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PowerHour FAQs

Transfer Switch Operation and Application

Transfer switch equipment is available in a variety of types, with a wide array of features. Selecting the appropriate transfer switch for a specific application requires a clear understanding of site requirements and application restraints. Topics include transfer scenarios, neutral switching strategies and bypass isolation mechanisms.

To learn more about transfer switch operations and applications, please join the Cummins PowerHour webinar:

Following this PowerHour participants should be able to:

- Discuss the basic operation of transfer switches and transition types to aid in the selection of equipment
- Identify when it is appropriate to use a 4 pole switch as compared to 3 pole switch
- Describe the operation modes of bypass switches and isolation methods

What is the difference between a three-pole transfer switch and a three-position transfer switch? Are these the same thing? What are these referring to?

The similar phrases can be confusing. Transfer switches that serve three-phase/four phase loads can be either 3-pole or 4-pole (switched neutral) type transfer switches. In a 3-pole transfer switch, the neutral does not utilize power transfer contacts, but rather is provided with a solid bus-bar connection.

Three-position refers to the position of the transfer switch when transferring loads from one source to other. For residential applications, there are only two positions: Emergency and Normal. For applications requiring load shedding functionality, there is a third position aka center off position where the transfer switch isn't connected to either the normal utility power source or the emergency source. This positon willl allow the generator to shed non-critical loads when an overload situation arises.

You talked a little bit about load shedding and how a three-position transfer switch was important for load shedding in case of non-critical loads when serving life safety loads. How is the load shed actually initiated? What does the generator set do? How does the transfer switch react to that? How does that all work together?

In order to load shed, you need a three-position switch so the transfer switch has a center/off position where it isn't connected to either the normal utility power source or the emergency source. For example, if you are connected to the emergency source in a critical situation and the generator set senses that it might overload, the generator control sends a load shed signal to the transfer switch, causing the transfer switch to move to the center/off position. At that point the generator set can start shedding the non-critical loads.

The load shed signal may come from the generator set control, but in more complex operations the signal may come from a digital master control. So the transfer switch needs to have a direct connection to either the generator set control or the digital master control.

Closed transition switches and bypass transfer switches have superior functions compared to open transition switches. Why wouldn't you want to use a closed transition or bypass switch on every project?

There are two factors to consider: cost and complexity. If you don't need a closed transition switch and your loads are okay with a brief power interruption (break-before-make), an open transition switch is economical and easy to configure.

When you upgrade to closed transition (make-before-break), the level of complexity increases. Because closed transition causes a brief overlap between the utility power and the backup power, the local utilities generally have regulations regarding the time of the overlap, and require paperwork as part of the approval process. Additional components may be required, such as an extended parallel relay or timer relay.

Bypass switches are considerably more complicated and more expensive than open or closed transition switches. Bypass functions require more complex controls and more programming. There are some life safety or mission-critical applications, such as hospitals or data centers, where a bypass switch is worth the additional cost.

With closed transition, when you're transferring between two live sources, there is no interruption to the loads. But what if there is an unscheduled utility power interruption? Is there an interruption before the transfer switch can transfer to the backup source?

Yes, because when there is an unexpected utility failure, the utility is no longer a live source. So there will be a brief interruption before the transfer switch can go to backup power.

With regard to ground fault sensing, what do you mean by "downstream of the bond"?

There are really a lot of different ways to sense ground fault, or monitor ground fault. One of the popular choices is residual ground fault sensing, wherein you would typically put current transformers(CTs) on the circuit breaker line side or on the cable itself to appropriately sense ground fault. If residual sensing is used then we need to have the sensing that meets the CT downstream of the bond – the bond meaning the connection in between the neutral and the ground wire, the bonding jumper will be looked at from source side. The CTs must be downstream from your source and the bonding jumper for appropriate flow of fault current. These rules are also explained in the IEEE Green book.

What does it mean when a transfer switch is "service entrance rated"?

A service entrance transfer switch is located at the utility service entrance and is connected directly to the utility power source. For this reason, a service entrance transfer switch must have circuit breaker to use as a manual disconnect so the transfer switch can act as the main disconnect, and can be used to manually disconnect both sources. A service entrance transfer switch may also contain an over-current protection device.

Service entrance transfer switches are typically installed where there is a single utility feed and a single backup power source.

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