

Low and Medium Voltage Service

Medium voltage circuit breaker refurbishment scope of work

Scope of work

I. Receipt inspection

1. Visually inspect breaker for any visible missing or damaged components prior to incoming testing. Record breaker nameplate and operations counter information.
2. Perform incoming operational testing to include (as applicable):
 - Manual and electrical functional operation tests
 - Check minimum and maximum coil operating voltages
 - Check for proper operation of anti-pump feature
 - Check for proper operation of electrical and mechanical safety interlocks
 - Check for operation of indicating devices, including all visual indicators and operational counter
 - Check for proper operation of racking device and check interlocks
3. Perform insulation resistance “megger” testing. All testing will be performed at 2,500 or 5,000 vdc (depending on voltage class of breaker). Individual tests on primary current carrying components will be performed to include phase to phase, phase to ground, and testing of each pole piece, with the main contacts open. Minimum acceptance value is 1000 megohms or greater. Insulation resistance checks of secondary (control) circuits, to ground, will be conducted. Testing of the spring charging motor will be conducted at 500 vdc. Minimum acceptance value is two megohms or greater. Note: Air Magnetic breakers may be shipped without arc chutes to prevent damage during shipping. In these cases, testing will be conducted only on the assembly provided to check the dielectric strength of leads, bushings, pushrods and insulators without arc chutes installed. Caution: Vacuum breakers must be shipped in the closed position.
4. Perform circuit breaker opening and closing tests at normal operating control voltage.
5. Perform main contact resistance checks. Maximum acceptable readings will dependent on the breaker manufacturer and model.
6. Test for proper operation of applicable circuit breaker trip features.
7. A detailed incoming inspection report documenting all test results, observations, findings and recommendations will be prepared for inclusion in the condition report located in the work package.

II. Refurbishment

1. The entire circuit breaker will be disassembled to sub-assembly component level. The operating mechanism, main contact moving and stationary assemblies, drawout bar assembly and jackshaft assembly will completely disassembled to the individual component level. Any moving parts and/or components on other sub-assemblies requiring lubrication will also be disassembled. Control devices will be disassembled to check for internal damage. The electrical control device will be disassembled and inspected for worn/ degraded contacts, proper formation of armatures and cracked housings. Limit switch contacts will be burnished and/or polished as required. Coils will be checked, as will all terminal connections. Note: The Pivot bolts and nuts for the moving and stationary contacts to be rejected on an as needed basis.
2. Each component will be thoroughly cleaned and inspected.
3. Some components that are damaged can be repaired/ refurbished at a greater cost savings to the customer. These components are as follows:
 - Charge motors
 - Control devices
 - Contacts (If wear on contact surface is < 50 percent they will be resurfaced for optimal use. If wear on contact surface is > 50 percent the component must be replaced for air magnetic breakers only)
 - Re-plating of frame, mechanism and contact plated parts will be performed for an added charge for that plating as necessary
4. All defective components will be documented, retained and returned to the customer, if requested. Prior to ordering any replacement components, approval will be obtained from maintenance and/or purchasing, as specified in the purchase order.
5. It is recommended that arc chutes not be sent in with the air magnetic circuit breakers.

III. Breaker re-assembly

1. Each individual moving component, including pivot pins, needle, roller and sleeve bearings, thrust washers; cams and gears will be lubricated per specific manufacturer's standards. Mobile 28 grease can be used, if the customer request the lubricant in the purchase order and supplies certified lubricant (if applicable). We ensure all excess exposed lubricant is removed to minimize contamination between maintenance periods.
2. All latches, roller clearances, adjustable spring tensions and mechanical adjustments within the operating mechanism will be setup per the applicable manufacturer's specification and/or instruction bulletin.
3. Main and arcing contact simultaneous make and wipe (main contact pressure) will be adjusted per manufacturer's specifications.
4. Control devices will be disassembled to check for internal damage. Limit switch contacts will be burnished and/ or polished as required. Coils will be checked, as will all terminal connections.
5. Upon final assembly, all hardware will be inspected to ensure proper installation and that all parts are properly secured.
6. Setup testing and all initial adjustments will be performed by the assembly technician prior to final testing by one of our certified Quality Assurance Inspectors.

IV. Final testing

1. Operate breaker electrically and manually. Check close, trip, latch and trip free operations. Visually check the operating mechanism for proper alignment of props, latches, toggle assemblies and operating levers and linkages.
2. Perform operational testing to include (as applicable):
 - Manual and electrical functional operation tests
 - A minimum of five (5) manual and five (5) electrical functional operational tests
 - Verify proper operation of anti-pump feature
 - Verify proper operation of electrical and mechanical safety interlocks
 - Verify proper operation of racking device and check interlocks
 - Check operation of indicating devices, including all visual indicators and operational counter
3. Perform circuit breaker opening and closing timing tests at normal operating control voltage.
4. Perform main contact resistance checks. Maximum acceptable readings will be dependent on the breaker model.
5. Perform insulation resistance “megger” testing. All testing will be performed at 2500 or 5000 vdc (depending on voltage class of breaker). Individual tests on primary current carrying components will be performed to include phase to phase, phase to ground, and testing of each pole piece, with the main contacts open. Minimum acceptance value is 1000 megohms or greater. Insulation resistance checks of secondary (control) circuits, to ground, will be conducted. Testing of the spring charging motor will be conducted at 500 vdc. Minimum acceptance value is 2 megohms or greater. Note: air magnetic breakers may be shipped without arc chutes to prevent damage during shipping. In these cases, testing will be conducted only on the assembly provided to check the dielectric strength of leads, bushings, pushrods and insulators with arc chutes installed.

6. If necessary, or as an alternative to megger test as listed in #5 above, a high potential (HI-POT) voltage withstand tests for a minimum of one (1) minute at the following values:

Class	AC	DC
5,000 Volt circuit breaker	14,400 Volts	20,000 Volts
7,500 Volt circuit breaker	27,000 Volts	38,000 Volts
15,000 Volt circuit breaker	27,000 Volts	38,000 Volts

7. If requested, the customer is welcomed and encouraged to have their Plant Electrical Engineer, Electrical Maintenance Supervisor, or other company representatives to witness all, or part of the final testing. This requirement should be outlined in the purchase order. We will provide a minimum of forty eight hours advance notice of our testing schedule.
8. A comprehensive condition report will be completed. This report will include:
 - All incoming inspection and test results
 - An incoming “as found” condition report
 - A listing of all components replaced during the refurbishment and an explanation of the defect to determine the impact of the failure. Standard refurbish parts, as defined by this work scope, will not be dispositioned
 - A list of any part painted or repaired
 - All final “as left” inspection and test results

Note: Upon request, all defective and rejected parts that are replaced can be returned to the customer.

For more information about ABB services, please contact your sales representative or call one of the numbers listed below:

ABB Inc.

Low and Medium Voltage Service

Florence, South Carolina

Phone: +1 800 HELP 365 (option 7) or +1 407 732 2000

www.abb.us/mvservice

Note:

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