Arc Quenching Switchgear

Description

The Arc Quenching Device (AQD) can be located on the line- or the load-side of the main low-voltage circuit breaker in an Arc Quenching Switchgear (AQS) lineup. With the switchgear energized and the Arc Quenching System active, the entire AQS lineup will be C37.20.7 arc-resistant regardless of the location of the AQD. However, the incident energy of the lineup is affected by the location of the AQD.

AQD load-side application

The standard AQS application includes the AQD mounted on the load-side of the low-voltage main circuit breaker. See **Figure 1**.

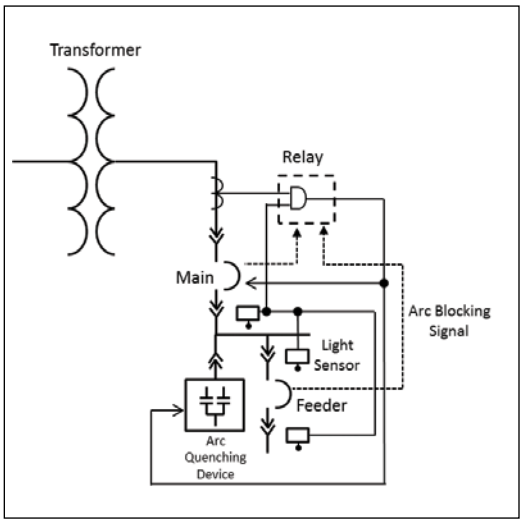

Figure 1. AQD load-side application

In this application, the lineup will carry two different incident energy levels while the Arc Quenching System is active (indicated by the illumination of the white light above the AQD). The incident energy on the line side of the low-voltage main breaker will be determined by the clearing time of the upstream overcurrent protective device. The incident energy on the load-side of the low-voltage main breaker will be determined by the arc quenching time of the Arc Quenching System. Typically, the load-side incident energy in this application will be less than 1.2 cal/cm^2. See **Figure 2**.

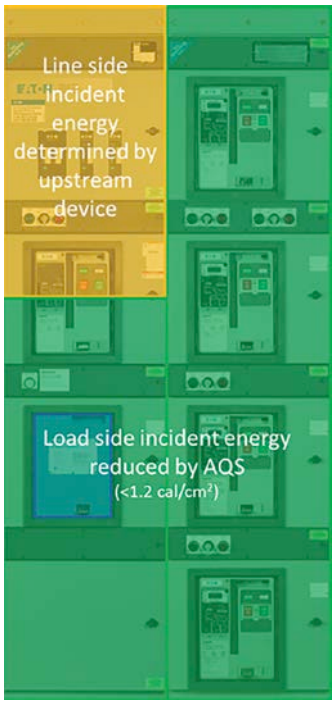

Figure 2. Standard application incident energy

If the Arc Quenching System is inactive (either due to a malfunction, loss of control power, disconnection of the AQD, or if the upstream LV main device is open), the white indicator light above the AQD will cease to be lit. In this case, the incident energy on the line-side of the main low-voltage breaker will remain the same (as determined by the clearing time of the upstream overcurrent protective device). Furthermore, when the main breaker is closed with the AQS inactive, the incident energy on the load-side of the low-voltage breaker will increase, determined by the total clearing time of the Eaton Arc Flash Relay (EAFR) tripping the low-voltage main breaker.

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Figure 3. Sample arc flash label for AQD on load-side of LV main breaker

AQD line-side application

The substation AQS application includes the AQD mounted on the line-side of the low-voltage main circuit breaker, and must include a wired trip signal from the EAFR to the upstream medium-voltage circuit breaker with a verified clearing time of less than 30 cycles. See **Figure 4**. It is not possible to shunt-trip an upstream medium-voltage switch unless the switch is rated to interrupt full available fault current within 30 cycles or less.

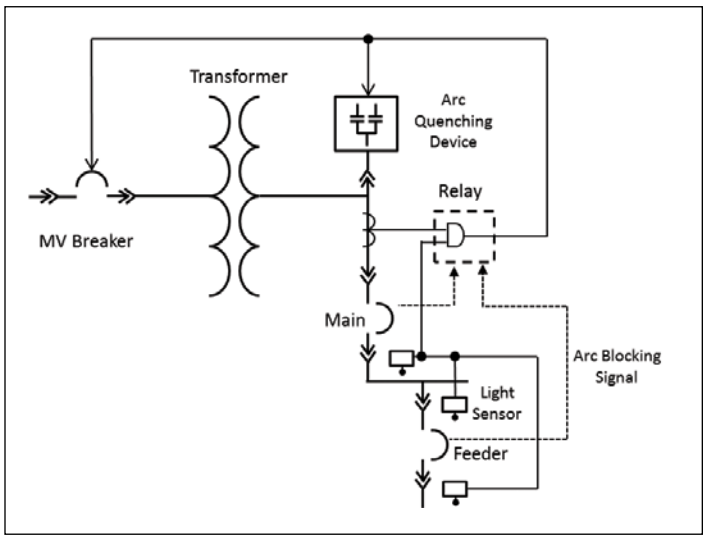

Figure 4. AQD line-side application

In this application, the entire low-voltage switchgear lineup will carry a single incident energy level while the Arc Quenching System is active (indicated by the illumination of the white light above the AQD). The incident energy of the entire lineup, including the line-side of the low-voltage main breaker, will be determined by the arc quenching time of the Arc Quenching System. Typically, the incident energy of the entire low-voltage switchgear lineup in this application will be less than 1.2 cal/cm^2. See **Figure 5**.

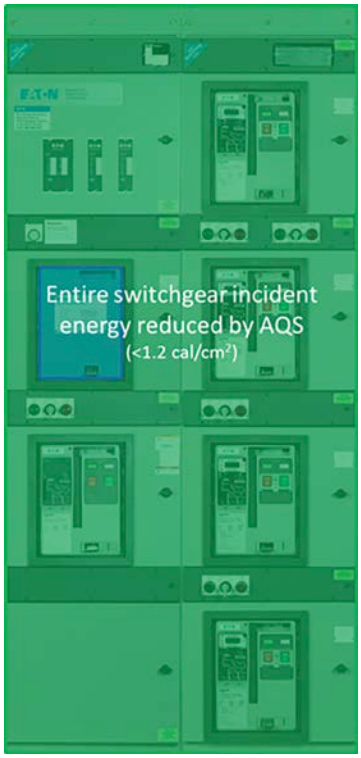

Figure 5. Substation application incident energy

If the Arc Quenching System is inactive (either due to a malfunction, loss of control power, or disconnection of the AQD), the white indicator light above the AQD will cease to be lit. In this case, the incident energy of the entire low-voltage switchgear lineup (on the line-side and load-side of the low-voltage main breaker) will be determined by the total clearing time of the Eaton EAFR tripping the upstream medium-voltage breaker.

Notes for line- and load-side applications

After switchgear installation, it is highly recommended to perform an arc flash study and label the switchgear with the calculated incident energy.

The Arc Quenching System is electrically interlocked with the main breaker to prevent closing the main if the health contact of either the EAFR or AQD is open, either because the device is still powering up or if there is an error.

The Arc Quenching System requires approximately 30 seconds of boot time on power-up. For applications in which the primary bus could become energized with the main breaker of the protected switchgear closed, an external control power source is recommended. Alternatively, a UPS internal to the switchgear can be specified to ensure that the Arc Quenching System is operational prior to energizing the switchgear primary bus. This will provide protection in the unlikely event that an arc occurs in the switchgear while energizing.

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