Specification Guide

for

RVAC™

Direct Replacement

AC Medium Voltage

Circuit Breakers

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1.0 General Work Scope

This specification covers the design, testing, manufacturing requirements, on-site installation and installation conformance of medium voltage replacement circuit breakers. The medium voltage replacement circuit breakers shall be functional replacements (both mechanically and electrically) for the existing medium voltage circuit breakers listed in this specification. This specification defines the requirements for the replacement of existing air magnetic circuit breakers with circuit breakers of the same or greater interrupting rating using vacuum interrupter technology. The replacement breakers shall be directly interchangeable between the breaker cells of the same ampere class and interrupting rating of the original equipment without cell modifications. The new replacement circuit breakers shall be fully compatible with the existing switchgear compartments and the identical interlocks and mechanism operated cell (MOC) switches. The replacement circuit breaker shall be a magnetically actuated ABB RVAC medium voltage replacement breaker or approved equal.

2.0 Standards

The replacement circuit breaker elements shall be designed, fabricated and tested in accordance with the latest applicable standards of the American National Institute (ANSI), National Electrical Manufacturers Association (NEMA), and the Institute of Electrical and Electronics Engineers, Inc. (IEEE) unless otherwise stated herein.

2.1 ANSI C37.04 “Standard Rating Structure for AC High Voltage Circuit Breakers”
2.2 ANSI C37.06 “AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis - Preferred Ratings and Related Required Capabilities”
2.3 ANSI C37.09 “Standard Test Procedure For AC High-voltage Circuit Breakers Rated On A Symmetrical Current Basis”
2.4 ANSI C37.010 “ Application Guide for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis”
2.5 ANSI C37.11 “Requirement for Electrical Control for AC High Voltage Circuit Breakers”
2.6 ANSI C37.12 “Guide to Specifications for AC High Voltage Circuit Breakers Rated on A Symmetrical Current Basis or a Total Current Basis”
2.7 ANSI C37.20.2 “Metal Clad and Station Type Cubicle Switchgear (above 1000V)”
2.8 ANSI C37.59 “Requirements for Conversion of Power Switchgear Equipment”

3.0 Supplier Qualifications

3.1 The supplier shall have replacement circuit breakers in service for a minimum of five (5) years.

3.2 The supplier shall be able to demonstrate experience in replacement breaker design for a minimum of five (5) years.

3.3 The supplier shall be the original manufacturer of the circuit breaker element being applied to the replacement circuit breaker.

4.0 Circuit Breaker Element Construction

4.1 The circuit breaker element shall be an ABB VKBR or VHKR, three-pole, electrically operated with spring-stored energy operating mechanism or approved equal.

4.2 Opening and closing speed shall be independent of the operator or of the control voltage within the rated control voltage range.

4.3 Manual provisions shall be provided for closing, tripping and charging the breaker. These provisions shall be installed and easily accessible at the front of the breaker element.

4.4 When fully installed as a replacement breaker, the breaker element shall be provided with self-aligning, fully automatic secondary coupling system to connect and disconnect all control wiring during circuit breaker insertion and withdrawal.

4.5 The secondary disconnect shall require no manual intervention to attain proper position when the breaker is racked to the connected, test or disconnected positions.

4.6 Secondary contacts shall use a tin-lead contact finish.

4.7 The circuit breaker element shall include eight on-board auxiliary contacts (4 “a”, 4 “b”) for customer use, wired through the secondary disconnect. All breaker-mounted contacts shall operate in both connected and test positions. Nine additional contacts (5 “a”, 4 “b”) shall be installed on the breaker and wired through the secondary disconnect, for a total of 17 on-board contacts.

4.8 The breaker element shall have flags to indicate open or closed position, and spring charge status. Only the correct status flag for any single function shall be visible. Pointer systems shall not be used to indicate status.

4.9 The springs in the stored energy operating mechanism for the breaker element shall be automatically discharged prior to removing a circuit breaker from a compartment.

4.10 The circuit breaker element shall have a five-digit, non-resetting operation counter clearly visible from the front of the breaker. The operation counter shall advance when the breaker opens.

4.11 Each primary lead assembly shall consist of a vacuum interrupter housed in a glass-polyester support, with copper upper and lower leads, and shall use tulip-type self-aligning primary disconnects.

4.12 Current transfer to moving interrupter stems shall be via flexible connectors or brush contacts with no moving parts.

4.13 Primary disconnects and contact surfaces of other current carrying parts shall be silver-plated.

4.14 Interrupters shall have a contact wear indication for evaluation by contact measurement tools.

5.0 Roll-in Replacement Circuit Breaker Construction

5.1 The roll-in replacement circuit breaker shall have a complete ANSI-tested mechanism. The element shall be mounted in a steel frame structure which interfaces with the existing cell levering system and has primary connections which match the existing inter and intra-phase spacing.

5.2 The replacement circuit breaker frame shall be constructed from steel. A combination of bolting and welding to assemble the frame is acceptable. The frame and associated interlocks shall be provided with a painted or zinc-plated with a yellow dichromate, protective coating to prevent the corrosive effects of the atmosphere. All hardware shall be a minimum grade five (5), zinc-plated or black oxide to prevent the corrosive effects of the atmosphere.

5.3 The circuit breaker manufacturer must have a test cubicle located in their factory to verify cell interlocks and racking system of the new replacement breaker.

5.4 The replacement breaker shall be suitable for use in the existing metal-clad switchgear. Only vacuum interrupter and mechanism assemblies that have jointly passed appropriate ANSI design tests listed in C37.09 shall be used in the circuit breaker.

5.5 Main current-carrying parts, insulators, supports, and housing of the circuit breaker shall have sufficient mechanical strength to withstand the effects of rated short circuit currents without damage.

5.6 The replacement breaker shall be held trip free during breaker levering. Safety interlocks shall interface with the existing breaker cell to prevent the breaker levering into the primary contacts in the closed position.

5.7 Control wiring shall be #14 gauge, type SIS as a minimum.

5.8 The primary connections and/or finger clusters shall be new, designed and tested to carry the full nameplate rating of the replacement circuit breaker without exceeding the allowable temperature rise as indicated by ANSI.

5.9 The primary contacts shall be capable of withstanding the full rated short circuit current rating of the circuit breaker as defined by ANSI.

5.10 The new secondary contact block shall be new and shall be capable of interfacing with the existing contact block located in the existing cell. Cell modifications of the enclosure are unacceptable.

5.11 The breaker shall be capable of operating all truck-operated contacts (TOC); mechanism operated contacts (MOC), and cubicle shutter functions and shall be fully function tested according to ANSI C37.20.2.

5.12 The functionality of the existing metal ”dead front” barrier shall be maintained.

5.13 Closing and tripping mechanisms for the replacement breaker shall operate satisfactorily over the voltage range in accordance with ANSI C37.06 Table 10.

5.14 Each new circuit breaker shall retain the copper connection to the ground bus throughout the levering process.

5.15 The circuit breaker shall retain the existing racking mechanism and interlocks and be capable of moving the breaker and operating the mechanical interlocks between the CONNECT, TEST, and DISCONNECT positions as originally designed. This shall include, but not limited to, the interlocks that prevent removal or insertion of a closed breaker, operation of cubicle shutter and positioning.

5.16 The operating mechanism shall be readily accessible for maintenance.

6.0 Installation Conformance

6.1 The replacement breaker manufacturer shall verify functional operation of all circuit breaker interlocks, cell interfaces and levering assembly in a cell structure in the replicated cell at the factory and again verify the same at each cell location for which the replacement breaker is installed. The service of factory trained service technicians shall be included to accomplish and verify this conformance.

6.2 The supplier shall also set all trip unit settings on each replacement circuit breaker as required for each circuit breaker being replaced under this project. The owner shall furnish the supplier with a recent coordination study for this purpose.

7.0 Documentation and Drawing Requirements

7.1 The circuit breaker element shall be supplied with certificates of type tests on similar devices performed by the manufacturer.

7.2 Copies of the design tests of the replacement breaker shall be supplied.

7.3 Copies of the production tests of the replacement breaker shall be supplied.

7.4 Outline drawings of the replacement circuit breaker shall be supplied.

7.5 Schematic wiring diagram of the circuit breaker element and connection diagram shall be supplied.

7.6 Schematic and wiring diagram of the replacement circuit breaker shall be supplied.

7.7 Instruction books for the replacement circuit breaker shall be provided. The instruction book shall also include the circuit breaker element.

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