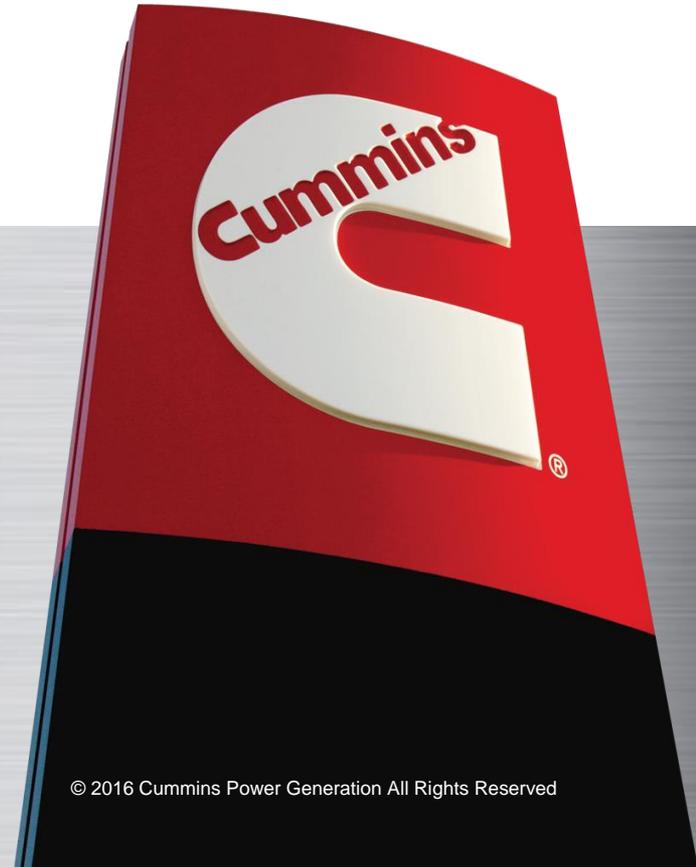


UL 1008 ATS Withstand and Close On Ratings

Revised: September 25, 2017



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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		
<u>Circuit Breaker and Short-Time Current Ratings</u>		
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.		
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.		
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.		
<u>Short-Circuit Current RMS Symmetrical Amperes</u>	<u>Short Circuit AC Voltage</u>	<u>Time Duration (Maximum Seconds)</u>
65000	600	0.050

Short-Circuit Current
RMS Symmetrical Amperes
 65000

Short Circuit
AC Voltage
 600

Time Duration
(Maximum Seconds)
 0.050

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.

Short-Circuit Current RMS Symmetrical Amperes	Short Circuit AC Voltage	Fuse Class	Maximum Fuse Amperes
200000	600	L	2000
200000	600	T	1200
200000	600	J, RK1, RK5	600

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

Type	Interrupting Rating at		
	240 VAC	480 VAC	600 VAC
AKRU 1200L max	200000	200000	200000
AKU 1200L max	200000	200000	200000

Siemens

Type	Interrupting Rating at		
	240 VAC	480 VAC	600 VAC
CMD6, CND6	200000	100000	65000
CPD6	200000	85000	65000
SCLD6	200000	150000	100000
SCMD6, SCND6	200000	100000	65000

Square D

Type	Interrupting Rating at		
	240 VAC	480 VAC	600 VAC
DSL	200000	200000	200000
LD	25000	18000	14000
LG	65000	35000	18000
LJ	100000	65000	25000
LL	125000	100000	50000
LR	200000	200000	100000

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



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

- 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

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

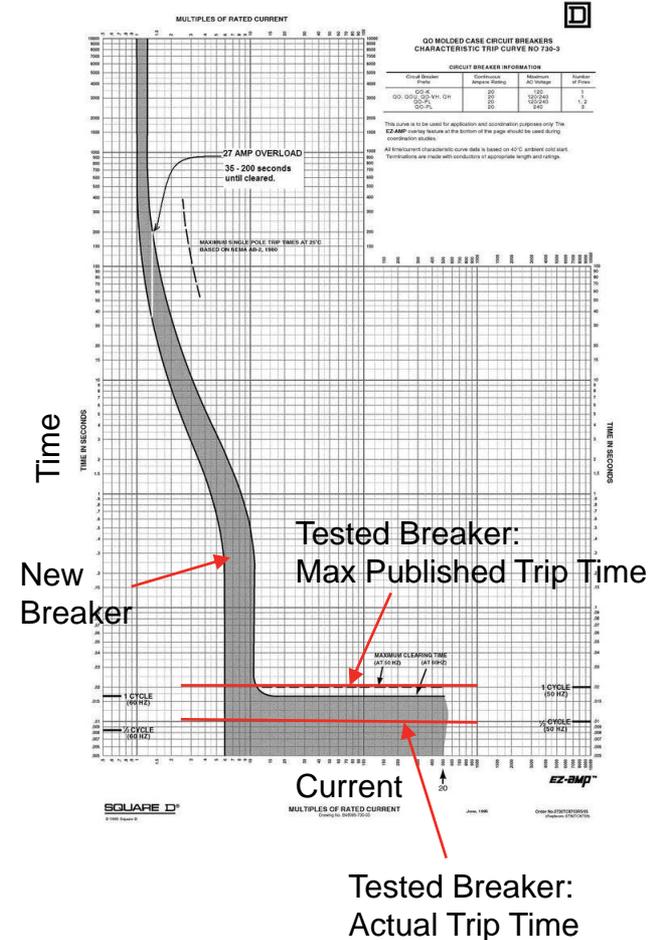
When protected by a circuit breaker with a short-time trip response, the short-time response of the circuit breaker must be coordinated with the short-time current rating of the transfer switch as listed below.

<u>RMS Symmetrical Amperes</u>	<u>AC Voltage</u>	<u>(Maximum Seconds)</u>
42000	480	0.500

- 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 \leq 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 \leq 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

Amps	ATS Model	Bypass Model	Squared D PowerPact				GE Spectra				Siemens Sentron				Eaton C Series			
			Breaker Model	WCR @ Volts			Breaker Model	WCR @ Volts			Breaker Model	WCR @ Volts			Breaker Model	WCR @ Volts		
				240	480	600		240	480	600		240	480	600		240	480	600
40	OTPC, OTEC		HL	125,000	100,000	50,000					HED6	14,000	14,000	14,000	HFD	14,000	14,000	14,000
70	OTPC, OTEC		HL	125,000	100,000	50,000					HFD6	14,000	14,000	14,000	HFD	14,000	14,000	14,000
125	OTPC, OTEC		HL	125,000	100,000	50,000					HFD6	14,000	14,000	14,000	HFD	14,000	14,000	14,000
150	OTPC, OTEC	BTPC	HL	125,000	100,000	50,000	SGL	100,000	65,000	65,000	HFD6	30,000	30,000	25,000	HKD	30,000	30,000	30,000
225	OTPC, OTEC	BTPC	JL	125,000	100,000	50,000	SGL	100,000	65,000	65,000	HJD6	30,000	30,000	30,000	HKD	30,000	30,000	30,000
260	OTPC, OTEC	BTPC	LL	125,000	100,000	50,000	SGL	100,000	65,000	65,000	HJD6	30,000	30,000	30,000	HKD	30,000	30,000	30,000
300	OTPC, OTEC	BTPC	LL	125,000	100,000	50,000	SGL	100,000	65,000	65,000	CLD6	200,000	150,000	100,000	HKD	65,000	65,000	35,000
400	OTPC, OTEC	BTPC	LL	125,000	100,000	50,000	SGL	100,000	65,000	65,000	CLD6	200,000	150,000	100,000	HKD	65,000	65,000	35,000
600	OTPC, OTEC	BTPC	LL	125,000	100,000	50,000	SGL	100,000	65,000	65,000	CLD6	200,000	150,000	100,000	HLD	65,000	65,000	35,000
800	OTPC, OTEC	BTPC	PJ	65,000	65,000	25,000	SKP	65,000	65,000	50,000	HMD6	65,000	65,000	50,000	HLD	65,000	65,000	35,000
1000	OTPC, OTEC	BTPC	PJ	65,000	65,000	25,000	SKP	65,000	65,000	50,000	HMD6	65,000	65,000	50,000	HLD	65,000	65,000	35,000
1200	OTPC, OTEC	BTPC	PJ	65,000	65,000	25,000	SKP	85,000	85,000	85,000	HMD6	85,000	65,000	50,000	HLD	65,000	65,000	35,000

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

Amps	ATS Model	Bypass Model	Fuse protection		Specific Breaker Protection (Common)			Specific Breaker Protection (General)			Time Based Ratings			Short Time Ratings			
			Max Fuse, Size and type	WCR @ Volts		WCR @ Volts			WCR @ Volts			Time (sec)	WCR @ Volts			Time (sec)	WCR @ 480V
				480	600	240	480	600	240	480	600		240	480	600		
260	OPEC, OTPC	BTPC	600 A Class J, RK1, RK5 or 1200 A Class L, T	200,000	200,000	125,000	100,000	50,000	200,000	200,000	200,000						
	OHPC, CHPC		400 A Class J or T or 200 A Class RK1 or 100 A ClassrK5	200,000	200,000				200,000	200,000	200,000	0.050	25,000	25,000	18,000	0.167	25,000
300	OPEC, OTPC	BTPC	600 A Class J, RK1, RK 5 or 1200 A Class L, T	200,000	200,000	125,000	100,000	50,000	200,000	200,000	200,000	0.050	25,000	25,000	25,000		
	OHPC, CHPC		400 A Class J or T or 200 A Class RK1 or 100 A ClassrK5	200,000	200,000	125,000	100,000	50,000	200,000	200,000	200,000	0.050	35,000	35,000	22,000	0.500	30,000

- 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

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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