The New Medium Voltage Circuit Breaker Interrupting Ratings Based on K Factors of 1

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The ANSI Standard for Medium Voltage Circuit Breaker Test Procedures, IEEE C37.09 was revised in 1999. This standard defines the short circuit tests required to certify a medium voltage circuit breaker’s interrupting rating. In the past the interrupting rating changed as a function of the voltage at which the breaker was applied. The new standards are an effort to recognize that modern vacuum and SF₆ interrupting technologies more closely represent a constant current interrupting device, independent of the nominal system voltage.

The standards evolved from the 1945 revision when breakers were rated based on interrupting MVA (see figure below). In 1968 the standards established varying k factors to adjust interrupting rating as a function of the voltage. The k factor reflects the performance of the oil and air interrupting technologies available at that time. This practice ended with the 1999 change, where circuit breaker k factors were all set at to a value of one. The k factor of 1 results in all medium voltage breakers, tested to the 1999 version of C37.09, having a constant interrupting rating irrespective of nominal system voltage. The changes in interrupting rating at the system voltage can be seen in the graphs below.

Using the 1968 standards, the 250MVA breaker had a 29kA interrupting rating if applied at 4.76kV while the same breaker applied at 4.16kV had a 33kA interrupting rating and when applied at 3.85kV it had a 35.5kA rating. Using the 1999 standards, a newly certified 36kA breaker with a k factor of 1 will retain the 36kA interrupting rating independent of the applied voltage.
Important Note:
Circuit breaker short circuit interrupting rating is the symmetrical RMS current at the time power contacts part.

These new rating structures do not change the rating of circuit breakers certified prior to the 1999 revision. They only impact breakers that are certified to the new testing standards. The new 1.0 k factor ratings will simplify breaker application and align with the long-standing IEC nomenclature. It is important that we do not make the mistake of trying to apply a short circuit rating that varies as a function of the voltage to circuit breakers certified to have a k factor of 1.
Old MVA Short Circuit Rating

Closing and Latching Capability

Maximum Symmetrical Interrupting Capability and Carrying Capability for the Number of Seconds Specified in 5.10.2.5 and 5.8

Max Interrupting @ Min Voltage

Rated SC Current = Rated Max Voltage

Symmetrical Interrupting Capability

Min Interrupting @ Max Voltage

Operating Voltage

1-K Rated Max Voltage

Nominal System Voltage

Rated Maximum Voltage

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