

Short-Circuit Current Ratings

The Bussmann logo consists of the word "Bussmann" in a bold, black, sans-serif font, with a registered trademark symbol (®) to the upper right of the final 'n'. The text is centered within a solid yellow rectangular background.

Jim Willey, P.E.
Technical Sales Engineer

Summary of Changes Requiring Marked Short Circuit Current Rating

- 409 **New Article** 409 Industrial Control Panels
- 409.110 Marked on Industrial Control Panels
- 430.8 Marked on Motor Controllers
- 440.4(B) Marked on HVAC
Greater than 60A Non Residential
- 670.3 Marked on Industrial Machinery
- 230.82(3) Marked on Meter Disconnect Switches

The Bussmann logo, featuring the word "Bussmann" in black on a yellow background, with the tagline "The Power to Protect." below it.The Cooper Bussmann logo, featuring the word "COOPER" in a small font above the word "Bussmann" in a larger font, with a stylized lightning bolt symbol above the 'P' in "COOPER".

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2002 NEC® and Before

- Required marking for interrupting rating of main Overcurrent Protective Device on Industrial machinery **(670.3)**
- Industrial control panels, HVAC control panels, motor controllers, and meter disconnects were not required to be marked with SCCR



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Now - 2005 NEC®

Required to be marked with short circuit current rating:

Components

- Motor Controllers
- Meter Disconnects

Assembly

- Industrial Control Panels
- Industrial Machinery Electrical Panels
- HVAC Panels above 60A non-residential



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WHY????



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Short Circuit Current Ratings (SCCR)

What is a Short Circuit Current Rating?

- The maximum short circuit current a component, assembly or equipment can safely withstand when protected by a specific overcurrent protective device, for a specified time interval
- SCCR pertains to protection of components, multiple component assemblies or entire control panels

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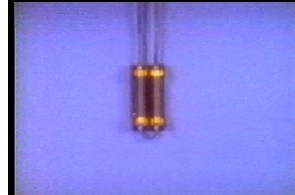
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Short Circuit Current Ratings

Short Circuit Current Rating is not the same as Interrupting Rating:

- Interrupting Rating – Maximum available current a fuse or circuit breaker can safely interrupt under standard test conditions
- Interrupting Rating only pertains to the overcurrent protective device
- Adequate Interrupting Ratings do not ensure protection of circuit components, assemblies or equipment



Class H Fuses 10kAIR



50,000A Fault

Inadequate Interrupting Rating

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Marked Short Circuit Current Ratings

Why are Marked Short Circuit Current Ratings Important?

- Needed to ensure compliance with NEC® 110.10
- Helps to eliminate hazards where components and equipment are applied above their ratings
- Simplifies inspection approval process

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Marked Short Circuit Current Ratings

Effective April 25, 2006

All Equipment listed to UL508A
is required to be marked with an
assembly short-circuit rating.

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Marked Short Circuit Current Ratings

Equipment Marking Requirements

- Short Circuit Current Rating can be established during testing as part of the Listing and Labeling process
- Where testing is not feasible, Short Circuit Current Ratings can be determined using approved engineering methods

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Meter Disconnects Marked Short Circuit Current Rating

230.82(3) – Equipment Connected to the Supply Side of Service Disconnect.

Only the following equipment shall be permitted to be connected to the supply side of the service disconnecting means:

(3) Meter disconnect switches nominally rated not in excess of 600 volts that have a **short-circuit current rating equal to or greater than the available short circuit current**, provided all metal housings and service enclosures are grounded.

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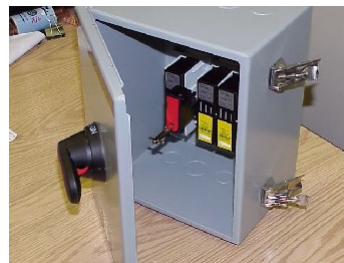
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230.82(3) Meter Disconnects Marked Short Circuit Current Ratings

Meter Disconnect Switches:

- Must have a marked short circuit current rating equal to or greater than the available short circuit currents
- Typically achieved by a fused disconnect utilizing current-limiting fuses



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430.8 Motor Controllers Marked Short Circuit Current Ratings

430.8 – **Motor Controllers**
A controller shall be **marked** with the manufacturer's name or identification, the voltage, the current or horsepower rating, **the short-circuit current rating**, and such other necessary data to properly indicate the applications for which it is suitable.



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430.8 Motor Controllers Marked Short Circuit Current Ratings

Exceptions where the Short Circuit Current Rating is **not** required on the controller:

- 1/8HP or less motors which are normally left running and constructed not to be damaged by overloads
- 1/3HP or less portable motors where the controller is the attachment plug and receptacle
- The rating is marked elsewhere on an assembly
- The assembly into which the controller is to be installed is marked with a rating
- Controller is rated 2HP or less at 300V or less and is listed exclusively for general purpose branch circuits

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Motor Controllers Marked Short Circuit Current Ratings

- UL 508 has:
 - “Standard” fault current test
 - An optional “high available” fault current test
 - Optional Type 2 “no damage”, “high available” fault current (UL 508E)
 - “Standard” level:
 - 5kA for 0 - 50HP ratings
 - 10kA for 51 - 200HP ratings, etc.
- Current limiting fuses are often used in the optional “high-available” fault current tests and Type 2 “no damage” tests to achieve high short circuit current ratings

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Marked Short Circuit Current Ratings

Motor Controller Label Example
(from an 80A, 40HP rated controller)



GENERAL PURPOSE SWITCH
INTERRUPTEUR, USAGE GENERAL

Short circuit rating 100kA at 600VAC max
when protected by 100A class J or T
5kA when protected by 150A class H or
RK5 fuses

LISTED 3E73
MAN MTR CNTRL



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409.110 – Industrial Control Panels – Marking.

An industrial control panel **shall be marked** with the following information that is plainly visible after installation:

- (3) **Short-circuit current rating** of the industrial control panel based on one of the following:
 - a. Short-circuit current rating of a listed and labeled assembly
 - b. Short-circuit current rating established utilizing an approved method

FPN: UL 508A-2001, Supplement SB, is an example of an approved method

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Marked Short Circuit Current Ratings

670.3 – Industrial Machine Nameplate Data.

(A) **Permanent Nameplate.** ... shall be attached to the control equipment enclosure or machine and shall be plainly visible after installation. The **nameplate shall include** the following information:

- (4) **Short-circuit current rating** of the industrial control panel based on one of the following:
- Short-circuit current rating of a listed and labeled assembly
 - Short-circuit current rating established utilizing an approved method

FPN: UL 508A-2001, Supplement SB, is an example of an approved method

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Marked Short Circuit Current Ratings

Example: Industrial Machinery Control Panel Label

Plastics Processing Machine	
Serial Number	SN2356YUP77
Current	87 Amperes
Largest Motor H.P.	25 Horsepower
Max OCP Device	60 Ampere
Voltage	460 - 480 volts
Phase & Freq..	3ph., 60 Hz
Short Circuit Current Rating 100,000 Amperes RMS	
Diagram Numbers	CM 12.1 THRU CM 12.5
Quality Machine Tool Somewhere, USA	

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Marked Short Circuit Current Ratings

440.4(B) – Marking on Hermetic Refrigerant Motor-Compressors and Equipment

(B) Multimotor and Combination-Load Equipment.

Multimotor and combination-load equipment shall be provided with a visible **nameplate marked with** the maker's name, the rating in volts, frequency and number of phases, minimum supply circuit conductor ampacity, the maximum rating of the branch-circuit short-circuit and ground-fault protective device, and **the short-circuit current rating of the motor controllers or industrial control panel.**

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Marked Short Circuit Current Ratings

Combination Load and Multimotor HVAC and Refrigeration Equipment

Exceptions:

- Equipment used in one and two family dwellings
- Cord-and-attachment-plug connected equipment
- Equipment supplied by a branch circuit protected at 60A or less

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Example of **HVAC** Label

HVAC Control Panel

Serial Number	HVDB708429521
Current	72 Amperes
Min Circuit Ampacity	90 Amperes
Max Fuse Size	125 Ampere
Voltage	460 - 480 volts
Phase & Freq..	3ph., 60 Hz

Short Circuit Current Rating 40,000 Amperes RMS

HVAC Equipment,
Inc. Anytown, USA

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Who is Affected and How are They Affected?

Who is affected	How are they affected
Facility/Process Engineers	Need to specify end use equipment with ratings adequate for available short-circuit current
Consulting Engineers	
Control Panel Builders	Need to determine and mark the assembly short-circuit current rating on the equipment they build. Need to market equipment with ratings as least as high as their competition.
Machine Builders	
HVAC Manufacturers	
Electrical Contractors	Need assurance that the equipment they install 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.

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Ensuring Compliance

For equipment requiring Marked Short Circuit Current Ratings

- Engineer provides:
 - Available short circuit currents at each installation point
 - Short circuit current rating of each piece of equipment or panel
- During site inspection, inspector compares actual marked short circuit current ratings to the submitted data: planned SCCRs and available short circuit currents

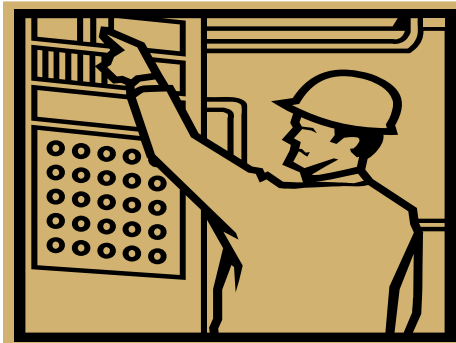
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Ensuring Compliance

This method requires proper engineering and analysis by the design engineers and proper review by inspectors.



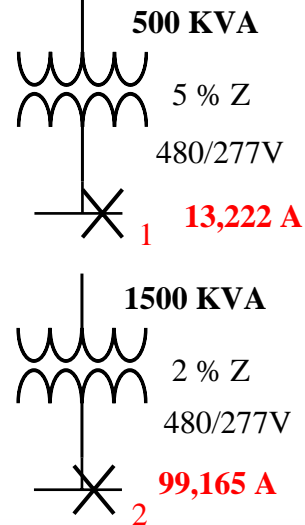
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Ensuring Compliance: Simple Check For Short Circuit Current Rating

- Determine the maximum, worst case short circuit current available at the terminals of the supply transformer
- Verify that all required equipment is marked with a short circuit current rating sufficient for this maximum, worst case available current
- If SCCRs are sufficient: installation approved. If this SCCRs insufficient by this quick check method, a detailed analysis may be required



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Achieving High Short Circuit Current Ratings

High Short Circuit Current Ratings Make Equipment and Controllers:

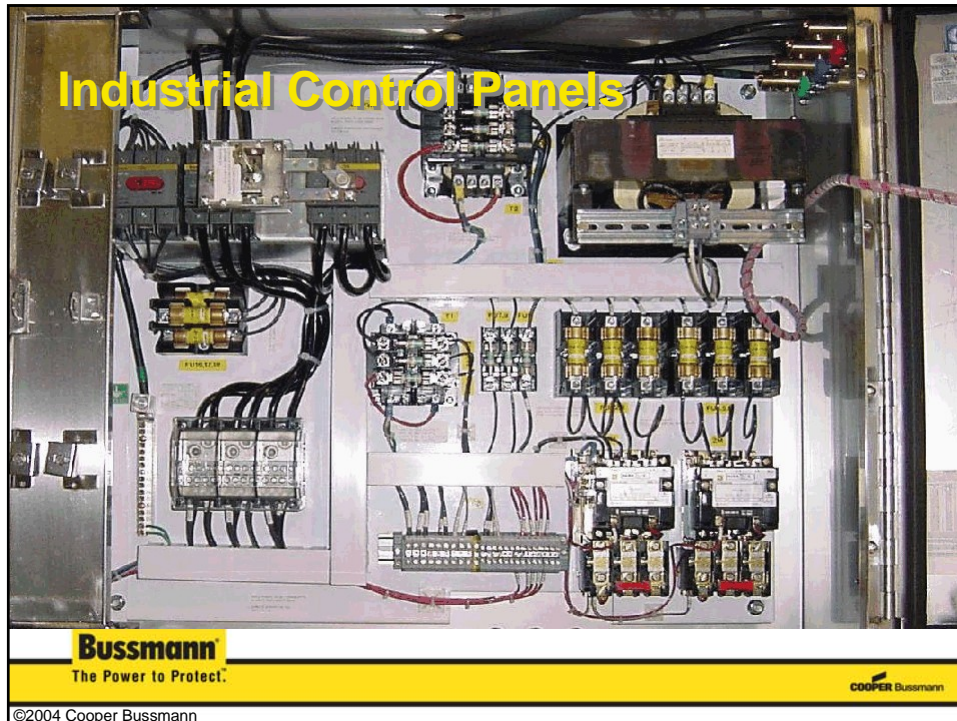
- Easier to specify and install for compliance
- More flexible – can be moved from location to location safely

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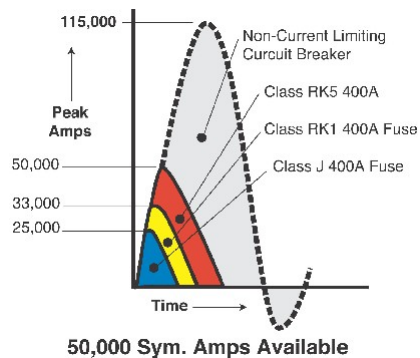
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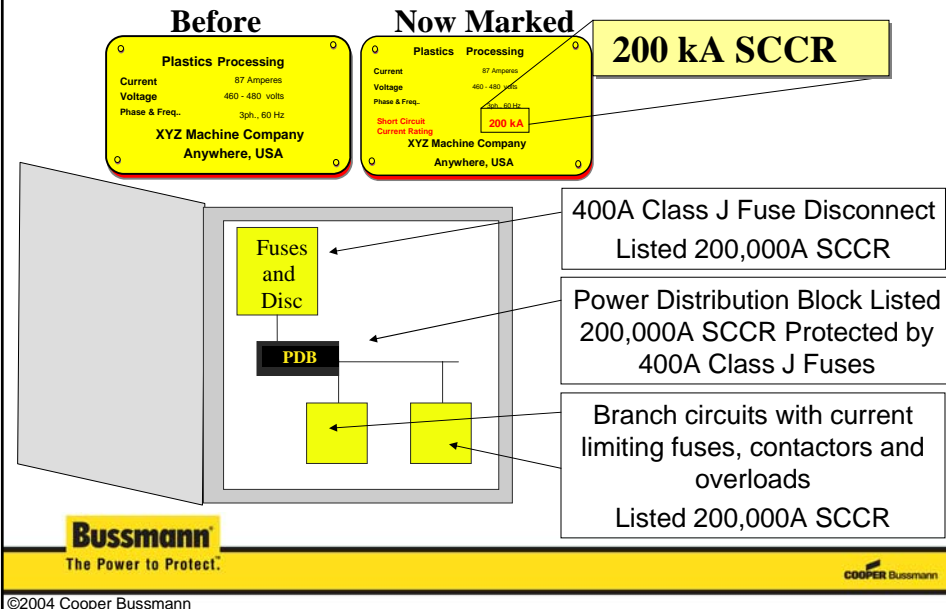
Achieving High Short Circuit Current Ratings

Current Limiting Fuses:

- Reduce fault energy
- Can be used to achieve high short circuit current ratings for motor controllers, assemblies of multiple components, disconnects, and industrial control panels



Regulatory - 2005 NEC® Changes Marked Short Circuit Current Ratings



How to Determine Short-Circuit Current Ratings

- Short-Circuit Current Rating can be established during testing as part of the Listing and Labeling process
- Where testing is not feasible, Short-Circuit Current Ratings can be determined using approved engineering methods
 - UL 508A is an approved method

Marked Short-Circuit Current Ratings

- What needs to be analyzed per UL 508A SB?
 - All power circuit components – components that supply main-line power to loads (disconnects, fuses/circuit breakers, load controllers, overload relays, power distribution/terminal blocks, etc)
 - Control circuits are not required to be analyzed (components that control loads – relays, contacts, etc)

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Marked Short-Circuit Current Ratings

- What is it looking for?
 - “Weak-Links”
 - Interrupting Rating always limits panel
 - SCCR rating of components unless they can be increased by current-limitation of devices in the feeder circuit (CL Fuses or Transformers)

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Marked Short Circuit Current Ratings

Summary: The 2005 NEC® now requires short circuit current ratings to be marked on:

- Meter Disconnect Switches
- Motor Controllers
- Industrial Control Panels
- Industrial Control Panels for Industrial Machinery
- Combination Load and Multimotor HVAC and Refrigeration Equipment

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