



# Emax power circuit breakers

## Specification guide

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## PART 1 – GENERAL

### 1.1 SUMMARY

Circuit breakers shall be ABB Emax as specified on the associated drawings. Circuit breakers shall have interrupting, and 60-cycle with-stand ratings that meet the application requirements. Interrupting rating shall be available up to 200 kA without fuses. Emax circuit breakers shall be available in 800, 1200, 1600, 2000, 2500, 3200, 3600, 4000, 5000 and 6000 frame sizes. An interchangeable rating plug shall determine the ampere rating of the circuit breaker, starting from 100 A.

### 1.2 REFERENCES

Circuit breakers shall be constructed in accordance with the following standards:

- A. ANSI C37.13 “Standard for Low-Voltage AC Power Circuit Breakers Used in Enclosures”.
- B. ANSI C37.16 “Low Voltage Power Circuit Breaker Preferred Ratings”.
- C. ANSI C37.17 “Trip Devices for AC and DC Low Voltage Power Circuit Breakers”.
- D. NEMA SG-3 “Low Voltage Circuit Breakers”.
- E. ANSI C37.50 “Low Voltage AC Power Circuit Breakers Used in Enclosures and Test Procedures”.
- F. UL 1066 “Low Voltage AC and DC Power Circuit Breakers Used in Enclosures”.
- G. American Bureau of Shipping (ABS) 2011 Steel Vessel Rules 1-1-4/7.7 , and 1-1-Appendix 3, 4-8-3/5.3.3.

### 1.3 QUALITY ASSURANCE

Circuit breakers shall be UL Listed and manufactured according to an ISO 9001 Quality System.

## PART 2 – PRODUCTS

### 2.1 EQUIPMENT, COMPONENTS AND ACCESSORIES

- A. Circuit Breaker:
  1. Circuit breaker shall be fixed or drawout type and manually or electrically operated.
  2. All circuit breaker operating mechanisms are to be stored energy devices with a maximum of 80 ms closing time. Open-close-open (O-C-O) cycle shall be possible without recharging.
  3. The circuit breaker shall be constructed using double insulation to provide total segregation between the power circuit and the control circuit.
  4. Circuit breaker must be equipped with a fail safe device to prevent the moving part of the drawout breaker from being racked out of the cradle when the springs are charged.
  5. The rated mechanical life of the circuit breaker shall be no less than 20,000 operations for E2 frame sizes of 1600 amperes and below.
  6. The rated mechanical life of the circuit breaker shall be no less than 15,000 operations for E3 frame sizes of 2500 amperes and below

7. The rated mechanical life of the circuit breaker shall be no less than 15,000 operations for E3 frame sizes of 3200 amperes.
8. The rated mechanical life of the circuit breaker shall be no less than 8,000 operations for E4 and E6 frames of 3200 amperes through 5000 amperes.
9. It shall be possible to check the wear of the main contacts without removal of the arc chute assembly.
10. Each low voltage circuit breaker shall be equipped with non-saturating Rogowski current sensors, trip unit, and a tripping coil. The trip unit shall sense overload, short circuit, and ground fault conditions. The trip unit, acting on the output of the Rogowski current sensors, shall actuate the coil to open the circuit breaker in response to a trip condition.

### B. Trip Unit

#### 1. General

- a. All trip units shall be removable to allow for field upgrades.
- b. The overcurrent trip system on the power circuit breaker shall be true RMS sensing. Circuit breaker trip systems shall be configured to use Rogowski coils for precise current sensing and voltage reference.
- c. All power circuit breaker trip units shall have self-diagnostics, providing indication when the trip unit microprocessor experiences malfunctions or is operating out of its tolerance band.
- d. Current transformers for external neutral shall be available.
- e. An external add-on module for wireless Bluetooth® communication shall be provided.
- f. Trip unit shall provide local trip indication. Information about which protection function tripped shall be readable even more than 48 hours after the trip.

#### 2. Standard Electronic Trip Unit

- a. The standard trip device shall be easily programmable by moving selector switches and shall feature LED indicators to indicate the status of the trip system.
- b. Standard trip unit functions shall consist of protection against overload, protection against short circuit, delayed, protection against short circuit, instantaneous protection against ground-fault.
- c. Standard trip unit protection against overload shall allow twenty-five long-time pickup settings (I1) from 0.4 to 1 times the rated current (In). Protection against overload delay settings shall be in eight options from 3 to 144 seconds at three times I1.
- d. Standard trip unit protection against short circuit, delayed shall allow fifteen settings from 1 to 10 times In for 1200-6000 A frames and shall allow fifteen settings from 0.6 to 10 In for 800 A frame. Delays shall be in four options from 0.1 to 0.4 seconds.

- e. Standard trip unit protection against short circuit, instantaneous shall be available in fifteen pickups from 1.5 to 15.
- f. standard trip unit protection against ground-fault shall allow seven settings from 0.2 to 1 time  $I_n$ . Delays shall be in three options from 0.1 to 0.4 seconds.
- g. All standard trip units shall have the capability for the adjustments to be set and read locally by setting a dip.

### 3. Advanced Electronic Trip Unit

- a. The advanced trip systems shall have keypad programming through a menu based system.
- b. The advanced trip systems shall have backlit LCD display for viewing the programming menus, load currents per phase, trip currents per phase, percent of primary contact wear, and status indication.
- c. Advanced trip unit functions shall consist of protection against overload, protection against short circuit, delayed, protection against short circuit, instantaneous protection against ground-fault, protection against phase unbalance, protection against overtemperature.
- d. Advanced trip unit protection against overload shall allow fine setting of long-time pickup values ( $I_1$ ) from 0.4 to 1 times the rated current ( $I_n$ ), with a resolution of 0,01  $I_n$ . Protection against overload delay settings shall be able to be chosen from 3 to 144 seconds with a resolution of 3s.
- e. Advanced trip unit protection against short circuit, delayed shall allow settings from 0.6 to 10 times  $I_n$  with a resolution of 0.01  $I_n$ . Delays shall be available from 0.05 to 0.4 seconds with a resolution of 0.01 s.
- f. Advanced trip unit protection against short circuit, instantaneous shall be available from 1.5 to 15 times  $I_n$  with a resolution of 0.01  $I_n$ .
- g. Advanced trip unit protection against ground-fault shall allow settings from 0.2 to 1 time  $I_n$ , with a resolution of 0.02  $I_n$ . Delays shall be available from 0.1 to 0.4 seconds with a resolution of 0.05 s.
- h. Advanced trip units shall be upgradable. All add on features shall be “plug and play” automatically recognized by the trip unit. All communication wiring shall be integrated through the secondary contacts.
- i. Advanced trip units shall have communication capabilities by means of an optional add on module. Communication via Modbus may be installed at the factory, time of commissioning or later by the end user. Modbus RTU protocol will be supplied.
- j. A power measurement module will let advanced trip units provide undervoltage, overvoltage, underfrequency, overfrequency, phase sequence and reverse power protection functions. Additionally this module shall supply power quality metrics including THD. External voltage transformers shall not be required. Accuracy shall be not inferior to:
  - Current (phase and neutral and ground fault, if required): 1.5%
  - Voltage (phase to phase and phase to neutral): 1%
  - Power (active, reactive and apparent): 2.5%

Frequency:  $\pm 0.2$  Hz

- Energy (active, reactive, apparent): 2.5%
- Harmonics Calculation: up to 35th at 60Hz
- k. An add-on module to provide digital signaling contacts shall be provided. Signaling contacts shall be user configurable to suit project requirements.
- l. A dual setting function shall be available on advanced trip units in order to reduce arc flash hazard during maintenance operations.

### C. Accessories:

1. Circuit breakers shall be available with optional close and open coils of a universal design used for all circuit breaker frame sizes. Additionally, for a given magnitude of control voltage, these coils shall be able to be powered by either direct current or alternating current without coil replacement. Close and open coils shall be mounted on a common module with integral electrical connections which shall allow rapid replacement after the front cover of the circuit breaker is removed.
2. Circuit breakers shall be available with an optional electric spring charging motor for remote charging of the mechanism closing springs. Motor shall be of a universal design that is used for all circuit breaker frame sizes.
3. Circuit breakers shall have an optional bell alarm contact with one changeover contact.

# Contact us

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