

Selection Guide

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This information bulletin is a guide for the selection, application, and coordination of S&C Type SMD® Power Fuses when applied on the primary side of small to medium-sized transformers installed in utility and industrial substations. For the purpose of this guide, transformers having primary voltage ratings between 34.5 kV and 138 kV, with medium-voltage (4.16 kV through 34.5 kV) secondaries, will be covered.

High-voltage power fuses provide a reliable and economical means of protecting small to medium-sized transformers installed in utility and industrial substations. The considerable economies inherent in power-fuse protection are possible, first, because the fuse itself is much less costly than other types of protective equipment and, second, because there is no need for such auxiliary equipment as station batteries, motor-driven switch operators, and protective relays.

Further benefits of a compact fuse-protection package are low installation cost and a space-saving design that will accommodate almost any structure. In addition, unlike relay-actuated protective devices, such as circuit breakers and reclosers, power fuses require only minimal physical maintenance. For example, periodic checks of the condition of the fuse-unit bore and occasional refinishing of fuse tubes exposed to severe weathering.

The transformer primary fuse should be selected to provide both system and transformer protection. With respect to system protection, the primary fuse should detect a potentially damaging overcurrent condition and operate promptly to isolate only the faulted segment, thereby minimizing short-circuit stresses on the remainder of the system and limiting the extent of the service interruption to the smallest possible portion of the system.

For transformer protection, the primary fuse should operate promptly in response to a bus or cable fault located between the transformer and the nearest secondary-side overcurrent protective device. It should further provide backup protection for the transformer in the event the secondary-side overcurrent protective device either fails to operate because of a malfunction, or operates too slowly because of incorrect (higher) ratings or settings.

To best achieve these objectives, group protection of transformers is not generally recommended — each transformer should be individually protected. The ampere rating of a primary fuse selected to accommodate the total loading requirements of two or more transformers would typically be so large that only a small degree of secondary fault protection — and almost no backup protection — would

be provided for each individual transformer. In addition, with group protection of transformers, the degree of service continuity is significantly reduced because a fault associated with any one transformer will result in the loss of service to *all* transformers protected by the fuse.

S&C Type SMD Power Fuses provide full fault-spectrum protection for transformers. These fuses will detect and interrupt all faults — large, medium, and small (even down to their minimum melting currents), regardless of whether the fault is on the primary or secondary side of the transformer or when line-to-line or line-to-ground voltage exists across the fuse. They also will detect or interrupt faults regardless of whether the transformer is adjacent to the fuse or connected to it via a cable from a remote location, and regardless of transformer winding connection.

SMD Power Fuses are capable of handling the full range of transient recovery voltages associated with these conditions. They develop a positive internal gap of high dielectric strength after circuit interruption, thereby preventing destructive re-ignitions when exposed to full system voltage. The “dropout” action of these power fuses provides the additional benefit of visible air-gap isolation for the transformer after fuse operation.

The close fusing necessary to provide superior protection for secondary-side faults is possible with S&C Type SMD Power Fuses because: (1) they use silver or pre-tensioned nickel-chrome fusible elements that are not damaged by surges that may heat the element nearly to the severing point; (2) they are available in a wide variety of ampere ratings and speed characteristics especially suited to protecting transformers against very-low-magnitude fault currents; and (3) they possess substantial peak-load capabilities and surge capacities that are more than adequate to withstand transformer magnetizing inrush currents and severe hot-load and cold-load pickup currents.

Close fusing with SMD Power Fuses, coupled with their exceptional low-current fault-interrupting performance, ensures maximum protection for the transformer against a broad range of secondary-side fault currents, thus minimizing the life-shortening thermal and mechanical stresses associated with prolonged transformer through-faults. In addition, the ability to fuse close to the full-load current of the transformer facilitates coordination with source-side protective devices by permitting the use of lower ratings or settings for faster response.

The selection of transformer primary-side protective devices and their ratings and settings has been a matter of considerable complexity. This publication provides

complete, simplified procedures for selecting the optimal transformer primary fuse, taking into consideration all of the following factors associated with the application:

- System voltage
- Available fault current
- Anticipated normal transformer loading schedule, including daily or repetitive peak loads, and emergency peak loads
- Inrush currents, including the combined effects of transformer magnetizing-inrush current and the energizing-inrush currents associated with connected loads, particularly following a loss-of-source voltage (momentary or extended)
- The degree of protection provided to the transformer against damaging overcurrents
- Coordination with secondary-side and other primary side overcurrent protective devices
- Protection of the downstream conductors against damaging overcurrents

These factors are discussed in detail in the “Application Principles” section that begins on page 4. This discussion refers to selection tables located on pages 50 to 128 of this document.

These tables are designed specifically to simplify the selection of the optimal transformer primary fuse for a particular application.

The fuse selection tables list for each transformer a variety of fuse-unit ampere ratings and speed characteristics, along with the information necessary to confirm coordination of a given fuse with a variety of secondary-side protective devices. The tables also feature a specially designed “Transformer Protection Index,” which indicates the degree of transformer protection provided by the primary fuse, as well as listings of the loading capabilities of the fuses when used with each of the transformers shown. Users must only refer to these tables to obtain the information required to make a selection.

Selecting the Primary Fuse Rating

A transformer primary fuse must be selected for the voltage rating, the available fault current, and the continuous current-carrying requirement of the transformer on which it is to be applied. Because there are a multitude of voltage, short-circuit interrupting, and maximum ampere ratings available, choose the most economical primary fuse that will meet both present and future requirements. In addition, from the wide variety of ampere ratings and speeds available, select the primary fuse providing the optimum protection for the transformer against secondary-side faults.

Voltage rating. The maximum voltage rating of the transformer primary fuse should equal or exceed the maximum phase-to-phase operating voltage level of the system. S&C Type SMD Power Fuses are not “voltage critical,” so they may be applied at any system operating voltage equal to *or less than* the maximum voltage rating of the fuse. Moreover, these fuses operate without producing overvoltages that can cause spurious operation of surge arresters or damage transformer insulation.

Short-circuit interrupting rating. The symmetrical short-circuit interrupting rating of the transformer primary fuse should equal or exceed the maximum available fault current at the fuse location. When determining the interrupting rating of the primary fuse, consider the X/R ratio of the system at the fuse location because power fuses may have *higher-than-nominal* symmetrical interrupting ratings for those applications where the X/R ratio is *less* than the value of 15 specified by the applicable standard.● As a result, it's possible to use a less expensive primary fuse having a lower nominal symmetrical interrupting rating. Refer to the local S&C Sales Office for these higher symmetrical short-circuit interrupting ratings.

The interrupting rating of the transformer primary fuse should be chosen with sufficient margin to accommodate anticipated increases in the interrupting duty caused by system growth. Again, because fuses are available with a wide variety of interrupting ratings, choose a primary fuse having an interrupting rating only as large as necessary to meet present and future requirements.

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

- Accommodate the anticipated normal transformer loading schedule, including daily or repetitive peak loads, and emergency peak loads
- Withstand the magnetizing-inrush current associated with the energizing of an unloaded transformer, as well as the combined magnetizing- and load-inrush currents associated with the re-energization of a loaded transformer following either a momentary *or* extended loss of source voltage
- Protect the transformer against damaging overcurrents
- Coordinate with secondary-side as well as other primary-side overcurrent protective devices
- Protect downstream conductors against damaging overcurrents. These principles, which are examined in greater detail in the following sections, provide the basic foundation of transformer primary fuse selection

● IEEE Standard C37.46, “Specifications for Power Fuses and Fuse Disconnecting Switches.”

Accommodating Expected Loading Levels

In general, the transformer primary fuse should be selected based on the anticipated normal transformer loading schedule, including daily or repetitive peak loads. The primary fuse ultimately selected should have a continuous loading capability, as differentiated from its ampere rating, equal to or greater than this highest anticipated loading level. Typical transformer loading levels for a number of conditions (i.e., self cooled, forced air-cooled) are shown in Table 1. Loadability recommendations for various S&C Type SMD Power Fuses protecting specific transformers are included in the selection tables on pages 50 to 128 of this document.

Conditions may occur during which the transformer will be loaded far in excess of the normal loading schedule. Such emergency peak loading typically occurs when one of two transformers (in a duplex substation, for example) is compelled under emergency conditions to carry the load of both transformers for a short period of time. Where

emergency peak loads are contemplated, the transformer primary fuse ultimately selected should have an emergency peak-load capability at least equal to the magnitude and duration of the emergency peak load. Refer to S&C Information Bulletin 210-190 for emergency peak-load capability values.

It is important to remember that a transformer primary fuse should be selected to accommodate — not to interrupt — emergency peak loads. This requirement may result in the selection of a primary fuse ampere rating *larger* than would be required for a similarly rated single transformer installed alone. Therefore, the degree of transformer protection provided by the primary fuse may be reduced.

Table 1. Transformer Loading Levels

kVA Three-Phase ↓	Loading Level, Percent of Oil/Air-Cooled (OA) Rating					
	Oa ^①		Oa/Fa ^②		Oa/Fa/Fa ^③	
Transformer Type →						
Temperature Capability →	131°F (55°C)	149°F (65°C)	131°F (55°C)	149°F (65°C)	131°F (55°C)	149°F (65°C)
< 2,500	100	100	115	115	NA	NA
2,500 – 10,000	100	100	125	125	NA	NA
> 10,000	100	100	133	133	167	167

NA=Not available.

① Base rating (self-cooled).

② Fan cooled (first stage); also applicable to OA/FOA rating.

③ Fan cooled (second stage); also applicable to OA/FA/FOA or OA/FOA/FOA ratings.

Withstanding Inrush Currents

Magnetizing-inrush current. When an unloaded distribution or power transformer is energized, a short-duration inrush of magnetizing current occurs that the transformer primary fuse must be capable of withstanding without operating. A conservative estimate of the integrated heating effect on the primary fuse caused by this inrush current is roughly equivalent to a current having a magnitude of 12 times the primary full-load current of the transformer for a duration of 0.1 seconds. A current having a magnitude of 25 times the primary full-load current of the transformer for 0.01 seconds is also frequently used.

The magnetizing inrush current for a 25-kVA, 7.62-kV, single-phase, pole top-style distribution transformer is shown in Figure 1 (dotted line). This example is from a laboratory test and is the highest inrush obtained for this transformer. For purposes of comparison, the magnetizing inrush current for a 10-MVA, 115-kV, three-phase, substation-class power transformer is also shown (solid line). Note

that the first peak of the inrush current for the 10-MVA substation transformer is significantly less, on a per-unit basis, than that of the 25-kVA distribution transformer. Note also that the inrush current for the 10-MVA transformer decays more slowly.

The inrush that occurs on any particular energization will depend on, among other things, the residual magnetism in the transformer core as well as the instantaneous value of the voltage when the transformer is energized. Because these two parameters are unknown and uncontrollable, the fuse must be sized to withstand the maximum inrush that can occur under the worst-case energization. The minimum melting time-current characteristic of the primary fuse should be such that the fuse will not operate as a result of this magnetizing-inrush current.

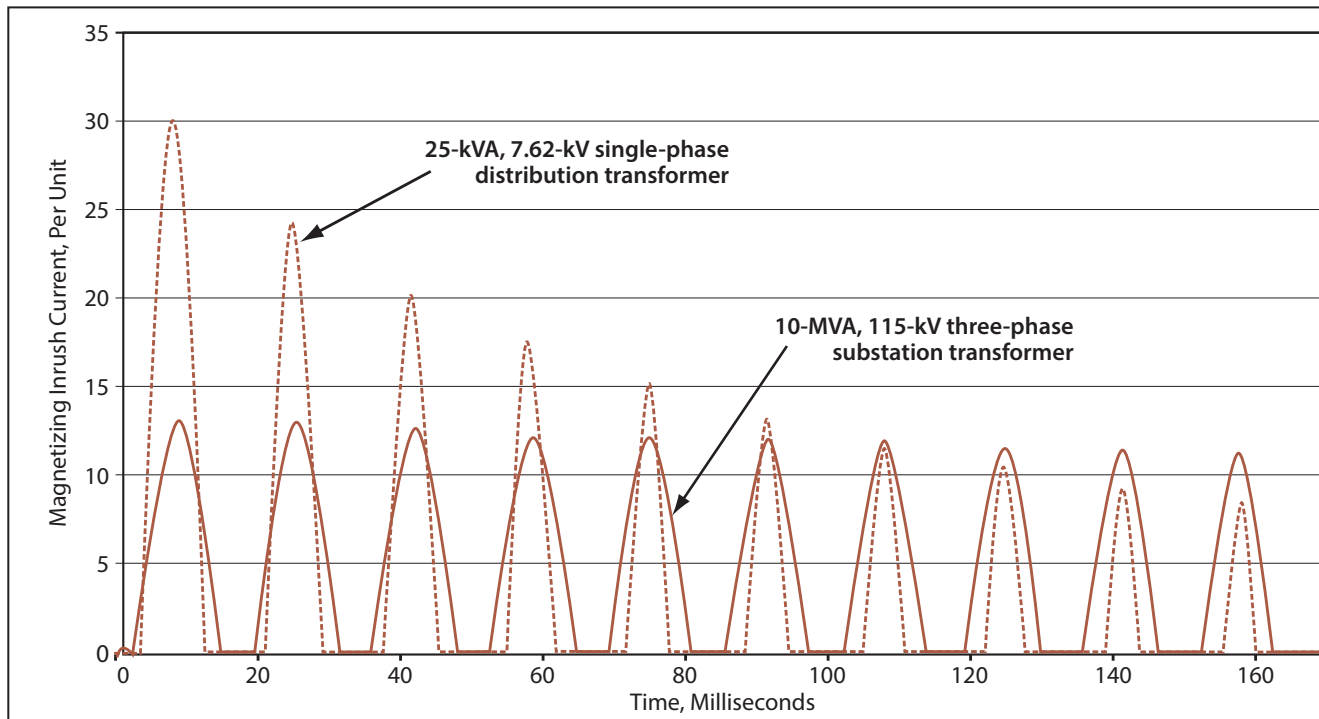


Figure 1. Magnetizing inrush currents for a 25-kVA single-phase distribution transformer (dotted line) and for a 10-MVA three-phase substation transformer (solid line). Note: 1 per-unit current is equal to transformer rated full-load current.

The integrated RMS equivalent of the inrush current for the 10-MVA substation transformer (from Figure 1) is shown in Figure 2, along with the “rule-of-thumb” inrush points previously mentioned. Observe that the inrush points are higher than the actual RMS equivalent of the inrush current and are thus a conservative estimate of the inrush current.

Sizing the transformer primary fuse such that its minimum melting curve is above these “rule-of-thumb”

inrush points will avoid unnecessary fuse operation, but it can occasionally cause coordination problems with source-side protective devices, or it may compromise the degree of protection for the transformer because of the large rating selected.

On these occasions, the use of a smaller fuse rating is desirable and can be justified by using a better estimate of the heating equivalent of the magnetizing inrush current.

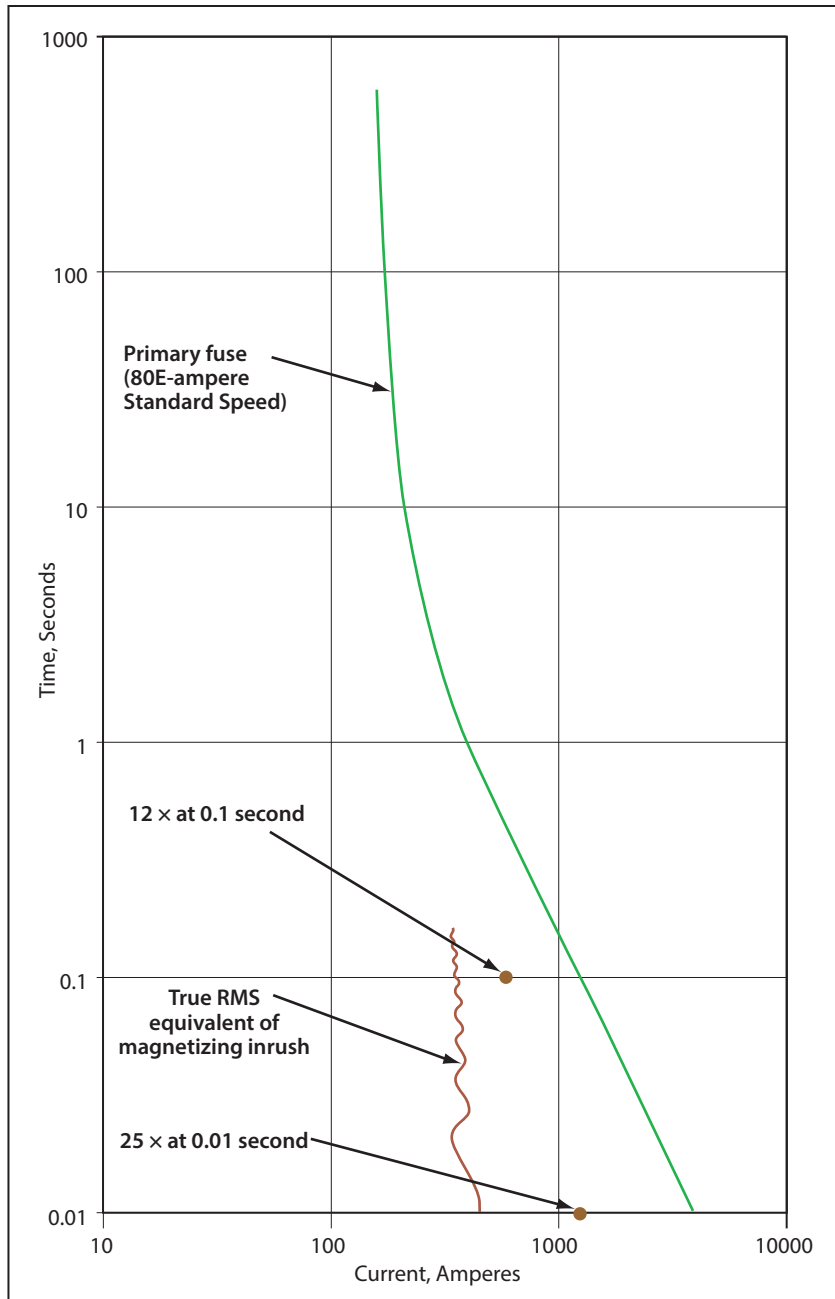


Figure 2. True RMS equivalent of the magnetizing inrush current for the 10-MVA transformer, from Figure 1, shown with “rule-of-thumb” inrush points and an 80E-ampere Standard Speed S&C power fuse minimum melting curve.

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Magnetizing inrush currents also depend on the transformer rating and the available fault current. Because of the voltage drop across the source impedance during the inrush period, the inrush current will be less when the transformer is supplied from a weak source as compared to a strong source.

Also, for small overhead-distribution transformers, the peak inrush current can be as high as 30 times the rated RMS current; for larger substation-class power transformers, the inrush peak will be lower, but the inrush duration will be longer.

Figure 3 illustrates the maximum RMS equivalent magnetizing inrush currents as a function of transformer size. Note that the per-unit inrush current is lower for larger transformer sizes. (Actual amperes of inrush current are, of course, higher for the larger transformers). The strength

of the source relative to the transformer full-load current is indicated by the ratio of the transformer full-load current to the system available fault current; a strong source will be able to supply a high fault current and will result in a lower ratio of full-load current to fault current.

“Hot-load” pickup. The transformer primary fuse must also be capable of withstanding the inrush current that occurs when a transformer that is carrying load experiences a momentary loss of source voltage followed by re-energization (such as occurs when a source-side circuit breaker operates to clear a temporary upstream fault and then automatically recloses). In this case, the inrush current consists of two components: the magnetizing-inrush current of the transformer, and the inrush current associated with the connected loads. The ability of the primary fuse to withstand combined magnetizing- and load-inrush current is referred to as hot-load pickup capability.

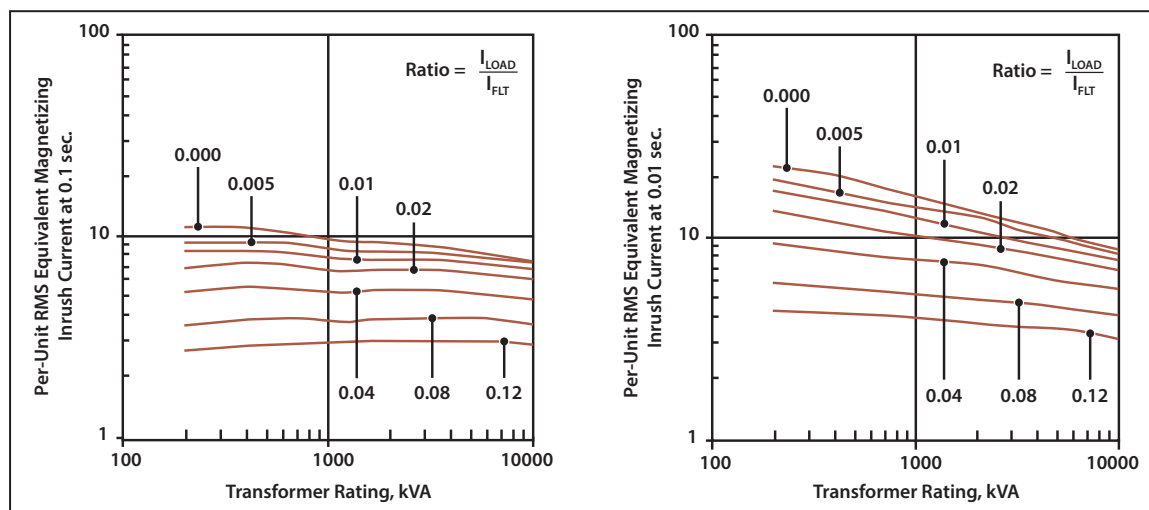


Figure 3. RMS equivalent magnetizing inrush currents at 0.1 second (left) and at 0.01 second (right), in per unit of transformer rated full-load current, shown as a function of transformer size (kVA rating), with source strength indicated as a parameter. A strong source will have a lower ratio of rated load current to available fault current.

The integrated heating effect on the transformer primary fuse caused by the combined magnetizing- and load-inrush current is equivalent to a current having a magnitude of between 12 and 15 times the primary full-load current of the transformer for a duration of 0.1 seconds. The specific multiple of primary full-load current is a function of several factors, including the transformer load immediately preceding the momentary loss of source voltage, the number of reclose operations attempted, and the available fault current. The hot-load pickup inrush current for a single reclose operation of the line-terminal circuit breakers serving the transformer is illustrated in Figure 4. The minimum melting time-current characteristic curve of the primary fuse, adjusted to reflect the pre-outage load current and elevated (or reduced) ambient temperatures, if applicable, should exceed the magnitude and duration of the combined inrush current.

Preload and ambient-temperature adjustments. Minimum melting time-current characteristic curves for medium- and high-voltage power fuses are determined in accordance with the appropriate standard[●], which specifies testing of fuses at an ambient temperature of +77°F (+25°C), and with no initial load. In practice, every fuse is carrying a load, which raises the temperature of the fusible element and thus reduces its melting time for a given value of current. To ensure the transformer primary fuse can withstand hot-load pickup current (and to provide precise coordination between the primary fuse and load-side circuit breakers and reclosers), it is necessary to adjust the published minimum melting time-current characteristic curve of the primary fuse to reflect the reduced melting time for each specific level of fuse loading.

● IEEE Standard C37.46, "Specifications for Power Fuses and Fuse Disconnecting Switches."

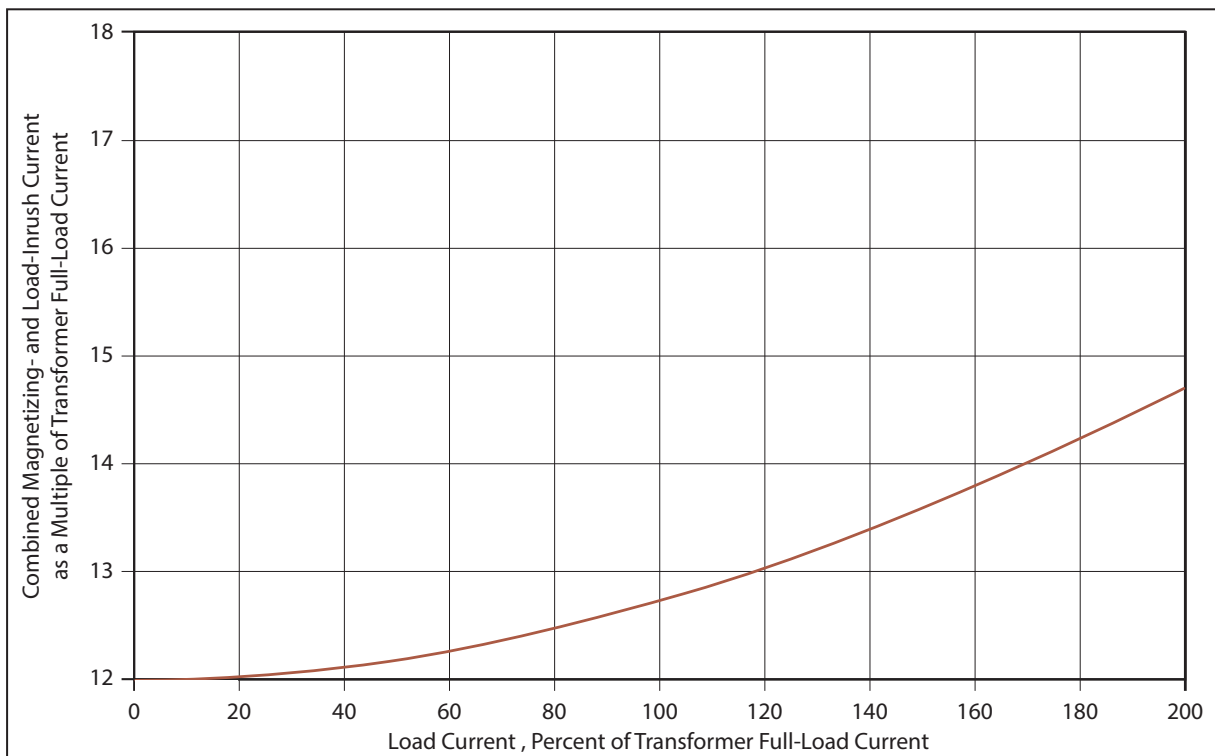


Figure 4. Curve for determining the magnitude of combined magnetizing- and load-inrush current for a single reclose operation.

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Figure 5 illustrates a typical curve used for making such an adjustment. Figure 6 illustrates a similar curve used to adjust the minimum melting time-current characteristic curve of the primary fuse for ambient temperatures above or below +77°F (+25°C). Figure 7 on page 11 illustrates the minimum melting time-current curve of a primary fuse

so adjusted. As a point of information, the fact that the primary fuse will operate more quickly when preloaded as described in Figure 7 does *not* mean that the fuse will clear the fault more quickly. No adjustments need be made to the published total clearing time-current characteristic curve of the primary fuse.

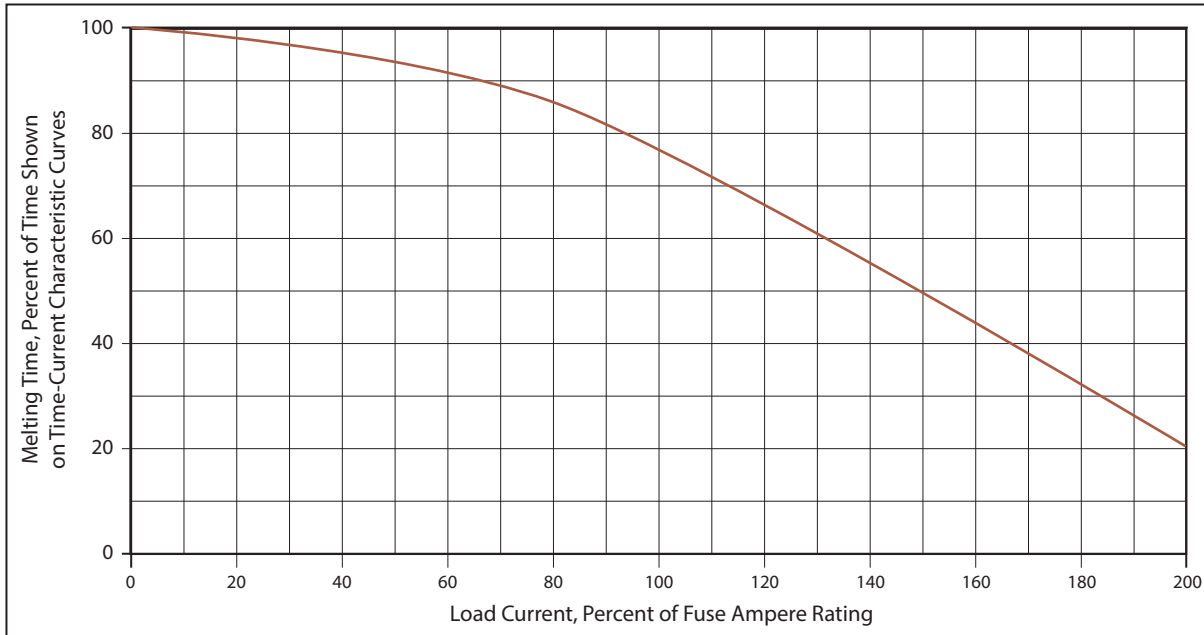


Figure 5. Curve for determining TCC adjustment factor caused by preloading.

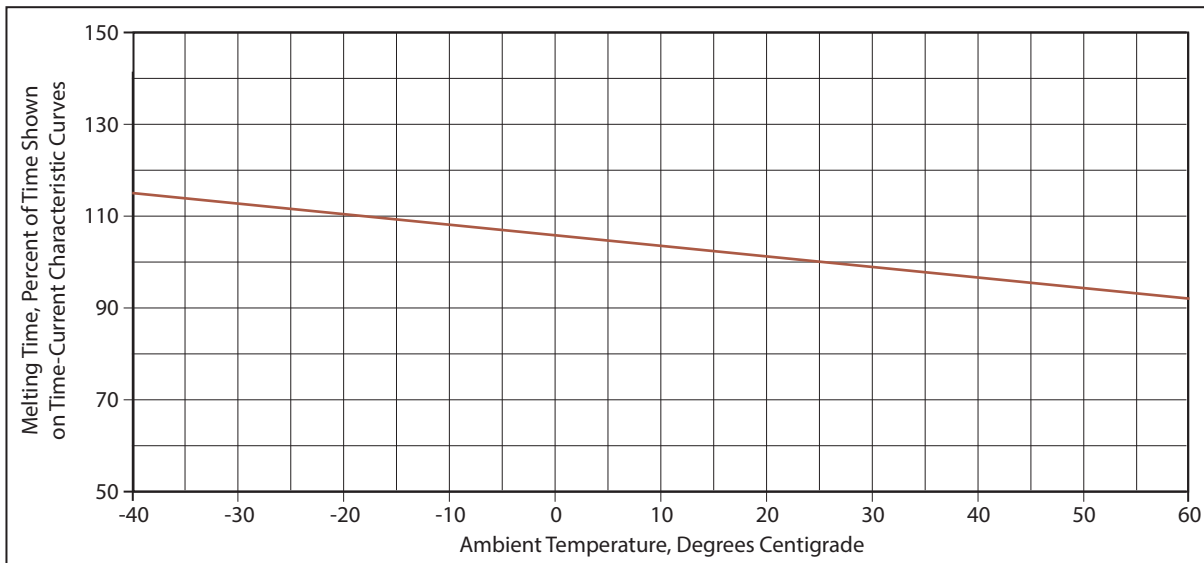


Figure 6. Curve for determining TCC adjustment factor for ambient temperatures above or below 77°F (25°C).

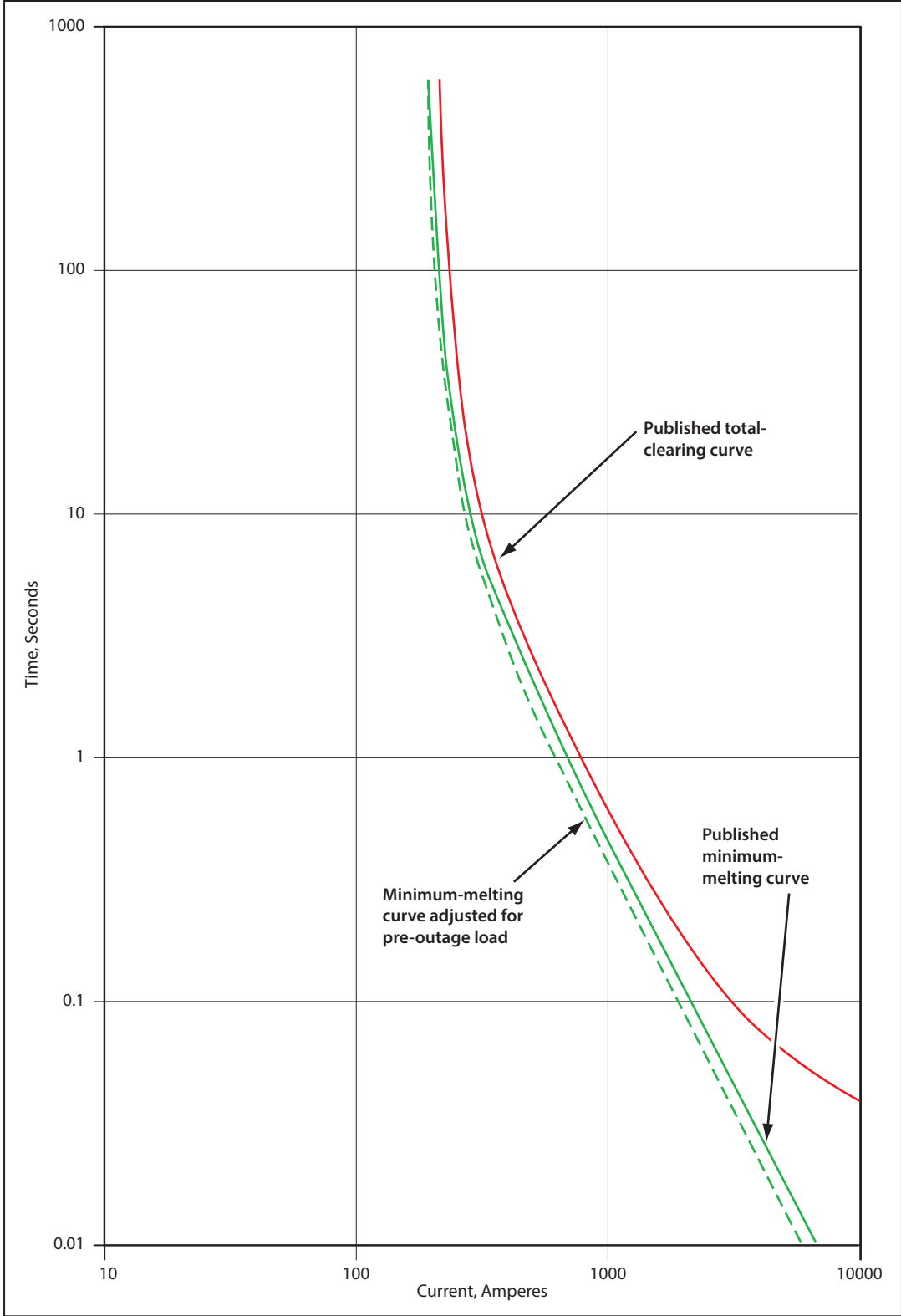


Figure 7. Minimum melting and total clearing curves for a 100E-ampere Very-Slow Speed fuse, with the minimum melting curve adjusted to reflect the reduced melting time resulting from an assumed pre-fault load current of approximately 80 amperes.

Application Principles

“Cold-load” pickup. The final type of “inrush” current to which the transformer primary fuse will be exposed is the long duration overcurrent that occurs because of the loss of load diversity following an extended outage (30 minutes or more). These long-duration overcurrents are referred to as cold-load pickup.

The cold-load pickup phenomenon is typically associated with utility distribution loading practices where the transformers are sized for the *average* peak load instead of the maximum expected peak load, thereby exposing the transformers to overcurrents of up to 30 minutes duration following re-energization.

This phenomenon occurs because many electrical loads, such as air conditioners, refrigerators, and electric space heaters, are thermostatically controlled; they cycle on and off at random times relative to each other such that only

a fraction of the total possible load is connected to the system at any given time. After an extended loss of power, however, many of these thermostatically controlled devices will be outside of their respective setpoint limits so that, when power is restored, all of the thermostats will simultaneously demand power for their controlled equipment.

Typical cold-load inrush current profiles from a number of utilities are shown in Figure 8. These curves are typical of distribution transformers serving residential-type loads. Most peak loads seen by these transformers are associated with central or large room-type air conditioners or electric heating equipment having cyclical characteristics.

As can be seen in this figure, the feeder current can remain significantly higher than the nominal current, calculated based on the total kVA rating of connected transformers, for quite a long time.

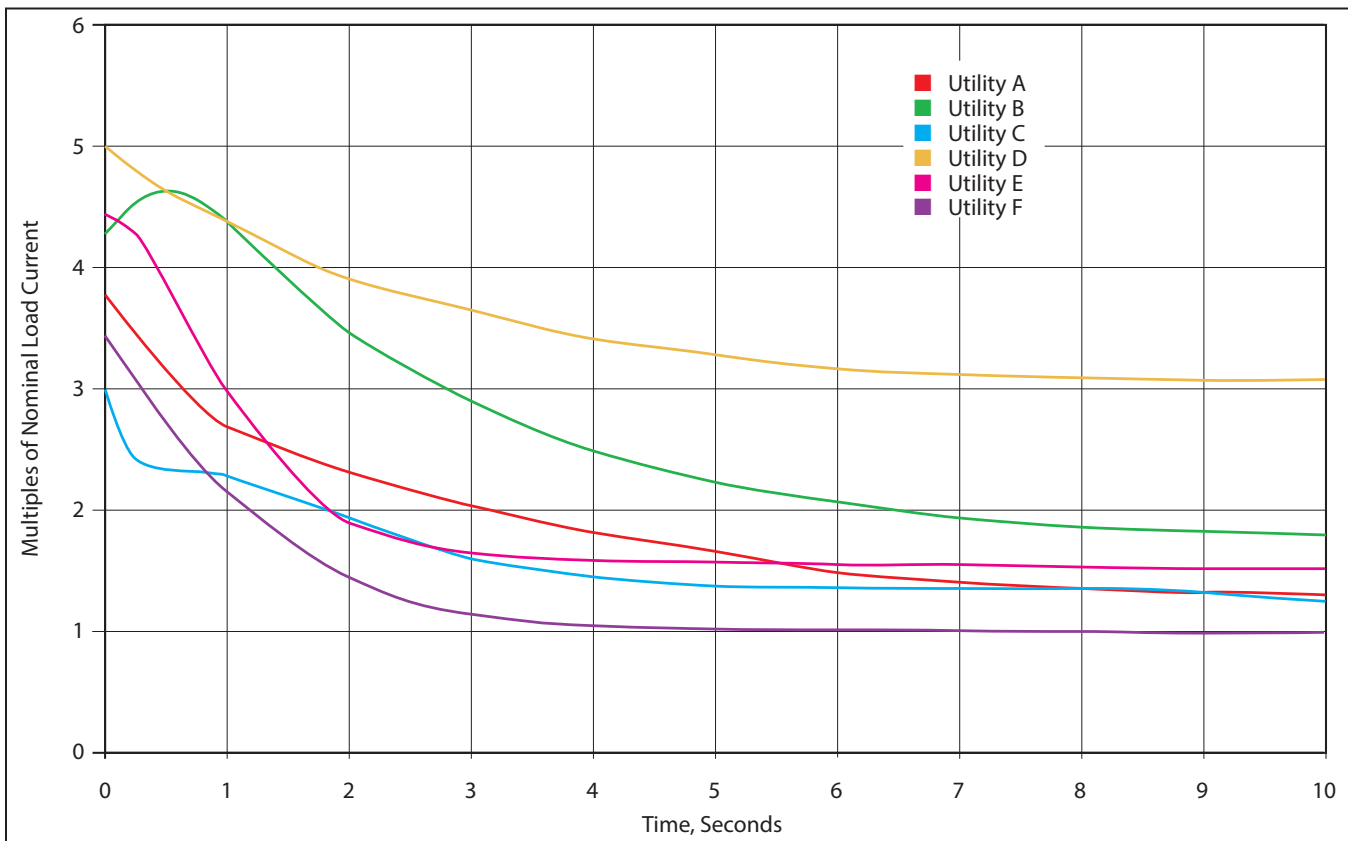


Figure 8. Cold-load pickup current profiles.

The integrated heating effect of the cold-load current profiles shown in Figure 8 on page 12, for thermally responsive devices such as fuses, is illustrated in Figure 9 on page 14. For simplicity, cold-load inrush currents are usually represented by the following equivalent multiples of transformer nominal full-load current:

- $6 \times$ nominal load current for one second
- $3 \times$ nominal load current for up to 10 seconds, and
- $2 \times$ nominal load current for up to 15 minutes.

The ability of the transformer primary fuse to withstand the combined magnetizing- and load-inrush current associated with an extended outage is referred to as its cold-load pickup capability. Here again, the cold-load inrush will be affected by the source impedance and, if the source is weak, the use of a smaller fuse rating may often be justified.

In contrast to transformers serving primarily residential-type loads, transformers serving industrial, commercial, or institutional type loads are frequently sized to accommodate the *maximum* peak demand load without being overloaded. As a result, these transformers are actually loaded to only a small fraction of their rated power — perhaps only one-half or less.

For this reason, and for the requirement for an orderly re-starting of equipment, the combined magnetizing- and load-inrush currents associated with the energizing of these transformers following an extended outage is no more

severe than the inrush currents encountered under hot-load pickup conditions. Accordingly, cold-load pickup need not be considered when selecting the ratings of primary fuses for transformers applied on industrial, commercial, and institutional power systems.

Protecting Transformer Against Damaging Overcurrents

The most important application principle to be considered when selecting a transformer primary fuse is that it must protect the transformer against damage from mechanical and thermal stresses resulting from a secondary-side fault that is not promptly interrupted. A properly selected primary fuse will operate to clear such a fault before the magnitude and duration of the overcurrent exceed the through-fault current duration limits recommended by the transformer manufacturer or published in the standards.

In the absence of specific information applicable to an individual transformer, the primary fuse should be selected in accordance with recognized guidelines for maximum permissible through-fault duration limits. Curves representing these limits can be found in IEEE Standard C37.91, “IEEE Guide for Protective Relay Applications to Power Transformers,” and IEEE C57.109, “IEEE Guide for Liquid-Immersed Transformer Through-Fault Current Duration.”

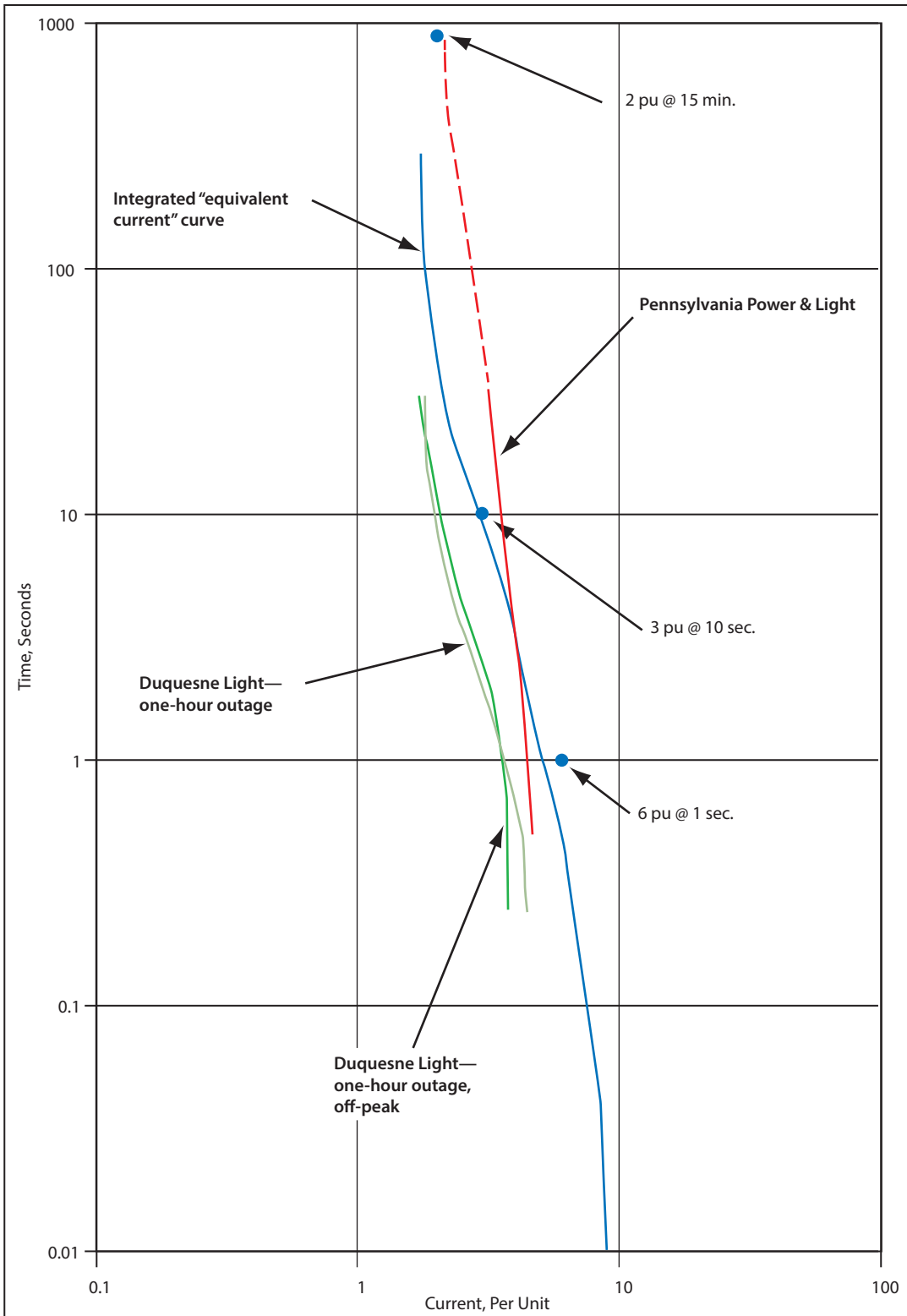


Figure 9. Integrated equivalent-current curves for some of the cold-load pickup current profiles shown in Figure 8 on page 12. Industry "rule-of-thumb" points are also shown.

Damage to transformers from through-faults is widely recognized as the result of thermal and mechanical effects. The latter has gained increased recognition as a major cause of transformer failure. Though the temperature rise associated with high-magnitude through-faults is typically quite acceptable, the mechanical effects are intolerable if such faults are permitted to occur with any regularity.

Of special concern is the cumulative nature of certain mechanical effects, such as insulation compression, insulation wear, and friction-induced displacement. The damage that occurs as a result of these cumulative effects is thus a function of not only the magnitude and duration of through faults, but also the total number of such faults.

The through-fault protection curves found in the aforementioned standards take into consideration the fact that transformer damage is cumulative and that the number of through-faults to which a transformer can be exposed is inherently different for different transformer applications. For example, transformers with secondary-side conductors enclosed in conduit or isolated in some other fashion, such as those typically found in industrial, commercial, and institutional power systems, experience an extremely low incidence of through-faults.

In contrast, transformers with secondary-side overhead lines, such as those found in utility distribution substations, have a relatively high incidence of through-faults, and the use of reclosers may subject the transformer to repeated current surges from each fault-clearing operation. Thus, for a given transformer in these two different applications, a different through-fault protection curve applies, depending on the type of application.

For applications in which faults occur infrequently, the through-fault protection curve should reflect primarily thermal damage considerations because the cumulative mechanical-damage effects of through-faults will not likely be a problem. For applications in which faults occur frequently, the through-fault protection curve should reflect the fact that the transformer will be subjected to both thermal *and* cumulative-mechanical damage effects of through-faults.

In using the through-fault protection curves to select the time-current characteristics of primary-side protective devices, take into account not only the inherent level of through-fault incidence but also the location of each protective device and its role in providing transformer protection. As just noted, substation transformers with secondary-side overhead feeders have a relatively high incidence of through-faults.

The secondary-side feeder-protective devices are the first line of defense against such faults, and thus their time-current characteristics should be selected by reference to the frequent-fault-incidence protection curve. More specifically, the time-current characteristics of feeder protective devices should be completely below and to the left of the appropriate frequent-fault-incidence protection curve.

Main secondary-side protective devices (if applicable) and transformer primary fuses typically operate to protect against through-faults only in the rare event of a fault between the transformer and the feeder protective devices, or in the equally rare event that a feeder protective device fails to operate or operates too slowly caused by an incorrect (higher) rating or setting. The time-current characteristics of these devices, therefore, should be selected by reference to the infrequent-fault-incidence protection curve. In addition, these time-current characteristics should be selected to achieve the desired levels of coordination with other source-side and load-side protective devices.

Transformers with protected secondary conductors (for example, cable, bus duct, or switchgear) will likely experience an extremely low incidence of through-faults. In this instance, the feeder protective devices may be selected by reference to the infrequent-fault-incidence protection curve. The main secondary-side protective device (if applicable) and the transformer primary fuse should also be selected by reference to the infrequent-fault-incidence protection curve. Again, these time-current characteristics should be selected to achieve the desired levels of coordination with other protective devices.

Most utility substation transformers protected by power fuses fall within two of the four size categories defined in IEEE Standard C57.12.00, "IEEE Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers": Category II transformers (501-1667 kVA single-phase, 501-5000 kVA three-phase) and Category III transformers (1668-10,000 kVA single-phase, 5001-30,000 kVA three-phase). The applicable through-fault protection curves for these two transformer categories are shown in Figure 10 on page 16 and Figure 11 on page 17.

In each case, the left-side curve reflects both thermal *and* mechanical damage considerations and should be used for selecting feeder protective device time-current characteristics for frequent-fault-incidence applications. It is dependent upon the impedance of the transformer for fault currents above a fixed percentage of the maximum possible (70% for Category II transformers, 50% for Category III transformers) and is keyed to the I_{2t} of the worst-case mechanical duty (maximum fault current for two seconds).

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The right-side curve reflects primarily thermal damage considerations and should be used for selecting feeder protective device time-current characteristics for infrequent-fault-incidence applications. This curve should also be used for selecting a main secondary-side protective device (if applicable) and primary-fuse time-current characteristics for all applications, regardless of the anticipated level of fault incidence. See Figure 12 on page 18.

The degree of transformer protection provided by the primary fuse should be checked for the level of fault current and type of fault (i.e., three-phase, phase-to-phase, or phase-to-ground) producing the most demanding conditions

possible for each particular application, i.e., those for which the ratio of the primary-side line current to transformer winding current is the lowest.

For these situations, one or more primary fuses will be exposed to a proportionately lower level of current than the windings and, as a consequence, the primary fuse must be carefully selected to operate fast enough to avoid damage to the transformer windings. Table 2 on page 19 lists the ratio of per-unit primary-side line currents to the per-unit transformer winding currents for three common transformer connections under a variety of secondary-fault conditions.

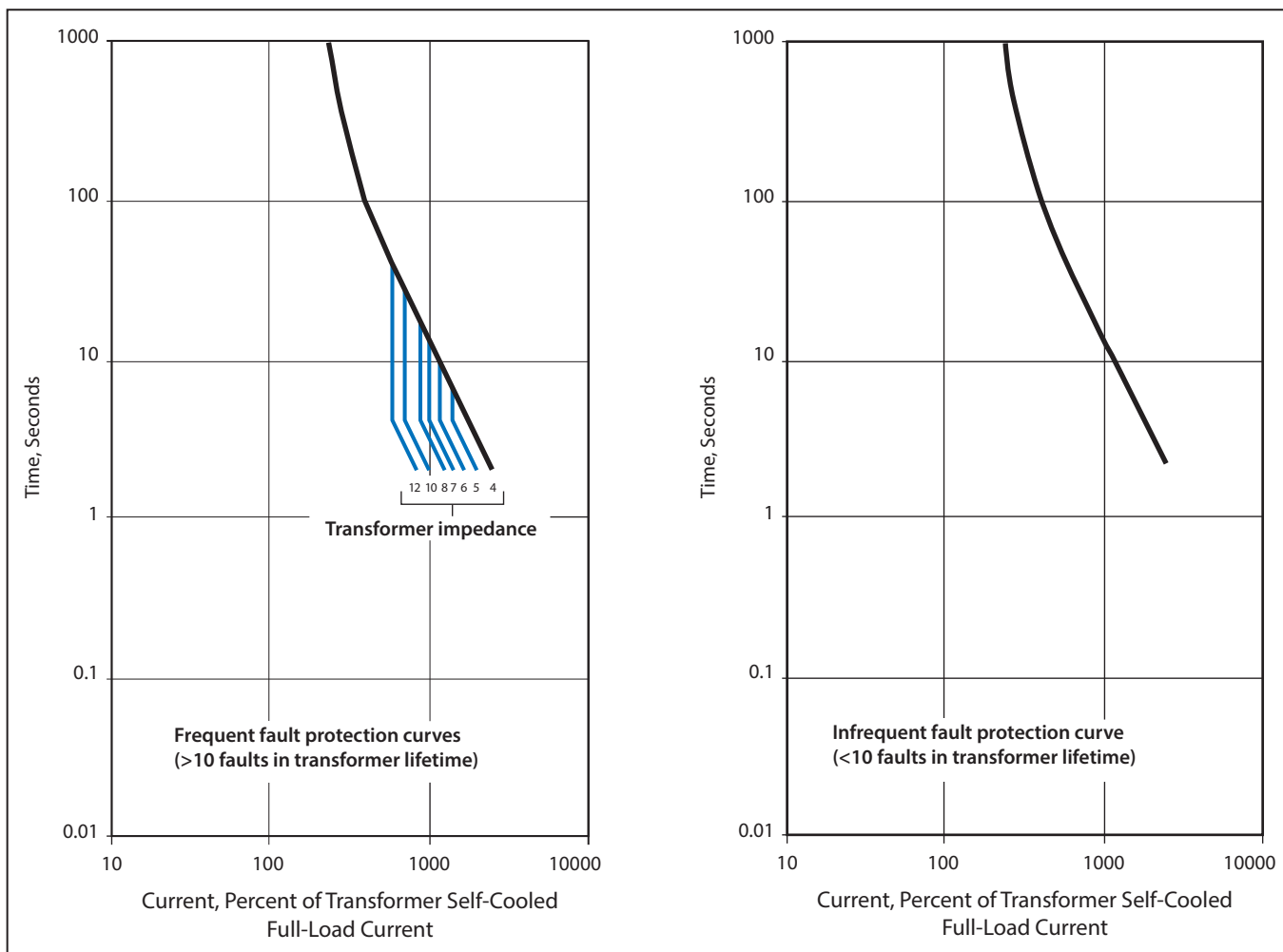


Figure 10. Through-fault protection curves for liquid-immersed Category II transformers (501 kVA to 1667 kVA single-phase, 501 kVA to 5000 kVA three-phase). Note: For fault currents from 70% to 100% of maximum possible, $I^2t = K$ where I is the symmetrical fault current in per-unit of normal base current and K is a constant determined at maximum I with $t = 2$ seconds. Sample $I^2t = K$ curves have been plotted for the transformer impedances noted.

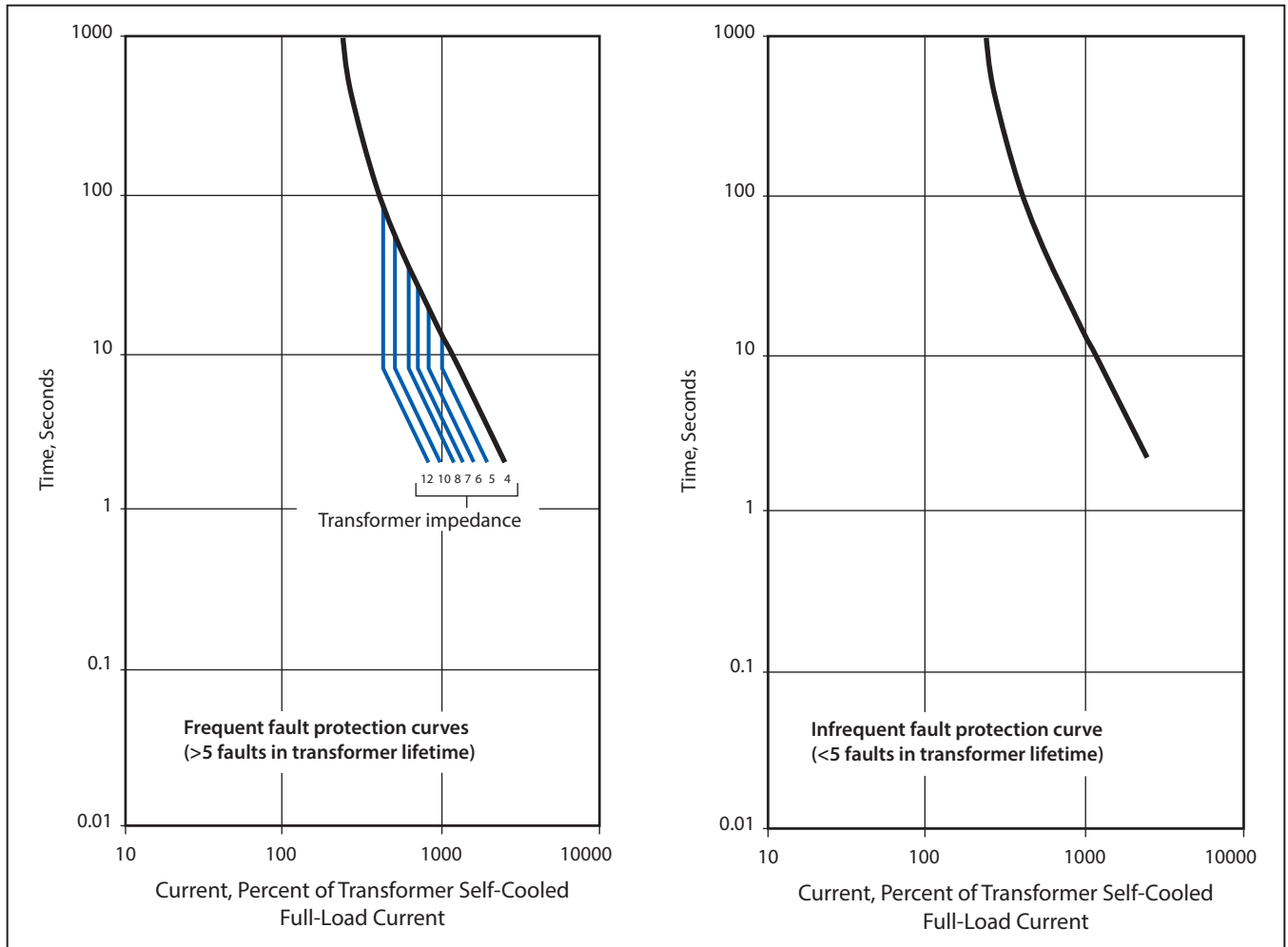


Figure 11. Through-fault protection curves for liquid-immersed Category III transformers (1668 kVA to 10000 kVA single-phase, 5001 kVA to 30000 kVA three-phase). Note: For fault currents from 50% to 100% of maximum possible, $I^2t = K$ where I is the symmetrical fault current in per-unit of normal base current and K is a constant determined at maximum I with $t = 2$ seconds. Sample $I^2t = K$ curves have been plotted for the transformer impedances noted.

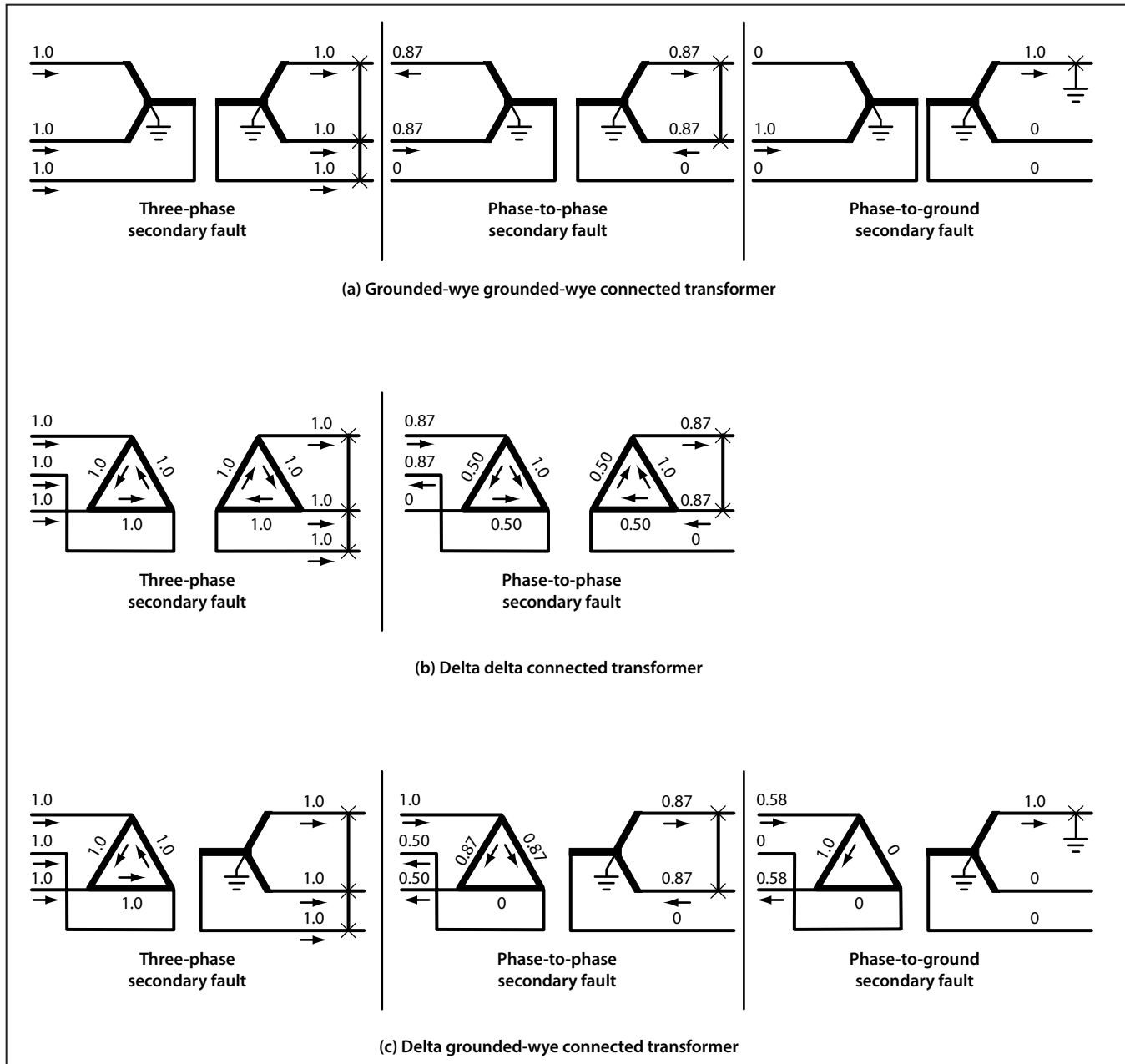


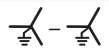


Figure 12. Relationship between the per-unit primary-side and secondary-side line currents and the associated per-unit transformer winding currents for (a) grounded-wye grounded-wye, (b) delta-delta, and (c) delta grounded-wye connected transformers for various types of secondary faults. (Line current and winding current values are expressed in per unit of their respective values for a “bolted” three-phase secondary fault.)

From Table 2, it is clear that a phase-to-phase secondary fault on a delta-delta connected transformer and a phase-to-ground secondary fault on a delta grounded-wye connected transformer produce the most demanding conditions possible for those particular transformer connections because the per-unit primary-side line currents are *less* than the per-unit transformer winding currents.

Accordingly, to ensure proper transformer protection for these two situations, it is necessary to “shift” the base transformer through-fault protection curve to the left (in terms of current) by the ratio of the per-unit primary-side

line current to the per-unit transformer winding current listed in Table 2. The shifted transformer through-fault protection curve will then be in terms of the primary-side line current and, as such, will be directly comparable with the total clearing time-current characteristic curve of the transformer primary fuse. For the grounded-wye grounded-wye connected transformer, the per-unit primary-side line currents and the per-unit transformer winding currents are the same, hence the base through-fault protection curve applies.

Table 2. Relationship Between Per-Unit Primary-Side Line Current and Per-Unit Transformer Winding Current for Various Types of Secondary Faults

Transformer Connection ↓ Type of Fault →	Ratio of Per-Unit Primary-Side Line Current to Per-Unit Transformer Winding Current ^①		
	Three-Phase	Phase-to-Phase	Phase-to-Ground
	1.0	1.0	1.0
	1.0	0.87	Not Applicable
	1.0	1.15	0.58

^① Line-current and winding-current values are expressed in per unit of their respective values for a “bolted” three-phase secondary fault.

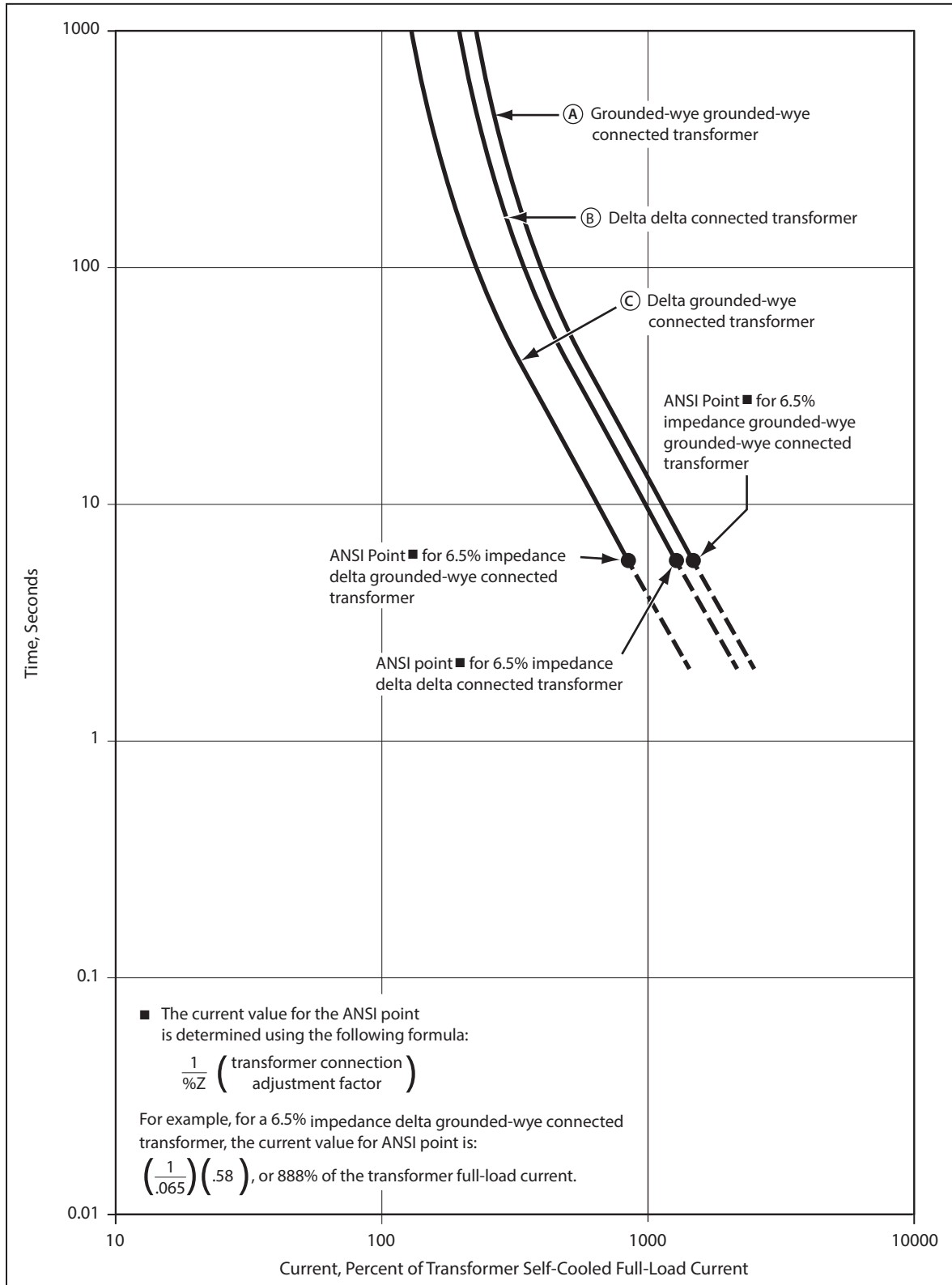


Figure 13. Infrequent-fault incidence through-fault protection curves for various transformers.

Figure 13 on page 20 illustrates the base transformer through-fault protection curve applicable to a grounded-wye grounded-wye connected transformer (Curve A) as well as through-fault protection curves adjusted to reflect the two situations discussed previously. Curve B represents Curve A adjusted to reflect the reduced level of current (0.87 per unit) seen by two primary fuses during a phase-to-phase secondary fault on a delta-delta connected transformer. Similarly, Curve C represents Curve A adjusted to reflect the reduced level of current (0.58 per unit) seen by two primary fuses during a phase-to-ground secondary fault on a delta grounded-wye connected transformer.

Although the transformer through-fault protection curves are only a guide, they are recommended as a criterion against which to measure the degree of transformer protection provided by the transformer primary fuse. To meet this criterion for high-magnitude secondary-side faults, the total clearing time-current characteristic curve of the primary fuse should pass below the point (historically called the “ANSI” point) on the appropriate through-fault protection curve at the current level corresponding to the maximum three-phase secondary-fault current as determined solely by the transformer impedance (i.e., an infinite source is assumed).

Based on the design and application of the primary fuse, as described below, the total clearing time-current characteristic curve of the primary fuse will typically cross the transformer through fault protection curve at some low level of current.

Another aspect of transformer protection involves low-current overloads. Medium- and high-voltage transformer primary fuses are *not* intended to provide overload protection. For this reason, the minimum operating current of medium- and high-voltage power fuses is required by the applicable standard● to be significantly greater than the ampere rating. For example, the “E”-rated power fuses discussed in this selection guide are required to operate at not less than 200 or 220% of the ampere rating.

Accordingly, the total-clearing time-current characteristic curve of the primary fuse will cross the transformer through-fault protection curve at some low level of current. Because the primary fuse does not provide overload protection for the transformer, this should not be a concern. However, efforts should be made to keep the current value

at which the two curves intersect as low as possible to maximize protection for the transformer against secondary-side faults.

The through-fault protection curve for a delta grounded-wye connected transformer can be used to illustrate these principles for primary-side fuses. See Figure 14 on page 22. The total clearing curves for primary fuses with a fusing ratio■ of 1.0, 1.5, or 2.0 all pass below the ANSI Point of the delta grounded-wye connected transformer’s through-fault protection curve.

The total clearing curve for primary fuses with a fusing ratio of 2.5 or 3.0 pass completely above and to the right of the transformer through-fault protection curve and thus would not provide any protection for the transformer for a phase-to-ground secondary fault. Because the object of transformer primary fusing is to provide protection for the transformer for *all* types of secondary faults, primary fuses having total clearing curves that pass above the ANSI Point (such as a primary fuse with a fusing ratio of 2.5 or 3.0 in Figure 14) would be considered unacceptable.

The transformer primary fuse having the *lowest* fusing ratio of the three fuses that pass beneath the ANSI point would provide the maximum protection for the transformer against secondary faults located between the transformer and the secondary-side circuit breakers or reclosers as well as maximum backup protection for the transformer in the event the secondary-side breakers or reclosers fail to operate, or operate too slowly due to incorrect (higher) ratings or settings.

From Figure 14 on page 22, it may be seen that a primary fuse with a fusing ratio of 1.0 will provide protection for a delta grounded-wye connected transformer against phase-to-ground secondary faults producing currents as low as 235% of the full-load current of the transformer as reflected to the primary side. When the fusing ratio is 2.0, however, protection for the transformer is provided only when secondary faults produce primary-side currents exceeding 700% of the transformer full-load current.

● IEEE Standard C37.46, “Specifications for Power Fuses and Fuse Disconnecting Switches.”

■ The fusing ratio is defined as the ratio of the transformer primary fuse ampere rating to the transformer self-cooled full-load region.

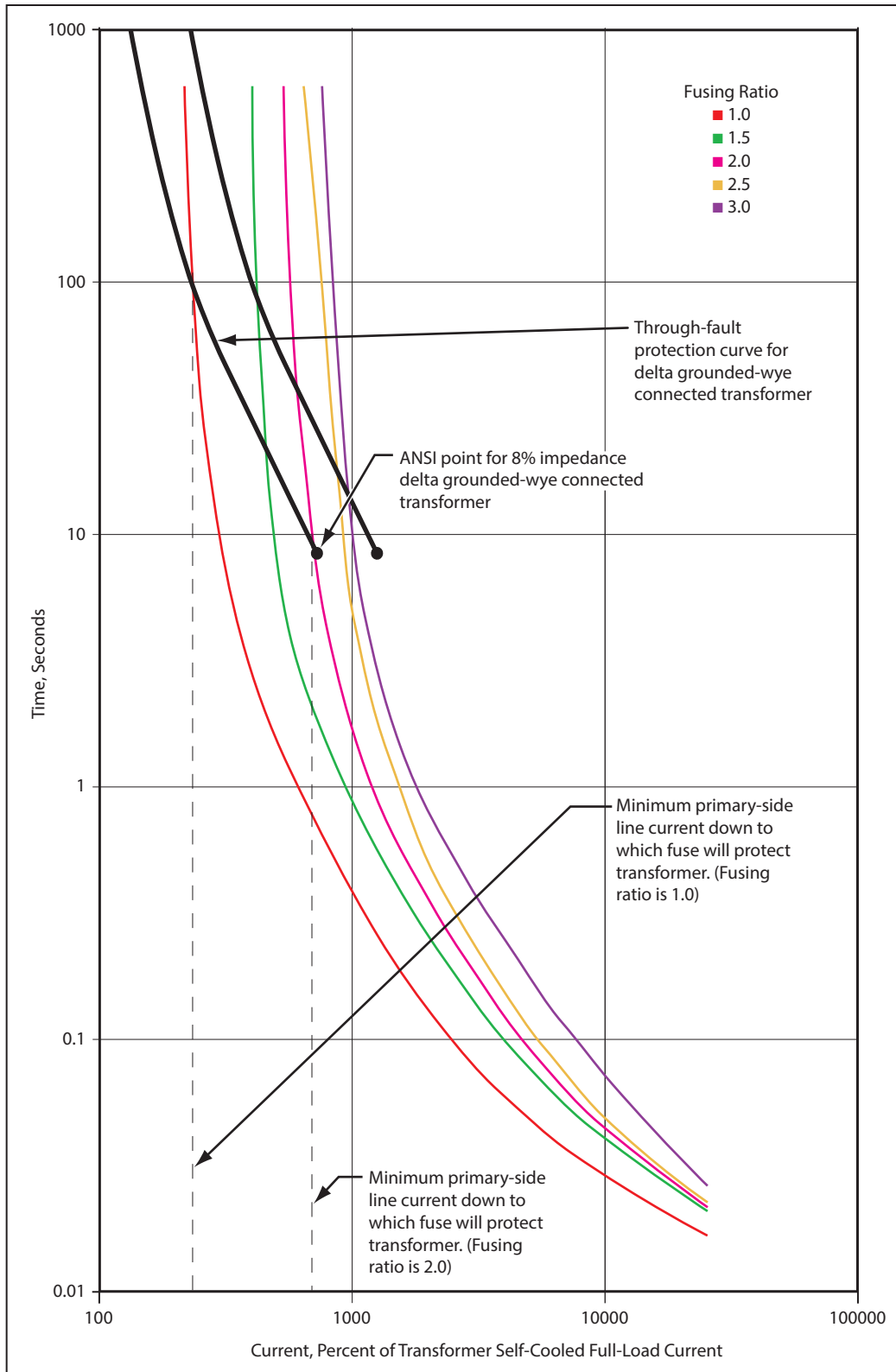


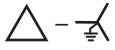


Figure 14. The effect of fusing ratios on the degree of protection provided a delta grounded-wye connected transformer against a phase-to-ground secondary fault.

As mentioned before, an effort should be made to select a transformer primary fuse that will protect the transformer against all types of secondary-side faults. The primary-side line-current values for various types of secondary-side faults and for various transformer connections and impedances, expressed in percent of the transformer full-load

current, are listed in Table 3. The desired protection is obtained if the current value at which the total clearing time-current curve of the primary fuse and the transformer through-fault protection curve intersect is *less* than the applicable values as shown in Table 3.

Table 3. Secondary Fault Currents Reflected to Primary Lines

Transformer Connection	Impedance	Maximum Primary-Side Line Current for Various Types of Secondary Faults, Percent of Transformer Full-Load Current		
		Phase-to-Ground	Phase-to-Phase	Three-Phase
	4%	2500	2165	2500
	5%	2000	1730	2000
	6%	1670	1445	1670
	7%	1430	1240	1430
	8%	1250	1085	1250
	10%	1000	865	1000
	4%	Not Applicable	2165	2500
	5%		1730	2000
	6%		1445	1670
	7%		1240	1430
	8%		1085	1250
	10%		865	1000
	4%	1445	2500	2500
	5%	1155	2000	2000
	6%	965	1670	1670
	7%	825	1430	1430
	8%	720	1250	1250
	10%	575	1000	1000
12%	480	830	830	

Coordinating With Other Protective Devices

The most important aspect of transformer primary fusing is the provision of maximum protection for the transformer. It is also important, however, for the time-current characteristics of the primary fuse to be coordinated with the time-current characteristics of certain other overcurrent protective devices on both the secondary side and the primary side of the transformer.

Coordination is defined as the selective operation of various overcurrent protective devices, and, if properly executed, will result in removal of the least-possible amount of load by the device clearing the fault while normal service is maintained on the remainder of the circuit. The following sections describe how proper coordination is achieved both between the transformer primary fuse and secondary-side protective devices and between the transformer primary fuse and source-side protective devices.

Figure 15 represents a portion of a simple radial circuit that serves to illustrate the principles of coordination just described. A secondary fault at Point C on the feeder should be cleared by feeder protective device ② before the transformer primary fuse ① operates. In the same manner, a secondary fault at Point B, or a primary fault at Point A, should be cleared by the transformer primary fuse ① before another protective device even farther upstream begins to operate.

For most applications, a main secondary-side protective device is considered economically unjustifiable because a properly selected primary fuse will provide the same degree of secondary-fault protection for the transformer as would a main secondary-side circuit breaker or recloser. There are applications, however, where a main secondary

protective device is commonly used for reasons other than secondary-side fault protection, such as:

- In circuits with a large number of feeders, where the main secondary device serves as a “master” disconnect to permit rapid shutdown of all feeders in an emergency
- In circuits where overload protection is desired because the combined load capability of the feeders exceeds the overload capability of the transformer
- In situations where the secondaries of two supply transformers are connected through a bus-tie circuit breaker to isolate a faulted transformer from the secondary-side bus

The use of a main secondary-side circuit breaker or recloser does not alter the desirability of providing the maximum degree of protection for the transformer while obtaining coordination with secondary-side devices such that the least-possible amount of load is removed in the event of a fault. This is best achieved by coordinating the transformer primary fuse with the feeder circuit breaker or recloser having the highest ampere rating or setting (or, in the case of a duplex substation, with the bus-tie circuit breaker).

A primary fuse so selected will have a smaller ampere rating than would be possible if the primary fuse were coordinated with the main secondary-side protective device, thereby providing a higher degree of protection for the transformer against secondary-side faults as well as superior backup protection for the transformer in the event a secondary-side circuit breaker or recloser fails to operate correctly.

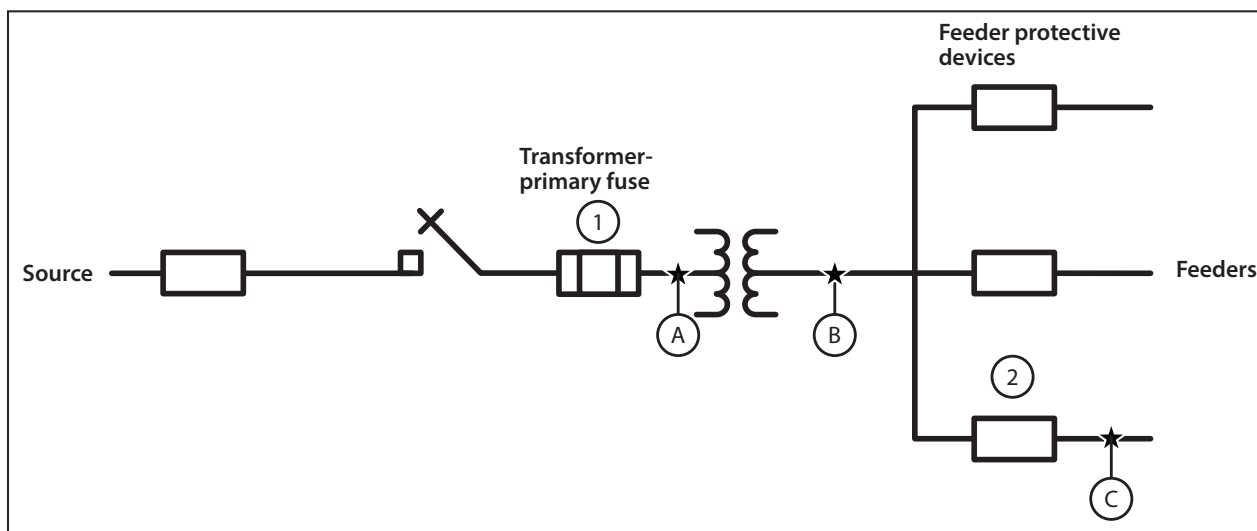


Figure 15. Coordination between a transformer primary fuse and a feeder protective device. Refer to text.

Lack of coordination between the transformer primary fuse and the main secondary-side device is no problem because the current range over which the two devices do not coordinate is very narrow, and even then it only occurs when: (1) a feeder fault is not cleared due to failure of a feeder circuit breaker or recloser, or (2) there is a secondary-side bus fault. Either combination of circumstances is so rare that the primary fuse will seldom operate. Even if the primary fuse does operate, the results are no different from that which ensues if only the main secondary breaker or recloser operates.

In either case, the entire output of the transformer will be lost. Rapid operation of the transformer primary fuse will actually improve the degree of transformer protection for the two situations mentioned above because the time required for the primary fuse to operate will be less than the time required if the primary fuse and the main secondary-side protective device were fully coordinated. The shorter operating time of the primary fuse results in a lesser accumulation of mechanical and thermal stresses on the transformer, thereby helping to preserve transformer operating life.

Coordinating With Non-Reclosing Secondary-Side Protective Devices

To establish coordination between the transformer primary fuse and a non-reclosing feeder protective device, it is necessary to examine the relationship between the minimum melting time-current characteristic curve of the primary fuse and the total clearing time-current characteristic curve of the feeder circuit breaker (assumed). In so doing, however, the time-current characteristic curves for both devices must be converted to equivalent currents applicable to a common voltage (either primary side or secondary side). For this publication, the primary-side voltage has been used.

Complete coordination between the two devices is obtained when the total clearing time-current characteristic curve of the feeder circuit breaker lies *below and to the left* of the minimum melting time-current characteristic curve of the transformer primary fuse for all current levels — from overload current up to the maximum three-phase secondary fault-current level — with proper allowances

made for the transformer connection (discussed later), for the prefault load current, and for elevated (or reduced) ambient temperatures (if applicable).

Proper coordination between a transformer primary fuse and a secondary-side circuit breaker is illustrated in Figure 16 on page 26. In this example, the transformer has a base (OA) rating of 7500 kVA three phase, 69 kV primary, 12.47 kV secondary. The transformer has a forced-air (FA) rating of 9375 kVA (125%). The transformer impedance is 7%, and the maximum three-phase secondary fault current is 810 amperes (1000 MVA), as seen on the primary side of the transformer. The transformer is connected delta grounded-wye.

The transformer primary fuse is a 100E-ampere Slow Speed SMD-1A Power Fuse rated 69 kV. The full-load current of the transformer, based on the FA rating, is 78.4 amperes. At this level of transformer loading, the primary fuse will be loaded to 78.4% of rating ($78.4 \div 100 = 0.784$). The pre-load adjustment factor, which can be determined from Figure 5 on page 10, is 0.85.

The secondary-side protective device is a Square D Type FVR circuit breaker controlled by Westinghouse CO-9 (very inverse) induction-disk overcurrent relays. The phase relay has a 360-ampere minimum pickup setting and a time-dial of 3.0. The ground relay has a 240-ampere minimum pickup current and a time-dial setting of 2.5. The coordinating time interval (CTI) for both relays is 0.15 seconds, consisting of 0.10 seconds for overtravel and 0.05 seconds for tolerance. (It is assumed that the relays have been carefully field calibrated.) The circuit breaker total clearing time is 0.05 seconds (3 cycles).

A check of coordination indicates a 100E Standard Speed SMD-1A Power Fuse will *not* coordinate with the phase relay described in Figure 16 on page 27 at the available three-phase secondary-side fault current level of 810 amperes. Simply put, the total clearing time of the secondary-side circuit breaker is greater than the pre-load-adjusted minimum melting time of the primary fuse. However, a Slow Speed SMD-1A Power Fuse *will* coordinate with the phase relay. Refer to Figure 16 on page 26. A 100E Very Slow Speed SMD-1A Power Fuse will also coordinate with the phase relay, although the degree of transformer protection will be reduced slightly.

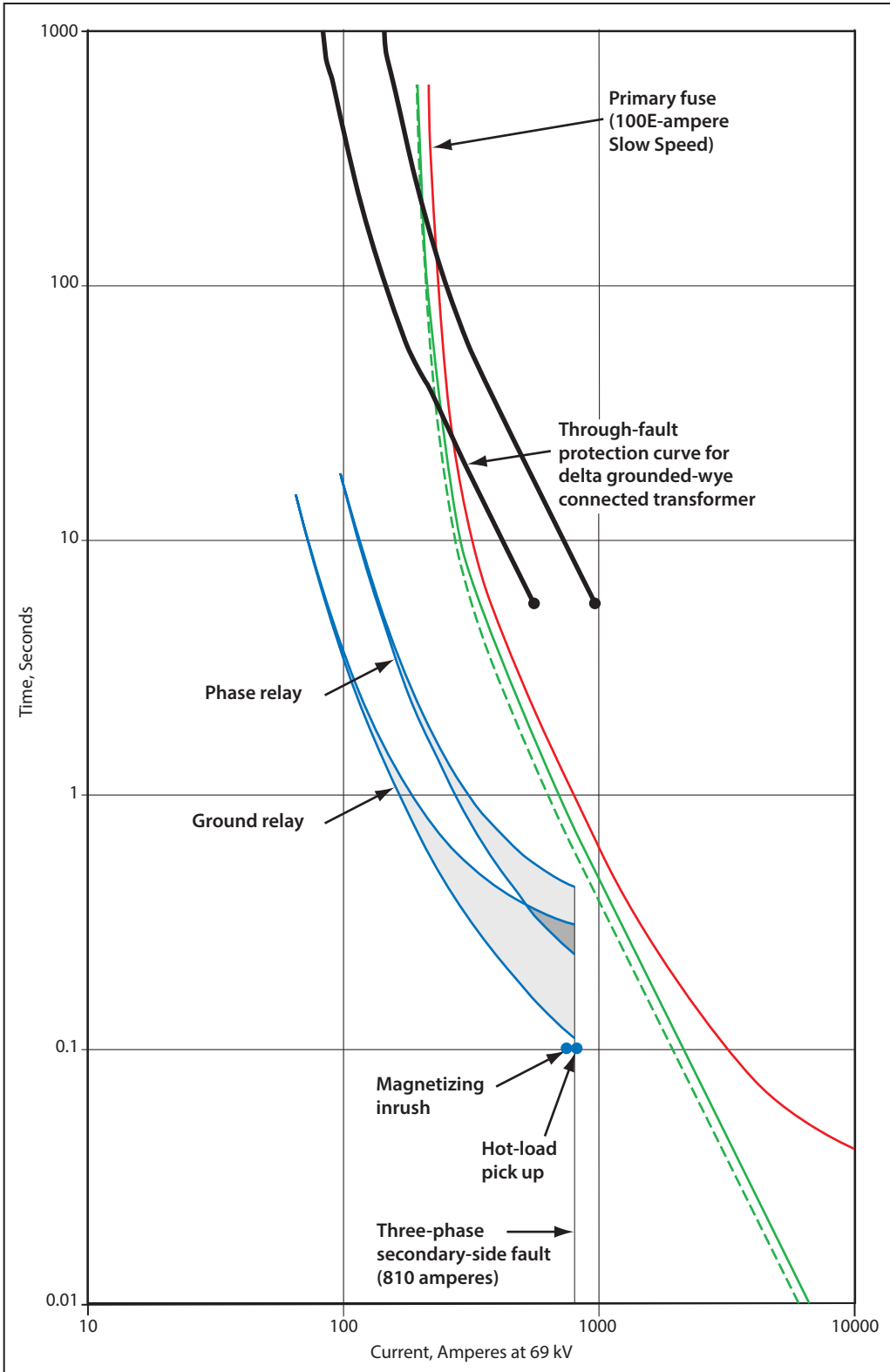


Figure 16. Coordination between a transformer primary fuse and a medium-voltage non-reclosing feeder circuit breaker.

If the fuse initially selected does not coordinate with the load-side protective device, then coordination should be rechecked, using a slower-speed fuse of the same ampere rating. If coordination still cannot be obtained — even with the slowest available fuse (i.e., Very Slow Speed) — then these alternatives should be considered before resorting to a fuse with a larger ampere rating, which would reduce the degree of protection afforded the transformer:

- Use more circuit breakers (feeders) on the secondary side of the transformer, thereby permitting the phase and ground relays to have lower minimum pickup currents.
- Eliminate the main-secondary circuit breaker if present and if used solely for overcurrent protection.
- Lower the time-dial settings of the load-side phase or ground relays.
- Use a transformer with a higher impedance rating to reduce the level of fault current seen by the primary fuse.
- Accept incomplete coordination under certain infrequent conditions on a calculated-risk basis.

Coordinating With Reclosing Secondary-Side Protective Devices

A circuit breaker with a reclosing relay or an automatic circuit recloser has the intelligence necessary to sense overcurrents, to interrupt those overcurrents, and to reclose automatically to reenergize the feeder. If the fault is permanent instead of temporary, the recloser will “lock out” after

a preset number of reclosing operations (usually three or four), thus isolating the faulted feeder from the system.

Most faults on overhead distribution feeders — perhaps as many as 80% — are temporary in nature and last only a few cycles to a few seconds at most. Automatic circuit reclosers, with their “trip-and-reclose” capability, eliminate prolonged outages on distribution systems because of these temporary faults.

Automatic circuit reclosers have dual timing capabilities that serve an important function in establishing coordination with other protective devices and in helping to limit areas affected by permanent faults. A typical recloser operating sequence to “lockout” is shown in Figure 17. As illustrated, the first two fault-clearing operations are performed in accordance with the “fast” timing characteristic to clear *temporary* faults before any load-side protective devices operate.

The remaining operations to lockout incorporate a predetermined time delay, which allows protective devices nearer the fault to interrupt *permanent* faults, thereby limiting the extent of the outage to the smallest possible portion of the system. This scheme is often referred to as a “fuse saving” scheme because fuses only respond to permanent faults within their zones of protection.

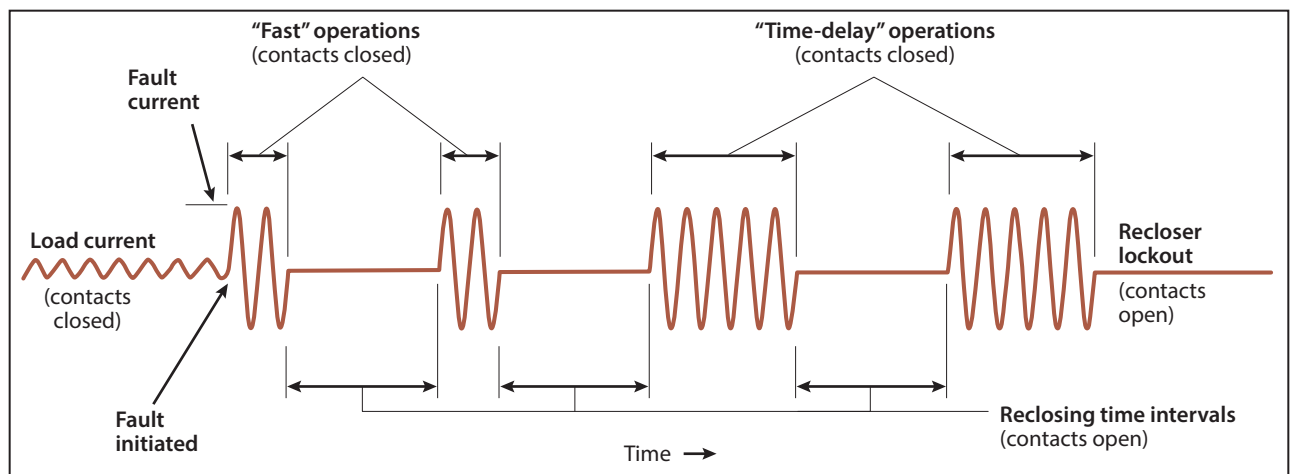


Figure 17. Typical recloser operating sequence to lockout.

Application Principles

The fast timing characteristic is generally identified as the “A” curve on the recloser’s published time-current characteristic curves. Time-delayed operations, which are usually referred to as “slow” or “delayed” operations, are given curve designations “B,” “C,” “D,” etc. Time-current curves for a typical recloser are shown in Figure 18. Note that the fast (A) curve specifies the *maximum* clearing time for a single operation, with all variations negative. By contrast, the slow or delayed curves specify *average* clearing times for a single operation, variations are typically $\pm 10\%$ in terms of time, or ± 0.01 seconds, whichever is greater.

Operating sequences for reclosers are selected primarily on the basis of providing protection against temporary faults and coordination with other protective devices. Typical sequences are: two fast / two delayed (2A/2B), one fast /

three delayed (1A/3B), one fast / two delayed (1A/2B), and two fast / one delayed (2A/1B). Although it is possible to select recloser operating sequences that are either all fast or all delayed, this is generally not done except in unusual situations because of difficulties that will be encountered in coordinating the recloser with other protective devices.

Proper selection of the operating sequence and reclosing time intervals is vital to ensure all outages caused by faults are restricted to the smallest possible section of the feeder or lateral. Generally, the time-current characteristics and operating sequence of a recloser are selected to coordinate with source-side protective devices. Then, after a specific recloser size and operating sequence has been determined, protective equipment further out on the feeder are selected to coordinate with it.

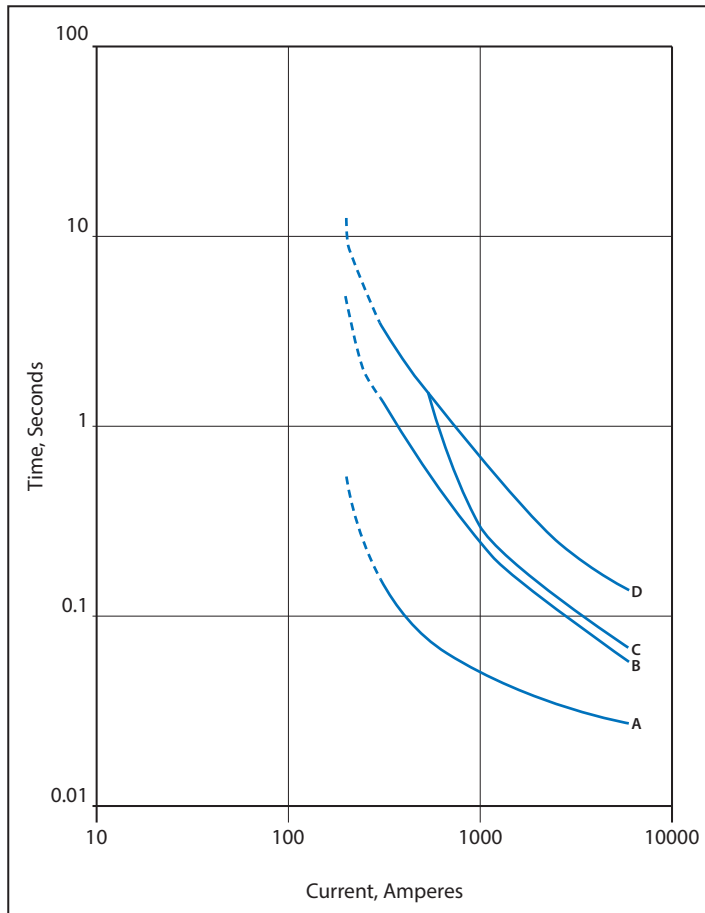


Figure 18. Typical recloser curves.

When coordinating a transformer primary fuse with a load-side circuit breaker with a reclosing relay, or with a load-side automatic-circuit recloser, the fault current flowing through the fuse will be interrupted by the breaker or recloser and then restored as the breaker or recloser goes through its operating sequence. Initially, the temperature of the fusible element in the primary fuse is determined by the pre-fault load current and by elevated (or reduced) ambient temperatures (if applicable).

When a fault is initiated, the temperature of the fusible element increases towards its melting point. If the breaker or recloser opens before the fusible element reaches its melting point, the fuse will cool during the reclosing time interval (i.e., the breaker or recloser contacts are open). This current cycling will continue until:

- The fault is cleared by a fast operation of the circuit breaker or recloser, followed by a successful reclose.
- A load-side fuse clears the fault during the recloser’s delayed operation.
- The recloser operates to lockout. Clearly, the preference would be for the recloser to operate to lockout *before* the transformer primary fuse operates.

Figure 19 illustrates the heating and cooling of a primary fuse subjected to multiple reclose operations.

When coordinating reclosers and fuses, the repeated heating and cooling of the fusible element must be considered. To achieve this end, adjustment factors are applied to

the time-current characteristic curves of the circuit breaker or recloser instead of the transformer primary fuse — to generate an “equivalent” recloser lockout curve as “seen” by the primary fuse. A number of different techniques have been used over the years to develop recloser lockout curves, each providing differing levels of accuracy.

One method, sometimes referred to as the “Conservative Method,” involves simply ignoring the cooling that occurs during the reclosing time intervals and considering only the heating of the primary fuse. Such a method, as the name suggests, yields very conservative results. A more accurate method — sometimes referred to as the “Cooling-Factor Method” — precisely defines the recloser lockout curve by reflecting both the heating *and* the specific cooling characteristics of the primary fuse as a function of the duration of each reclosing time interval. Cooling factor curves for S&C Type SMD Power Fuses are shown in Figure 20 on page 30.

As shown in Figure 20, cooling factors for different fuses can vary substantially. For example, after a reclosing time interval of 2 seconds has elapsed, a Standard Speed SMD Fuse Unit rated less than 40E amperes has lost 60% of its heat input as compared with a Slow Speed SMD Fuse Unit (having the same ampere rating), which has lost only 20% of its heat input.

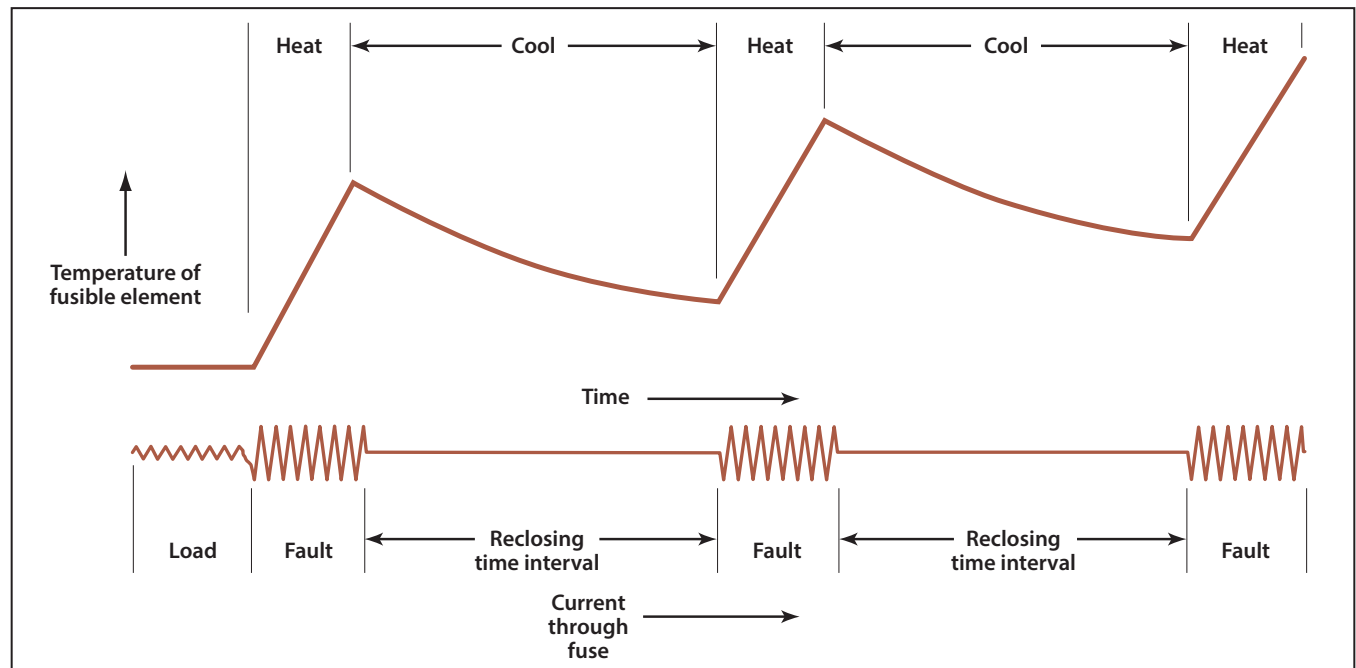


Figure 19. Heating and cooling of a fuse in series with a recloser during the recloser’s operating sequence.

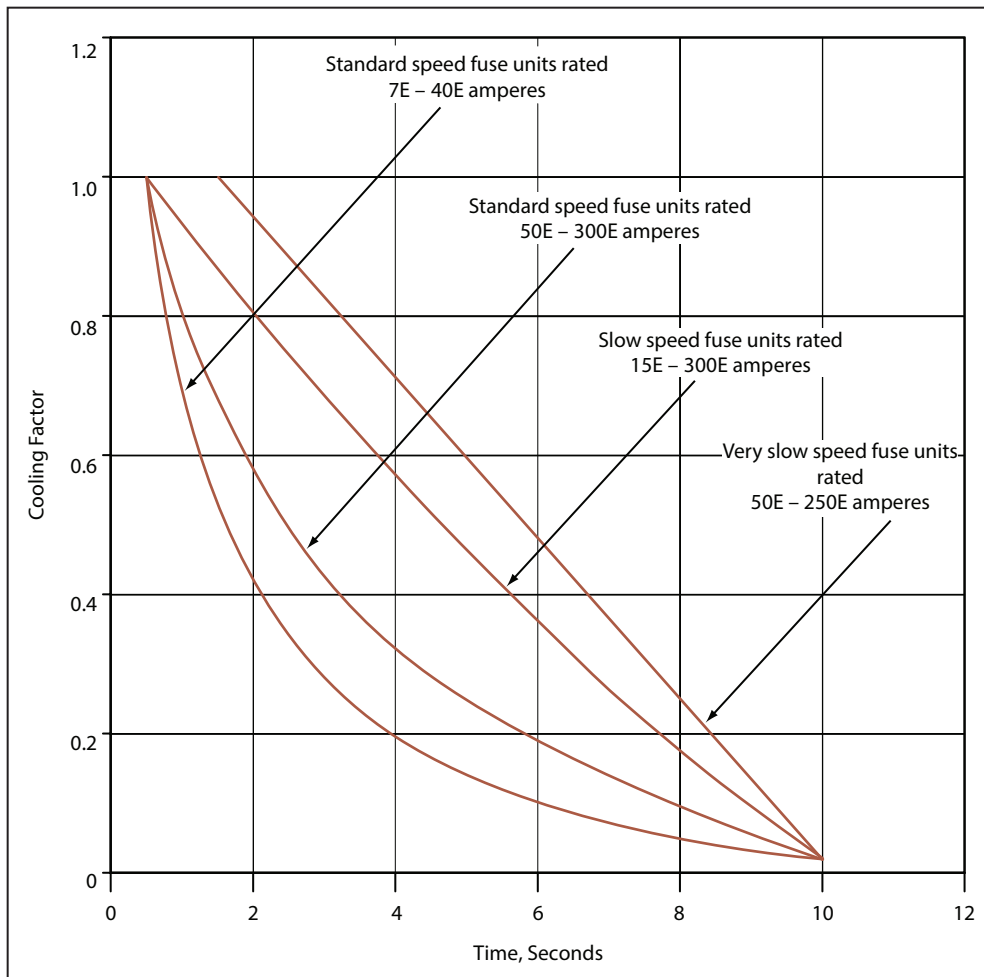


Figure 20. Cooling factors versus time for various SMD Power Fuses.

Because the transformer primary fuse is located on the source side of the feeder circuit breakers or reclosers, the goal is to have the primary fuse *not* melt before the breaker or recloser on the faulted feeder operates all the way to lockout. The maximum current value up to which the primary fuse and breaker or recloser will coordinate is generally the lower of either:

- (a) The maximum interrupting capacity of the circuit breaker, recloser, or fuse
- (b) The intersection of the minimum melting curve of the primary fuse and the maximum equivalent operating curve of breaker or recloser (i.e., the “lockout” curve)

Example 1: Conservative Method. Coordination between a transformer primary fuse and a secondary-side recloser is illustrated in Figure 21 on page 32. In this example, the transformer has a base (OA) rating of 7500 kVA three phase, 115 kV primary, 13.2 kV secondary. The transformer has an FA rating of 9375 kVA (125%). The transformer impedance is 7.5%, and the maximum three-phase secondary fault current is 478 amperes (2000 MVA), as seen on the primary side of the transformer. The transformer is connected delta grounded-wye.

The transformer primary fuse is a 65E-ampere Standard Speed SMD-2B Power Fuse rated 115 kV. The full-load current of the transformer, based on its FA rating, is 47 amperes.

At this level of transformer loading, the primary fuse will be loaded to 72% of rating (47 amperes ÷ 65 amperes = 0.72). The preload adjustment factor, which can be determined from Figure 5 on page 10, is 0.88.

The secondary-side recloser is a Cooper Type VSML electronically controlled vacuum recloser, rated 14.4 kV, 560 amperes continuous. The phase-trip pickup current is 280 amperes, and the operating sequence is one fast (A), three slow (C) operations. The reclosing time interval between the fast operation and the first delayed operation is 0.5 seconds (instantaneous). Between the delayed operations, the reclosing time interval is 5 seconds.

As noted earlier, the most conservative approach to establishing coordination between the transformer primary fuse and a feeder recloser would be to ignore the cooling of the primary fuse during the reclosing time intervals and simply sum the heating effect or heat input of each operation. That is, the recloser lockout curve would be created by adding the total clearing times of the proper number of fast and delayed operations at various current levels.

While the conservative method will ensure coordination, it may force the selection of a larger transformer primary fuse than otherwise would be necessary. A larger fuse, in turn, will provide a reduced level of transformer protection, and it may create coordination problems with devices located even further to the source side of the fuse.

The maximum equivalent lockout curve for a reclosing circuit breaker or recloser can be obtained by use of the following equation:

$$T_l = \frac{\sum_{j=1}^n T_{Rj}}{1 - P} \quad \text{(Equation 1)}$$

T_l = Point on the maximum equivalent lockout curve of the recloser, at current (I)

P = Reduction in the melting time of the fuse caused by preloading, expressed as a decimal part of its total melting time

T_{Rj} = Maximum clearing time at current (I) for the j^{th} operation of the recloser

n = Number of operations of the recloser

Because the fuse must allow the recloser to operate to lockout without melting, the recloser's maximum equivalent

lockout curve is calculated by adding up the individual operating times of the one fast (A) curve and three slow (C) curves at various current levels. As noted previously, the published fast (A) curve is based on maximum clearing time, but the delayed (C) curve is based on average clearing time and must be adjusted by its positive tolerance of 10%.

The recloser's maximum's equivalent lockout curve can be calculated by using Equation 1:

$$T_l = \frac{T_A + 3(1.1T_C)}{1 - P}$$

Where T_A and T_C are points from the published recloser A and C curves, respectively, at the selected current I.

At the maximum three-phase secondary-side fault current value of 478 A:

$$T_A = 0.025 \text{ second}$$

$$T_C = 0.14 \text{ second}$$

$$P = 0.12 \text{ (For 72\% preload) (From Figure 5 on page 10)}$$

$$T_l = \frac{0.025 + 3[(1.1)(.14)]}{1 - 0.12} = 0.55 \text{ seconds}$$

The minimum melting time of the 65E-ampere Standard Speed SMD-2B Power Fuse at 478 amperes (0.42 seconds) is less than the maximum equivalent lockout curve of the recloser at this same current level (0.55 seconds), so complete coordination between the primary fuse and the recloser is *not* obtained. Before considering a fuse with a slower speed characteristic or one with a larger ampere rating having the same speed characteristic, coordination should be checked using the more precise Cooling-Factor Method.

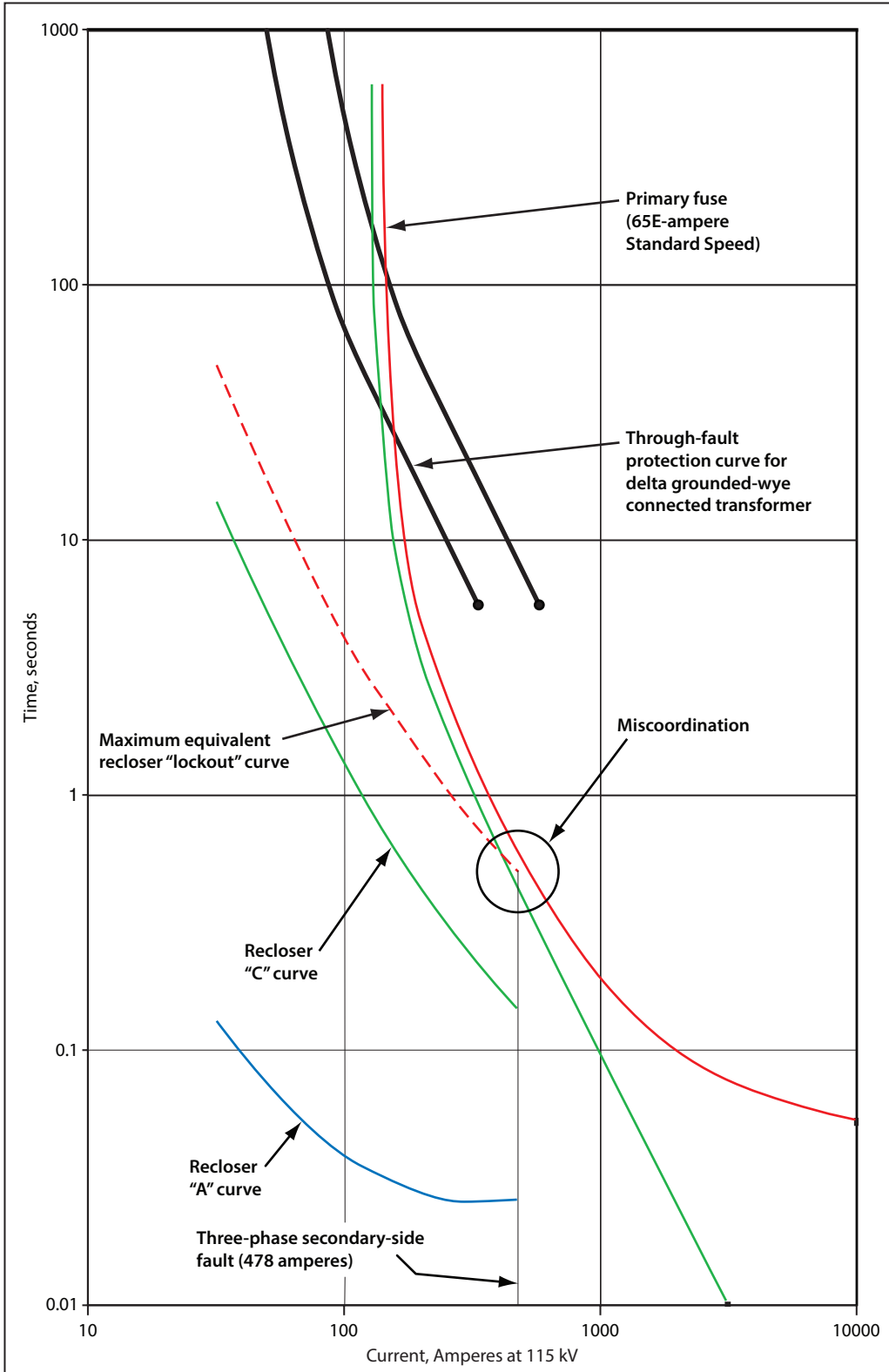


Figure 21. Source-side fuse/load-side recloser coordination using Conservative Method. The primary fuse does not coordinate with the recloser.

Example 2: Cooling-Factor Method. To obtain precise coordination between the transformer-primary fuse and a secondary-side circuit breaker or recloser, it is necessary to compensate for the heat stored in the primary fuse when the recloser contacts are closed and the heat that is lost when the contacts are open. The heat stored in the fuse (preheating) during the time the recloser contacts are closed is directly proportional to the recloser's total clearing times (for fast or delayed operations).

As noted before, an adjustment can be made to the recloser's fast (A) and slow (B, C, etc.) curves by the application of a factor (C) to the clearing times. These cooling factors (C) for a specific reclosing time interval, or cooling time, reflect the heat remaining in the fuse after preheating and cooling in percent of preheating. See Figure 20 on page 30.

Maximum equivalent lockout curves for the circuit breaker or recloser for various operating sequences are obtained by use of the following equations.

a. One operation of reclosing device:

$$T_l = \frac{T_{R1}}{(1 - P)} \quad \text{(Equation 2)}$$

b. Two operations of reclosing device:

$$T_l = \frac{T_{R1} C_1 + T_{R2}}{(1 - P C_1)} \quad \text{(Equation 3)}$$

c. Three operations of reclosing device:

$$T_l = \frac{T_{R1} C_1 C_2 + T_{R2} C_2 + T_{R3}}{(1 - P C_1 C_2)} \quad \text{(Equation 4)}$$

when the reclosing times are the same, this simplifies to:

$$T_l = \frac{T_{R1} C^2 + T_{R2} C + T_{R3}}{(1 - P C^2)} \quad \text{(Equation 4a)}$$

d. Four operations of reclosing device:

$$T_l = \frac{T_{R1} C_1 C_2 C_3 + T_{R2} C_2 C_3 + T_{R3} C_3 + T_{R4}}{(1 - P C_1 C_2 C_3)} \quad \text{(Equation 5)}$$

when the reclosing times are the same, this simplifies to:

$$T_l = \frac{T_{R1} C^3 + T_{R2} C^2 + T_{R3} C + T_{R4}}{(1 - P C^3)} \quad \text{(Equation 5a)}$$

Where:

T_l = Point on the maximum equivalent lockout curve of the recloser at current (I)

P = Reduction in the melting time of the fuse caused by preloading, expressed as a decimal part of its total melting time

T_{Rj} = Maximum clearing time at current (I) for the j^{th} operation of the recloser

C_k = Cooling factors from Figure 20 on page 30 for k^{th} reclosing time interval of the recloser

As in the previous example, the goal is to have the recloser operate all the way to lockout before the transformer primary fuse operates. The reclosing time interval between the fast operation and the first delayed operation is 0.5 seconds (instantaneous). Between the delayed operations, the reclosing time interval is 5 seconds. The equivalent recloser lockout curve is calculated using Equation 5:

$$T_l = \frac{T_A C_1 C_2 C_3 + 1.1 T_C C_2 C_3 + 1.1 T_C C_3 + 1.1 T_C}{(1 - P C_1 C_2 C_3)}$$

Where T_A and T_C are points from the published recloser A and C curves, respectively, at the current I .

At the maximum three-phase secondary-side fault value of 478 A:

$$T_A = 0.025 \text{ second}$$

$$T_C = 0.14 \text{ second}$$

$$P = 0.12 \text{ (For 72\% preload)} \quad \text{(From Figure 5)}$$

For a 0.5-second reclosing time interval: $C_1 = 1.0$

For a 5-second reclosing time interval: $C_2 = C_3 = 0.25$
(from Figure 20 on page 30)

$$T_l = \frac{(0.025)(1.0)(0.25)(0.25) + (1.1)(0.14)(0.25)(0.25) + (1.1)(0.14)(0.25) + (1.1)(0.14)}{(1 - (0.12)(1.0)(0.25)(0.25))} = 0.21 \text{ second}$$

As noted earlier, the minimum melting time of the 65E Standard Speed SMD-2B Power Fuse at 478 amperes is 0.42 second. In this example, complete coordination results because the equivalent lockout time of the recloser, at 478 amperes (0.21 seconds), is well below the minimum melting time of the primary fuse, thereby illustrating the advantages of the Cooling-Factor Method.

As the above example illustrates, including the effects of cooling of the transformer primary fuse during the reclosing time intervals often allows the selection of a smaller primary fuse ampere rating, or a primary fuse with the same rating but having a faster speed characteristic, for better transformer protection. The Cooling-Factor Method is particularly useful when the coordination with the secondary-side breaker or recloser is particularly tight. See Figure 22 on page 35.

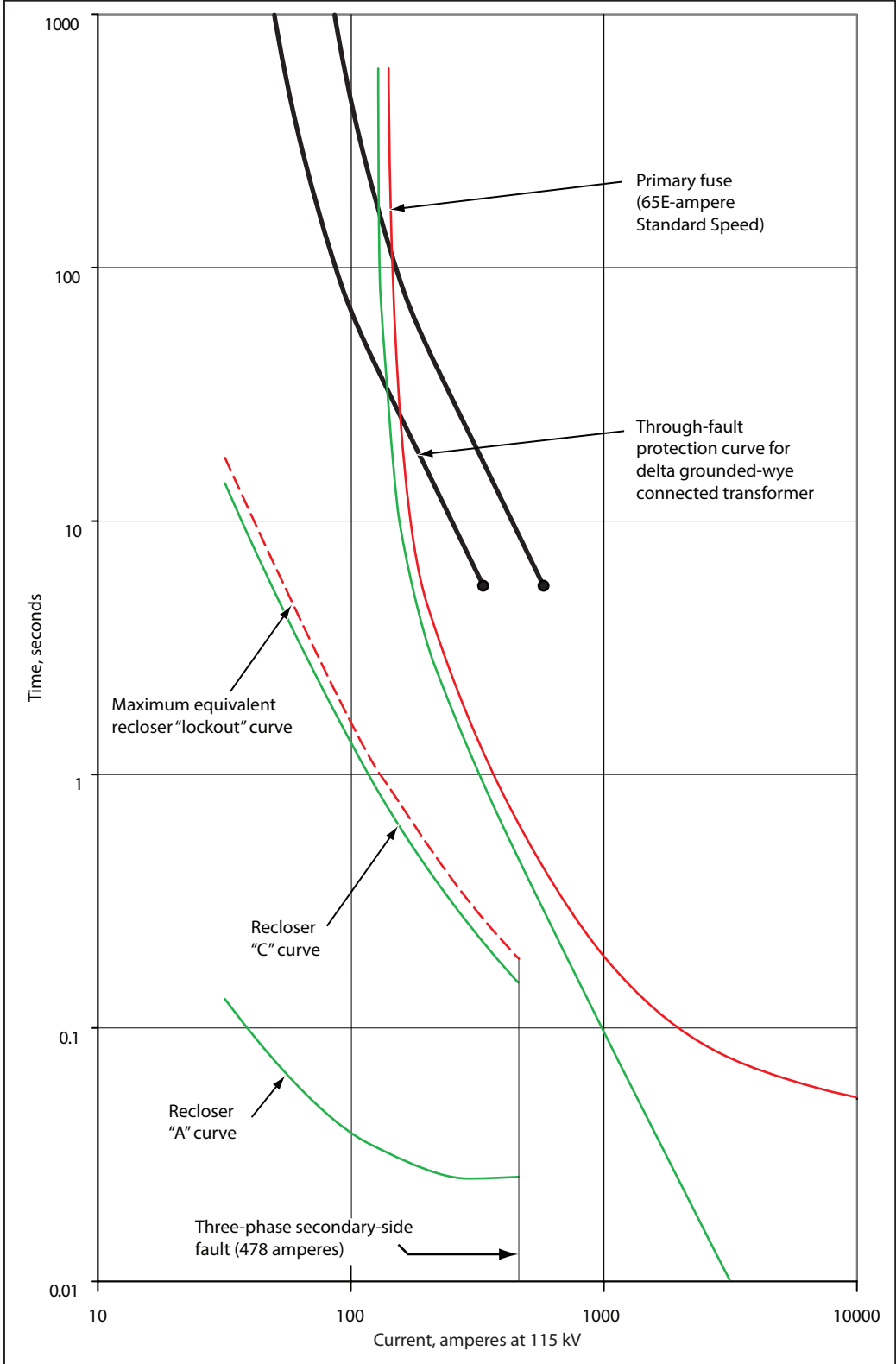


Figure 22. Source-side fuse/load-side recloser coordination using Cooling-Factor Method. Complete coordination is achieved.

Additional Coordination Considerations for Delta Grounded-Wye Connected Transformers

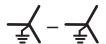


Coordination between the transformer primary fuse and the feeder circuit breaker or recloser is typically checked for the level of fault current and for the type of fault (i.e., three-phase, phase-to-phase, or phase-to-ground) producing the most demanding conditions possible for the transformer in each application. From the standpoint of coordination, the most demanding conditions possible are those where the per-unit line current on the primary side of the transformer is *greater* than the per-unit line current on the secondary side of the transformer.

For this situation, the primary fuse experiences more current, on a relative basis, than does the secondary-side breaker or recloser. Accordingly, an allowance must be made before checking for proper coordination between the two devices. Table 4 lists the ratio of the per-unit primary-side line current to the per-unit secondary-side line current

for the same transformer connections and types of secondary faults as illustrated in Figure 12 on page 18.

For a phase-to-phase secondary fault not involving ground on a delta grounded-wye connected transformer, the per-unit primary-side line current in one phase is the same as that resulting from a three-phase secondary fault, while the secondary-side line current is only 0.87 per unit of the three-phase secondary fault-current value (hence, the ratio, as listed in Table 4, is $1.0 \div 0.87$, or 1.15). To compensate for the line-current differential inherent to the delta grounded-wye connected transformer, it is generally recommended that a 15% margin in terms of current (or an equivalent margin in terms of time) be maintained between the total clearing time-current characteristic curve of the *feeder* protective device and the minimum melting time-current characteristic curve of the transformer primary fuse. Refer to Figure 23 on page 37.

Table 4. Relationship Between Per-Unit Primary-Side Line Current and Per-Unit Secondary-Side Line Current for Various Types of Secondary Faults

Transformer Connection ↓	Ratio of Per-Unit Primary-Side Line Current to Per-Unit Secondary-Side Line Current ^①			
	Type of Fault →	Three-Phase	Phase-to-Phase	Phase-to-Ground
		1.0	1.0	1.0
		1.0	1.0	Not Applicable
		1.0	1.15	0.58

^① Primary-side and secondary-side line current values are expressed per unit of their respective values for a “bolted” three-phase secondary fault.

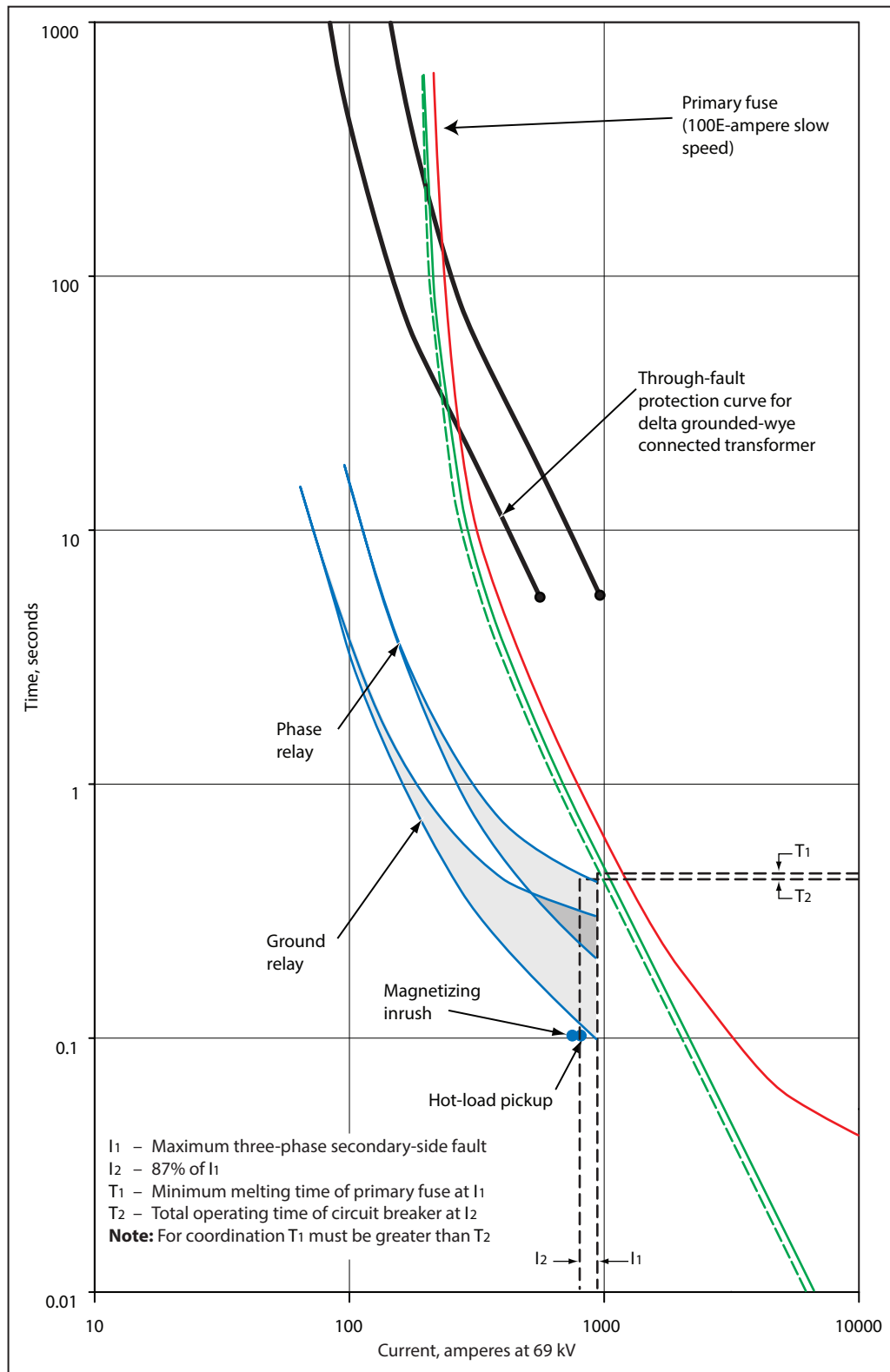


Figure 23. Application of minimum time margin (equivalent to 15% current margin) between the minimum melting curve of the transformer primary fuse and a medium-voltage circuit breaker (feeder or main) for a delta grounded-wye connected transformer.

Coordination Between the Transformer Primary Fuse and the Upstream Protective Devices

After the transformer primary fuse has been selected to provide the maximum degree of protection for the transformer and to coordinate with secondary-side circuit breakers and reclosers, it is necessary to consider coordination with upstream protective devices.

To achieve coordination with an upstream protective device, the total clearing time of the primary fuse must be less than the minimum melting time of a source-side fuse, or the minimum-operating time of the relay associated with a source-side circuit breaker, for all currents less than the maximum-available fault current at the location of the primary fuse. In establishing such coordination, no adjustment need be made to the total clearing time-current characteristic curve of the primary fuse.

Certain adjustments must be made to the minimum operating time-current curves of the source-side protective devices, however. Specifically, the minimum melting time-current characteristic curves for source-side power fuses must be adjusted to reflect the assumed prefault load current and elevated (or reduced) ambient temperatures (if applicable). Similarly, the time-current characteristic curves for source-side relays must be adjusted for any overtravel and tolerance, as recommended by the manufacturer of the device. Refer to Figure 24 on page 39.

Earlier in this guide, S&C recommended selecting the smallest practicable ampere rating of transformer primary fuse to maximize transformer protection. Such a fuse selection will also greatly facilitate coordination with upstream protective devices because the lower total clearing time-current curve associated with this fuse will more easily fit below the time-current curve of the upstream protective device.

Protecting Downstream Conductors Against Damaging Overcurrents

The final application principle to be considered when selecting a transformer primary fuse is that it must protect the conductors between the primary fuse and the transformer against damage from overheating caused by excessive overcurrents. In general, the size of conductor to be used is determined by considering the conductor's ampacity and its behavior under short-circuit current conditions.

Selection of the conductor size from the standpoint of its continuous current-carrying capability is easily done by reference to ampacity tables available in the industry literature or those published by the conductor manufacturer. Similarly, conductor sizes capable of withstanding available short-circuit currents easily can be selected from industry-accepted graphs or those distributed by the conductor manufacturers. If the size of conductor to be used is selected in this manner, the primary fuses selected in accordance with the recommendations presented in this publication will easily protect the conductors against damage from overheating due to excessive overcurrents.

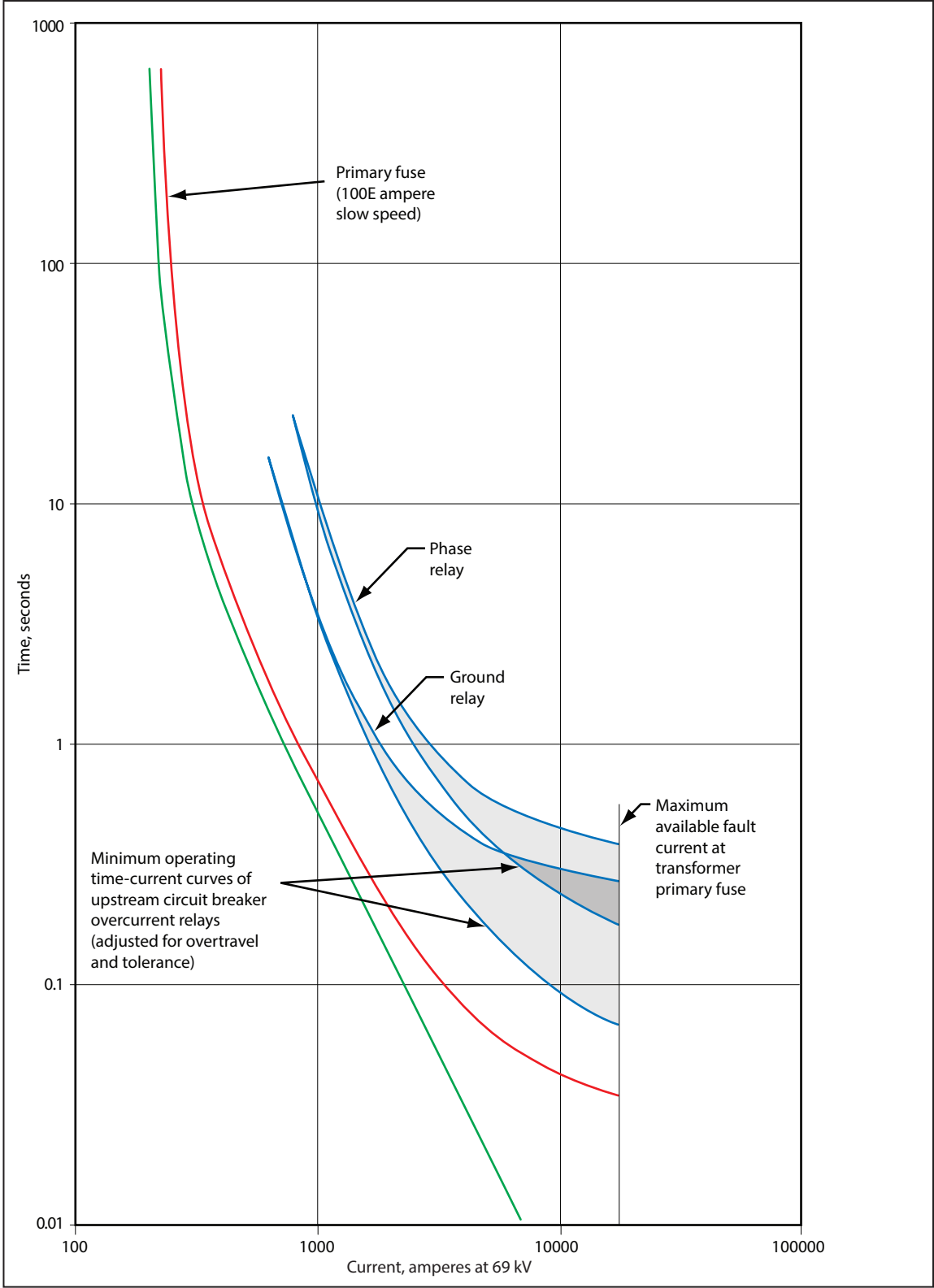


Figure 24. Coordination between a transformer primary fuse and an upstream circuit breaker.

Introduction to Fuse Selection Tables

As described previously, the selection of a transformer primary fuse ampere rating and speed characteristic involves consideration of the following factors:

- Anticipated normal transformer loading schedule, including daily or repetitive peak loads, and emergency peak loads
- Inrush currents, including the combined effects of transformer magnetizing-inrush current and the energizing-inrush currents associated with connected loads (i.e., hot-load pickup), and the long-term overcurrent that occurs upon re-energizing the transformer following an extended outage (i.e., cold-load pickup)
- The degree of protection provided to the transformer against damaging overcurrents
- Coordination with secondary-side as well as other primary-side overcurrent protective devices
- Protecting downstream conductors against damaging overcurrents

In the past, the task of selecting a transformer primary fuse ampere rating and speed involved complex graphical solutions using time-current characteristic curves published for the various overcurrent protective devices, taking into consideration the many adjustment factors required by the manufacturers of those devices and the particular transformer connection.

The fuse selection tables located on pages 50 to 128 of this document are based on the consideration of the aforementioned factors, and permit the selection of the optimal transformer primary fuse after just a few simple calculations. The need to perform graphical coordination studies has been eliminated.

The tables list, for each transformer, primary-fuse ampere ratings and speeds that will accommodate the full range of loading levels normally encountered and that will withstand the energizing-inrush currents associated with each transformer shown. In addition, for each such fuse, the degree of transformer protection provided by the primary fuse is quantified using S&C's unique "Transformer Protection Index," which indicates the level of secondary-fault current down to which the primary fuse will operate to protect the transformer in accordance with the appropriate transformer through-fault protection curve.

Furthermore, each fuse ampere rating and speed listed in the tables has been "precoordinated" with medium-voltage secondary-side circuit breakers and reclosers. One must only refer to these tables to select the optimal fuse ampere

rating and speed to protect a transformer and coordinate with the appropriate secondary-side overcurrent protective device.

S&C Type SMD Power Fuses possess the performance characteristics and quality that make them especially suited for the simultaneous satisfaction of all of the selection criteria. These time-tested fuses are available in a wide variety of ampere ratings and speeds, permitting close fusing for maximum protection and optimum coordination. And their time-current characteristics are precise, with only 10% total tolerance in melting current compared with the 20% (or greater) tolerance of other fuses (20% and 40% respectively, in terms of *time*).

Because of these narrow tolerances, S&C power fuses can be counted on to respond faster than other fuses of comparable ampere rating and speed, resulting in better and more reliable protection for the transformer. Furthermore, these narrow tolerances allow the upstream protective devices to be set to operate faster for better system protection while still retaining coordination.

Exceptional care in the design and manufacture of S&C power fuses guarantees that they are accurate with respect to their minimum melting time-current characteristics not only initially, but also on a sustained basis, neither age and vibration nor surges that heat the element nearly to the severing point will affect the characteristics of these fuses. S&C power fuses possess sufficient loading capability to easily accommodate daily or repetitive peak loads in excess of the normal transformer loading schedule. And they have surge capacities that are more than adequate to withstand any inrush currents they will likely experience. This provides operating economies because there is no need to replace unblown companion fuses on suspicion of damage following a fuse operation, a performance characteristic not generally found in other brands of power fuses.

As a consequence of these performance characteristics, S&C power fuses allow fusing closer to the transformer full-load current than is possible with other fuses, providing the maximum degree of protection against secondary faults. They are thus better able to protect the transformer against damage caused by faults between the transformer and secondary-side circuit breakers or reclosers. They also supply backup protection in the event of the incorrect functioning of secondary-side devices. In addition, the ability to fuse closer to the transformer full-load current facilitates coordination with upstream protective devices by allowing them to have lower ampere ratings and/or settings for faster response.

When the transformer primary fuse ampere rating and speed characteristic have been selected as outlined in the section entitled “How to Use the Fuse Selection Tables” on page 43, it is only necessary to determine the appropriate power fuse type based on the voltage rating, short-circuit interrupting rating (considering the maximum anticipated available fault current at the fuse location), and maximum ampere rating required.

As can be seen from Table 6 on page 48, S&C Type SMD Power Fuses are offered in a multitude of voltage, short-circuit interrupting, and maximum ampere ratings, allowing you to economically matching the power fuse to the load- and fault-current levels of the particular applications. Moreover, S&C Type SMD Power Fuses are offered in a wide variety of mounting configurations designed to accommodate the space and bus configuration requirements of many different station layouts. Consult the nearest S&C Sales Office for help in making the most economical selection.

Basis for Listings in the Fuse Selection Tables

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

Transformer self-cooled ratings. Table 7 on page 49 serves as an index to the fuse-selection tables applicable to transformers having primary voltage ratings between 34.5 kV and 138 kV, with medium-voltage (2.4 kV through 34.5 kV) secondaries. The transformer ratings in Table 7 are listed on a self-cooled basis. The fuse-selection tables are applicable to all transformers with the listed ratings even if they are equipped with cooling fans, if they have increased temperature capability (e.g., +149°F [+65°C] temperature rise instead of +131°F [+55°C] temperature rise), or if they have both cooling fans and increased temperature capability.

The transformer impedances listed in Table 7 were selected as being representative of transformers used in utility and large industrial substations and were used in preparing the fuse-selection tables. Transformers with special impedances are not within the scope of this publication and thus have not been considered.

Prefault load. As mentioned previously, the time-current characteristic curves for medium-voltage power fuses are determined at +77°F (+25°C) and with no initial load. In practice, every fuse is carrying some load that, in addition to ambient temperatures in excess of +77°F, raises the temperature of the fusible element and hence reduces the melting time for a given value of current. This adjustment must be considered when determining coordination between the transformer primary fuse and secondary-side circuit breakers or reclosers and in calculating the hot-load pickup capability of the primary fuse.

Coordination with secondary-side overcurrent protective devices. In general, this section of the fuse-selection tables was developed by examining the relationships that exist between the minimum melting time-current characteristic curve of the transformer primary fuse and the total clearing time-current characteristic curves for medium-voltage secondary-side circuit breakers and reclosers. As explained previously, proper coordination between the primary fuse and the secondary-side overcurrent protective device requires the consideration of a number of factors. The assumptions made in considering these factors are outlined below.

The maximum three-phase secondary-fault current level used in determining coordination between the transformer primary fuse and the secondary-side circuit breaker or recloser is based on consideration of the source impedance and as the more dominant transformer impedance. For the purpose of the fuse-selection tables, the source impedance is based on a variety of short-circuit MVA levels up through: 2000 MVA at 34.5 kV, 2500 MVA at 46 kV, 3000 MVA at 69 kV, 2000 MVA at 115 kV, and 2000 MVA 138 kV. Additional fault-current contribution by motors or other secondary-side devices has not been considered, thus ensuring that coordination between the transformer primary fuse and the secondary-side protective device will be realized under all circumstances.

The Transformer Protection Index. The Transformer Protection Index is provided in the fuse-selection tables to help evaluate the degree of transformer protection provided by the transformer primary fuse ampere rating selected. As explained in the section entitled, “Protect Transformer Against Damaging Overcurrents . . .” beginning on page 13, two objectives must be achieved to obtain a comprehensive level of protection for the transformer.

First, the total-clearing time-current characteristic curve of the primary fuse should pass below and to the left of the ANSI Point of the appropriate transformer through-fault protection curve and, second, the point at which the

two curves intersect should be at as low a multiple of the transformer primary full-load current as possible. The Transformer Protection Index indicates how well these two objectives are achieved.

The presence of an index indicates that the first objective was achieved, whereas the absence of an index signifies the primary fuse does not provide protection for the transformer because the total clearing time-current curve of the primary fuse passes above and to the right of the ANSI Point. Accordingly, a smaller primary-fuse ampere rating should be selected. The indexes indicate the percentage of the transformer primary full-load current down to which the primary fuse will operate to protect the transformer in accordance with the appropriate transformer through-fault protection curve.

The indexes are listed in the fuse-selection tables for commonly used transformer connections. For delta grounded-wye connected transformers, the indexes are based on a phase-to-ground secondary fault, which is the most demanding type of fault for this transformer connection from a protection standpoint. For delta-delta connected transformers, the indexes are based on a phase-to-phase secondary fault, which is the most demanding type of fault for this transformer connection from a protection standpoint.

Similarly, for grounded-wye grounded-wye connected transformers and for delta wye connected transformers with the secondary-side neutral grounded through an impedance, the indexes should be based on a three-phase secondary fault. However, because the indexes for these transformer connections (based on a three-phase secondary fault) are only slightly smaller (better) than the indexes determined for delta-delta connected transformers, for simplicity indexes for the delta-delta connected transformer have been listed in the fuse selection tables.

Loading capability. In general, loading capability refers to the amount of load the transformer primary fuse can pick up (even after a momentary or extended loss of source voltage) without operating and carry on a continuous basis. Two loadability values are listed in the fuse selection tables for each fuse ampere rating: the minimum of the continuous peak-load capability and the hot load pickup capability, and the cold-load pickup capability. These three capabilities are discussed below:

1. **Continuous peak-load capability**—The ability of the transformer primary fuse to carry on a continuous basis, daily, or repetitive peak loads regardless of duration. Continuous peak-load values for S&C Type SMD Power Fuses can be determined by referring to S&C Information Bulletin 210-190.

2. **Hot-load pickup capability**—The ability of the transformer primary fuse carrying load to withstand the combined magnetizing- and load-inrush currents associated with the re-energizing of the transformer following a momentary loss of source voltage. Specifically, hot-load pickup capability is the maximum transformer load current that, when used as the pre-outage load current in adjusting the minimum melting time-current characteristic curve of the primary fuse, results in a fuse curve that passes above and to the right of the point representing the magnitude and duration of the combined magnetizing- and load-inrush currents.

3. **Cold-load pickup capability**—The ability of the transformer primary fuse to withstand the combined magnetizing- and load-inrush currents associated with the re-energizing of the transformer following an extended outage (30 minutes or more). Cold-load pickup capability is typically associated with utility distribution transformer loading practices, where the transformers are often sized for the average peak load instead of the maximum-expected peak load, thereby exposing the transformers to overcurrent of up to 30 minutes in duration following re-energization. In contrast, transformers applied in industrial, commercial, and institutional power systems are usually sized to accommodate maximum peak-load conditions without being overloaded. For this reason, the combined magnetizing- and load-inrush current associated with the energizing of a transformer following an extended outage is no more severe than the inrush current encountered under hot-load pickup conditions, where the primary fuse is loaded to the peak-load capability listed in the fuse selection tables. As a consequence, cold-load pickup capability need not be considered when protecting transformers serving industrial, commercial, and institutional power systems.

4. **Ampere ratings.** For each transformer kVA rating, the fuse-selection tables list a choice of fuse ampere ratings in all of three speed characteristics: S&C Standard Speed, TCC No. 153; S&C Slow Speed, TCC No. 119; and S&C Very Slow Speed, TCC No. 176. The smallest ampere rating listed for each transformer kVA rating and for each speed characteristic provides a minimum loading capability for any of the three conditions evaluated of at least 80% of the full-load current of the transformer.

5. **Elevated ambient temperature.** An ambient operating temperature not exceeding +40°C (+104°F) is considered to be typical for medium-voltage power fuse installations. The required adjustment (reduction) in melting time for an ambient temperature of 40°C would be very small, on the order of 2% in terms of time, or 1% in terms of current, and thus can be ignored.

How to Use the Fuse Selection Tables

When using these tables, S&C recommends the transformer primary fuse be coordinated with the largest feeder circuit breaker or recloser instead of a main secondary-side protective device (if any). This will provide superior protection for the transformer and maintain the same degree of service continuity.

Accordingly, follow the steps below as they apply to the largest feeder protective device. *The examples on pages 44 and 46 illustrate the use of these steps in selecting a primary fuse.*

Non-Reclosing Secondary-Side Protective Device (Circuit Breaker)

Follow these steps to select the ampere rating of the primary fuse for a transformer with a non-reclosing secondary-side protective device (circuit breaker):

- STEP 1.** Locate the appropriate selection table based on the applicable transformer kV rating. Refer to Table 7 on page 49 for the Index to Selection Tables.
- STEP 2.** Determine from published operating characteristics, the maximum total clearing time of the feeder circuit breaker having the largest (highest) ratings or settings [i.e., the total operating time of the phase or ground relay (which ever is longer) plus the interrupting time of the circuit breaker] at the maximum three-phase secondary-side fault current level. In this publication, the primary-side system voltage is used.
- STEP 3.** Enter the table in the column entitled, “Secondary-side Circuit Breaker or Recloser — Upper Limit for T_E . . .,” in the specific column corresponding to the maximum three-phase secondary fault-current level. Select the first line containing a “ T_E ” entry equal to or larger than the value determined in Step 2.
- STEP 4.** In the line selected in Step 3 and in the “Transformer Protection Index . . .” column corresponding to the transformer connection, determine the Transformer Protection Index (TPI). If there is no TPI in this line, choose a smaller transformer primary fuse ampere rating as described below. Compare the TPI with the

entries listed in Table 5 on page 47 corresponding to the transformer connection and impedance.

Entries greater than or equal to the TPI indicate the fault types for which transformer protection is provided in accordance with the appropriate through-fault protection curve. If protection is not provided for the fault types listed, perhaps select a smaller primary-fuse ampere rating to obtain a smaller TPI by adjusting the settings of the phase and/or ground relay, as follows:

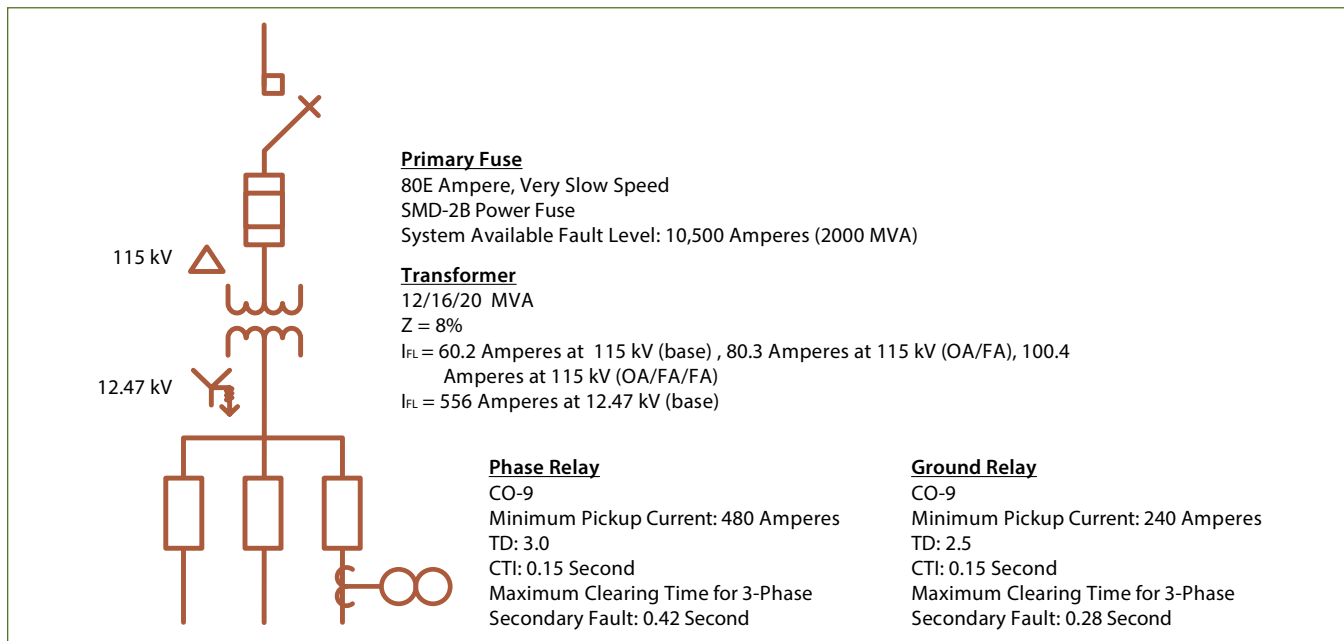
- Lower the time-dial setting.
- Lower the minimum pickup current.
- Use a different (faster) relay time-current characteristic.

Return to Step 2.

- STEP 5.** In the line selected in Step 4 and in the column headed “Loading Capability . . .,” verify the listed value is sufficient to meet hot-load or cold-load pickup requirements. If not, read down the table in this column, stopping in the first line containing an adequate loading capability value. Verify the entries in the secondary-side protective device ratings or settings columns and the “Transformer Protection Index . . .” columns are still acceptable. If not, perhaps consider reducing the loading requirements.
- STEP 6.** The primary-fuse ampere rating and time-current characteristic shown in the line selected above are those recommended for the application. The T_E values listed in the tables assume no preloading of the primary fuse. Verify coordination still exists by adjusting the T_E value using the graph in Figure 5 on page 10.
- STEP 7.** Verify the primary fuse selected in Step 6 coordinates with the upstream protective device. See page 38.
- STEP 8.** To select the type of primary fuse (i.e., SMD-1A, SMD-2B, SMD-2C, SMD-3, or SMD-50), refer to Table 6 on page 48. Based on the system voltage, interrupting duty, and maximum continuous current, note the power fuse types that can be used. The local S&C Sales Office can help with making the most economical selection.

Fuse-Selection Tables

Example 1 — Non-Reclosing Secondary-Side Protective Device (Circuit Breaker)



Here is an example of outcomes to the steps described on page 43:

- STEP 1.** The index on page 49 lists Table 9 as applying to transformers rated 115 kV three-phase, 12 MVA (base), 8% impedance.
- STEP 2.** The maximum total clearing time (TE) for the phase relay for a maximum three-phase secondary-side fault (701 amperes at 115 kV) is 0.42 seconds.
- STEP 3.** The appropriate entry in the column corresponding to a 2000-MVA system available fault-current level is 0.54 seconds.
- STEP 4.** The Transformer Protection Index (TPI) for the transformer in this example is 335%. A comparison of this value with the values listed in Table 5 on page 47 indicates the primary fuse will protect the transformer in accordance with the through-fault protection curve against all types of secondary faults.
- STEP 5.** The primary fuse has a continuous and hot-load pickup capability of 220% of the transformer full-load current, which is greater than the OA/FA/FA rating of the transformer (167%). The primary fuse has a cold-load pickup capability of 110% of the transformer full-load current.
- STEP 6.** A primary-fuse rating of 80E amperes, Slow Speed, TCC No. 119 is conditionally recommended.

- STEP 7.** Confirm that coordination is achieved based on pre-loading the primary fuse under the assumption that the transformer is operating at its top (20-MVA) rating. The preload adjustment factor (see Figure 5 on page 10) is 0.64. The adjusted minimum melting time of the 80E-ampere Slow Speed fuse is 0.35 seconds [0.54 second (from Step 3) \times 0.64 = 0.35 seconds].

Because this value is less than TE for the phase relay determined earlier (0.42 seconds), the 80E ampere Slow Speed fuse will *not* coordinate with the phase relay after all. An 80E-ampere Very Slow Speed primary fuse (TCC No. 176) *will* coordinate with the phase relay, even when preloaded to a current level equal to the top rating of the transformer. The adjusted minimum melting time for the 80E-ampere Very Slow Speed fuse is 0.79 second (from the table) \times 0.64 = 0.51 seconds.

- STEP 8.** The recommended primary-fuse ampere rating (80E amperes, Very Slow Speed, TCC No. 176) coordinates with source-side overcurrent protective devices (not considered in this example).
- STEP 9.** From Table 6 on page 48, an S&C Power Fuse Type SMD-2B is available in the voltage rating (115 kV), maximum ampere rating (250E), and interrupting rating (10,500 amperes symmetrical) sufficient for the application in this example.

Reclosing the Secondary-Side Protective Device (Recloser)

Follow these steps to select the ampere rating of the primary fuse for a transformer with a reclosing secondary-side protective device (recloser):

- STEP 1.** Locate the appropriate selection table based on the applicable transformer kV rating. Refer to Table 7 on page 49 for the Index to Selection Tables.
- STEP 2.** Collect data.
- STEP 3.** Complete these steps:
- (a) Determine from published operating characteristics, the *maximum* total clearing time of the feeder recloser having the largest (highest) ratings or settings for the fast (A) operation(s) at the maximum three-phase secondary-side fault current level. Next, for this same recloser, determine the *nominal* clearing time for the delayed (B,C, or D, etc.) operations at the maximum three-phase secondary-side fault current level. For this publication, the primary-side system voltage is used.
 - (b) Determine the cooling factors for the various available fuse unit speeds (e.g., Standard, Slow, Very Slow), and for the reclosing time intervals being used. See Figure 20 on page 30.
 - (c) Using the Preload Adjustment Curve shown in Figure 5 on page 10, determine preload factor “P.” This is the reduction in the melting time of the fuse caused by preloading, expressed as a decimal part of the melting time (i.e., 1.0 – the preload adjustment factor).
- STEP 4.** Based on the information determined above, calculate T_E for the various fuse unit speeds using Equations 2 through 5a, depending on the specific reclosing sequence being used. See page 33.
- STEP 5.** Enter the table in the column entitled, “Secondary-side Circuit Breaker or Recloser — Upper Limit for T_E . . .,” in the specific column corresponding to the maximum three-phase secondary fault current level. Select the first line containing a “ T_E ” entry equal to or larger than the values determined in Step 2 for the various fuse speeds under consideration.

- STEP 6.** In the lines selected in Step 3 and in the “Transformer Protection Index . . .” column corresponding to the transformer connection, determine the Transformer Protection Indices (TPIs). If there is no TPI in these lines, choose a smaller transformer primary fuse ampere rating as described below. Compare the TPI to the entries listed in Table 5 on page 48 corresponding to the transformer connection and impedance.

Entries greater than or equal to the TPIs indicate the fault types for which transformer protection is provided in accordance with the appropriate through-fault protection curve. If protection is not provided for one or more of the fault types listed, perhaps select a smaller primary fuse ampere rating to obtain a smaller TPI by adjusting the settings of the recloser, as follows:

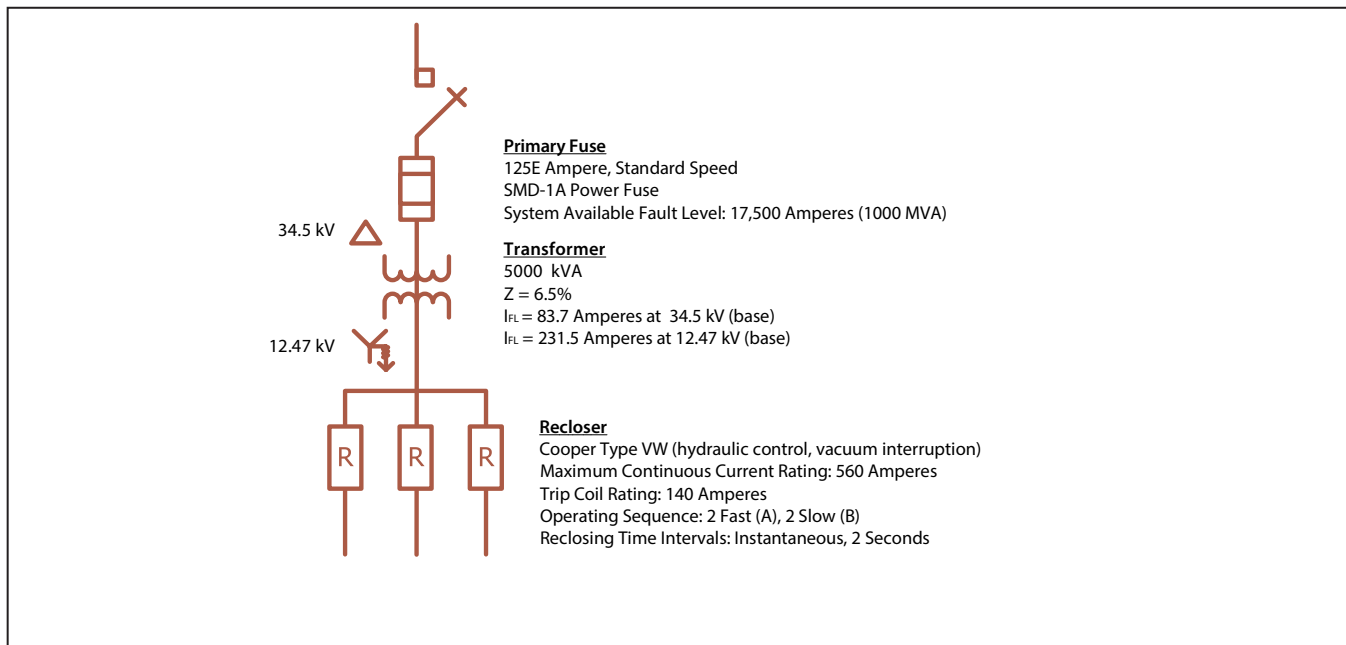
- Lower the recloser’s minimum pickup current.
- Use a different (faster) time-current characteristic curve for the delayed operation (e.g., a “C” curve instead of a “D” curve or a “B” curve instead of a “C” curve).

Return to Step 2.

- STEP 7.** In the line selected in Step 4 and in the column headed “Loading Capability . . .,” verify the listed value is sufficient to meet hot-load or cold-load pickup requirements. If not, read down the table in this column, stopping in the first line containing an adequate loading capability value. Verify the entries in the secondary-side protective device ratings or settings columns and the “Transformer Protection Index . . .” columns are still acceptable. If not, perhaps consider reducing the loading requirement.
- STEP 8.** The primary fuse ampere rating and time-current characteristic shown in the line selected above are those recommended for the application.
- STEP 9.** Verify that the primary fuse selected in Step 7 coordinates with the upstream protective device. See page 38.
- STEP 10.** To select the type of primary fuse (i.e., SMD-1A, SMD-2B, SMD-2C, SMD-3, or SMD-50), refer to Table 6 on page 49. Based on the system voltage, interrupting duty, and maximum continuous current, note the power fuse types that can be used. The local S&C Sales Office can help with making the most economical selection.

Fuse-Selection Tables

Example 2 — Reclosing Secondary-Side Protective Device (Recloser)



Here is an example of outcomes to the steps described on page 45:

STEP 1. The index in Table 8 on page 50 lists applies to transformers rated 34.5 kV three-phase, 5,000 kVA (base), 6.5% impedance.

STEP 2. Complete these steps:

- The published *maximum* total clearing time for the recloser fast (A) curve for a maximum three-phase secondary-side fault (1195 amperes at 34.5 kV) is 0.05 second. The published *nominal* total clearing time for the recloser slow (B) curve is 0.14 seconds.
- Cooling factors (C1, C2, etc.) for the various available fuse speeds, for an instantaneous and a 2-second reclosing time interval, are:

Standard Speed: 1.0
 (Instantaneous) 0.58 (2 seconds)

Slow Speed: 1.0
 (Instantaneous) 0.80 (2 seconds)

Very Slow Speed: 1.0
 (Instantaneous) 0.95 (2 seconds)

(c) The preload adjustment factor is 0.90 (from Figure 5). The factor “P” is 0.10 (1.0 - 0.90 = 0.10).

STEP 3. The calculated values for TE for the various fuse speeds using Equation 5 (two fast, two slow sequence) are:

Standard Speed: $T_E = 0.28$ seconds

Slow Speed: $T_E = 0.35$ seconds

Very Slow Speed: $T_E = 0.42$ seconds

STEP 4. The appropriate entries in the column corresponding to a 1000-MVA system available fault-current level and conditionally recommended fuse ratings are:

Standard Speed: $T_E = 0.30$ sec.
 125E Standard Speed

Slow Speed: $T_E = 0.53$ sec.
 125E Slow Speed

Very Slow Speed: $T_E = 0.53$ sec.
 100E Very Slow Speed

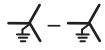

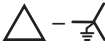
STEP 5. The Transformer Protection Indices (TPIs) for the fuses selected above are 375%, 405%, and 310%, respectively. A comparison of these values with the values listed in Table 5 indicates that the primary fuse will protect the transformer in accordance with the through-fault protection curve against all types of secondary faults.

STEP 6. The primary fuses selected above have a continuous and hot-load pickup capability of at least 175% of the full-load current of the transformer, which is more than sufficient for the application given that the transformer is not equipped with fans. The 100E-ampere Very Slow Speed fuse has a somewhat limited cold-load pickup capability of 105% of the transformer full-load current. If cold-load pickup is a concern, the 125E-ampere Standard Speed fuse or the 125E-ampere Slow Speed fuse should be used.

STEP 7. All of the recommended primary-fuse ampere ratings coordinate with source-side overcurrent protective devices (not considered in this example).

STEP 8. From Table 6 on page 48, an S&C power fuse, Type SMD-1A, is available in the voltage rating (34.5 kV), maximum ampere rating (200E), and interrupting rating (17,500 amperes symmetrical) sufficient for the application in this example.

Table 5. Secondary Fault Currents Reflected to Primary Lines

Transformer Connection	Impedance	Maximum Primary-Side Line Current for Various Types of Secondary Faults, Percent of Transformer Full-Load Current		
		Phase-to-Ground	Phase-to-Phase	Three-Phase
	4%	2500	2165	2500
	5%	2000	1730	2000
	6%	1670	1445	1670
	7%	1430	1240	1430
	8%	1250	1085	1250
	10%	1000	865	1000
	12%	830	720	830
	4%	Not Applicable	2165	2500
	5%		1730	2000
	6%		1445	1670
	7%		1240	1430
	8%		1085	1250
	10%		865	1000
	12%		720	830
	4%	1445	2500	2500
	5%	1155	2000	2000
	6%	965	1670	1670
	7%	825	1430	1430
	8%	720	1250	1250
	10%	575	1000	1000
	12%	480	830	830

Fuse-Selection Tables

Table 6. SMD Power Fuses — Short-Circuit Interrupting Ratings

kV, Nominal ↓		Short-Circuit Interrupting Ratings (Bold Font Is Nominal Rating) ^①															
Power Fuse Type →		SMD-50			SMD-1A			SMD-2B ^②			SMD-2C ^②			SMD-3			
Fuse	System	Amperes			MVA, 3-Phase Sym. ^③	Amperes			MVA, 3-Phase Sym. ^③	Amperes			MVA, 3-Phase Sym. ^③	Amperes			MVA, 3-Phase Sym. ^③
		Sym. ^③	Asym.			Sym. ^③	Asym.			Sym. ^③	Asym.			Sym. ^③	Asym.		
34.5	23	6 700	10 600	265	17 500	28 000	700				33 500	53 500	1300				
	27.6	6 700	10 600	320	17 500	28 000	840				33 500	53 500	1600				
	34.5	6 700	10 600	400	17 500	28 000	1000				33 500	53 500	2000				
46	23	6 000	9 600	****	15 000	24 000	****				31 500	50 500	****				
	27.6	6 000	9 600	****	15 000	24 000	****				31 500	50 500	****				
	34.5	6 000	9 600	****	15 000	24 000	****				31 500	50 500	****				
	46	5 000	8 000	400	13 100	21 000	1000				31 500	50 500	2500				
69	23			****			****	21 900	****					25 000	****	****	
	27.6	4 000	6 400	****	10 000	16 000	****	21 900	****					25 000	****	****	
	34.5	4 000	6 400	****	10 000	16 000	****	21 900	****					25 000	****	****	
	46	3 350	5 300	400	8 750	14 000	1000	21 900	****					25 000	****	****	
	69							17 500	28 000					25 000	40 000	3000	
115	69				5 000	8 000	****	10 500	16 800								
	115				5 000	8 000	1000	10 500	16 800								
138	115				5 000	8 000	1000	10 500	16 800								
	138				4 200	6 700	1000	8 750	14 000								

① Where no interrupting rating is listed or when higher interrupting capacity is needed, refer to the nearest S&C Sales Office.

② The listed ratings apply only to SMD-2B and SMD-2C Fuse Units used with mountings that are of the latest design (i.e., incorporating upper end fittings having four attachment bolts for 69 kV and below, or three

attachment bolts for 115 kV and 138 kV), or that have been modernized with new end fittings, as listed in the current Specification Bulletin 212-31.

③ Symmetrical ratings assigned are based on available symmetrical short-circuit current at locations where the X/R ratio is 20. See text starting on page 4 for a complete explanation.

TABLE CONTINUED ►

Table 7. Index to Selection Tables^①

Transformer Rating (Self Cooled)			Table Number
kV	kVA	Impedance, Percent	
34.5	300	6.0%, 6.5%, 7.0%	8
	500		
	750		
	1 000		
	1 500		
	2 000		
	2 500		
	3 750		
	5 000		
	7 500		
	10 000		
	12 000		
	15 000		
46	300	6.5%, 7.0%, 7.5%	9
	500		
	750		
	1 000		
	1 500		
	2 000		
	2 500		
	3 750		
	5 000		
	7 500		
	10 000		
	12 000		
	15 000		
18 000			
69	1 500	7.0%, 7.5%, 8.0%	10
	2 000		
	2 500		
	3 750		
	5 000		
	7 500		
	10 000		
	12 000		
	15 000		
	18 000		
	20 000		

Transformer Rating (Self Cooled)			Table Number
kV	kVA	Impedance, Percent	
115	5 000	7.5%, 8.0%, 8.5%	11
	7 500		
	10 000		
	12 000		
	15 000		
	18 000		
	20 000		
	24 000		
	25 000		
	30 000		
138	5 000	9.0%, 9.5%, 10.0%	12
	7 500		
	10 000		
	12 000		
	15 000		
	18 000		
	20 000		
	24 000		
	25 000		
	30 000		

^① Fuse selection tables are located on pages 50 to 128.

Fuse-Selection Tables

Table 8. Transformers Rated 34.5 kV, Three Phase

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds						S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)						
System Available Fault Level MVA →			Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
KVA, Three-Phase	Impedance	Full Load Current, Amperes							Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
300	6.0%	5.0	0.21	0.20	0.20	0.20	0.20	0.20	315	315	205	115	7E	Std.	153
			0.38	0.37	0.37	0.37	0.36	0.36	435	435	290	130	10E	Std.	153
			0.63	0.61	0.61	0.61	0.61	0.60	435	435	290	130	10E	Std.	153
			0.83	0.81	0.81	0.80	0.80	0.80	680	810	435	205	15E	Std.	153
			1.30	1.28	1.27	1.26	1.26	1.26	720	****	435	195	15E	Slow	119
			1.61	1.58	1.57	1.56	1.55	1.55	990	****	580	280	20E	Std.	153
			2.26	2.21	2.19	2.18	2.17	2.17	1200	****	580	295	20E	Slow	119
	6.5%	5.0	0.24	0.24	0.24	0.24	0.24	0.24	315	315	205	115	7E	Std.	153
			0.44	0.43	0.43	0.43	0.43	0.43	435	435	290	130	10E	Std.	153
			0.73	0.72	0.71	0.71	0.71	0.71	560	570	380	165	13E	Std.	153
			0.97	0.92	0.95	0.94	0.94	0.94	680	810	435	205	15E	Std.	153
			1.54	1.51	1.50	1.50	1.49	1.49	720	****	435	195	15E	Slow	119
			1.94	1.90	1.88	1.88	1.87	1.87	990	****	580	280	20E	Std.	153
			2.72	2.66	2.64	2.63	2.63	2.62	1200	****	580	295	20E	Slow	119
	7.0%	5.0	0.28	0.28	0.28	0.28	0.27	0.27	315	315	205	115	7E	Std.	153
			0.51	0.50	0.50	0.49	0.49	0.49	435	435	290	130	10E	Std.	153
			0.85	0.83	0.83	0.83	0.82	0.82	560	570	380	165	13E	Std.	153
			1.13	1.11	1.11	1.10	1.10	1.10	680	810	435	205	15E	Std.	153
			1.80	1.77	1.75	1.75	1.74	1.74	720	****	435	195	15E	Slow	119
			2.32	2.27	2.26	2.25	2.24	2.24	990	****	580	280	20E	Std.	153
			3.25	3.18	3.16	3.15	3.14	3.14	1200	****	580	295	20E	Slow	119
500	6.0%	8.4	0.23	0.23	0.22	0.22	0.22	0.22	340	340	225	100	13E	Std.	153
			0.31	0.30	0.30	0.29	0.29	0.29	395	400	260	125	15E	Std.	153
			0.47	0.45	0.45	0.45	0.45	0.44	395	420	260	115	15E	Slow	119
			0.57	0.56	0.55	0.55	0.54	0.54	530	565	350	165	20E	Std.	153
			0.76	0.74	0.74	0.73	0.73	0.73	550	630	350	175	20E	Slow	119
			0.92	0.89	0.88	0.87	0.87	0.87	665	800	435	205	25E	Std.	153
			1.03	0.99	0.98	0.98	0.97	0.97	695	890	435	215	25E	Slow	119
			1.21	1.17	1.16	1.15	1.14	1.14	915	****	520	255	30E	Std.	153
			1.85	1.78	1.76	1.75	1.74	1.73	1020	****	520	280	30E	Slow	119

① Self-cooled rating. OA/FA rating is 115% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)							
System Available Fault Level MVA →			Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
KVA, Three-Phase	Impedance	Full Load Current, Amperes							Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
500	6.5%	8.4	0.27	0.26	0.26	0.26	0.26	0.26	340	340	225	100	13E	Std.	153
			0.36	0.35	0.35	0.34	0.34	0.34	395	400	260	125	15E	Std.	153
			0.55	0.53	0.53	0.53	0.52	0.52	395	420	260	115	15E	Slow	119
			0.67	0.65	0.64	0.64	0.64	0.63	530	565	350	165	20E	Std.	153
			0.90	0.87	0.87	0.86	0.86	0.85	550	630	350	175	20E	Slow	119
			1.08	1.05	1.04	1.03	1.03	1.02	665	800	435	205	25E	Std.	153
			1.22	1.18	1.17	1.16	1.15	1.15	695	890	435	215	25E	Slow	119
			1.45	1.40	1.38	1.38	1.37	1.36	915	****	520	255	30E	Std.	153
	2.22	2.13	2.11	2.10	2.09	2.08	1020	****	520	280	30E	Slow	119		
	7.0%	8.4	0.31	0.30	0.30	0.30	0.30	0.30	340	340	225	100	13E	Std.	153
			0.42	0.41	0.40	0.40	0.40	0.40	395	400	260	125	15E	Std.	153
			0.64	0.63	0.62	0.62	0.62	0.61	395	420	260	115	15E	Slow	119
			0.77	0.75	0.74	0.74	0.74	0.74	530	565	350	165	20E	Std.	153
			1.05	1.02	1.01	1.00	1.00	0.99	550	630	350	175	20E	Slow	119
			1.26	1.22	1.21	1.20	1.19	1.19	665	800	435	205	25E	Std.	153
			1.42	1.38	1.37	1.36	1.35	1.35	695	****	435	215	25E	Slow	119
1.72			1.66	1.64	1.63	1.62	1.61	915	****	520	255	30E	Std.	153	
2.65	2.56	2.53	2.51	2.50	2.49	1020	****	520	280	30E	Slow	119			

① Self-cooled rating. OA/FA rating is 115% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
750	6.0%	12.6		0.26	0.25	0.25	0.25	0.24	0.24	350	355	235	110	20E	Std.	153	
				0.35	0.33	0.33	0.32	0.32	0.32	350	365	230	120	20E	Slow	119	
				0.43	0.41	0.41	0.40	0.40	0.40	435	440	290	135	25E	Std.	153	
				0.47	0.44	0.44	0.43	0.43	0.43	440	465	290	140	25E	Slow	119	
				0.54	0.51	0.51	0.50	0.50	0.49	555	610	350	170	30E	Std.	153	
				0.81	0.77	0.75	0.75	0.74	0.74	580	675	350	185	30E	Slow	119	
				0.92	0.87	0.86	0.85	0.84	0.84	820	****	460	230	40E	Std.	153	
				1.72	1.63	1.60	1.59	1.57	1.56	885	****	460	255	40E	Slow	119	
				1.43	1.35	1.32	1.31	1.29	1.29	1030	****	580	280	50E	Std.	153	
		2.97	2.79	2.73	2.70	2.68	2.66	1240●	****	580	330	50E	Slow	119			
		6.5%	12.6		0.31	0.29	0.29	0.29	0.28	0.28	350	355	235	110	20E	Std.	153
				0.41	0.39	0.38	0.38	0.38	0.38	350	365	230	120	20E	Slow	119	
				0.50	0.48	0.47	0.47	0.46	0.46	435	440	290	135	25E	Std.	153	
				0.54	0.52	0.51	0.51	0.50	0.50	440	465	290	140	25E	Slow	119	
				0.63	0.60	0.59	0.58	0.58	0.58	555	610	350	170	30E	Std.	153	
				0.94	0.90	0.89	0.88	0.87	0.87	580	675	350	185	30E	Slow	119	
				1.09	1.04	1.02	1.01	1.00	1.00	820	****	460	230	40E	Std.	153	
				2.04	1.94	1.90	1.89	1.87	1.87	885	****	460	255	40E	Slow	119	
	1.72			1.63	1.60	1.58	1.57	1.56	1030	****	580	280	50E	Std.	153		
	3.62	3.41	3.35	3.32	3.29	3.27	1240●	****	580	330	50E	Slow	119				

① Self-cooled rating. OA/FA rating is 115% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
750	7.0%	12.6		0.35	0.34	0.33	0.33	0.33	0.33	350	355	235	110	20E	Std.	153	
				0.47	0.45	0.44	0.44	0.44	0.44	350	365	230	120	20E	Slow	119	
				0.57	0.55	0.54	0.54	0.53	0.53	435	440	290	135	25E	Std.	153	
				0.63	0.60	0.59	0.58	0.58	0.58	440	465	290	140	25E	Slow	119	
				0.72	0.69	0.68	0.68	0.68	0.67	555	610	350	170	30E	Std.	153	
				1.09	1.04	1.03	1.02	1.01	1.01	580	675	350	185	30E	Slow	119	
				1.29	1.22	1.21	1.20	1.19	1.18	820	****	460	230	40E	Std.	153	
				2.41	2.29	2.25	2.22	2.20	2.19	885	****	460	255	40E	Slow	119	
				2.07	1.96	1.92	1.91	1.89	1.88	1030	****	580	280	50E	Std.	153	
				4.40	4.15	4.07	4.03	3.99	3.97	1240●	****	580	330	50E	Slow	119	
1,000	6.0%	16.7		0.25	0.24	0.23	0.23	0.23	0.22	325	325	220	100	25E	Std.	153	
				0.27	0.26	0.25	0.25	0.24	0.24	330	330	220	105	25E	Slow	119	
				0.31	0.29	0.29	0.28	0.28	0.28	405	420	260	130	30E	Std.	153	
				0.47	0.44	0.43	0.43	0.42	0.42	415	445	260	140	30E	Slow	119	
				0.51	0.48	0.47	0.46	0.46	0.46	580	635	345	175	40E	Std.	153	
				0.97	0.90	0.88	0.87	0.87	0.86	590	720	345	190	40E	Slow	119	
				0.78	0.73	0.71	0.70	0.69	0.69	715	810	435	210	50E	Std.	153	
				1.58	1.47	1.44	1.42	1.41	1.40	840	****	435	250	50E	Slow	119	
				2.34	2.19	2.14	2.12	2.09	2.08	930	****	480	265	50E	V. Slow	176	
				1.61	1.48	1.45	1.43	1.41	1.40	1060	****	495	290	65E	Std.	153	
	2.78	2.58	2.51	2.48	2.44	2.42	1440	****	495	320	65E	Slow	119				
					4.00	3.72	3.62	3.57	3.52	3.50	1485●	****	495	345	65E	V. Slow	176
		6.5%	16.7		0.25	0.24	0.23	0.23	0.23	0.22	325	325	220	100	25E	Std.	153
	0.27				0.26	0.25	0.25	0.24	0.24	330	330	220	105	25E	Slow	119	
	0.31				0.29	0.29	0.28	0.28	0.28	405	420	260	130	30E	Std.	153	
	0.47				0.44	0.43	0.43	0.42	0.42	415	445	260	140	30E	Slow	119	
	0.51				0.48	0.47	0.46	0.46	0.46	580	635	345	175	40E	Std.	153	
	0.97				0.90	0.88	0.87	0.87	0.86	590	720	345	190	40E	Slow	119	
	0.78				0.73	0.71	0.70	0.69	0.69	715	810	435	210	50E	Std.	153	
	1.58				1.47	1.44	1.42	1.41	1.40	840	****	435	250	50E	Slow	119	
2.34	2.19				2.14	2.12	2.09	2.08	930	****	480	265	50E	V. Slow	176		
1.61	1.48				1.45	1.43	1.41	1.40	1060	****	495	290	65E	Std.	153		
2.78	2.58	2.51	2.48	2.44	2.42	1440	****	495	320	65E	Slow	119					
				4.00	3.72	3.62	3.57	3.52	3.50	1485●	****	495	345	65E	V. Slow	176	

① Self-cooled rating. OA/FA rating is 115% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)							
KVA, Three-Phase	Impedance	Full Load Current, Amperes	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
									Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
1,000	7.0%	16.7	0.33	0.32	0.31	0.31	0.30	0.30	325	325	220	100	25E	Std.	153
			0.36	0.34	0.34	0.33	0.33	0.33	330	330	220	105	25E	Slow	119
			0.42	0.40	0.39	0.39	0.38	0.38	405	420	260	130	30E	Std.	153
			0.62	0.59	0.58	0.58	0.57	0.57	415	445	260	140	30E	Slow	119
			0.70	0.66	0.64	0.64	0.63	0.63	580	635	345	175	40E	Std.	153
			1.30	1.23	1.21	1.20	1.19	1.18	590	720	345	190	40E	Slow	119
			1.06	1.00	0.98	0.97	0.96	0.96	715	810	435	210	50E	Std.	153
			2.18	2.04	2.00	1.98	1.96	1.95	840	****	435	250	50E	Slow	119
			3.25	3.05	2.98	2.94	2.91	2.89	930	****	480	265	50E	V. Slow	176
			2.39	2.20	2.14	2.12	2.09	2.07	1060	****	495	290	65E	Std.	153
4.16	3.85	3.74	3.69	3.65	3.62	1180●	****	570	320	65E	Slow	119			

① Self-cooled rating. OA/FA rating is 115% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)							
KVA, Three-Phase	Impedance	Full Load Current, Amperes	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
									Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
1,500	6.0%	25.1	0.24	0.22	0.21	0.21	0.21	0.20	365	385	230	115	40E	Std.	153
			0.46	0.42	0.40	0.40	0.39	0.39	365	390	230	130	40E	Slow	119
			0.36	0.33	0.32	0.31	0.31	0.31	450	475	290	140	50E	Std.	153
			0.73	0.67	0.65	0.64	0.63	0.62	490	560	290	165	50E	Slow	119
			1.06	0.97	0.94	0.92	0.90	0.89	485	615	320	175	50E	V. Slow	176
			0.68	0.62	0.60	0.59	0.58	0.57	620	700	330	195	65E	Std.	153
			1.15	1.04	1.00	0.99	0.97	0.96	685	940	330	215	65E	Slow	119
			1.72	1.55	1.50	1.48	1.45	1.44	705	****	380	225	65E	V. Slow	176
			1.11	0.99	0.96	0.94	0.92	0.92	875	****	405	240	80E	Std.	153
			1.91	1.72	1.65	1.62	1.60	1.58	965	****	405	270	80E	Slow	119
	3.02	2.70	2.60	2.56	2.51	2.49	1315	****	445	275	80E	V. Slow	176		
	2.31	2.03	1.94	1.90	1.86	1.84	1285	****	580	320	100E	Std.	153		
	4.09	3.61	3.45	3.39	3.33	3.30	1435●	****	580	345	100E	Slow	119		
	6.5%	25.1	0.28	0.26	0.25	0.25	0.24	0.24	365	385	230	115	40E	Std.	153
			0.53	0.48	0.47	0.46	0.46	0.45	365	390	230	130	40E	Slow	119
			0.42	0.38	0.37	0.37	0.36	0.36	450	475	290	140	50E	Std.	153
			0.84	0.77	0.75	0.74	0.73	0.72	490	560	290	165	50E	Slow	119
			1.23	1.13	1.10	1.08	1.06	1.05	485	615	320	175	50E	V. Slow	176
			0.80	0.73	0.71	0.70	0.68	0.68	620	700	330	195	65E	Std.	153
			1.35	1.23	1.19	1.17	1.15	1.14	685	****	330	215	65E	Slow	119
			2.01	1.83	1.77	1.75	1.72	1.70	705	****	380	230	65E	V. Slow	176
			1.32	1.19	1.15	1.13	1.11	1.10	875	****	405	240	80E	Std.	153
2.29			2.06	1.99	1.95	1.91	1.89	965	****	405	270	80E	Slow	119	
3.63			3.26	3.14	3.08	3.05	2.99	1315	****	445	275	80E	V. Slow	176	
2.87			2.52	2.41	2.36	2.31	2.28	1285	****	580	320	100E	Std.	153	
5.02	4.43	4.25	4.17	4.09	4.04	1435●	****	580	345	100E	Slow	119			

① Self-cooled rating. OA/FA rating is 115% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)							
System Available Fault Level MVA →			Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
KVA, Three-Phase	Impedance	Full Load Current, Amperes							Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
1,500	7.0%	25.1	0.32	0.29	0.29	0.28	0.28	0.28	365	385	230	115	40E	Std.	153
			0.60	0.56	0.54	0.53	0.53	0.52	365	390	230	130	40E	Slow	119
			0.48	0.44	0.43	0.43	0.42	0.42	450	475	290	140	50E	Std.	153
			0.96	0.89	0.87	0.85	0.84	0.84	490	560	290	165	50E	Slow	119
			1.43	1.31	1.27	1.25	1.23	1.23	485	615	320	175	50E	V. Slow	176
			0.94	0.86	0.83	0.82	0.80	0.80	620	700	330	195	65E	Std.	153
			1.58	1.44	1.40	1.38	1.35	1.34	685	****	330	215	65E	Slow	119
			2.32	2.14	2.07	2.04	2.01	1.99	705	****	380	230	65E	V. Slow	176
			1.56	1.41	1.36	1.34	1.32	1.30	875	****	405	240	80E	Std.	153
			2.70	2.45	2.37	2.33	2.29	2.27	965	****	405	270	80E	Slow	119
			4.28	3.88	3.75	3.69	3.63	3.59	1005●	****	445	275	80E	V. Slow	176
3.56	3.11	2.99	2.93	2.87	2.84	1180●	****	580	320	100E	Std.	153			

① Self-cooled rating. OA/FA rating is 115% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
2,000	6.0%	33.5		0.22	0.19	0.18	0.18	0.18	0.18	330	340	220	105	50E	Std.	153	
				0.44	0.39	0.38	0.37	0.36	0.35	350	375	220	125	50E	Slow	119	
				0.63	0.56	0.54	0.52	0.51	0.51	340	375	240	130	50E	V. Slow	176	
				0.40	0.36	0.34	0.33	0.33	0.32	445	475	250	145	65E	Std.	153	
				0.66	0.58	0.56	0.54	0.53	0.53	480	540	250	160	65E	Slow	119	
				1.00	0.88	0.85	0.83	0.81	0.80	470	580	285	170	65E	V. Slow	176	
				0.63	0.55	0.53	0.52	0.50	0.50	605	680	305	180	80E	Std.	153	
				1.09	0.96	0.92	0.90	0.88	0.88	635	795	305	200	80E	Slow	119	
				1.67	1.46	1.40	1.37	1.31	1.31	670	****	335	215	80E	V. Slow	176	
				1.18	1.02	0.97	0.94	0.90	0.90	830	****	380	240	100E	Std.	153	
				2.17	1.88	1.80	1.75	1.69	1.69	910	****	380	260	100E	Slow	119	
		3.55	3.09	2.94	2.87	2.78	2.78	1025●	****	435	260	100E	V. Slow	176			
		1.87	1.61	1.53	1.49	1.43	1.43	1030	****	475	300	125E	Std.	153			
		4.13	3.46	3.31	3.23	3.11	3.11	1390●	****	475	400	125E	Slow	119			
		6.5%	33.5		0.25	0.22	0.22	0.21	0.21	0.20	330	340	220	105	50E	Std.	153
				0.51	0.46	0.44	0.43	0.42	0.42	350	375	220	125	50E	Slow	119	
				0.73	0.65	0.62	0.61	0.60	0.59	340	375	240	130	50E	V. Slow	176	
				0.46	0.41	0.40	0.39	0.38	0.38	445	475	250	145	65E	Std.	153	
				0.77	0.68	0.65	0.64	0.63	0.62	480	540	250	160	65E	Slow	119	
				1.15	1.03	0.99	0.97	0.94	0.93	470	580	285	170	65E	V. Slow	176	
				0.93	0.65	0.62	0.61	0.60	0.59	610	680	305	180	80E	Std.	153	
				1.26	1.13	1.08	1.06	1.04	1.03	635	795	305	200	80E	Slow	119	
	1.96			1.72	1.65	1.62	1.58	1.57	670	****	335	215	80E	V. Slow	176		
	1.39			1.22	1.16	1.13	1.11	1.09	830	****	380	240	100E	Std.	153		
	2.57			2.25	2.15	2.10	2.05	2.03	910	****	380	260	100E	Slow	119		
	4.23	3.69	3.51	3.44	3.36	3.32	1060●	****	435	260	100E	V. Slow	176				
	2.24	1.94	1.85	1.80	1.75	1.73	1030	****	475	300	125E	Std.	153				
	5.04	4.29	4.08	3.97	3.86	3.80	1390●	****	475	400	125E	Slow	119				

① Self-cooled rating. OA/FA rating is 115% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
2,000	7.0%	33.5		0.28	0.26	0.25	0.24	0.24	0.24	330	340	220	105	50E	Std.	153
				0.58	0.52	0.50	0.50	0.49	0.48	350	375	220	125	50E	Slow	119
				0.83	0.74	0.72	0.71	0.69	0.69	340	375	240	130	50E	V. Slow	176
				0.53	0.48	0.46	0.45	0.44	0.44	445	475	250	145	65E	Std.	153
				0.88	0.79	0.76	0.74	0.73	0.72	480	540	250	160	65E	Slow	119
				1.32	1.19	1.14	1.11	1.10	1.09	470	580	285	170	65E	V. Slow	176
				0.84	0.75	0.72	0.71	0.69	0.69	610	680	305	180	80E	Std.	153
				1.45	1.30	1.25	1.22	1.20	1.19	635	795	305	200	80E	Slow	119
				2.28	2.02	1.94	1.90	1.86	1.84	670	****	335	215	80E	V. Slow	176
				1.65	1.44	1.38	1.35	1.32	1.31	830	****	380	240	100E	Std.	153
				3.01	2.65	2.54	2.49	2.43	2.40	910	****	380	260	100E	Slow	119
				4.98	4.38	4.17	4.08	4.00	3.95	1025●	****	435	260	100E	V. Slow	176
				2.69	2.33	2.21	2.15	2.09	2.07	1060	****	475	300	125E	Std.	153
6.09	5.26	4.97	4.82	4.67	4.60	1390●	****	475	400	125E	Slow	119				
2,500	6.0%	41.8		0.30	0.26	0.25	0.24	0.23	0.23	270	285	175	100	50E	Slow	119
				0.43	0.37	0.35	0.34	0.33	0.33	265	280	190	105	50E	V. Slow	176
				0.27	0.24	0.22	0.22	0.21	0.21	345	365	200	115	65E	Std.	153
				0.44	0.38	0.36	0.35	0.34	0.34	370	400	200	130	65E	Slow	119
				0.67	0.58	0.55	0.54	0.52	0.51	360	395	225	135	65E	V. Slow	176
				0.42	0.37	0.35	0.34	0.33	0.33	465	505	245	145	80E	Std.	153
				0.74	0.64	0.60	0.59	0.57	0.57	480	545	245	160	80E	Slow	119
				1.10	0.94	0.89	0.87	0.84	0.83	485	630	270	175	80E	V. Slow	176
				0.75	0.63	0.60	0.58	0.56	0.55	620	720	305	190	100E	Std.	153
				1.40	1.20	1.13	1.10	1.07	1.05	645	930	305	210	100E	Slow	119
				2.29	1.95	1.84	1.78	1.72	1.70	740	****	350	205	100E	V. Slow	176
				1.18	1.00	0.95	0.92	0.90	0.88	780	905	380	240	125E	Std.	153
				2.49	2.09	1.95	1.87	1.82	1.80	975	****	380	320	125E	Slow	119
				3.59	2.95	2.80	2.73	2.66	2.63	1270	****	380	250	125E	V. Slow	176
				1.88	1.58	1.47	1.42	1.39	1.37	1070	****	435	290	150E	Std.	153
4.00	3.26	3.07	2.96	2.86	2.80	1210●	****	435	375	150E	Slow	119				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to “How to use the Fuse Selection Tables” on page 44.

TABLE CONTINUED ►

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)							
KVA, Three-Phase	Impedance	Full Load Current, Amperes	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
									Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
2,500	6.5%	41.8	0.34	0.30	0.28	0.28	0.27	0.27	270	285	175	100	50E	Slow	119
			0.49	0.43	0.41	0.40	0.39	0.39	265	280	190	105	50E	V. Slow	176
			0.31	0.27	0.26	0.25	0.25	0.24	345	365	200	115	65E	Std.	153
			0.51	0.44	0.42	0.41	0.40	0.39	370	400	200	130	65E	Slow	119
			0.77	0.67	0.64	0.63	0.61	0.60	360	395	225	135	65E	V. Slow	176
			0.48	0.42	0.46	0.39	0.39	0.38	465	505	245	145	80E	Std.	153
			0.85	0.74	0.70	0.68	0.67	0.66	480	545	245	160	80E	Slow	119
			1.27	1.10	1.05	1.02	0.99	0.98	485	630	270	165	80E	V. Slow	176
			0.87	0.75	0.70	0.69	0.67	0.66	620	720	305	190	100E	Std.	153
			1.63	1.40	1.33	1.30	1.26	1.24	645	****	305	210	100E	Slow	119
			2.68	2.29	2.17	2.11	2.06	2.03	740	****	350	205	100E	V. Slow	176
			1.37	1.18	1.11	1.08	1.04	1.03	780	****	380	240	125E	Std.	153
	2.98	2.49	2.36	2.30	2.23	2.20	975	****	380	320	125E	Slow	119		
	4.15	3.59	3.39	3.28	3.17	3.12	1310	****	380	250	125E	V. Slow	176		
	2.27	1.88	1.77	1.72	1.68	1.65	1070	****	435	290	150E	Std.	153		
	4.85	4.00	3.74	3.60	3.47	3.41	1225●	****	435	375	150E	Slow	119		
	7.0%	41.8	0.34	0.30	0.28	0.28	0.27	0.27	270	285	175	100	50E	Slow	119
			0.49	0.43	0.41	0.40	0.39	0.39	265	280	190	105	50E	V. Slow	176
			0.31	0.27	0.26	0.25	0.25	0.24	345	365	200	115	65E	Std.	153
			0.51	0.44	0.42	0.41	0.40	0.39	370	400	200	130	65E	Slow	119
			0.77	0.67	0.64	0.63	0.61	0.60	360	395	225	135	65E	V. Slow	176
			0.48	0.42	0.46	0.39	0.39	0.38	465	505	245	145	80E	Std.	153
			0.85	0.74	0.70	0.68	0.67	0.66	480	545	245	160	80E	Slow	119
			1.27	1.10	1.05	1.02	0.99	0.98	485	630	270	165	80E	V. Slow	176
0.87			0.75	0.70	0.69	0.67	0.66	620	720	305	190	100E	Std.	153	
1.63			1.40	1.33	1.30	1.26	1.24	645	****	305	210	100E	Slow	119	
2.68			2.29	2.17	2.11	2.06	2.03	740	****	350	205	100E	V. Slow	176	
1.37			1.18	1.11	1.08	1.04	1.03	780	****	380	240	125E	Std.	153	
2.98	2.49	2.36	2.30	2.23	2.20	975	****	380	320	125E	Slow	119			
4.15	3.59	3.39	3.28	3.17	3.12	1310	****	380	250	125E	V. Slow	176			
2.27	1.88	1.77	1.72	1.68	1.65	1070	****	435	290	150E	Std.	153			
4.85	4.00	3.74	3.60	3.47	3.41	1225●	****	435	375	150E	Slow	119			

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
3,750	6.0%	62.8		0.38	0.31	0.29	0.28	0.26	0.26	290	320	165	110	80E	Slow	119	
				0.54	0.44	0.41	0.40	0.38	0.37	285	320	180	110	80E	V. Slow	176	
				0.36	0.29	0.26	0.25	0.24	0.24	375	415	205	130	100E	Std.	153	
				0.67	0.54	0.50	0.48	0.46	0.45	385	430	204	140	100E	Slow	119	
				1.10	0.89	0.82	0.78	0.76	0.74	395	490	235	140	100E	V. Slow	176	
				0.58	0.48	0.45	0.43	0.41	0.40	495	520	255	160	125E	Std.	153	
				1.14	0.90	0.84	0.80	0.76	0.74	525	650	255	210	125E	Slow	119	
				1.68	1.33	1.24	1.19	1.14	1.12	555	815	255	165	125E	V. Slow	176	
				0.90	0.70	0.66	0.63	0.61	0.60	635	710	290	195	150E	Std.	153	
				1.77	1.42	1.29	1.21	1.16	1.14	670	****	290	250	150E	Slow	119	
				2.93	2.31	2.10	2.03	1.96	1.92	815	838	290	260	150E	V. Slow	176	
				1.13	0.88	0.82	0.79	0.76	0.74	725	****	305	230	175E	Std.	153	
				2.25	1.75	1.62	1.56	1.50	1.46	825	****	305	275	175E	Slow	119	
				3.89	3.12	2.86	2.73	2.59	2.51	1115	****	305	305	175E	V. Slow	176	
				1.46	1.13	1.05	1.00	0.96	0.93	840	****	320	280	200E	Std.	153	
				3.04	2.34	2.14	2.04	1.93	1.88	1055	****	320	335	200E	Slow	119	
				5.26	4.00	3.67	3.49	3.31	3.21	1200●	****	320	340	200E	V. Slow	176	
				2.66	1.95	1.78	1.69	1.60	1.56	1165	****	440	320	250E	Std.	153	
		5.98	4.39	3.90	3.72	3.54	3.45	1455●	****	440	420	250E	Slow	119			
		6.5%	62.8		0.43	0.35	0.33	0.32	0.31	0.30	290	320	165	110	80E	Slow	119
				0.62	0.51	0.48	0.46	0.44	0.44	285	320	180	110	80E	V. Slow	176	
				0.41	0.33	0.31	0.30	0.29	0.28	375	415	205	130	100E	Std.	153	
				0.77	0.62	0.58	0.56	0.54	0.53	385	430	205	140	100E	Slow	119	
				1.27	1.03	0.95	0.92	0.89	0.87	395	490	235	140	100E	V. Slow	176	
				0.66	0.54	0.51	0.49	0.48	0.47	495	520	235	160	125E	Std.	153	
				1.31	1.04	0.96	0.93	0.90	0.89	525	650	235	210	125E	Slow	119	
				1.91	1.56	1.42	1.37	1.33	1.31	555	815	255	165	125E	V. Slow	176	
				1.01	0.83	0.76	0.73	0.70	0.69	635	710	290	195	150E	Std.	153	
				2.02	1.66	1.55	1.48	1.42	1.39	670	****	290	250	150E	Slow	119	
				3.38	2.74	2.53	2.42	2.31	2.25	815	840	290	260	150E	V. Slow	176	
				1.33	1.05	0.97	0.93	0.88	0.87	725	****	305	230	175E	Std.	153	
				2.68	2.10	1.93	1.84	1.75	1.71	825	****	305	275	175E	Slow	119	
				4.64	3.58	3.36	3.24	3.12	3.06	1115	****	305	305	175E	V. Slow	176	
				1.73	1.35	1.24	1.18	1.13	1.11	840	****	320	280	200E	Std.	153	
				3.63	2.81	2.56	2.43	2.34	2.29	1055	****	320	335	200E	Slow	119	
				6.13	4.78	4.32	4.16	4.00	3.92	1200●	****	320	340	200E	V. Slow	176	
	3.29			2.39	2.17	2.06	1.95	1.91	1165	****	440	320	250E	Std.	153		
	7.38	5.39	4.86	4.63	4.39	4.27	1455●	****	440	420	250E	Slow	119				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
3,750	7.0%	62.8		0.49	0.40	0.38	0.37	0.35	0.35	290	320	165	110	80E	Slow	119
				0.71	0.58	0.54	0.53	0.51	0.50	285	320	180	110	80E	V. Slow	176
				0.47	0.38	0.36	0.35	0.33	0.33	375	415	205	130	100E	Std.	153
				0.88	0.72	0.67	0.65	0.62	0.61	385	430	205	140	100E	Slow	119
				1.43	1.18	1.10	1.07	1.03	1.01	395	490	235	140	100E	V. Slow	176
				0.74	0.62	0.58	0.55	0.54	0.53	495	525	255	160	125E	Std.	153
				1.50	1.23	1.14	1.09	1.04	1.02	525	650	255	210	125E	Slow	119
				2.20	1.80	1.68	1.62	1.56	1.53	560	815	255	165	125E	V. Slow	176
				1.15	0.96	0.90	0.86	0.83	0.82	645	710	290	195	150E	Std.	153
				2.35	1.87	1.17	1.72	1.66	1.63	805	****	290	250	150E	Slow	119
				3.96	3.11	2.93	2.83	2.74	2.69	815	****	290	260	150E	V. Slow	176
				1.55	1.23	1.13	1.09	1.05	1.03	725	****	305	230	175E	Std.	153
				3.10	2.45	2.25	2.18	2.10	2.06	825	****	305	275	175E	Slow	119
				5.30	4.28	3.89	3.69	3.58	3.53	1115	****	305	305	175E	V. Slow	176
				2.03	1.60	1.46	1.40	1.35	1.32	840	****	320	280	200E	Std.	153
				4.28	3.33	3.04	2.93	2.81	2.75	1085	****	320	335	200E	Slow	119
7.40	5.71	5.26	5.02	4.78	4.65	1200●	****	320	340	200E	V. Slow	176				
4.09	2.95	2.66	2.53	2.39	2.33	1190	****	440	320	250E	Std.	153				
5,000	6.0%	83.7		0.42	0.32	0.29	0.27	0.26	0.25	265	295	155	105	100E	Slow	119
				0.70	0.53	0.48	0.46	0.44	0.42	265	310	175	105	100E	V. Slow	176
				0.37	0.30	0.28	0.26	0.25	0.24	365	375	190	120	125E	Std.	153
				0.69	0.53	0.47	0.44	0.42	0.41	370	405	190	160	125E	Slow	119
				1.04	0.80	0.72	0.67	0.64	0.63	385	445	190	125	125E	V. Slow	176
				0.56	0.43	0.40	0.38	0.36	0.35	455	495	220	145	150E	Std.	153
				1.08	0.80	0.73	0.71	0.68	0.66	460	535	220	185	150E	Slow	119
				1.80	1.31	1.20	1.14	1.08	1.04	510	725	220	195	150E	V. Slow	176
				0.69	0.52	0.47	0.45	0.43	0.42	525	555	240	170	175E	Std.	153
				1.36	1.02	0.91	0.86	0.82	0.80	550	690	240	210	175E	Slow	119
				2.29	1.78	1.58	1.47	1.37	1.34	605	****	240	230	175E	V. Slow	176
				0.86	0.65	0.59	0.56	0.54	0.52	600	650	240	210	200E	Std.	153
				1.76	1.32	1.20	1.14	1.07	1.03	675	****	240	250	200E	Slow	119
				2.98	2.20	1.99	1.90	1.80	1.74	750	****	240	255	200E	V. Slow	176
				1.45	1.05	0.94	0.90	0.85	0.82	785	940	330	240	250E	Std.	153
				3.15	2.25	2.02	1.90	1.77	1.71	930	****	330	315	250E	Slow	119
5.70	4.05	3.53	3.32	3.16	3.07	1055●	****	330	325	250E	V. Slow	176				
2.80	1.92	1.68	1.59	1.48	1.43	1025	****	360	275	300E	Std.	153				
6.65	4.38	3.86	3.64	3.40	3.27	1380●	****	360	365	300E	Slow	119				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.
Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)							
KVA, Three-Phase	Impedance	Full Load Current, Amperes	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
									Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
5,000	6.5%	83.7	0.48	0.37	0.34	0.32	0.30	0.30	265	295	155	105	100E	Slow	119
			0.78	0.61	0.56	0.53	0.51	0.49	265	310	175	105	100E	V. Slow	176
			0.43	0.33	0.31	0.30	0.29	0.28	365	375	190	120	125E	Std.	153
			0.80	0.61	0.56	0.53	0.51	0.49	370	405	190	160	125E	Slow	119
			1.19	0.91	0.84	0.80	0.76	0.74	385	435	190	125	125E	V. Slow	176
			0.63	0.48	0.45	0.43	0.41	0.41	460	485	220	145	150E	Std.	153
			1.21	0.95	0.85	0.80	0.76	0.75	465	530	220	185	150E	Slow	119
			2.03	1.55	1.36	1.31	1.26	1.23	510	725	220	195	150E	V. Slow	176
			0.79	0.61	0.55	0.52	0.49	0.48	525	555	230	170	175E	Std.	153
			1.56	1.18	1.08	1.02	0.97	0.94	550	665	230	210	175E	Slow	119
			2.73	2.05	1.88	1.78	1.68	1.63	605	****	230	230	175E	V. Slow	176
			1.00	0.76	0.69	0.65	0.61	0.30	600	650	240	210	200E	Std.	153
			2.04	1.52	1.38	1.32	1.26	1.23	675	****	240	250	200E	Slow	119
			3.49	2.62	2.34	2.20	2.08	2.04	750	****	240	255	200E	V. Slow	176
			1.69	1.23	1.11	1.05	0.99	0.97	785	****	330	240	250E	Std.	153
			3.72	2.69	2.39	2.25	2.14	2.08	930	****	330	315	250E	Slow	119
			6.61	4.74	4.29	4.05	3.80	3.67	1055●	****	330	325	250E	V. Slow	176
	3.36	2.32	2.05	1.92	1.79	1.73	1025	****	360	275	300E	Std.	153		
	7.95	5.35	4.72	4.38	4.08	3.97	1380●	****	360	365	300E	Slow	119		
	7.0%	83.7	0.54	0.42	0.39	0.37	0.35	0.34	265	295	155	105	100E	Slow	119
			0.89	0.70	0.64	0.61	0.59	0.57	265	310	175	105	100E	V. Slow	176
			0.48	0.37	0.34	0.33	0.32	0.32	365	375	190	120	125E	Std.	153
			0.90	0.69	0.64	0.61	0.59	0.57	370	405	190	160	125E	Slow	119
			1.33	1.04	0.95	0.91	0.88	0.86	385	435	190	125	125E	V. Slow	176
			0.70	0.56	0.51	0.48	0.46	0.46	455	485	220	145	150E	Std.	153
			1.42	1.08	1.00	0.95	0.90	0.88	460	530	220	185	150E	Slow	119
			2.31	1.80	1.64	1.55	1.46	1.41	510	725	220	195	150E	V. Slow	176
			0.88	0.69	0.63	0.61	0.58	0.57	520	555	230	170	175E	Std.	153
			1.75	1.36	1.23	1.18	1.13	1.10	550	665	230	210	175E	Slow	119
			3.12	2.29	2.14	2.05	1.97	1.92	605	****	230	230	175E	V. Slow	176
			1.13	0.86	0.80	0.76	0.73	0.71	595	650	240	210	200E	Std.	153
			2.34	1.76	1.61	1.52	1.44	1.41	670	****	240	250	200E	Slow	119
			4.00	2.98	2.74	2.62	2.48	2.41	750	****	240	255	200E	V. Slow	176
			1.95	1.45	1.30	1.23	1.17	1.14	785	****	330	240	250E	Std.	153
4.39			3.15	2.84	2.69	2.54	2.47	930	****	330	315	250E	Slow	119	
7.90			5.70	5.02	4.74	4.52	4.41	1055●	****	330	325	250E	V. Slow	176	
4.10	2.80	2.48	2.32	2.17	2.11	1025	****	360	275	300E	Std.	153			
9.89	6.65	5.69	5.35	5.04	4.88	1380●	****	360	365	300E	Slow	119			

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
7,500	6.0%	125.5	0.61	0.41	0.37	0.35	0.32	0.31	290	305	145	125	150E	Slow	119	
			0.94	0.66	0.55	0.51	0.48	0.46	305	340	145	130	150E	V. Slow	176	
			0.38	0.28	0.24	0.21	0.20	0.19	340	345	155	115	175E	Std.	153	
			0.74	0.51	0.44	0.40	0.37	0.36	340	365	155	140	175E	Slow	119	
			1.25	0.84	0.74	0.68	0.63	0.59	355	400	155	150	175E	V. Slow	176	
			0.48	0.34	0.29	0.26	0.25	0.24	385	395	160	140	200E	Std.	153	
			0.94	0.66	0.57	0.54	0.51	0.49	405	445	160	165	200E	Slow	119	
			1.58	1.07	0.94	0.87	0.80	0.76	420	500	160	170	200E	V. Slow	176	
			0.74	0.51	0.45	0.42	0.39	0.37	490	520	220	160	250E	Std.	153	
			1.58	1.07	0.91	0.84	0.79	0.76	520	620	220	210	250E	Slow	119	
			2.80	1.85	1.55	1.43	1.34	1.29	555	965	220	215	250E	V. Slow	176	
			1.30	0.84	0.73	0.68	0.62	0.59	610	680	240	185	300E	Std.	153	
			2.88	1.85	1.58	1.43	1.32	1.27	720	****	240	245	300E	Slow	119	
			4.58	2.94	2.47	2.32	2.16	2.07	1120	****	345	270	2-175E	V. Slow	176	
	1.78	1.12	0.97	0.89	0.81	0.79	835	****	375	230	2-200E	Std.	153			
	3.60	2.32	1.96	1.78	1.66	1.60	1065	****	375	295	2-200E	Slow	119			
	6.28	3.93	3.25	3.03	2.78	2.65	1190●	****	375	230	2-200E	V. Slow	176			
	3.67	2.01	1.64	1.50	1.35	1.30	1170	****	395	290	2-250E	Std.	153			
	8.47	4.49	3.70	3.31	3.03	2.89	1440●	****	395	380	2-250E	Slow	119			
	6.5%	125.5	0.68	0.46	0.41	0.39	0.37	0.36	290	305	145	125	150E	Slow	119	
			1.08	0.75	0.66	0.61	0.55	0.52	305	340	145	130	150E	V. Slow	176	
			0.43	0.31	0.28	0.26	0.24	0.22	335	345	155	115	175E	Std.	153	
			0.82	0.57	0.51	0.48	0.44	0.42	340	365	155	140	175E	Slow	119	
			1.37	0.96	0.84	0.79	0.74	0.71	355	400	155	150	175E	V. Slow	176	
			0.54	0.38	0.34	0.31	0.29	0.27	385	395	160	140	200E	Std.	153	
			1.07	0.77	0.66	0.60	0.57	0.55	405	445	160	165	200E	Slow	119	
			1.80	1.24	1.07	1.00	0.94	0.90	420	500	160	170	200E	V. Slow	176	
			0.85	0.58	0.51	0.48	0.45	0.44	490	520	220	160	250E	Std.	153	
1.77			1.21	1.07	0.99	0.91	0.87	520	620	220	210	250E	Slow	119		
3.16			2.11	1.85	1.71	1.55	1.47	555	****	220	215	250E	V. Slow	176		
1.48			0.98	0.84	0.78	0.73	0.70	610	680	240	185	300E	Std.	153		
3.40			2.17	1.85	1.72	1.58	1.51	720	****	240	245	300E	Slow	119		
5.28			3.38	2.94	2.70	2.47	2.39	1120	****	345	270	2-175E	V. Slow	176		
2.04	1.32	1.12	1.05	0.97	0.93	835	****	375	230	2-200E	Std.	153				
4.18	2.69	2.32	2.14	1.96	1.86	1065	****	375	295	2-200E	Slow	119				
7.26	4.64	3.93	3.54	3.25	3.14	1190●	****	375	230	2-200E	V. Slow	176				
4.59	2.41	2.01	1.81	1.64	1.57	1170	****	395	290	2-250E	Std.	153				
10.5	5.46	4.49	4.07	3.70	3.50	1440●	****	395	380	2-250E	Slow	119				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.
Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds						S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)							
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
7,500	7.0%	125.5		0.73	0.54	0.46	0.43	0.41	0.40	290	305	145	125	150E	Slow	119
				1.20	0.83	0.75	0.71	0.66	0.63	305	340	145	130	150E	V. Slow	176
				0.47	0.34	0.31	0.30	0.28	0.27	335	345	155	115	175E	Std.	153
				0.91	0.65	0.57	0.54	0.51	0.49	340	365	155	140	175E	Slow	119
				1.58	1.11	0.96	0.88	0.84	0.81	355	400	155	150	175E	V. Slow	176
				0.59	0.41	0.38	0.36	0.34	0.32	385	395	160	140	200E	Std.	153
				1.20	0.86	0.77	0.71	0.66	0.63	405	445	160	165	200E	Slow	119
				1.99	1.40	1.24	1.16	1.07	1.03	420	500	160	170	200E	V. Slow	176
				0.94	0.67	0.58	0.54	0.51	0.50	490	520	220	160	250E	Std.	153
				2.02	1.39	1.21	1.14	1.07	1.03	520	620	220	210	250E	Slow	119
				3.53	2.39	2.11	1.99	1.85	1.78	555	****	220	215	250E	V. Slow	176
				1.68	1.13	0.98	0.92	0.84	0.81	610	680	240	185	300E	Std.	153
				3.86	2.53	2.17	1.97	1.85	1.78	720	****	240	245	300E	Slow	119
				6.12	3.96	3.38	3.17	2.94	2.82	1120	****	345	270	2-175E	V. Slow	176
				2.38	1.50	1.32	1.22	1.12	1.09	835	****	375	230	2-200E	Std.	153
				4.81	3.13	2.69	2.48	2.32	2.23	1065	****	375	295	2-200E	Slow	119
				8.51	5.26	4.64	4.30	3.93	3.74	1190●	****	375	230	2-200E	V. Slow	176
5.71	2.94	2.41	2.19	2.01	1.91	1170	****	395	290	2-250E	Std.	153				
10,000	6.0%	167.3		0.51	0.32	0.27	0.24	0.22	0.21	255	260	115	105	175E	Slow	119
				0.84	0.52	0.45	0.42	0.37	0.35	255	270	115	115	175E	V. Slow	176
				0.34	0.21	0.18	0.16	0.15	0.14	290	295	120	105	200E	Std.	153
				0.66	0.44	0.36	0.32	0.29	0.28	295	310	120	125	200E	Slow	119
				1.07	0.68	0.59	0.53	0.47	0.44	300	325	120	130	200E	V. Slow	176
				0.51	0.32	0.28	0.26	0.24	0.22	360	370	165	120	250E	Std.	153
				1.07	0.67	0.55	0.51	0.46	0.43	365	400	165	160	250E	Slow	119
				1.85	1.14	0.91	0.85	0.77	0.74	385	445	165	165	250E	V. Slow	176
				0.84	0.53	0.43	0.40	0.36	0.34	445	470	180	140	300E	Std.	153
				1.85	1.10	0.93	0.86	0.77	0.73	485	585	180	180	300E	Slow	119
				2.94	1.80	1.49	1.37	1.24	1.18	600	****	260	200	2-175E	V. Slow	176
				1.12	0.70	0.57	0.53	0.48	0.46	600	650	280	170	2-200E	Std.	153
				2.32	1.40	1.17	1.07	0.96	0.90	675	900	280	220	2-200E	Slow	119
				3.93	2.28	1.95	1.76	1.55	1.44	750	****	280	170	2-200E	V. Slow	176
				2.01	1.11	0.91	0.81	0.73	0.68	780	935	295	220	2-250E	Std.	153
				4.49	2.42	1.98	1.74	1.56	1.47	930	****	295	285	2-250E	Slow	119
				7.76	4.18	3.38	3.06	2.76	2.60	1075●	****	295	220	2-250E	V. Slow	176
4.25	2.04	1.63	1.45	1.28	1.20	1025	****	325	255	2-300E	Std.	153				
9.75	4.62	3.65	3.20	2.85	2.67	1370●	****	325	345	2-300E	Slow	119				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
10,000	6.5%	167.3	0.56	0.36	0.31	0.28	0.25	0.24	255	260	115	105	175E	Slow	119	
			0.92	0.59	0.51	0.47	0.44	0.42	255	270	115	115	175E	V. Slow	176	
			0.37	0.24	0.21	0.19	0.17	0.16	290	290	120	105	200E	Std.	153	
			0.74	0.49	0.42	0.38	0.34	0.32	295	310	120	125	200E	Slow	119	
			1.20	0.76	0.66	0.61	0.56	0.53	300	325	120	130	200E	V. Slow	176	
			0.56	0.37	0.31	0.29	0.27	0.26	360	370	165	120	250E	Std.	153	
			1.18	0.76	0.64	0.57	0.53	0.51	365	400	165	160	250E	Slow	119	
			2.05	1.29	1.09	0.97	0.88	0.85	385	445	165	165	250E	V. Slow	176	
			0.95	0.59	0.50	0.46	0.41	0.40	445	470	180	140	300E	Std.	153	
			2.07	1.27	1.04	0.97	0.89	0.86	485	585	180	180	300E	Slow	119	
			3.28	2.07	1.70	1.54	1.43	1.37	600	****	260	200	2-175E	V. Slow	176	
			1.27	0.79	0.67	0.60	0.55	0.53	600	650	280	170	2-200E	Std.	153	
			2.57	1.60	1.32	1.22	1.12	1.07	675	****	280	220	2-200E	Slow	119	
			4.47	2.65	2.20	2.04	1.86	1.76	750	****	280	170	2-200E	V. Slow	176	
	2.28	1.30	1.05	0.96	0.85	0.81	780	****	295	220	2-250E	Std.	153			
	5.23	2.89	2.29	2.08	1.86	1.74	930	****	295	285	2-250E	Slow	119			
	9.06	4.99	4.00	3.60	3.20	1.45	1075●	****	295	220	2-250E	V. Slow	176			
	5.14	2.45	1.93	1.73	1.53	1.91	1025	****	325	255	2-300E	Std.	153			
	12.3	5.54	4.34	3.89	3.40	3.20	1370●	****	325	345	2-300E	Slow	119			
	0.60	0.40	0.35	0.32	0.30	0.28	255	255	115	105	175E	Slow	119			
	1.04	0.68	0.56	0.52	0.49	0.47	255	270	115	115	175E	V. Slow	176			
	0.40	0.26	0.23	0.21	0.20	0.19	290	295	120	105	200E	Std.	153			
	0.81	0.54	0.48	0.44	0.40	0.38	295	310	120	125	200E	Slow	119			
	1.32	0.87	0.72	0.68	0.63	0.61	300	325	120	130	200E	V. Slow	176			
	0.62	0.42	0.35	0.32	0.30	0.29	360	370	165	120	250E	Std.	153			
	1.29	0.84	0.73	0.67	0.60	0.57	365	400	165	160	250E	Slow	119			
	2.23	1.43	1.25	1.14	1.03	0.97	385	445	165	165	250E	V. Slow	176			
	1.05	0.68	0.57	0.53	0.48	0.46	445	470	180	140	300E	Std.	153			
2.35	1.43	1.22	1.10	1.00	0.97	485	585	180	180	300E	Slow	119				
3.62	2.32	1.98	1.80	1.59	1.54	600	****	260	200	2-175E	V. Slow	176				
1.41	0.89	0.76	0.70	0.63	0.60	600	650	280	170	2-200E	Std.	153				
2.92	1.78	1.53	1.40	1.26	1.22	675	****	280	220	2-200E	Slow	119				
4.96	3.03	2.51	2.28	2.12	2.04	750	****	280	170	2-200E	V. Slow	176				
2.68	1.50	1.24	1.11	1.00	0.96	780	****	295	220	2-250E	Std.	153				
6.11	3.31	2.74	2.42	2.19	2.08	930	****	295	285	2-250E	Slow	119				
10.4	5.77	4.71	4.18	3.80	3.60	1075●	****	295	220	2-250E	V. Slow	176				
6.31	2.95	2.32	2.04	1.84	1.73	1025	****	325	255	2-300E	Std.	153				
15.3	6.66	5.24	4.62	4.12	3.89	1370●	****	325	345	2-300E	Slow	119				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.
Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
12,000	6.0%	200.8		0.26	0.16	0.14	0.12	0.11	0.10	290	240	100	85	200E	Std.	153	
				0.54	0.32	0.27	0.24	0.22	0.20	290	250	100	105	200E	Slow	119	
				0.87	0.53	0.42	0.39	0.35	0.33	295	255	100	110	200E	V. Slow	176	
				0.42	0.26	0.21	0.18	0.16	0.15	300	305	135	100	250E	Std.	153	
				0.84	0.51	0.41	0.36	0.33	0.31	300	320	135	130	250E	Slow	119	
				1.43	0.85	0.69	0.61	0.53	0.50	310	340	135	135	250E	V. Slow	176	
				0.68	0.40	0.32	0.29	0.26	0.25	365	375	150	115	300E	Std.	153	
				1.43	0.86	0.68	0.60	0.54	0.51	390	430	150	150	300E	Slow	119	
				2.32	1.37	1.10	0.96	0.88	0.84	470	615	215	165	2-175E	V. Slow	176	
				0.89	0.53	0.43	0.38	0.34	0.33	490	515	235	145	2-200E	Std.	153	
				1.78	1.07	0.85	0.78	0.70	0.66	530	630	235	185	2-200E	Slow	119	
				3.03	1.76	1.38	1.25	1.11	1.03	560	885	235	145	2-200E	V. Slow	176	
				1.50	0.81	0.64	0.58	0.51	0.48	630	705	245	185	2-250E	Std.	153	
				3.31	1.74	1.39	1.21	1.08	1.01	695	****	245	240	2-250E	Slow	119	
		5.77	3.06	2.43	2.13	1.90	1.78	840	****	245	185	2-250E	V. Slow	176			
		2.95	1.45	1.13	0.98	0.87	0.81	800	****	270	210	2-300E	Std.	153			
		6.66	3.20	2.48	2.18	1.86	1.75	1065	****	270	285	2-300E	Slow	119			
		6.5%	200.8		0.29	0.18	0.15	0.14	0.13	0.12	240	240	100	85	200E	Std.	153
				0.57	0.37	0.29	0.27	0.25	0.24	245	250	100	105	200E	Slow	119	
				0.95	0.60	0.49	0.43	0.40	0.38	245	255	100	105	200E	V. Slow	176	
				0.46	0.29	0.24	0.22	0.19	0.17	300	305	135	100	250E	Std.	153	
				0.93	0.56	0.47	0.42	0.37	0.35	300	320	135	130	250E	Slow	119	
				1.59	0.94	0.79	0.72	0.63	0.58	310	340	135	135	250E	V. Slow	176	
				0.74	0.44	0.37	0.33	0.29	0.28	365	375	150	115	300E	Std.	153	
				1.62	0.95	0.79	0.70	0.61	0.58	390	430	150	150	300E	Slow	119	
				2.50	1.51	1.28	1.14	0.99	0.94	470	610	215	165	2-175E	V. Slow	176	
				0.99	0.58	0.49	0.44	0.39	0.37	490	515	235	145	2-200E	Std.	153	
				2.01	1.20	0.99	0.87	0.80	0.76	530	630	235	185	2-200E	Slow	119	
	3.31			1.99	1.61	1.41	1.29	1.22	560	885	235	145	2-200E	V. Slow	176		
	1.68			0.93	0.75	0.66	0.60	0.56	630	705	245	185	2-250E	Std.	153		
	3.80			2.03	1.60	1.43	1.24	1.18	695	****	245	240	2-250E	Slow	119		
	6.60	3.49	2.84	2.51	2.19	2.08	840	****	245	185	2-250E	V. Slow	176				
	3.40	1.68	1.33	1.16	1.02	0.95	800	****	270	210	2-300E	Std.	153				
	7.79	3.77	2.94	2.57	2.25	2.10	1065	****	270	285	2-300E	Slow	119				

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
12,000	7.0%	200.8		0.32	0.21	0.17	0.15	0.14	0.14	240	240	100	85	200E	Std.	153
				0.63	0.42	0.34	0.30	0.28	0.27	245	250	100	105	200E	Slow	119
				1.03	0.66	0.56	0.50	0.44	0.42	245	255	100	105	200E	V. Slow	176
				0.50	0.31	0.27	0.25	0.22	0.21	300	305	135	100	250E	Std.	153
				1.03	0.64	0.53	0.48	0.43	0.41	300	320	135	130	250E	Slow	119
				1.78	1.09	0.88	0.81	0.74	0.69	310	340	135	135	250E	V. Slow	176
				0.81	0.50	0.41	0.38	0.34	0.32	365	375	150	115	300E	Std.	153
				1.78	1.04	0.89	0.81	0.73	0.68	390	430	150	150	300E	Slow	119
				2.82	1.70	1.43	1.31	1.18	1.10	470	610	215	165	2-175E	V. Slow	176
				1.09	0.67	0.55	0.50	0.46	0.43	490	515	235	145	2-200E	Std.	153
				2.23	1.32	1.12	1.02	0.90	0.85	530	630	235	185	2-200E	Slow	119
				3.74	2.20	1.86	1.66	1.44	1.38	560	****	235	145	2-200E	V. Slow	176
				1.91	1.05	0.85	0.77	0.68	0.64	630	705	245	185	2-250E	Std.	153
				4.25	2.29	1.86	1.64	1.47	1.39	695	****	245	240	2-250E	Slow	119
				7.44	4.00	3.20	2.92	2.60	2.43	840	****	245	185	2-250E	V. Slow	176
	3.97	1.93	1.53	1.37	1.20	1.13	800	****	270	210	2-300E	Std.	153			
	9.16	4.34	3.40	3.03	2.67	2.48	1065	****	270	285	2-300E	Slow	119			

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
15,000	6.0%	251.0		0.53	0.29	0.23	0.20	0.18	0.17	290	295	120	90	300E	Std.	153	
				1.10	0.60	0.48	0.41	0.36	0.34	305	320	120	120	300E	Slow	119	
				1.80	0.96	0.79	0.69	0.58	0.54	355	400	175	135	2-175E	V. Slow	176	
				0.70	0.38	0.31	0.26	0.23	0.22	385	400	190	115	2-200E	Std.	153	
				1.40	0.78	0.61	0.53	0.48	0.45	400	450	190	145	2-200E	Slow	119	
				2.28	1.25	0.97	0.86	0.75	0.68	420	495	190	115	2-200E	V. Slow	176	
				1.11	0.58	0.46	0.41	0.35	0.32	490	520	195	145	2-250E	Std.	153	
				2.42	1.21	0.94	0.82	0.71	0.65	515	620	195	190	2-250E	Slow	119	
				4.18	2.13	1.65	1.43	1.24	1.13	565	****	195	145	2-250E	V. Slow	176	
				2.04	0.98	0.76	0.66	0.57	0.53	610	680	215	170	2-300E	Std.	153	
		4.62	2.18	1.64	1.39	1.20	1.11	720	****	215	230	2-300E	Slow	119			
		6.5%	251.0		0.57	0.32	0.26	0.23	0.20	0.18	290	295	120	90	300E	Std.	153
				1.22	0.68	0.54	0.48	0.41	0.38	305	320	120	120	300E	Slow	119	
				1.98	1.10	0.88	0.79	0.69	0.63	355	400	175	135	2-175E	V. Slow	176	
				0.76	0.43	0.34	0.31	0.26	0.25	385	400	190	115	2-200E	Std.	153	
				1.53	0.85	0.70	0.61	0.53	0.51	400	450	190	145	2-200E	Slow	119	
				2.51	1.38	1.11	0.97	0.86	0.81	420	495	190	115	2-200E	V. Slow	176	
				1.24	0.64	0.51	0.46	0.41	0.38	490	520	195	145	2-250E	Std.	153	
				2.74	1.39	1.08	0.94	0.82	0.76	515	620	195	190	2-250E	Slow	119	
				4.71	2.43	1.90	1.65	1.43	1.34	565	****	195	145	2-250E	V. Slow	176	
	2.32			1.13	0.87	0.76	0.66	0.61	610	680	215	170	2-300E	Std.	153		
	5.24	2.48	1.86	1.64	1.39	1.30	720	****	215	230	2-300E	Slow	119				

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Table 8. Transformers Rated 34.5 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)							
System Available Fault Level MVA →			Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
KVA, Three-Phase	Impedance	Full Load Current, Amperes							Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
15,000	7.0%	251.0	0.62	0.36	0.29	0.26	0.23	0.22	290	295	120	90	300E	Std.	153
			1.32	0.77	0.60	0.54	0.48	0.45	305	320	120	120	300E	Slow	119
			2.16	1.24	0.96	0.88	0.79	0.74	355	400	175	135	2-175E	V. Slow	176
			0.81	0.48	0.38	0.34	0.31	0.29	385	399	190	115	2-200E	Std.	153
			1.66	0.96	0.78	0.70	0.61	0.57	400	450	190	145	2-200E	Slow	119
			2.78	1.55	1.25	1.11	0.97	0.92	420	495	190	115	2-200E	V. Slow	176
			1.35	0.73	0.58	0.51	0.46	0.43	490	520	195	145	2-250E	Std.	153
			3.03	1.56	1.21	1.08	0.94	0.86	515	620	195	190	2-250E	Slow	119
			5.26	2.76	2.13	1.90	1.65	1.52	565	****	195	145	2-250E	V. Slow	176
			2.61	1.28	0.98	0.87	0.76	0.71	610	680	215	170	2-300E	Std.	153
5.88	2.85	2.18	1.86	1.64	1.52	720	****	215	230	2-300E	Slow	119			

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

Fuse-Selection Tables

Table 9. Transformers Rated 46 kV, Three Phase

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
300	6.5%	3.8	System Available Fault Level MVA →	0.21	0.21	0.21	0.21	0.21	0.21	300	300	195	90	5E	Std.	153
				0.43	0.43	0.42	0.42	0.42	0.42	420	435	270	150	7E	Std.	153
				0.78	0.77	0.76	0.76	0.76	0.76	580	605	390	175	10E	Std.	153
				1.33	1.30	1.29	1.29	1.28	1.28	750	****	505	220	13E	Std.	153
				1.84	1.80	1.78	1.77	1.77	1.77	980	****	580	275	15E	Std.	153
				2.96	2.90	2.87	2.86	2.85	2.85	1300	****	580	260	15E	Slow	119
	7.0%	3.8		0.24	0.24	0.24	0.24	0.23	0.23	300	300	195	90	5E	Std.	153
				0.50	0.49	0.49	0.49	0.49	0.49	420	435	270	150	7E	Std.	153
				0.92	0.90	0.89	0.89	0.89	0.89	580	605	390	175	10E	Std.	153
				1.56	1.53	1.51	1.51	1.50	1.50	750	****	505	220	13E	Std.	153
				2.19	2.15	2.13	2.12	2.11	2.11	980	****	580	275	15E	Std.	153
				3.56	3.48	3.44	3.43	3.42	3.41	1040●	****	580	260	15E	Slow	119
	7.5%	3.8		0.28	0.27	0.27	0.27	0.27	0.27	300	300	195	90	5E	Std.	153
				0.57	0.57	0.56	0.56	0.56	0.56	420	435	270	150	7E	Std.	153
				1.06	1.05	1.04	1.03	1.03	1.03	580	605	390	175	10E	Std.	153
				1.81	1.78	1.76	1.76	1.75	1.75	750	****	505	220	13E	Std.	153
				2.62	2.56	2.53	2.52	2.52	2.51	980	****	580	275	15E	Std.	153
				4.25	4.15	4.10	4.09	4.08	4.07	1040●	****	580	260	15E	Slow	119
500	6.5%	6.3	0.29	0.28	0.28	0.27	0.27	0.27	350	350	235	105	10E	Std.	153	
			0.48	0.46	0.46	0.46	0.45	0.45	450	450	305	135	13E	Std.	153	
			0.64	0.62	0.61	0.60	0.60	0.60	535	560	350	165	15E	Std.	153	
			0.99	0.96	0.94	0.94	0.94	0.93	545	640	350	155	15E	Slow	119	
			1.20	1.17	1.15	1.14	1.14	1.13	735	****	465	220	20E	Std.	153	
			1.68	1.63	1.60	1.59	1.58	1.58	785	****	465	235	20E	Slow	119	
			2.04	1.96	1.93	1.92	1.91	1.91	965	****	580	270	25E	Std.	153	
			2.30	2.23	2.19	2.18	2.18	2.17	1065	****	580	285	25E	Slow	119	
			0.33	0.32	0.32	0.32	0.32	0.32	350	350	235	105	10E	Std.	153	
	7.0%	6.3	0.55	0.54	0.53	0.53	0.53	0.53	450	450	305	135	13E	Std.	153	
			0.73	0.71	0.70	0.70	0.69	0.69	535	560	350	165	15E	Std.	153	
			1.14	1.11	1.09	1.09	1.08	1.08	545	640	350	155	15E	Slow	119	
			1.41	1.37	1.35	1.34	1.34	1.33	735	****	465	220	20E	Std.	153	
			1.96	1.90	1.87	1.86	1.86	1.85	785	****	465	235	20E	Slow	119	
			2.42	2.34	2.30	2.29	2.28	2.27	965	****	580	270	25E	Std.	153	
			2.72	2.62	2.58	2.56	2.55	2.55	1065	****	580	285	25E	Slow	119	

① Self-cooled rating. OA/FA rating is 115% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 9. Transformers Rated 46 kV, Three Phase — Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
500	7.5%	6.3		0.38	0.37	0.37	0.36	0.36	0.36	350	350	235	105	10E	Std.	153	
				0.63	0.62	0.61	0.61	0.61	0.60	450	450	305	135	13E	Std.	153	
				0.84	0.82	0.81	0.80	0.80	0.80	535	560	350	165	15E	Std.	153	
				1.32	1.28	1.27	1.26	1.26	1.26	545	640	350	155	15E	Slow	119	
				1.64	1.59	1.57	1.56	1.55	1.55	735	****	465	220	20E	Std.	153	
				2.29	2.23	2.19	2.18	2.17	2.17	785	****	465	235	20E	Slow	119	
				2.85	2.76	2.71	2.70	2.69	2.69	965	****	580	270	25E	Std.	153	
				3.22	3.11	3.06	3.04	3.03	3.03	1065	****	580	285	25E	Slow	119	
750	6.5%	9.4		0.29	0.28	0.28	0.27	0.27	0.27	350	355	235	110	15E	Std.	153	
				0.45	0.43	0.42	0.42	0.41	0.41	350	360	235	105	15E	Slow	119	
				0.55	0.52	0.51	0.50	0.50	0.50	470	490	310	150	20E	Std.	153	
				0.73	0.70	0.69	0.68	0.68	0.68	480	525	310	160	20E	Slow	119	
				0.87	0.84	0.82	0.81	0.81	0.81	580	640	390	180	25E	Std.	153	
				0.97	0.93	0.91	0.90	0.90	0.89	605	705	390	190	25E	Slow	119	
				1.15	1.09	1.07	1.06	1.05	1.05	780	****	465	230	30E	Std.	153	
				1.75	1.66	1.62	1.61	1.60	1.60	845	****	465	250	30E	Slow	119	
				2.25	2.12	2.05	2.03	2.02	2.01	1215	****	615	310	40E	Std.	153	
					4.12	3.87	3.76	3.73	3.71	3.70	1345●	****	615	340	40E	Slow	119
		7.0%	9.4		0.34	0.33	0.32	0.32	0.32	0.32	350	355	235	110	15E	Std.	153
	0.52				0.50	0.49	0.48	0.48	0.48	350	360	235	105	15E	Slow	119	
	0.63				0.60	0.59	0.58	0.58	0.58	470	490	310	150	20E	Std.	153	
	0.84				0.81	0.79	0.78	0.78	0.78	480	525	310	160	20E	Slow	119	
	1.01				0.97	0.95	0.94	0.94	0.94	580	640	390	180	25E	Std.	153	
	1.14				1.08	1.06	1.05	1.05	1.05	605	705	390	190	25E	Slow	119	
	1.35				1.28	1.25	1.24	1.24	1.23	780	****	465	230	30E	Std.	153	
2.06	1.96				1.91	1.89	1.88	1.88	845	****	465	250	30E	Slow	119		
				2.77	2.59	2.52	2.49	2.48	2.47	1215	****	615	310	40E	Std.	153	
				5.02	4.74	4.65	4.56	4.54	4.53	1345●	****	615	340	40E	Slow	119	
	7.5%	9.4		0.39	0.37	0.37	0.36	0.36	0.36	350	355	235	110	15E	Std.	153	
0.60				0.57	0.56	0.56	0.55	0.55	350	360	235	105	15E	Slow	119		
0.72				0.69	0.68	0.67	0.67	0.67	470	490	310	150	20E	Std.	153		
0.96				0.92	0.91	0.90	0.90	0.90	480	525	310	160	20E	Slow	119		
1.16				1.12	1.09	1.09	1.08	1.08	580	640	390	180	25E	Std.	153		
1.31				1.25	1.23	1.22	1.22	1.22	605	705	390	190	25E	Slow	119		
1.57				1.50	1.46	1.45	1.45	1.44	780	****	465	230	30E	Std.	153		
2.41				2.30	2.25	2.23	2.22	2.21	845	****	465	250	30E	Slow	119		
				3.41	3.20	3.11	3.08	3.06	3.05	1145	****	615	310	40E	Std.	153	

① Self-cooled rating. OA/FA rating is 115% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 9. Transformers Rated 46 kV, Three Phase — Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
1,000	6.5%	12.6	0.31	0.30	0.29	0.29	0.28	0.28	350	355	235	110	20E	Std.	153	
			0.42	0.39	0.38	0.38	0.38	0.38	350	365	230	120	20E	Slow	119	
			0.51	0.48	0.47	0.46	0.46	0.46	435	440	290	135	25E	Std.	153	
			0.56	0.53	0.51	0.50	0.50	0.50	440	465	290	140	25E	Slow	119	
			0.65	0.61	0.59	0.58	0.58	0.58	555	610	350	170	30E	Std.	153	
			0.97	0.91	0.89	0.88	0.87	0.87	580	675	350	185	30E	Slow	119	
			1.13	1.06	1.02	1.01	1.00	1.00	820	****	460	230	40E	Std.	153	
			2.10	1.97	1.90	1.88	1.87	1.87	885	****	460	255	40E	Slow	119	
			1.79	1.66	1.60	1.58	1.57	1.56	1030	****	580	280	50E	Std.	153	
	3.76	3.48	3.35	3.31	3.29	3.28	1240●	****	580	330	50E	Slow	119			
	7.0%	12.6	0.36	0.34	0.33	0.33	0.33	0.33	350	355	235	110	20E	Std.	153	
			0.48	0.45	0.44	0.44	0.44	0.44	350	365	230	120	20E	Slow	119	
			0.59	0.56	0.54	0.54	0.53	0.53	435	440	290	135	25E	Std.	153	
			0.64	0.61	0.59	0.58	0.58	0.58	440	465	290	140	25E	Slow	119	
			0.74	0.70	0.68	0.68	0.68	0.67	555	610	350	170	30E	Std.	153	
			1.12	1.06	1.03	1.02	1.01	1.01	580	675	350	185	30E	Slow	119	
			1.33	1.24	1.21	1.19	1.19	1.18	820	****	460	230	40E	Std.	153	
			2.48	2.33	2.25	2.22	2.20	2.20	885	****	460	255	40E	Slow	119	
			2.16	2.00	1.92	1.90	1.89	1.89	1030	****	580	280	50E	Std.	153	
	4.59	4.23	4.07	4.02	3.99	3.97	1240●	****	580	330	50E	Slow	119			
	7.5%	12.6	0.41	0.39	0.38	0.38	0.38	0.38	350	355	235	110	20E	Std.	153	
			0.56	0.53	0.51	0.51	0.51	0.50	350	365	230	120	20E	Slow	119	
			0.67	0.64	0.62	0.62	0.61	0.61	435	440	290	135	25E	Std.	153	
			0.73	0.69	0.68	0.67	0.67	0.67	440	465	290	140	25E	Slow	119	
			0.85	0.81	0.79	0.78	0.78	0.77	555	610	350	170	30E	Std.	153	
			1.29	1.22	1.19	1.18	1.17	1.17	580	675	350	185	30E	Slow	119	
			1.56	1.47	1.42	1.41	1.40	1.39	820	****	460	230	40E	Std.	153	
			2.89	2.72	2.64	2.61	2.60	2.59	885	****	460	255	40E	Slow	119	
			2.59	2.41	2.32	2.29	2.28	2.27	1030	****	580	280	50E	Std.	153	
	5.62	5.18	4.98	4.91	4.87	4.85	1240●	****	580	330	50E	Slow	119			

① Self-cooled rating. OA/FA rating is 115% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Table 9. Transformers Rated 46 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
1,500	6.5%	18.8	0.31	0.28	0.27	0.26	0.26	0.26	0.26	355	370	230	115	30E	Std.	153
			0.46	0.42	0.40	0.40	0.39	0.39	0.39	365	385	230	125	30E	Slow	119
			0.50	0.46	0.44	0.43	0.43	0.42	0.42	505	545	310	155	40E	Std.	153
			0.94	0.86	0.82	0.81	0.81	0.80	0.80	510	585	310	170	40E	Slow	119
			0.75	0.69	0.66	0.65	0.64	0.64	0.64	620	685	390	190	50E	Std.	153
			1.53	1.40	1.33	1.30	1.29	1.29	1.29	710	****	390	220	50E	Slow	119
			2.28	2.07	1.98	1.95	1.93	1.92	1.92	740	****	425	233	50E	V. Slow	176
			1.56	1.40	1.33	1.30	1.29	1.29	1.29	895	****	440	260	65E	Std.	153
			2.39	2.42	2.28	2.24	2.22	2.21	2.21	1075	****	440	285	65E	Slow	119
			3.88	3.49	3.32	3.26	3.24	3.22	3.22	1240●	****	485	300	65E	V. Slow	176
			2.89	2.51	2.36	2.31	2.29	2.27	2.27	1330	****	540	320	80E	Std.	153
5.06	4.44	4.14	4.04	4.00	3.97	3.97	1475●	****	540	360	80E	Slow	119			

① Self-cooled rating. OA/FA rating is 115% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 9. Transformers Rated 46 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
1,500	7.0%	18.8	0.35	0.32	0.31	0.31	0.30	0.30	355	370	230	115	30E	Std.	153	
			0.52	0.48	0.46	0.46	0.46	0.45	365	385	230	125	30E	Slow	119	
			0.57	0.53	0.51	0.50	0.50	0.49	505	545	310	155	40E	Std.	153	
			1.08	1.00	0.95	0.94	0.93	0.93	510	585	310	170	40E	Slow	119	
			0.87	0.80	0.77	0.75	0.75	0.75	620	685	390	190	50E	Std.	153	
			1.77	1.62	1.55	1.53	1.51	1.51	710	****	390	220	50E	Slow	119	
			2.65	2.40	2.31	2.28	2.26	2.25	740	****	425	235	50E	V. Slow	176	
			1.85	1.67	1.58	1.56	1.54	1.53	895	****	440	260	65E	Std.	153	
			3.22	2.89	2.74	2.69	2.67	2.66	1075	****	440	285	65E	Slow	119	
			4.58	4.13	3.94	3.88	3.85	3.83	1075●	****	485	300	65E	V. Slow	176	
	3.65	3.14	2.95	2.89	2.85	2.83	1230●	****	540	320	80E	Std.	153			
	7.5%	18.8	0.40	0.37	0.35	0.35	0.35	0.34	355	370	230	115	30E	Std.	153	
			0.59	0.55	0.53	0.52	0.52	0.52	365	385	230	125	30E	Slow	119	
			0.66	0.61	0.58	0.57	0.57	0.57	505	545	310	155	40E	Std.	153	
			1.23	1.14	1.09	1.08	1.07	1.07	510	585	310	170	40E	Slow	119	
			1.00	0.92	0.88	0.87	0.87	0.86	620	685	390	190	50E	Std.	153	
			2.04	1.88	1.80	1.77	1.76	1.75	710	****	390	220	50E	Slow	119	
			3.05	2.80	2.68	2.65	2.63	2.61	740	****	425	235	50E	V. Slow	176	
			2.20	1.98	1.88	1.85	1.83	1.82	895	****	440	260	65E	Std.	153	
			3.85	3.46	3.28	3.22	3.19	3.18	1075	****	440	285	65E	Slow	119	
5.37			4.89	4.65	4.58	4.54	4.52	1075●	****	485	300	65E	V. Slow	176		
4.84	4.07	3.73	3.65	3.61	3.58	1230●	****	540	320	80E	Std.	153				
2,000	6.5%	25.1	0.29	0.26	0.25	0.24	0.24	0.24	365	385	230	115	40E	Std.	153	
			0.56	0.50	0.47	0.46	0.46	0.45	365	390	230	130	40E	Slow	119	
			0.44	0.40	0.37	0.37	0.36	0.36	450	475	290	140	50E	Std.	153	
			0.89	0.80	0.75	0.74	0.73	0.72	490	560	290	165	50E	Slow	119	
			1.31	1.17	1.10	1.07	1.06	1.05	485	615	320	175	50E	V. Slow	176	
			0.86	0.76	0.71	0.69	0.68	0.68	620	700	330	195	65E	Std.	153	
			1.44	1.27	1.19	1.16	1.15	1.14	685	****	330	215	65E	Slow	119	
			2.14	1.89	1.77	1.74	1.72	1.70	705	****	365	225	65E	V. Slow	176	
			1.41	1.23	1.15	1.12	1.11	1.10	875	****	405	240	80E	Std.	153	
			2.45	2.13	1.99	1.94	1.91	1.90	965	****	405	270	80E	Slow	119	
			3.88	3.37	3.14	3.06	3.02	3.00	1315	****	415	275	80E	V. Slow	176	
			3.11	2.63	2.41	2.35	2.31	2.29	1285	****	510	320	100E	Std.	153	
			5.43	4.62	4.25	4.14	4.09	4.05	1435●	****	510	345	100E	Slow	119	

① Self-cooled rating. OA/FA rating is 115% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 9. Transformers Rated 46 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
2,000	7.0%	25.1	0.34	0.30	0.29	0.28	0.28	0.28	365	385	230	115	40E	Std.	153	
			0.64	0.57	0.54	0.53	0.53	0.52	365	390	230	130	40E	Slow	119	
			0.50	0.46	0.43	0.42	0.42	0.42	450	475	290	140	50E	Std.	153	
			1.02	0.92	0.87	0.85	0.84	0.84	490	560	290	165	50E	Slow	119	
			1.50	1.35	1.27	1.25	1.23	1.23	485	615	320	175	50E	V. Slow	176	
			0.99	0.88	0.83	0.81	0.80	0.80	620	700	330	195	65E	Std.	153	
			1.68	1.48	1.40	1.37	1.35	1.34	685	****	330	215	65E	Slow	119	
			2.47	2.20	2.07	2.03	2.01	1.99	705	****	365	225	65E	V. Slow	176	
			1.67	1.46	1.36	1.33	1.32	1.31	875	****	405	240	80E	Std.	153	
			2.91	2.54	2.37	2.31	2.29	2.27	965	****	405	270	80E	Slow	119	
	4.59	4.01	3.75	3.67	3.63	3.60	1005●	****	415	275	80E	V. Slow	176			
	3.92	3.25	2.99	2.91	2.87	2.84	1180●	****	510	320	100E	Std.	153			
	7.5%	25.1	0.38	0.35	0.33	0.32	0.32	0.32	365	385	230	115	40E	Std.	153	
			0.72	0.66	0.62	0.61	0.60	0.60	365	390	230	130	40E	Slow	119	
			0.57	0.52	0.49	0.48	0.48	0.48	450	475	290	140	50E	Std.	153	
			1.16	1.05	0.99	0.97	0.96	0.96	490	560	290	165	50E	Slow	119	
			1.72	1.54	1.47	1.44	1.43	1.42	485	615	320	175	50E	V. Slow	176	
			1.14	1.02	0.96	0.94	0.94	0.93	620	700	330	195	65E	Std.	153	
			1.94	1.73	1.63	1.60	1.58	1.57	685	****	330	215	65E	Slow	119	
			2.83	2.55	2.40	2.34	2.32	2.31	705	****	365	225	65E	V. Slow	176	
1.96			1.73	1.61	1.58	1.56	1.55	875	****	405	240	80E	Std.	153		
3.43			3.00	2.80	2.74	2.70	2.69	965	****	405	270	80E	Slow	119		
5.44	4.74	4.44	4.33	4.28	4.25	1005●	****	415	275	80E	V. Slow	176				
5.08	4.10	3.73	3.62	3.56	3.53	1180●	****	510	320	100E	Std.	153				
2,500	6.5%	31.4	0.38	0.33	0.31	0.30	0.30	0.29	285	300	185	100	40E	Slow	119	
			0.30	0.26	0.24	0.24	0.23	0.23	355	365	235	115	50E	Std.	153	
			0.60	0.53	0.50	0.48	0.48	0.47	375	410	235	130	50E	Slow	119	
			0.87	0.76	0.71	0.69	0.68	0.67	365	415	255	140	50E	V. Slow	176	
			0.56	0.48	0.45	0.44	0.43	0.43	475	515	265	155	65E	Std.	153	
			0.93	0.80	0.74	0.73	0.72	0.71	520	590	265	170	65E	Slow	119	
			1.40	1.21	1.11	1.09	1.08	1.07	510	675	290	180	65E	V. Slow	176	
			0.89	0.77	0.71	0.69	0.68	0.67	655	750	325	195	80E	Std.	153	
			1.54	1.32	1.22	1.19	1.18	1.17	695	****	325	215	80E	Slow	119	
			2.42	2.07	1.90	1.85	1.82	1.81	745	****	330	220	80E	V. Slow	176	
			1.78	1.48	1.35	1.31	1.29	1.28	910	****	380	255	100E	Std.	153	
			3.20	2.71	2.49	2.41	2.38	2.35	1020	****	380	275	100E	Slow	119	
			5.34	4.48	4.08	3.97	3.91	3.88	1220●	****	380	275	100E	V. Slow	176	
			2.91	2.39	2.15	2.07	2.05	2.03	1155	****	460	320	125E	Std.	153	

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

● Index applies to wye-wye connected transformers only.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 9. Transformers Rated 46 kV, Three Phase — Continued

Transformer Data ① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
2,500	7.0%	31.4	0.43	0.38	0.35	0.35	0.34	0.34	285	300	185	100	40E	Slow	119	
			0.34	0.30	0.28	0.27	0.27	0.27	355	365	235	115	50E	Std.	153	
			0.69	0.60	0.57	0.56	0.55	0.55	375	410	235	130	50E	Slow	119	
			1.00	0.87	0.82	0.80	0.79	0.78	365	415	255	140	50E	V. Slow	176	
			0.64	0.56	0.52	0.51	0.50	0.50	475	515	265	155	65E	Std.	153	
			1.07	0.93	0.87	0.85	0.83	0.83	520	590	265	170	65E	Slow	119	
			1.60	1.40	1.30	1.27	1.25	1.25	510	675	290	180	65E	V. Slow	176	
			1.03	0.89	0.83	0.81	0.80	0.79	655	750	325	195	80E	Std.	153	
			1.78	1.54	1.43	1.39	1.37	1.36	695	****	325	215	80E	Slow	119	
			2.81	2.42	2.24	2.18	2.15	2.14	745	****	330	220	80E	V. Slow	176	
			2.12	1.78	1.62	1.57	1.54	1.53	910	****	380	255	100E	Std.	153	
			3.76	3.20	2.95	2.87	2.83	2.81	1020	****	380	275	100E	Slow	119	
	6.34	5.34	4.86	4.74	4.68	4.64	1220●	****	380	275	100E	V. Slow	176			
	3.56	2.91	2.61	2.53	2.50	2.47	1155	****	460	320	125E	Std.	153			
	7.5%	31.4	0.48	0.43	0.40	0.40	0.39	0.39	285	300	185	100	40E	Slow	119	
			0.38	0.34	0.32	0.31	0.31	0.31	355	365	235	115	50E	Std.	153	
			0.77	0.69	0.65	0.63	0.63	0.62	375	410	235	130	50E	Slow	119	
			1.13	1.00	0.94	0.91	0.90	0.90	365	415	255	140	50E	V. Slow	176	
			0.73	0.64	0.60	0.58	0.58	0.57	475	515	265	155	65E	Std.	153	
			1.23	1.07	1.00	0.98	0.97	0.96	520	590	265	170	65E	Slow	119	
			1.83	1.60	1.50	1.47	1.45	1.44	510	675	290	180	65E	V. Slow	176	
			1.19	1.03	0.96	0.94	0.92	0.92	655	750	325	195	80E	Std.	153	
			2.06	1.78	1.65	1.61	1.60	1.58	695	****	325	215	80E	Slow	119	
			3.26	2.81	2.60	2.54	2.51	2.49	745	****	330	220	80E	V. Slow	176	
2.52			2.12	1.94	1.89	1.86	1.84	910	****	380	255	100E	Std.	153		
4.43			3.76	3.45	3.37	3.33	3.30	1020	****	380	275	100E	Slow	119		
7.51	6.34	5.79	5.64	5.57	5.52	1220●	****	380	275	100E	V. Slow	176				
4.39	3.56	3.20	3.11	3.06	3.03	1155	****	460	320	125E	Std.	153				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

● Index applies to wye-wye connected transformers only.

TABLE CONTINUED ►

Table 9. Transformers Rated 46 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
3,750	6.5%	47.1		0.28	0.23	0.21	0.20	0.20	0.19	305	320	175	105	65E	Std.	153	
				0.45	0.37	0.33	0.32	0.32	0.31	320	345	175	115	65E	Slow	119	
				0.69	0.57	0.51	0.49	0.48	0.48	310	340	195	120	65E	V. Slow	176	
				0.43	0.36	0.33	0.31	0.31	0.30	410	435	215	130	80E	Std.	153	
				0.76	0.63	0.56	0.54	0.53	0.53	415	460	215	145	80E	Slow	119	
				1.13	0.93	0.83	0.80	0.78	0.77	415	495	220	150	80E	V. Slow	176	
				0.77	0.62	0.55	0.53	0.52	0.51	540	605	255	170	100E	Std.	153	
				1.45	1.17	1.05	1.01	0.99	0.97	550	675	255	185	100E	Slow	119	
				2.37	1.91	1.69	1.63	1.60	1.58	605	****	255	185	100E	V. Slow	176	
				1.22	0.98	0.88	0.84	0.82	0.81	685	765	305	210	125E	Std.	153	
				2.57	2.04	1.79	1.72	1.69	1.66	775	****	305	285	125E	Slow	119	
				3.72	2.89	2.61	2.51	2.46	2.43	890	****	305	220	125E	V. Slow	176	
		1.97	1.54	1.36	1.31	1.29	1.27	910	****	350	260	150E	Std.	153			
		4.17	3.20	2.78	2.64	2.60	2.57	1120	****	350	330	150E	Slow	119			
		6.96	5.44	4.64	4.48	4.40	4.35	1400●	****	350	350	150E	V. Slow	176			
		2.89	2.15	1.87	1.78	1.74	1.72	1055	****	410	305	175E	Std.	153			
		5.95	4.43	3.84	3.66	3.57	3.51	1265●	****	410	370	175E	Slow	119			
		7.0%	47.1		0.32	0.26	0.24	0.23	0.23	0.22	305	320	175	105	65E	Std.	153
				0.52	0.43	0.38	0.37	0.37	0.36	320	345	175	115	65E	Slow	119	
				0.78	0.65	0.59	0.57	0.56	0.55	310	340	195	120	65E	V. Slow	176	
				0.49	0.41	0.37	0.36	0.35	0.35	410	435	215	130	80E	Std.	153	
				0.86	0.71	0.65	0.63	0.61	0.61	415	460	215	145	80E	Slow	119	
				1.29	1.07	0.96	0.93	0.91	0.90	415	495	220	150	80E	V. Slow	176	
				0.89	0.72	0.64	0.62	0.61	0.60	540	605	255	170	100E	Std.	153	
	1.65			1.36	1.22	1.17	1.15	1.14	550	675	255	185	100E	Slow	119		
	2.72			2.21	1.98	1.91	1.87	1.85	605	****	255	185	100E	V. Slow	176		
	1.40			1.13	1.01	0.98	0.97	0.96	685	765	305	220	125E	Std.	153		
	3.04			2.40	2.14	2.04	2.00	1.97	775	****	305	285	125E	Slow	119		
	4.20			3.45	3.02	2.89	2.84	2.82	890	****	305	220	125E	V. Slow	176		
	2.32	1.80	1.61	1.54	1.51	1.48	910	****	350	260	150E	Std.	153				
	4.97	3.83	3.33	3.20	3.13	3.09	1120	****	350	330	150E	Slow	119				
	8.27	6.48	5.72	5.44	5.30	5.22	1400●	****	350	350	150E	V. Slow	176				
	3.53	2.60	2.26	2.15	2.11	2.08	1055	****	410	305	175E	Std.	153				
	7.23	5.37	4.68	4.43	4.30	4.22	1265●	****	410	370	175E	Slow	119				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only. Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 9. Transformers Rated 46 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
3,750	7.5%	47.1		0.36	0.30	0.27	0.26	0.26	0.26	305	320	175	105	65E	Std.	153
				0.58	0.49	0.44	0.43	0.42	0.42	320	345	175	115	65E	Slow	119
				0.88	0.73	0.67	0.65	0.64	0.64	310	340	195	120	65E	V. Slow	176
				0.55	0.46	0.42	0.41	0.40	0.40	410	435	215	130	80E	Std.	153
				0.96	0.81	0.74	0.71	0.70	0.69	415	460	215	145	80E	Slow	119
				1.46	1.21	1.10	1.07	1.05	1.04	415	495	220	150	80E	V. Slow	176
				1.02	0.83	0.75	0.72	0.70	0.70	540	605	255	170	100E	Std.	153
				1.88	1.55	1.40	1.36	1.33	1.32	550	675	255	185	100E	Slow	119
				3.09	2.54	2.29	2.21	2.17	2.14	605	****	255	185	100E	V. Slow	176
				1.61	1.30	1.18	1.13	1.11	1.10	685	765	306	210	125E	Std.	153
				3.46	2.80	2.49	2.40	2.36	2.34	775	****	306	285	125E	Slow	119
				4.91	3.97	3.59	3.45	3.39	3.34	890	****	306	220	125E	V. Slow	176
				2.79	2.15	1.88	1.80	1.77	1.75	910	****	350	260	150E	Std.	153
				5.84	4.49	4.00	3.83	3.74	3.69	1120	****	350	330	150E	Slow	119
5,000	6.5%	62.8		0.28	0.22	0.19	0.18	0.18	0.18	290	310	165	95	80E	Std.	153
				0.49	0.38	0.33	0.32	0.31	0.30	290	320	165	110	80E	Slow	119
				0.71	0.54	0.48	0.45	0.44	0.44	285	320	165	110	80E	V. Slow	176
				0.47	0.36	0.31	0.29	0.29	0.28	375	415	190	130	100E	Std.	153
				0.88	0.67	0.58	0.55	0.54	0.53	385	430	190	140	100E	Slow	119
				1.43	1.10	0.95	0.91	0.89	0.87	395	490	190	140	100E	V. Slow	176
				0.74	0.58	0.51	0.49	0.48	0.47	495	520	230	160	125E	Std.	153
				1.50	1.14	0.96	0.92	0.90	0.89	525	650	230	210	125E	Slow	119
				2.20	1.68	1.42	1.36	1.33	1.31	555	815	230	165	125E	V. Slow	176
				1.15	0.90	0.76	0.71	0.70	0.69	635	710	265	195	150E	Std.	153
				2.35	1.77	1.55	1.46	1.42	1.39	670	****	265	250	150E	Slow	119
				3.96	2.93	2.53	2.39	2.31	2.26	815	****	265	260	150E	V. Slow	176
				1.55	1.13	0.97	0.91	0.88	0.87	725	840	305	230	175E	Std.	153
				3.10	2.25	1.93	1.81	1.75	1.71	825	****	305	275	175E	Slow	119
				5.30	3.89	3.36	3.20	3.12	3.07	1115	****	305	305	175E	V. Slow	176
				2.03	1.46	1.24	1.16	1.13	1.11	840	****	320	280	200E	Std.	153
				4.28	3.04	2.56	2.40	2.34	2.30	1085	****	320	335	200E	Slow	119
				7.40	5.26	4.32	4.11	4.00	3.94	1190●	****	320	340	200E	V. Slow	176
4.09	2.66	2.17	2.02	1.95	1.92	1165	****	440	320	250E	Std.	153				
9.19	5.98	4.86	4.55	4.39	4.29	1455●	****	440	420	250E	Slow	119				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only. Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 9. Transformers Rated 46 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
5,000	7.0%	62.8		0.31	0.25	0.22	0.21	0.21	0.20	290	310	165	95	80E	Std.	153	
				0.54	0.43	0.38	0.36	0.35	0.35	290	320	165	110	80E	Slow	119	
				0.80	0.62	0.54	0.52	0.51	0.50	285	320	165	110	80E	V. Slow	176	
				0.53	0.41	0.36	0.34	0.33	0.33	375	415	190	130	100E	Std.	153	
				1.01	0.77	0.67	0.64	0.62	0.61	385	430	190	140	100E	Slow	119	
				1.63	1.27	1.10	1.05	1.03	1.01	395	490	190	140	100E	V. Slow	176	
				0.84	0.66	0.58	0.55	0.54	0.53	495	520	230	160	125E	Std.	153	
				1.72	1.31	1.14	1.07	1.04	1.02	525	650	230	210	125E	Slow	119	
				2.51	1.91	1.68	1.60	1.56	1.53	560	815	230	165	125E	V. Slow	176	
				1.31	1.01	0.90	0.85	0.83	0.82	635	710	265	195	150E	Std.	153	
				2.64	2.02	1.77	1.70	1.66	1.64	670	****	265	250	150E	Slow	119	
				4.48	3.38	2.93	2.80	2.74	2.70	815	****	265	260	150E	V. Slow	176	
				1.78	1.33	1.13	1.08	1.05	1.03	725	****	305	230	175E	Std.	153	
				3.66	2.68	2.25	2.15	2.10	2.06	825	****	305	275	175E	Slow	119	
		6.24	4.64	3.89	3.65	3.58	3.54	1115	****	305	305	175E	V. Slow	176			
		2.37	1.73	1.46	1.39	1.35	1.33	840	****	320	280	200E	Std.	153			
		5.05	3.63	3.04	2.89	2.81	2.76	1085	****	320	335	200E	Slow	119			
		8.73	6.13	5.26	4.94	4.78	4.68	1200●	****	320	340	200E	V. Slow	176			
		5.18	3.29	2.66	2.48	2.39	2.34	1190	****	440	320	250E	Std.	153			
		7.5%	62.8		0.35	0.28	0.25	0.24	0.23	0.23	290	310	165	95	80E	Std.	153
				0.60	0.49	0.43	0.41	0.40	0.40	290	320	165	110	80E	Slow	119	
				0.89	0.71	0.62	0.60	0.58	0.58	285	320	165	110	80E	V. Slow	176	
				0.60	0.47	0.41	0.39	0.38	0.38	375	415	190	130	100E	Std.	153	
				1.13	0.88	0.77	0.74	0.72	0.71	385	430	190	140	100E	Slow	119	
				1.84	1.43	1.27	1.21	1.18	1.16	395	490	190	140	100E	V. Slow	176	
				0.95	0.74	0.66	0.64	0.62	0.61	495	520	230	160	125E	Std.	153	
				1.95	1.50	1.31	1.25	1.23	1.21	525	650	230	210	125E	Slow	119	
				2.80	2.20	1.91	1.84	1.80	1.78	560	***	230	165	125E	V. Slow	176	
	1.47			1.15	1.01	0.98	0.96	0.94	635	710	265	195	150E	Std.	153		
	3.07			2.35	2.02	1.91	1.87	1.85	670	****	265	250	150E	Slow	119		
	5.16			3.96	3.38	3.17	3.11	3.07	815	****	265	260	150E	V. Slow	176		
	2.06			1.55	1.33	1.27	1.23	1.21	725	****	305	230	175E	Std.	153		
	4.18			3.10	2.68	2.52	2.45	2.40	825	****	305	275	175E	Slow	119		
	7.18	5.30	4.64	4.40	4.28	4.20	1115	****	305	305	175E	V. Slow	176				
	2.78	2.03	1.73	1.64	1.60	1.57	840	****	320	280	200E	Std.	153				
	6.03	4.28	3.63	3.43	3.33	3.26	1085	****	320	335	200E	Slow	119				
	10.6	7.40	6.13	5.85	5.71	5.62	1200●	****	320	340	200E	V. Slow	176				
	7.16	4.09	3.29	3.07	2.95	2.88	1090●	****	440	320	250E	Std.	153				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 9. Transformers Rated 46 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
7,500	6.5%	94.1		0.42	0.31	0.26	0.24	0.23	0.22	325	330	155	105	125E	Std.	153
				0.79	0.55	0.43	0.41	0.40	0.39	325	350	155	140	125E	Slow	119
				1.18	0.83	0.66	0.62	0.60	0.59	335	375	155	110	125E	V. Slow	176
				0.63	0.44	0.37	0.34	0.33	0.32	405	430	175	130	150E	Std.	153
				1.19	0.84	0.70	0.66	0.63	0.62	405	445	175	165	150E	Slow	119
				2.00	1.35	1.12	1.03	0.99	0.96	440	540	175	175	150E	V. Slow	176
				0.78	0.54	0.44	0.41	0.40	0.39	455	485	205	155	175E	Std.	153
				1.54	1.06	0.85	0.80	0.77	0.75	475	545	205	185	175E	Slow	119
				2.68	1.85	1.43	1.33	1.29	1.26	505	720	205	205	175E	V. Slow	176
				0.99	0.68	0.56	0.52	0.50	0.49	520	560	210	185	200E	Std.	153
				2.01	1.36	1.11	1.02	0.97	0.95	570	720	210	220	200E	Slow	119
				3.43	2.29	1.86	1.73	1.65	1.61	620	****	210	225	200E	V. Slow	176
				1.66	1.09	0.88	0.81	0.78	0.75	680	770	290	210	250E	Std.	153
				3.66	2.33	1.85	1.70	1.64	1.60	770	****	290	280	250E	Slow	119
		6.51	4.21	3.27	3.04	2.92	2.85	970	****	290	290	250E	V. Slow	176		
		3.30	2.01	1.55	1.41	1.35	1.32	870	****	320	245	300E	Std.	153		
		7.81	4.61	3.56	3.23	3.06	2.95	1260	****	320	325	300E	Slow	119		
	7.0%	94.1		0.47	0.34	0.29	0.28	0.27	0.26	325	330	155	105	125E	Std.	153
				0.88	0.62	0.52	0.47	0.45	0.44	325	350	155	140	125E	Slow	119
				1.30	0.92	0.77	0.72	0.69	0.67	335	375	155	110	125E	V. Slow	176
				0.68	0.49	0.42	0.40	0.38	0.38	405	430	175	130	150E	Std.	153
				1.38	0.97	0.77	0.73	0.72	0.70	405	445	175	165	150E	Slow	119
				2.23	1.58	1.28	1.20	1.16	1.14	440	540	175	175	150E	V. Slow	176
				0.86	0.62	0.50	0.47	0.46	0.45	455	485	205	155	175E	Std.	153
				1.70	1.19	0.99	0.91	0.87	0.86	475	545	205	185	175E	Slow	119
				3.04	2.08	1.72	1.58	1.51	1.46	505	720	205	205	175E	V. Slow	176
				1.10	0.77	0.62	0.59	0.57	0.56	520	560	210	185	200E	Std.	153
				2.28	1.55	1.28	1.20	1.16	1.13	570	720	210	220	200E	Slow	119
			3.90	2.66	2.11	1.99	1.93	1.89	620	****	210	225	200E	V. Slow	176	
			1.89	1.25	1.00	0.94	0.91	0.89	680	770	290	210	250E	Std.	153	
			4.23	2.74	2.17	2.02	1.94	1.89	770	****	290	280	250E	Slow	119	
	7.61	4.81	3.88	3.53	3.38	3.31	970	****	290	290	250E	V. Slow	176			
	3.94	2.38	1.84	1.68	1.62	1.58	870	****	320	245	300E	Std.	153			
	9.47	5.45	4.15	3.86	3.71	3.62	1060●	****	320	325	300E	Slow	119			

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 9. Transformers Rated 46 kV, Three Phase — Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
7,500	7.5%	94.1		0.51	0.37	0.32	0.31	0.30	0.30	325	330	155	105	125E	Std.	153
				0.96	0.69	0.59	0.55	0.53	0.52	325	350	155	140	125E	Slow	119
				1.42	1.04	0.88	0.83	0.80	0.78	335	375	155	110	125E	V. Slow	176
				0.76	0.56	0.46	0.44	0.43	0.42	405	430	175	130	150E	Std.	153
				1.55	1.08	0.90	0.84	0.80	0.78	405	445	175	165	150E	Slow	119
				2.53	1.80	1.46	1.35	1.31	1.29	440	540	175	175	150E	V. Slow	176
				0.97	0.69	0.58	0.54	0.52	0.51	455	485	205	155	175E	Std.	153
				1.93	1.36	1.13	1.06	1.02	1.00	475	545	205	185	175E	Slow	119
				3.36	2.29	1.97	1.85	1.78	1.74	505	720	205	205	175E	V. Slow	176
				1.24	0.86	0.73	0.68	0.65	0.63	520	560	210	185	200E	Std.	153
				2.56	1.76	1.44	1.36	1.32	1.30	570	720	210	220	200E	Slow	119
				4.32	2.98	2.48	2.29	2.20	2.14	620	****	210	225	200E	V. Slow	176
				2.17	1.45	1.17	1.09	1.05	1.02	680	770	290	210	250E	Std.	153
				4.86	3.15	2.54	2.33	2.25	2.20	770	****	290	280	250E	Slow	119
				8.73	5.70	4.52	4.21	4.05	3.95	970	****	290	290	250E	V. Slow	176
4.77	2.80	2.17	2.01	1.92	1.87	870	****	320	245	300E	Std.	153				
11.3	6.65	5.04	4.61	4.38	4.24	1060●	****	320	325	300E	Slow	119				
10,000	6.5%	125.5		0.43	0.28	0.23	0.21	0.20	0.19	295	305	130	95	150E	Std.	153
				0.80	0.54	0.41	0.38	0.37	0.36	290	310	130	125	150E	Slow	119
				1.31	0.83	0.66	0.59	0.55	0.53	305	340	130	130	150E	V. Slow	176
				0.52	0.34	0.28	0.25	0.24	0.23	340	350	155	115	175E	Std.	153
				1.02	0.65	0.51	0.46	0.44	0.42	340	365	155	140	175E	Slow	119
				1.78	1.11	0.84	.077	0.74	0.72	355	400	155	150	175E	V. Slow	176
				0.65	0.41	0.34	0.30	0.29	0.28	390	400	160	140	200E	Std.	153
				1.32	0.86	0.66	0.58	0.57	.056	405	445	160	165	200E	Slow	119
				2.20	1.40	1.07	0.98	0.94	0.91	420	500	160	170	200E	V. Slow	176
				1.05	0.67	0.51	0.47	0.45	0.44	490	520	220	160	250E	Std.	153
				2.25	1.39	1.07	0.96	0.91	0.87	520	620	220	210	250E	Slow	119
				4.05	2.39	1.85	1.66	1.55	1.49	555	****	220	215	250E	V. Slow	176
				1.92	1.13	0.84	0.77	0.73	0.71	610	680	240	185	300E	Std.	153
				4.38	2.53	1.85	1.67	1.58	1.52	720	****	240	245	300E	Slow	119
				6.89	3.96	2.94	2.61	2.47	2.41	1120	****	345	270	2-175E	V. Slow	176
				2.74	1.50	1.12	1.02	0.97	0.94	835	****	375	230	2-200E	Std.	153
				5.52	3.13	2.32	2.08	1.96	1.88	1065	****	375	295	2-200E	Slow	119
				9.98	5.26	3.93	3.40	3.25	3.16	1190●	****	375	230	2-200E	V. Slow	176
7.15	2.94	2.01	1.74	1.64	1.59	1170	****	395	290	2-250E	Std.	153				
17.2	6.82	4.49	3.95	3.70	3.54	1440●	****	395	380	2-250E	Slow	119				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 9. Transformers Rated 46 kV, Three Phase — Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
10,000	7.0%	125.5		0.46	0.32	0.25	0.24	0.23	0.22	295	305	130	95	150E	Std.	153	
				0.90	0.61	0.46	0.42	0.41	0.40	290	310	130	125	150E	Slow	119	
				1.46	0.94	0.75	0.69	0.66	0.64	305	340	130	130	150E	V. Slow	176	
				0.58	0.38	0.31	0.29	0.28	0.27	340	350	155	115	175E	Std.	153	
				1.13	0.74	0.57	0.53	0.51	0.50	340	365	155	140	175E	Slow	119	
				1.97	1.25	0.96	0.87	0.84	0.82	355	400	155	150	175E	V. Slow	176	
				0.73	0.48	0.38	0.35	0.34	0.33	390	400	160	139	200E	Std.	153	
				1.44	0.94	0.77	0.70	0.66	0.64	405	445	160	165	200E	Slow	119	
				2.48	1.58	1.24	1.13	1.07	1.03	420	500	160	170	200E	V. Slow	176	
				1.17	0.74	0.58	0.53	0.51	0.50	490	520	220	160	250E	Std.	153	
				2.54	1.58	1.21	1.12	1.07	1.04	520	620	220	210	250E	Slow	119	
				4.52	2.80	2.11	1.94	1.85	1.79	555	****	220	215	250E	V. Slow	176	
				2.17	1.30	0.98	0.89	0.84	0.81	610	680	240	185	300E	Std.	153	
				5.04	2.88	2.17	1.93	1.85	1.80	720	****	240	245	300E	Slow	119	
				8.09	4.58	3.38	3.09	2.94	2.85	1120	****	345	270	2-175E	V. Slow	176	
		3.14	1.78	1.32	1.18	1.12	1.09	835	****	375	230	2-200E	Std.	153			
		6.47	3.60	2.69	2.42	2.32	2.25	1065	****	375	295	2-200E	Slow	119			
		11.7	6.28	4.64	4.18	3.93	3.78	1190●	****	375	230	2-200E	V. Slow	176			
		9.34	3.67	2.41	2.13	2.01	1.93	1170	****	395	290	2-250E	Std.	153			
		7.5%	125.5		0.51	0.36	0.28	0.26	0.25	0.25	295	305	130	95	150E	Std.	153
				1.00	0.68	0.54	0.49	0.46	0.44	290	310	130	125	150E	Slow	119	
				1.64	1.08	0.83	0.78	0.75	0.73	305	340	130	130	150E	V. Slow	176	
				0.63	0.43	0.34	0.32	0.31	0.31	340	350	155	115	175E	Std.	153	
				1.23	0.82	0.65	0.59	0.57	0.56	340	365	155	140	175E	Slow	119	
				2.14	1.37	1.11	1.01	0.96	0.93	355	400	155	152	175E	V. Slow	176	
				0.80	0.54	0.41	0.39	0.38	0.37	390	400	160	140	200E	Std.	153	
				1.61	1.07	0.86	0.80	0.77	0.75	405	445	160	165	200E	Slow	119	
				2.74	1.80	1.40	1.30	1.24	1.21	420	500	160	170	200E	V. Slow	176	
				1.30	0.85	0.67	0.61	0.58	0.56	490	520	220	160	250E	Std.	153	
				2.84	1.77	1.39	1.26	1.21	1.18	520	620	220	210	250E	Slow	119	
	5.02			3.16	2.39	2.19	2.11	2.06	555	****	220	215	250E	V. Slow	176		
	2.48			1.48	1.13	1.03	0.98	0.96	610	680	240	185	300E	Std.	153		
	5.69			3.40	2.53	2.29	2.17	2.09	720	****	240	245	300E	Slow	119		
	9.18			5.28	3.96	3.52	3.38	3.30	1120	****	345	270	2-175E	V. Slow	176		
	3.62	2.04	1.50	1.38	1.32	1.28	835	****	375	230	2-200E	Std.	153				
	7.59	4.18	3.13	2.84	2.39	2.60	1065	****	375	295	2-200E	Slow	119				
	13.9	7.26	5.26	4.85	4.64	4.50	1190●	****	375	230	2-200E	V. Slow	176				
	13.0	4.59	2.94	2.59	2.41	2.30	1095●	****	395	290	2-250E	Std.	153				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 9. Transformers Rated 46 kV, Three Phase — Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
12,000	6.5%	150.6	0.35	0.22	0.16	0.15	0.14	0.14	240	250	110	80	150E	Std.	153	
			0.67	0.41	0.31	0.28	0.26	0.25	245	250	110	105	150E	Slow	119	
			1.06	0.64	0.47	0.42	0.40	0.38	250	270	110	110	150E	V. Slow	176	
			0.42	0.27	0.20	0.18	0.17	0.16	280	290	127	95	175E	Std.	153	
			0.81	0.50	0.36	0.33	0.31	0.30	285	295	127	115	175E	Slow	119	
			1.35	0.82	0.61	0.53	0.51	0.50	285	310	127	125	175E	V. Slow	176	
			0.53	0.33	0.24	0.22	0.21	0.20	325	325	133	115	200E	Std.	153	
			1.04	0.64	0.50	0.45	0.43	0.41	330	355	133	140	200E	Slow	119	
			1.76	1.04	0.77	0.69	0.66	0.65	335	370	133	140	200E	V. Slow	176	
			0.83	0.50	0.37	0.33	0.32	0.31	405	420	183	135	250E	Std.	153	
			1.72	1.04	0.77	0.69	0.65	0.62	415	465	183	175	250E	Slow	119	
			3.10	1.80	1.31	1.18	1.11	1.06	435	545	183	180	250E	V. Slow	176	
			1.45	0.82	0.60	0.54	0.51	0.49	500	535	199	155	300E	Std.	153	
			3.32	1.81	1.29	1.14	1.06	1.02	555	715	199	200	300E	Slow	119	
			5.13	2.86	2.10	1.86	1.73	1.65	715	****	288	225	2-175E	V. Slow	176	
			1.98	1.10	0.79	0.72	0.68	0.65	675	750	313	190	2-200E	Std.	153	
	4.09	2.26	1.62	1.44	1.35	1.29	785	****	313	245	2-200E	Slow	119			
	7.11	3.80	2.69	2.33	2.23	2.16	935	****	313	190	2-200E	V. Slow	176			
	4.42	1.94	1.32	1.15	1.07	1.03	900	****	329	245	2-250E	Std.	153			
	10.2	4.31	2.94	2.53	2.32	2.24	1150	****	329	315	2-250E	Slow	119			
	16.8	7.55	5.08	4.32	4.06	3.91	1510●	****	329	245	2-250E	V. Slow	176			
	14.0	4.05	2.49	2.14	1.97	1.89	1210	****	359	280	2-300E	Std.	153			
	7.0%	150.6	0.38	0.24	0.19	0.16	0.15	0.15	240	250	110	80	150E	Std.	153	
			0.72	0.44	0.36	0.32	0.31	0.29	245	250	110	105	150E	Slow	119	
			1.16	0.72	0.52	0.48	0.46	0.44	250	270	110	110	150E	V. Slow	176	
			0.46	0.30	0.22	0.20	0.19	0.19	280	290	125	95	175E	Std.	153	
			0.87	0.55	0.41	0.37	0.35	0.34	285	295	125	115	175E	Slow	119	
			1.51	0.90	0.70	0.63	0.58	0.56	285	310	125	125	175E	V. Slow	176	
			0.57	0.36	0.27	0.25	0.24	0.23	325	325	135	115	200E	Std.	153	
			1.16	0.73	0.55	0.51	0.49	0.47	330	355	135	140	200E	Slow	119	
			1.93	1.19	0.89	0.80	0.75	0.72	335	370	135	140	200E	V. Slow	176	
			0.91	0.55	0.43	0.39	0.36	0.35	405	420	185	135	250E	Std.	153	
1.94			1.17	0.86	0.79	0.75	0.73	415	465	185	175	250E	Slow	119		
3.38			2.03	1.46	1.34	1.28	1.24	435	545	185	180	250E	V. Slow	176		
1.62			0.94	0.70	0.62	0.58	0.56	500	535	200	155	300E	Std.	153		
3.71			2.04	1.48	1.32	1.25	1.21	555	715	200	200	300E	Slow	119		
5.85			3.24	2.37	2.16	2.04	1.97	715	****	290	225	2-175E	V. Slow	176		
2.27			1.25	0.92	0.81	0.78	0.75	675	750	315	190	2-200E	Std.	153		
4.56	2.53	1.83	1.66	1.58	1.53	785	****	315	245	2-200E	Slow	119				
7.99	4.41	3.10	2.78	2.60	2.49	935	****	315	190	2-200E	V. Slow	176				
5.26	2.25	1.55	1.35	1.28	1.23	900	****	330	245	2-250E	Std.	153				
12.3	5.15	3.44	3.03	2.84	2.72	1150	****	330	315	2-250E	Slow	119				

① Self-cooled rating. OA/FA rating is 133% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

Fuse-Selection Tables

Table 9. Transformers Rated 46 kV, Three Phase — Continued

Transformer Data ① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
12,000	7.5%	150.6		0.41	0.27	0.21	0.19	0.18	0.17	240	250	110	80	150E	Std.	153
				0.76	0.50	0.39	0.36	0.35	0.34	245	250	110	105	150E	Slow	119
				1.26	0.79	0.61	0.53	0.51	0.50	250	270	110	110	150E	V. Slow	176
				0.49	0.33	0.26	0.23	0.21	0.21	280	290	125	95	175E	Std.	153
				0.97	0.60	0.48	0.43	0.40	0.38	285	295	125	115	175E	Slow	119
				1.68	1.04	0.79	0.72	0.68	0.66	285	310	125	125	175E	V. Slow	176
				0.61	0.40	0.31	0.28	0.26	0.26	325	325	135	115	200E	Std.	153
				1.26	0.81	0.60	0.56	0.54	0.53	330	355	135	140	200E	Slow	119
				2.08	1.32	1.00	0.91	0.87	0.84	335	370	135	140	200E	V. Slow	176
				0.99	0.62	0.48	0.44	0.42	0.41	405	420	185	135	250E	Std.	153
				2.14	1.29	0.99	0.88	0.84	0.82	415	465	185	175	250E	Slow	119
				3.80	2.23	1.71	1.50	1.43	1.40	435	545	185	180	250E	V. Slow	176
				1.79	1.05	0.78	0.71	0.68	0.65	500	535	200	155	300E	Std.	153
				4.08	2.35	1.72	1.53	1.43	1.38	555	715	200	200	300E	Slow	119
				6.51	3.62	2.70	2.42	2.32	2.25	715	****	290	225	2-175E	V. Slow	176
				2.53	1.41	1.05	0.95	0.89	0.86	675	750	315	190	2-200E	Std.	153
				5.17	2.92	2.14	1.90	1.78	1.73	785	****	315	245	2-200E	Slow	119
				9.26	4.96	3.54	3.18	3.03	2.93	935	****	315	195	2-200E	V. Slow	176
6.44	2.68	1.81	1.60	1.50	1.44	900	****	330	245	2-250E	Std.	153				
14.9	6.11	4.07	3.57	3.31	3.20	1150	****	330	315	2-250E	Slow	119				
15,000	6.5%	188.3		0.40	0.24	0.16	0.15	0.14	0.14	255	260	105	95	200E	Std.	153
				0.83	0.49	0.33	0.29	0.27	0.27	260	270	105	110	200E	Slow	119
				1.35	0.75	0.55	0.47	0.43	0.42	260	280	105	115	200E	V. Slow	176
				0.64	0.36	0.27	0.24	0.22	0.21	320	325	145	105	250E	Std.	153
				1.33	0.75	0.52	0.46	0.43	0.40	325	345	145	140	250E	Slow	119
				2.27	1.28	0.87	0.77	0.72	0.69	335	370	145	145	250E	V. Slow	176
				1.07	0.58	0.41	0.36	0.34	0.32	390	405	160	120	300E	Std.	153
				2.41	1.25	0.88	0.77	0.71	0.67	420	480	160	160	300E	Slow	119
				3.74	2.04	1.41	1.24	1.15	1.09	510	725	230	180	2-175E	V. Slow	176
				1.44	0.78	0.54	0.48	0.45	0.43	525	560	250	155	2-200E	Std.	153
				2.99	1.58	1.11	0.96	0.88	0.84	575	705	250	195	2-200E	Slow	119
				5.06	2.60	1.82	1.55	1.42	1.38	620	****	250	155	2-200E	V. Slow	176
				2.76	1.28	0.83	0.73	0.67	0.64	685	775	265	195	2-250E	Std.	153
				6.35	2.84	1.82	1.56	1.44	1.37	765	****	265	255	2-250E	Slow	119
				10.7	4.90	3.16	2.76	2.54	2.40	1005	****	265	195	2-250E	V. Slow	176
				6.56	2.41	1.50	1.28	1.17	1.12	870	****	285	225	2-300E	Std.	153
				16.1	5.44	3.32	2.85	2.61	2.45	1270	****	285	305	2-300E	Slow	119

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Table 9. Transformers Rated 46 kV, Three Phase — Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
15,000	7.0%	188.3		0.44	0.26	0.19	0.16	0.15	0.15	255	260	105	95	200E	Std.	153	
				0.89	0.53	0.39	0.33	0.30	0.29	260	270	105	110	200E	Slow	119	
				1.44	0.85	0.62	0.55	0.51	0.49	260	280	105	115	200E	V. Slow	176	
				0.69	0.41	0.30	0.27	0.25	0.24	320	325	145	105	250E	Std.	153	
				1.46	0.83	0.58	0.52	0.49	0.47	325	345	145	140	250E	Slow	119	
				2.53	1.40	0.99	0.87	0.82	0.79	335	370	145	145	250E	V. Slow	176	
				1.19	0.66	0.46	0.41	0.39	0.37	390	405	160	120	300E	Std.	153	
				2.64	1.39	0.98	0.88	0.83	0.79	420	480	160	160	300E	Slow	119	
				4.18	2.27	1.56	1.41	1.33	1.28	510	725	230	180	2-175E	V. Slow	176	
				1.60	0.86	0.61	0.54	0.51	0.49	525	560	250	155	2-200E	Std.	153	
				3.27	1.74	1.23	1.11	1.04	0.99	575	705	250	195	2-200E	Slow	119	
				5.57	2.95	2.06	1.82	1.69	1.61	620	****	250	155	2-200E	V. Slow	176	
		3.19	1.45	0.97	0.83	0.78	0.75	685	775	265	195	2-250E	Std.	153			
		7.28	3.22	2.12	1.82	1.66	1.60	765	****	265	255	2-250E	Slow	119			
		12.4	5.60	3.67	3.16	2.97	2.84	1005	****	265	195	2-250E	V. Slow	176			
		7.94	2.84	1.77	1.50	1.40	1.33	870	****	285	225	2-300E	Std.	153			
		19.5	6.40	3.97	3.32	3.09	2.95	1050●	****	285	305	2-300E	Slow	119			
		7.5%	188.3		0.48	0.29	0.21	0.19	0.18	0.17	255	260	105	95	200E	Std.	153
				0.94	0.57	0.44	0.39	0.36	0.34	260	260	105	110	200E	Slow	119	
				1.58	0.94	0.68	0.62	0.59	0.56	260	280	105	115	200E	V. Slow	176	
				0.74	0.45	0.32	0.30	0.28	0.27	320	325	145	105	250E	Std.	153	
				1.58	0.91	0.67	0.58	0.55	0.53	325	345	145	140	250E	Slow	119	
				2.80	1.55	1.14	0.99	0.91	0.89	335	370	145	145	250E	V. Slow	176	
				1.30	0.73	0.53	0.46	0.43	0.42	390	405	160	120	300E	Std.	153	
	2.88			1.58	1.10	0.98	0.93	0.90	420	480	160	160	300E	Slow	119		
	4.58			2.47	1.80	1.56	1.49	1.44	510	725	230	180	2-175E	V. Slow	176		
	1.78			0.97	0.70	0.61	0.57	0.55	525	560	250	155	2-200E	Std.	153		
	3.60			1.96	1.40	1.23	1.17	1.13	575	705	250	195	2-200E	Slow	119		
	6.28			3.25	2.28	2.06	1.95	1.87	620	****	250	155	2-200E	V. Slow	176		
	3.67	1.64	1.11	0.97	0.91	0.86	685	****	265	195	2-250E	Std.	153				
	8.47	3.70	2.42	2.12	1.98	1.88	765	****	265	255	2-250E	Slow	119				
	13.9	6.43	4.18	3.67	3.38	3.23	1005	****	265	195	2-250E	V. Slow	176				
	9.77	3.28	2.04	1.77	1.63	1.54	870	****	285	225	2-300E	Std.	153				
	24.9	7.50	4.62	3.97	3.65	3.45	1050●	****	285	305	2-300E	Slow	119				

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 9. Transformers Rated 46 kV, Three Phase — Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
18,000	6.5%	225.9	0.53	0.29	0.19	0.16	0.15	0.15	265	270	120	90	250E	Std.	153	
			1.10	0.57	0.38	0.33	0.31	0.29	265	275	120	115	250E	Slow	119	
			1.91	0.96	0.65	0.54	0.50	0.48	270	290	120	120	250E	V. Slow	176	
			0.88	0.45	0.30	0.26	0.25	0.23	325	330	135	100	300E	Std.	153	
			1.90	0.96	0.62	0.55	0.51	0.49	340	370	135	135	300E	Slow	119	
			3.04	1.53	1.02	0.89	0.83	0.80	405	475	190	150	2-175E	V. Slow	176	
			1.16	0.59	0.40	0.35	0.32	0.31	430	450	210	125	2-200E	Std.	153	
			2.39	1.21	0.81	0.71	0.65	0.62	455	520	210	165	2-200E	Slow	119	
			4.10	2.03	1.31	1.12	1.02	0.97	480	620	210	125	2-200E	V. Slow	176	
			2.09	0.95	0.61	0.52	0.48	0.46	550	600	220	160	2-250E	Std.	153	
			4.72	2.07	1.28	1.10	1.01	0.95	590	750	220	210	2-250E	Slow	119	
			8.07	3.57	2.23	1.93	1.76	1.66	670	****	220	160	2-250E	V. Slow	176	
	4.51	1.72	1.05	0.88	0.80	0.76	690	800	240	190	2-300E	Std.	153			
	10.5	3.86	2.30	1.90	1.74	1.65	855	****	240	255	2-300E	Slow	119			
	7.0%	225.9	0.56	0.31	0.22	0.18	0.17	0.16	265	270	120	90	250E	Std.	153	
			1.18	0.64	0.44	0.37	0.35	0.33	265	275	120	115	250E	Slow	119	
			2.06	1.09	0.74	0.63	0.56	0.54	270	290	120	120	250E	V. Slow	176	
			0.95	0.51	0.35	0.29	0.28	0.27	325	330	135	100	300E	Std.	153	
			2.08	1.05	0.73	0.61	0.57	0.55	340	370	135	135	300E	Slow	119	
			3.29	1.71	1.18	0.99	0.93	0.90	405	475	190	150	2-175E	V. Slow	176	
			1.27	0.67	0.46	0.39	0.36	0.35	430	450	210	125	2-200E	Std.	153	
			2.59	1.33	0.91	0.79	0.74	0.71	455	520	210	165	2-200E	Slow	119	
			4.49	2.21	1.45	1.28	1.19	1.13	480	620	210	125	2-200E	V. Slow	176	
			2.29	1.05	0.69	0.59	0.55	0.52	550	600	210	160	2-250E	Std.	153	
			5.26	2.30	1.48	1.24	1.16	1.11	590	750	220	210	2-250E	Slow	119	
			9.11	4.02	2.62	2.18	2.03	1.94	670	****	220	160	2-250E	V. Slow	176	
	5.19	1.95	1.21	1.01	0.93	0.89	690	800	240	190	2-300E	Std.	153			
	12.4	4.36	2.69	2.24	2.04	1.91	855	****	240	255	2-300E	Slow	119			
	7.5%	225.9	0.61	0.33	0.25	0.22	0.20	0.19	265	270	120	90	250E	Std.	153	
			1.26	0.71	0.49	0.43	0.39	0.37	265	275	120	115	250E	Slow	119	
			2.19	1.21	0.82	0.72	0.67	0.63	270	290	120	120	250E	V. Slow	176	
			1.03	0.55	0.39	0.34	0.31	0.29	325	330	135	100	300E	Std.	153	
			2.29	1.18	0.83	0.71	0.65	0.61	340	370	135	135	300E	Slow	119	
			3.52	1.92	1.33	1.15	1.05	0.99	405	475	190	150	2-175E	V. Slow	176	
			1.38	0.74	0.51	0.45	0.41	0.39	430	450	210	125	2-200E	Std.	153	
			2.84	1.49	1.04	0.88	0.82	0.80	455	520	210	165	2-200E	Slow	119	
4.85			2.42	1.69	1.42	1.34	1.29	480	620	210	125	2-200E	V. Slow	176		
2.59			1.20	0.78	0.67	0.62	0.60	550	600	220	160	2-250E	Std.	153		
5.86			2.63	1.66	1.44	1.32	1.25	590	750	220	210	2-250E	Slow	119		
10.1			4.52	2.97	2.54	2.31	2.19	670	****	220	160	2-250E	V. Slow	176		
6.06	2.23	1.40	1.17	1.08	1.02	690	****	240	190	2-300E	Std.	153				
14.4	5.04	3.09	2.61	2.37	2.25	855	****	240	255	2-300E	Slow	119				

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

Table 10. Transformers Rated 69 kV, Three Phase

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
1,500	7.0%	12.6	0.38	0.35	0.34	0.33	0.33	0.33	350	355	235	110	20E	Std.	153	
			0.51	0.47	0.45	0.44	0.44	0.44	350	365	230	120	20E	Slow	119	
			0.62	0.57	0.55	0.54	0.54	0.53	435	440	290	135	25E	Std.	153	
			0.68	0.63	0.60	0.59	0.58	0.58	440	465	290	140	25E	Slow	119	
			0.79	0.72	0.69	0.68	0.68	0.68	555	610	350	170	30E	Std.	153	
			1.19	1.09	1.04	1.03	1.02	1.01	580	675	350	185	30E	Slow	119	
			1.42	1.29	1.22	1.21	1.20	1.19	820	****	460	230	40E	Std.	153	
			2.64	2.41	2.29	2.25	2.22	2.20	885	****	460	255	40E	Slow	119	
			2.32	2.07	1.96	1.92	1.91	1.89	1030	****	580	280	50E	Std.	153	
	4.98	4.40	4.15	4.07	4.03	3.99	1240●	****	580	330	50E	Slow	119			
	7.5%	12.6	0.44	0.40	0.39	0.38	0.38	0.38	350	355	235	110	20E	Std.	153	
			0.58	0.54	0.52	0.51	0.51	0.51	350	365	230	120	20E	Slow	119	
			0.70	0.65	0.63	0.62	0.62	0.61	435	440	290	135	25E	Std.	153	
			0.77	0.71	0.68	0.68	0.67	0.67	440	465	290	140	25E	Slow	119	
			0.90	0.83	0.80	0.79	0.78	0.78	555	610	350	170	30E	Std.	153	
			1.36	1.26	1.21	1.19	1.18	1.17	580	675	350	185	30E	Slow	119	
			1.67	1.51	1.45	1.42	1.41	1.40	820	****	460	230	40E	Std.	153	
			3.08	2.81	2.68	2.64	2.62	2.60	885	****	460	255	40E	Slow	119	
			2.78	2.50	2.36	2.32	2.30	2.28	1030	****	580	280	50E	Std.	153	
	6.08	5.40	5.08	4.98	4.92	4.87	1240●	****	580	330	50E	Slow	119			
	8.0%	12.6	0.49	0.46	0.44	0.44	0.43	0.43	350	355	233	110	20E	Std.	153	
			0.66	0.61	0.59	0.58	0.58	0.58	350	365	230	120	20E	Slow	119	
			0.79	0.74	0.71	0.70	0.70	0.69	435	440	290	135	25E	Std.	153	
			0.87	0.81	0.78	0.77	0.76	0.76	440	465	290	140	25E	Slow	119	
			1.02	0.95	0.91	0.90	0.89	0.89	555	610	350	170	30E	Std.	153	
			1.55	1.44	1.38	1.36	1.36	1.35	580	675	350	185	30E	Slow	119	
			1.94	1.78	1.70	1.67	1.66	1.64	820	****	460	230	40E	Std.	153	
			3.58	3.27	3.13	3.08	3.06	3.03	885	****	460	255	40E	Slow	119	
			3.33	2.97	2.83	2.78	2.76	2.73	1030	****	580	280	50E	Std.	153	
	7.59	6.59	6.21	6.08	6.01	5.94	1240●	****	580	330	50E	Slow	119			
	2,000	7.0%	16.7	0.37	0.33	0.32	0.31	0.30	0.30	325	325	220	100	25E	Std.	153
				0.40	0.36	0.34	0.34	0.33	0.33	330	330	220	105	25E	Slow	119
				0.47	0.42	0.40	0.39	0.39	0.38	405	420	260	130	30E	Std.	153
				0.69	0.62	0.59	0.58	0.58	0.57	415	445	260	140	30E	Slow	119
				0.78	0.70	0.66	0.64	0.64	0.63	580	635	345	175	40E	Std.	153
				1.46	1.30	1.23	1.21	1.20	1.19	590	720	345	190	40E	Slow	119
1.19				1.06	1.00	0.98	0.97	0.96	715	810	435	210	50E	Std.	153	
2.47				2.18	2.04	2.00	1.98	1.96	830	****	435	250	50E	Slow	119	
3.66				3.25	3.05	2.98	2.94	2.91	930	****	450	265	50E	V. Slow	176	
2.80				2.39	2.20	2.14	2.12	2.09	1060	****	495	290	65E	Std.	153	
4.91	4.16	3.85	3.74	3.69	3.65	1180●	****	495	320	65E	Slow	119				

① Self-cooled rating. OA/FA rating is 115% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

Fuse-Selection Tables

Table 10. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
2,000	7.5%	16.7	0.42	0.38	0.36	0.35	0.35	0.35	325	325	220	100	25E	Std.	153	
			0.46	0.41	0.39	0.38	0.38	0.38	330	330	220	105	25E	Slow	119	
			0.53	0.48	0.45	0.45	0.44	0.44	405	420	260	130	30E	Std.	153	
			0.79	0.71	0.67	0.66	0.66	0.65	415	445	260	140	30E	Slow	119	
			0.89	0.80	0.76	0.75	0.74	0.73	580	635	345	175	40E	Std.	153	
			1.67	1.50	1.42	1.39	1.38	1.37	590	720	345	190	40E	Slow	119	
			1.39	1.23	1.16	1.14	1.13	1.11	715	****	435	210	50E	Std.	153	
			2.88	2.55	2.40	2.35	2.32	2.30	840	****	435	250	50E	Slow	119	
			4.22	3.77	3.54	3.47	3.44	3.41	930	****	450	265	50E	V. Slow	176	
			3.37	2.90	2.69	2.62	2.59	2.56	1060	****	495	290	65E	Std.	153	
	6.01	5.10	4.71	4.58	4.52	4.47	1180●	****	495	320	65E	Slow	119			
	8.0%	16.7	0.47	0.43	0.41	0.41	0.40	0.40	325	325	225	100	25E	Std.	153	
			0.51	0.47	0.44	0.44	0.43	0.43	330	330	225	105	25E	Slow	119	
			0.59	0.54	0.51	0.51	0.50	0.50	405	420	270	130	30E	Std.	153	
			0.89	0.81	0.77	0.75	0.75	0.74	415	445	270	140	30E	Slow	119	
			1.02	0.92	0.87	0.86	0.85	0.84	580	635	360	175	40E	Std.	153	
			1.90	1.72	1.63	1.60	1.59	1.57	590	720	360	190	40E	Slow	119	
			1.60	1.43	1.35	1.32	1.31	1.29	715	****	450	210	50E	Std.	153	
			3.35	2.97	2.79	2.73	2.70	2.68	830	****	450	250	50E	Slow	119	
			4.90	4.36	4.10	4.03	3.99	3.96	930	****	450	265	50E	V. Slow	176	
4.05			3.49	3.25	3.17	3.13	3.09	1060	****	520	290	65E	Std.	153		
7.46	6.27	5.78	5.62	5.54	5.47	1180●	****	520	320	65E	Slow	119				
2,500	7.0%	20.9	0.31	0.27	0.26	0.25	0.25	0.24	315	325	210	105	30E	Std.	153	
			0.47	0.41	0.39	0.38	0.38	0.37	325	340	210	110	30E	Slow	119	
			0.51	0.45	0.42	0.41	0.40	0.40	450	480	275	140	40E	Std.	153	
			0.97	0.85	0.79	0.77	0.76	0.75	450	500	275	155	40E	Slow	119	
			0.78	0.68	0.63	0.62	0.61	0.60	555	595	350	169	50E	Std.	153	
			1.58	1.37	1.28	1.25	1.23	1.22	615	775	350	200	50E	Slow	119	
			2.34	2.04	1.90	1.85	1.83	1.80	625	****	395	210	50E	V. Slow	176	
			1.61	1.37	1.27	1.24	1.22	1.20	775	****	395	232	65E	Std.	153	
			2.78	2.37	2.18	2.11	2.08	2.06	890	****	360	260	65E	Slow	119	
			4.00	3.42	3.18	3.10	3.05	3.01	1030	****	415	270	65E	V. Slow	176	
			3.01	2.46	2.24	2.17	2.13	2.10	1130	****	460	290	80E	Std.	153	
			5.27	4.34	3.92	3.79	3.73	3.67	1190●	****	460	325	80E	Slow	119	

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.
Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Table 10. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
2,500	7.5%	20.9	0.35	0.31	0.29	0.29	0.28	0.28	315	325	210	105	30E	Std.	153	
			0.53	0.47	0.44	0.43	0.43	0.42	325	340	210	110	30E	Slow	119	
			0.58	0.51	0.48	0.47	0.46	0.46	450	480	275	140	40E	Std.	153	
			1.09	0.97	0.90	0.88	0.87	0.87	450	501	275	155	40E	Slow	119	
			0.88	0.78	0.73	0.71	0.70	0.69	550	595	350	170	50E	Std.	153	
			1.80	1.58	1.47	1.44	1.42	1.41	615	****	350	200	50E	Slow	119	
			2.68	2.34	2.19	2.14	2.12	2.09	625	****	360	210	50E	V. Slow	176	
			1.88	1.61	1.48	1.45	1.43	1.41	775	****	395	230	65E	Std.	153	
			3.28	2.78	2.58	2.51	2.48	2.44	890	****	395	260	65E	Slow	119	
			4.65	4.00	3.72	3.62	3.57	3.52	1030	****	415	270	65E	V. Slow	176	
	3.73	3.01	2.73	2.64	2.59	2.54	1130	****	460	290	80E	Std.	153			
	6.50	5.27	4.80	4.64	4.56	4.49	1190●	****	460	325	80E	Slow	119			
	8.0%	20.9	0.40	0.35	0.33	0.33	0.32	0.32	315	3275	215	105	30E	Std.	153	
			0.59	0.53	0.50	0.49	0.49	0.48	325	340	215	110	30E	Slow	119	
			0.66	0.58	0.55	0.54	0.53	0.52	450	480	285	140	40E	Std.	153	
			1.23	1.09	1.03	1.01	1.00	0.99	450	500	285	155	40E	Slow	119	
			1.00	0.88	0.83	0.81	0.80	0.79	550	595	360	170	50E	Std.	153	
			2.04	1.80	1.68	1.65	1.63	1.61	615	****	360	200	50E	Slow	119	
			3.05	2.68	2.51	2.44	2.41	2.39	625	****	360	210	50E	V. Slow	176	
			2.20	1.88	1.74	1.70	1.68	1.66	775	****	415	230	65E	Std.	153	
3.85			3.28	3.02	2.94	2.90	2.86	890	****	415	260	65E	Slow	119		
5.37			4.65	4.32	4.21	4.15	4.09	1030	****	415	270	65E	V. Slow	176		
4.84	3.73	3.35	3.23	3.16	3.10	1065●	****	460	290	80E	Std.	153				
8.23	6.50	5.86	5.67	5.57	5.47	1190●	****	460	325	80E	Slow	119				
3,750	7.0%	31.4	0.48	0.40	0.36	0.35	0.35	0.34	285	300	190	100	40E	Slow	119	
			0.38	0.32	0.29	0.28	0.28	0.27	355	365	240	115	50E	Std.	153	
			0.77	0.65	0.59	0.57	0.56	0.55	375	410	240	130	50E	Slow	119	
			1.13	0.94	0.84	0.82	0.80	0.79	365	415	240	140	50E	V. Slow	176	
			0.73	0.60	0.54	0.52	0.51	0.50	475	515	275	155	65E	Std.	153	
			1.23	1.00	0.90	0.87	0.85	0.83	520	590	275	170	65E	Slow	119	
			1.83	1.50	1.34	1.30	1.28	1.25	510	675	275	180	65E	V. Slow	176	
			1.19	0.96	0.86	0.83	0.81	0.80	655	750	305	195	80E	Std.	153	
			2.06	1.65	1.48	1.43	1.40	1.37	695	****	305	215	80E	Slow	119	
			3.26	2.60	2.32	2.24	2.20	2.15	745	****	305	220	80E	V. Slow	176	
			2.52	1.94	1.69	1.62	1.58	1.54	910	****	365	255	100E	Std.	153	
			4.43	3.45	3.07	2.95	2.89	2.83	1020	****	365	275	100E	Slow	119	
			7.51	5.79	5.10	4.86	4.77	4.68	1220●	****	365	275	100E	V. Slow	176	
4.39	3.20	2.76	2.61	2.55	2.50	1165	****	435	320	125E	Std.	153				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 10. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data ① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
3,750	7.5%	31.4	0.54	0.46	0.42	0.40	0.40	0.39	285	300	185	100	40E	Slow	119	
			0.43	0.36	0.33	0.32	0.31	0.31	355	365	235	115	50E	Std.	153	
			0.87	0.73	0.67	0.65	0.64	0.63	375	410	235	130	50E	Slow	119	
			1.27	1.06	0.97	0.94	0.92	0.90	365	415	240	140	50E	V. Slow	176	
			0.83	0.68	0.62	0.60	0.59	0.58	475	515	265	155	65E	Std.	153	
			1.40	1.15	1.04	1.00	0.99	0.97	520	590	265	170	65E	Slow	119	
			2.07	1.72	1.55	1.50	1.48	1.45	510	675	275	180	65E	V. Slow	176	
			1.36	1.11	0.99	0.96	0.94	0.92	655	750	305	195	80E	Std.	153	
			2.37	1.91	1.72	1.65	1.62	1.60	695	****	305	215	80E	Slow	119	
			3.75	3.02	2.70	2.60	2.56	2.51	745	****	305	220	80E	V. Slow	176	
			2.99	2.31	2.03	1.94	1.90	1.86	910	****	365	255	100E	Std.	153	
			5.26	4.09	3.61	3.45	3.39	3.33	1020	****	365	275	100E	Slow	119	
	8.79	6.89	6.06	5.79	5.68	5.57	1220●	****	365	275	100E	V. Slow	176			
	8.0%	31.4	0.60	0.51	0.47	0.46	0.45	0.44	285	300	185	100	40E	Slow	119	
			0.48	0.41	0.37	0.36	0.36	0.35	355	365	235	115	50E	Std.	153	
			0.96	0.82	0.75	0.73	0.72	0.71	375	410	235	130	50E	Slow	119	
			1.43	1.20	1.10	1.06	1.04	1.03	365	415	240	140	50E	V. Slow	176	
			0.94	0.78	0.71	0.68	0.67	0.66	475	515	265	155	65E	Std.	153	
			1.58	1.31	1.19	1.15	1.13	1.11	520	590	265	170	65E	Slow	119	
			2.32	1.94	1.77	1.72	1.69	1.66	510	675	275	180	65E	V. Slow	176	
			1.56	1.27	1.15	1.11	1.09	1.07	655	****	305	195	80E	Std.	153	
			2.70	2.21	1.99	1.91	1.88	1.85	695	****	305	215	80E	Slow	119	
			4.28	3.50	3.14	3.02	2.97	2.92	745	****	305	220	80E	V. Slow	176	
			3.56	2.75	2.41	2.31	2.26	2.21	910	****	365	255	100E	Std.	153	
6.09			4.81	4.25	4.09	4.00	3.92	1020	****	365	275	100E	Slow	119		
10.4	8.13	7.20	6.89	6.75	6.62	1220●	****	365	275	100E	V. Slow	176				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Table 10. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
5,000	7.0%	41.8	0.50	0.39	0.34	0.33	0.32	0.31	270	285	180	100	50E	Slow	119	
			0.71	0.56	0.49	0.47	0.46	0.45	265	280	180	105	50E	V. Slow	176	
			0.45	0.36	0.31	0.30	0.29	0.29	345	365	210	115	65E	Std.	153	
			0.74	0.58	0.51	0.49	0.47	0.46	370	400	210	130	65E	Slow	119	
			1.11	0.88	0.77	0.73	0.72	0.70	360	395	210	135	65E	V. Slow	176	
			0.71	0.55	0.48	0.46	0.45	0.44	465	505	230	145	80E	Std.	153	
			1.22	0.96	0.85	0.81	0.79	0.78	480	545	230	160	80E	Slow	119	
			1.90	1.46	1.27	1.21	1.18	1.15	485	330	230	165	80E	V. Slow	176	
			1.35	1.02	0.87	0.83	0.81	0.79	620	720	275	190	100E	Std.	153	
			2.49	1.88	1.63	1.55	1.52	1.48	645	****	275	210	100E	Slow	119	
			4.08	3.09	2.68	2.54	2.47	2.41	740	****	275	205	100E	V. Slow	176	
			2.15	1.61	1.37	1.30	1.27	1.24	790	****	325	240	125E	Std.	153	
			4.82	3.46	2.98	2.80	2.71	2.62	980	****	325	320	125E	Slow	119	
			6.72	4.91	4.15	3.97	3.88	3.78	975●	****	325	250	125E	V. Slow	176	
4.19	2.79	2.27	2.15	2.08	2.02	1080	****	375	290	150E	Std.	153				
8.50	5.84	4.85	4.49	4.37	4.25	1240●	****	375	375	150E	Slow	119				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 10. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
5,000	7.5%	41.8		0.55	0.44	0.39	0.38	0.37	0.36	270	285	175	100	50E	Slow	119
				0.79	0.63	0.56	0.54	0.52	0.51	265	280	180	105	50E	V. Slow	176
				0.50	0.40	0.36	0.34	0.33	0.33	345	365	200	115	65E	Std.	153
				0.83	0.66	0.58	0.56	0.54	0.53	370	400	200	130	65E	Slow	119
				1.25	1.00	0.88	0.85	0.83	0.81	360	395	210	135	65E	V. Slow	176
				0.80	0.63	0.55	0.53	0.52	0.51	465	505	230	145	80E	Std.	153
				1.37	1.09	0.96	0.92	0.90	0.89	480	545	230	160	80E	Slow	119
				2.15	1.67	1.46	1.40	1.37	1.33	485	630	230	165	80E	V. Slow	176
				1.54	1.18	1.02	0.97	0.94	0.92	620	720	275	190	100E	Std.	153
				2.83	2.17	1.88	1.80	1.75	1.71	645	****	275	210	100E	Slow	119
				4.68	3.55	3.09	2.94	2.87	2.81	740	****	275	205	100E	V. Slow	176
				2.50	1.87	1.61	1.53	1.49	1.45	790	****	325	240	125E	Std.	153
				5.67	4.13	3.46	3.31	3.23	3.15	980	****	325	320	125E	Slow	119
				7.71	5.68	4.91	4.64	4.49	4.35	975●	****	325	250	125E	V. Slow	176
		5.27	3.42	2.79	2.62	2.53	2.45	1080	****	375	290	150E	Std.	153		
		10.4	7.10	5.84	5.52	5.36	5.19	1240●	****	375	375	150E	Slow	119		
	8.0%	41.8		0.60	0.50	0.44	0.42	0.42	0.41	270	285	175	100	50E	Slow	119
				0.87	0.71	0.63	0.61	0.59	0.58	265	280	180	105	50E	V. Slow	176
				0.56	0.45	0.40	0.38	0.38	0.37	345	365	200	115	65E	Std.	153
				0.93	0.74	0.66	0.64	0.62	0.61	370	400	200	130	65E	Slow	119
				1.40	1.11	1.00	0.96	0.93	0.92	360	395	245	135	65E	V. Slow	176
				0.89	0.71	0.63	0.60	0.59	0.58	465	505	250	145	80E	Std.	153
				1.54	1.22	1.09	1.05	1.03	1.01	480	545	230	160	80E	Slow	119
				2.42	1.90	1.67	1.60	1.57	1.53	485	630	230	165	80E	V. Slow	176
				1.78	1.35	1.18	1.12	1.09	1.07	620	720	275	190	100E	Std.	153
				3.20	2.49	2.17	2.08	2.03	1.98	645	****	275	210	100E	Slow	119
			5.34	4.08	3.55	3.40	3.32	3.25	740	****	275	205	100E	V. Slow	176	
			2.91	2.15	1.87	1.78	1.73	1.68	790	****	325	240	125E	Std.	153	
			6.66	4.82	4.13	3.91	3.80	3.69	980	****	325	320	125E	Slow	119	
			9.16	6.72	5.68	5.44	5.31	5.18	975●	****	325	250	125E	V. Slow	176	
	7.02	4.19	3.42	3.18	3.05	2.95	1080	****	375	290	150E	Std.	153			
	13.0	8.50	7.10	6.64	6.41	6.17	1240●	****	375	375	150E	Slow	119			

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 10. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
7,500	7.0%	62.8		0.39	0.28	0.23	0.22	0.21	0.21	290	310	155	95	80E	Std.	153	
				0.67	0.49	0.40	0.38	0.37	0.35	290	320	155	110	80E	Slow	119	
				0.99	0.71	0.58	0.54	0.53	0.51	285	320	155	110	80E	V. Slow	176	
				0.67	0.47	0.38	0.36	0.35	0.33	375	415	185	130	100E	Std.	153	
				1.26	0.88	0.72	0.67	0.65	0.62	395	430	185	140	100E	Slow	119	
				2.06	1.43	1.18	1.10	1.07	1.03	395	490	185	140	100E	V. Slow	176	
				1.04	0.74	0.62	0.58	0.55	0.54	495	525	220	160	125E	Std.	153	
				2.23	1.50	1.23	1.14	1.09	1.04	520	650	220	210	125E	Slow	119	
				3.17	2.20	1.80	1.68	1.62	1.56	550	820	220	165	125E	V. Slow	176	
				1.68	1.15	0.96	0.90	0.86	0.83	640	715	250	195	150E	Std.	153	
				3.47	2.35	1.87	1.77	1.72	1.66	670	****	250	250	150E	Slow	119	
				5.98	3.96	3.11	2.93	2.83	2.74	815	****	250	260	150E	V. Slow	176	
				2.38	1.55	1.23	1.13	1.09	1.05	730	****	305	230	175E	Std.	153	
				4.92	3.10	2.45	2.25	2.18	2.10	835	****	305	275	175E	Slow	119	
		8.26	5.30	4.28	3.89	3.69	3.58	1125	****	305	305	175E	V. Slow	176			
		3.36	2.03	1.60	1.46	1.40	1.35	860	****	320	280	200E	Std.	153			
		7.22	4.28	3.33	3.04	2.93	2.81	1075	****	320	335	200E	Slow	119			
		12.6	7.40	5.71	5.26	5.02	4.78	1195●	****	320	340	200E	V. Slow	176			
		10.4	4.09	2.95	2.66	2.53	2.39	1180	****	440	320	250E	Std.	153			
		7.5%	62.8		0.42	0.31	0.27	0.25	0.24	0.23	290	310	155	95	80E	Std.	153
				0.74	0.54	0.46	0.43	0.42	0.40	290	320	155	110	80E	Slow	119	
				1.10	0.80	0.66	0.62	0.60	0.58	285	320	155	110	80E	V. Slow	176	
				0.75	0.53	0.44	0.41	0.40	0.38	375	415	185	130	100E	Std.	153	
				1.40	1.01	0.83	0.77	0.75	0.72	395	430	185	140	100E	Slow	119	
				2.29	1.63	1.35	1.27	1.23	1.18	395	490	185	140	100E	V. Slow	176	
				1.18	0.84	0.70	0.66	0.64	0.62	495	525	220	160	125E	Std.	153	
				2.49	1.72	1.39	1.31	1.27	1.23	520	650	220	210	125E	Slow	119	
				3.59	2.51	2.02	1.91	1.86	1.80	550	****	220	165	125E	V. Slow	176	
	1.88			1.31	1.07	1.01	0.99	0.96	640	715	250	195	150E	Std.	153		
	4.00			2.64	2.19	2.02	1.93	1.87	670	****	250	250	150E	Slow	119		
	6.72			4.48	3.68	3.38	3.22	3.11	815	****	250	260	150E	V. Slow	176		
	2.75			1.78	1.43	1.33	1.28	1.23	730	****	305	230	175E	Std.	153		
	5.61			3.66	2.89	2.68	2.56	2.45	835	****	305	275	175E	Slow	119		
	9.56	6.24	4.98	4.64	4.46	4.28	1125	****	305	305	175E	V. Slow	176				
	3.99	2.37	1.86	1.73	1.66	1.60	860	****	320	280	200E	Std.	153				
	8.73	5.05	3.92	3.63	3.48	3.33	1075	****	320	335	200E	Slow	119				
	15.1	8.73	6.78	6.13	5.92	5.71	1195●	****	320	340	200E	V. Slow	176				
	16.3	5.18	3.65	3.29	3.12	2.95	1085●	****	440	320	250E	Std.	153				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 10. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
7,500	8.0%	62.8		0.46	0.35	0.30	0.28	0.27	0.27	290	310	155	95	80E	Std.	153
				0.81	0.60	0.52	0.49	0.47	0.46	290	320	155	110	80E	Slow	119
				1.21	0.89	0.75	0.71	0.69	0.66	285	320	155	110	80E	V. Slow	176
				0.83	0.60	0.50	0.47	0.45	0.44	375	415	185	130	100E	Std.	153
				1.55	1.13	0.94	0.88	0.86	0.83	395	430	185	140	100E	Slow	119
				2.54	1.84	1.54	1.43	1.39	1.35	395	490	185	140	100E	V. Slow	176
				1.30	0.95	0.79	0.74	0.72	0.70	495	525	220	160	125E	Std.	153
				2.80	1.95	1.61	1.50	1.44	1.39	520	650	220	210	125E	Slow	119
				3.97	2.80	2.36	2.20	2.11	2.02	550	****	220	165	125E	V. Slow	176
				2.15	1.47	1.24	1.15	1.11	1.07	640	715	250	195	150E	Std.	153
				4.49	3.07	2.50	2.35	2.27	2.19	670	****	250	250	150E	Slow	119
				7.43	5.16	4.23	3.96	3.82	3.68	815	****	250	260	150E	V. Slow	176
				3.17	2.06	1.66	1.55	1.48	1.43	730	****	305	230	175E	Std.	153
				6.61	4.18	3.38	3.10	3.00	2.89	835	****	305	275	175E	Slow	119
				11.0	7.18	5.73	5.30	5.15	4.98	1125	****	305	305	175E	V. Slow	176
				4.75	2.78	2.19	2.03	1.95	1.86	860	****	320	280	200E	Std.	153
				10.6	6.03	4.66	4.28	4.08	3.92	1075	****	320	335	200E	Slow	119
				18.5	10.6	7.98	7.40	7.09	6.78	1195●	****	320	340	200E	V. Slow	176
31.7	7.16	4.61	4.09	3.87	3.65	1180●	****	440	320	250E	Std.	153				
10,000	7.0%	83.7		0.44	0.29	0.22	0.20	0.20	0.19	265	290	135	95	100E	Std.	153
				0.83	0.54	0.42	0.39	0.37	0.35	265	295	135	105	100E	Slow	119
				1.35	0.89	0.70	0.64	0.61	0.59	265	310	135	105	100E	V. Slow	176
				0.70	0.48	0.37	0.34	0.33	0.32	365	375	165	120	125E	Std.	153
				1.39	0.90	0.69	0.64	0.61	0.59	370	405	165	160	125E	Slow	119
				2.02	1.33	1.04	0.95	0.91	0.88	380	430	165	125	125E	V. Slow	176
				1.07	0.70	0.56	0.51	0.48	0.46	460	490	190	145	150E	Std.	153
				2.19	1.42	1.08	1.00	0.95	0.90	460	540	190	185	150E	Slow	119
				3.68	2.31	1.80	1.64	1.55	1.46	500	730	190	195	150E	V. Slow	176
				1.43	0.88	0.69	0.63	0.61	0.58	525	565	230	170	175E	Std.	153
				2.89	1.75	1.36	1.23	1.18	1.13	555	705	230	210	175E	Slow	119
				4.98	3.12	2.29	2.14	2.05	1.97	605	****	230	230	175E	V. Slow	176
				1.86	1.13	0.86	0.80	0.76	0.73	605	660	230	210	200E	Std.	153
				3.92	2.34	1.76	1.61	1.52	1.44	675	****	230	250	200E	Slow	119
				6.78	4.00	2.98	2.74	2.62	2.48	750	****	230	255	200E	V. Slow	176
				3.65	1.95	1.45	1.30	1.23	1.17	785	****	330	240	250E	Std.	153
				8.17	4.39	3.15	2.84	2.69	2.54	950	****	330	315	250E	Slow	119
				15.5	7.90	5.70	5.02	4.74	4.52	1050●	****	330	325	250E	V. Slow	176
12.0	4.10	2.80	2.48	2.32	2.17	1020	****	360	275	300E	Std.	153				
31.3	9.89	6.65	5.69	5.35	5.04	1390●	****	360	365	300E	Slow	119				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 10. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
10,000	7.5%	83.7	0.48	0.32	0.25	0.23	0.22	0.21	265	290	135	95	100E	Std.	153	
			0.91	0.60	0.48	0.44	0.42	0.40	265	295	135	105	100E	Slow	119	
			1.49	0.99	0.78	0.73	0.70	0.67	265	310	135	105	100E	V. Slow	176	
			0.76	0.52	0.43	0.39	0.37	0.35	365	375	165	120	125E	Std.	153	
			1.56	0.99	0.80	0.73	0.69	0.66	370	405	165	160	125E	Slow	119	
			2.28	1.49	1.19	1.09	1.04	0.98	380	430	165	125	125E	V. Slow	176	
			1.20	0.80	0.63	0.59	0.56	0.54	460	490	190	145	150E	Std.	153	
			2.42	1.61	1.21	1.12	1.08	1.04	460	540	190	185	150E	Slow	119	
			4.10	2.64	2.03	1.88	1.80	1.72	500	730	190	195	150E	V. Slow	176	
			1.61	1.01	0.79	0.73	0.69	0.66	525	565	230	170	175E	Std.	153	
			3.23	2.01	1.56	1.43	1.36	1.29	555	705	230	210	175E	Slow	119	
			5.47	3.47	2.73	2.44	2.29	2.22	605	****	230	230	175E	V. Slow	176	
			2.11	1.30	1.00	0.91	0.86	0.83	605	660	240	210	200E	Std.	153	
			4.47	2.69	2.04	1.84	1.76	1.69	675	****	240	250	200E	Slow	119	
			7.69	4.52	3.49	3.11	2.98	2.87	750	****	240	255	200E	V. Slow	176	
			4.31	2.28	1.69	1.53	1.45	1.38	785	****	335	240	250E	Std.	153	
	9.67	5.09	3.72	3.35	3.15	2.98	950	****	315	315	250E	Slow	119			
	18.9	9.12	6.61	6.01	5.70	5.37	1050●	****	325	325	250E	V. Slow	176			
	17.6	5.11	3.36	2.99	2.80	2.63	1020	****	275	275	300E	Std.	153			
	8.0%	83.7	0.53	0.36	0.29	0.26	0.25	0.24	265	290	135	95	100E	Std.	153	
			1.01	0.67	0.54	0.50	0.48	0.46	265	295	135	105	100E	Slow	119	
			1.63	1.10	0.89	0.82	0.78	0.76	265	310	135	105	100E	V. Slow	176	
			0.84	0.58	0.48	0.45	0.43	0.41	365	375	165	120	125E	Std.	153	
			1.72	1.14	0.90	0.84	0.80	0.76	370	405	165	160	125E	Slow	119	
			2.51	1.68	1.33	1.24	1.19	1.14	380	430	165	125	125E	V. Slow	176	
			1.31	0.90	0.70	0.66	0.63	0.61	460	490	190	145	150E	Std.	153	
			2.64	1.77	1.42	1.29	1.21	1.16	460	540	190	185	150E	Slow	119	
			4.48	2.93	2.31	2.10	2.03	1.96	500	****	190	195	150E	V. Slow	176	
			1.78	1.13	0.88	0.82	0.79	0.76	525	565	230	170	175E	Std.	153	
			3.66	2.25	1.75	1.62	1.56	1.50	555	705	230	210	175E	Slow	119	
			6.24	3.89	3.12	2.86	2.73	2.59	605	****	230	230	175E	V. Slow	176	
			2.37	1.46	1.13	1.05	1.00	0.96	605	660	240	210	200E	Std.	153	
5.05			3.04	2.34	2.14	2.04	1.93	675	****	240	250	200E	Slow	119		
8.73			5.26	4.00	3.67	3.49	3.31	750	****	240	255	200E	V. Slow	176		
5.18			2.66	1.95	1.78	1.69	1.60	785	****	330	240	250E	Std.	153		
11.7	5.98	4.39	3.90	3.72	3.54	950	****	330	315	250E	Slow	119				
23.3	11.0	7.90	7.01	6.61	6.32	1050●	****	330	325	250E	V. Slow	176				
29.0	6.49	4.10	3.61	3.36	3.18	1020	****	360	275	300E	Std.	153				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 10. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
12,000	7.0%	100.4	0.55	0.35	0.29	0.26	0.25	0.24	300	305	135	100	125E	Std.	153	
			1.09	0.66	0.51	0.44	0.42	0.40	300	320	135	135	125E	Slow	119	
			1.62	0.98	0.76	0.67	0.64	0.61	305	335	135	105	125E	V. Slow	176	
			0.86	0.54	0.41	0.38	0.36	0.34	380	395	155	120	150E	Std.	153	
			1.72	1.04	0.76	0.71	0.68	0.64	375	405	155	155	150E	Slow	119	
			2.83	1.72	1.26	1.14	1.08	1.01	395	475	155	165	150E	V. Slow	176	
			1.09	0.66	0.49	0.45	0.43	0.41	430	450	190	145	175E	Std.	153	
			2.18	1.29	0.97	0.86	0.82	0.78	445	500	190	175	175E	Slow	119	
			3.69	2.22	1.68	1.47	1.37	1.31	460	615	190	190	175E	V. Slow	176	
			1.40	0.83	0.61	0.56	0.54	0.51	495	525	200	175	200E	Std.	153	
			2.93	1.69	1.26	1.14	1.07	0.99	530	630	200	210	200E	Slow	119	
			5.02	2.87	2.08	1.90	1.80	1.69	560	****	200	215	200E	V. Slow	176	
			2.53	1.38	0.99	0.90	0.85	0.79	630	695	275	200	250E	Std.	153	
			5.69	2.98	2.14	1.90	1.77	1.67	700	****	275	265	250E	Slow	119	
	10.4	5.37	3.80	3.32	3.16	2.98	820	****	275	270	250E	V. Slow	176			
	6.01	2.63	1.79	1.59	1.48	1.38	790	****	300	230	300E	Std.	153			
	14.3	6.18	4.08	3.64	3.40	3.15	1080	****	300	305	300E	Slow	119			
	7.5%	100.4	0.61	0.40	0.32	0.30	0.28	0.27	300	305	135	100	125E	Std.	153	
			1.20	0.74	0.57	0.52	0.49	0.46	300	320	135	135	125E	Slow	119	
			1.77	1.12	0.86	0.78	0.74	0.69	305	335	135	105	125E	V. Slow	176	
			0.91	0.60	0.46	0.42	0.41	0.39	380	395	155	120	150E	Std.	153	
			1.85	1.14	0.88	0.77	0.75	0.72	375	405	155	155	150E	Slow	119	
			3.07	1.92	1.41	1.29	1.23	1.17	395	475	155	165	150E	V. Slow	176	
			1.21	0.74	0.57	0.51	0.48	0.46	430	450	190	145	175E	Std.	153	
			2.39	1.46	1.10	1.00	0.94	0.88	445	500	190	175	175E	Slow	119	
			4.18	2.51	1.92	1.73	1.63	1.53	460	615	190	190	175E	V. Slow	176	
			1.56	0.93	0.71	0.63	0.60	0.58	495	525	200	175	200E	Std.	153	
			3.25	1.88	1.41	1.29	1.23	1.17	530	630	200	210	200E	Slow	119	
5.60			3.21	2.41	2.13	2.04	1.95	560	****	200	215	200E	V. Slow	176		
2.87			1.56	1.14	1.01	0.97	0.92	630	695	275	200	250E	Std.	153		
6.41			3.45	2.47	2.19	2.08	1.96	700	****	275	265	250E	Slow	119		
11.9	6.17	4.41	3.93	3.67	3.40	820	****	275	270	250E	V. Slow	176				
7.53	3.08	2.11	1.86	1.73	1.64	790	****	300	230	300E	Std.	153				
17.8	7.32	4.88	4.20	3.97	3.75	1080	****	300	305	300E	Slow	119				

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Table 10. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
12,000	8.0%	100.4		0.66	0.45	0.34	0.32	0.31	0.30	300	305	135	100	125E	Std.	153
				1.31	0.84	0.64	0.59	0.56	0.53	300	320	135	135	125E	Slow	119
				1.91	1.24	0.95	0.88	0.84	0.80	305	335	135	105	125E	V. Slow	176
				1.01	0.66	0.51	0.46	0.45	0.43	380	395	155	120	150E	Std.	153
				2.02	1.29	1.00	0.90	0.85	0.80	375	405	155	155	150E	Slow	119
				3.38	2.10	1.64	1.46	1.36	1.31	395	475	155	165	150E	V. Slow	176
				1.33	0.82	0.63	0.58	0.55	0.52	430	455	190	145	175E	Std.	153
				2.68	1.62	1.23	1.13	1.08	1.02	445	500	190	175	175E	Slow	119
				4.64	2.86	2.14	1.97	1.88	1.78	460	615	190	190	175E	V. Slow	176
				1.73	1.05	0.80	0.73	0.69	0.65	495	525	200	175	200E	Std.	153
				3.63	2.14	1.61	1.44	1.38	1.32	530	630	200	210	200E	Slow	119
				6.13	3.67	2.74	2.48	2.34	2.20	560	****	200	215	200E	V. Slow	176
				3.29	1.78	1.30	1.17	1.11	1.05	630	695	275	200	250E	Std.	153
				7.38	3.90	2.84	2.54	2.39	2.25	700	****	275	265	250E	Slow	119
14.0	7.01	5.02	4.52	4.29	4.05	820	****	275	270	250E	V. Slow	176				
9.43	3.61	2.48	2.17	2.05	1.92	790	****	300	230	300E	Std.	153				
23.6	8.60	5.69	5.04	4.72	4.38	1080	****	300	305	300E	Slow	119				
15,000	7.0%	125.5		0.66	0.40	0.28	0.25	0.24	0.23	295	305	125	95	150E	Std.	153
				1.29	0.73	0.54	0.46	0.43	0.41	290	305	125	125	150E	Slow	119
				2.10	1.20	0.83	0.75	0.71	0.66	295	330	125	130	150E	V. Slow	176
				0.82	0.47	0.34	0.31	0.30	0.28	340	350	155	115	175E	Std.	153
				1.62	0.91	0.65	0.57	0.54	0.51	345	365	155	140	175E	Slow	119
				2.86	1.58	1.11	0.96	0.88	0.84	350	400	155	150	175E	V. Slow	176
				1.05	0.59	0.41	0.38	0.36	0.34	390	405	160	140	200E	Std.	153
				2.14	1.20	0.86	0.77	0.71	0.66	405	450	160	165	200E	Slow	119
				3.67	1.99	1.40	1.24	1.16	1.07	420	495	160	170	200E	V. Slow	176
				1.78	0.94	0.67	0.58	0.54	0.51	490	520	220	160	250E	Std.	153
				3.90	2.02	1.39	1.21	1.14	1.07	525	630	220	210	250E	Slow	119
				7.01	3.53	2.39	2.11	1.99	1.85	555	****	220	215	250E	V. Slow	176
				3.61	1.68	1.13	0.98	0.92	0.84	605	675	240	185	300E	Std.	153
				8.60	3.86	2.53	2.17	1.97	1.85	705	****	240	245	300E	Slow	119
				13.5	6.12	3.96	3.38	3.17	2.94	1065	****	345	270	2-175E	V. Slow	176
				6.17	2.38	1.50	1.32	1.22	1.12	850	****	375	230	2-200E	Std.	153
				13.0	4.81	3.13	2.69	2.48	2.32	1085	****	375	295	2-200E	Slow	119
				26.1	8.51	5.26	4.64	4.30	3.93	1175●	****	375	230	2-200E	V. Slow	176
***	5.71	2.94	2.41	2.19	2.01	1170	****	395	290	2-250E	Std.	153				

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 10. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
15,000	7.5%	125.5	0.70	0.43	0.32	0.28	0.27	0.25	295	305	125	95	150E	Std.	153	
			1.42	0.80	0.61	0.54	0.50	0.46	290	305	125	125	150E	Slow	119	
			2.31	1.31	0.94	0.83	0.79	0.75	295	330	125	130	150E	V. Slow	176	
			0.88	0.52	0.38	0.34	0.33	0.31	340	350	155	115	175E	Std.	153	
			1.75	1.02	0.74	0.65	0.60	0.57	345	365	155	140	175E	Slow	119	
			3.12	1.78	1.25	1.11	1.04	0.96	350	400	155	150	175E	V. Slow	176	
			1.13	0.65	0.48	0.41	0.40	0.38	390	405	160	140	200E	Std.	153	
			2.34	1.32	0.94	0.86	0.81	0.77	405	450	160	165	200E	Slow	119	
			4.00	2.20	1.58	1.40	1.32	1.24	420	495	160	170	200E	V. Slow	176	
			1.95	1.05	0.74	0.67	0.62	0.58	490	520	220	160	250E	Std.	153	
			4.39	2.25	1.58	1.39	1.29	1.21	525	630	220	210	250E	Slow	119	
			7.90	4.05	2.80	2.39	2.23	2.11	555	****	220	215	250E	V. Slow	176	
			4.10	1.92	1.30	1.13	1.05	0.98	605	675	240	185	300E	Std.	153	
			9.89	4.38	2.88	2.53	2.35	2.17	705	****	240	245	300E	Slow	119	
			16.0	6.89	4.58	3.96	3.62	3.38	1065	****	345	270	2-175E	V. Slow	176	
			7.77	2.74	1.78	1.50	1.41	1.32	850	****	375	230	2-200E	Std.	153	
	16.3	5.52	3.60	3.13	2.92	2.69	1085	****	375	295	2-200E	Slow	119			
	33.3	9.98	6.28	5.26	4.96	4.64	1175●	****	375	230	2-200E	V. Slow	176			
	***	7.15	3.67	2.94	2.68	2.41	1095●	****	395	290	2-250E	Std.	153			
	8.0%	125.5	0.76	0.46	0.36	0.32	0.29	0.28	295	305	125	95	150E	Std.	153	
			1.55	0.90	0.68	0.61	0.58	0.54	290	305	125	125	150E	Slow	119	
			2.53	1.46	1.08	0.94	0.87	0.83	295	330	125	130	150E	V. Slow	176	
			0.97	0.58	0.43	0.38	0.36	0.34	340	350	155	115	175E	Std.	153	
			1.93	1.13	0.82	0.74	0.70	0.65	345	365	155	140	175E	Slow	119	
			3.36	1.97	1.37	1.25	1.18	1.11	350	400	155	150	175E	V. Slow	176	
			1.24	0.73	0.54	0.48	0.45	0.41	390	405	160	140	200E	Std.	153	
			2.56	1.44	1.07	0.94	0.90	0.86	405	450	160	165	200E	Slow	119	
			4.32	2.48	1.80	1.58	1.47	1.40	420	495	160	170	200E	V. Slow	176	
			2.17	1.17	0.85	0.74	0.70	0.67	490	520	220	160	250E	Std.	153	
			4.86	2.54	1.77	1.58	1.49	1.39	525	630	220	210	250E	Slow	119	
			8.73	4.52	3.16	2.80	2.60	2.39	555	****	220	215	250E	V. Slow	176	
			4.77	2.17	1.48	1.30	1.22	1.13	605	675	240	185	300E	Std.	153	
11.3			5.04	3.40	2.88	2.69	2.53	705	****	240	245	300E	Slow	119		
18.4			8.09	5.28	4.58	4.28	3.96	1065	****	345	270	2-175E	V. Slow	176		
10.3			3.14	2.04	1.78	1.64	1.50	850	****	375	230	2-200E	Std.	153		
21.0	6.47	4.18	3.60	3.33	3.13	1085	****	375	295	2-200E	Slow	119				
46.8	11.7	7.26	6.28	5.75	5.26	1175●	****	375	230	2-200E	V. Slow	176				
***	9.34	4.59	3.67	3.32	2.94	1095●	****	395	290	2-250E	Std.	153				

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 10. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
18,000	7.0%	150.6		1.06	0.59	0.40	0.36	0.33	0.31	240	250	105	105	150E	Slow	119
				1.75	0.89	0.62	0.52	0.49	0.46	240	260	105	110	150E	V. Slow	176
				0.67	0.36	0.26	0.22	0.20	0.19	280	290	125	95	175E	Std.	153
				1.31	0.71	0.49	0.41	0.38	0.35	285	295	125	115	175E	Slow	119
				2.24	1.20	0.81	0.70	0.65	0.58	285	305	125	125	175E	V. Slow	176
				0.84	0.46	0.32	0.27	0.25	0.24	325	330	135	115	200E	Std.	153
				1.71	0.92	0.62	0.55	0.52	0.49	330	355	135	140	200E	Slow	119
				2.91	1.50	1.02	0.89	0.82	0.75	335	370	135	140	200E	V. Slow	176
				1.40	0.72	0.49	0.43	0.40	0.36	405	420	185	135	250E	Std.	153
				3.02	1.52	1.02	0.86	0.81	0.75	425	465	185	175	250E	Slow	119
				5.48	2.67	1.76	1.46	1.37	1.28	435	545	185	180	250E	V. Slow	176
				2.68	1.24	0.80	0.70	0.64	0.58	490	525	200	155	300E	Std.	153
				6.34	2.75	1.76	1.48	1.36	1.25	550	705	200	200	300E	Slow	119
				9.86	4.38	2.78	2.37	2.21	2.04	695	****	290	225	2-175E	V. Slow	176
				3.97	1.69	1.07	0.92	0.83	0.78	685	760	315	190	2-200E	Std.	153
				8.40	3.40	2.20	1.83	1.70	1.58	770	****	315	245	2-200E	Slow	119
		15.7	5.93	3.67	3.10	2.86	2.60	930	****	315	190	2-200E	V. Slow	176		
		18.7	3.44	1.88	1.55	1.39	1.28	900	****	330	245	2-250E	Std.	153		
		38.3	7.75	4.19	3.44	3.13	2.84	1175	****	330	315	2-250E	Slow	119		
	7.5%	150.6		1.12	0.64	0.43	0.39	0.37	0.35	240	250	105	105	150E	Slow	119
				1.88	1.01	0.71	0.61	0.55	0.51	240	260	105	110	150E	V. Slow	176
				0.73	0.41	0.30	0.26	0.24	0.21	280	290	125	95	175E	Std.	153
				1.43	0.78	0.54	0.48	0.44	0.40	285	295	125	115	175E	Slow	119
				2.44	1.31	0.88	0.79	0.74	0.68	285	305	125	125	175E	V. Slow	176
				0.91	0.51	0.36	0.31	0.29	0.26	325	330	135	115	200E	Std.	153
				1.84	0.99	0.71	0.60	0.57	0.54	330	355	135	140	200E	Slow	119
				3.11	1.69	1.16	1.00	0.94	0.87	335	370	135	140	200E	V. Slow	176
				1.53	0.79	0.54	0.48	0.45	0.42	405	420	185	135	250E	Std.	153
				3.35	1.67	1.14	0.99	0.91	0.84	425	465	185	175	250E	Slow	119
				6.01	2.98	1.99	1.71	1.55	1.43	435	545	185	180	250E	V. Slow	176
				2.99	1.38	0.92	0.78	0.73	0.68	490	525	200	155	300E	Std.	153
				7.10	3.15	1.97	1.72	1.58	1.43	550	705	200	200	300E	Slow	119
			11.2	4.87	3.17	2.70	2.47	2.32	695	****	290	225	2-175E	V. Slow	176	
			4.62	1.90	1.22	1.05	0.97	0.89	685	760	315	190	2-200E	Std.	153	
			9.73	3.90	2.48	2.14	1.96	1.78	770	****	315	245	2-200E	Slow	119	
	18.9	6.79	4.30	3.54	3.25	3.03	930	****	315	190	2-200E	V. Slow	176			
	33.9	4.06	2.19	1.81	1.64	1.50	900	****	330	245	2-250E	Std.	153			
	54.0	9.51	4.99	4.07	3.70	3.31	1010●	****	330	315	2-250E	Slow	119			

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.
Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 10. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
18,000	8.0%	150.6		1.19	0.70	0.49	0.42	0.41	0.38	240	250	105	105	150E	Slow	119
				2.00	1.12	0.78	0.69	0.64	0.59	240	260	105	110	150E	V. Slow	176
				0.78	0.44	0.32	0.29	0.27	0.25	280	290	125	95	175E	Std.	153
				1.54	0.85	0.59	0.53	0.50	0.46	285	295	125	115	175E	Slow	119
				2.68	1.43	1.01	0.87	0.82	0.77	285	305	125	125	175E	V. Slow	176
				0.99	0.56	0.39	0.35	0.33	0.30	325	330	135	115	200E	Std.	153
				2.01	1.11	0.80	0.70	0.64	0.58	330	355	135	140	200E	Slow	119
				3.43	1.86	1.30	1.13	1.04	0.98	335	370	135	140	200E	V. Slow	176
				1.66	0.88	0.61	0.53	0.50	0.47	405	420	185	135	250E	Std.	153
				3.66	1.85	1.26	1.12	1.04	0.96	425	465	185	175	250E	Slow	119
				6.51	3.27	2.19	1.94	1.80	1.66	435	545	185	180	250E	V. Slow	176
				3.30	1.55	1.03	0.89	0.82	0.77	490	525	200	155	300E	Std.	153
				7.81	3.56	2.29	1.93	1.81	1.67	550	705	200	200	300E	Slow	119
				12.5	5.57	3.52	3.09	2.86	2.61	695	****	290	225	2-175E	V. Slow	176
				5.41	2.16	1.38	1.18	1.10	1.02	685	****	315	190	2-200E	Std.	153
				11.3	4.36	2.84	2.42	2.26	2.08	770	****	315	245	2-200E	Slow	119
				21.9	7.57	4.85	4.18	3.80	3.40	930	****	315	190	2-200E	V. Slow	176
				***	4.93	2.59	2.13	1.94	1.74	900	****	330	245	2-250E	Std.	153
93.9	11.2	5.86	4.83	4.31	3.95	1010●	****	330	315	2-250E	Slow	119				
20,000	7.0%	167.3		1.18	0.60	0.40	0.35	0.32	0.30	255	260	115	105	175E	Slow	119
				2.05	1.04	0.68	0.56	0.52	0.49	255	270	115	115	175E	V. Slow	176
				0.76	0.40	0.26	0.23	0.21	0.20	290	295	120	105	200E	Std.	153
				1.52	0.81	0.54	0.48	0.44	0.40	290	310	120	125	200E	Slow	119
				2.62	1.32	0.87	0.72	0.68	0.63	295	325	120	130	200E	V. Slow	176
				1.23	0.62	0.42	0.35	0.32	0.30	360	370	165	120	250E	Std.	153
				2.69	1.29	0.84	0.73	0.67	0.60	375	400	165	160	250E	Slow	119
				4.74	2.23	1.43	1.25	1.14	1.03	380	445	165	165	250E	V. Slow	176
				2.32	1.05	0.68	0.57	0.53	0.48	440	460	180	140	300E	Std.	153
				5.35	2.35	1.43	1.22	1.10	1.00	480	570	180	180	300E	Slow	119
				8.65	3.62	2.32	1.98	1.80	1.59	590	****	260	200	2-175E	V. Slow	176
				3.35	1.41	0.89	0.76	0.70	0.63	610	660	280	170	2-200E	Std.	153
				6.95	2.92	1.78	1.53	1.40	1.26	660	****	280	220	2-200E	Slow	119
				12.9	4.96	3.03	2.51	2.28	2.12	740	****	280	170	2-200E	V. Slow	176
				10.9	2.68	1.50	1.24	1.11	1.00	785	****	295	220	2-250E	Std.	153
				26.0	6.11	3.31	2.74	2.42	2.19	930	****	295	285	2-250E	Slow	119
				47.6	10.4	5.77	4.71	4.18	3.80	1060●	****	295	220	2-250E	V. Slow	176
				***	6.31	2.95	2.32	2.04	1.84	1005	****	325	255	2-300E	Std.	153
***	15.3	6.66	5.24	4.62	4.12	1400●	****	325	345	2-300E	Slow	119				

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 10. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
20,000	7.5%	167.3		1.25	0.67	0.46	0.38	0.36	0.33	255	260	115	105	175E	Slow	119	
				2.18	1.15	0.76	0.66	0.59	0.54	255	270	115	115	175E	V. Slow	176	
				0.81	0.43	0.30	0.25	0.24	0.22	290	295	120	105	200E	Std.	153	
				1.65	0.88	0.58	0.52	0.49	0.46	290	310	120	125	200E	Slow	119	
				2.81	1.43	0.97	0.83	0.76	0.70	295	325	120	130	200E	V. Slow	176	
				1.34	0.69	0.47	0.40	0.37	0.33	360	370	165	120	250E	Std.	153	
				2.91	1.44	0.95	0.82	0.76	0.70	375	400	165	160	250E	Slow	119	
				5.20	2.50	1.63	1.39	1.26	1.20	380	445	165	165	250E	V. Slow	176	
				2.55	1.17	0.76	0.65	0.59	0.55	440	460	180	140	300E	Std.	153	
				5.94	2.61	1.65	1.37	1.27	1.16	480	570	180	180	300E	Slow	119	
				9.44	4.12	2.57	2.24	2.07	1.89	590	****	260	200	2-175E	V. Slow	176	
				3.75	1.57	1.01	0.85	0.79	0.73	610	655	280	170	2-200E	Std.	153	
				7.90	3.23	2.05	1.72	1.60	1.47	660	****	280	220	2-200E	Slow	119	
				14.5	5.48	3.36	2.90	2.65	2.37	740	****	280	170	2-200E	V. Slow	176	
				14.4	3.13	1.71	1.42	1.30	1.18	785	****	295	220	2-250E	Std.	153	
				32.8	7.17	3.89	3.17	2.89	2.58	930	****	295	285	2-250E	Slow	119	
		65.1	12.2	6.78	5.52	4.99	4.42	1060●	****	295	220	2-250E	V. Slow	176			
		***	7.77	3.52	2.78	2.45	2.18	1005	****	325	255	2-300E	Std.	153			
		8.0%	167.3		1.36	0.74	0.51	0.44	0.40	0.37	255	260	115	105	175E	Slow	119
				2.29	1.25	0.84	0.74	0.68	0.63	255	270	115	115	175E	V. Slow	176	
				0.86	0.48	0.34	0.29	0.26	0.25	290	295	120	105	200E	Std.	153	
				1.76	0.94	0.66	0.57	0.54	0.51	290	310	120	125	200E	Slow	119	
				2.98	1.58	1.07	0.94	0.87	0.80	295	325	120	130	200E	V. Slow	176	
				1.45	0.74	0.51	0.45	0.42	0.39	360	370	165	120	250E	Std.	153	
				3.15	1.58	1.07	0.91	0.84	0.79	375	400	165	160	250E	Slow	119	
				5.70	2.80	1.85	1.55	1.43	1.34	380	445	165	165	250E	V. Slow	176	
				2.80	1.30	0.84	0.73	0.68	0.62	440	460	180	140	300E	Std.	153	
				6.65	2.88	1.85	1.58	1.43	1.32	480	570	180	180	300E	Slow	119	
				10.4	4.58	2.94	2.47	2.32	2.16	590	****	260	200	2-175E	V. Slow	176	
				4.20	1.78	1.12	0.97	0.89	0.81	610	655	280	170	2-200E	Std.	153	
				8.79	3.60	2.32	1.96	1.78	1.66	660	****	280	220	2-200E	Slow	119	
				17.0	6.28	3.93	3.25	3.03	2.78	740	****	280	170	2-200E	V. Slow	176	
	23.6			3.67	2.01	1.64	1.50	1.35	785	****	295	220	2-250E	Std.	153		
	44.7			8.47	4.49	3.70	3.31	3.03	930	****	295	285	2-250E	Slow	119		
	***	13.9	7.76	6.43	5.77	5.26	1060●	****	295	220	2-250E	V. Slow	176				
	***	9.77	4.25	3.28	2.95	2.61	1005	****	325	255	2-300E	Std.	153				

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

Fuse-Selection Tables

Table 11. Transformers Rated 69 kV, Three Phase

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
5,000	7.5%	25.1		0.50	0.40	0.37	0.35	0.34	0.33	365	385	245	115	40E	Std.	153	
				0.95	0.75	0.70	0.67	0.64	0.63	365	390	255	130	40E	Slow	119	
				0.76	0.60	0.55	0.53	0.51	0.50	450	475	320	140	50E	Std.	153	
				1.54	1.22	1.12	1.07	1.03	1.00	490	560	320	165	50E	Slow	119	
				2.29	1.80	1.66	1.59	1.51	1.48	485	615	320	175	50E	V. Slow	176	
				1.57	1.20	1.10	1.05	1.00	0.98	620	705	415	195	65E	Std.	153	
				2.72	2.06	1.87	1.79	1.70	1.65	685	****	415	215	65E	Slow	119	
				3.91	3.01	2.74	2.62	2.50	2.43	705	****	415	230	65E	V. Slow	176	
				2.92	2.10	1.88	1.78	1.69	1.64	875	****	495	240	80E	Std.	153	
				5.11	3.67	3.29	3.10	2.94	2.86	965	****	495	270	80E	Slow	119	
				8.00	5.83	5.20	4.91	4.64	4.51	1005	****	495	290	80E	V. Slow	176	
				10.6	5.68	4.73	4.33	3.98	3.83	1180●	****	600	320	100E	Std.	153	
		8.0%	25.1		0.56	0.45	0.42	0.40	0.38	0.38	365	385	245	115	40E	Std.	153
				1.05	0.85	0.79	0.75	0.73	0.71	365	390	255	130	40E	Slow	119	
				0.85	0.68	0.63	0.60	0.58	0.57	450	475	320	140	50E	Std.	153	
				1.72	1.37	1.27	1.22	1.17	1.14	490	560	320	165	50E	Slow	119	
				2.57	2.04	1.88	1.80	1.73	1.70	485	615	320	175	50E	V. Slow	176	
				1.79	1.37	1.26	1.20	1.15	1.12	620	705	415	195	65E	Std.	153	
				3.11	2.37	2.16	2.06	1.96	1.91	685	****	415	215	65E	Slow	119	
				4.43	3.42	3.15	3.01	2.86	2.80	705	****	415	230	65E	V. Slow	176	
				3.48	2.46	2.21	2.10	1.98	1.93	875	****	495	240	80E	Std.	153	
				6.08	4.34	3.88	3.67	3.47	3.38	965	****	495	270	80E	Slow	119	
				9.46	6.84	6.16	5.83	5.50	5.34	1005	****	495	290	80E	V. Slow	176	
				15.6	7.64	6.26	5.68	5.17	4.94	1180●	****	600	320	100E	Std.	153	
		8.5%	25.1		0.62	0.50	0.47	0.45	0.43	0.42	365	385	245	115	40E	Std.	153
				1.16	0.95	0.88	0.85	0.82	0.80	365	390	255	130	40E	Slow	119	
				0.94	0.76	0.70	0.68	0.65	0.64	450	475	320	140	50E	Std.	153	
				1.92	1.54	1.43	1.37	1.32	1.29	490	560	320	165	50E	Slow	119	
				2.85	2.29	2.12	2.04	1.96	1.92	485	615	320	175	50E	V. Slow	176	
				2.03	1.57	1.43	1.37	1.32	1.29	620	705	415	195	65E	Std.	153	
				3.55	2.72	2.49	2.37	2.26	2.21	685	****	415	215	65E	Slow	119	
				5.01	3.91	3.59	3.42	3.29	3.22	705	****	415	230	65E	V. Slow	176	
				4.26	2.92	2.60	2.46	2.34	2.27	875	****	495	240	80E	Std.	153	
				7.27	5.11	4.59	4.34	4.08	3.98	965	****	495	270	80E	Slow	119	
				11.2	8.00	7.21	6.84	6.51	6.34	1005	****	495	290	80E	V. Slow	176	

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 11. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
7,500	7.5%	37.7		0.41	0.30	0.27	0.25	0.24	0.23	290	300	215	95	50E	Std.	153	
				0.82	0.60	0.54	0.51	0.48	0.47	305	325	215	110	50E	Slow	119	
				1.20	0.87	0.78	0.73	0.69	0.67	295	320	215	115	50E	V. Slow	176	
				0.78	0.56	0.50	0.47	0.44	0.42	390	415	275	130	65E	Std.	153	
				1.31	0.93	0.82	0.77	0.73	0.70	420	455	275	145	65E	Slow	119	
				1.94	1.40	1.24	1.16	1.09	1.06	405	465	275	150	65E	V. Slow	176	
				1.27	0.89	0.79	0.74	0.69	0.67	525	580	330	160	80E	Std.	153	
				2.21	1.54	1.35	1.27	1.19	1.16	550	645	330	180	80E	Slow	119	
				3.50	2.42	2.12	1.98	1.85	1.78	560	****	330	185	80E	V. Slow	176	
				2.75	1.78	1.52	1.41	1.31	1.26	715	****	400	215	100E	Std.	153	
				4.81	3.20	2.79	2.60	2.41	2.32	750	****	400	230	100E	Slow	119	
				8.13	5.34	4.61	4.28	3.97	3.82	950	****	400	230	100E	V. Slow	176	
				4.90	2.91	2.46	2.27	2.07	2.00	900	****	480	265	125E	Std.	153	
		11.5	6.66	5.58	5.12	4.62	4.45	1045●	****	480	355	125E	Slow	119			
		16.5	9.16	7.61	7.06	6.48	6.18	1225●	****	480	280	125E	V. Slow	176			
		33.7	7.02	5.11	4.51	3.97	3.76	1135	****	550	320	150E	Std.	153			
		8.0%	37.7		0.45	0.33	0.30	0.28	0.27	0.26	290	300	215	95	50E	Std.	153
				0.90	0.67	0.60	0.57	0.54	0.53	305	325	215	110	50E	Slow	119	
				1.32	0.98	0.87	0.83	0.78	0.75	295	320	215	115	50E	V. Slow	176	
				0.86	0.62	0.56	0.53	0.50	0.48	390	415	275	130	65E	Std.	153	
				1.46	1.05	0.93	0.88	0.82	0.80	420	455	275	145	65E	Slow	119	
				2.16	1.57	1.40	1.31	1.24	1.20	405	465	275	150	65E	V. Slow	176	
				1.42	1.00	0.89	0.84	0.79	0.76	525	580	330	160	80E	Std.	153	
				2.48	1.74	1.54	1.44	1.35	1.31	550	645	330	180	80E	Slow	119	
				3.92	2.74	2.42	2.27	2.12	2.05	560	****	330	185	80E	V. Slow	176	
				3.16	2.06	1.78	1.64	1.52	1.47	715	****	400	215	100E	Std.	153	
	5.51			3.66	3.20	2.99	2.79	2.69	750	****	400	230	100E	Slow	119		
	9.30			6.16	5.34	4.94	4.61	4.45	950	****	400	230	100E	V. Slow	176		
	6.20			3.43	2.91	2.66	2.46	2.37	900	****	480	265	125E	Std.	153		
	14.0	7.84	6.66	6.02	5.58	5.35	1045●	****	480	355	125E	Slow	119				
	20.3	10.8	9.16	8.30	7.61	7.34	1225●	****	480	280	125E	V. Slow	176				
	87.0	10.3	7.02	5.91	5.11	4.76	1135	****	550	320	150E	Std.	153				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 11. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
7,500	8.5%	37.7	0.49	0.37	0.33	0.32	0.30	0.29	290	300	215	95	50E	Std.	153	
			0.98	0.74	0.67	0.64	0.60	0.59	305	325	215	110	50E	Slow	119	
			1.45	1.09	0.98	0.93	0.87	0.85	295	320	215	115	50E	V. Slow	176	
			0.95	0.70	0.62	0.59	0.56	0.54	390	415	275	130	65E	Std.	153	
			1.61	1.17	1.05	0.99	0.93	0.90	420	455	275	145	65E	Slow	119	
			2.37	1.76	1.57	1.49	1.40	1.35	405	465	275	150	65E	V. Slow	176	
			1.60	1.14	1.00	0.95	0.89	0.86	525	580	330	160	80E	Std.	153	
			2.77	1.96	1.74	1.63	1.54	1.49	550	645	330	180	80E	Slow	119	
			4.38	3.10	2.74	2.57	2.42	2.34	560	****	330	185	80E	V. Slow	176	
			3.67	2.38	2.06	1.92	1.78	1.71	715	****	400	215	100E	Std.	153	
			6.26	4.20	3.66	3.41	3.20	3.09	750	****	400	230	100E	Slow	119	
			10.7	7.09	6.16	5.72	5.34	5.14	950	****	400	230	100E	V. Slow	176	
			7.91	4.03	3.43	3.15	2.91	2.79	900	****	480	265	125E	Std.	153	
18.0	9.50	7.84	7.27	6.66	6.35	1045●	****	480	355	125E	Slow	119				
10,000	7.5%	50.2	0.51	0.35	0.30	0.28	0.26	0.25	285	295	185	95	65E	Std.	153	
			0.85	0.57	0.49	0.45	0.42	0.40	295	320	205	105	65E	Slow	119	
			1.28	0.86	0.74	0.69	0.64	0.61	300	315	205	115	65E	V. Slow	176	
			0.81	0.54	0.47	0.43	0.40	0.39	380	405	245	120	80E	Std.	153	
			1.40	0.94	0.82	0.76	0.70	0.67	370	425	245	135	80E	Slow	119	
			2.20	1.43	1.22	1.12	1.04	0.99	385	445	245	140	80E	V. Slow	176	
			1.58	0.99	0.83	0.77	0.70	0.67	495	555	300	160	100E	Std.	153	
			2.89	1.84	1.57	1.44	1.32	1.26	505	605	300	175	100E	Slow	119	
			4.77	3.01	2.56	2.35	2.14	2.06	545	****	300	170	100E	V. Slow	176	
			2.55	1.57	1.31	1.21	1.10	1.04	630	700	360	200	125E	Std.	153	
			5.80	3.38	2.83	2.55	2.34	2.23	695	****	360	265	125E	Slow	119	
			7.87	4.78	4.00	3.69	3.35	3.17	775	****	360	210	125E	V. Slow	176	
			5.51	2.71	2.17	1.95	1.75	1.68	815	****	410	240	150E	Std.	153	
			10.8	5.68	4.55	4.13	3.70	3.47	990	****	410	310	150E	Slow	119	
			18.0	9.53	7.54	6.90	6.30	5.98	1095	****	410	325	150E	V. Slow	176	
12.3	4.18	3.22	2.85	2.52	2.38	960	****	475	285	175E	Std.	153				
21.4	8.64	6.69	5.87	5.21	4.92	1110●	****	475	345	175E	Slow	119				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 11. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
10,000	8.0%	50.2		0.56	0.38	0.34	0.31	0.29	0.28	285	295	185	95	65E	Std.	153	
				0.93	0.64	0.55	0.51	0.47	0.45	295	320	205	105	65E	Slow	119	
				1.40	0.96	0.83	0.77	0.71	0.69	290	315	205	115	65E	V. Slow	176	
				0.89	0.60	0.52	0.48	0.45	0.43	380	405	245	120	80E	Std.	153	
				1.54	1.05	0.91	0.85	0.79	0.76	385	425	245	135	80E	Slow	119	
				2.42	1.60	1.38	1.27	1.17	1.12	385	445	245	140	80E	V. Slow	176	
				1.78	1.12	0.95	0.87	0.80	0.77	495	555	300	160	100E	Std.	153	
				3.20	2.08	1.77	1.63	1.50	1.44	505	605	300	175	100E	Slow	119	
				5.34	3.40	2.90	2.68	2.45	2.35	545	****	300	170	100E	V. Slow	176	
				2.91	1.78	1.51	1.37	1.26	1.21	630	700	360	200	125E	Std.	153	
				6.66	3.91	3.25	2.98	2.68	2.55	695	****	360	265	125E	Slow	119	
				9.16	5.44	4.54	4.15	3.85	3.69	775	****	360	210	125E	V. Slow	176	
				7.02	3.18	2.56	2.27	2.06	1.95	815	****	410	240	150E	Std.	153	
				13.0	6.64	5.42	4.85	4.33	4.13	990	****	410	310	150E	Slow	119	
		21.2	10.9	9.06	8.07	7.18	6.90	1095	****	410	325	150E	V. Slow	176			
		18.6	5.15	3.91	3.44	3.02	2.85	960	****	475	285	175E	Std.	153			
		28.9	10.5	8.05	7.08	6.29	5.87	1110●	****	475	345	175E	Slow	119			
		8.5%	50.2		0.61	0.42	0.37	0.35	0.32	0.31	285	295	185	95	65E	Std.	153
				1.02	0.70	0.61	0.57	0.53	0.51	295	320	205	105	65E	Slow	119	
				1.53	1.06	0.92	0.86	0.80	0.77	290	315	205	115	65E	V. Slow	176	
				0.97	0.67	0.58	0.54	0.50	0.48	380	405	245	120	80E	Std.	153	
				1.68	1.16	1.01	0.94	0.88	0.85	385	425	245	135	80E	Slow	119	
				2.65	1.78	1.54	1.43	1.32	1.27	385	445	245	140	80E	V. Slow	176	
				1.98	1.26	1.07	0.99	0.91	0.87	495	555	300	160	100E	Std.	153	
				3.53	2.32	2.00	1.84	1.70	1.63	505	605	300	175	100E	Slow	119	
				5.91	3.82	3.27	3.01	2.79	2.68	545	****	300	170	100E	V. Slow	176	
				3.28	2.00	1.70	1.57	1.44	1.37	630	****	360	200	125E	Std.	153	
				7.56	4.45	3.73	3.38	3.12	2.98	695	****	360	265	125E	Slow	119	
	10.4			6.18	5.22	4.78	4.30	4.15	775	****	360	210	125E	V. Slow	176		
	9.35			3.76	2.98	2.71	2.42	2.27	815	****	410	240	150E	Std.	153		
	16.1			7.75	6.25	5.68	5.14	4.85	990	****	410	310	150E	Slow	119		
	25.6	12.9	10.4	9.53	8.57	8.07	1095	****	410	325	150E	V. Slow	176				
	38.2	6.51	4.80	4.18	3.66	3.44	960	****	475	285	175E	Std.	153				
	45.8	12.9	9.77	8.64	7.46	7.08	1110●	****	475	345	175E	Slow	119				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 11. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
12,000	7.5%	60.2		0.63	0.41	0.35	0.32	0.29	0.28	305	325	195	100	80E	Std.	153	
				1.10	0.71	0.60	0.55	0.50	0.48	305	335	220	110	80E	Slow	119	
				1.69	1.06	0.89	0.81	0.73	0.70	300	340	220	115	80E	V. Slow	176	
				1.19	0.71	0.59	0.54	0.48	0.46	395	435	270	135	100E	Std.	153	
				2.20	1.35	1.13	1.02	0.92	0.87	405	455	275	145	100E	Slow	119	
				3.60	2.20	1.83	1.65	1.49	1.41	415	535	275	145	100E	V. Slow	176	
				1.89	1.13	.95	0.86	0.76	0.73	515	550	300	165	125E	Std.	153	
				4.19	2.39	1.93	1.75	1.57	1.47	540	705	300	220	125E	Slow	119	
				5.74	3.44	2.79	2.55	2.29	2.15	580	****	300	175	125E	V. Slow	176	
				3.48	1.79	1.46	1.33	1.20	1.13	655	730	345	200	150E	Std.	153	
				7.21	3.81	3.05	2.69	2.44	2.31	715	****	345	260	150E	Slow	119	
				11.9	6.45	5.12	4.54	4.12	3.89	855	****	345	270	150E	V. Slow	176	
				5.76	2.59	2.05	1.81	1.62	1.52	765	****	395	240	175E	Std.	153	
				11.7	5.35	4.16	3.73	3.26	3.05	900	****	395	290	175E	Slow	119	
		19.5	9.08	7.15	6.37	5.51	5.23	970	****	395	315	175E	V. Slow	176			
		13.6	3.69	2.77	2.42	2.13	1.99	885	****	430	290	200E	Std.	153			
		27.3	8.09	5.99	5.18	4.50	4.18	1020	****	430	345	200E	Slow	119			
		46.7	14.2	10.5	8.97	7.74	7.25	1280	****	430	360	200E	V. Slow	176			
		***	13.8	7.05	5.40	4.36	3.98	1130	****	450	330	250E	Std.	153			
		8.0%	60.2		0.69	0.45	0.39	0.35	0.33	0.31	305	325	195	100	80E	Std.	153
				1.19	0.79	0.67	0.61	0.56	0.54	305	335	220	110	80E	Slow	119	
				1.85	1.17	0.99	0.91	0.83	0.79	300	340	220	115	80E	V. Slow	176	
				1.31	0.80	0.67	0.61	0.55	0.52	395	435	270	135	100E	Std.	153	
				2.41	1.50	1.26	1.15	1.05	1.00	405	455	275	145	100E	Slow	119	
				3.97	2.45	2.06	1.87	1.69	1.62	415	535	275	145	100E	V. Slow	176	
				2.07	1.26	1.04	0.97	0.88	0.83	515	550	300	165	125E	Std.	153	
				4.62	2.68	2.23	2.00	1.79	1.70	540	705	300	220	125E	Slow	119	
				6.48	3.85	3.17	2.84	2.61	2.49	580	****	300	175	125E	V. Slow	176	
	3.97			2.06	1.68	1.51	1.36	1.30	655	****	345	200	150E	Std.	153		
	8.10			4.33	3.47	3.13	2.78	2.62	715	****	345	260	150E	Slow	119		
	13.7			7.18	5.98	5.30	4.64	4.44	855	****	345	270	150E	V. Slow	176		
	7.10			3.02	2.38	2.11	1.87	1.76	765	****	395	240	175E	Std.	153		
	14.1			6.29	4.92	4.30	3.84	3.62	900	****	395	290	175E	Slow	119		
	23.9	10.4	8.26	7.33	6.57	6.16	970	****	395	315	175E	V. Slow	176				
	21.5	4.50	3.36	2.87	2.51	2.33	885	****	430	290	200E	Std.	153				
	40.7	9.87	7.22	6.19	5.39	4.96	1020	****	430	345	200E	Slow	119				

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 11. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
12,000	8.5%	60.2		0.75	0.49	0.42	0.39	0.36	0.35	305	325	195	100	80E	Std.	153
				1.29	0.86	0.74	0.68	0.63	0.60	305	335	220	110	80E	Slow	119
				2.01	1.29	1.10	1.02	0.93	0.89	300	340	220	115	80E	V. Slow	176
				1.44	0.89	0.75	0.68	0.62	0.59	395	435	270	135	100E	Std.	153
				2.64	1.66	1.41	1.29	1.18	1.13	405	455	275	145	100E	Slow	119
				4.36	2.73	2.30	2.10	1.92	1.83	415	535	275	145	100E	V. Slow	176
				2.32	1.40	1.18	1.07	0.99	0.95	515	550	300	165	125E	Std.	153
				5.24	3.05	2.50	2.29	2.06	1.93	540	****	300	220	125E	Slow	119
				7.20	4.22	3.61	3.26	2.90	2.79	580	****	300	175	125E	V. Slow	176
				4.63	2.34	1.90	1.72	1.55	1.46	655	****	345	200	150E	Std.	153
				9.36	5.00	4.02	3.58	3.22	3.05	715	****	345	260	150E	Slow	119
				15.5	8.32	6.75	6.14	5.48	5.12	855	****	345	270	150E	V. Slow	176
				8.99	3.55	2.76	2.45	2.16	2.05	765	****	395	240	175E	Std.	153
				17.2	7.27	5.65	5.06	4.46	4.16	900	****	395	290	175E	Slow	119
				30.5	12.2	9.61	8.54	7.51	7.15	970	****	395	315	175E	V. Slow	176
				48.3	5.65	4.02	3.47	3.00	2.77	885	****	430	290	200E	Std.	153
68.7	12.1	8.80	7.48	6.40	5.99	1020	****	430	345	200E	Slow	119				
15,000	7.5%	75.3		0.87	0.50	0.40	0.36	0.32	0.30	300	330	200	105	100E	Std.	153
				1.63	0.94	0.76	0.67	0.59	0.56	305	335	200	115	100E	Slow	119
				2.68	1.54	1.24	1.10	0.98	0.92	305	360	200	115	100E	V. Slow	176
				1.37	0.79	0.65	0.58	0.52	0.49	405	420	240	135	125E	Std.	153
				2.98	1.61	1.28	1.14	0.98	0.93	415	460	240	175	125E	Slow	119
				4.15	2.36	1.87	1.68	1.47	1.37	435	515	240	140	125E	V. Slow	176
				2.27	1.24	0.99	0.90	0.79	0.73	505	545	275	160	150E	Std.	153
				4.85	2.50	1.96	1.77	1.59	1.48	530	655	275	205	150E	Slow	119
				8.07	4.23	3.27	2.93	2.60	2.42	570	****	275	215	150E	V. Slow	176
				3.44	1.66	1.30	1.13	1.00	0.93	590	640	315	190	175E	Std.	153
				7.08	3.38	2.60	2.25	1.99	1.84	640	****	315	230	175E	Slow	119
				11.9	5.73	4.52	3.89	3.44	3.24	715	****	315	255	175E	V. Slow	176
				5.39	2.19	1.68	1.46	1.28	1.18	680	750	345	230	200E	Std.	153
				11.7	4.66	3.53	3.04	2.65	2.43	775	****	345	280	200E	Slow	119
				20.4	7.98	5.99	5.26	4.44	4.16	930	****	345	285	200E	V. Slow	176
				66.6	4.61	3.18	2.66	2.24	2.06	880	****	360	265	250E	Std.	153
79.4	10.3	7.13	5.98	5.01	4.63	1020	****	360	350	250E	Slow	119				

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 11. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
15,000	8.0%	75.3		0.95	0.55	0.45	0.40	0.36	0.34	300	330	200	105	100E	Std.	153	
				1.77	1.05	0.85	0.76	0.67	0.63	305	335	200	115	100E	Slow	119	
				2.90	1.69	1.38	1.24	1.10	1.04	305	360	200	115	100E	V. Slow	176	
				1.51	0.88	0.72	0.65	0.58	0.54	405	420	240	135	125E	Std.	153	
				3.25	1.79	1.42	1.28	1.14	1.06	415	460	240	175	125E	Slow	119	
				4.54	2.61	2.08	1.87	1.68	1.58	435	515	240	140	125E	V. Slow	176	
				2.56	1.36	1.10	0.99	0.90	0.84	505	545	275	160	150E	Std.	153	
				5.42	2.78	2.24	1.96	1.77	1.68	530	655	275	205	150E	Slow	119	
				9.06	4.64	3.78	3.27	2.93	2.77	570	****	275	215	150E	V. Slow	176	
				3.91	1.87	1.46	1.30	1.13	1.06	590	640	315	190	175E	Std.	153	
				8.05	3.84	2.96	2.60	2.25	2.12	640	****	315	230	175E	Slow	119	
				13.5	6.57	5.09	4.52	3.89	3.62	715	****	315	255	175E	V. Slow	176	
				6.59	2.51	1.92	1.68	1.46	1.37	680	****	345	230	200E	Std.	153	
				14.3	5.39	4.01	3.53	3.04	2.85	775	****	345	280	200E	Slow	119	
		9.37	9.37	6.99	5.99	5.26	4.86	930	****	345	285	200E	V. Slow	176			
		5.78	5.78	3.80	3.18	2.66	2.43	880	****	360	265	250E	Std.	153			
		12.7	12.7	8.52	7.13	5.98	5.49	1025●	****	360	350	250E	Slow	119			
		8.5%	75.3		1.03	0.61	0.50	0.45	0.40	0.38	300	330	200	105	100E	Std.	153
				1.92	1.15	0.94	0.85	0.76	0.72	305	335	200	115	100E	Slow	119	
				3.14	1.87	1.54	1.38	1.24	1.17	305	360	200	115	100E	V. Slow	176	
				1.63	0.97	0.79	0.72	0.65	0.61	405	420	240	135	125E	Std.	153	
				3.53	2.00	1.61	1.42	1.28	1.21	415	460	240	175	125E	Slow	119	
				5.00	2.84	2.36	2.08	1.87	1.78	435	515	240	140	125E	V. Slow	176	
				2.84	1.51	1.24	1.10	0.99	0.95	505	545	275	160	150E	Std.	153	
				5.94	3.13	2.50	2.24	1.96	1.86	530	655	275	205	150E	Slow	119	
				9.99	5.30	4.23	3.78	3.27	3.08	570	****	275	215	150E	V. Slow	176	
	4.45			2.11	1.66	1.46	1.30	1.22	590	640	315	190	175E	Std.	153		
	9.21			4.30	3.38	2.96	2.60	2.41	640	****	315	230	175E	Slow	119		
	15.3			7.33	5.73	5.09	4.52	4.21	715	****	315	255	175E	V. Slow	176		
	8.10	2.87	2.19	1.92	1.68	1.57	680	****	345	230	200E	Std.	153				
	17.6	6.19	4.66	4.01	3.53	3.27	775	****	345	280	200E	Slow	119				
	29.9	10.9	7.98	6.99	5.99	5.63	930	****	345	285	200E	V. Slow	176				
	***	7.57	4.61	3.80	3.18	2.89	880	****	360	265	250E	Std.	153				
	***	15.8	10.3	8.52	7.13	6.47	1025●	****	360	350	250E	Slow	119				

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.
Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Table 11. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)							
KVA, Three-Phase	Impedance	Full Load Current, Amperes	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
									Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
18,000	7.5%	90.4	1.10	0.61	0.49	0.44	0.38	0.35	335	345	200	110	125E	Std.	153
			2.34	1.21	0.93	0.82	0.70	0.65	360	360	200	150	125E	Slow	119
			3.35	1.78	1.37	1.23	1.06	0.97	345	385	200	115	125E	V. Slow	176
			1.75	0.95	0.73	0.65	0.57	0.53	415	435	230	135	150E	Std.	153
			3.70	1.86	1.48	1.26	1.10	1.03	425	475	230	175	150E	Slow	119
			6.30	3.08	2.42	2.07	1.83	1.70	440	570	230	180	150E	V. Slow	176
			2.52	1.22	0.93	0.81	0.70	0.65	480	510	265	160	175E	Std.	153
			5.21	2.41	1.84	1.60	1.38	1.27	505	600	265	190	175E	Slow	119
			8.81	4.21	3.24	2.82	2.34	2.19	530	****	265	210	175E	V. Slow	176
			3.58	1.57	1.18	1.03	0.88	0.82	555	590	285	195	200E	Std.	153
	7.73	3.27	2.43	2.11	1.79	1.66	615	****	285	230	200E	Slow	119		
	13.7	5.63	4.16	3.61	3.02	2.83	650	****	285	240	200E	V. Slow	176		
	12.6	2.89	2.06	1.75	1.48	1.35	705	****	300	220	250E	Std.	153		
	24.5	6.47	4.63	3.84	3.22	2.93	830	****	300	290	250E	Slow	119		
	60.0	12.0	8.32	6.85	5.80	5.25	1075	****	300	300	250E	V. Slow	176		
	8.0%	90.4	1.19	0.67	0.54	0.49	0.43	0.40	335	345	200	110	125E	Std.	153
			2.51	1.33	1.03	0.92	0.80	0.74	335	360	200	150	125E	Slow	119
			3.63	1.93	1.54	1.35	1.20	1.12	345	385	200	115	125E	V. Slow	176
			1.91	1.03	0.82	0.71	0.64	0.60	415	435	230	135	150E	Std.	153
			4.06	2.05	1.65	1.45	1.22	1.14	425	475	230	175	150E	Slow	119
6.80			3.45	2.71	2.36	2.04	1.92	440	570	230	180	150E	V. Slow	176	
2.79			1.35	1.04	0.90	0.79	0.74	480	510	265	160	175E	Std.	153	
5.73			2.73	2.08	1.79	1.57	1.46	505	600	265	190	175E	Slow	119	
9.69			4.72	3.56	3.18	2.74	2.50	530	****	265	210	175E	V. Slow	176	
4.08			1.75	1.34	1.15	1.01	0.93	555	600	285	195	200E	Std.	153	
8.91	3.70	2.78	2.38	2.05	1.87	615	****	285	230	200E	Slow	119			
15.4	6.28	4.72	4.08	3.51	3.20	650	****	285	240	200E	V. Slow	176			
17.5	3.36	2.36	1.99	1.70	1.56	705	****	300	220	250E	Std.	153			
32.9	7.54	5.33	4.50	3.74	3.44	830	****	300	290	250E	Slow	119			
91.7	14.3	9.62	8.09	6.64	6.15	1075	****	300	300	250E	V. Slow	176			

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 11. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
18,000	8.5%	90.4		1.28	0.73	0.59	0.53	0.48	0.45	335	345	200	110	125E	Std.	153
				2.73	1.46	1.16	1.00	0.90	0.84	335	360	200	150	125E	Slow	119
				3.90	2.13	1.72	1.51	1.33	1.25	345	385	200	115	125E	V. Slow	176
				2.10	1.12	0.91	0.81	0.70	0.66	415	435	230	135	150E	Std.	153
				4.40	2.29	1.80	1.62	1.41	1.30	425	475	230	175	150E	Slow	119
				7.27	3.85	2.98	2.66	2.30	2.11	440	570	230	180	150E	V. Slow	176
				3.08	1.50	1.16	1.02	0.88	0.83	480	510	265	160	175E	Std.	153
				6.42	3.02	2.29	2.03	1.74	1.63	505	600	265	190	175E	Slow	119
				10.7	5.18	4.00	3.50	3.11	2.89	530	****	265	210	175E	V. Slow	176
				4.60	1.96	1.50	1.31	1.13	1.06	555	600	285	195	200E	Std.	153
				10.2	4.12	3.11	2.72	2.33	2.17	615	****	285	230	200E	Slow	119
				17.7	7.16	5.38	4.58	3.99	3.71	650	****	285	240	200E	V. Slow	176
				27.6	3.92	2.73	2.30	1.94	1.80	705	****	300	220	250E	Std.	153
				46.7	8.80	6.13	5.16	4.37	3.95	830	****	300	290	250E	Slow	119
***	16.4	11.3	9.26	7.85	7.11	890	****	300	300	250E	V. Slow	176				
20,000	7.5%	100.4		0.99	0.53	0.42	0.36	0.32	0.31	300	305	180	100	125E	Std.	153
				2.06	1.02	0.79	0.67	0.59	0.55	300	315	180	135	125E	Slow	119
				2.90	1.53	1.19	1.01	0.88	0.82	305	335	180	105	125E	V. Slow	176
				1.55	0.82	0.63	0.55	0.47	0.44	370	385	205	120	150E	Std.	153
				3.22	1.63	1.20	1.06	0.91	0.83	375	410	205	155	150E	Slow	119
				5.48	2.69	2.02	1.76	1.47	1.34	385	460	205	165	150E	V. Slow	176
				2.16	1.03	0.79	0.67	0.59	0.54	430	450	235	145	175E	Std.	153
				4.46	2.06	1.55	1.33	1.14	1.05	445	500	235	175	175E	Slow	119
				7.51	3.53	2.70	2.25	1.98	1.83	460	605	235	190	175E	V. Slow	176
				3.00	1.32	1.00	0.85	0.73	0.67	495	515	255	175	200E	Std.	153
				6.40	2.75	2.02	1.72	1.45	1.35	535	630	255	210	200E	Slow	119
				11.2	4.65	3.46	2.93	2.51	2.27	555	****	255	215	200E	V. Slow	176
				8.08	2.33	1.68	1.42	1.18	1.08	625	685	270	200	250E	Std.	153
				17.0	5.24	3.69	3.05	2.57	2.30	700	****	270	265	250E	Slow	119
37.7	9.44	6.56	5.53	4.56	4.17	820	****	270	270	250E	V. Slow	176				

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 11. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
20,000	8.0%	100.4		1.04	0.58	0.47	0.41	0.35	0.33	300	305	180	100	125E	Std.	153	
				2.23	1.14	0.88	0.76	0.65	0.61	300	315	180	135	125E	Slow	119	
				3.17	1.68	1.30	1.14	0.97	0.91	305	335	180	105	125E	V. Slow	176	
				1.68	0.90	0.68	0.61	0.53	0.48	370	385	205	120	150E	Std.	153	
				3.47	1.77	1.38	1.16	1.03	0.95	375	410	205	155	150E	Slow	119	
				5.98	2.93	2.23	1.96	1.70	1.55	385	460	205	165	150E	V. Slow	176	
				2.38	1.13	0.86	0.76	0.65	0.61	430	450	235	145	175E	Std.	153	
				4.92	2.25	1.70	1.50	1.27	1.18	445	500	235	175	175E	Slow	119	
				8.26	3.89	3.04	2.59	2.19	2.05	460	605	235	190	175E	V. Slow	176	
				3.36	1.46	1.10	0.96	0.82	0.76	495	515	255	175	200E	Std.	153	
				7.22	3.04	2.28	1.93	1.66	1.52	535	630	255	210	200E	Slow	119	
				12.6	5.26	3.90	3.31	2.83	2.62	555	****	255	215	200E	V. Slow	176	
				10.4	2.66	1.89	1.60	1.35	1.23	625	685	270	200	250E	Std.	153	
				20.8	5.98	4.23	3.54	2.93	2.69	700	****	270	265	250E	Slow	119	
		48.6	11.0	7.61	6.32	5.25	4.74	820	****	270	270	250E	V. Slow	176			
		8.5%	100.4		1.13	0.63	0.51	0.45	0.39	0.36	300	305	180	100	125E	Std.	153
				2.39	1.25	0.96	0.85	0.73	0.67	300	315	180	135	125E	Slow	119	
				3.44	1.83	1.41	1.27	1.10	1.01	305	335	180	105	125E	V. Slow	176	
				1.79	0.97	0.76	0.67	0.59	0.55	370	385	205	120	150E	Std.	153	
				3.81	1.90	1.54	1.32	1.13	1.06	375	410	205	155	150E	Slow	119	
				6.45	3.15	2.51	2.13	1.89	1.76	385	460	205	165	150E	V. Slow	176	
				2.59	1.26	0.93	0.84	0.73	0.67	430	450	235	145	175E	Std.	153	
				5.35	2.51	1.92	1.65	1.44	1.33	445	500	235	175	175E	Slow	119	
				9.08	4.37	3.34	2.93	2.46	2.25	460	605	235	190	175E	V. Slow	176	
				3.69	1.63	1.23	1.07	0.92	0.85	495	515	255	175	200E	Std.	153	
				8.09	3.40	2.54	2.19	1.85	1.72	535	630	255	210	200E	Slow	119	
				14.2	5.81	4.29	3.76	3.15	2.93	555	****	255	215	200E	V. Slow	176	
				13.8	3.04	2.15	1.82	1.54	1.42	625	****	270	200	250E	Std.	153	
	26.4			6.80	4.82	4.02	3.38	3.05	700	****	270	265	250E	Slow	119		
	65.5	12.7	8.66	7.24	6.06	5.53	820	****	270	270	250E	V. Slow	176				

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 11. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
24,000	7.5%	120.5		1.28	0.64	0.47	0.42	0.36	0.32	305	315	170	100	150E	Std.	153
				2.59	1.23	0.93	0.77	0.67	0.62	305	325	170	130	150E	Slow	119
				4.39	2.05	1.51	1.27	1.07	0.96	305	345	170	135	150E	V. Slow	176
				1.73	0.80	0.60	0.50	0.43	0.39	355	365	200	120	175E	Std.	153
				3.56	1.57	1.16	0.98	0.82	0.75	360	390	200	145	175E	Slow	119
				6.06	2.76	2.02	1.71	1.36	1.26	365	425	200	160	175E	V. Slow	176
				2.29	1.01	0.75	0.62	0.54	0.49	405	420	215	145	200E	Std.	153
				4.88	2.07	1.49	1.28	1.06	0.95	430	475	215	175	200E	Slow	119
				8.36	3.54	2.56	2.11	1.79	1.61	435	535	215	180	200E	V. Slow	176
				4.97	1.71	1.21	1.00	0.84	0.75	510	540	225	165	250E	Std.	153
				11.2	3.77	2.63	2.16	1.75	1.60	550	675	225	220	250E	Slow	119
				21.7	6.68	4.65	3.86	3.14	2.84	590	****	225	225	250E	V. Slow	176
24,000	8.0%	120.5		1.36	0.68	0.53	0.45	0.40	0.37	305	315	170	100	150E	Std.	153
				2.78	1.38	1.03	0.87	0.73	0.69	305	325	170	130	150E	Slow	119
				4.64	2.23	1.70	1.39	1.20	1.10	305	345	170	135	150E	V. Slow	176
				1.87	0.86	0.65	0.56	0.47	0.44	355	365	200	120	175E	Std.	153
				3.84	1.70	1.27	1.10	0.91	0.84	360	390	200	145	175E	Slow	119
				6.57	3.04	2.19	1.91	1.58	1.39	365	425	200	160	175E	V. Slow	176
				2.51	1.10	0.82	0.70	0.59	0.55	405	420	215	145	200E	Std.	153
				5.39	2.28	1.66	1.40	1.20	1.09	430	475	215	175	200E	Slow	119
				9.37	3.90	2.83	2.39	1.99	1.83	435	535	215	180	200E	V. Slow	176
				5.78	1.89	1.35	1.13	0.94	0.86	510	540	225	165	250E	Std.	153
				12.7	4.23	2.93	2.44	2.02	1.81	550	675	225	220	250E	Slow	119
				26.2	7.61	5.25	4.37	3.53	3.21	590	****	225	225	250E	V. Slow	176
	8.5%	120.5		1.44	0.74	0.58	0.49	0.43	0.40	305	315	170	100	150E	Std.	153
				3.01	1.51	1.11	0.97	0.81	0.74	305	325	170	130	150E	Slow	119
				5.03	2.47	1.86	1.59	1.32	1.23	305	345	170	135	150E	V. Slow	176
				2.02	0.94	0.72	0.62	0.53	0.48	355	365	200	120	175E	Std.	153
				4.11	1.88	1.41	1.20	1.03	0.93	360	390	200	145	175E	Slow	119
				7.05	3.29	2.40	2.09	1.79	1.62	365	425	200	160	175E	V. Slow	176
				2.73	1.21	0.90	0.78	0.65	0.60	405	420	215	145	200E	Std.	153
				5.90	2.48	1.82	1.56	1.33	1.23	430	475	215	175	200E	Slow	119
				10.3	4.23	3.07	2.67	2.21	2.03	435	535	215	180	200E	V. Slow	176
	6.79	2.10	1.51	1.26	1.05	0.96	510	540	225	165	250E	Std.	153			
	14.6	4.73	3.30	2.75	2.26	2.07	550	675	225	220	250E	Slow	119			
	30.5	8.49	5.94	4.83	4.07	3.65	590	****	225	225	250E	V. Slow	176			

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Table 11. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
25,000	7.5%	125.5		1.24	0.61	0.45	0.40	0.33	0.29	290	300	165	95	150E	Std.	153
				2.50	1.16	0.87	0.73	0.63	0.58	290	310	165	125	150E	Slow	119
				4.23	1.96	1.39	1.20	0.99	0.87	290	325	165	130	150E	V. Slow	176
				1.66	0.76	0.56	0.47	0.40	0.36	340	350	190	115	175E	Std.	153
				3.38	1.50	1.10	0.91	0.77	0.70	345	370	190	140	175E	Slow	119
				5.73	2.59	1.91	1.58	1.29	1.18	345	400	190	150	175E	V. Slow	176
				2.19	0.96	0.70	0.59	0.50	0.45	390	400	205	140	200E	Std.	153
				4.66	1.93	1.40	1.20	0.97	0.90	410	450	205	165	200E	Slow	119
				7.98	3.31	2.39	1.99	1.65	1.47	415	495	205	170	200E	V. Slow	176
				4.61	1.60	1.13	0.94	0.78	0.70	490	515	215	160	250E	Std.	153
				10.3	3.54	2.44	2.02	1.64	1.49	525	630	215	210	250E	Slow	119
				20.2	6.32	4.37	3.53	2.92	2.60	555	****	215	215	250E	V. Slow	176
25,000	8.0%	125.5		1.31	0.66	0.49	0.43	0.37	0.34	290	300	165	95	150E	Std.	153
				2.64	1.29	0.97	0.80	0.70	0.64	290	310	165	125	150E	Slow	119
				4.48	2.10	1.58	1.31	1.12	1.01	290	325	165	130	150E	V. Slow	176
				1.78	0.82	0.62	0.52	0.44	0.41	340	350	190	115	175E	Std.	153
				3.66	1.62	1.19	1.02	0.85	0.78	345	370	190	140	175E	Slow	119
				6.24	2.86	2.08	1.78	1.43	1.31	345	400	190	150	175E	V. Slow	176
				2.37	1.05	0.77	0.65	0.56	0.51	390	400	205	140	200E	Std.	153
				5.05	2.14	1.55	1.32	1.11	0.99	410	450	205	165	200E	Slow	119
				8.73	3.67	2.66	2.20	1.86	1.69	415	495	205	170	200E	V. Slow	176
				5.18	1.78	1.25	1.05	0.88	0.79	490	515	215	160	250E	Std.	153
				11.7	3.90	2.74	2.25	1.85	1.67	525	630	215	210	250E	Slow	119
				23.3	7.01	4.81	4.05	3.27	2.98	555	****	215	215	250E	V. Slow	176
	8.5%	125.5		1.39	0.70	0.55	0.46	0.41	0.38	290	300	165	95	150E	Std.	153
				2.86	1.42	1.06	0.90	0.75	0.71	290	310	165	125	150E	Slow	119
				4.72	2.31	1.75	1.46	1.24	1.14	290	325	165	130	150E	V. Slow	176
				1.92	0.88	0.67	0.58	0.49	0.45	340	350	190	115	175E	Std.	153
				3.93	1.75	1.31	1.13	0.95	0.86	345	370	190	140	175E	Slow	119
				6.73	3.12	2.24	1.97	1.65	1.47	345	400	190	150	175E	V. Slow	176
				2.58	1.13	0.84	0.73	0.61	0.56	390	400	205	140	200E	Std.	153
				5.55	2.34	1.71	1.44	1.24	1.14	410	450	205	165	200E	Slow	119
				9.68	4.00	2.91	2.48	2.05	1.90	415	495	205	170	200E	V. Slow	176
				6.08	1.95	1.40	1.17	0.97	0.90	490	515	215	160	250E	Std.	153
				13.3	4.39	3.02	2.54	2.10	1.90	525	630	215	210	250E	Slow	119
				27.6	7.90	5.48	4.52	3.71	3.32	555	****	215	215	250E	V. Slow	176

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 11. Transformers Rated 69 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
30,000	7.5%	150.6		2.10	0.95	0.69	0.58	0.45	0.41	240	250	135	105	150E	Slow	119	
				3.53	1.55	1.10	0.87	0.74	0.66	240	255	135	110	150E	V. Slow	176	
				1.38	0.61	0.44	0.36	0.31	0.28	280	285	160	95	175E	Std.	153	
				2.79	1.18	0.84	0.70	0.56	0.51	285	295	160	115	175E	Slow	119	
				4.81	2.05	1.39	1.18	0.93	0.84	280	305	160	125	175E	V. Slow	176	
				1.79	0.76	0.55	0.45	0.37	0.34	320	330	170	115	200E	Std.	153	
				3.78	1.52	1.09	0.90	0.75	0.66	330	355	170	140	200E	Slow	119	
				6.46	2.62	1.83	1.47	1.21	1.07	330	365	170	145	200E	V. Slow	176	
				3.45	1.23	0.86	0.70	0.57	0.51	405	415	180	135	250E	Std.	153	
				7.75	2.69	1.81	1.49	1.19	1.07	420	465	180	175	250E	Slow	119	
	14.8	4.74	3.21	2.60	2.07	1.85	430	545	180	180	250E	V. Slow	176				
30,000	8.0%	150.6		2.24	1.03	0.73	0.63	0.51	0.45	240	250	135	105	150E	Slow	119	
				3.78	1.70	1.20	0.99	0.81	0.74	240	255	135	110	150E	V. Slow	176	
				1.46	0.65	0.47	0.40	0.33	0.31	280	285	160	95	175E	Std.	153	
				2.96	1.27	0.91	0.77	0.62	0.56	285	295	160	115	175E	Slow	119	
				5.09	2.19	1.58	1.29	1.06	0.93	280	305	160	125	175E	V. Slow	176	
				1.92	0.82	0.59	0.50	0.40	0.37	320	330	170	115	200E	Std.	153	
				4.01	1.66	1.20	0.97	0.83	0.75	325	355	170	140	200E	Slow	119	
				6.99	2.83	1.99	1.65	1.35	1.21	320	365	170	145	200E	V. Slow	176	
				3.80	1.35	0.94	0.78	0.64	0.57	400	415	180	135	250E	Std.	153	
		8.52	2.93	2.02	1.64	1.33	1.19	410	465	180	175	250E	Slow	119			
		16.0	5.25	3.53	2.92	2.27	2.07	415	545	180	180	250E	V. Slow	176			
		8.5%	150.6		2.37	1.10	0.78	0.69	0.58	0.51	240	250	135	105	150E	Slow	119
				4.01	1.83	1.29	1.10	0.87	0.81	240	255	135	110	150E	V. Slow	176	
				1.57	0.70	0.51	0.44	0.36	0.33	280	285	160	95	175E	Std.	153	
				3.13	1.38	1.01	0.84	0.70	0.62	285	295	160	115	175E	Slow	119	
				5.36	2.34	1.75	1.39	1.18	1.06	280	305	160	125	175E	V. Slow	176	
				2.06	0.88	0.64	0.55	0.45	0.40	320	330	170	115	200E	Std.	153	
				4.34	1.79	1.30	1.09	0.90	0.83	325	355	170	140	200E	Slow	119	
	7.50			3.02	2.15	1.83	1.47	1.35	320	365	170	145	200E	V. Slow	176		
	4.16			1.48	1.02	0.86	0.70	0.64	400	415	180	135	250E	Std.	153		
	9.35	3.22	2.21	1.81	1.49	1.33	410	465	180	175	250E	Slow	119				
	18.0	5.80	3.97	3.21	2.60	2.27	415	545	180	180	250E	V. Slow	176				

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Table 12. Transformers Rated 138 kV, Three Phase

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
5,000	9.0%	20.9		0.59	0.49	0.46	0.44	0.43	0.42	315	325	220	105	30E	Std.	153	
				0.89	0.73	0.68	0.66	0.64	0.62	325	340	230	115	30E	Slow	119	
				1.02	0.83	0.77	0.74	0.71	0.70	450	480	305	140	40E	Std.	153	
				1.90	1.54	1.43	1.38	1.33	1.30	450	500	305	155	40E	Slow	119	
				1.60	1.27	1.17	1.13	1.08	1.06	550	595	380	170	50E	Std.	153	
				3.35	2.62	2.42	2.32	2.23	2.18	615	****	380	200	50E	Slow	119	
				4.90	3.89	3.58	3.44	3.31	3.25	625	****	380	210	50E	V. Slow	176	
				4.05	3.01	2.73	2.59	2.46	2.39	775	****	495	230	65E	Std.	153	
				7.46	5.33	4.78	4.52	4.29	4.16	890	****	495	260	65E	Slow	119	
		10.2	7.39	6.67	6.32	6.00	5.84	875	****	495	270	65E	V. Slow	176			
		9.5%	20.9		0.65	0.54	0.51	0.49	0.47	0.47	315	325	220	105	30E	Std.	153
				0.97	0.81	0.75	0.73	0.70	0.69	325	340	230	110	30E	Slow	119	
				1.13	0.92	0.86	0.83	0.79	0.78	450	480	305	140	40E	Std.	153	
				2.10	1.72	1.60	1.54	1.48	1.46	450	500	305	155	40E	Slow	119	
				1.79	1.43	1.32	1.27	1.22	1.19	550	595	380	170	50E	Std.	153	
				3.76	2.97	2.73	2.62	2.52	2.47	615	****	380	200	50E	Slow	119	
				5.50	4.36	4.03	3.89	3.74	3.66	625	****	380	210	50E	V. Slow	176	
				4.78	3.49	3.17	3.01	2.86	2.80	775	****	495	230	65E	Std.	153	
				8.89	6.27	5.62	5.33	5.04	4.91	890	****	495	260	65E	Slow	119	
		11.9	8.67	7.80	7.39	7.01	6.85	875●	****	495	270	65E	V. Slow	176			
		10.0%	20.9		0.70	0.59	0.55	0.54	0.52	0.51	315	325	220	105	30E	Std.	153
				1.06	0.89	0.83	0.81	0.78	0.77	325	340	230	110	30E	Slow	119	
				1.24	1.02	0.96	0.92	0.89	0.87	450	480	305	140	40E	Std.	153	
				2.33	1.90	1.78	1.72	1.66	1.63	450	500	305	155	40E	Slow	119	
				2.00	1.60	1.48	1.43	1.37	1.35	550	****	380	170	50E	Std.	153	
				4.23	3.35	3.10	2.97	2.85	2.79	615	****	380	200	50E	Slow	119	
				6.14	4.90	4.55	4.36	4.17	4.10	625	****	380	210	50E	V. Slow	176	
				5.76	4.05	3.65	3.49	3.33	3.25	775	****	495	230	65E	Std.	153	
	10.7			7.46	6.66	6.27	5.94	5.78	835●	****	495	260	65E	Slow	119		
	14.1	10.2	9.15	8.67	8.20	8.00	875●	****	495	270	65E	V. Slow	176				

① Self-cooled rating. OA/FA rating is 125% of nameplate; OA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 12. Transformers Rated 138 kV, Three Phase— Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)							
System Available Fault Level MVA →			Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
KVA, Three-Phase	Impedance	Full Load Current, Amperes							Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
7,500	9.0%	31.4	0.97	0.74	0.67	0.64	0.60	0.58	285	300	205	100	40E	Slow	119
			0.78	0.59	0.53	0.50	0.48	0.47	355	365	245	115	50E	Std.	153
			1.58	1.19	1.07	1.02	0.96	0.94	375	410	255	130	50E	Slow	119
			2.34	1.76	1.59	1.50	1.43	1.39	365	415	255	140	50E	V. Slow	176
			1.61	1.17	1.05	0.99	0.94	0.91	475	515	330	155	65E	Std.	153
			2.78	2.00	1.79	1.68	1.58	1.53	520	590	330	170	65E	Slow	119
			4.00	2.92	2.62	2.47	2.32	2.26	510	****	330	185	65E	V. Slow	176
			3.01	2.03	1.78	1.67	1.56	1.51	655	****	395	195	80E	Std.	153
			5.27	3.54	3.10	2.91	2.70	2.62	695	****	395	215	80E	Slow	119
			8.26	5.63	4.91	4.59	4.28	4.15	745	****	395	230	80E	V. Slow	176
			11.4	5.36	4.33	3.92	3.56	3.40	910	****	480	255	100E	Std.	153
			16.1	8.43	7.14	6.60	6.09	5.87	925●	****	480	275	100E	Slow	119
7,500	9.5%	31.4	1.05	0.81	0.74	0.71	0.67	0.66	285	300	205	100	40E	Slow	119
			0.85	0.65	0.59	0.56	0.53	0.52	355	365	245	115	50E	Std.	153
			0.72	1.30	1.19	1.13	1.07	1.05	375	410	255	130	50E	Slow	119
			2.57	1.95	1.76	1.68	1.59	1.54	365	415	255	140	50E	V. Slow	176
			1.79	1.30	1.17	1.11	1.05	1.02	475	515	330	155	65E	Std.	153
			3.11	2.24	2.00	1.89	1.79	1.73	520	590	330	170	65E	Slow	119
			4.43	3.26	2.92	2.76	2.62	2.55	510	****	330	185	65E	V. Slow	176
			3.48	2.31	2.03	1.90	1.78	1.73	655	****	395	195	80E	Std.	153
			6.08	4.04	3.54	3.32	3.10	3.00	695	****	395	215	80E	Slow	119
			9.46	6.44	5.63	5.26	4.91	4.74	745	****	395	230	80E	V. Slow	176
	15.6	6.80	5.36	4.81	4.33	4.10	910	****	480	255	100E	Std.	153		
	20.7	10.3	8.43	7.70	7.14	6.86	925●	****	480	275	100E	Slow	119		
	10.0%	31.4	1.14	0.88	0.81	0.77	0.74	0.72	285	300	205	100	40E	Slow	119
			0.92	0.71	0.65	0.62	0.59	0.57	355	365	245	115	50E	Std.	153
			1.88	1.44	1.30	1.25	1.19	1.16	375	410	255	130	50E	Slow	119
			2.80	2.14	1.95	1.85	1.76	1.72	365	415	255	140	50E	V. Slow	176
			1.98	1.45	1.30	1.24	1.17	1.14	475	515	330	155	65E	Std.	153
			3.46	2.51	2.24	2.11	2.00	1.94	520	****	330	170	65E	Slow	119
			4.89	3.62	3.26	3.10	2.92	2.83	510	****	330	185	65E	V. Slow	176
			4.07	2.64	2.31	2.17	2.03	1.96	655	****	395	195	80E	Std.	153
6.99			4.64	4.04	3.79	3.54	3.43	695	****	395	215	80E	Slow	119	
10.9			7.29	6.44	6.02	5.63	5.44	745	****	395	230	80E	V. Slow	176	
21.9	8.69	6.80	6.01	5.36	5.08	865●	****	480	255	100E	Std.	153			
27.0	12.8	10.3	9.28	8.43	8.07	925●	****	480	275	100E	Slow	119			

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 12. Transformers Rated 138 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
10,000	9.0%	41.8	1.02	0.73	0.65	0.60	0.57	0.55	270	285	190	100	50E	Slow	119	
			1.50	1.06	0.94	0.87	0.82	0.79	265	280	190	105	50E	V. Slow	176	
			0.99	0.68	0.60	0.56	0.52	0.50	345	365	245	115	65E	Std.	153	
			1.68	1.15	1.00	0.93	0.87	0.83	370	400	250	130	65E	Slow	119	
			2.47	1.72	1.50	1.40	1.30	1.25	360	395	.250	135	65E	V. Slow	176	
			1.67	1.11	0.96	0.89	0.83	0.80	465	505	295	145	80E	Std.	153	
			2.91	1.91	1.65	1.54	1.43	1.37	480	545	295	160	80E	Slow	119	
			4.59	3.02	2.60	2.42	2.24	2.15	485	630	295	165	80E	V. Slow	176	
			3.92	2.31	1.94	1.78	1.62	1.54	625	****	360	190	100E	Std.	153	
			6.60	4.09	3.45	3.20	2.95	2.83	645	****	360	210	100E	Slow	119	
			11.3	6.89	5.79	5.34	4.86	4.68	740	****	360	205	100E	V. Slow	176	
			8.97	3.91	3.20	2.91	2.61	2.50	785	****	425	240	125E	Std.	153	
			20.3	9.15	7.38	6.66	5.93	5.67	965	****	425	320	125E	Slow	119	
			31.0	12.8	10.1	9.16	8.12	7.71	970●	****	425	250	125E	V. Slow	176	
			***	15.2	8.75	7.02	5.75	5.27	990●	****	490	290	150E	Std.	153	
***	26.7	13.2	9.94	7.76	7.02	990●	****	490	290	150E	Std.	153				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 12. Transformers Rated 138 kV, Three Phase— Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
10,000	9.5%	41.8		1.10	0.80	0.71	0.67	0.63	0.60	270	285	190	100	50E	Slow	119	
				1.63	1.17	1.03	0.97	0.90	0.87	265	280	190	105	50E	V. Slow	176	
				1.08	0.76	0.66	0.62	0.58	0.56	345	365	245	115	65E	Std.	153	
				1.84	1.27	1.11	1.04	0.97	0.93	370	400	250	130	65E	Slow	119	
				2.69	1.89	1.66	1.55	1.45	1.40	360	395	.250	135	65E	V. Slow	176	
				1.84	1.23	1.07	0.99	0.92	0.89	465	505	295	145	80E	Std.	153	
				3.21	2.13	1.85	1.72	1.60	1.54	480	545	295	160	80E	Slow	119	
				5.09	3.37	2.92	2.70	2.51	2.42	485	****	295	165	80E	V. Slow	176	
				4.56	2.63	2.21	2.03	1.86	1.78	625	****	360	190	100E	Std.	153	
				7.40	4.62	3.92	3.61	3.33	3.20	645	****	360	210	100E	Slow	119	
				12.9	7.82	6.62	6.06	5.57	5.34	740	****	360	205	100E	V. Slow	176	
				12.0	4.65	3.74	3.37	3.06	2.91	785	****	425	240	125E	Std.	153	
		27.0	10.7	8.62	7.73	7.03	6.66	850●	****	425	320	125E	Slow	119			
		42.2	15.3	12.1	10.6	9.66	9.16	970●	****	425	250	125E	V. Slow	176			
		10.0%	41.8		1.19	0.87	0.77	0.73	0.69	0.67	270	285	190	100	50E	Slow	119
				1.76	1.27	1.13	1.06	1.00	0.97	265	280	190	105	50E	V. Slow	176	
				1.17	0.83	0.73	0.68	0.64	0.62	345	365	245	115	65E	Std.	153	
				2.00	1.40	1.23	1.15	1.07	1.04	370	400	250	130	65E	Slow	119	
				2.92	2.07	1.83	1.72	1.60	1.55	360	395	.250	135	65E	V. Slow	176	
				2.03	1.36	1.19	1.11	1.03	0.99	465	505	295	145	80E	Std.	153	
				3.54	2.37	2.06	1.91	1.78	1.72	480	545	295	160	80E	Slow	119	
				5.63	3.75	3.26	3.02	2.81	2.70	485	****	295	165	80E	V. Slow	176	
				5.36	2.99	2.52	2.31	2.12	2.03	625	****	360	190	100E	Std.	153	
				8.43	5.23	4.43	4.09	3.76	3.61	645	****	360	210	100E	Slow	119	
	14.5			8.79	7.51	6.89	6.34	6.06	740	****	360	205	100E	V. Slow	176		
	16.8			5.62	4.39	3.91	3.56	3.37	785	****	425	240	125E	Std.	153		
	38.0	12.9	10.2	9.15	8.07	7.73	850●	****	425	320	125E	Slow	119				
	61.3	18.8	14.3	12.8	11.3	10.6	970●	****	425	250	125E	V. Slow	176				
	***	57.2	21.4	15.2	11.2	9.94	990●	****	490	290	150E	Std.	153				

① Self-cooled rating. OA/FA rating is 125% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Table 12. Transformers Rated 138 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
12,000	9.0%	50.2		0.76	0.50	0.43	0.40	0.37	0.36	285	295	185	95	65E	Std.	153	
				1.27	0.83	0.72	0.66	0.61	0.58	295	320	205	105	65E	Slow	119	
				1.89	1.25	1.08	1.00	0.92	0.88	290	315	205	115	65E	V. Slow	176	
				1.23	0.80	0.68	0.63	0.58	0.55	380	405	245	120	80E	Std.	153	
				2.13	1.37	1.18	1.09	1.01	0.96	385	425	245	135	80E	Slow	119	
				3.37	2.15	1.82	1.67	1.53	1.46	385	445	245	145	80E	V. Slow	176	
				2.63	1.54	1.29	1.18	1.07	1.02	495	555	300	160	100E	Std.	153	
				4.62	2.83	2.38	2.17	1.98	1.88	505	605	300	175	100E	Slow	119	
				7.82	4.68	3.91	3.55	3.25	3.09	545	****	300	170	100E	V. Slow	176	
				4.65	2.50	2.05	1.87	1.68	1.61	630	****	355	200	125E	Std.	153	
				10.7	5.67	4.55	4.13	3.69	3.46	695	****	355	265	125E	Slow	119	
				15.3	7.71	6.36	5.68	5.18	4.91	775	****	355	210	125E	V. Slow	176	
				26.7	5.27	3.87	3.42	2.95	2.79	815	****	405	240	150E	Std.	153	
				33.4	10.4	7.96	7.10	6.17	5.84	880●	****	405	310	150E	Slow	119	
		52.4	17.4	13.4	11.7	10.3	9.8	1095●	****	405	325	150E	V. Slow	176			
		***	11.4	6.84	5.60	4.73	4.34	960	****	450	285	175E	Std.	153			
		***	20.1	13.6	11.5	9.66	8.99	1110●	****	450	345	175E	Slow	119			
		9.5%	50.2		0.82	0.55	0.48	0.44	0.41	0.39	285	295	185	95	65E	Std.	153
				1.38	0.91	0.79	0.73	0.67	0.65	295	320	205	105	65E	Slow	119	
				2.04	1.37	1.19	1.10	1.02	0.98	290	315	205	115	65E	V. Slow	176	
				1.34	0.87	0.75	0.69	0.64	0.61	380	405	245	120	80E	Std.	153	
				2.33	1.51	1.30	1.20	1.11	1.07	385	425	245	135	80E	Slow	119	
				3.69	2.37	2.02	1.86	1.70	1.64	385	445	245	145	80E	V. Slow	176	
				2.93	1.74	1.44	1.32	1.20	1.15	495	555	300	160	100E	Std.	153	
				5.12	3.14	2.65	2.43	2.22	2.12	505	605	300	175	100E	Slow	119	
				8.59	5.22	4.38	4.00	3.64	3.47	545	****	300	170	100E	V. Slow	176	
				5.40	2.84	2.33	2.09	1.92	1.82	630	****	355	200	125E	Std.	153	
				12.6	6.47	5.26	4.67	4.24	4.03	695	****	355	265	125E	Slow	119	
	18.2			8.91	7.23	6.54	5.80	5.56	775	****	355	210	125E	V. Slow	176		
	50.4			6.64	4.66	4.03	3.53	3.30	815	****	405	240	150E	Std.	153		
	47.3			12.5	9.41	8.18	7.32	6.88	880●	****	405	310	150E	Slow	119		

① Self-cooled rating. OA/FA rating is 133% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 12. Transformers Rated 138 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
12,000	10.0%	50.2	0.88	0.60	0.52	0.48	0.45	0.43	285	295	185	95	65E	Std.	153	
			1.48	1.00	0.87	0.80	0.74	0.72	295	320	205	105	65E	Slow	119	
			2.20	1.50	1.30	1.21	1.11	1.08	290	315	205	115	65E	V. Slow	176	
			1.46	0.96	0.83	0.77	0.71	0.68	380	405	245	120	80E	Std.	153	
			2.54	1.65	1.43	1.32	1.22	1.18	385	425	245	135	80E	Slow	119	
			4.01	2.60	2.24	2.07	1.90	1.82	385	445	245	145	80E	V. Slow	176	
			3.25	1.94	1.62	1.48	1.35	1.29	495	555	300	160	100E	Std.	153	
			5.65	3.45	2.95	2.71	2.49	2.38	505	****	300	175	100E	Slow	119	
			9.55	5.79	4.86	4.48	4.08	3.91	545	****	300	170	100E	V. Slow	176	
			6.49	3.20	2.61	2.39	2.15	2.05	630	****	355	200	125E	Std.	153	
			14.8	7.38	5.93	5.40	4.82	4.55	695	****	355	265	125E	Slow	119	
			21.8	10.1	8.12	7.39	6.72	6.36	775	****	355	210	125E	V. Slow	176	
			***	8.75	5.75	4.81	4.19	3.87	815	****	405	240	150E	Std.	153	
			77.1	15.4	11.2	9.7	8.50	7.96	880●	****	405	310	150E	Slow	119	
15,000	9.0%	62.8	0.89	0.55	0.46	0.42	0.39	0.37	290	310	185	95	80E	Std.	153	
			1.54	0.96	0.81	0.74	0.67	0.64	290	320	200	110	80E	Slow	119	
			2.42	1.46	1.21	1.10	0.99	0.94	285	320	200	110	80E	V. Slow	176	
			1.78	1.02	0.83	0.75	0.67	0.63	375	415	240	130	100E	Std.	153	
			3.20	1.88	1.55	1.40	1.26	1.20	385	430	240	140	100E	Slow	119	
			5.34	3.09	2.54	2.29	2.06	1.95	395	490	240	140	100E	V. Slow	176	
			2.91	1.61	1.30	1.18	1.04	1.00	490	525	280	160	125E	Std.	153	
			6.66	3.46	2.80	2.49	2.23	2.09	515	****	280	210	125E	Slow	119	
			9.16	4.91	3.97	3.59	3.17	2.95	550	****	280	165	125E	V. Slow	176	
			7.02	2.79	2.15	1.88	1.68	1.58	625	****	325	195	150E	Std.	153	
			13.0	5.84	4.49	4.00	3.47	3.26	675	****	325	250	150E	Slow	119	
			21.2	9.81	7.43	6.72	5.98	5.58	795	****	325	260	150E	V. Slow	176	
			18.6	4.34	3.17	2.75	2.38	2.20	730	****	360	230	175E	Std.	153	
			28.9	8.99	6.61	5.61	4.92	4.56	830	****	360	275	175E	Slow	119	
			63.6	14.9	11.0	9.56	8.26	7.62	900●	****	360	305	175E	V. Slow	176	
			***	7.80	4.75	3.99	3.36	3.07	840	****	395	280	200E	Std.	153	
***	16.6	10.6	8.73	7.22	6.56	960●	****	395	335	200E	Slow	119				

① Self-cooled rating. OA/FA rating is 133% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 12. Transformers Rated 138 kV, Three Phase— Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
15,000	9.5%	62.8		0.96	0.60	0.51	0.46	0.42	0.40	290	310	185	95	80E	Std.	153	
				1.65	1.05	0.89	0.81	0.74	0.70	290	320	200	110	80E	Slow	119	
				2.60	1.60	1.33	1.21	1.10	1.05	285	320	200	110	80E	V. Slow	176	
				1.94	1.12	0.92	0.83	0.75	0.70	375	415	240	130	100E	Std.	153	
				3.45	2.08	1.71	1.55	1.40	1.33	385	430	240	140	100E	Slow	119	
				5.79	3.40	2.81	2.54	2.29	2.17	395	490	240	140	100E	V. Slow	176	
				3.20	1.78	1.45	1.30	1.18	1.11	490	525	280	160	125E	Std.	153	
				7.38	3.91	3.15	2.80	2.49	2.36	515	****	280	210	125E	Slow	119	
				10.1	5.44	4.35	3.97	3.59	3.39	550	****	280	165	125E	V. Slow	176	
				8.75	3.18	2.45	2.15	1.88	1.77	625	****	325	195	150E	Std.	153	
				15.4	6.64	5.19	4.49	4.00	3.74	675	****	325	250	150E	Slow	119	
				24.7	10.8	8.67	7.43	6.72	6.39	795	****	325	260	150E	V. Slow	176	
				33.1	5.15	3.71	3.17	2.75	2.55	730	****	360	230	175E	Std.	153	
				40.3	10.5	7.56	6.61	5.61	5.26	830	****	360	275	175E	Slow	119	
		98.0	17.6	12.7	11.0	9.56	8.92	900●	****	360	305	175E	V. Slow	176			
		***	10.7	6.01	4.75	3.99	3.63	840	****	395	280	200E	Std.	153			
		***	22.1	13.1	10.6	8.73	7.87	960●	****	395	335	200E	Slow	119			
		10.0%	62.8		1.03	0.65	0.55	0.51	0.46	0.44	290	310	185	95	80E	Std.	153
				1.78	1.14	0.96	0.89	0.81	0.78	290	320	200	110	80E	Slow	119	
				2.81	1.74	1.46	1.33	1.21	1.15	285	320	200	110	80E	V. Slow	176	
				2.12	1.23	1.02	0.92	0.83	0.79	375	415	240	130	100E	Std.	153	
				3.76	2.27	1.88	1.71	1.55	1.48	385	430	240	140	100E	Slow	119	
				6.34	3.73	3.09	2.81	2.54	2.41	395	490	240	140	100E	V. Slow	176	
				3.56	1.96	1.61	1.45	1.30	1.24	490	525	280	160	125E	Std.	153	
				8.07	4.34	3.46	3.15	2.80	2.62	515	****	280	210	125E	Slow	119	
				11.3	5.99	4.91	4.35	3.97	3.78	550	****	280	165	125E	V. Slow	176	
				11.2	3.65	2.79	2.45	2.15	2.02	625	****	325	195	150E	Std.	153	
				18.7	7.54	5.84	5.19	4.49	4.25	675	****	325	250	150E	Slow	119	
	29.5			12.6	9.81	8.67	7.43	7.07	795	****	325	260	150E	V. Slow	176		
	65.5			6.21	4.34	3.71	3.17	2.96	730	****	360	230	175E	Std.	153		
	65.9			12.4	8.99	7.56	6.61	6.12	830	****	360	275	175E	Slow	119		
	***	21.1	14.9	12.7	11.0	10.2	900●	****	360	305	175E	V. Slow	176				
	***	15.7	7.80	6.01	4.75	4.38	840	****	395	280	200E	Std.	153				
	***	30.9	16.6	13.1	10.6	9.6	960●	****	395	335	200E	Slow	119				

① Self-cooled rating. OA/FA rating is 133% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 12. Transformers Rated 138 kV, Three Phase— Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)									
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic		
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.	
18,000	9.0%	75.3		1.35	0.75	0.60	0.53	0.47	0.44	300	330	200	105	100E	Std.	153	
				2.49	1.40	1.13	1.01	0.88	0.83	305	335	200	115	100E	Slow	119	
				4.08	2.29	1.84	1.63	1.43	1.35	305	360	200	115	100E	V. Slow	176	
				2.15	1.18	0.95	0.84	0.74	0.70	405	420	235	135	125E	Std.	153	
				4.82	2.49	1.95	1.72	1.50	1.39	415	460	235	175	125E	Slow	119	
				6.72	3.59	2.80	2.51	2.20	2.02	435	515	235	140	125E	V. Slow	176	
				4.19	1.88	1.47	1.31	1.15	1.07	505	545	270	160	150E	Std.	153	
				8.50	4.00	3.07	2.64	2.35	2.19	530	****	270	205	150E	Slow	119	
				14.2	6.72	5.16	4.48	3.96	3.68	570	****	270	215	150E	V. Slow	176	
				7.61	2.75	2.06	1.78	1.55	1.43	590	640	300	190	175E	Std.	153	
				15.2	5.61	4.18	3.66	3.10	2.89	640	****	300	230	175E	Slow	119	
				26.0	9.56	7.18	6.24	5.30	4.98	715	****	300	255	175E	V. Slow	176	
				27.3	3.99	2.78	2.37	2.03	1.86	680	****	330	230	200E	Std.	153	
				46.2	8.73	6.03	5.05	4.28	3.92	775	****	330	280	200E	Slow	119	
		90.9	15.1	10.6	8.73	7.40	6.78	930	****	330	285	200E	V. Slow	176			
		***	16.3	7.16	5.18	4.09	3.65	880	****	350	265	250E	Std.	153			
		***	31.1	15.2	11.7	9.19	8.17	1025●	****	350	350	250E	Slow	119			
		9.5%	75.3		1.46	0.81	0.65	0.58	0.52	0.49	300	330	200	105	100E	Std.	153
				2.67	1.53	1.24	1.11	0.99	0.92	305	335	200	115	100E	Slow	119	
				4.41	2.49	2.02	1.80	1.60	1.50	305	360	200	115	100E	V. Slow	176	
				2.35	1.28	1.03	0.93	0.82	0.77	405	420	235	135	125E	Std.	153	
				5.31	2.74	2.18	1.90	1.69	1.58	415	460	235	175	125E	Slow	119	
				7.28	3.91	3.10	2.75	2.46	2.31	435	515	235	140	125E	V. Slow	176	
				4.71	2.10	1.64	1.43	1.29	1.21	505	545	270	160	150E	Std.	153	
				9.51	4.41	3.39	3.00	2.60	2.45	530	****	270	205	150E	Slow	119	
				15.8	7.29	5.85	5.01	4.40	4.14	570	****	270	215	150E	V. Slow	176	
				9.32	3.09	2.32	2.01	1.74	1.63	590	****	300	190	175E	Std.	153-	
				17.6	6.45	4.80	4.10	3.57	3.28	640	****	300	230	175E	Slow	119	
	31.3			10.7	8.03	7.04	6.08	5.56	715	****	300	255	175E	V. Slow	176		
	53.7			4.62	3.26	2.72	2.30	2.14	680	****	330	230	200E	Std.	153		
	73.2			10.3	7.00	5.88	4.90	4.53	775	****	330	280	200E	Slow	119		
	***	17.9	12.2	10.3	8.40	7.79	805●	****	330	285	200E	V. Slow	176				
	***	28.1	9.73	6.73	4.99	4.41	880	****	350	265	250E	Std.	153				
	***	47.5	19.5	14.6	11.2	9.8	1025●	****	350	350	250E	Slow	119				

① Self-cooled rating. OA/FA rating is 133% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to "How to Use the Fuse Selection Tables" on page 43.

TABLE CONTINUED ►

Table 12. Transformers Rated 138 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
18,000	10.0%	75.3		1.57	0.89	0.72	0.64	0.57	0.54	300	330	200	105	100E	Std.	153
				2.87	1.65	1.36	1.22	1.09	1.03	305	335	200	115	100E	Slow	119
				4.74	2.72	2.21	1.98	1.76	1.66	305	360	200	115	100E	V. Slow	176
				2.53	1.40	1.13	1.01	0.92	0.86	405	420	235	135	125E	Std.	153
				5.76	3.04	2.40	2.14	1.85	1.75	415	460	235	175	125E	Slow	119
				7.81	4.20	3.45	3.02	2.71	2.56	435	515	235	140	125E	V. Slow	176
				5.43	2.32	1.80	1.61	1.41	1.34	505	545	270	160	150E	Std.	153
				10.7	4.97	3.83	3.33	2.93	2.71	530	****	270	205	150E	Slow	119
				17.8	8.27	6.48	5.72	4.87	4.56	570	****	270	215	150E	V. Slow	176
				12.0	3.53	2.60	2.26	1.97	1.82	590	****	300	190	175E	Std.	153
				21.0	7.23	5.37	4.68	4.01	3.75	640	****	300	230	175E	Slow	119
				40.1	12.1	9.14	7.80	6.88	6.41	715	****	300	255	175E	V. Slow	176
				***	5.60	3.73	3.17	2.65	2.44	680	****	330	230	200E	Std.	153
				***	12.1	8.16	6.78	5.72	5.22	775	****	330	280	200E	Slow	119
***	20.9	14.3	11.7	9.99	9.05	805●	****	330	285	200E	V. Slow	176				
***	***	14.1	9.04	6.38	5.48	855●	****	350	265	250E	Std.	153				
20,000	9.0%	83.7		1.18	0.63	0.50	0.44	0.38	0.36	265	290	165	95	100E	Std.	153
				2.17	1.20	0.94	0.83	0.72	0.67	265	295	180	105	100E	Slow	119
				3.55	1.95	1.54	1.35	1.18	1.10	265	310	180	105	100E	V. Slow	176
				1.87	1.00	0.79	0.70	0.62	0.58	360	375	210	120	125E	Std.	153
				4.13	2.09	1.61	1.39	1.23	1.14	365	395	210	160	125E	Slow	119
				5.68	2.95	2.36	2.02	1.80	1.68	380	430	210	125	125E	V. Slow	176
				3.42	1.58	1.24	1.07	0.96	0.90	450	475	245	145	150E	Std.	153
				7.10	3.26	2.50	2.19	1.87	1.77	465	535	245	185	150E	Slow	119
				11.7	5.58	4.23	3.68	3.11	2.93	490	****	245	195	150E	V. Slow	176
				5.60	2.20	1.66	1.43	1.23	1.13	525	560	270	170	175E	Std.	153
				11.5	4.56	3.38	2.89	2.45	2.25	560	****	270	210	175E	Slow	119
				19.0	7.62	5.73	4.98	4.28	3.89	600	****	270	230	175E	V. Slow	176
				13.0	3.07	2.19	1.86	1.60	1.46	605	****	295	210	200E	Std.	153
				26.1	6.56	4.66	3.92	3.33	3.04	675	****	295	250	200E	Slow	119
				45.2	11.4	7.98	6.78	5.71	5.26	745	****	295	260	200E	V. Slow	176
				***	8.38	4.61	3.65	2.95	2.66	775	****	315	240	250E	Std.	153
***	17.7	10.3	8.17	6.61	5.98	950	****	315	315	250E	Slow	119				
***	39.7	20.2	15.5	12.3	11.0	1045●	****	315	325	250E	V. Slow	176				

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.
Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 12. Transformers Rated 138 kV, Three Phase— Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
20,000	9.5%	83.7		1.26	0.69	0.55	0.48	0.42	0.40	265	290	165	95	100E	Std.	153
				2.32	1.30	1.04	0.91	0.80	0.75	265	295	180	105	100E	Slow	119
				3.82	2.11	1.68	1.49	1.31	1.23	265	310	180	105	100E	V. Slow	176
				2.00	1.08	0.87	0.76	0.68	0.64	360	375	210	120	125E	Std.	153
				4.45	2.30	1.77	1.56	1.35	1.27	365	395	210	160	125E	Slow	119
				6.18	3.28	2.59	2.28	1.96	1.86	380	430	210	125	125E	V. Slow	176
				3.76	1.72	1.35	1.20	1.04	0.99	450	475	245	145	150E	Std.	153
				7.75	3.60	2.75	2.42	2.10	1.93	465	535	245	185	150E	Slow	119
				13.0	6.17	4.60	4.10	3.53	3.22	490	****	245	195	150E	V. Slow	176
				6.51	2.46	1.84	1.61	1.38	1.28	525	560	270	170	175E	Std.	153
				12.9	5.09	3.80	3.23	2.79	2.56	560	****	270	210	175E	Slow	119
				22.2	8.59	6.49	5.47	4.81	4.46	600	****	270	230	175E	V. Slow	176
				17.9	3.49	2.48	2.11	1.79	1.66	605	****	295	210	200E	Std.	153
				33.5	7.53	5.31	4.47	3.78	3.48	675	****	295	250	200E	Slow	119
		62.0	13.2	9.21	7.69	6.46	5.92	745	****	295	260	200E	V. Slow	176		
		****	11.6	5.63	4.31	3.45	3.12	775	****	315	240	250E	Std.	153		
		****	23.0	12.4	9.67	7.75	7.00	865●	****	315	315	250E	Slow	119		
		****	55.5	25.5	18.9	14.8	13.1	1045●	****	315	325	250E	V. Slow	176		
	10.0%	83.7		1.35	0.75	0.60	0.53	0.47	0.44	265	290	165	95	100E	Std.	153
				2.49	1.40	1.13	1.01	0.88	0.83	265	295	180	105	100E	Slow	119
				4.08	2.29	1.84	1.63	1.43	1.35	265	310	180	105	100E	V. Slow	176
				2.15	1.18	0.95	0.84	0.74	0.70	360	375	210	120	125E	Std.	153
				4.82	2.49	1.95	1.72	1.50	1.39	365	395	210	160	125E	Slow	119
				6.72	3.59	2.80	2.51	2.20	2.02	380	430	210	125	125E	V. Slow	176
				4.19	1.88	1.47	1.31	1.15	1.07	450	475	245	145	150E	Std.	153
				8.50	4.00	3.07	2.64	2.35	2.19	465	535	245	185	150E	Slow	119
				14.2	6.72	5.16	4.48	3.96	3.68	490	****	245	195	150E	V. Slow	176
				7.61	2.75	2.06	1.78	1.55	1.43	525	560	270	170	175E	Std.	153
			15.2	5.61	4.18	3.66	3.10	2.89	560	****	270	210	175E	Slow	119	
			26.0	9.56	7.18	6.24	5.30	4.98	600	****	270	230	175E	V. Slow	176	
			27.3	3.99	2.78	2.37	2.03	1.86	605	****	295	210	200E	Std.	153	
			46.2	8.73	6.03	5.05	4.28	3.92	675	****	295	250	200E	Slow	119	
	90.9	15.1	10.6	8.73	7.40	6.78	745	****	295	260	200E	V. Slow	176			
	****	16.3	7.16	5.18	4.09	3.65	775	****	315	240	250E	Std.	153			
	****	31.1	15.2	11.7	9.19	8.17	865	****	315	315	250E	Slow	119			

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

● Index applies to wye-wye connected transformers only.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Table 12. Transformers Rated 138 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
24,000	9.0%	100.4	1.49	0.76	0.60	0.52	0.46	0.43	300	305	175	100	125E	Std.	153	
			3.23	1.56	1.18	0.99	0.87	0.80	300	315	175	135	125E	Slow	119	
			4.49	2.28	1.74	1.49	1.29	1.19	305	335	175	105	125E	V. Slow	176	
			2.53	1.20	0.93	0.80	0.68	0.63	370	385	205	120	150E	Std.	153	
			5.36	2.42	1.82	1.61	1.35	1.21	375	410	205	155	150E	Slow	119	
			8.97	4.10	3.02	2.64	2.19	2.03	385	460	205	165	150E	V. Slow	176	
			3.86	1.61	1.18	1.01	0.85	0.79	430	450	225	145	175E	Std.	153	
			7.93	3.23	2.33	2.01	1.68	1.56	445	500	225	175	175E	Slow	119	
			13.3	5.47	4.09	3.47	2.99	2.73	460	605	225	190	175E	V. Slow	176	
			6.43	2.11	1.53	1.30	1.09	1.00	495	515	245	175	200E	Std.	153	
			14.0	4.47	3.17	2.69	2.24	2.04	535	630	245	210	200E	Slow	119	
			23.5	7.69	5.48	4.52	3.84	3.49	555	****	245	215	200E	V. Slow	176	
	****	4.31	2.79	2.28	1.87	1.69	625	****	260	200	250E	Std.	153			
	****	9.67	6.25	5.09	4.14	3.72	700	****	260	265	250E	Slow	119			
	****	18.8	11.6	9.12	7.46	6.61	820	****	260	270	250E	V. Slow	176			
	9.5%	100.4	1.59	0.83	0.65	0.56	0.50	0.47	300	305	175	100	125E	Std.	153	
			3.42	1.69	1.29	1.11	0.95	0.89	300	315	175	135	125E	Slow	119	
			4.85	2.48	1.88	1.65	1.40	1.31	305	335	175	105	125E	V. Slow	176	
			2.75	1.29	1.00	0.88	0.74	0.69	370	385	205	120	150E	Std.	153	
			5.76	2.61	1.97	1.75	1.52	1.39	375	410	205	155	150E	Slow	119	
			9.67	4.42	3.30	2.88	2.48	2.25	385	460	205	165	150E	V. Slow	176	
			4.26	1.75	1.31	1.11	0.95	0.87	430	450	225	145	175E	Std.	153	
			8.81	3.59	2.62	2.22	1.89	1.71	445	500	225	175	175E	Slow	119	
			14.7	6.12	4.55	3.79	3.30	3.06	460	605	225	190	175E	V. Slow	176	
7.58			2.32	1.69	1.43	1.21	1.11	495	515	245	175	200E	Std.	153		
16.0			4.93	3.56	2.99	2.49	2.29	535	630	245	210	200E	Slow	119		
27.9			8.49	6.02	5.14	4.24	3.92	555	****	245	215	200E	V. Slow	176		
****	5.04	3.21	2.59	2.11	1.91	625	****	260	200	250E	Std.	153				
****	11.3	7.19	5.83	4.75	4.27	700	****	260	265	250E	Slow	119				
****	22.2	13.6	10.7	8.52	7.68	820	****	260	270	250E	V. Slow	176				

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 12. Transformers Rated 138 kV, Three Phase— Continued

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
24,000	10.0%	100.4	1.68	0.90	0.70	0.62	0.54	0.51	300	305	175	100	125E	Std.	153	
			3.69	1.82	1.39	1.23	1.04	0.96	300	315	175	135	125E	Slow	119	
			5.18	2.66	2.02	1.80	1.56	1.42	305	335	175	105	125E	V. Slow	176	
			2.95	1.39	1.07	0.96	0.83	0.76	370	385	205	120	150E	Std.	153	
			6.17	2.86	2.19	1.87	1.66	1.55	375	410	205	155	150E	Slow	119	
			10.3	4.72	3.68	3.11	2.74	2.53	385	460	205	165	150E	V. Slow	176	
			4.73	1.92	1.43	1.23	1.05	0.97	430	450	225	145	175E	Std.	153	
			9.66	3.93	2.89	2.45	2.10	1.93	445	500	225	175	175E	Slow	119	
			16.2	6.73	4.98	4.28	3.58	3.36	460	605	225	190	175E	V. Slow	176	
			9.12	2.58	1.86	1.60	1.35	1.24	495	515	245	175	200E	Std.	153	
			19.4	5.55	3.92	3.33	2.81	2.56	535	****	245	210	200E	Slow	119	
			32.4	9.68	6.78	5.71	4.78	4.32	555	****	245	215	200E	V. Slow	176	
			***	6.08	3.65	2.95	2.39	2.17	625	****	260	200	250E	Std.	153	
			***	13.3	8.17	6.61	5.39	4.86	700	****	260	265	250E	Slow	119	
***	27.6	15.5	12.3	9.76	8.73	820	****	260	270	250E	V. Slow	176				
25,000	9.0%	104.6	3.08	1.46	1.10	0.94	0.81	0.73	285	300	170	125	125E	Slow	119	
			4.25	2.13	1.63	1.38	1.20	1.10	290	315	170	100	125E	V. Slow	176	
			2.37	1.12	0.87	0.73	0.64	0.59	355	370	195	115	150E	Std.	153	
			5.06	2.28	1.73	1.50	1.23	1.13	355	390	195	150	150E	Slow	119	
			8.43	3.85	2.85	2.44	2.04	1.90	365	430	195	155	150E	V. Slow	176	
			3.60	1.50	1.10	0.94	0.80	0.73	410	425	215	140	175E	Std.	153	
			7.35	3.02	2.19	1.86	1.57	1.44	425	470	215	165	175E	Slow	119	
			12.4	5.18	3.73	3.27	2.76	2.47	435	550	215	185	175E	V. Slow	176	
			5.77	1.96	1.41	1.19	1.01	0.92	475	495	235	165	200E	Std.	153	
			12.4	4.12	2.95	2.45	2.06	1.85	505	585	235	200	200E	Slow	119	
			21.4	7.16	5.07	4.19	3.53	3.15	520	****	235	205	200E	V. Slow	176	
			***	3.91	2.55	2.08	1.71	1.54	600	****	250	190	250E	Std.	153	
			***	8.79	5.75	4.68	3.76	3.39	665	****	250	250	250E	Slow	119	
			***	16.4	10.5	8.40	6.67	6.07	760	****	250	260	250E	V. Slow	176	

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Table 12. Transformers Rated 138 kV, Three Phase— Continued

Transformer Data ^① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)								
KVA, Three-Phase	Impedance	Full Load Current, Amperes	System Available Fault Level MVA →	Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
										Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
25,000	9.5%	104.6	3.28	1.59	1.21	1.02	0.89	0.82	290	300	170	125	125E	Slow	119	
			4.58	2.33	1.78	1.53	1.31	1.22	290	315	170	100	125E	V. Slow	176	
			2.59	1.22	0.94	0.82	0.69	0.65	355	370	195	115	150E	Std.	153	
			5.46	2.47	1.85	1.64	1.39	1.26	355	390	195	150	150E	Slow	119	
			9.14	4.18	3.07	2.70	2.26	2.07	365	430	195	155	150E	V. Slow	176	
			3.96	1.64	1.21	1.03	0.87	0.81	410	425	215	140	175E	Std.	153	
			8.14	3.32	2.40	2.06	1.71	1.60	425	470	215	165	175E	Slow	119	
			13.6	5.63	4.20	3.54	3.07	2.81	435	550	215	185	175E	V. Slow	176	
			6.72	2.16	1.57	1.33	1.11	1.03	475	495	235	165	200E	Std.	153	
			14.5	4.58	3.26	2.76	2.30	2.10	505	585	235	200	200E	Slow	119	
			24.6	7.86	5.62	4.68	3.94	3.60	520	****	235	205	200E	V. Slow	176	
			***	4.49	2.88	2.34	1.92	1.74	600	****	250	190	250E	Std.	153	
	***	10.0	6.45	5.27	4.29	3.83	665	****	250	250	250E	Slow	119			
	***	19.6	12.0	9.51	7.73	6.82	760	****	250	260	250E	V. Slow	176			
	10.0%	104.6	3.46	1.72	1.31	1.14	0.96	0.90	290	300	170	125	125E	Slow	119	
			4.91	2.51	1.91	1.68	1.42	1.33	290	315	170	100	125E	V. Slow	176	
			2.79	1.31	1.01	0.90	0.76	0.70	355	370	195	115	150E	Std.	153	
			5.84	2.64	2.02	1.77	1.55	1.42	355	390	195	150	150E	Slow	119	
			9.81	4.48	3.38	2.93	2.53	2.31	365	430	195	155	150E	V. Slow	176	
			4.34	1.78	1.33	1.13	0.97	0.88	410	425	215	140	175E	Std.	153	
			8.99	3.66	2.68	2.25	1.93	1.75	425	470	215	165	175E	Slow	119	
			14.9	6.24	4.64	3.89	3.36	3.12	435	550	215	185	175E	V. Slow	176	
			7.80	2.37	1.73	1.46	1.24	1.13	475	495	235	165	200E	Std.	153	
			16.6	5.05	3.63	3.04	2.56	2.34	505	****	235	200	200E	Slow	119	
28.8			8.73	6.13	5.26	4.32	4.00	520	****	235	205	200E	V. Slow	176		
****			5.18	3.29	2.66	2.17	1.95	600	****	250	190	250E	Std.	153		
****	11.7	7.38	5.98	4.86	4.39	665	****	250	250	250E	Slow	119				
****	23.3	14.0	10.9	8.73	7.90	760	****	250	260	250E	V. Slow	176				

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.

TABLE CONTINUED ►

Fuse-Selection Tables

Table 12. Transformers Rated 138 kV, Three Phase

Transformer Data① ↓			Secondary-Side Circuit Breaker or Recloser —Upper Limit for T _E at Maximum Three-Phase Secondary Fault Current, Seconds					S&C Primary Fuse (SMD-1A, SMD-2C, or SMD-50)							
System Available Fault Level MVA →			Up thru 25	251 thru 500	501 thru 750	751 thru 1000	1001 thru 1500	1501 thru 2000	Transformer Protection Index, Percent of Transformer Full-Load Current		Loading Capability, Percent of Transformer Primary Full-Load Current		Rating, Amperes	Time-Current Characteristic	
KVA, Three-Phase	Impedance	Full Load Current, Amperes							Δ-Δ Y-Y	Δ-Y	Cont. & Hot-Load Pickup	Cold-Load Pickup		Speed	TCC No.
30,000	9.0%	125.5	1.88	0.90	0.66	0.56	0.46	0.43	290	300	165	95	150E	Std.	153
			4.00	1.77	1.29	1.08	0.90	0.80	290	310	165	125	150E	Slow	119
			6.72	2.93	2.10	1.80	1.46	1.31	290	325	165	130	150E	V. Slow	176
			2.75	1.13	0.82	0.69	0.58	0.52	340	350	180	115	175E	Std.	153
			5.61	2.25	1.62	1.36	1.13	1.02	345	370	180	140	175E	Slow	119
			9.56	3.89	2.86	2.29	1.97	1.78	345	390	180	150	175E	V. Slow	176
			3.99	1.46	1.05	0.86	0.73	0.65	390	400	200	140	200E	Std.	153
			8.73	3.04	2.14	1.76	1.44	1.32	410	450	200	165	200E	Slow	119
			15.1	5.26	3.67	2.98	2.48	2.20	415	495	200	170	200E	V. Slow	176
			16.3	2.66	1.78	1.45	1.17	1.05	490	515	210	160	250E	Std.	153
			31.1	5.98	3.90	3.15	2.54	2.25	525	630	210	210	250E	Slow	119
			85.3	10.9	7.01	5.70	4.52	4.05	555	****	210	215	250E	V. Slow	176
30,000	9.5%	125.5	2.02	0.96	0.70	0.61	0.51	0.46	290	300	165	95	150E	Std.	153
			4.25	1.87	1.42	1.16	1.00	0.90	290	310	165	125	150E	Slow	119
			7.07	3.11	2.31	1.96	1.64	1.46	290	325	165	130	150E	V. Slow	176
			2.96	1.23	0.88	0.76	0.63	0.58	340	350	180	115	175E	Std.	153
			6.12	2.45	1.75	1.50	1.23	1.13	345	370	180	140	175E	Slow	119
			10.2	4.28	3.12	2.59	2.14	1.97	345	400	180	150	175E	V. Slow	176
			4.38	1.60	1.13	0.96	0.80	0.73	390	400	200	140	200E	Std.	153
			9.55	3.33	2.34	1.93	1.61	1.44	410	450	200	165	200E	Slow	119
			16.5	5.71	4.00	3.31	2.74	2.48	415	495	200	170	200E	V. Slow	176
			21.7	2.95	1.95	1.60	1.30	1.17	490	515	210	160	250E	Std.	153
			38.9	6.61	4.39	3.54	2.84	2.54	525	****	210	210	250E	Slow	119
			****	12.3	7.90	6.32	5.02	4.52	555	****	210	215	250E	V. Slow	176
	10.0%	125.5	2.15	1.01	0.76	0.66	0.56	0.51	290	300	165	95	150E	Std.	153
			4.49	2.02	1.55	1.29	1.08	1.00	290	310	165	125	150E	Slow	119
			7.43	3.38	2.53	2.10	1.80	1.64	290	325	165	130	150E	V. Slow	176
			3.17	1.33	0.97	0.82	0.69	0.63	340	350	180	115	175E	Std.	153
			6.61	2.68	1.93	1.62	1.36	1.23	345	370	180	140	175E	Slow	119
			11.0	4.64	3.36	2.86	2.29	2.14	345	400	180	150	175E	V. Slow	176
			4.75	1.73	1.24	1.05	0.86	0.80	390	400	200	140	200E	Std.	153
			10.6	3.63	2.56	2.14	1.76	1.61	410	450	200	165	200E	Slow	119
18.5	6.13	4.32	3.67	2.98	2.74	415	495	200	170	200E	V. Slow	176			
31.7	3.29	2.17	1.78	1.45	1.30	490	515	210	160	250E	Std.	153			
51.7	7.38	4.86	3.90	3.15	2.84	525	****	210	210	250E	Slow	119			
****	14.0	8.73	7.01	5.70	5.02	555	****	210	215	250E	V. Slow	176			

① Self-cooled rating. OA/FA rating is 133% of nameplate; OA/FA/FA rating is 167% of nameplate. Select fuse to have continuous peak-load capability greater than these values.

Note: Refer to “How to Use the Fuse Selection Tables” on page 43.