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**Session: September 2017**

# PowerHour FAQs

## UL 1008 Withstand and Close On Ratings

Electrical distribution system design requires sizing equipment so that it can safely withstand any level of fault current to which it may be exposed. In the case of transfer switches, this involves an evaluation of the transfer switch's short circuit withstand and close on rating (WCR), the available fault current at the line terminals of the transfer switch, and the fault clearing time of the overcurrent protection device.

UL 1008 requires that all transfer switches have a short circuit withstand and close on rating (WCR). This refers to a level of fault current which the transfer switch can withstand and close onto without creating a hazardous condition.

To learn more about the UL 1008 withstand and close on ratings, please join the Cummins PowerHour webinar.

Following this PowerHour participants should 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

**How do you correctly show an ATS damage curve line on a graph in a program such as SKM PTW?**

Typically it's not shown on the graph, it's just called out. For example, "this transfer switch has a 50-millisecond rating and a 65,000 amp three-cycle rating." You could show it on the graph if you're basing the transfer switch rating on a specific duration. If you were to show it on the graph, for this example it would be at 65,000 amps and 50 milliseconds. I haven't seen this information on a graph, but that's how you could show it.

So, you would compare an SKM value with what is immediately upstream. If the maximum clearing time of that breaker on the line side of the transfer switches is clearing in that time, then the transfer switch is suitably protected. If you're using a specific device rating, then again there's no need to plot that in SKM because as long as the breaker selected is listed for the

transfer switch then you know the transfer switch is protected. That's one advantage of the specific duration rating—you don't have to compare curves; you just need to know the breaker is listed.

**How do we show an ATS on a TCC curve?**

This is similar to the first question about how it's shown on SKM. Again, it isn't typically shown. For a transfer switch, if you're using a specific duration and not a specific device, what the TCC curve is telling you is a damage point. For example, if you have a 50-millisecond rating of 65,000 amps, that would be a point on a time current curve. If that point is to the right of the overcurrent device curve, that demonstrates that the overcurrent device would protect the transfer switch.

**Does the UL 1008 on-time based reading always say 50 milliseconds three-cycle, or would you see different times; for example, 10 milliseconds or 25 milliseconds?**

It's up to the manufacturer what time duration they want to use. Typically, 50 milliseconds is the most common and that's partly because of the UL 489 requirement that molded case breakers 400 amps and larger clear a fault in 50 milliseconds. But it's not a requirement to have any time duration rating. You can use a specific device rating. It's somewhat common for smaller transfer switches to have a 1.5 cycle or 25-millisecond rating, and that's actually the UL 489 requirement for circuit breakers smaller than 400 amps—to clear a fault in 25 milliseconds.

UL defines several different time durations for withstand and closing ratings ranging all the way up to six cycles or 100 milliseconds, and it's up to the manufacturer's discretion which of those listings they want to use. I use 50 milliseconds as an example because it's the most common, but there are several acceptable durations going up to 100 milliseconds.

**Is there a withstand thermal limit curve for an ATS?**

No. What's published under UL is a point, not a curve. So there isn't really a published limit curve for thermal withstand.

**What is the sample size for UL witness test of a UL 1008 breaker?**

The sample size is actually one, and maybe there's a little bit of a misnomer here. UL 1008 is the standard for the transfer switch, not the breaker. So, for a molded case breaker it would be UL 489, but if you're testing with a different breaker that wouldn't necessarily be a UL 489 breaker. But the sample size of that test is one. You don't have to test multiple samples.

**Does Cummins publish a chart showing all of the transfer switches and their three-cycle ratings, breaker ratings or fuse ratings?**

Yes. We just published a white paper on this subject and the paper should be available on Power Suite.

**If the ATS is destroyed during a fault, how can we show the customer that the protected device took too long to clear the fault? The circuit breaker may be listed on the ATS spec sheet, but it may be defective.**

That's a difficult question and I don't know that there is a simple answer. We don't have anything in our transfer switch control that would show that information. You'd have to have some kind of high-speed power monitoring device that would record that information; I'm not aware of any device with this capability.

**Should fast-acting fuses or breakers be specified when using closed-transition ATS's?**

Fast-acting fuses or breakers do provide more protection. For closed-transition transfer switches there is some difference of opinion about whether your withstand rating needs to apply to fault currents from both sources. A closed transition transfer switch is "make-before-break" so there is a period of time when both the utility and the emergency generators are connected to the load. If a fault occurs during that time, both sources could be serving the load.

So you don't necessarily have to specify fast-acting fuses or breakers, but they do allow for a higher withstand rating. The question is, when doing closed transition, do you need to apply a withstand rating that covers both the utility source and the generator set combined? There's disagreement within the industry on this answer to this question.

In general, you don't need to apply that rating, for a couple of reasons. Typically if a transfer switch fails during a fault, the moveable contacts are what fails. In most transfer switches there's a set of contacts on the normal side and a set of contacts on the emergency side, and each set of contacts carries only the fault current from that side. So you're not doubling the level of fault current on the contacts. Each set is closing on only their own source, so you don't need to add the two fault currents together.

To summarize, fast-acting fuses and breakers allow a transfer switch to withstand a higher level of fault current because they're clearing it faster. For closed-transition applications there is a period of time when both sources are serving the load, but through two separate sets of contacts. So, although it's not a requirement, there are definitely benefits to using fast-acting fuses or breakers.

**If the ATS does not have a time-based rating, isn't it true that it must be applied with a specific protective device upstream on both the normal and emergency side?**

Yes, UL 1008 requires that a transfer switch have either a time-based rating or a specific overcurrent device rating. Some transfer switches don't have time-based ratings and if it doesn't have a time-based rating there has to be an overcurrent device protecting it on both sides that are listed for that transfer switch. On the emergency side, when you're using a Cummins' generator set, we do have an emergency side overcurrent protective function in the generator set called AmpSentry and AmpSentry is listed as overcurrent protection for our transfer switches.

So, if you have a Cummins transfer switch that is being fed by a Cummins generator set, and it's the only transfer switch connected to that generator, AmpSentry will protect the transfer switch on the emergency side. You still need to have an overcurrent device on the normal side. In general, if a transfer switch does not have a specific duration rating, you do need to have a listed overcurrent device on both the normal and the emergency side.

**Are there any plans for testing the BTPCC and the BTPCD ATS with insulated case circuit breakers, such as Schneider's MasterPact NW or ABB Emax, for example?**

I can tell you that there are plans but this is somewhat of a proprietary question and I can't provide any details.

**If a standard MCCB doesn't limit current below the transfer switch withstand rating, is it cheaper to use a higher-rated transfer switch or go to a current-limited circuit breaker?**

So, you're asking if a standard UL 489 molded case circuit breaker doesn't adequately protect the transfer switch, is it cheaper to use that transfer switch and add a current-limiting breaker, or use the molded case circuit breaker and oversize the transfer switch? I think the answer is going to vary depending on the application. If you're going from a 225 to a 300 amp transfer switch, I think it would be less expensive to oversize the switch. But the larger transfer switch will require more space, and that might impact your decision.

With a larger transfer switch, it might be less expensive to go with a current-limiting breaker or fuse. The difference in price between a molded case breaker and a current-limiting breaker may be less than the cost of upsizing the transfer switch.

If you're using a bypass transfer switch, they are more expensive and much larger than standard transfer switches, so going up to the next frame size will be significantly more expensive, probably more expensive than going from a molded case breaker to a current-limiting breaker.

Don't forget about the other possibility: using a current-limiting fuse. Putting a current-limiting fuse in series with the breaker is an alternative solution. I know a lot of people don't like fuses because they have to be replaced, often by a licensed electrician. But it is another option.

**Per UL 1008, are closed-transition transfer switches tested in the same way as open transition switches?**

Yes, the withstand and closing rating for closed-transition transfer switches are tested the same way as open transition switches.

**What is the reason for UL 1008 7th Edition requirement to review new breakers published against the recorded breaker times? Was this change based on field issues or safety concerns? It would be good to know what the reasoning was behind the change.**

I'm not part of the UL 1008 working group, so I don't know what motivated the change, but I can see the logic behind it. If you just compare the published trip curves, as opposed to the actual tested values, you may not be about to demonstrate that the new breaker clears quickly enough to protect the ATS. If you're comparing the trip curve from a new breaker with the published trip curve of a breaker you used for the test, the published trip curve from the previously tested breaker may say it clears in 50 milliseconds but the manufacturer of the breaker may have been conservative with the rating—it may actually clear in 30 seconds. If you have a new breaker that takes longer than 30 milliseconds to clear, you aren't demonstrating that the transfer switch is able to withstand that level of fault current until the breaker clears; you've only demonstrated that it will withstand for 30 milliseconds. So I think that's the logic behind the change.

**Does Cummins publish or recognize lower resistance ohm meter specifications across the contacts of each of the ATS sources?**

I think what you're asking is, if you've had a fault, how can you determine if the contacts have been damaged? One way to find out is by taking a resistance reading. I don't think that information is published but if you need that information, you can consult with the factory or your local Cummins distributor.

**Please comment on selective coordination with AmpSentry. I've had some difficulty achieving selective coordination based on the SKM model because it plots so low.**

This question isn't directly related to transfer switches, but I'll try to answer. In general, AmpSentry, because it has no instantaneous trip on the emergency side, usually makes selective coordination easier, compared to a molded case circuit breaker with instantaneous trip. The trip curve for AmpSentry allows for the maximum period of time before clearing a fault, before crossing the damage curve of the alternator.

I have found that AmpSentry makes selective coordination easier, not more difficult. I'd like to discuss this with you further; please connect with your Cummins distributor about this question.

**What limitations apply to adjustable trip circuit breakers in front of the ATS?**

If your transfer switch doesn't have a short-time rating, then any time delay has to be turned off. The basic withstand and closing rating, for a specific breaker or overcurrent device, assumes an instantaneous trip. If you have an adjustable trip, instantaneous must be on in this situation. You can make adjustments but if the breaker has instantaneous turned off, then the withstand and closing rating is not valid; that would be a mis-application. Instantaneous has to be on.

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