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
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

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
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
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

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
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
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.

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
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.

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
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

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
Marked Short Circuit Current Ratings

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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Industrial Control Panels: Now Marked with Short Circuit Current Rating
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:
   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

Example: Industrial Machinery Control Panel Label

<table>
<thead>
<tr>
<th>Plastics Processing Machine</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial Number</td>
<td>SN2356YUP77</td>
</tr>
<tr>
<td>Current</td>
<td>87 Amperes</td>
</tr>
<tr>
<td>Largest Motor H.P.</td>
<td>25 Horsepower</td>
</tr>
<tr>
<td>Max OCP Device</td>
<td>60 Ampere</td>
</tr>
<tr>
<td>Voltage</td>
<td>460 - 480 volts</td>
</tr>
<tr>
<td>Phase &amp; Freq.</td>
<td>3ph., 60 Hz</td>
</tr>
</tbody>
</table>

**Short Circuit Current Rating** **100,000 Amperes RMS**

**Quality Machine**

**Tool Somewhere,**

**USA**
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.

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
Marked Short Circuit Current Ratings

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

Who is Affected and How are They Affected?

<table>
<thead>
<tr>
<th>Who is affected</th>
<th>How are they affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility/Process Engineers</td>
<td>Need to specify end use equipment with ratings adequate for available short-circuit current</td>
</tr>
<tr>
<td>Consulting Engineers</td>
<td></td>
</tr>
<tr>
<td>Control Panel Builders</td>
<td>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.</td>
</tr>
<tr>
<td>Machine Builders</td>
<td></td>
</tr>
<tr>
<td>HVAC Manufacturers</td>
<td></td>
</tr>
<tr>
<td>Electrical Contractors</td>
<td>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.</td>
</tr>
<tr>
<td>Electrical Inspectors</td>
<td>Need to assure that the available short-circuit current where equipment is being installed does not exceed the rating marked on the equipment.</td>
</tr>
</tbody>
</table>
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

Ensuring Compliance

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

500 KVA
5% Z
480/277V
1 13,222 A

1500 KVA
2% Z
480/277V
2 99,165 A

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
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

Before

- Plastics Processing
- XYZ Machine Company
- Anywhere, USA

Now Marked

- 200 kA SCCR

- Power Distribution Block Listed
- 200,000A SCCR Protected by
- 400A Class J Fuses

- Branch circuits with current limiting fuses, contactors and overloads
- Listed 200,000A SCCR

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)

• 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)
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