Kv Three-Phase

Capacitor Bank Rating, Kvar, Three-Phase ↓	Application Condition										S&C Positrol Fuse Link Rating, Amperes
Capacitor-Unit Rating, Kvar, Single-Phase →	Paper-Film Construction					All-Film Construction					
	50	100	150	200	300	50	100	150	200	300	
150											8N 10QR 7 Std. 6K 8T
300											15N 20QR 15 Std. 12K 12T
450											20N 25QR 20 Std. 20K 20T
600											30N 30QR 25 Std. 25K 25T
750	A										40N 40QR 30 Std. 30K 30T
900	D										50N 50QR 40 Std. 40K 40T
1200		B D		A A A A A							65N 60QR 65 Std. 50K 50T
1350			A A A A E								75N 75QR 65 Std. 65K 65T
1500		B B E					F				75N 75QR 65 Std. 65K 65T
1800		B E B E E	A A A A E	A A A A C	A A A A		F F N	G			85N 100QR 80 Std. 80K 80T
2250			E E E E E					H G P P L			100N 125QR 125 Std. 140K 100T
2400				A A E E E					P P P		100N 125QR 125 Std. 140K 140T
2700			E E E E E		E D E E E			P H P P P			125N 150QR 125 Std. 140K 140T
3000				E C E E E					N L P P		125N 150QR 125 Std. 140K 140T
3600				E E E E E	E E E E E				L N L P P	H N H P P	125N 200QR 125 Std. 140K 140T

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 40—Single Ungrounded-Wye Connected Capacitor Banks Rated 14.40 Kv Three-Phase

Capacitor Bank Rating, Kvar, Three-Phase ↓	Application Condition										S&C Positrol Fuse Link Rating, Amperes
Capacitor-Unit Rating, Kvar, Single-Phase →	Paper-Film Construction					All-Film Construction					
	50	100	150	200	300	50	100	150	200	300	
150											8N 10QR 7 Std. 6K 6T
300											15N 15QR 15 Std. 10K 12T
450											20N 25QR 20 Std. 15K 20T
600											25N 30QR 25 Std. 20K 25T
750	A										30N 40QR 30 Std. 30K 30T
900	D	B	A								45N 50QR 40 Std. 40K 40T
1200		D D		A A A A A							65N 60QR 65 Std. 50K 50T
1350			A A A A E								75N 75QR 65 Std. 65K 65T
1500		B B E					F				75N 75QR 65 Std. 65K 65T
1800		B E B E E	A D A A E	A A A A C	A A A A A		F F N	G			85N 100QR 80 Std. 80K 80T
2250			E E E E E					H G G L			100N 125QR 100 Std. 100K 100T
2400				C A E E E					P P H		100N 125QR 125 Std. 140K 100T
2700			E E E E E		E D E E E			P H P P P		M M P P	125N 150QR 125 Std. 140K 140T
3000				E C E E E					N N P P		125N 150QR 125 Std. 140K 140T
3600				E E E E E	E E E E E				L L L P P	H H H P P	125N 175QR 125 Std. 140K 140T

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 41—Single Ungrounded-Wye Connected Capacitor Banks Rated 20.80 Kv Three-Phase

Capacitor Bank Rating, Kvar, Three-Phase ↓	Application Condition										S&C Positrol Fuse Link Rating, Amperes
Capacitor-Unit Rating, Kvar, Single-Phase →	Paper-Film Construction					All-Film Construction					
	50	100	150	200	300	50	100	150	200	300	
150											8N 7QR 5 Std. 6K 6T
300											10N 15QR 10 Std. 8K 10T
450											15N 20QR 15 Std. 12K 12T
600											20N 25QR 20 Std. 15K 15T
750											20N 25QR 20 Std. 20K 20T
900											30N 30QR 25 Std. 25K 25T
1200											45N 50QR 40 Std. 30K 30T
1350											50N 50QR 40 Std. 40K 40T
1500											50N 50QR 50 Std. 50K 40T
1800		B D	A A	A A A A A							65N 60QR 65 Std. 50K 50T
2250			D								75N 75QR 65 Std. 65K 65T
2400				A A A A A							85N 100QR 80 Std. 65K 65T
2700			A A A A E		A A A A			G			85N 100QR 80 Std. 80K 80T
3000				A A A A C							95N 100QR 100 Std. 80K 80T
3600				C A E E E	A A E E E				P P P	M P P	100N 125QR 125 Std. 140K 140T

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 42—Single Ungrounded-Wye Connected Capacitor Banks Rated 22.90 Kv Three-Phase

Capacitor Bank Rating, Kvar, Three-Phase ↓	Application Condition										S&C Positrol Fuse Link Rating, Amperes
Capacitor-Unit Rating, Kvar, Single-Phase →	Paper-Film Construction					All-Film Construction					
	50	100	150	200	300	50	100	150	200	300	
150											5N 5QR 5 Std. 6K 6T
300											10N 10QR 7 Std. 6K 8T
450											15N 15QR 15 Std. 10K 12T
600											20N 20QR 15 Std. 12K 15T
750											20N 25QR 20 Std. 20K 20T
900											25N 30QR 25 Std. 20K 25T
1200											30N 40QR 30 Std. 30K 30T
1350			A								45N 50QR 40 Std. 40K 40T
1500											50N 50QR 40 Std. 40K 40T
1800		D	A	A A A A A							65N 60QR 50 Std. 50K 50T
2250			E								75N 75QR 65 Std. 65K 65T
2400				A A A A A							75N 75QR 65 Std. 65K 65T
2700			A D A D D								85N 100QR 80 Std. 80K 65T
3000				A A A A C							85N 100QR 80 Std. 80K 80T
3600				C C A C E	A A A A E				H		100N 125QR 100 Std. 100K 100T

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 43—Single Ungrounded-Wye Connected Capacitor Banks Rated 23.90 Kv Three-Phase

Capacitor Bank Rating, Kvar, Three-Phase ↓	Application Condition										S&C Positrol Fuse Link Rating, Amperes
Capacitor-Unit Rating, Kvar, Single-Phase →	Paper-Film Construction					All-Film Construction					
	50	100	150	200	300	50	100	150	200	300	
150											5N 5QR 5 Std. 6K 6T
300											10N 10QR 7 Std. 6K 8T
450											15N 15QR 10 Std. 10K 12T
600											20N 20QR 15 Std. 12K 15T
750											20N 25QR 20 Std. 15K 20T
900											20N 25QR 20 Std. 20K 20T
1200											30N 40QR 30 Std. 25K 30T
1350											45N 40QR 40 Std. 30K 30T
1500		B									45N 50QR 40 Std. 40K 40T
1800		D	D	A A A A A							50N 60QR 50 Std. 50K 50T
2250			A E								75N 75QR 65 Std. 65K 65T
2400				A A A A A							75N 75QR 65 Std. 65K 65T
2700			E A D								85N 100QR 80 Std. 65K 65T
3000				A A A A C							85N 100QR 80 Std. 80K 80T
3600				E C A C E	C A A A E				H	G	100N 125QR 100 Std. 100K 100T

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

TABLE 44—Single Ungrounded-Wye Connected Capacitor Banks Rated 24.90 Kv Three-Phase

Capacitor Bank Rating, Kvar, Three-Phase ↓	Application Condition										S&C Positrol Fuse Link Rating, Amperes
Capacitor-Unit Rating, Kvar, Single-Phase →	Paper-Film Construction					All-Film Construction					
	50	100	150	200	300	50	100	150	200	300	
150											5N 5QR 5 Std. 6K 6T
300											10N 10QR 7 Std. 6K 8T
450											10N 15QR 10 Std. 8K 10T
600											20N 20QR 15 Std. 12K 15T
750											20N 25QR 20 Std. 15K 15T
900											20N 25QR 20 Std. 20K 20T
1200											30N 40QR 30 Std. 25K 25T
1350											40N 40QR 30 Std. 30K 30T
1500		D									45N 50QR 40 Std. 40K 40T
1800											50N 50QR 50 Std. 50K 40T
2250			A E								65N 60QR 65 Std. 50K 65T
2400				A A A A A							75N 75QR 65 Std. 65K 65T
2700			D								75N 75QR 65 Std. 65K 65T
3000				A A A A A							85N 100QR 80 Std. 80K 65T
3600				A A A A C	A A A A A						95N 100QR 100 Std. 80K 80T

Note: Refer to "How to Use the Fuse Selection Tables" on page 88 (foldout).

THE FUSE SELECTION TABLES — Continued

TABLE 45—S&C Type XS Fuse Cutouts (for use with S&C Positrol Fuse Links)—Summary of Available Ratings

System Voltage, Kv ↓	60-Hertz① Short-Circuit Interrupting Rating,② Amperes Rms, Asymmetrical③ and Symmetrical④ (one-shot rating, where applicable, shown in parentheses)										
Cutout Continuous Rating →	100 AMPERES								200 AMPERES		
Style →	EXTRA-HEAVY-DUTY⑤			ULTRA-HEAVY-DUTY⑥					HEAVY-DUTY⑦		
Cutout Voltage Rating—Kv, Nom. →	14.4	25	25	14.4	25	25	25	25	7.2	14.4	14.4
Cutout Voltage Rating—Kv, Max →	15	27	27	15	27	27	27	27	7.8	15	15
Cutout Voltage Rating—Kv, BIL →	95	125	150	95	125	150	150	150✦	95	125	150
Leakage Distance to Ground, Minimum, Inches →	8½	11	17	8½	11	17◆	17■	26■	8½	11	17
Catalog Number →	89021R9	89022R9	89042R9	89031R9	89032R9	89052R9	89033R9	89053R9	89071R9	89072R9	89092R9
4.16 thru 7.2									**12 000** 8 600		
4.16 thru 14.4	**10 000** **(12 000)**□ 7 100 (8 600)□	**8 000** 5 300	**8 000** 5 300	**16 000** 10 600	**12 000** **(16 000)**★ 8 000 (10 600)★	**12 000** **(16 000)**★ 8 000 (10 600)★					
8.32● thru 12.47●									**12 000** 8 600		
8.32 thru 14.4										**10 000** 7 100	**10 000** 7 100
16.5 thru 24.9		**8 000** 5 300	**8 000** 5 300		**12 000** **(16 000)**★ 8 000 (10 600)★	**12 000** **(16 000)**★ 8 000 (10 600)★	**12 000** 8 000				
20.8● thru 24.9●										**10 000** 7 100	**10 000** 7 100
26.4● thru 34.5●			**8 000** 5 300			**12 000** **(16 000)**★ 8 000 (10 600)★	**12 000** 8 000				
26.4▲ thru 34.5▲								**12 000** 8 000			

① Consult the nearest S&C Sales Office for 50-hertz ratings.

② Asymmetrical and symmetrical ratings are given for each catalog number in each applicable system-voltage range. In each case, the asymmetrical rating is given first (in bold-face type) and the symmetrical rating second (in light-face type). Ratings in parentheses are the associated one-shot ratings (see Note □ and ★).

③ Nominal asymmetrical ratings are based on total available short-circuit current of the circuit including the dc component, in accordance with ANSI Standards.

④ Symmetrical ratings assigned are based on available symmetrical short-circuit current at locations where X/R ratio is equal to 8 (for fuse cutout Catalog Numbers 89021R9, 89071R9, 89072R9, and 89092R9) or 12 (for all other overhead—pole-top style fuse cutouts) ANSI Standard C37.41-1988 specifies these X/R ratios, as applicable, depending on cutout voltage rating and interrupting current rating.

⑤ Uses either nonremovable or removable buttonhead fuse links.

⑥ Uses removable buttonhead fuse links only.

⑦ Fuse cutout, Catalog Number 89071R9, uses removable buttonhead fuse links only. Fuse cutouts, Catalog Numbers 89072R9 and 89092R9, use either nonremovable or removable buttonhead fuse links.

◆ Approximate fuse-tube length, top of fuse-tube cap to bottom of the fuse tube: 14¾ inches.

■ Approximate fuse-tube length, top of fuse-tube cap to bottom of fuse tube: 18¼ inches.

✦ Meets 170-kv BIL rating requirement of IEC Publication 282-2.

● Applicable for protection of grounded-wye connected capacitor banks in solidly-grounded-neutral (multigrounded-neutral) systems—where the leakage distance to ground meets user's requirements.

▲ Applicable for protection of grounded-wye connected capacitor banks in solidly-grounded-neutral (multigrounded-neutral) systems.

□ One-shot rating, based on replacement of cutout tube only.

★ One-shot rating, based on replacement of cutout tube only. In applications where fuse links rated 75 amperes and above are used in this cutout, the one-shot rating is based on the use of S&C Extra-Performance Style Positrol Fuse Links.

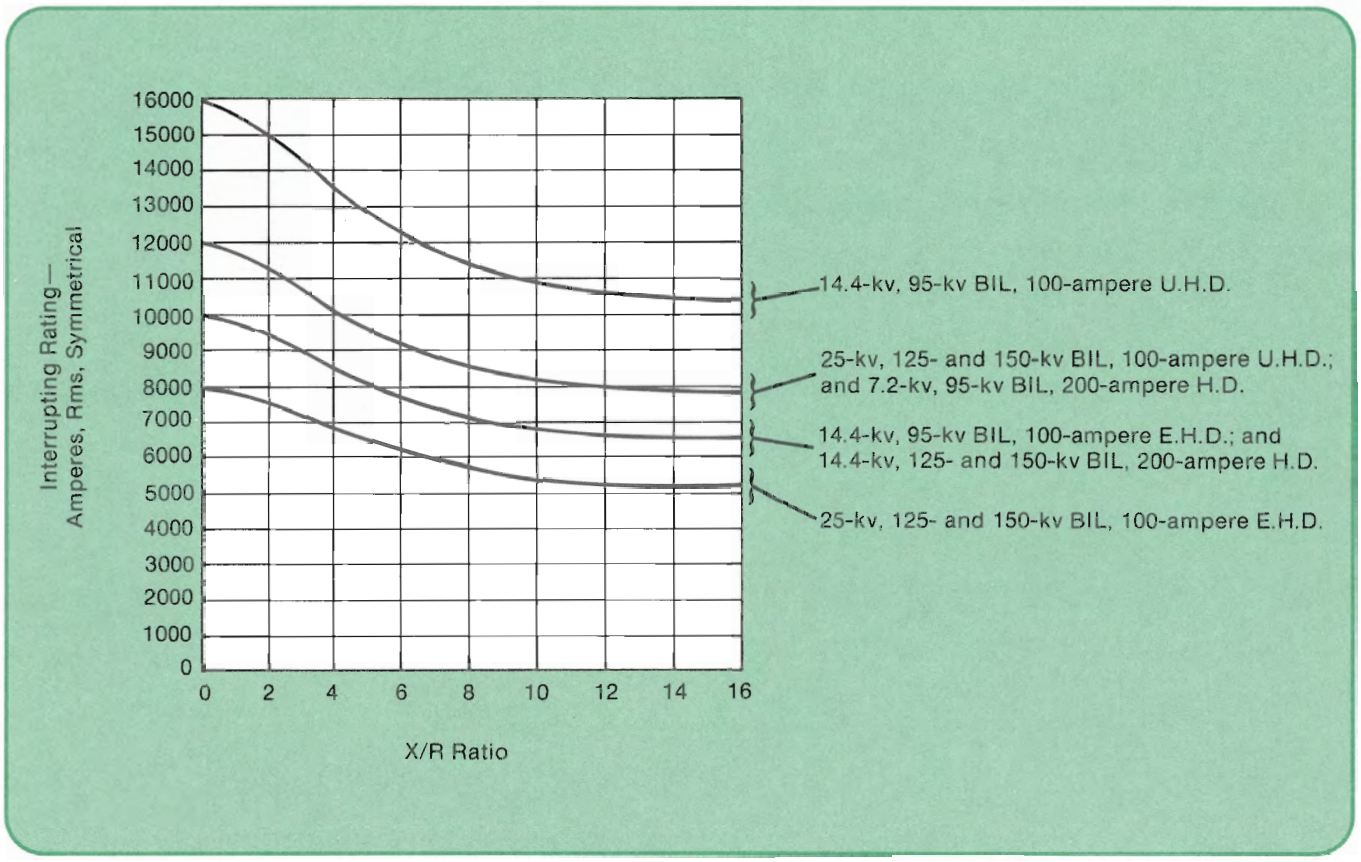


Figure 8. Symmetrical interrupting ratings for S&C Type XS Fuse Cutouts at various X/R ratios.

How to Use the Fuse Selection Tables

Grounded-Wye and Delta Connected Capacitor Banks

STEP 1. Locate the appropriate selection table based on the capacitor bank voltage rating and connection. Refer to page 89 for index to selection tables.

STEP 2. Enter the table in the "Maximum Fault Current for Capacitor Bank Protection . . . " column corresponding to the manufacturer and type of the capacitor units in the bank. Read down the table in this column, stopping in the section corresponding to the capacitor bank kvar rating and configuration. Find the line (or lines) for which the maximum fault-current value(s) listed is *greater* than the available phase-to-ground fault-current level (for grounded-wye connected banks) or phase-to-phase fault-current level (for delta connected banks) at the capacitor bank location.

If you are unable to locate a line containing a maximum fault-current value greater than the available fault-current level, then there are no fuse links available that will protect the capacitor bank as configured. You may wish to consider one or more of the following alternatives: (1) reconfigure the bank using larger individual capacitor units, or units of a different construction type or from a different manufacturer, which, as can be seen from the selection tables, may result in higher maximum fault-current value for capacitor bank protection; (2) individually fuse the capacitor units in the bank; or (3) use partial-range (backup) current-limiting fuses■ in series with the fuse cutouts.

STEP 3. In the line or lines located in Step 2 that are *not* identified with the "▲" symbol, read across the table to the right to find the fuse link(s) recommended for your applications.●

If all of the maximum fault-current entries are identified with the symbol "▲" or if the maximum fault-current value corresponding to the desired fuse link speed is identified by the symbol "▲," then there is a possibility that the fuse link(s) listed may not protect the capacitor units employed against case rupture in the event of a low-current evolving fault (see text, page 17). You may wish to reconfigure the bank using larger individual capacitor units, or units of a different construction type or from a different manufacturer, to obtain a fuse link recommendation not subject to an application condition indicated by the symbol "▲."

STEP 4. For applications involving switching of parallel (i.e., back-to-back) capacitor banks, refer to the section entitled "Minimum Separation Distance Between Banks" on page 89.

STEP 5. Select the appropriate S&C Type XS Fuse Cutout based on the system voltage, and on the interrupting duty and maximum continuous current required. Refer to Table 45 on page 86.

Ungrounded-Wye Connected Capacitor Banks

STEP 1. Locate the appropriate selection table based on the capacitor bank voltage rating. Refer to page 89 for index to selection tables.

STEP 2. Enter the table in the "Application Condition" column corresponding to the capacitor-unit construction type and capacitor-unit kvar rating employed. Read down the table in this column, stopping in the section corresponding to the capacitor bank kvar rating under consideration. An application-condition letter-code entry in this section indicates that there is a possibility that the fuse link(s) listed may not protect the capacitor units employed against case rupture in the event of a low-current evolving fault (see text, page 17). Refer to Tables 46 and 47 for paper-film and all-film capacitor units, respectively, to determine whether this application condition applies to your particular capacitor units (as indicated by an "X" in the line corresponding to the letter code and in the column for the manufacturer of the capacitor units employed).

If there is no application-condition letter code, or if the application condition does not apply to your particular capacitor units, then read across the table to the right in the appropriate line(s) to find the fuse link(s) recommended for your application.●

If an application-condition letter code applies to your particular capacitor units, you may wish to reconfigure the bank using larger individual capacitor units, or units of a different construction type or from a different manufacturer, to obtain a fuse link recommendation not subject to an application condition.

STEP 3. For applications involving switching of parallel (i.e., back-to-back) capacitor banks, refer to the section entitled "Minimum Separation Distance Between Banks" on page 89.

STEP 4. Select the appropriate S&C Type XS Fuse Cutout based on the system voltage, and on the interrupting duty and maximum continuous current required. Refer to Table 45 on page 86.

TABLE 46—Application Conditions for Paper-Film Capacitor Units

Application Condition	General Electric	Sangamo	ABB (Westinghouse)
A		X	
B			X
C	X	X	
D		X	X
E	X	X	X

TABLE 47—Application Conditions for All-Film Capacitor Units

Application Condition	General Electric	McGraw-Edison		Sangamo	ABB (Westinghouse)
		Type ES	Type EC		
F		X			
G				X	
H	X			X	
I	X				X
J	X	X		X	
K	X		X	X	
L	X			X	X
M	X	X	X	X	
N	X	X		X	X
O	X		X	X	X
P	X	X	X	X	X

■ If partial-range current-limiting fuses are employed, the available fault current must be of sufficient magnitude to melt the current-limiting fuse in one-half cycle or less for the fuse to be effective.

● As noted in the text on page 15, the "N" Speed fuse link, because of its low 300-second maximum clearing current and relatively steep time-current characteristics in the low-current region, will almost always provide the earliest possible response for an evolving capacitor-unit failure. For this reason, the "N" Speed fuse link is the preferred recommendation. "Q" Speed, Standard Speed, "K" Speed, or "T" Speed fuse links should be used only where it is not possible to standardize on "N" Speed fuse links for all capacitor bank fusing applications.

Index to the Fuse Selection Tables

Capacitor Bank Rating, Kv, Three-Phase	Capacitor Bank Connection					
	Grounded-Wye		Delta		Ungrounded-Wye	
	Table Number	Page Number	Table Number	Page Number	Table Number	Page Number
2.4	—	—	24	58	—	—
4.16	9	30	25	59	33	74
4.8	10	31	26	60 and 61	34	75
7.2	11	32 and 33	27	62 and 63	35	76
8.32	12	34 and 35	28	64 and 65	36	77
12.47	13	36 and 37	29	66 and 67	37	78
13.2	14	38 and 39	30	68 and 69	38	79
13.8	15	40 and 41	31	70 and 71	39	80
14.4	16	42 and 43	32	72 and 73	40	81
20.8	17	44 and 45	—	—	41	82
22.9	18	46 and 47	—	—	42	83
23.9	19	48 and 49	—	—	43	84
24.9	20	50 and 51	—	—	44	85
26.4	21	52 and 53	—	—	—	—
27.6	22	54 and 55	—	—	—	—
34.5	23	56 and 57	—	—	—	—

Minimum Separation Distance Between Banks

To avoid nuisance operation of the capacitor bank fuse link when energizing an adjacent parallel-connected capacitor bank (of the same kvar rating and configuration), the two banks should be spearated by a *minimum* of two pole-spans of conductor. In certain instances, a minimum separation distance in excess of two pole-spans of conductor is required. Refer to the table below.

Capacitor Bank Rating, Kv, Three-Phase ↓	Minimum Separation Distance, Pole-Spans												
Capacitor Bank Rating, Kvar, Three-Phase →	150			300			450		600	750	900	1200	1350
Speed Characteristic →	"N"	"QR"	Std.	"N"	"QR"	"K"	"N"	"K"	"N"	"N"	"N"	"N"	"N"
13.8	3★												
14.4	3●												
20.8				3◆						3◆			
22.9	3◆	4◆				5■							
23.9	3◆	4◆				5◆					3■		
24.9		4◆				4◆	5■	4■			3■		
26.4		3●				4●	5●	4●			3●		
27.6		3●				4●	4●	4●	3●		3●		
34.5		3●	3●	4●	4●	3●	3●			4●		4●	3●

★ Applicable only to ungrounded-wye or delta-connected capacitor banks.

● Applicable only to grounded-wye connected capacitor banks.

◆ Applicable only to grounded-wye and ungrounded-wye connected capacitor banks.

■ Applicable only to ungrounded-wye connected capacitor banks.

Note: See over for "How to Use the Fuse Selection Tables" on page 88. For your convenience, these instructions should be left folded out for ready reference while using the fuse selection tables.

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