Guidelines on the Short Circuit Current Rating for Industrial Control Panels

Technical Paper for Practical Applications

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I. General Background and Introduction of the SCCR for Industrial Control Panels

Since the 2005 edition, the NFPA70: National Electrical Code® (NEC) requires that industrial control panels have to be marked with an appropriate short circuit current rating (SCCR). This became effective and mandatory in April 2006.

The SCCR value in kA, at a defined voltage, is an indication of what fault current the industrial control panel can withstand (without unacceptable damage) in the event of a fault. Thus, the maximum fault current and the panel’s short circuit current rating should not be confused. Furthermore, an industrial control panel shall not be installed where the available fault current exceeds its short circuit current rating.

The available fault current at the input terminals of an industrial control panel must be known in order to determine if the short circuit current ratings marked on the nameplate of the control panel are adequate to interrupt such levels of fault current without damage to equipment or causing hazard to personnel.

As follows, the NEC defines two acceptable methods for labeling an industrial control panel’s short circuit current rating:

1. Short-circuit current rating of the listed and labeled assembly
2. Short-circuit current rating established utilizing an approved method

Thus, the two options for panel designers and builders are:

1. Using the SCCR of a listed and labeled assembly, which requires testing the individual panel design and then recording the test result for each panel design.

Note: The variety of possible combinations is usually very high, and this option therefore requires a lengthy test procedure. In addition, testing is a time-consuming and costly undertaking, since it is “destructive” (testing is conducted until the product fails). After testing, the results must be recorded in the panel builder’s file.

2. Utilizing an approved method. This translates to applying the method described in UL 508A Second Ed., Dec. 2013, Supplement SB.

Note: The latest edition of the NEC (NEC Ed. 2014) refers to an “Informational Note in Article 409,” “Industrial Control Panels,” which addresses the short circuit current ratings of the standard UL508A Supplement SB, as an example for an approved calculation method.

For many years, the UL508A Supplement SB has been the approved method for the calculation and determination of the short circuit current rating for industrial control panels, and one could proceed without further tests. It is important to note that the calculation method and the rules in the UL508A were changed in the latest edition, which was reissued in December 2013.

The calculation method and all the latest changes will be explained step-by-step below.

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**NEC 2014 – Section 409.110 Marking**

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

(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

**Informational Note:** UL 508A, Standard for Industrial Control Panels, Supplement SB, is an example of an approved method.

**Exception to (4):** Short-circuit current rating markings are not required for industrial control panels containing only control circuit components
II. Overview of the UL508A Supplement SB for Calculating the SCCR for Industrial Control Panels

Calculating the overall SCCR of an industrial control panel involves three essential steps:

1. Establishing the short circuit current ratings of the individual, relevant power circuit components
2. Applying current limiting components to modify the SCCR within a portion of a circuit in the panel
3. Determining the overall SCCR of the industrial control panel

Step 1: Establishing the short circuit current ratings of the individual, relevant power circuit components

Which components are relevant?

All power circuit components, including the disconnect switches, branch circuit protective devices, branch circuit fuse holders, load controllers, motor overload relays, terminal blocks, and bus bars

Exempt from this rule are the following components:

- Power transformers
- Reactors
- Current transformers
- Dry-type capacitors
- Resistors
- Varistors
- Voltmeters
- “S” contactor of a wye-delta motor controller

Enclosed air conditioners, multi-motor, and combination load equipment are also exempt from having a SCCR rating, as long as one of the following conditions is met:

- The equipment is cord-and-attachment-plug connected.
- The equipment is protected by a branch circuit protective device with a rated current of no more than 60 A.

Note: The primary short circuit protective device for the control circuit is also included in the calculation of the SCCR for the power circuit. Therefore, the SCCR of the overcurrent protective device (i.e., a supplementary protector or set of fuses) used on the primary side of a control power transformer is included in the determination of the SCCR for the control panel. Control circuit components downstream from these devices would not be included in the calculation of the SCCR.

Where can the SCCR ratings of the individual power circuit components be found?

Option 1: Capture this information from the device markings or component instruction sheets.

Most Siemens power control and circuit protection components include a standard short circuit rating on the front or side label.

Example of an SCCR marking on a 3RT Siemens contactor:
Option 2: For unmarked components, use the assumed maximum short circuit current ratings listed in Table S8 4.1 of the UL508A.

<table>
<thead>
<tr>
<th>Component</th>
<th>Assumed Maximum Short Circuit Rating for Unmarked Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus bars</td>
<td>10</td>
</tr>
<tr>
<td>Circuit breaker (including GFCI type)</td>
<td>5</td>
</tr>
<tr>
<td>Current meters</td>
<td>a</td>
</tr>
<tr>
<td>Current shunt</td>
<td>10</td>
</tr>
<tr>
<td>Fuse holder</td>
<td>10</td>
</tr>
<tr>
<td>Industrial control equipment:</td>
<td></td>
</tr>
<tr>
<td>a. Auxiliary devices (overload relay)</td>
<td>5</td>
</tr>
<tr>
<td>b. Switches (other than mercury tube type)</td>
<td>5</td>
</tr>
<tr>
<td>c. Mercury tube switches</td>
<td>5</td>
</tr>
<tr>
<td>d. Rated over 60 amperes or over 250 volts</td>
<td>3.5</td>
</tr>
<tr>
<td>e. Rated 250 volts or less, 60 amperes or less, and over 2 kVA</td>
<td>1</td>
</tr>
<tr>
<td>f. Rated 250 volts or less and 2 kVA or less</td>
<td></td>
</tr>
<tr>
<td>Motor controller (including combination motor controllers, float and</td>
<td></td>
</tr>
<tr>
<td>pressure-operated motor controllers, power conversion equipment, and</td>
<td></td>
</tr>
<tr>
<td>solid-state motor controllers)</td>
<td></td>
</tr>
<tr>
<td>a. 0–50 (0–37.3)</td>
<td>5c</td>
</tr>
<tr>
<td>b. 51–200 (38–149)</td>
<td>10c</td>
</tr>
<tr>
<td>c. 201–400 (150–298)</td>
<td>18c</td>
</tr>
<tr>
<td>d. 401–600 (299–447)</td>
<td>30c</td>
</tr>
<tr>
<td>e. 601–900 (448–671)</td>
<td>42c</td>
</tr>
<tr>
<td>f. 901–1600 (672–1193)</td>
<td>85c</td>
</tr>
<tr>
<td>Meter socket base</td>
<td>10</td>
</tr>
<tr>
<td>Miniature or miscellaneous fuse</td>
<td>10b</td>
</tr>
<tr>
<td>Receptacle (GFCI type)</td>
<td>2</td>
</tr>
<tr>
<td>Receptacle (other than GFCI type)</td>
<td>10</td>
</tr>
<tr>
<td>Supplementary protector</td>
<td>0.2</td>
</tr>
<tr>
<td>Switch unit</td>
<td>5</td>
</tr>
<tr>
<td>Terminal block or power distribution block</td>
<td>10</td>
</tr>
<tr>
<td>Multi-point interconnection power cable assembly</td>
<td>5</td>
</tr>
</tbody>
</table>

* A short circuit current rating is not required when meter connected via a current transformer or current shunt. A directly connected current meter shall have a marked short circuit current rating.
* The use of a miniature fuse is limited to 125-volt circuits.
* Standard fault current rating for motor controller rated within specified horsepower range.
* Highest rated horsepower of motor controller.

Option 3: High-capacity SCCR is based on testing a combination of components per UL508 Supplement SB, so follow those guidelines.

Within the UL508A Supplement SB, the application of previously investigated and tested assemblies from a supplier of equipment can be utilized as described in the manufacturer’s procedures to determine the SCCR.

Manufacturers of low-voltage protection, distribution, and control equipment may perform tests according to UL508 “Standard for Industrial Equipment,” which allows obtaining “high-capacity short circuit current ratings.” These high-capacity short circuit current ratings exceed the standard short circuit current ratings, in most cases.

Note: The High Capacity Short Circuit Current Ratings for Siemens components can be found at: www.usa.siemens.com/sccr

All the ratings for Siemens components are conveniently summarized in Excel spreadsheets.

Important note for tested combinations:

If the specified protective device is a Class CC, G, J, L, RK1, RK5, or T fuse, a fuse of a different class may be used, provided that the peak let-through current (Ip) and the peak let-through energy (I²t) is equal to or lower than the specified fuse. The peak let-through currents and peak let-through energy shall be taken from Table SB4.2 in the UL508A standard.

If the specified protective device is a “current limiting” circuit breaker, a different current limiting circuit breaker may be used, provided that the peak let-through current and the peak let-through energy is equal to or lower than the specified circuit breaker. The values shall be taken from the data sheets that are provided by the manufacturer of the circuit breaker (see example).

If the specified protective device is a “non-current limiting” overcurrent protective device, a current limiting device is able to be used at the same high fault rating, as long as the interrupting rating of the current limiting overcurrent device is equal to or greater than the specified overcurrent device.

A graphic explanation of Step 1 for the determination of the SCCR for individual power circuit components is available in Figure 2.

Step 2: Applying current limiting components to modify the SCCR within a portion of a circuit in the panel

Which components are considered to be “current limiting”?

UL508A allows the use of one of the following components to limit the available fault current to components downstream of the current limiting device:

1. Power transformers with an isolated secondary winding
2. Circuit breakers that are marked as “current limiting”
3. Fuses of Class CC, G, J, L, RK1, RK5, CF or T

Note: The current limiting component shall be installed in the Feeder Circuit!

A graphic explanation of the feeder circuit and the branch circuit can be seen in Figure 1.

The following information details how to effectively apply the current limiting components in the feeder circuit. Three scenarios are detailed.

Option 1: Use of power transformer with an isolated secondary winding, installed in the feeder circuit

In general, the SCCR on the line side of the transformer shall be the interrupting rating of the overcurrent protection device on the primary side of the power transformer, provided that the short circuit current of all the components and overcurrent protective devices is equal to or higher than the available short circuit current on the secondary side of the transformer.

How can the available secondary short circuit current of a transformer be determined?

Method A: Calculation with Formulas

Single-phase Transformers

Transformer Full-Load Current (IFL) = (Transformer kVA × 1000) / Voltage*

Short Circuit Current (ISC line-to-line) = ((Transformer Full Load Current (IFL))) / Transformer Impedance (Z)

Three-phase Transformers

Transformer Full-Load Current (IFL) = (Transformer kVA × 1000) / (Voltage** × 1.732)

Short Circuit Current (ISC line-to-line-to-line) = ((Transformer Full Load Current (IFL))) / Transformer Impedance (Z)

*Line-to-line secondary voltage

**Line-to-line-to-line secondary voltage
Method B: Use of default ratings for transformers

If the transformer impedance $Z$ is not available, either a default impedance $Z = 2.1\%$ or the values in the tables SB 4.3 for single-phase transformers or SB 4.4 for three-phase transformers can be applied.

Table SB 4.3 (Source: UL508A Second Edition)

<table>
<thead>
<tr>
<th>Transformer Max kVA</th>
<th>120</th>
<th>120/240</th>
<th>208</th>
<th>240</th>
<th>277</th>
<th>347</th>
<th>480</th>
<th>600</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>400 A</td>
<td>300 A</td>
<td>230 A</td>
<td>200 A</td>
<td>180 A</td>
<td>140 A</td>
<td>100 A</td>
<td>80 A</td>
</tr>
<tr>
<td>3</td>
<td>1,200 A</td>
<td>900 A</td>
<td>690 A</td>
<td>600 A</td>
<td>520 A</td>
<td>420 A</td>
<td>300 A</td>
<td>240 A</td>
</tr>
<tr>
<td>5</td>
<td>1,990 A</td>
<td>1,490 A</td>
<td>1,150 A</td>
<td>1,000 A</td>
<td>860 A</td>
<td>690 A</td>
<td>500 A</td>
<td>400 A</td>
</tr>
<tr>
<td>10</td>
<td>3,970 A</td>
<td>2,980 A</td>
<td>2,290 A</td>
<td>1,990 A</td>
<td>1,720 A</td>
<td>1,380 A</td>
<td>1,000 A</td>
<td>800 A</td>
</tr>
<tr>
<td>15</td>
<td>5,960 A</td>
<td>4,470 A</td>
<td>3,440 A</td>
<td>2,980 A</td>
<td>2,580 A</td>
<td>2,060 A</td>
<td>1,490 A</td>
<td>1,200 A</td>
</tr>
<tr>
<td>25</td>
<td>9,930 A</td>
<td>7,450 A</td>
<td>5,730 A</td>
<td>4,970 A</td>
<td>4,300 A</td>
<td>3,440 A</td>
<td>2,490 A</td>
<td>1,990 A</td>
</tr>
<tr>
<td>37.5</td>
<td>14,890 A</td>
<td>11,170 A</td>
<td>8,590 A</td>
<td>7,450 A</td>
<td>6,450 A</td>
<td>5,150 A</td>
<td>3,730 A</td>
<td>2,980 A</td>
</tr>
<tr>
<td>50</td>
<td>19,850 A</td>
<td>14,890 A</td>
<td>11,450 A</td>
<td>9,930 A</td>
<td>8,600 A</td>
<td>6,870 A</td>
<td>4,970 A</td>
<td>3,970 A</td>
</tr>
<tr>
<td>75</td>
<td>29,770 A</td>
<td>22,330 A</td>
<td>17,180 A</td>
<td>14,890 A</td>
<td>12,900 A</td>
<td>10,300 A</td>
<td>7,450 A</td>
<td>5,960 A</td>
</tr>
</tbody>
</table>

$^a$ Z assumed to be 2.1%.
$^b$ Short circuit current shown is line-to-neutral.

Table SB 4.4 (Source: UL508A Second Edition)

<table>
<thead>
<tr>
<th>Transformer Max kVA</th>
<th>120</th>
<th>120/240</th>
<th>208</th>
<th>240</th>
<th>277</th>
<th>347</th>
<th>480</th>
<th>600</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>1,160 A</td>
<td>930 A</td>
<td>810 A</td>
<td>510 A</td>
<td>410 A</td>
<td>410 A</td>
<td>330 A</td>
<td>80 A</td>
</tr>
<tr>
<td>10</td>
<td>2,320 A</td>
<td>1,860 A</td>
<td>1,610 A</td>
<td>1,010 A</td>
<td>810 A</td>
<td>810 A</td>
<td>650 A</td>
<td>240 A</td>
</tr>
<tr>
<td>15</td>
<td>3,470 A</td>
<td>2,780 A</td>
<td>2,410 A</td>
<td>1,510 A</td>
<td>1,210 A</td>
<td>1,210 A</td>
<td>970 A</td>
<td>400 A</td>
</tr>
<tr>
<td>20</td>
<td>4,630 A</td>
<td>3,710 A</td>
<td>3,210 A</td>
<td>2,010 A</td>
<td>1,610 A</td>
<td>1,610 A</td>
<td>1,290 A</td>
<td>800 A</td>
</tr>
<tr>
<td>25</td>
<td>5,790 A</td>
<td>4,630 A</td>
<td>4,010 A</td>
<td>2,510 A</td>
<td>2,010 A</td>
<td>2,010 A</td>
<td>1,610 A</td>
<td>1,200 A</td>
</tr>
<tr>
<td>30</td>
<td>6,940 A</td>
<td>5,560 A</td>
<td>4,820 A</td>
<td>3,010 A</td>
<td>2,410 A</td>
<td>2,410 A</td>
<td>1,930 A</td>
<td>1,990 A</td>
</tr>
<tr>
<td>45</td>
<td>10,410 A</td>
<td>8,330 A</td>
<td>7,220 A</td>
<td>4,520 A</td>
<td>3,610 A</td>
<td>3,610 A</td>
<td>2,890 A</td>
<td>2,980 A</td>
</tr>
<tr>
<td>75</td>
<td>17,350 A</td>
<td>13,880 A</td>
<td>12,030 A</td>
<td>7,520 A</td>
<td>6,020 A</td>
<td>6,020 A</td>
<td>4,820 A</td>
<td>3,970 A</td>
</tr>
<tr>
<td>100</td>
<td>23,140 A</td>
<td>18,510 A</td>
<td>16,040 A</td>
<td>10,030 A</td>
<td>8,020 A</td>
<td>8,020 A</td>
<td>6,420 A</td>
<td>5,960 A</td>
</tr>
</tbody>
</table>

$^a$ Z assumed to be 2.1%.
$^b$ Short circuit current shown is line-to-neutral.

A graphic explanation of Step 2 for using power transformers in the feeder circuit as a current limiting device is available in Figure 3.1.
Option 2: Use of circuit breaker marked as “current limiting” installed in the feeder circuit

In General:

The SCCR on the line side of feeder circuit breaker shall be the interrupting rating of the breaker if the following two conditions are fulfilled:

1. The components on the load side of the circuit breaker have a SCCR equal to or higher than the peak let-through current of the feeder circuit breaker.

2. The branch protection devices have an interrupting rating equal or higher than the interrupting rating of the circuit breaker in the feeder circuit.

If condition 1. is not fulfilled, the lowest SCCR any component on the load side of the circuit breaker shall be the SCCR for the entire circuit on the line side of the feeder circuit breaker.

If condition 2. is not fulfilled, the interrupting rating of the branch circuit protective device shall be the SCCR of the entire circuit on the line side of the feeder circuit breaker.

Note: The peak let-through values of the Circuit Breaker need to be provided by the Circuit Breaker manufacturer.

Example: Siemens ED Circuit Breaker, CED 6

A graphic explanation of Step 2 for using circuit breakers in the feeder circuit as a current limiting device is available in Figure 3.3.
Option 3: Use of current limiting fuses installed in the feeder circuit

Fuses of the Class CC, G, J, L, RK1, RK5, or T are current limiting.

The SCCR on the line side of fuse in the feeder circuit shall be the interrupting rating of the fuse if the following two conditions are fulfilled:

1. The components on the load side of the fuse have a SCCR equal to or higher than the peak let-through current of the fuse in the feeder circuit.

2. The branch protection devices have an interrupting rating equal to or higher than the interrupting rating of the fuse in the feeder circuit.

If condition 1. is not fulfilled, the lowest SCCR of any component on the load side of the circuit breaker shall be the SCCR for the entire circuit on the line side of the feeder circuit breaker.

If condition 2. is not fulfilled, the interrupting rating of the branch circuit protective device shall be the SCCR of the entire circuit on the line side of the feeder circuit fuse.

Note: The peak let-through values of the Fuse shall be taken from the table SB 4.2 in the UL508A Standard for Industrial Control Panels!

Extract of the table SB 4.2 UL508A, Second Edition

<table>
<thead>
<tr>
<th>Fuse Types</th>
<th>Fuse Rating Ampere</th>
<th>Between Threshold and 50 kA</th>
<th>100 kA</th>
<th>200 kA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Ip $10^3$</td>
<td>Ip $10^3$</td>
<td>Ip $10^3$</td>
</tr>
<tr>
<td>Class CC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>20</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>30</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>7.5</td>
</tr>
<tr>
<td>Class G</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>–</td>
<td>–</td>
<td>3.8</td>
<td>4</td>
</tr>
<tr>
<td>20</td>
<td>–</td>
<td>–</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>30</td>
<td>–</td>
<td>–</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>60</td>
<td>–</td>
<td>–</td>
<td>25</td>
<td>10.5</td>
</tr>
</tbody>
</table>

Source UL508A, Second Edition

A graphic explanation of Step 2 for using fuses in the feeder circuit as a current limiting device is available in Figure 3.2.
II. Overview of the UL508A Supplement SB for Calculating the SCCR for Industrial Control Panels

Step 3: Determining the overall SCCR of the industrial control panel

To do so, establish the overall rating for the industrial control panel, which cannot exceed the rating of the lowest rated component or circuit, including

• the modified rating determined in Step 2 (applying current limiting components to modify the SCCR within a portion of a circuit in the panel) above, and

• the overcurrent protection device on the primary side of the control circuit.
III. Figures Referenced in the Calculation Steps

Figure 1: Graphic explanation of branch circuit and feeder circuit
Figure 2: Graphic explanation of Step 1: Determination of the SCCR for individual power circuit components

SCCR of the individual components.
Ratings are either from the nameplate or for unmarked components from Table SB4.1 UL508A

High Fault/Capacity Short Circuit Current
Ratings are based on Combination Tests, certified by UL and documented in a UL Certificate of Compliance.

www.usa.siemens.com/sccr
Figure 3.1: Graphic explanation/example of Step 2: Use of current limiting transformers in the feeder circuit

**Result:**

Overall SCCR = 100kA = A.I.C. of the Class J Fuse on the primary side of the transformer since the available secondary fault current of the transformer (4.6kA) is less than the SCCR and A.I.C.'s of the components on the load side of the transformer.
Figure 3.2: Graphic explanation / example of Step 2: Use of current limiting fuses in the feeder circuit

**Result:**

Overall SCCR = 5 kA = SCCR of the contactor and solid-state relay
The Class J, 100 Amp fuse has a peak-let through current of 12 kA at an available fault current of 65 kA.
Therefore, the peak-let through current is not smaller than the lowest SCCR of the components in the Branch Circuits which are the Solid-state relay and the contactors with each 5kA
Figure 3.3: Graphic explanation / example of Step 2: Use of circuit breaker marked as “current limiting” in the feeder circuit

**Result:**

Overall SCCR = 5 kA = SCCR of the contactor and solid-state relay

The C.B. 100 Amp has a **peak-let through current of 20 kA** at an available fault current of 65 kA. Thus the peak-let through current is not smaller than the lowest SCCR of the components in the Branch Circuits which are the Solid-state relay and the contactors with each 5 kA.

3 Ph. 480Y/277V AC

Siemens CFD “current limiting” Breaker, 100 Amps
A.I.C.: 100 kA
\[\Rightarrow\] Acc. Siemens data sheet: Ip = 20 kA
IV. Flow Charts for the Determination of the SCCR

Step 1: Establishing the SCCR of individual power circuit components

Start

Is the component UL listed or recognized?

no

Is the component part of the power circuit?

yes

Component is not required to have a SCCR

Is the component a transformer, reactor, current transformer, dry-type capacitor, resistor, varistor, voltmeter, S-contractor of a wye delta starter, enclosure air conditioner or multi-motor equipment which is cord connected or protected with a Branch Circuit Protective Device less than 60 Amps?

yes

Use the tested high fault SCCR for this component / assembly

no

Is it tested for high fault short circuit current ratings and is the specified Overcurrent Protective Device installed ahead of the component?

yes

Is the component part of the power circuit?

no

Is the component marked with a SCCR?

yes

Use the marked SCCR for this component

no

Is there any other components in the control panel?

no

Use the SCCR ratings of the lowest SCCR rating and/or the high fault SCCR current rating and proceed to Step 2: Use of current limiting devices in the feeder circuit

Specialized software tools are available to assist with the selection and configuration of industrial control panels, ensuring compliance with safety standards and optimizing system performance.
Step 2: Use of “current limiting” components in the feeder circuit

Proceed to Step 3:
Determining of the overall SCCR for the Industrial Control Panel

Is there a current limiting component installed in the feeder circuit, either Circuit Breaker, Fuse or a transformer?

Is it a Circuit Breaker, marked as “current limiting”?

Is it a Fuss, Class CC, J, G, T, CF, RK1 or RK5?

Is the secondary available fault current of the transformer, based on calculation acc. UL508A or based on the default values in Table SB 4.3 or SB4.4 of the UL508A smaller than the SCCR ratings of all components and overcurrent protective devices in the branch?

Use the SCCR’s at the end of Step 1.

Is the peak-let through current acc. to table SB 4.2 in the UL508A less than the SCCR of the components in the Branch Circuits?

Use the SCCR’s at the end of Step 1.

Are the SCCR’s of the components based on a High Fault SCCR test?

Are the SCCR’s of the components based on a High Fault SCCR test?

Are the high fault SCCR’s higher than the A.I.C. of the overcurrent protective device on the primary side of the transformer?

Are the high fault SCCR’s higher than the A.I.C. of the overcurrent protective device on the primary side of the transformer?

Use the A.I.C. of the overcurrent protective devize on the primary side of the transformer for the SCCR on the primary side of the transformer

Proceed to Step 3:
Determining of the overall SCCR for the Industrial Control Panel
Step 3: Determination of the overall short circuit current rating of the panel

Start

All SCCR’s of individual components and/or high fault SCCR (Step 1) and/or the SCCR on the line side of the current

Does the industrial control panel consist of a single branch circuit and the branch circuit protective device is not installed within the panel?

- Yes
  - Use the smallest SCCR of any components in the branch circuit including the SCCR of a possible control circuit overcurrent protective device and assign it as the overall SCCR on the panel
  - No
  - No
  - Yes
  - Is the SCCR based on a high fault current test?
    - Yes
      - Use the High Fault Current and assign this value as the overall SCCR on the panel
    - No
    - No
  - No
  - No
  - Yes
    - Branch
      - Feeder Circuits
        - Have the components in the feeder circuit been tested for “high fault SCCR”?
          - Yes
            - Use the smallest SCCR of any feeder circuit component including a possible control circuit overcurrent protective device in the feeder circuit
          - No
            - Use the smaller of the “high fault SCCR” compared with the SCCR of a possible control circuit overcurrent protective device in the feeder circuit
        - Use the smallest SCCR of any branch circuits based on SCCR of individual power circuit components and/or high fault SCCR’s (Step 1) or the SCCR on the line side of the current limiting device in the feeder circuit (Step 2) including the SCCR of a possible control circuit overcurrent protective device connected to the branch circuit
      - Does the industrial control panel consist of several branch circuits and feeder circuit components within the industrial control panel?
        - Yes
          - Compare the smallest SCCR of all branch circuits with the smallest SCCR of the components in the feeder circuit and assign the smaller one as the overall SCCR for the Industrial Control Panel
        - No
          - No

End
V. Glossary

Available Fault Current
R.M.S. value of the current that would flow if the supply conductors to the circuit are short-circuited by a conductor of negligible impedance located as near as practicable to the supply terminals of the industrial control panel. The available fault current at the point of the supply to the machine shall not be greater than the short circuit current rating marked on the industrial control panel nameplate.

Branch Circuit
The conductors and components following the last overcurrent protective device protecting a load.

Current-Limiting Overcurrent Protective Device
A device that, when interrupting currents in its current-limiting range, reduces the current flowing in the faulted circuit to a magnitude substantially less than that obtainable in the same circuit if the device were replaced with a solid conductor having comparable impedance.

Feeder Circuit
The conductors and circuitry on the supply side of the branch circuit overcurrent protective device.

High Fault / Capacity Short Circuit Current Rating
A marked short circuit current rating of a motor controller that is greater than the standard fault short circuit current rating.

Industrial Control Panel
An assembly of two or more components
• In the power circuit, such as motor controllers, overload relays, fused disconnect switches, and circuit breakers
• In the control circuit, such as pushbuttons, signal lamps, selector switches, time-delay switches/relays, switches, control relays
• In a combination of two circuits
These components are mounted in an enclosure or panel with the associated wiring and terminals. The industrial control panel does not include the controlled equipment.

Interrupting Rating
(aka Available Interrupting Capacity – A.I.C.)
The highest current at rated voltage that a device is identified to interrupt under standard test conditions.

Overcurrent Protection
A device designed to open a circuit when the current through it exceeds a predetermined value. The ampere rating of the device is selected for a circuit to terminate a condition where the current exceeds the rating of conductors and equipment due to overloads, short circuits, and faults to ground.

Peak Let-Through Current - IP
The highest instantaneous current passed by the over-current protection device during the interruption of the current.

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

Standard Fault Short Circuit Current Rating
Short circuit current rating of a motor controller as specified in Table SB4.1. UL508A, Second Edition.

Standard References:
i. UL508A Second Edition, Standard for Industrial Control Panels
ii. UL508, Standard for Industrial Control Equipment