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(Supplement to IEEE C37.09-1979)

Supplement to

IEEE Standard Test Procedure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis

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Abstract: The required load-current switching capability and life are defined, and load-current switching tests are specified.
Keywords: circuit breakers, high-voltage circuit breakers, load-current switching tests

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Replace Section 4.12 on page 36 of IEEE C37.09-1979 with the following:

4.12 Required Load-Current Switching Capability and Life. All types of circuit breakers shall interrupt load currents up to rated continuous current with a normal-frequency recovery voltage up to rated maximum voltage.

Circuit breakers designed to meet this standard are expected to be capable of performing the number of load-switching operations shown in Column 3 of Table 8 of ANSI C37.06-1987[1] in a circuit having a power factor from 1.0 to either 0.8 lagging or 0.8 leading. They are also expected to close circuits having making currents at 600% of rated continuous current for the number of times shown in Column 4 of Table 8 of ANSI C37.06-1987. A demonstration of the two foregoing capabilities is not required because if a circuit breaker has successfully met the service capability requirements for short-circuit conditions in accordance with ANSI C37.09-1979, 4.6.3, it is normally assured that the circuit breaker will meet these load-switching capabilities. In all cases, the service capability tests demonstrate adequate interrupter life in switching load currents for the number of operations and types specified.

4.12.1 Load-Current Switching Tests. Tests may be made to demonstrate the capability of the circuit breaker to switch load currents such as may be encountered in normal service. Load-current switching ability of a circuit breaker is demonstrated by the following series of tests performed under the specified conditions.

(1) Opening tests shall be made at 100% of rated continuous current and any current below rated continuous current at which the circuit breaker exhibits a maximum arcing time if that current is not demonstrated by other tests. In those cases where the maximum arcing time occurs above rated continuous current, as demonstrated by short-circuit tests, tests at 20 to 30% of rated continuous current shall be performed.

(2) If three-phase tests are made, they shall be made with the normal-frequency recovery voltage at least equal to the rated maximum voltage of the circuit breaker, and they shall be made with the neutral of the switched circuit or the supply ungrounded. They shall also be made with the switched circuit and supply grounded. If single-phase tests are made, they shall be made with the normal-frequency recovery voltage at least equal to 87% of the rated maximum voltage of the circuit breaker.

[1]This revision supersedes the 1979 edition listed in IEEE C37.09-1979.

(3) The load circuit impedance shall provide a power factor from 1.0 to 0.8 lagging or 0.8 leading. The source reactance at a minimum shall be set to provide no more than rated short-circuit current, and at a maximum shall be no higher than 15% of the total circuit impedance. Where reactance is added to control power factor, it shall be connected in parallel with the load resistance. An alternative method to control power factor is to add reactance in series with load resistance, in which case the circuit shall be further modified to match the damped transient recovery voltage response of the parallel connected load circuit. The preferred location for the circuit breaker is between the source and load.

NOTE: Tests may be performed with power factors less than 0.8 lagging or with transient recovery voltages exceeding the damped response of parallel connector load circuit.

(4) A minimum of two tests for three-phase tests or a minimum of six tests for single-phase tests are required unless otherwise specified (see 4.6.5.11). Tests shall be made with the circuit-breaker contacts parting at various positions on the current wave to ensure satisfactory operation under all switching conditions within its rating. If the minimum number of tests are performed, they shall be at 30° intervals.

(5) The normally grounded parts of the circuit breaker shall be grounded.

(6) If the interrupter or interrupters are not symmetrical with respect to the terminals, the tests shall be made with the source connected to one side of the circuit breaker, then repeated with the source connected to the other side of the circuit breaker.

(7) Tests shall be made at rated frequency with a tolerance of ±20% unless otherwise specified.