Series Rating: Protecting Circuit Breakers

Generally, a circuit breaker should not be applied where the available short-circuit current at its line side terminals exceeds the circuit breaker's interrupting rating. This is a requirement per 110.9. However, 240.86 has an allowance for fuses or circuit breakers to protect downstream circuit breakers where the available short-circuit current exceeds the downstream circuit breaker's interrupting rating. The term given to this is a series rated combination, series rating, or series combination rating. The application of series ratings has many technical limitations and additional NEC® requirements that must be met for proper application. Series rated combinations allowed per 240.86 should be used sparingly. The most suitable and often the only proper application of series rated combinations is for branch circuit, lighting panels. At the end of this section are tables of commercially available fuse/circuit breaker series rated combinations published by panelboard and switchboard manufacturers. These tables, along with a compliance check list for evaluating a series rated combination for a specific installation can be viewed or downloaded from www.cooperbussmann.com.

First, it is best to understand the definitions of fully rated and series rated. As far as interrupting ratings are concerned, fully rated systems are recommended and can be used everywhere, as long as individual interrupting ratings are in compliance with 110.9. On the other hand, series rated combinations have limited applications and have extra NEC® requirements that must be met.

Fully Rated

A fully rated system is one in which all of the overcurrent protective devices have an individual interrupting rating equal to or greater than the available short-circuit current at their line terminals per 110.9. Fully rated systems can consist of all fuses, all circuit breakers, or a combination of fuses and circuit breakers. The interrupting rating of a branch circuit fuse is required by 240.60 to be marked on the fuse (unless its interrupting rating is 10,000A). The interrupting rating of a branch circuit circuit breaker is required by 240.83 to be marked on the circuit breaker (unless its interrupting rating is 5000A). In this section, "individual" or "stand-alone" interrupting rating is used to denote the interrupting rating of a circuit breaker or fuse. It is the "individual" or "stand-alone" interrupting rating that is marked on a fuse or circuit breaker. See Figure 1. A major advantage with modern current-limiting fuses is that they have interrupting ratings of 200,000A or 300,000A.

Fully Rated Fuse System

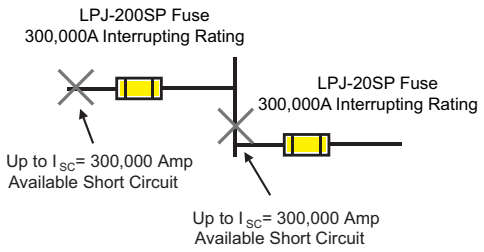


Figure 1

Series Rated Combinations

A series rated combination is a specific combination of circuit breakers or fuses and circuit breakers that can be applied at available short-circuit current levels above the interrupting rating of the load side (protected) circuit breaker, but not above the interrupting rating of the line-side (protecting) device. A series rated combination can consist of fuses protecting circuit breakers, or circuit breakers protecting circuit breakers. Figure 2 illustrates a fuse/circuit breaker series rated combination. There are unique requirements for series rated combinations in new and existing installations, as well as common requirements for both. The following addresses both the common and specific requirements for each.

CAUTION: *A series rated combination allows a load side (protected) circuit breaker to be applied where the available short circuit current exceeds the interrupting rating marked on that circuit breaker.*

Series Rated System Fuse/CB

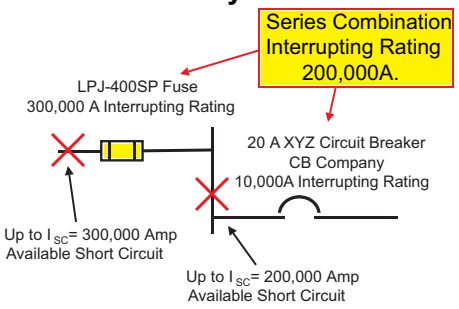


Figure 2

Series Rated Combinations – New Installations

For new installations, the series rated combinations shall be tested, listed and marked for use with specific panelboards and switchboards. Testing determines the series combination interrupting rating, but this interrupting rating is not marked on circuit breakers or fuses. As will be shown in this section, the manufacturer of the panelboard, load-center, switchboard or other equipment in which the protected circuit breaker is installed must mark the equipment with the details of a tested series rated combination. In a later section, field labeling per NEC® 110.22 and motor contribution limitation requirements are discussed.

How Is A Series Rated Combination Listed?

The industry has devised a method for a National Recognized Testing Laboratory (NRTL) to test a combination of a manufacturer's specific type and size circuit breaker beyond its marked interrupting rating when protected by specific type line side fuses of a maximum amp rating. A National Recognized Testing Laboratory (NRTL) does not list the fuse/circuit breaker combination by itself as a series rated combination. The listing for a series combination has to be evaluated and found suitable for a specific manufacturer's panelboard, loadcenter, switchboard or other equipment.

Section 240.86(B) requires that, when a series rating is used, the switchboard, panelboard, loadcenter, or other equipment be marked by the manufacturer for use with the series rated combinations to be utilized. This indicates that the appropriate switchboard, panelboard or loadcenter assembly has been investigated for such use with the specific series rated combination. For instance, the series rated combination shown in Figure 2 is tested and marked for use in a particular manufacturer's panelboard type as shown in Figure 3. Notice in these two figures that the load side circuit breaker has an individual marked interrupting rating of only 10,000A. But with the series rated combination testing and marking, it may be possible to use it where 200,000A of available short-circuit current are available. Also, note that this rating applies to (1) a specific manufacturer's type and size circuit breaker, (2) when used in a specific manufacturer's type panelboard, switchboard line, or other equipment, (3) when protected on the line side by a specific maximum amp rating and class fuse and (4) the panelboard is factory marked with the necessary series combination rating specifics. The line side (protecting) fuse can be installed in the same panelboard or a separate enclosure.

Series Rating: Protecting Circuit Breakers

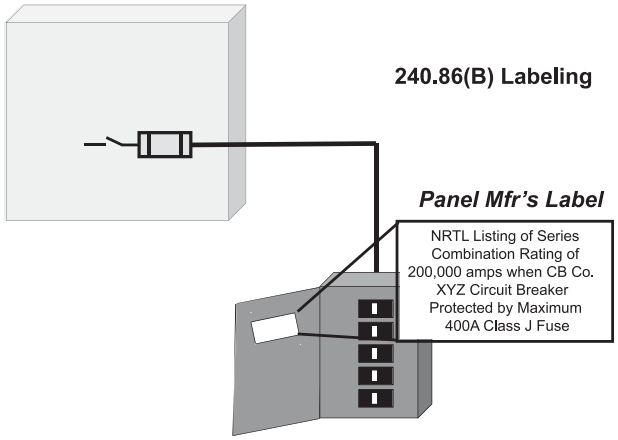


Figure 3

Because there is often not enough room in the equipment to show all of the legitimate series rated combinations, UL 67 (Panelboards) allows for a bulletin to be referenced and supplied with the panelboard. These bulletins typically provide all of the acceptable series rated combinations for that panelboard.

Unfortunately, if using manufacturers' literature, it is often difficult to determine which combinations go with which panelboards. In order to clear the confusion, Cooper Bussmann has researched the major manufacturers' application literature and published the tables at the end of this section. These tables show, by manufacturer, the various series rated combinations of fuses and breakers that are acceptable by panelboard and switchboard type. Note more combinations may be available for loadcenters and metercenters; refer to the equipment manufacturer's literature.

Although series rated combinations save a small percentage of the initial equipment costs, there are many issues about designing and utilizing series rated combinations. If series rated combinations are considered for use, there are other NEC® requirements that must be met! Since series rated combinations are evaluated by laboratory testing under specific conditions, these other requirements are extremely important to make sure a series rated combination is, in fact, applied per its testing, listing and marking [110.3(B)].

Series Rated Combinations – Existing Installations

For existing installations, NEC® 240.86(A) permits licensed professional engineers to select series rated combinations by other means than just the method of tested, listed and marked by a Nationally Recognized Testing Laboratory (NRTL).

When buildings undergo improvements, or when new transformers are installed, the new available short-circuit currents can exceed the existing circuit breakers' interrupting ratings. This is a serious safety hazard and does not comply with NEC® 110.9. In the past, an owner in this situation faced the possibility of removing and scrapping the existing circuit breaker panel and installing a new circuit breaker or fusible switch panel with overcurrent devices that have sufficient interrupting ratings for the new available short-circuit currents. This could be very expensive and disruptive.

Now, for existing systems, a licensed professional engineer can determine if an upgrade of lineside fuses or circuit breakers can constitute a sufficient series rated combination with existing loadside breakers. This option may represent a significant cost savings versus replacing the existing gear.

The professional engineer must be qualified by primarily working in the design or maintenance of electrical installations. Documents on the selection shall be stamped and available to all necessary parties. The series rated combination must also be labeled in the field, including identification of the upstream protecting device.

There may be several analysis options for a licensed professional engineer to comply with 110.9 where existing circuit breakers have inadequate interrupting ratings. In some cases, a suitable method may not be feasible. New methods may surface in the future.

Some Methods

1. Check to see if a new fused disconnect can be installed ahead of the existing circuit breakers by using a listed series rated combination. Even though the existing system may not take advantage of series ratings, if the existing circuit breakers are not too old, the panel may have a table or booklet that provides all the possible listed combinations of fuse-circuit breaker series ratings.
2. If the existing system used series ratings with Class R fuses, analyze whether a specific Cooper Bussmann Class RK1, J or T fuse may provide the protection at the higher short-circuit current. The series ratings for panelboards that use lineside Class R fuses have been determined with special, commercially unavailable Class RK5 umbrella fuses. (Commercially unavailable umbrella fuses are only sold to electrical equipment manufacturers in order to perform equipment short circuit testing.) Actual, commercially available Cooper Bussmann Class RK1, J or T fuses will have current-limiting let-through characteristics considerably less than the Class RK5 umbrella limits.
3. Supervise short circuit testing of lineside current-limiting fuses to verify that protection is provided to circuit breakers that are identical to the installed, existing circuit breakers.
4. Perform an analysis to determine if a set of current-limiting fuses installed on the lineside of the existing circuit breakers provides adequate protection for the circuit breakers. For instance, if the existing equipment is low voltage power circuit breakers (approximately three cycle opening time), then the line-side fuse short circuit let-through current (up, over, and down method) must be less than the circuit breaker's interrupting rating. An appropriate analysis method has yet to be found for circuit breakers that clear in less than a ½ cycle. It is possible, but a practical analysis method based on present available circuit breaker data is not yet feasible.

Requirements In Applying Series Rated Combinations

240.86(B) Factory Labeling Requirement

As discussed earlier, 240.86(B) requires that, when a series rated combination is used on a new installation, the switchboard, panelboard or other equipment be tested, listed and **factory marked** for use with the series rated combinations to be utilized. See Figure 4 for the 110.22 & 240.86(B) labeling requirements illustration.

110.22 Field Labeling Requirement

This section places responsibility on the **installer** (electrical contractor) to **affix labels** on the equipment enclosures, which note the series combination interrupting rating, and call out the specific replacement overcurrent protective devices to be utilized. If the upstream overcurrent protective device protecting the downstream circuit breaker is in a different enclosure, then both enclosures need to have field-installed labels affixed. See Figure 4 for the 110.22 & 240.86(A) & (B) labeling requirements illustration.

240.86(B) Factory Labeling Requirement (New Installation)

110.22 Field Labeling Requirement (New & Existing Installations)

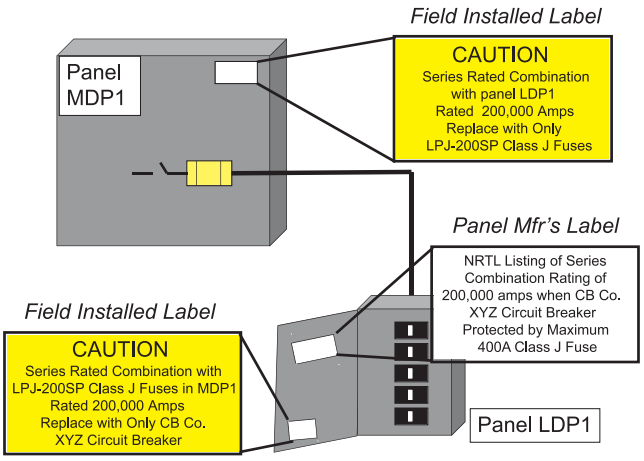


Figure 4

240.86(C) Motor Contribution Limitations

This is a major limitation. It is critical for initial installations but in addition, future system changes can negate the series combination rating. Where motors are connected between the line side (protecting) device and the load side (protected) circuit breaker, 240.86(C) has a critical limitation on the use of series rated combinations. This section requires that a series rated combination shall not be used where the sum of **motor full load currents exceeds 1% of the load side (protected) circuit breaker's individual interrupting rating**. See Figure 5. The reason is that when a fault occurs, running motors momentarily contribute current to the short circuit (usually about four to six times their full load rating). This added motor contribution results in a short-circuit current in excess of what the loadside (protected) circuit breaker was tested to handle in relation to the lineside (protecting) device per the series rated combination testing. See Figure 6.

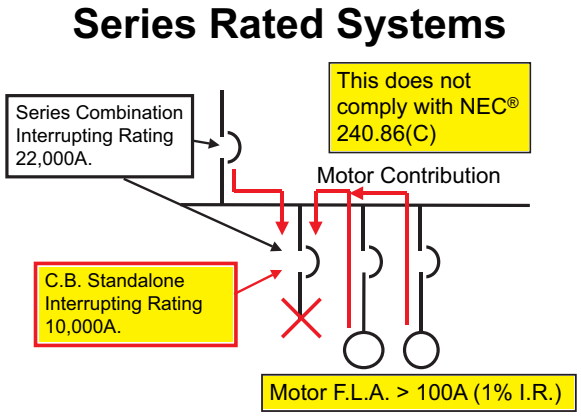


Figure 5

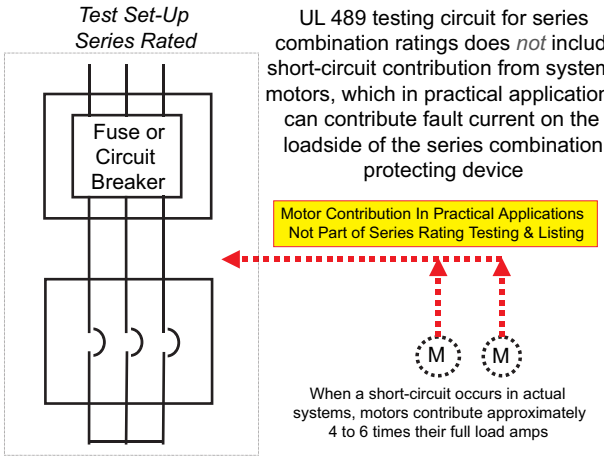


Figure 6

This is one of the major reasons that series rated combinations are generally recommended only for lighting panel applications. Lighting panels typically do not have significant motor loads so the motor contribution between the feeder overcurrent device and lighting panel branch-circuit circuit breakers is not an issue upon initial installation or in the future. However, series rated combinations used for power panel or main/feeder applications can often pose a problem upon initial installation or if the loads change in the future.

Example 1

As an example of the implications of 240.86(C) look at Figure 7. On an installation with a 1000A total load, 50% motor load (which is motor load of 500A), the motor contribution could be an issue in selecting a series rated combination. If a main/feeder series rating were to be considered, the feeder circuit breaker must have at least a 50,000A individual or stand-alone interrupting rating per 240.86(C) (1% of 50,000 = 500). If the protected circuit breaker has to have an individual interrupting rating of at least 50,000A, it negates the reason that series rated combinations are utilized for most applications.

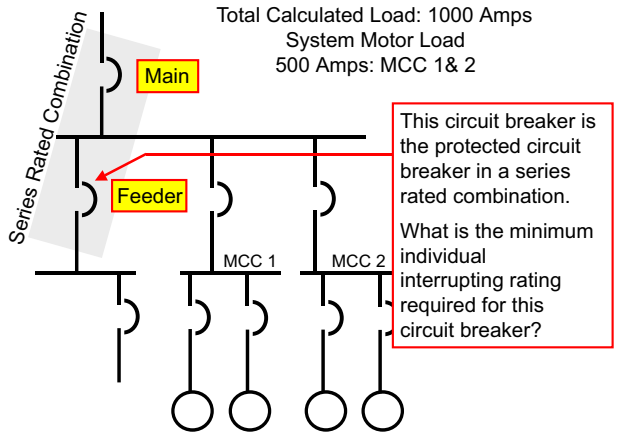


Figure 7

Series Rating: Protecting Circuit Breakers

Example 2

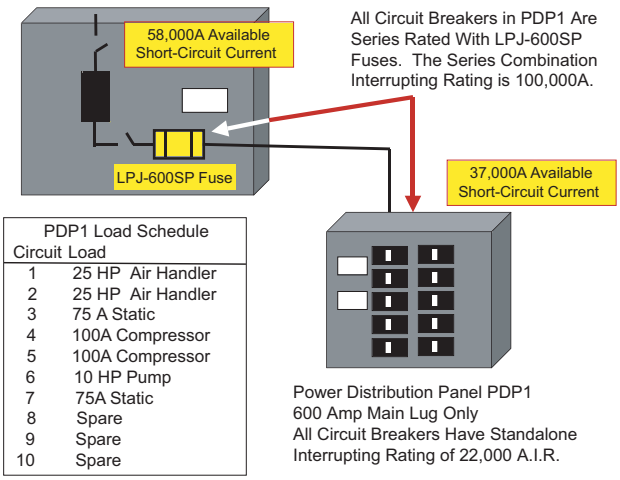
Below is an easy to use table to evaluate the "protected" (loadside) circuit breaker in a series rated combination for meeting the motor contribution limits in 240.86(C). In the Figure 7 example, the motors that are connected that could contribute current where the feeder circuit breaker ("protected" device of the series combination) would have to interrupt but that the main circuit breaker ("protecting" device of the series combination) would not have to interrupt is represented by 500A of normal full load current. Reading the table below, it is seen that 500A full load motor current exceeds 420A in column A. Therefore, a series rating with a "protected" circuit breaker having a stand-alone interrupting rating of 42,000 AIR is insufficient to meet 240.86(B). A series combination that uses a "protected" circuit breaker with a stand-alone interrupting rating of at least 50,000A would be required to meet 240.86(C). Note; do not confuse the stand-alone interrupting rating of the "protected" circuit breaker with the series combination interrupting rating. The series combination interrupting rating is the rating for both devices working together to interrupt short-circuit currents. The series combination interrupting rating is much greater than the stand-alone interrupting rating of the "protected" circuit breaker.

Motor Full Load Amps Shall Not Exceed This Value, If Using Series Combination With "Protected" Circuit Breaker Having Standalone Interrupting Rating In Column B	"Protected" Circuit Breaker Standalone Interrupting Rated In Series Combination	Motor Full Load Amps Shall Not Exceed Value If Using Series Combination With "Protected" Circuit Breaker Having Standalone Interrupting Rating In Column B	"Protected" Circuit Breaker Standalone Interrupting Rated In Series Combination
(A)	**(B)***	**(A)**	**(B)***
75A	**7500 AIR**	**250A**	**25,000 AIR**
100A	**10,000 AIR**	**300A**	**30,000 AIR**
140A	**14,000 AIR**	**350A**	**35,000 AIR**
180A	**18,000 AIR**	**420A**	**42,000 AIR**
200A	**20,000 AIR**	**500A**	**50,000 AIR**
220A	**22,000 AIR**	**650A**	**65,000 AIR**

*Some Possible circuit breaker interrupting ratings per UL489, Table 8.1

Example 3

Assess the series combination rating for motor contribution limits in the following system.



Step 1: Motor Load

(2) 100A Compressors	200A
(2) 25Hp Motors @ 34A ea.	68A
(1) 10Hp Pump @ 14A	14A
Total Motor Load Connected Between Series Rated Devices	282A

Step 2: Is the Series Rated Combination Shown Acceptable?

No. The series combination shown has a series combination interrupting rating of 100,000A, which is sufficient for the 37,000A available short-circuit current at PDP1. And the LPJ-600SP fuses have an interrupting rating of 300,000A, which is sufficient for the 58,000A available short-circuit current at the main switchboard. However, the "protected" circuit breakers of the series combination, which are located in PDP1, have a stand-alone or individual rating of 22,000A. The motor load connected between the protecting and protected devices in the series rated combination can not exceed 1% of the protected circuit breaker's stand-alone interrupting rating. The motor load is 282A, which exceeds 1% of 22,000A (220A). So this series rated combination applied as shown does not comply with 240.86(C).

Then consider the uncertain future of building spaces. For instance, many building spaces, such as office buildings, manufacturing facilities, institutional buildings, and commercial spaces, by their nature, incur future changes. A properly designed and initially installed series combination rating could be compromised if the building loads change to a larger percentage of motor loads.

As just illustrated, it is not enough to only check the available short-circuit current against the series combination interrupting rating. 240.86(C) also requires that the designer, contractor, and AHJ investigate the individual or stand-alone interrupting rating of the protected circuit breaker of a series combination. This is necessary for series rated combinations for new installations as well as existing series rated combinations when existing systems are refurbished or upgraded.

Selective Coordination Requirement Limitations

Inherently, series rated combinations cannot be selectively coordinated. In order to protect the loadside circuit breaker, the lineside (protecting) device must open in conjunction with the loadside (protected) circuit breaker. This means that the entire panel can lose power because the device feeding the panel must open even under relatively low-level short-circuit conditions.

Therefore, in health care facilities where selective coordination for ground faults is required per 517.17 between the main and feeders, the application of series rated combinations does not meet this requirement. Also, with the application of series rated combinations it is difficult to meet the selective coordination requirements for elevator circuits per 620.62, emergency systems per 700.27, legally required standby systems per 701.18 and healthcare essential electrical systems per 517.26. The application of series rated combinations reduces emergency circuit overall system reliability because of their inherent lack of fault current coordination. See Figure 8.

Series Rating: Protecting Circuit Breakers

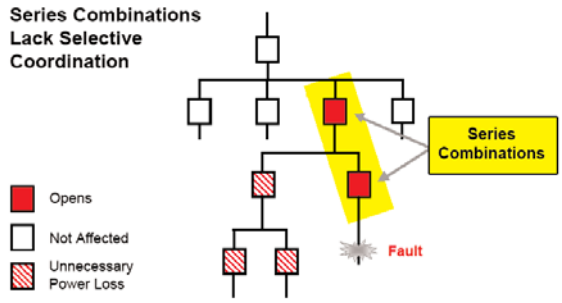


Figure 8

Component Protection

Using series rated combinations does not assure protection for the circuit components. The series rating only pertains to the overcurrent protective devices. Specifically, it means that the load side circuit breaker of lower interrupting rating can be used in an application with higher available short circuit currents. In practical applications, the other circuit components, such as conductors, busway, contactors, etc., should independently be assessed for protection under the worst-case short circuit conditions.

Which Is Best: Fully Rated or Series Rated?

Fully rated systems are the preferred choice for many reasons. If fully rated fuses are used and the proper choices are made, the systems will not have any of the limitations described in the previous paragraphs. In addition, if a fully rated system uses modern current-limiting fuses with interrupting ratings of 200,000A and higher, the system will likely remain fully rated over the life of the system even if changes or additions occur that increase the available short-circuit current.

Series rated combinations should be used sparingly. The most suitable application for series rated combinations is for branch circuit, lighting panel circuit breaker protection. In today's market place, lighting panelboards are only commercially available utilizing circuit breakers for the branch circuits. Also, lighting panels typically do not have significant motor loads so the motor contribution limitation [240.86(C)] is not an issue for series rated combinations in lighting panelboard applications. However, series rated combinations used for power panel or main/feeder applications can pose a problem upon initial installation or if the loads change in the future.

A recommendation is to use lighting panels with circuit breakers that are series rated with feeder fuses. Then for the remainder of the system, use fully rated fuses for all power panelboards, distribution panelboards, motor control centers, motor branch circuits, emergency circuits, elevator circuits and switchboards.

Series rated combinations inherently can not be selectively coordinated. This is a major limitation that most building owners or tenets do not want to incur. To unnecessarily blackout a portion of an electrical system in today's business environment, technology driven health care systems, or emergency circuits is unacceptable. Consider the consequences if there is a disaster to a portion of the building; it is important for safety egress to have as much of the electrical system in service as possible.

If Using Series Ratings, What Line-Side Choice Considerations Are There?

Remember that with a series rated combination, the load side circuit breaker is applied beyond its individual interrupting rating. Because of this, if a series rated combination is to be used, the designer and contractor should select the tested and marked line side protection that will assure reliable performance over the lifetime of the electrical system. If the line side (protecting) overcurrent protective device does not react as intended, due to lack of maintenance or loss of calibration, the load side circuit breaker may be on its own to interrupt the short-circuit current.

For the reasons mentioned in the previous paragraph, if series rated combinations are going to be used, it is recommended to use fuses as the line side (protecting) devices. Modern current-limiting fuses are the most reliable overcurrent protective devices available. Periodic maintenance of fuses is not required. It is recommended that disconnects and all conductor and fuse terminations be periodically assessed and maintained. However, whether it is the first day of service or years later, modern current-limiting fuses will respond to protect the circuit components as originally designed.

If and when fuses are called upon to open on an overcurrent, installing the same type and amp rated fuses provide the circuit with new factory-calibrated fuses. The original design integrity can be maintained throughout the life of the electrical system. With fuses there is typically no worry about putting an incorrect one in per the series rating. Modern current-limiting fuses have mountings that only accept the same class fuse. All the testing, listing and marking of series rated combinations that utilize fuses as the line side (protecting) device are tested with the maximum amp rated fuse that fits into the fuse clip. For instance, all the series ratings with line side fuses are at the maximum amp ratings for standard fuse clips of 100A, 200A, 400A, and etc.

In contrast, if circuit breakers are used as the line side (protecting) devices in a circuit breaker/circuit breaker series rated combination, periodic maintenance and periodic testing are required per the circuit breaker manufacturers' recommendations, NFPA 70B, and NEMA. If and when the line side (protecting) circuit breaker is called upon to interrupt a fault current to protect the load side (protected) circuit breaker, it is absolutely necessary that this line side circuit breaker operate with the same or better speed and let-through characteristics as if it were newly manufactured. Therefore, owners must periodically examine and electrically test their circuit breakers to the manufacturer's stated maintenance and testing recommendations. If and when the line side circuit breaker is called upon to interrupt a fault, per the manufacturers' recommendations, the circuit breaker should be examined for damage and electrically tested for calibration and operation. Molded case circuit breakers and insulated case circuit breakers cannot be repaired if they are damaged, inoperative, or out of calibration, they must be replaced. If a circuit breaker that is part of a series combination rating is replaced, it is absolutely imperative to install the exact same type and size circuit breaker as the originally installed series rated combination. Circuit breakers of different voltage ratings, different interrupting ratings and potentially different let-through characteristics are physically interchangeable; therefore, the installer must be sure to install the proper replacement circuit breaker.

Caution: *Even with diligent field maintenance of a circuit breaker, mid to high level short circuit currents can drastically reduce the life and change the performance of a circuit breaker, specifically the line side (protective) circuit breaker, and possibly require replacement. There is no field maintenance or testing procedures that can verify a circuit breaker meets the original manufactured specification for speed of operation or let-through characteristics under medium to high-level short circuit currents at rated voltage. Consult the appropriate device manufacturer for verification of the proper performance of the series rated combination following a fault condition; replacement of one or both devices may be required.*

Series Rating: Protecting Circuit Breakers

What about the consistency of short-circuit current performance for the commercially available line side (protecting) devices?

The line side fuses used for testing for series rated combinations are special "umbrella" fuses that intentionally exceed the maximum short circuit current let-through values for specific fuse classes and amp ratings per UL/CSA/ANCE 248 Fuse Standards. This adds an extra safety factor; these special "umbrella" fuses insure that the short-circuit current let-through energy represents the worst case for all the commercially available fuses of that amp rating and class. (Umbrella fuses are not commercially available. They are sold only to electrical equipment manufacturers for testing purposes.) And as mentioned previously, it is an umbrella fuse of the largest amp rating that fits in a given amp rated fuse clip. In addition, the commercially available fuses undergo periodic follow up testing witnessed by the NRTL listing agency to verify that the products continue to have short circuit let-through values under the umbrella limits. Circuit breaker industry standards for the majority of the circuit breakers used (non current-limiting circuit breakers), do not have established short-circuit current let-through limits (umbrella let-through values) as do the fuse industry standards for current-limiting fuses. Consequently, during the testing to establish circuit breaker/circuit breaker series combination ratings, commercially available line side (protecting) circuit breakers are utilized rather than "umbrella" circuit breakers. Granted there is a difference with circuit breaker/circuit breaker series rating requirements. Circuit breaker/circuit breaker series ratings are marked with the specific manufacturer's type circuit breakers while fuses are marked with the fuse industry class. That means when using circuit breaker/circuit breaker series ratings, there are no options to use a different manufacturer's circuit breaker. However, since the circuit breaker industry does not have "umbrella" circuit breakers, there is no provision for variance in the short circuit current let-through energies that might occur due to normal circuit breaker manufacturing tolerances.

Also, if a fuse/circuit breaker series combination is chosen, the designer or contractor has much greater flexibility to mix panelboard/switchboard manufacturers. For instance, the lighting panel could be from one manufacturer with that manufacturer's circuit breakers installed and the distribution panel equipped with switches can be from another manufacturer. However, if a circuit breaker/circuit breaker series combination is selected, then the lighting panelboard and distribution panelboard must come from the same manufacturer with their circuit breakers installed in both. There are no circuit breaker/circuit breaker series combinations that mix circuit breakers of different manufacturers.

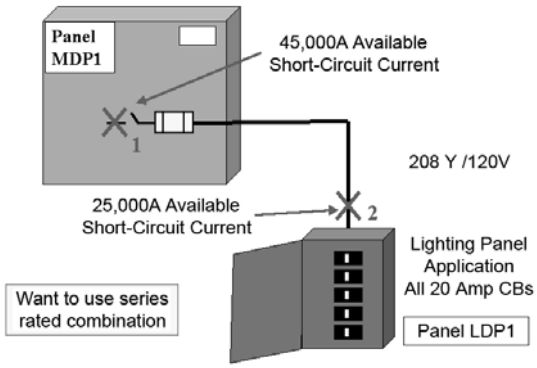


Figure 9

Example of Practical Application of Series Rated Combination

See Figure 9. The 208Y/120V, 200A, lighting panel LDP1 has 25,000A available short-circuit current. The distribution panel MDP1 has 45,000A available. The lighting panel has all single pole, 20A circuit breakers. The typical standard 20A lighting panel circuit breaker has a 10,000A interrupting rating, which is insufficient for the 25,000A available. The options are (1) to use a higher interrupting rated circuit breaker for the lighting panel, which may cost more and require more space or (2) to use a series rated combination. The series rated combination option can be investigated by looking at the fuse/circuit breaker tables by panelboard manufacturer that follow at the end of this section.

Every major panelboard manufacturer has a suitable fuse/circuit breaker series rated solution. The example that follows uses Square D equipment, so review their table at the end of this section. The following is selected: Square D panelboard type NQOD with Square D QO single pole, 20A, circuit breakers (which have an individual interruption rating of 10,000A) protected by Cooper Bussmann LPJ-200SP Fuses (which have a 300,000A interrupting rating). From the table it is seen that this series combination interrupting rating is 200,000A. That means if all the other requirements are met, these QO circuit breakers in this type panelboard can be applied in a system which has an available short-circuit current up to 200,000A at the point where the panelboard is installed. The requirements that must be met are:

1. The series combination interrupting rating must be equal to or greater than the available short-circuit current at the circuit breaker location, X2. Remember, the load side circuit breaker in a series rated combination can be applied beyond its individual interrupting rating (a QO circuit breaker in this case has an individual interrupting rating of 10,000A).
2. In this example, the series rated combination interrupting rating is 200,000A and there is 25,000A available short-circuit current. The interrupting rating of the protecting overcurrent protective device must have an individual interrupting rating equal to or greater than the available short-circuit current at its point of application, X1. In this example, the LPJ-200SP fuses have an individual interrupting rating of 300,000A and there is 45,000A available short-circuit current available.
3. The load side (protected) circuit breaker's individual interrupting rating must meet the minimum required in 240.86(B) due to motor contribution. In this case, it is a lighting panel application and there are no motor loads on the load side of the LPJ-200SP fuses.
4. Selective coordination requirements. Selective coordination in this application is not required per the NEC® since this is neither a health care application, an elevator circuit nor a part of an emergency circuit. However, the owner and designer should consider the consequences of a lack of selective coordination. If selective coordination were considered to be necessary, another approach would have to be taken.
5. Labeling requirements. The panelboard must be marked by the manufacturer providing sufficient details about the listed series combination rating. The installer must field install a label on the panelboard and the distribution panelboard providing specific details of the installed series combination rating, the devices and their respective locations. These are critical for verifying the proper ratings for the initial installation and during the life of the system.

Tables by Manufacturer of Available Fuse/ Circuit Breaker Series Combination Ratings are on the following pages:

Square D	41 to 42
Cutler-Hammer	43 to 45
General Electric	46 to 49
Siemens	50 to 51

Square D Series Rating Chart

I-Line Switchboard/Panelboard

(See Notes on Next Page)

Maximum System Voltage	SCIR*	Line Side Fuse	Max Fuse Current Rating	Load Side		
				Circuit Breaker	Amps	Poles
240Vac	100kA	LPN-RK	600	FH, KA, KH, LA, LH, MA, MH, MX	ALL	2, 3
		JJS	600	FA	ALL	2, 3
		JJS	800	FH, KA, KH, LA, LH, MA, MH, MX	ALL	2, 3
		LPJ	600	FA, FH, KA, KH, LA, LH, MA, MH, MX	ALL	2, 3
		KRP-C	800	KA	ALL	2, 3
		KRP-C	1200	FH, LA, LH	ALL	2, 3
		KRP-C	2000	KH, MA, MH, MX	ALL	2, 3
	200kA	LPN-RK	600	FH, FC, KH, KC, LA, LH, LC, LX, MA, MH, MX, NA, NC, NX	ALL	2, 3
		JJS	600	FA	ALL	2, 3
		JJS	800	FH, FC, KA, KH, KC, LA, LH, LC, LX, MA, MH, MX, NA, NC, NX	ALL	2, 3
		LPJ	600	FA, FH, FC, KA, KH, KC, LA, LH, LC, LX, MA, MH, MX, NA, NC, NX	ALL	2, 3
		KRP-C	800	FH, LA, LH	ALL	2, 3
		KRP-C	1200	FC, KH, KC, LC, LX, MA, MH, MX	ALL	2, 3
		KRP-C	2000	NA, NC, NX	ALL	2, 3
480Vac	100kA	LPS-RK	600	FC, KA, KH, KC, LA, LH, LC, LX, MA, MH, MX, NA	ALL	2, 3
		JJS	600	FA, FH	ALL	2, 3
		JJS	800	FC, KA, KH, KC, LA, LH, LC, LX, MA, MH, MX, NA	ALL	2, 3
		LPJ	600	FA, FH, FC, KA, KH, KC, LA, LH, LC, LX, MA, MH, MX, NA	ALL	2, 3
		KRP-C	800	KA	ALL	2, 3
		KRP-C	1200	KH, LA, LH		
		KRP-C	1600	MA		
		KRP-C	2000	FC, KC, LC, LX, MH, MX, NA		
	200kA	LPS-RK	600	FC, KC, LA, LH, LC, LX, MA, MH, MX, NA, NC, NX	ALL	2, 3
		JJS	400	FA, FH	ALL	2, 3
		JJS	800	FC, KA, KH, KC, LA, LH, LC, LX, MA, MH, MX, NA, NC, NX	ALL	2, 3
		LPJ	400	FA, FH	ALL	2, 3
		LPJ	600	FC, KA, KH, KC, LA, LH, LC, LX, MA, MH, MX, NA, NC, NX	ALL	2, 3
		KRP-C	800	LA, LH	ALL	2, 3
		KRP-C	1200	FC, KC, LC, LX, MA, MH, MX	ALL	2, 3
		KRP-C	2000	NA, NC, NX	ALL	2, 3

*Series Combination Interrupting Rating

Square D Series Rating Chart

NQOD Panelboards

(See Notes Below)

Maximum System Voltage	SCIR*	Line Side Fuse	Max Fuse Current Rating	Load Side		
				Circuit Breaker	Amps	Poles
240Vac	200kA	JJS, LPJ	200	QO, QOB	ALL	1, 2, 3
				QO, QOB (AS)	ALL	1, 2, 3
				QO, QOB (GFI)	ALL	1, 2, 3
		JJN	400	QO, QOB	ALL	1, 2, 3
				QO, QOB (AS)	ALL	1, 2, 3
				QO, QOB (GFI)	ALL	1, 2, 3

Note for NQOD Panelboards: 1P for use at 120V Only

NEHB Panelboards

(See Notes Below)

Maximum System Voltage	SCIR*	Line Side Fuse	Max Fuse Current Rating	Load Side		
				Circuit Breaker	Amps	Poles
480Y/277Vac	100kA	JJS, LPJ	200	EH, EHB	ALL	1, 2, 3

Note for NEHB Panelboards: 1P for use at 277V Only

NF Panelboard

(See Notes Below)

Maximum System Voltage	SCIR*	Line Side Fuse	Max Fuse Current Rating	Load Side		
				Circuit Breaker	Amps	Poles
480Y/277Vac	100kA	JJS, LPJ	400	EDB, EGB, EJB	ALL	1, 2, 3
	200kA	JJS, LPJ	200			

Note for NF Panelboards: 1P for use at 277V Only

SF Switchboards with I-Line or NQOD Distribution

(See Notes Below)

Maximum System Voltage	SCIR*	Line Side Fuse	Max Fuse Current Rating	Load Side		
				Circuit Breaker	Amps	Poles
120/240Vac	42kA	JJS	400	QO-VH, QOB-VH	ALL	1 (120V)
240Vac	42kA	JJS	800	QO-VH, QOB-VH, FA, Q4	ALL	2, 3
				Q2-H	ALL	2
480Vac	50kA	JJS	800	FA, FH	ALL	2, 3
	65kA	JJS	800	KA, KH, LA, LH	ALL	

*Series Combination Interrupting Rating

NOTE (1): The data in these charts was compiled from information in Square D, Series Rating Data Bulletin No. 2700DB9901 and Square D Digest 171. Cooper Bussmann assumes no responsibility for the accuracy or reliability of the information. The information contained in the tables may change without notice due to equipment design modifications

NOTE (2): The line-side fused switch may be in a separate enclosure or in the same enclosure as the load-side circuit breaker. A line-side fused switch may be integral or remote.

NOTE (3): Max fuse current rating denotes the largest amperage fuse that may be used for that series rated combination. A lower amperage fuse may be substituted for the listed fuse.

Cutler-Hammer Series Rating Chart

Switchboards: PRL-C / PRL-i

Panelboards: PRL 5P, PRL 4, PRL 3A & Pow-R-Command Panelboards (See Notes on Page 45)

Max System Voltage	SCIR*	Line Side Fuse	Max Fuse Current Rating	Load Side		
				Circuit Breaker	Amps	Poles
120/240	100kA	LPN-RK	200	GB, GHB	ALL	1,2
		JJN, LPJ	400	BA, BAB, HQP, QBHW, QPHW	ALL	1,2
	200kA	LPN-RK	100	BA, BAB, HQP, QBHW, QPHW, GB, GHB	ALL	1,2
		JJN, LPJ	200	BA, BAB, HQP, QBHW, QPHW	ALL	1,2
		JJN, LPJ	400	GB, GHB	ALL	1,2
240	100kA	LPN-RK	200	GHB	ALL	1,2,3
				GB, CA	ALL	2,3
		JJN, LPJ	400	BAB_H, QBHW_H, HQP_H, QPHW_H	ALL	2,3
		JJN	600	CA, CAH, HCA	ALL	2,3
		KRP-C	6000	EHD, FD	ALL	1,2,3
		KRP-C	6000	FDB, ED, JDB, JD, DK, KDB, KD	ALL	2,3
	200kA	LPN-RK	100	GHB	ALL	1,2,3
				BAB_H, QBHW_H, HQP_H, QPHW_H, CAH, HCA, GB	ALL	2,3
		LPN-RK	200	GB, GHB	ALL	2,3
		JJN, LPJ	200	BAB_H, HQP_H, QBHW_H, QPHW_H, CA, CAH, HCA	ALL	2,3
		JJN, LPJ	400	GHB	ALL	1,2,3
				GB	ALL	2,3
480/277	65kA	JJS, LPJ	200	GHBS	ALL	1,2
	100kA	JJS, LPJ	100	GHBS	ALL	1,2
		LPS-RK	200	GHB	ALL	1,2,3
		LPJ	600	EHD, FD, HFD, FDC	ALL	2,3
		JJS	600	GHB, EHD, FD, HFD, FDC, JD, HJD, JDC	ALL	2,3
	200kA	LPS-RK	100	GHB	ALL	1,2,3
		JJS, LPJ	400			
480	100kA	LPS-RK	100	EHD	ALL	2,3
		JJS, LPJ	200	EHD, FD, HFD,FDC	ALL	2,3
		KRP-C	1200	MC, HMC, NC, HNC	ALL	2,3
	200kA	KRP-C	800	MC, HMC	ALL	2,3
600	100kA	LPS-RK	100	FD, HFD	ALL	2,3
				FDC	ALL	2,3
			200	JD, HJD, JDC	ALL	2,3
			400	KD, HKD, KDC	ALL	2,3
			600	LC	ALL	2,3
		JJS, LPJ	200	FD, HFD	ALL	2,3
				FDC	ALL	2,3
			400	JD, HJD, JDC	ALL	2,3
		KRP-C	1200	LC	ALL	2,3
	200kA	LPS-RK	400	LC	ALL	2,3
		JJS, LPJ	600	KD, HKD, KDC, LC	ALL	2,3

*Series Combination Interrupting Rating

Cutler-Hammer Series Rating Chart

Panelboards: PRL 1A, PRL 2A, PRL 1A-LX, PRL 2A-LX (See Notes Below & Page 45)

Max System Voltage	SCIR*	Line Side Fuse	Max Fuse Current Rating	Load Side		
				Circuit Breaker	Amps	Poles
120/240	100kA	LPN-RK	200	GB, GHB	ALL	1,2
		JJN, LPJ	400	BA, BAB, HQP, QBHW, QPHW	ALL	1,2
	200kA	LPN-RK	100	BA, BAB, HQP, QBHW, QPHW, GB, GHB	ALL	1,2
		JJN, LPJ	200	BA, BAB, HQP, QBHW, QPHW	ALL	1,2
		JJN, LPJ	400	GB, GHB	ALL	1,2
240	100kA	LPN-RK	200	GHB	ALL	1,2,3
				GB, CA	ALL	2,3
		JJN, LPJ	400	BAB_H, QBHW_H, HQP_H, QPHW_H	ALL	2,3
		JJN	600	CA, CAH, HCA	ALL	2,3
		KRP-C	6000	EHD, FD	ALL	1,2,3
		KRP-C	6000	FDB, ED, JDB, JD, DK, KDB, KD	ALL	2,3
	200kA	LPN-RK	100	GHB	ALL	1,2,3
				BAB_H, QBHW_H, HQP_H, QPHW_H, CAH, HCA, GB	ALL	2,3
		LPN-RK	200	GB, GHB	ALL	2,3
		JJN, LPJ	200	BAB_H, HQP_H, QBHW_H, QPHW_H, CA, CAH, HCA	ALL	2,3
		JJN, LPJ	400	GHB	ALL	1,2,3
				GB	ALL	2,3
480/277	65kA	JJS, LPJ	200	GHBS	ALL	1,2
	100kA	JJS, LPJ	100	GHBS	ALL	1,2
		LPS-RK	200	GHB	ALL	1,2,3
		LPJ	600	EHD, FD, HFD, FDC	ALL	2,3
		JJS	600	GHB, EHD, FD, HFD, FDC, JD, HJD, JDC	ALL	2,3
	200kA	LPS-RK	100	GHB	ALL	1,2,3
		JJS, LPJ	400			

*Series Combination Interrupting Rating

Notes for above Table:

1. The HQP & QPHW are not listed for use in the PRL1A-LX Panel.
2. PRL1A & PRL1A-LX are for use at 240V maximum
3. Branch breakers for maximum 120/240V systems include: BAB, HQP, QBHW & QPHW.
4. Branch breakers for maximum 240V systems include: BAB_H, HQP_H, QBHW_H & QPHW_H.
5. PRL2A & PRL2A-LX, branch breakers include: GHB, GHBS & GB.
6. PRL1A-LX & PRL2A-LX Main & Sub-feed breakers include: ED, FD, HFD, FDC.
7. PRL1A & PRL2A Main & Sub-feed breakers include: CA, CAH, HCA, ED, FD, HFD, FDC, JD, HJD, JDC, KD, HKD & KDC

Cutler-Hammer Series Rating Chart

Triple Series Rating - Switchboards: PRL-C & PRL-i
Panelboard Types: PRL 5P, PRL 4, PRL 3A, PRL 2A, PRL 2A-LX, PRL 1A, PRL 1A-LX
& Pow-R-Command Panels **(See Notes Below)**

Max System Voltage	SCIR*	Line Side Fuse	Tenant Main Type	Branch Type		
				Circuit Breaker	Amps	Poles
120/240	100kA	KRP-C (Max Fuse Size - 6000A)	DK, KDB, KD	GB, GHB	ALL	1,2
			JD, JDB	GB, GHB	ALL	1,2
			FD	GB, GHB	ALL	1,2
			FD, FDB	HQP	15-70	1,2
				BA, BAB	ALL	1,2
			EHD	BA, BAB, HQP	ALL	1,2
240	100kA	KRP-C (Max Fuse Size - 6000A)	DK, KDB, KD	GHB	ALL	1,2,3
				GB, EHD	ALL	2,3
				CA, CAH, HCA	ALL	2,3
				FD, FDB	ALL	2,3
				JD, JDB	ALL	2,3
			JD, JDB	GHB	ALL	1,2,3
				GB	ALL	2,3
			FD	GHB	ALL	1,2,3
				GB	ALL	2,3
			FD, FDB	BAB_H, QBHW_H, HQP_H, QPHW_H	ALL	2,3
			EHD	BAB_H, HQP_H	ALL	2,3

*Series Combination Interrupting Rating

NOTE (1): The data in these charts was compiled from information in Cutler-Hammer, Series Rating Information Manual, catalog reference number 1C96944H01 Rev. E, pages 18-24, and Cutler-Hammer Consulting Application Catalog 12th Edition, pages F1-11 - F1-12. Cooper Bussmann assumes no responsibility for the accuracy or reliability of the information. The information contained in the tables may change without notice due to equipment design modifications.

NOTE (2): The line-side fused switch may be in a separate enclosure or in the same enclosure as the load-side circuit breaker. A line-side fused switch may be integral or remote.

NOTE (3): Max fuse current rating denotes the largest amperage fuse that may be used for that series rated combination. A lower amperage fuse may be substituted for the listed fuse.

General Electric Series Rating Chart

Spectra Series

(See Notes on Page 49)

Maximum System Voltage	SCIR*	Line Side Fuse	Max Fuse Current Rating	Load Side		
				Circuit Breaker	Amps	Poles
240Vac	42kA	JJN, LPJ	600	TJD	250-400	2, 3
		KRP-C	2000	TJD	250-400	2, 3
	100kA	LPJ, JJN	400	TQD	125-225	2, 3
			600	THHQB	40-100	3
				TQD	100-225	2
				TQD	125-225	3
			800	TJD	250-400	2, 3
		KRP-C	1200	SFH	70-250	2, 3
			2000	TJD	250-400	2, 3
			2500	THJK	250-600	2, 3
	200kA	LPN-RK	200	TEB, TED	15-100	1, 2, 3
				SFH, SFL	70-250	2, 3
				SED, SEH, SEL	15-150	2, 3
		LPJ, JJN	400	TEB	15-100	1, 2
				TEB, TED	15-100	2, 3
				TJD	250-400	2, 3
				SFH, SFL	70-250	2, 3
			600	SED, SEH, SEL	15-150	2, 3
		KRP-C	2000	SGD, SGH, SGL	125-600	
277Vac	100kA	LPS-RK	100	TED	15-50	1
				THED	15-30	1
				TEY	15-100	1
			200	SED, SEH, SEL	15-150	2, 3
				TEY	15-100	1
				TED	15-50	1
		LPJ, JJS	400	TED	15-50	1
				THED	15-30	1
				SED, SEH, SEL	15-150	2, 3
			600	TEY	15-100	1
				SED, SEH, SEL	15-150	2, 3
480Vac	65kA	LPJ	600	TED, THED	15-150	2, 3
	100kA	LPS-RK	100	TED, THED6	15-100	2, 3
			200	TEY	15-100	2, 3
				SED, SEH, SEL	15-150	2, 3
				TED	15-50	1
		LPJ, JJS	400	TED, THED6	15-100	2, 3
				SFH, SFL	70-250	2, 3
				SGH, SGL	125-600	2, 3
			600	TEY	15-100	2, 3
				SED, SEH, SEL	15-150	2, 3
		JJS	800	SKH, SKL	300-1200	2, 3
		KRP-C	1200	THJK	125-600	2, 3
			2000	SKH, SKL	300-1200	2, 3
				SGH, SGL	125-600	2, 3
	200kA	KRP-C	2000	TPV, THPV	800A FRAME (1)	3
			2500	TPV, THPV	2500A FRAME (1)	3
600Vac	200kA	KRP-C	2000	TPV, THPV	800A FRAME (1)	3
			2500	TPV, THPV	2500A FRAME (1)	3

*Series Combination Interrupting Rating

(1) Includes all sensor/rating plug or setting values within stated frame size.

General Electric Series Rating Chart

AL / AQ PANELBOARD

(See Notes on Page 49)

Maximum System Voltage	SCIR*	Line Side Fuse	Max Fuse Current Rating	Load Side		
				Circuit Breaker	Amps	Poles
240Vac	42kA	JJN	600	THQL-GF	15-30	1
				THQL	15-100 (2)	1, 2, 3
		JJN, LPJ	600	TJD	250-400	2, 3
		KRP-C	2000	TJD	250-400	2, 3
	65kA	JJN	600	THHQL	15-70	1
				THHQL	15-125	2
		JJN, LPJ, LPN-RK	600	TFJ	70-225	2, 3
		KRP-C	3000	TFJ	70-225	2, 3
	100kA	LPN-RK	200	THQL	15-100 (2)	1, 2, 3
		JJN	200	THQP	15-50	1, 2
		LPJ, JJN	400	THQL	15-100 (2)	1, 2, 3
				TQD	125-225	2, 3
			600	THHQL, THHQB	40-100	3
				TFJ	70-225	2, 3
				TQD	100-225	2
				TQD	125-225	3
			800	TJD	250-400	2, 3
		KRP-C	1200	TFJ	70-225	2, 3
				SFH	70-250	2, 3
			2000	TJD	250-400	2, 3
	200kA	LPN-RK	200	THQL	15-100 (2)	1, 2
				TFJ	70-200	2, 3
				SFH, SFL	70-250	2, 3
				SED, SEH, SEL	15-150	2, 3
		LPJ, JJN	400	THQL	15-100 (2)	1, 2
				TFJ	70-225	2, 3
				TJD	250-400	2, 3
				SFH, SFL	70-250	2, 3
			600	SED, SEH, SEL	15-150	2, 3
		KRP-C	2000	SGD, SGH, SGL	125-600	

(2) THQL 1 pole rating is 70 amperes maximum. Maximum system voltage is 120/240Vac.
THQL 2 pole 110-125A ratings are also series rated on 120/240Vac maximum services.

ALC / AQC Panelboard

(See Notes on Page 49)

Maximum System Voltage	SCIR*	Line Side Fuse	Max Fuse Current Rating	Load Side		
				Circuit Breaker	Amps	Poles
240Vac	42kA	JJN	600	THQL-GF	15-30	1
				THQL	15-100 (2)	1, 2, 3
	65kA	JJN	600	THHQL	15-70	1
				THHQL	15-125	2
		JJN, LPJ, LPN-RK	600	TFJ	70-225	2, 3
		KRP-C	3000	TFJ	70-225	2, 3
	100kA	LPN-RK	200	THQL	15-100 (2)	1, 2, 3
		JJN	200	THQP	15-50	1, 2
		LPJ, JJN	400	THQL	15-100 (2)	1, 2, 3
				TQD	125-225	2, 3
			600	THHQL, THHQB	40-100	3
				TFJ	70-225	2, 3
				TQD	100-225	2
				TQD	125-225	3
		KRP-C	1200	TFJ	70-225	2, 3
				SFH	70-250	2, 3
	200kA	LPN-RK	200	THQL	15-100 (2)	1, 2
				TFJ	70-200	2, 3
				SFH, SFL	70-250	2, 3
				SED, SEH, SEL	15-150	2, 3
		LPJ, JJN	400	THQL	15-100 (2)	1, 2
				TFJ	70-225	2, 3
				SFH, SFL	70-250	2, 3
			600	SED, SEH, SEL	15-150	

*Series Combination Interrupting Rating
(2) THQL 1 pole rating is 70 amperes maximum. Maximum system voltage is 120/240Vac.
THQL 2 pole 110-125A ratings are also series rated on 120/240Vac maximum services.

General Electric Series Rating Chart

AE / AD PANELBOARD

(See Notes on Page 49)

Maximum System Voltage	SCIR*	Line Side Fuse	Max Fuse Current Rating	Load Side		
				Circuit Breaker	Amps	Poles
277Vac	100kA	LPS-RK	100	TED	15-50	1
				THED	15-30	1
				TEY	15-100	1
			200	SED, SEH, SEL	15-150	2, 3
				TEY	15-100	1
				TED	15-50	1
		LPJ, JJS	400	TED	15-50	1
				THED	15-30	1
				SED, SEH, SEL	15-150	2, 3
			600	TEY	15-100	1
				SED, SEH, SEL	15-150	
480Vac	65kA	LPJ	600	TED, THED	15-150	2, 3
	100kA	LPS-RK	100	TED, THED6	15-100	2, 3
			200	TEY	15-100	2, 3
				SED, SEH, SEL	15-150	2, 3
				TED	15-50	1
		LPJ, JJS	400	TED, THED6	15-100	2, 3
				TFJ	70-225	2, 3
				TJJ	125-400	2, 3
				SFH, SFL	70-250	2, 3
				SGH, SGL	125-600	2, 3
			600	TEY	15-100	2, 3
				SED, SEH, SEL	15-150	2, 3
		JJS	800	SKH, SKL	300-1200	2, 3
		KRP-C	1200	TJJ	125-400	2, 3
			2000	SKH, SKL	300-1200	2, 3
				SGH, SGL	1	

*Series Combination Interrupting Rating

AEC PANELBOARD

(See Notes on Page 49)

Maximum System Voltage	SCIR*	Line Side Fuse	Max Fuse Current Rating	Load Side		
				Circuit Breaker	Amps	Poles
277Vac	100kA	LPS-RK	100	TED	15-50	1
				TEY	15-100	1
			200	SED, SEH, SEL	15-150	2, 3
				TEY	15-100	1
				TED	15-50	1
		LPJ, JJS	400	TED	15-50	1
				SED, SEH, SEL	15-150	2, 3
			600	TEY	15-100	1
				SED, SEH, SEL	15-150	
480Vac	65kA	LPJ	600	TED	15-150	2, 3
	100kA	LPS-RK	100	TED	15-100	2, 3
			200	TEY	15-100	2, 3
				SED, SEH, SEL	15-150	2, 3
				TED	15-50	1
		LPJ, JJS	400	TED	15-100	2, 3
				TFJ	70-225	2, 3
				SFH, SFL	70-250	2, 3
				SGH, SGL	125-600	2, 3
			600	TEY	15-100	2, 3
				SED, SEH, SEL	15-150	

*Series Combination Interrupting Rating

General Electric Series Rating Chart

Note: The following circuit breakers may be substituted for the circuit breakers shown in the series rating tabulations. Devices with MicroVersaTrip Plus and PM trip units may also be substituted, provided the short circuit rating is equal to or greater than series connected rating. Ref. GE publication DET-008A.

Breaker	Substitute Breaker(s)
THQL	THQB, THQC, THQE, THHQL, THHQB, THHQC
THHQL	THHQB, THHQC
THQL-GF	THQB-GF, THQC-GF
TED	THED
SED	SEH, SEL, SEP
SEH	SEL, SEP
SEL	SEP
TQD	THQD
TFJ	TFK, THFK
SFH	SFL, SFP
SFL	SFP
TJJ	TJK, THJK, TJ4V, THJ4V, THJ9V, TJH
THJK	THJ4V, THJ9V, TJH, TJL
SGD	SGH, SGL, SGP
SGH	SGL, SGP
SGL	SGP
SKH	SKL, SKP
SKL	SKP
TPV	SS, SH, TP, TC, TCV, THP, THC, THCV
THPV	SH, THP, THC, THCV

NOTE 1: The data in these charts was compiled from information in GE Electrical Distribution & Control publication, catalog reference number GEP-1100P and GE Electrical Distribution & Control publication - UL Component Recognized Series Ratings, publication reference number DET-008A. Cooper Bussmann assumes no responsibility for the accuracy or reliability of the information. The information contained in the tables may change without notice due to equipment design modifications.

NOTE 2: The line-side fused switch may be in a separate enclosure or in the same enclosure as the load-side circuit breaker. A line-side fused switch may be integral or remote.

NOTE 3: Max fuse current rating denotes the largest amperage fuse that may be used for that series rated combination. A lower amperage fuse may be substituted for the listed fuse.

Siemens Series Rating Chart

Switchboards SB1, SB2, SB3
Panelboard S1

(See Notes on Next Page)

Max System Voltage	SCIR*	Line Side Fuse	Max Fuse Current Rating	Load side		
				Circuit Breaker	Amps	Poles
120/240Vac	65kA	LPJ, LPN-RK	600	QPH, BQH, BLH	15-70	1 (120V)
		JJN (300V)	1200		15-125	2
		KRP-C	6000		15-100	3
	100kA	JJN (300V)	200	QP, BQ, BL	15-70	1 (120V)
					15-125	2
					15-100	3
				HQP, HBQ, HBL, QPH, BQH, BLH	15-100	3
				QPF, BQF, BLF, QE, BE, BLE, QEH, BLEH, BLHF, QPHF, BQHF	15-30	1 (120V)
				QEH, BLEH, QE, QPHF, BLHF, BLE, QPF, BLF	15-60	2
				QT	15-50	1 (120V),2
			600	QPH, BQH, BLH, HQP, HBQ, HBL	15-70	1 (120V)
					15-125	2
					15-100	3
240Vac	100kA	LPJ, LPN-RK	600	ED4, HED4	15-100	1 (120V)
				ED4, ED6, HED4, HED6	15-125	2,3
				FD6-A, FXD6-A	70-250	2,3
				JD6-A, JXD6-A, JXD2-A, SJD6-A	200-400	2,3
				LD6-A	200-600	2,3
				SLD6-A	300-600	3
				LXD6-A	450-600	2,3
		JJN (300V)	1200	ED4, HED4	15-100	1 (120V)
				ED4, ED6, HED4, HED6	15-125	2,3
				FD6-A, FXD6-A	70-250	2,3
				JD6-A, JXD6-A, JXD2-A, SJD6-A	200-400	2,3
				LD6-A	200-600	2,3
				SLD6-A	300-600	3
				LXD6-A	450-600	2,3
		KRP-C	6000	ED4, HED4	15-100	1 (120V)
				ED4, ED6, HED4, HED6	15-125	2,3
				FD6-A, FXD6-A	70-250	2,3
				JD6-A, JXD6-A, JXD2-A, SJD6-A	200-400	2,3
				LD6-A	200-600	2,3
				SLD6-A	300-600	3
				LXD6-A	450-600	2,3
				SMD6	500-800	3
				SND6	500-1200	3
				PD6, PXD6, SPD6	1200-1600	3
				RD6, RXD6	1600-2000	3
	200kA	LPN-RK	200	QJH2, QJ2H, QJ2	125-200	2,3
		JJN (300V) LPJ	400	QJ2	125-225	2,3
			600	QJH2, QJ2H	125-225	2,3
		LPJ, LPN-RK	600	HFD6, HFXD6	70-250	2,3
		JJN (300V)	1200	HFD6, HFXD6	70-250	2,3
		KRP-C	6000	HFD6, HFXD6	70-250	2,3
				MD6, MXD6, HMD6, HMXD6	500-800	2,3
				ND6, NXD6, HND6, HNXD6	500-1200	2,3

*Series Combination Interrupting Rating