UL 1008 ATS Withstand and Close On Ratings

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Meet your panelists

**Cummins presenter:**

Rich Scroggins  
Technical Advisor, Field Support and Application Engineering Group  
Cummins

**Cummins facilitator:**

Tom Bakritzes,  
Global Sales Training Manager  
Cummins

Your local Cummins contacts:

- AZ, ID, NM, NV: Carl Knapp ([carl.knapp@cummins.com](mailto:carl.knapp@cummins.com)), Rocky Mountain Region
- CO, MT, ND, UT, WY: Joe Pekarek ([joe.a.pekarek@cummins.com](mailto:joe.a.pekarek@cummins.com)), Rocky Mountain Region
- IL, IA, NB, SD: John Kilinskis ([john.a.kilinskis@cummins.com](mailto:john.a.kilinskis@cummins.com)), Central Region
- WI, MN, ND: Michael Munson ([michael.s.munson@cummins.com](mailto:michael.s.munson@cummins.com)), Central Region
- MO, KS: Earnest Glaser ([earnest.a.glaser@cummins.com](mailto:earnest.a.glaser@cummins.com)), Central Region
- TX: Scott Thomas ([m.scott.thomas@cummins.com](mailto:m.scott.thomas@cummins.com)), Gulf Region
- FL, GA, SC, NC and Eastern TN: Robert Kelly ([robert.kelly@cummins.com](mailto:robert.kelly@cummins.com)), South Region
- IN, KY, OH, TN, WV: Thomas Stadulis ([thomas.stadulis@cummins.com](mailto:thomas.stadulis@cummins.com)), East Region
- NY, NJ, CT, PA, MD: Charles Attisani ([charles.attisani@cummins.com](mailto:charles.attisani@cummins.com)), East Region
- CA, HI: Brian E Pumphrey ([brian.Pumphrey@cummins.com](mailto:brian.Pumphrey@cummins.com))
- WA, OR, AK: Tom Tomlinson ([tom.tomlinson@cummins.com](mailto:tom.tomlinson@cummins.com))
- For other states and territories, email powergenchannel@cummins.com or visit [http://power.cummins.com/sales-service-locator](http://power.cummins.com/sales-service-locator)
Objectives

- Participants will be able to:
  - Describe the UL 1008 requirements for transfer switch short circuit withstand and closing ratings
  - Specify withstand and closing ratings to allow for transfer switch selection and system design.
UL 1008 Short Circuit Ratings

- UL 1008 requires all ATS to have a withstand and closing rating (WCR)
- Rating can either be time based or specific OCPD (Breaker) based
  - Specific breaker based ratings allow for higher available fault current but requires the ATS to be protected by a listed breaker
- UL changed the requirements for listing breakers which has reduced the number of listed breakers for all ATS manufacturers
  - Many commonly used breakers remain
- Allowing for either time based or specific breaker based ratings enables flexibility for a cost effective design
Short Circuit Testing (UL 1008)

- Transfer switches **must** have a WCR rating
- The WCR rating may be based on either:
  - A specific duration
  - A specific overcurrent protective device
- Test sequence is as follows:
  - Specified fault current is applied for either
    - A specified period of time (e.g. 50 ms)
    - Until the specified overcurrent protective device clears the fault
  - After withstanding the fault current, the ATS must close into the fault using the same set of contacts
Short Circuit Testing (UL 1008)

- Specific Duration Test
  - ATS must withstand specified current applied for a specific duration
    - Allowed durations range from 8 ms (1/2 cycle) to 100 ms (6 cycles)
  - After withstanding the fault current, the ATS must close into the fault using the same set of contacts
  - Maximum short circuit current, voltage and short circuit duration must appear on the label

### SHORT-CIRCUIT WITHSTAND/CLOSING RATINGS

<table>
<thead>
<tr>
<th>Circuit Breaker and Short-Time Current Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>When protected by a circuit breaker, this transfer switch is suitable for use in a circuit capable of delivering the short-circuit current for the maximum time duration and voltage listed below.</td>
</tr>
<tr>
<td>The circuit breaker must include an instantaneous trip response unless the available short-circuit current is less than or equal to the short-time rating of the transfer switch and the circuit breaker includes a short-time response.</td>
</tr>
<tr>
<td>The maximum clearing time of the instantaneous trip response must be equal to or less than the time duration shown for the listed short-circuit current.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Short-Circuit Current</th>
<th>Short Circuit Time Duration (Maximum Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMS Symmetrical Amperes</td>
<td>AC Voltage</td>
</tr>
<tr>
<td>65000</td>
<td>600</td>
</tr>
</tbody>
</table>
Short Circuit Testing (UL 1008)

- Specific overcurrent protective device test
  - ATS must withstand specified current applied until overcurrent protective device clears
  - After withstanding the fault current, the ATS must close into the fault using the same set of contacts
  - Rated devices along with the maximum current and voltage must be declared on product markings or documentation

Specific Fuse Manufacturer and Type Listing

When protected by a fuse of the specific fuse class and up to the fuse amperes listed below, this transfer switch is suitable for use in a circuit capable of delivering up to the short circuit current and voltage listed below.

<table>
<thead>
<tr>
<th>Short-Circuit Current RMS Symmetrical Amperes</th>
<th>Short-Circuit AC Voltage</th>
<th>Fuse Class</th>
<th>Maximum Fuse Amperes</th>
</tr>
</thead>
<tbody>
<tr>
<td>200000</td>
<td>600</td>
<td>L</td>
<td>2000</td>
</tr>
<tr>
<td>200000</td>
<td>600</td>
<td>T</td>
<td>1200</td>
</tr>
<tr>
<td>200000</td>
<td>600</td>
<td>J, RK1, RK5</td>
<td>600</td>
</tr>
</tbody>
</table>

Circuit Breaker Protection

When protected by one of the following circuit breakers rated not more than 1400 amperes, this transfer switch is rated for use on a circuit capable of delivering not more than the indicated RMS symmetrical amperes at the voltage shown.

**GE**

<table>
<thead>
<tr>
<th>Type</th>
<th>Interrupting Rating at</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>240 VAC</td>
</tr>
<tr>
<td>AKRU 1200L</td>
<td>200000</td>
</tr>
<tr>
<td>AKU 1200L</td>
<td>200000</td>
</tr>
</tbody>
</table>

**Siemens**

<table>
<thead>
<tr>
<th>Type</th>
<th>Interrupting Rating at</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>240 VAC</td>
</tr>
<tr>
<td>CMD6, CND6</td>
<td>200000</td>
</tr>
<tr>
<td>CPD6</td>
<td>200000</td>
</tr>
<tr>
<td>SCLD6</td>
<td>200000</td>
</tr>
<tr>
<td>SCMD6, SCND6</td>
<td>200000</td>
</tr>
</tbody>
</table>

**Square D**

<table>
<thead>
<tr>
<th>Type</th>
<th>Interrupting Rating at</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>240 VAC</td>
</tr>
<tr>
<td>DSL</td>
<td>200000</td>
</tr>
<tr>
<td>LD</td>
<td>250000</td>
</tr>
<tr>
<td>LG</td>
<td>65000</td>
</tr>
<tr>
<td>LJ</td>
<td>100000</td>
</tr>
<tr>
<td>LL</td>
<td>125000</td>
</tr>
<tr>
<td>LR</td>
<td>200000</td>
</tr>
</tbody>
</table>
What is an any breaker rating?

- “Any breaker rating” has never been a recognized term by UL
- “Any breaker rating” is commonly used for a 50 msec or 3 cycle time based rating
- Comes from the UL 489 requirement that Molded Case Circuit breakers rated 400 amps and above must clear a fault in no more than 50 msec (3 cycles)
  - Fault clearing time requirement for molded case breakers rated less than 400 amps is 25 msec
- Applying the “any breaker rating” when the breaker is not listed to UL 489 is a code violation
WCR Test: Specific Duration

Acceptance Criteria
- Operable by intended means
- No Breakage of Switch Base
- Door Must Be Secure
- No Conductors Pulled Out of Terminals
- Must Pass Dielectric Test

400A Switch tested at:
480VAC, 35k Amps, 50ms

Switch is not required to carry rated current after the test, or even work
WCR Test: Specific Duration

400A Switch tested at:
480VAC, 35k Amps, 50ms
Short Circuit Testing (UL 1008)

- Transfer switches may also have a Short Time Rating of up to 0.5 sec (30 cycles)
  - Same test as a specific duration test except switch must pass a temperature rise test after the short circuit
  - Demonstrates that the switch can still carry rated current
  - Maximum short circuit current, voltage and short circuit duration must appear on the label

When protected by a circuit breaker with a short-time trip response, the short-time response of the circuit breaker must be coordinated with the short-time current rating of the transfer switch as listed below.

<table>
<thead>
<tr>
<th>RMS Symmetrical Amperes</th>
<th>AC Voltage</th>
<th>(Maximum Seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>42000</td>
<td>480</td>
<td>0.500</td>
</tr>
</tbody>
</table>

- The WCR is considered a safety rating
- The short time rating is considered a performance rating
UL 1008 Change

- Before UL1008 7th edition, a new breaker could be added by comparing the max published trip time with the max published trip time of the tested breaker
  - MAX published trip time of new breaker ≤ MAX published trip time of tested breaker
- After UL1008 7th edition, a new breaker can be added by comparing the max published trip time with the tested trip time using the original breaker
  - MAX published trip time of new breaker ≤ ACTUAL tested breaker trip time measured during the UL witness test
- Effectively most circuit breakers must be tested in order to be added to the specific breaker list
## WCR with commonly used breakers

<table>
<thead>
<tr>
<th>Amps</th>
<th>ATS Model</th>
<th>Bypass Model</th>
<th>Squired D PowerPact WCR @ Volts</th>
<th>GE Spectra WCR @ Volts</th>
<th>Siemens Sentron WCR @ Volts</th>
<th>Eaton C Series WCR @ Volts</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>OTPC, OTEC</td>
<td>HL</td>
<td>125.0, 100.0, 50.0, 0.0, 0.0</td>
<td>240 480 600</td>
<td>HED8 14.0, 14.0, 14.0, 14.0</td>
<td>HFD 14.0, 14.0, 14.0, 14.0</td>
</tr>
<tr>
<td>70</td>
<td>OTPC, OTEC</td>
<td>HL</td>
<td>125.0, 100.0, 50.0, 0.0, 0.0</td>
<td>240 480 600</td>
<td>HFD8 14.0, 14.0, 14.0, 14.0</td>
<td>HFD 14.0, 14.0, 14.0, 14.0</td>
</tr>
<tr>
<td>125</td>
<td>OTPC, OTEC</td>
<td>HL</td>
<td>125.0, 100.0, 50.0, 0.0, 0.0</td>
<td>240 480 600</td>
<td>HFD8 14.0, 14.0, 14.0, 14.0</td>
<td>HFD 14.0, 14.0, 14.0, 14.0</td>
</tr>
<tr>
<td>150</td>
<td>OTPC, OTEC</td>
<td>BTPC</td>
<td>125.0, 100.0, 50.0, 0.0, 0.0</td>
<td>SGL 100.0, 65.0, 65.0, 0.0</td>
<td>HFD8 30.0, 30.0, 25.0, 0.0</td>
<td>HKD 30.0, 30.0, 30.0, 30.0</td>
</tr>
<tr>
<td>225</td>
<td>OTPC, OTEC</td>
<td>BTPC</td>
<td>125.0, 100.0, 50.0, 0.0, 0.0</td>
<td>SGL 100.0, 65.0, 65.0, 0.0</td>
<td>HJD8 30.0, 30.0, 30.0, 30.0</td>
<td>HKD 30.0, 30.0, 30.0, 30.0</td>
</tr>
<tr>
<td>260</td>
<td>OTPC, OTEC</td>
<td>BTPC</td>
<td>125.0, 100.0, 50.0, 0.0, 0.0</td>
<td>SGL 100.0, 65.0, 65.0, 0.0</td>
<td>HJD8 30.0, 30.0, 30.0, 30.0</td>
<td>HKD 30.0, 30.0, 30.0, 30.0</td>
</tr>
<tr>
<td>300</td>
<td>OTPC, OTEC</td>
<td>BTPC</td>
<td>125.0, 100.0, 50.0, 0.0, 0.0</td>
<td>SGL 100.0, 65.0, 65.0, 0.0</td>
<td>CLD8 200.0, 150.0, 100.0, 0.0</td>
<td>HKD 65.0, 65.0, 35.0, 0.0</td>
</tr>
<tr>
<td>400</td>
<td>OTPC, OTEC</td>
<td>BTPC</td>
<td>125.0, 100.0, 50.0, 0.0, 0.0</td>
<td>SGL 100.0, 65.0, 65.0, 0.0</td>
<td>CLD8 200.0, 150.0, 100.0, 0.0</td>
<td>HKD 65.0, 65.0, 35.0, 0.0</td>
</tr>
<tr>
<td>600</td>
<td>OTPC, OTEC</td>
<td>BTPC</td>
<td>125.0, 100.0, 50.0, 0.0, 0.0</td>
<td>SGL 100.0, 65.0, 65.0, 0.0</td>
<td>CLD8 200.0, 150.0, 100.0, 0.0</td>
<td>HLD 65.0, 65.0, 35.0, 0.0</td>
</tr>
<tr>
<td>800</td>
<td>OTPC, OTEC</td>
<td>BTPC</td>
<td>65.0, 65.0, 65.0, 50.0, 0.0</td>
<td>SKP 65.0, 65.0, 65.0, 50.0</td>
<td>HMD8 65.0, 65.0, 50.0, 0.0</td>
<td>HLD 65.0, 65.0, 35.0, 0.0</td>
</tr>
<tr>
<td>1000</td>
<td>OTPC, OTEC</td>
<td>BTPC</td>
<td>65.0, 65.0, 65.0, 50.0, 0.0</td>
<td>SKP 65.0, 65.0, 65.0, 50.0</td>
<td>HMD8 65.0, 65.0, 50.0, 0.0</td>
<td>HLD 65.0, 65.0, 35.0, 0.0</td>
</tr>
<tr>
<td>1200</td>
<td>OTPC, OTEC</td>
<td>BTPC</td>
<td>65.0, 65.0, 65.0, 50.0, 0.0</td>
<td>SKP 65.0, 65.0, 65.0, 50.0</td>
<td>HMD8 65.0, 65.0, 50.0, 0.0</td>
<td>HLD 65.0, 65.0, 35.0, 0.0</td>
</tr>
</tbody>
</table>

Commonly used circuit breakers from Square D, GE, Siemens and Eaton are listed for Cummins ATS under UL 1008 7th Edition
## ATS Short Circuit Ratings

- Several Short Circuit Ratings are available at each amp node
- Specific overcurrent device ratings are substantially higher than time based ratings
  - As high as 200,000 amps with current limiting breakers and fuses

<table>
<thead>
<tr>
<th>Amps</th>
<th>ATS Model</th>
<th>Bypass Model</th>
<th>Fuse protection</th>
<th>Specific Breaker Protection (Common)</th>
<th>Specific Breaker Protection (General)</th>
<th>Time Based Ratings</th>
<th>Short Time Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Max Fuse, Size and type</td>
<td>WCR @ Volts</td>
<td>WCR @ Volts</td>
<td>WCR @ Volts</td>
<td>Time (sec)</td>
<td>WCR @ Volts</td>
<td>Time (sec)</td>
</tr>
<tr>
<td>260</td>
<td>OTEC, OTPC</td>
<td>BTPC</td>
<td>600 A Class J, RK1, RK5 or 1200 A Class L, T</td>
<td>200,000</td>
<td>200,000</td>
<td>125,000</td>
<td>100,000</td>
</tr>
<tr>
<td></td>
<td>OHPC, CHPC</td>
<td></td>
<td>400 A Class J or T or 200 A Class RK1 or 100 A Class K5</td>
<td>200,000</td>
<td>200,000</td>
<td>200,000</td>
<td>200,000</td>
</tr>
<tr>
<td>300</td>
<td>OTEC, OTPC</td>
<td>BTPC</td>
<td>600 A Class J, RK1, RK5 or 1200 A Class L, T</td>
<td>200,000</td>
<td>200,000</td>
<td>125,000</td>
<td>100,000</td>
</tr>
<tr>
<td></td>
<td>OHPC, CHPC</td>
<td></td>
<td>400 A Class J or T or 200 A Class RK1 or 100 A Class K5</td>
<td>200,000</td>
<td>200,000</td>
<td>125,000</td>
<td>100,000</td>
</tr>
</tbody>
</table>
Spec Recommendations

- ATS Specs are usually written based on incomplete information
  - Circuit Breakers have not yet been selected when the spec is written
  - In some cases available fault current is not known
    - 20X the service rating is a reasonable estimate
    - Assumes transformer with 5% impedance

- Spec language should allow ATS supplier to meet the requirement with either a specific device rating or a specific duration rating
- Allows for flexibility in selecting ATS once breakers are selected
- Opportunities to use a smaller, less expensive ATS if selected breaker is listed for the ATS
Recommended language from AIA Spec

Tested Fault-Current Closing and Short-Circuit Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

- ATS can comply with either time based or specific breaker based rating
- Ratings based on a specific overcurrent device will be significantly higher than a specific duration rating
- The higher rating often allows use of a smaller, less expensive transfer switch
- ATS suppliers will help identify listed breakers
Conclusions

- Most transfer switches have several short circuit Withstand and Close On ratings based on fault duration times and on specific overcurrent protection devices.

- Specific overcurrent device ratings are almost always higher than time based ratings
  - This allows for the smallest most cost effective transfer switch to be selected when these ratings can be applied.

- Specifications should require that the transfer switch short circuit ratings be coordinated with the overcurrent protective devices at the fault current available on the line side of the transfer switch.
  - Allows for flexibility in selecting transfer switches once breakers are chosen for the project
  - Minimizes the possibility of having to oversize the transfer switch to meet the short circuit WCR requirements.

- Work with your Cummins distributor for assistance in selecting transfer switches for your application
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Your local Cummins contacts:
- AZ, ID, NM, NV: Carl Knapp (carl.knapp@cummins.com), Rocky Mountain Region
- CO, MT, ND, UT, WY: Joe Pekarek (joe.a.pekarek@cummins.com), Rocky Mountain Region
- Northern IL, IA: John Kilinskis (john.a.kilinskis@cummins.com), Central Region
- UP of MI, MN, East ND, WI: Michael Munson (michael.s.munson@cummins.com), Central Region
- NB, SD, West MO, KS: Earnest Glaser (earnest.a.glaser@cummins.com), Central Region
- South IL, East MO: Jeff Yates (jeffery.yates@cummins.com), Central Region
- TX: Scott Thomas (m.scott.thomas@cummins.com), Gulf Region
- FL, GA, SC, NC and Eastern TN: Robert Kelly (robert.kelly@cummins.com), South Region
- NY, NJ, CT, PA, MD: Charles Attisani (charles.attisani@cummins.com), East Region
- CA, HI: Brian E Pumphrey (brian.Pumphrey@cummins.com)
- WA, OR, AK: Tom Tomlinson (tom.tomlinson@cummins.com)
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