

COOPER

Bussmann®

Productivity Through Protection™

Simplified Guide To Understanding Short-Circuit Current Rating

FIND IT, FIX IT, FORGET IT



COOPER Bussmann

Are You Ready For The New SCCR Marking Requirements?

What Is A Short-Circuit Current Rating (SCCR)?

SCCRs on components and assemblies represent the maximum level of short-circuit current that the component or assembly can withstand and is used for determining compliance with NEC® 110.10. This rating can be marked on individual components or assemblies. Assembly ratings take into account all components contained within the equipment.

A common mistake is to assume that the interrupting rating of the overcurrent protective device protecting the circuit represents the SCCR for the entire circuit. Interrupting ratings, used for compliance with NEC® 110.9, apply solely to the overcurrent protective device. It is the characteristics of the overcurrent protective device (e.g. opening time, let-through energy) that need to be used in determining compliance with NEC® 110.10, not the interrupting rating.

CAUTION: Short-circuit current ratings (SCCRs) are different than interrupting ratings marked on overcurrent protective devices.

Who Is Affected By The SCCR Markings

The 2005 NEC® has requirements for anyone building equipment listed to the 2005 NEC® or to UL508A and requires the following to be marked with an SCCR:

- Industrial control panels [409.110]
- Industrial machinery electrical panels [670.3(A)]
- HVAC equipment [440.4(B)]
- Meter disconnect switches [230.82(3)]
- Motor controllers [430.8]

Effective April, 2006, all equipment listed to UL508A will be required to be marked with an assembly SCCR.

Inspectors and installers need this information in order to ensure compliance with NEC® 110.10. Equipment installed where fault current levels exceed their short-circuit current can be hazardous to persons and property. SCCR markings on components and assemblies make it easier to verify proper protection for components and assemblies for specific applications — whether it be the initial installation or relocation of equipment.







How Is SCCR Determined?

For meter disconnect switches and motor controllers, this withstand level or SCCR is often determined by product testing. For assemblies, the marking can be determined through product listing or by an approved method. With the release of the UL508A Industrial Control Panel standard, an industry approved method is now available. Any method used, whether UL508A or another approved method, should be based upon the **weakest link** approach. In other words, the assembly should be limited to installation where fault levels do not exceed the **withstand rating of devices with the lowest SCCR**. The marking determined should represent the limits of the assembly for a safe installation. Current-limiting overcurrent protective devices can be used in the feeder or branch circuits to increase the assembly SCCR where lower rated components are used.







Who Is Affected	How Are They Affected
Facility/Process Engineers/ Consulting Engineers	Need to specify end use equipment with ratings adequate for available short-circuit current.
Control Panel Builders/ Machine Builders/ HVAC Manufacturers	Need to determine and mark the assembly short-circuit current rating on the equipment being built. Need to market equipment with ratings at least as high as their competition.
Electrical Contractors	Need assurance that the equipment installed is adequate for the available short-circuit current at the point of installation, to avoid red tags and lost time and labor.
Electrical Inspectors	Need to assure that the available short-circuit current where equipment is being installed does not exceed the rating marked on the equipment.

Use this table to initiate the process of identifying the short-circuit current rating of your components and devices in power circuits. For further information contact your local Cooper Bussmann sales engineer, Cooper Bussmann Application Engineering, or visit www.cooperbussmann.com.

Supply Disconnect and OCPD

 Branch Circuit Fuses	 UL489 Circuit Breakers	 UL98 Fusible Disconnect Switches	 UL98 Non-Fusible Disconnect Switches	 UL1429 Pullout	 Molded Case Switch
200kA*	5kA	200kA*	5kA‡	10kA	5kA

Feeder Circuit OCPD and Components

 Branch Circuit Fuses	 UL489 Circuit Breakers	 UL98 Fusible Disconnect Switches	 UL98 Non-Fusible Disconnect Switches	 Power Distribution	 Fuse Holder
200kA*	5kA	200kA*	5kA‡	10kA	200kA*

Branch Circuit OCPD and Components

 Branch Circuit Fuses	 UL489 Circuit Breakers	 UL98 Fusible Disconnect Switches	 UL98 Non-Fusible Disconnect Switches	 Magnetic Motor Starter	 Type E Self Protected Starter	 Molded Case Switch	 Instantaneous Trip Circuit Breakers
200kA*	5kA	200kA*	5kA‡	5kA***	5kA***	5kA	+

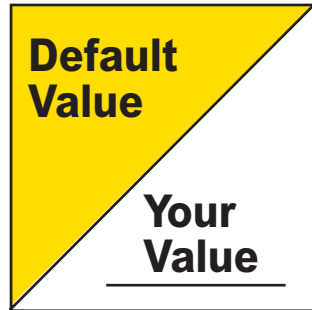
*Class CC, J, T, R, and L UL248 Branch Circuit Type Fuses.

**When used in conjunction with Class CC, J, T, R, and L UL248 Branch Circuit Type Fuses.

***50HP or less 480V

‡Default value increases to 10kA when protected by fuses

+Combination Rating is used for Sweep 1. For Sweep 2 IR=5kA (Default Value)



Glossary of Terms

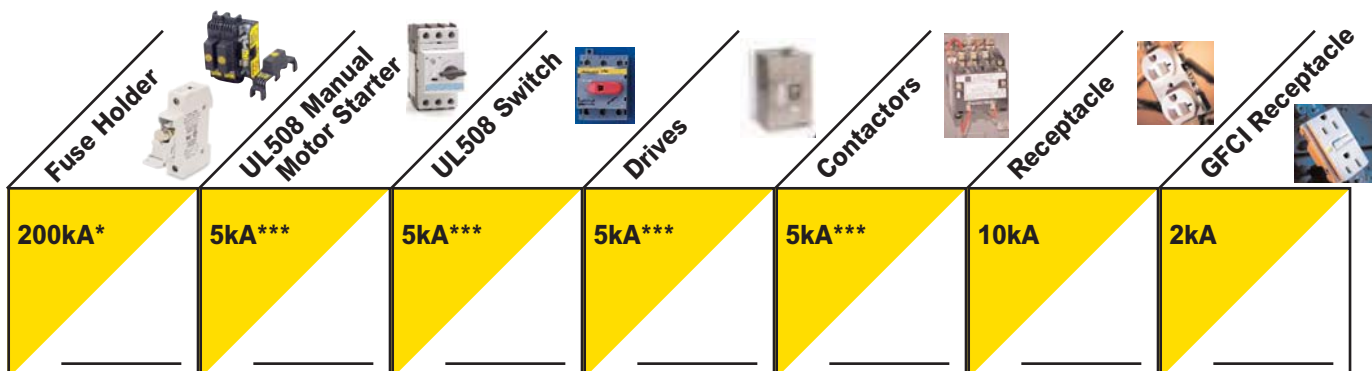
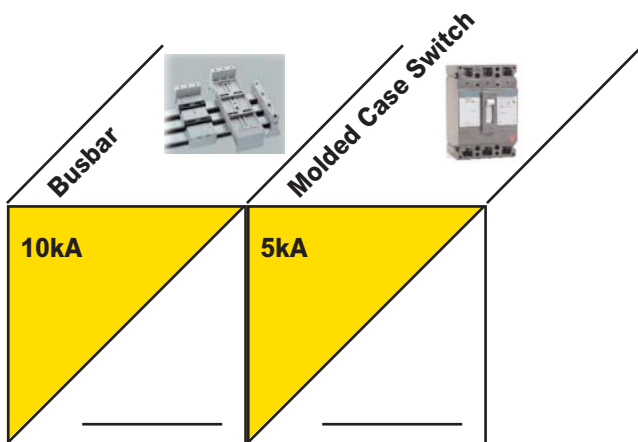
Industrial Control Panel - An assembly of a systematic and standard arrangement of two or more components such as motor controllers, overload relays, fused disconnect switches, fuses, and circuit breakers and related control devices such as pushbutton stations, selector switches, timers, switches, and control relays with associated wiring, terminal blocks, pilot lights and similar components.

Interrupting Rating - The highest current at rated voltage that a device is intended to interrupt under standard test conditions.

Short-Circuit Current Rating – The prospective symmetrical fault current at a nominal voltage to which an apparatus or system is able to be connected without sustaining damage exceeding the defined acceptance criteria

Control Circuit – A circuit that carries the electric signals directing the performance of a controller, and which does not carry the main power circuit. A control circuit is, in most cases, limited to 15 amp.

Power Circuit – Conductors and components of supply, branch, and feeder circuits, supplying main line power to loads such as heaters, motors, lighting, receptacles, power transformers, and appliances.



Find It, Fix It, Forget It

FIND IT – Look for... the *Weakest Link*

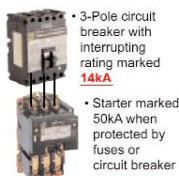
The SCCR marking for the assembly will be based upon the lowest short-circuit current or withstand rating of any power circuit component contained within the assembly — or the “*weakest link*”. Many components used in industrial control panels, industrial machinery and HVAC equipment may be the weakest link, including:

- motor controllers
- definite purpose contactors
- supplemental protectors
- circuit breakers (with low interrupting ratings)
- power distribution blocks.

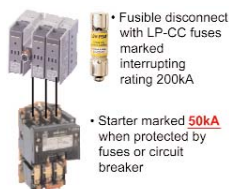
FIX IT — How To Get A Higher SCCR So Equipment Isn’t Limited

By fixing these *weakest links*, higher SCCRs can be achieved. In general, there are three options:

1. **Use overcurrent protective devices with higher interrupting ratings** — Overcurrent protective devices with low interrupting ratings often become the weakest link and limit the SCCR of the assembly. The interrupting ratings of the overcurrent protective devices used directly affects the assembly rating. The only fix is to use devices with higher interrupting ratings.

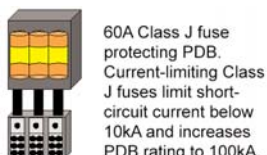


SCCR = 14kA

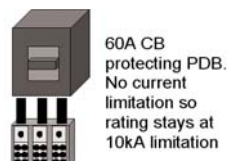


SCCR = 50kA

2. **Use current limitation to fix low rated components** — It only takes one component with a low SCCR to limit the entire assembly. Many of the components used in industrial control applications have low short-circuit current ratings. Fix these low rated components and the assembly rating by using current limitation. Since current-limiting fuses reduce high level short-circuit currents to a minimal level, they allow the use of these lower rated devices while providing a higher SCCR.



SCCR = 100kA



SCCR = 10kA

3. **Buy more expensive components with higher ratings** — A 65kA circuit breaker will more than double your cost compared to a 14kA circuit breaker. The fusible solution provides an interrupting rating as high as 200kA, at a comparable cost to your existing design, making it the most economical solution.

FORGET IT — Use Current-Limiting Fuses

Not only can modern current-limiting fusible solutions fix undesired weak links and obtain a high assembly short-circuit current rating, they can also provide enhancements to your design in the areas of flexibility of installation, increased workplace safety, and reliable protection through the life of your equipment. These enhancements take care of the hassle associated with equipment with limited ratings so you can *FORGET IT!*

Benefits of Using Cooper Bussmann Current-Limiting Fuses

Straight Voltage Ratings:

- Straight voltage ratings allow for more installations where equipment can be installed. Straight voltage rated equipment can be installed in any type of electrical system. With a straight voltage rating you can ship it anywhere and not have to worry.

High Assembly SCCRs:

- High SCCRs allow for more applications where equipment can be installed. With a high SCCR you can ship it anywhere and not have to worry.
- A wider range of fault current levels provides assurance that the equipment will be installed correctly and safely.
- Meets the UL508A and NEC® requirements for SCCR marking.
- Marketing advantage over competitive equipment with a lower rating.

Increased Flexibility In Panel Use and Installation:

- Valuable time that was spent gathering information for proper application is drastically reduced with fuses because modern current-limiting fuses can provide high assembly SCCRs and straight voltage ratings since they have:
 - High Interrupting Ratings of 200,000A or more
 - Excellent current limitation to protect low rated components at high short-circuit current levels
 - Straight voltage ratings so they can be installed in any type of application independent of the grounding scheme used, unlike devices with a slash voltage rating which are limited to installation in ONLY a solidly grounded wye type system

Cooper Bussmann Products And Technical Support Delivered Worldwide

Customer Assistance

Customer Satisfaction Team

The Cooper Bussmann Customer Satisfaction Team is available to answer questions regarding Cooper Bussmann products and services. Calls should be made Monday – Friday, 8:00 a.m. – 4:30 p.m. Central Time for all US time zones.

The Customer Satisfaction Team can be reached via:

- Phone: 636-527-3877
- Toll-free fax: 800-544-2570
- E-mail: busscustsat@cooperbussmann.com

Emergency and After-Hours Orders

To accommodate time-critical needs, Cooper Bussmann offers emergency and after-hours service for next flight out or will call. Customers pay only standard price for the circuit protection device, rush freight charges and a modest emergency fee for this service. Emergency and after-hours orders should be placed through the Customer Satisfaction Team. Call:

- Monday – Friday, 8:00 a.m. – 4:30 p.m. Central Time 636-527-3877
- After hours 314-995-1342

Application Engineering

Application Engineering assistance is available to all customers. The Application Engineering team is staffed by degreed electrical engineers and available by phone with technical and application support Monday – Friday, 8:00 a.m. – 5:00 p.m. Central Time.

Application Engineering can be reached via phone, fax or email:

- Phone: 636-527-1270
- Fax: 636-527-1607
- E-mail: fusetech@cooperbussmann.com

Online Resources

Visit www.cooperbussmann.com for the following services:

- Product cross reference
- Arc-flash calculator
- SCCR calculator
- Training modules

Your Authorized Cooper Bussmann Distributor is:



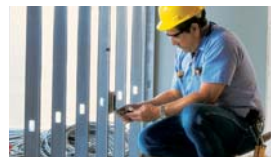
COOPER Lighting



COOPER Crouse-Hinds



COOPER Power Systems



COOPER Wiring Devices



COOPER B-Line