



Tmax molded case circuit breakers

Specification guide

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Conditions, and other applicable specification sections in the Project Manual apply to the work specified in this Section.

1.2 SUMMARY

- A. Scope: This specification covers the design, testing, and installation conformance of low voltage Molded Case Circuit Breakers (MCCBs). The information referenced in this Specification includes, but shall not be limited to MCCBs.
- B. Section Includes: Versions included in this Specification are as follows:
 - 1. Thermal magnetic MCCBs, for AC and DC networks.
 - 2. Electronic trip unit MCCBs, for AC networks.

1.3 REFERENCES

The MCCB shall be designed, fabricated, and tested in accordance with the latest applicable standards of Underwriters Laboratory (UL), National Electrical Manufacturers Association (NEMA), and the Canadian Standards Association (CSA).

MCCBs must comply with:

- A. Canadian Standards Association (CSA):
 - 1. CSA C22.2 No. 5, "Molded Case MCCB, Molded Case Switches and Circuit Breaker Enclosures."
- B. International Electrotechnical Commission (IEC):
 - 1. IEC 60947, "Low Voltage Switchgear and Control Gear – Part 2: MCCB."
 - 2. IEC 61000-4 Series, "Electromagnetic Compatibility."
- C. Mexican Standards, Underwriters Laboratories Inc. of Mexico (NMX):
 - 1. NMX J 266, "Molded Case MCCB, Molded Case Switches and Circuit Breaker Enclosures."
- D. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA AB 1, "Molded Case MCCB and Molded Case Switches."
- E. American Bureau of Shipping (ABS):
 - 1. 2009 Steel Vessel Rules 1-1-4/7.7 , 4-8-3/5.3.3.
- F. Underwriters Laboratories, Inc. (UL):
 - 1. UL 489, "Standard for Molded Case MCCB and Circuit Breaker Enclosures."
 - 2. UL 508, "Standard for Industrial Control Equipment".

1.4 SUBMITTALS

- A. General: See [Section 01 33 00 SUBMITTAL PROCEDURES] [Section 01300 SUBMITTALS].
- B. Product Data: Submit product data showing material proposed. Submit sufficient information to determine compliance with the Drawings and Specifications.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of MCCBs of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of 20 years.
 - a. The manufacturer shall be ISO 9001-2000 certified and shall be designed to internationally accepted standards.
 2. Installer Qualifications: Installer shall be a firm that shall have a minimum of five years of successful installation experience with projects utilizing MCCBs similar in type and scope to that required for this Project.
 3. Inspecting and Testing Agency Qualifications: To qualify for acceptance, the manufacturer or a qualified independent inspecting and testing agency hired by the Contractor or manufacturer to test products shall demonstrate to the Architect/Engineer's satisfaction that they are qualified according to ASTM E 329 to conduct testing indicated.
- B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.
- C. Electrical Components, Devices, and Accessories: Electrical components, devices, and accessories shall be listed and labeled as defined in NEC, Article 100, by an inspecting and testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and lot number, if any.
- B. Store materials in their original, undamaged packages and containers, inside a well ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity. MCCBs must be able to be stored in environments with temperatures between -40 °F and +158 °F (-40 °C and +70 °C).

1.7 PROJECT CONDITIONS

- A. Environmental Requirements: MCCBs must be used in ambient conditions where air temperature varies between -13°F and +158 °F (-25 °C and +70 °C) MCCBs and accessories must be tested in compliance with the IEC 60068-2-30 Standard, carrying out 2 cycles at 131 °F (55 °C) with the "variant 1" method (clause 6.3.3). The suitability of the MCCBs for use under the most severe environmental conditions must be therefore ensured with the hot-humid climate defined in the climatograph 8 of the IEC 60721-2-1 Standards.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Products specified shall be manufactured by ABB. Items specified are to establish a standard of quality for design, function and materials.

2.2 MOLDED CASE CIRCUIT BREAKERS

A. General Characteristics:

1. MCCBs shall have double insulation between the live power parts (excluding the terminals) and the front of the apparatus where the operator works during normal operation of the device. The placement of each electrical accessory shall be completely segregated from the power circuit, preventing any risk of contact with live parts.
2. MCCBs operating mechanism shall include a quick-make, quick-break, non-welding silver alloy contacts. and a common Trip, Open and Close mechanism such that all poles open and close simultaneously.
3. Arc Extinction shall be confined to the arc chutes.
4. The operating lever shall indicate the precise position of the moving contacts of the circuit breaker, thereby providing safe and reliable indication. The circuit breaker operating mechanism shall be trip free regardless of the pressure on the lever.
5. The circuit breaker handle shall reside in a tripped position between on and off to provide local trip indication. Circuit breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings.
6. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and their corresponding interrupting ratings shall be clearly marked on the face of circuit breaker.
7. Each circuit breaker shall be equipped with a push to trip button, located on the face of the circuit breaker to mechanically operate the circuit breaker tripping mechanism for maintenance and testing purposes.
8. Every MCCB must have a hologram on the front of the device, obtained using special anti counterfeit techniques, which guarantees the quality and that the circuit breaker is an original ABB product.
9. Circuit breakers shall be UL listed for reverse connection without line and load markings and be suitable for mounting in any position.

THE FOLLOWING TWO PARAGRAPHS ARE OPTIONAL. RETAIN IF APPLICABLE TO THE PROJECT.

10. Molded Case Switches (MCSs) derived from the MCCB range shall be provided. MCSs up to 800 A will be able to be used in alternating current and direct current applications.
11. UL Current Limiting MCCBs up to 400 A shall be provided. Current Limiting circuit breakers will be marked "Current Limiting" on the front and will have a label on the right hand side specifying peak current and specific let-through energy values.

B. Trip Unit:

1. General:

- a. MCCBs with ratings starting from 25 amperes up to 800 amperes shall be equipped with thermal magnetic or electronic trip units.
- b. MCCBs with ratings greater than 800 amperes shall be equipped with electronic trip units only.
- c. The trip units shall not increase the overall circuit breaker volume.

2. Thermal Magnetic (800 Ampere Frame and Below):

- a. Basis of Design: TMAX MCCBs as manufactured by ABB.
- b. General:
 - 1) MCCBs shall be true RMS sensing and thermally responsive to protect circuit conductor(s) in a 104 °F (40 °C) ambient temperature.
 - 2) Thermal Magnetic trip units shall be able to be used in AC or DC circuits.

ABOVE AND BELOW ARE OPTIONAL. RETAIN IF APPLICABLE TO THE PROJECT.

3. Electronic Trip MCCB:

a. Basic electronic trip units:

- 1) Basis of Design: TMAX MCCBs equipped with PR221/P or PR231/P trip units as manufactured by ABB.
- 2) General:
 - a) Circuit breaker trip system shall be an ABB electronic trip unit with true RMS sensing.
 - b) Electronic trip unit shall be fitted with a dip switches interface, in order to ensure the best accuracy in tuning the protection thresholds.
 - c) The basic electronic trip unit shall be fitted with protection functions against overload (L function) and against short-circuit. The latter function can either be of the instantaneous type (function I) or, alternatively, with intentional delay (function S). The function of protection against short circuit must be excludable.
 - d) The trip thresholds on electronic trip units shall not be affected by ambient temperature; temperature derating of breaker may apply.
 - e) Electronic trip units shall be suitable for use on AC circuits only.

THE FOLLOWING THREE SUBPARAGRAPHS ARE OPTIONAL. RETAIN IF APPLICABLE TO THE PROJECT.

- (i) L protection minimum pickup will be 0.4 times I_n .
- (ii) S protection pickup shall allow at least fifteen settings from 1 to 10 times I_n .
- (iii) Both L and S protection will be available in two different time delay curves.
- (iv) I protection pickup shall allow at least fifteen setting thresholds from 1 to 10 times I_n .

ABOVE AND BELOW ARE OPTIONAL. RETAIN IF APPLICABLE TO THE PROJECT.

d) Trip units shall have the capability to be electronically adjusted, the setting thresholds can be adjusted locally and remotely to fine increments below the switch settings. Fine increments for pickup adjustments shall be 0.04 In for L protection and 0.5 In for S and I protection.

b. Advanced electronic trip units:

1) Basis of Design: TMAX MCCBs equipped with PR222/P or PR232/P or PR331/P or PR332/P trip units as manufactured by ABB.

2) General:

- a) Circuit breaker trip system shall be an ABB electronic trip unit with true RMS sensing.
- b) Optional portable configuration and test unit shall be available with features for checking every function of the electronic trip unit so that the trip unit shall be able to be fully tested and configured.
- c) Trip units shall carry a Bluetooth socket so that they can perform wireless communication capabilities.
- d) The advanced electronic trip unit shall be fitted with protection functions against overload (L function) and short-circuit, optional against ground fault. The short-circuit function can be at the same time both of the instantaneous type (function I) and with intentional delay (function S). Protections against short circuit and ground fault shall be excludable.
- e) The trip thresholds on electronic trip units shall not be affected by ambient temperature; temperature derating of breaker may apply.
- f) Electronic trip units shall be suitable for use on AC circuits only.

THE FOLLOWING THREE SUBPARAGRAPHS ARE OPTIONAL. RETAIN IF APPLICABLE TO THE PROJECT.

- (i) The minimum pickup threshold for protection against overload will be 0.4 times In.
- (ii) S protection pickup shall allow at least fifteen settings from 0.6 to 10 times In.
- (iii) Both L and S protection will be available in four different time delay curves.
- (iv) Two different kinds of S protection (with inverse or definite time) shall be available.
- (v) I protection pickup shall allow at least fifteen settings from 1.5 to 12 times In.
- (vi) G protection pickup shall allow at least seven settings from 0.2 to 1 times In.
- (vii) G protection shall be available with four different time delay curves.
- (viii) Two different kinds of G protection (with inverse or definite time) shall be available.

ABOVE AND BELOW ARE OPTIONAL. RETAIN IF APPLICABLE TO THE PROJECT.

e) Trip units shall be able to provide real time metering. Metering functions shall include, but shall not be limited to, the following:

- (i) Current (phases, neutral, ground).
- (ii) Voltage (phase to phase, phase to neutral, residual).
- (iii) Power (active [kW], reactive [kVAR], apparent [kVA]).
- (iv) Power factor.
- (v) Peak factor.
- (vi) Energy (active [kWh], reactive [kVAR], apparent [kVA]).
- (vii) Frequency.
- (viii) Total harmonic distortion (current, voltage).
- (ix) Metering accuracy shall be 1.5% current, 1% voltage, and 2.5% energy. These accuracies shall be total system.

- f) The measurements shall be displayed on the breaker itself and/or on a remote display and/or on a remote system via Modbus and/or Bluetooth communication.
- g) Communication and voltage measuring units shall be optional functions integrated inside the trip unit.

SUBPARAGRAPH BELOW IS OPTIONAL. RETAIN IF APPLICABLE TO THE PROJECT.

- h) Optional features for applications above 400A, choose all that apply:
 - (i) Voltage-related protection functions such as overvoltage, undervoltage, overfrequency, underfrequency, residual voltage, reverse power, and phase imbalance.
 - (ii) Zone selectivity.
 - (iii) Contact wear indication.
 - (iv) Phase rotation reversed alarm.
 - (v) Wave form capture.
 - (vi) Data logging.

C. Accessories:

1. Auxiliary contacts and service releases:

- a. The addition of the auxiliary contacts and service releases shall not increase the volume of the MCCB.
- b. Auxiliary contacts must allow the state of the circuit-breaker (open or closed) to be known. Auxiliary contacts for use at 250 V AC/DC, 400 V AC and 24 V DC (digital contacts) shall be available.
- c. The shunt trip and under-voltage releases must be available with different power supply voltages both in AC and DC.
- d. Electrical auxiliaries shall be separated from power circuits.

2. Motor Operating Mechanism:
 - a. It shall be possible to equip MCCBs with a motor operating mechanism for electrical operation of the circuit breaker.
 - b. For MCCBs over 250 A rated current, the operating mechanism shall be of the stored energy type.
 - c. The addition of a motor mechanism shall in no way affect circuit breaker characteristics.
3. Mechanical Accessories:
 - a. Mechanical interlocks: mechanical interlocks must be available for all circuit breakers up to 1200A.
 - b. Rotary handle: a rotary handle operating mechanism both in the direct and transmitted version shall be available for circuit breakers up to 1200A.
 - c. Flange handle: a UL-certified flange handle shall be available for circuit breakers up to 600A.
 - d. Padlock devices and keylock accessories shall be available to lock the circuit breaker in the open position.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect/Engineer, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

1. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.

3.2 INSTALLATION

A. Preparation and installation shall be in accordance with reviewed product data, final shop drawings, manufacturer's written recommendations, and as indicated on the Drawings.

1. Install MCCBs in accordance with the NEC and applicable local codes.

3.3 ADJUSTING

A. MCCBs pickup level and time delay settings shall be adjusted to values indicated on the Drawings or schedule, as indicated by the coordination study, or as instructed by the Architect/Engineer.

3.4 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to the Installer, that shall ensure that the MCCBs shall be without damage at time of Substantial Completion.

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