Codes and Regulations for Panel Builders

- Organizations
- Standards and Codes
- Recent changes in the codes and standards
THE INFORMATION PROVIDED HEREIN IS PROVIDED AS A GENERAL REFERENCE REGARDING THE USE OF THE APPLICABLE PRODUCTS IN GENERIC APPLICATIONS. THIS INFORMATION IS PROVIDED WITHOUT WARRANTY. IT IS YOUR RESPONSIBILITY TO ENSURE THAT YOU ARE USING ALL SIEMENS PRODUCTS PROPERLY IN YOUR SPECIFIC APPLICATION. ALTHOUGH THIS SITE STRIVES TO MAINTAIN ACCURATE AND RELEVANT INFORMATION, THERE IS NO OFFICIAL GUARANTEE THAT THE INFORMATION PROVIDED HEREIN IS ACCURATE. IF YOU USE THE INFORMATION PROVIDED HEREIN IN YOUR SPECIFIC APPLICATION, PLEASE DOUBLE CHECK ITS APPLICABILITY AND BE ADVISED THAT YOU ARE USING THIS INFORMATION AT YOUR OWN RISK. THE PURCHASER OF THE PRODUCT MUST CONFIRM THE SUITABILITY OF THE PRODUCT FOR THE INTENDED USE, AND ASSUME ALL RISK AND LIABILITY IN CONNECTION WITH THE USE.
Standard Organizations – extract

UL:
Underwriter Laboratories publishes standards and certifies products in accordance with its own and other standards (CSA, IEC,...). Headquarter: Northbrook, Illinois. In general, UL certification is not required by law. However, all Authorities accept UL certification without restrictions.

CSA:
The Canadian Standard Association publishes standards and certifies products in accordance with its own and other standards (UL, IEC,...). Headquarter: Toronto

NFPA:
The National Fire Protection Association publishes diverse regulations and directives such as NEC, NFPA79; NFPA70E; NFPA70B

ANSI:
The American National Standards Institute is the highest level national standard authority in the USA. Most regulations are based on the ANSI standard
1893 World Exhibition in Chicago
Outbreak of a fire

1894 Start of UL
William H. Merrill opens the “Underwriters Electrical Bureau”
NFPA Organization

- Foundation: 1896, due to increasing sprinkler system installations
- Headquarters: Quincy, Massachusetts
- Publication of over 300 standards to date

**National Fire Protection Association**
The authority on fire, electrical, and building safety

- National Electrical Code
- or
- NFPA70

- NFPA79
  Electrical Standard for Industrial Machinery

Standardization organization in the field of *fire protection, electrical safety and building safety*
### Organizations Currently Recognized by OSHA as NRTLs

The pages below include information about the NRTL (such as the list of standards, sites, and programs that OSHA has recognized for the NRTL).

- [Canadian Standards Association (CSA)](www.osha.gov/dts/otpca/nrtl)
- [Curtis-Straus LLC (CSL)](www.osha.gov/dts/otpca/nrtl)
- [FM Approvals LLC (FM)](www.osha.gov/dts/otpca/nrtl)
- [Intertek Testing Services NA, Inc. (ITSNA)](www.osha.gov/dts/otpca/nrtl)
- [MET Laboratories, Inc. (MET)](www.osha.gov/dts/otpca/nrtl)
- [Nemko-CCL (CCL)](www.osha.gov/dts/otpca/nrtl)
- [NSF International (NSF)](www.osha.gov/dts/otpca/nrtl)
- [QPS Evaluation Services Inc. (QPS)](www.osha.gov/dts/otpca/nrtl)
- [SGS North America, Inc. (SGS)](www.osha.gov/dts/otpca/nrtl)
- [Southwest Research Institute (SWRI)](www.osha.gov/dts/otpca/nrtl)
- [TUV Rheinland of North America, Inc. (TUV)](www.osha.gov/dts/otpca/nrtl)
- [TUV Rheinland PTL, LLC (TUVPTL)](www.osha.gov/dts/otpca/nrtl)
- [TÜV SÜD America, Inc. (TUVAM)](www.osha.gov/dts/otpca/nrtl)
- [TÜV SÜD Product Services GmbH (TUVPSG)](www.osha.gov/dts/otpca/nrtl)
- [Underwriters Laboratories Inc. (UL)](www.osha.gov/dts/otpca/nrtl)
Important Standards for OEMs and Industrial Control Panel Manufacturers

National Electrical Code or NFPA70

UL508A Industrial Control Panels

NFPA79 Industrial Machinery

NEC is the only statutory standard in the USA
UL508A and NFPA79 have a quasi-legislative character
Standard References in the USA

**NEC (NFPA 70) 2014**

Art. 409.1 Scope
Safety Standard for Industrial Control Panels

**UL508A (Industrial Control Panels)**

Chapt.65.1
These requirements cover industrial control panel for industrial machinery.

**NFPA 79 (Electrical Standard for Industrial Machinery)**

Art. 670
Electrical Standard for Industrial Machinery
**Standard**
Definition “Industrial Control Panels” in acc. with NEC 2014

**Industrial Control Panel.** An assembly of two or more components consisting of one of the following:

1. **Power circuit components only,** such as motor controllers, overload relays, fused disconnect switches, and circuit breakers.
2. **Control circuit components only,** such as pushbuttons, pilot lights, selector switches, timers, switches, control relays.
3. A combination of power and control circuit components.

These components, with associated wiring and terminals, are mounted on or contained within an enclosure or mounted on a subpanel. The industrial control panel does not include the controlled equipment.

**Components suitable for an Industrial Control Panel → UL508A, Table SA1.1**

**Definition:**
2 or more devices installed in the power circuit including their control circuits and control devices

e.g. motor starter
Application of the wrong standard

Example: Scope of the UL508A…

<table>
<thead>
<tr>
<th>... includes the following</th>
<th>... does not include the following</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Industrial Control Panels</td>
<td>- Panels for Construction Sites</td>
</tr>
<tr>
<td>- Flame Control Panels</td>
<td>- Motor Control Center</td>
</tr>
<tr>
<td>- Industrial Machinery</td>
<td>- Panels for Classified Locations</td>
</tr>
<tr>
<td>- Crane Control</td>
<td>- Switchgear (UL891)</td>
</tr>
<tr>
<td>- Air Conditioning and Refrigerating Equipment</td>
<td>- Control Panels for Wind Mills or photovoltaic</td>
</tr>
<tr>
<td>- Service Equipment</td>
<td>- Control Panels for Swimming Pools</td>
</tr>
<tr>
<td>- Industrial Control Panel Enclosures</td>
<td>- Alarmpanels</td>
</tr>
<tr>
<td>- Irrigation Equipment</td>
<td>- Fire Pump Stations</td>
</tr>
<tr>
<td>- panels for fountain control</td>
<td></td>
</tr>
</tbody>
</table>
Meaning of the NPFA79 2015 Edition...

Scope of the standard:

- ...application standard for electrical equipment and systems with max. 600 V for operator and system protection
- ...from the electric infeed down to the individual machine modules
- ...for non-hazardous ambient conditions (non-hazardous locations)
Industrial Machinery

Definition of "industrial machinery" according to NFPA79 & NEC70:
- Motorized machine(s) for material processing (e.g. forming, pressing, cutting)
- Not transportable by hand during operation
- With corresponding modules, as the case may be (e.g. conveyor belts, mounting accessories, testing equipment, packing units)
- Including control technology with PLC controls, actuators / sensors

Definition of "industrial machinery" according to UL508A §65:
- Metal-processing machines
- Plastic-processing machines
- Wood-processing machines
- Mounting machines
- Material-handling machines
- Maintenance and testing equipment
Annex C  Examples of Industrial Machines Covered by NFPA 79

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

C.1 Machine Tools. Examples of machine tools are as follows:
(1) Metal cutting
(2) Metal forming

C.2 Plastics Machinery. Examples of plastics machinery are as follows:
(1) Injection molding machines
(2) Extrusion machinery
(3) Blow molding machines
(4) Specialized processing machines
(5) Thermoset molding machines
(6) Size reduction equipment

C.3 Wood Machinery. Examples of wood machinery are as follows:
(1) Woodworking machinery
(2) Laminating machinery
(3) Sawmill machines

C.4 Assembly Machines.

C.5 Material-Handling Machines. Examples of material-handling machines are as follows:
(1) Industrial robots
(2) Transfer machines
(3) Sortation machines

C.6 Inspection/Testing Machines. Examples of inspection/testing machines are as follows:
(1) Coordinate measuring machines
(2) In-process gauging machines
Example of the scope of application standards

NEC (NFPA70)

*) UL508A

NFPA79
Definition of Terms

AHJ

Authorities Having Jurisdiction (AHJ’s):
Compliance with laws and codes is monitored by the responsible authorities of the respective federal states, districts or municipalities

Example: State Electrical Commission, State Fire Marshal

The current NEC (National Electrical Code) serves as reference in most cases
Approved:

Acceptable to the authority having jurisdiction. [Approval is a primary responsibility of an electrical inspector. Investigations by a thirdparty and the listing and labeling that result are a great aid to inspectors in this responsibility (see "Labeled, and"Listed").]

→ The inspector decides on what is and what is not accepted;
  UL certificates serve as a great help and reference for the inspector

AHJ function:

The key to a successful and correct electrical inspection lies in applying the rules of the Code, not the personal preferences of the inspector. To reiterate, if the installation meets the Code requirements (including any local amendments) and is safe, the installation should pass inspection.

→ The application of standards facilitates acceptance by the inspector
Recent changes - National Electrical Code (NEC) 2014
Maximum voltage of an Industrial Control Panels has been changed from 600V to 1000V

ARTICLE 409
Industrial Control Panels

I. General
409.1 Scope
This article covers industrial control panels intended for general use and operating at 1000 volts or less.

Informational Note: ANSI/UL 508, Standard for Industrial Control Panels, is a safety standard for industrial control panels.
Recent changes - National Electrical Code (NEC) 2014
Maximum voltage of an Industrial Control Panels has been changed

When it comes to Industrial control panels the NEC 2014 refers still to UL 508A!

Recommendation:
Industrial control Panels should fulfill furthermore the UL 508A
→ Maximum voltage 600V!

UL 508A is still limited to 600V or less!
**UL 508A**

Important changes

**UL 508A was extended by the following specific use parts:**

- Fountain control panels
- Industrial control panels for irrigation equipment  \[\text{New!!!}\]
- Enclosures
- Industrial machinery
- Crane control
- Service Equipment Use
- Flame Control
- Marine Use
- Air Conditioning and Refrigeration Equipment
Definition of Terms
Listings / Symbols

UL “listed” Mark for USA and Canada

UL “classified” Mark for USA and Canada

UL “enhanced” Mark for USA and Canada

Notes:  
- Long transition time (approx. 10 years)  
- The current “classified” and “listed” marks will not expire
409.106 Spacings

Spacings in feeder circuits between uninsulated live parts of adjacent components, between uninsulated live parts of components and grounded or accessible non–current-carrying metal parts, between uninsulated live parts of components and the enclosure, and at field wiring terminals shall be as shown in Table 430.97(D).

Exception: Spacings shall be permitted to be less than those specified in Table 430.97(D) at circuit breakers and switches and in listed components installed in industrial control panels.
### Table 10.1
Minimum required spacings in branch and control circuits

Table 10.1 effective April 25, 2003

<table>
<thead>
<tr>
<th>Potential involved in volts rms ac or dc</th>
<th>Minimum spacing, inch (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>General industrial control equipment</td>
</tr>
<tr>
<td></td>
<td>51 – 150</td>
</tr>
<tr>
<td>Between any uninsulated live part and an uninsulated live part of opposite polarity, uninsulated grounded part other than the enclosure, or exposed metal part [a]</td>
<td>Through air or oil</td>
</tr>
<tr>
<td></td>
<td>Over surface</td>
</tr>
<tr>
<td>Between any uninsulated live part and the walls of a metal enclosure including fittings for conduit or armored cable [b, c]</td>
<td>Shortest distance</td>
</tr>
</tbody>
</table>
## Table 10.2
### Spacings in feeder circuit

Table 10.2 revised September 1, 2005

<table>
<thead>
<tr>
<th>Voltage Involved</th>
<th>Minimum spacing. inch (mm)</th>
<th>Between live parts of opposite polarity</th>
<th>Between live parts and grounded metal parts, through air and over surface</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Through air</td>
<td>Over surface</td>
<td></td>
</tr>
<tr>
<td>125 or less</td>
<td>1/2 (12.7)</td>
<td>3/4 (19.1)</td>
<td>1/2 (12.7)</td>
</tr>
<tr>
<td>126 – 250</td>
<td>3/4 (19.1)</td>
<td>1-1/4 (31.8)</td>
<td>1/2 (12.7)</td>
</tr>
<tr>
<td>251 – 600</td>
<td>1 (25.4)</td>
<td>2 (50.8)</td>
<td>1³(25.4)³</td>
</tr>
</tbody>
</table>

**NOTE** – An isolated dead metal part, such as a screw head or a washer, interposed between uninsulated parts of opposite polarity or between an uninsulated live part and grounded dead metal is evaluated as reducing the spacing by an amount equal to the dimension of the interposed part along the path of measurement.

³ The through-air spacing shall not be less than 1/2 inch between live parts of a circuit breaker or fusible disconnecting means and grounded metal, and between grounded metal and the neutral of an industrial control panel rated 277/480 volt, 3-phase, 4-wire.
Enclosure Air conditioners are not part of short circuit current (SCCR) calculation when cord-and-attachment plug connected or supplied from a branch circuit protected maximum 60A

SB4.2 Short circuit current ratings of individual power circuit components

SB4.2.1 All power circuit components, including disconnect switches, branch circuit protective devices, branch circuit fuseholders, load controllers, motor overload relays, terminal blocks, and bus bars, shall have a short circuit current rating expressed in amperes or kiloamperes and voltage.

Exception No. 1: Power transformers, reactors, current transformers, dry-type capacitors, resistors, varistors, and voltmeters are not required to have a short circuit current rating.

Exception No. 2: The “S” contactor of a wye-delta motor controller is not required to have a short circuit current rating.

Exception No. 3: Enclosure air conditioners or multimotor and combination load equipment that is cord-and-attachment-plug connected or supplied from a branch circuit protected at 60 A or less is not required to have a short circuit current rating.
UL 508A
Important changes

Transformer peak-let-through currents can be used to protect Branch circuits!

Every Transformer is current limiting

Feeder circuit

Branch circuit

Main Disconnect

Current limiting device

Overload-relay

Motor

Short circuit protection

Contactor

Short circuit protection

Contactor

Short circuit protection

Contactor

Heater
**UL 508A**

Important changes

**Previous rule:**

A.) Transformer < 5kVA and max. 120V sec. => max. 2kA at the secondary side
   → all devices at the secondary side for at least 2kA

B.) Transformer < 10kVA => max. 5kA at the secondary side
   → all devices at the secondary side for at least 5kA

C.) All other transformers are not considered as current limiting
   → same short-circuit current at the secondary and primary side

---

**SCCR ≥ 2 kA**

A) ≤ 5 kVA (120 V sec)

B) ≤ 10 kVA

C) > 10 kVA

SCCR ≥ x kA

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Industry Sector
New rule:

- **Loads provided by a Transformer with isolated secondary acc. to UL 508A SB4.3.1**

  **Possibility 1:** For transformer with marked or known impedance (Z acc. To UL 508A), the maximum secondary short circuit current will be calculated as follows:

  \[
  \text{Transformer full load current } (I_{FL}) = \frac{\text{Transformer VA}}{\text{secondary voltage}} \times \sqrt{3}
  \]

  \[
  \text{Short circuit current } (I_{SC}) = \frac{I_{FL}[A]}{\text{Impedance } Z \text{ [%]}}
  \]

  All devices located at transformer secondary shall be ≥ the calculated short circuit current rating \((I_{sc})\)
  
  \(\Rightarrow \) **SCCR of the loads = Interrupting rating of primary overcurrent protection device**
New rule:

- **Loads provided by a Transformer with isolated secondary acc. to UL 508A SB4.3.1**
  - **Possibility 2:** For a transformer with unknown impedance (Z acc. To UL 508A) or $\geq 2.1\%$, the maximum secondary short circuit current will be calculated as in possibility 1 described (assumption $Z = 2.1\%$) or determined with Table SB4.3 (single phase) respectively SB4.4 (three phase) as follows:
    1. Transformer kVA \(\leq\) maximum value column 1 and
    2. Secondary voltage not smaller as values in column 2. If the secondary voltage is between the values, the next smaller voltage shall be used.

<table>
<thead>
<tr>
<th>Table SB4.3</th>
<th>Table SB4.4</th>
</tr>
</thead>
</table>

### Table SB4.3

<table>
<thead>
<tr>
<th>Transformer kVA</th>
<th>Minimum Transformer Secondary Voltage (V)</th>
<th>Column 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>400 A</td>
<td>309 A</td>
</tr>
<tr>
<td>2</td>
<td>1,200 A</td>
<td>990 A</td>
</tr>
<tr>
<td>3</td>
<td>1,990 A</td>
<td>1,949 A</td>
</tr>
<tr>
<td>5</td>
<td>3,990 A</td>
<td>2,980 A</td>
</tr>
<tr>
<td>10</td>
<td>6,990 A</td>
<td>5,970 A</td>
</tr>
<tr>
<td>15</td>
<td>8,990 A</td>
<td>7,460 A</td>
</tr>
<tr>
<td>25</td>
<td>8,990 A</td>
<td>7,460 A</td>
</tr>
<tr>
<td>35</td>
<td>12,990 A</td>
<td>11,170 A</td>
</tr>
<tr>
<td>50</td>
<td>12,990 A</td>
<td>11,170 A</td>
</tr>
</tbody>
</table>

### Table SB4.4

<table>
<thead>
<tr>
<th>Transformer kVA</th>
<th>Minimum Transformer Secondary Voltage (V)</th>
<th>Column 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>1,160 A</td>
<td>690 A</td>
</tr>
<tr>
<td>10</td>
<td>2,360 A</td>
<td>1,969 A</td>
</tr>
<tr>
<td>15</td>
<td>3,470 A</td>
<td>2,799 A</td>
</tr>
<tr>
<td>20</td>
<td>4,600 A</td>
<td>3,719 A</td>
</tr>
<tr>
<td>25</td>
<td>5,790 A</td>
<td>4,850 A</td>
</tr>
<tr>
<td>30</td>
<td>6,940 A</td>
<td>5,990 A</td>
</tr>
<tr>
<td>40</td>
<td>10,410 A</td>
<td>8,350 A</td>
</tr>
<tr>
<td>50</td>
<td>17,560 A</td>
<td>13,800 A</td>
</tr>
</tbody>
</table>

**Footnotes:**
- *Z assumed to be 2.1%.
- Short-circuit current shown is line-to-neutral.

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Table SB4.3
Single phase transformer secondary available short circuit currents (Amps)*

<table>
<thead>
<tr>
<th>Transformer Max kVA</th>
<th>Column 1</th>
<th>Column 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>120</td>
<td>120/240</td>
</tr>
<tr>
<td>1</td>
<td>400 A</td>
<td>300 A</td>
</tr>
<tr>
<td>3</td>
<td>1,200 A</td>
<td>900 A</td>
</tr>
<tr>
<td>5</td>
<td>1,990 A</td>
<td>1,490 A</td>
</tr>
<tr>
<td>10</td>
<td>3,970 A</td>
<td>2,980 A</td>
</tr>
<tr>
<td>15</td>
<td>5,960 A</td>
<td>4,470 A</td>
</tr>
<tr>
<td>25</td>
<td>9,930 A</td>
<td>7,450 A</td>
</tr>
<tr>
<td>37.5</td>
<td>14,890 A</td>
<td>11,170 A</td>
</tr>
<tr>
<td>50</td>
<td>19,850 A</td>
<td>14,890 A</td>
</tr>
<tr>
<td>75</td>
<td>29,770 A</td>
<td>22,330 A</td>
</tr>
</tbody>
</table>

* Z assumed to be 2.1%.

b Short-circuit current shown is line-to-neutral.
### Table SB4.4
Three phase transformer secondary available short circuit currents (Amps)\(^a\)

<table>
<thead>
<tr>
<th>Transformer Max kVA</th>
<th>Column 1</th>
<th></th>
<th>Column 2</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Column 1</td>
<td></td>
<td>Column 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transformer Max kVA</td>
<td></td>
<td>208Y/120(^b)</td>
<td>208</td>
<td>240</td>
<td>480Y/277(^b)</td>
<td>480</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
<td>1,160 A</td>
<td>930 A</td>
<td>810 A</td>
<td>510 A</td>
<td>410 A</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td></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>
</tr>
<tr>
<td></td>
<td>15</td>
<td></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>
</tr>
<tr>
<td></td>
<td>20</td>
<td></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>
</tr>
<tr>
<td></td>
<td>25</td>
<td></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>
</tr>
<tr>
<td></td>
<td>30</td>
<td></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>
</tr>
<tr>
<td></td>
<td>45</td>
<td></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>
</tr>
<tr>
<td></td>
<td>75</td>
<td></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>
</tr>
<tr>
<td></td>
<td>100</td>
<td></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>
</tr>
</tbody>
</table>

\(^a\) Z assumed to be 2.1%.
\(^b\) Short-circuit current shown is line-to-neutral.
Example:

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.
Sizing of *branch-circuit protection* of a *variable speed drive* if not specified by the manufacturer instruction

**Up to now**

31.3.2 The branch circuit protection for a single-motor circuit provided with a variable-speed drive shall be of the type and size specified by the manufacturer's instructions provided with the drive. When the instructions do not specify the type and size, a branch-circuit fuse or inverse-time circuit breaker shall be used and shall be sized based upon the input current rating of the drive multiplied by the percentage from Table 31.1.

**As of now**

31.3.2 The branch circuit protection for a single-motor circuit provided with a variable-speed drive shall be of the type and size specified by the manufacturer’s instructions provided with the drive. When the instructions do not specify the type and size, a branch-circuit fuse or inverse-time circuit breaker shall be used and shall be sized in accordance with 31.3.1(a) based upon the **full-load motor output current rating** of the drive.
Protection devices in *dc control circuits above 32V* shall be approved for the rating equal or greater

40.1.5 Where a branch circuit fuse, inverse-time circuit breaker, miscellaneous or miniature type fuse, or supplemental protector is applied in a dc circuit with a voltage above 32 V, it must be evaluated in accordance with the appropriate product standard to have a dc voltage rating equal to or greater than the circuit voltage.

Excerpt from *Certificate of compliance of Siemens supplementary protectors 5SY…*

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Type</th>
<th>UG</th>
<th>FW</th>
<th>Max Volts</th>
<th>Max Amperes</th>
<th>TC</th>
<th>OL</th>
<th>SC</th>
</tr>
</thead>
<tbody>
<tr>
<td>5SY4, 5SY6, 5SY7, 5SY8</td>
<td>OC</td>
<td>A</td>
<td>0</td>
<td>480</td>
<td>63</td>
<td>2</td>
<td>0</td>
<td>5kA U2, 7.5kA U2, 14kA U2</td>
</tr>
<tr>
<td>5SY4, 5SY6</td>
<td>OC</td>
<td>A</td>
<td>0</td>
<td>60 Vdc</td>
<td>1A - 63</td>
<td>2</td>
<td>0</td>
<td>3.5kA U2</td>
</tr>
</tbody>
</table>
**NFPA 79 Ed. 2007**

**8.2.3.1** The continuity of the equipment grounding (protective bonding) circuit shall be ensured by effective connections through conductors or structural members.

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**NFPA 79 Ed. 2012**

**8.2.3.1** The continuity of the equipment grounding (protective bonding) circuit shall be ensured by effective connections through conductors.
UL 508 Migration to UL 60947-4-1A
(Components Only)

UL 60947-4-1
Low-Voltage Switchgear and Controlgear Part 4-1: Contactors and Motor-Starters Electromechanical Contactors and Motor-Starters

UL 508 → UL 609471-4-1A
The standard for Industrial Control Equipment UL 508 is being harmonized with relevant IEC standards for Low-Voltage Switchgear and Control Gear IEC 60947. Effective Jan. 27, 2017, all UL 508 certified products must meet the new UL 60947-4-1A standard. This does not invalidate any existing UL508 certifications.

Effect on UL 508A Industrial Control Panels
It is important to note that the UL 508A Standard for Safety Industrial Control panels is not directly affected by the UL 508 to UL60947-4-1A migration at this time.
Questions?