



SACE Emax 2 Specification guide

Specification Number: 26 01 20.17

Product Name: LOW VOLTAGE POWER CIRCUIT BREAKERS

PART 1 – GENERAL

NOTE: () Indicates option or a selection is to be made for quantity or applicability.

1.1 SUMMARY

Circuit breakers shall be fixed or draw out type Emax 2 with Ekip® electronic trip units in 3 pole or 4 pole versions. Circuit breakers shall have interrupting, and 30-cycle withstand ratings that meet the application requirements. Interrupting rating shall be available up to 200 kAIR RMS amperes without fuses. Thirty-cycle withstand rating available up to 100 kA to provide maximum coordination with downstream circuit breakers. Emax 2 circuit breakers shall be available in [250], [400], [800], [1000], [1200], [1600], [2000], [3200], [4000], [5000] and [6000] A frame sizes.

The rated mechanical life of the circuit breaker shall be no less than 20,000 operations for E1.2 frame sizes of 1200 amperes and below.

The rated mechanical life of the circuit breaker shall be no less than 25,000 operations for E2.2 frame sizes of 2000 amperes and below.

The rated mechanical life of the circuit breaker shall be no less than 20,000 operations for E4.2 frame sizes of 3200 amperes and below.

The rated mechanical life of the circuit breakers shall be no less than 12,000 operations for E6.2 frame sizes up to 6000 amperes.

An adjustable rating plug (range of 0.4-1 times the sensor plug value) and a field-replaceable sensor plug (available in standard amperage steps from 50% to 100% of the frame size) shall determine the ampere rating of the circuit breaker.

Circuit breakers shall be constructed in accordance with the following:

1.2 REFERENCES

Standards:

- A. IEEE C37.13-Low-Voltage AC Power Circuit Breakers Used in Enclosures
- B. ANSI C37.50-Test Procedures for Low-Voltage AC Power Circuit Breakers
- C. NEMA® SG-3-Low-Voltage Power Circuit Breakers
- D. UL® 1066-Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures

1.3 QUALITY ASSURANCE

Circuit breakers shall be UL Listed as Low-Voltage Power Circuit Breakers.

PART 2 – PRODUCTS

2.1 EQUIPMENT, COMPONENTS AND ACCESSORIES

A. Circuit Breaker:

1. Circuit breaker shall be draw out type Emax 2 [manually] [electrically] operated.
2. All circuit breaker operating mechanisms are to be stored energy devices with a maximum of 50ms closing time. With the breaker closed and the spring charged, breaker should be able to complete an Open-close-open (O-C-O) cycle without recharging.
3. Current-carrying components shall be completely isolated from the accessory mounting area and double insulated from the operator with accessory cover in place.
4. Each phase inside the circuit breaker shall be completely isolated from other phases and grounded by polyester thermoset material.
5. Circuit breaker must be equipped with an interlock to discharge the stored energy spring before the circuit breaker can be withdrawn from its cell. Circuit breaker must provide a positive ground.
6. Primary connectors that can be rotated to provide flexible vertical or horizontal connections shall be available as an option. Front connections shall also be available for shallow depth equipment designs. Connectors can be installed at the factory, time of commissioning or later by the user.
7. Ready-to-close contact must be available to indicate remotely that the circuit breaker is “ready-to-close.” The circuit breaker is ready to close when it is open, spring mechanism is charged, a maintained closing order is not present, a maintained opening order is not present, and the circuit breaker is in an operational position.
8. Secondary wiring shall be front accessible and available in spring terminal connections. Secondary wiring must not be accessible when switchgear door is closed.
9. Circuit breaker shall be equipped with a visual contact wear indicator, visible from the display or from a PC using a communication unit.

B. Trip Unit:

1. Circuit breaker trip system shall be an EKIP electronic trip unit.
 2. All trip units shall be removable to allow for field upgrades.
 3. Trip units shall incorporate "True RMS Sensing" and have LED long-time pickup indications.
 4. Trip unit shall provide local trip indication; information about which protection function tripped shall be readable at any time after the trip.
 5. **Standard** trip unit protection against short circuit delay shall allow fifteen settings from 0.6 to 10 times. Delays shall be in four options from 0.1 to 0.4 seconds.
 6. **Standard** trip unit protection against ground-fault shall allow for seven settings from 0.1 to 1 times I_n . UL Breakers are limited to 1200A max setting. Delays shall be in three options from 0.1 to 0.8 seconds.
 7. **(Advanced)** trip system shall be programmable through a color touch-screen HMI.
 8. **(Advanced)** trip unit protection against overload shall allow fine settings of long-time pickup values (I_1) from 0.4 to 1 times the rated current (I_n), with a resolution of 0.001 I_n . Protection against the overload delay settings shall be available to be chosen from 3 to 144 seconds with a resolution of 1s.
 9. **(Advanced)** trip unit protection against short circuit delay shall allow settings from 0.6 to 10 times I_n with a resolution of 0.1 I_n . Delays shall be available from 0.05 to 0.4 seconds with a resolution of 0.01s.
 10. **(Advanced)** trip unit protection against short circuit, instantaneous shall be available from 1.5 to 15 times I_n with a resolution of 0.1 I_n .
 11. **(Advanced)** trip unit protection against ground-fault shall allow settings from 0.1 to 1 times I_n , with a resolution of 0.1 I_n . Delays shall be available from 0.1 to 1 seconds with a resolution of 0.05s. UL Breakers are limited to 1200A max setting for ground fault.
 12. **(Advanced)** trip units shall have communications capabilities by means of an optional add on module. Communication module may be installed at the factory, time of commissioning or later by the user. IEC 61850
- [Modbus RTU, Profibus, Devicenet, Modbus TCP, Ethernet IP or Profinet are additional protocols that can be provided.
13. **(Advanced)** a generator protection trip unit version should be available as an option.
 14. A power measurement module will let advanced units provide under voltage, under frequency, over frequency, phase sequence and reverse power protection functions. Additionally, this module shall supply power quality metrics including but not limited to THD (e.g., voltage sags, voltage swells). External voltage transformers shall not be required. Accuracy shall not be inferior to:
 - a. Current (phase and neutral and ground fault, if required) 1%
 - b. Power (active, reactive and apparent) 2%
 - c. Frequency $\pm 0.2\%$
 - d. Energy (active, reactive, apparent) 2%
 - e. Harmonics calculations up to 50th at 60Hz

Standard Trip Unit for Distribution

Features	Ekip Dip Trip Unit Series		
	LI	LSI	LSIG
True RMS Sensing	X	X	X
Power-on LED for signaling correct operation (watchdog)	X	X	X
Protection LED L (alarm and trip) (L – ANSI 49)	X	X	X
Protection LED L (pre-alarm) (upon reaching 90% of threshold)	X	X	X
Protection LED S (alarm and trip) (S – ANSI 51 and 50TD)		X	X
Protection LED I (trip) (I – ANSI 50)	X	X	X
Protection LED G (alarm and trip) (G ANSI 51N and 50NTD)			X
Thermal memory	X	X	X
Test and programming connector	X	X	X
Interchangeable rating plug	X	X	X
Self-protection against abnormal temperature (OT)	X	X	X
Communications - Bluetooth wireless	X	X	X
Protective relay functions			
Neutral protection - 50%, 100% or 200% of phase current	X	X	X
Data logging/measurement			
Maximum and average current per phase	X	X	X
Date, time, fault current per phase and type of protection tripped over the last 30 trips	X	X	X
Date, time and type of operation of the last 200 events	X	X	X
Number of mechanical and electric operations of the circuit-breaker	X	X	X
Total operating time	X	X	X
Contact wear	X	X	X
Circuit breaker identifying data: type, serial number, firmware version	X	X	X

(Optional Modules):

- Ekip multi-meter
- Multi-voltage supply module
- Ekip link

Advanced Trip Unit for Distribution

Features	Ekip Touch Trip Unit Series		
	LI	LSI	LSIG
High resolution color touch screen display	X	X	X
RMS Sensing of value of the currents of the three phases L1, L2, L3 and of the neutral Ne with 1% accuracy in the 0.2 to 1.2 in range. The most loaded phase displayed in both numeric and analog format on an ammeter with 0-125% In scale.	X	X	X
Power-on LED for signaling correct operation (watchdog)	X	X	X
Pre-alarm LED	X	X	X
Alarm LED	X	X	X
Pushbutton for test and indicating cause of trip	X	X	X
Test and programming connector	X	X	X
Overload protection (L - ANSI 49)	X	X	X
Time delayed overcurrent protection (S - ANSI 51 and 50TD)		X	X
Thermal memory (for L and S)	X	X	X
Instantaneous overcurrent (I - ANSI 50)	X	X	X
Closing on short circuit (MCR)	X	X	X
Earth fault (G - ANSI 51 and 50NTD)			X
Instantaneous earth fault (G - ANSI 50N)			X
Earth fault on toroid (G ext - ANSI 51G and 50 GTD)			X
Interchangeable rating plug	X	X	X
Zone selectivity for S and G protection (ANSI 68)		X	X
Self-protection against abnormal temperature (OT)	X	X	X
Communications - Bluetooth wireless	X	X	X
Neutral protection - 50%, 100%, 150% or 200% of phase current	X	X	X
Start-up function higher trip threshold available from 100ms to 30S	X	X	X
Data logging/measurement			
Protection tripped	X	X	X
Opening data (current, voltage or frequency)	X	X	X
Time stamping (data, time, and consecutive opening number)	X	X	X
Date, time and type of operation of the last 200 events	X	X	X
Number of mechanical and electric operations of the circuit-breaker	X	X	X
Date, time, fault current per phase and type of protection tripped over the last 30 trips	X	X	X
Total operating time	X	X	X
Contact wear	X	X	X
Date and time of the last maintenance session, scheduling of the next maintenance session	X	X	X
Circuit breaker identifying data: type, serial number, firmware version	X	X	X

(Optional Modules):

EKIP Measuring Pro

- Under voltage (UV-ANSI 27)
- Over voltage (OV-ANSI 59)
- Under frequency (UF-ANSI 81L)
- Over frequency (OF-ANSI 81H)
- Power controller

Ekip Measuring and Ekip Measuring Pro

- Multi-meter measures
- Voltage: phase - phase, phase-neutral (accuracy 0.5%)
- Power: active, reactive, apparent (accuracy 2%)
- Energy: active, reactive, apparent (accuracy 2%)
- Frequency: (accuracy 0.2%)
- Power factor by phase and total peak factor

(Protection Trip Unit for Generators)

Features	Ekip G Touch	Ekip G High Touch
Same protection functions as Ekip Touch and Ekip High Touch	X	X
Ekip measuring pro provided as standard	X	X
Generator protection function can be set to: active, alarm only, or deactivated	X	X
Voltage controlled overcurrent protection (S(V) ANSI 51 V	X	X
Residual overvoltage (RV - ANSI 59N)	X	X
Loss of field or reverse reactive power (RQ-ANSI 40 or 32RQ)	X	X
Reactive overpower (OQ - ANSI 320F)	X	X
Active overpower (OP - ANSI 320F)	X	X
Active underpower (UP - ANSI 32LF)		X
Rate of change of frequency (ROCOF - ANSI 81R)		X
Second protection against voltage controlled overcurrent protection - (S2(V) - ANSI 51V)		X
Second protection against loss of field or reverse reactive power (RQ - ANSI 40 or 32R)		X

C. Accessories (Optional):

Circuit breakers shall be equipped with the below listed accessories. All accessories shall be UL Listed as field-installable and be interchangeable between frame sizes. Circuit breakers shall provide isolation from primary power when accessory cover is removed.

Secondary wiring shall be front accessible and available in spring terminal connections. Secondary wiring should not be accessible when switchgear door is closed.

1. Standard Accessories:

- a. IP 30 Protection for switchgear door.
- b. Locking lifting plates for E2.2..E6.2
- c. Front terminals for E1.2
- d. Adjustable rear terminals for E2.2..E6.2 circuit breaker mounted in HR – HR Configuration

The following accessories shall be available for the whole range:

1. Electrical Accessories:

- a. Open/closed auxiliary contacts
- b. Auxiliary position contacts
- c. Ready to close contacts
- d. Shunt opening/closing release
- e. Second shunt opening and second shunt closing release, for redundancy
- f. Undervoltage release
- g. Time-delay device for undervoltage release

h. Geared motor for the automatic charging of the closing springs, with limited inrush power (no more than 300 VA / 500 W)

- i. Mechanical and electrical signaling of overcurrent release trip
- j. Trip reset release; remote resetting of the circuit breaker after a release has tripped due to overcurrent condition
- k. Auxiliary contacts (status, connected/test/disconnected position, ready to close, spring charged) that identifies the different circuit breaker conditions
- l. Current transformer for the neutral conductor outside the circuit-breaker
- m. Homopolar toroid for the main power supply earth conductor (star center of the transformer)
- n. Homopolar toroid for residual current protection (3...30 A)

2. Mechanical Accessories:

Interlocks between two circuit-breakers or among three circuit-breakers shall have the possibility to be used horizontally, vertically or in “L” position using different types of cables (All cables can be cut to fit-respecting the minimum and maximum distances) that shall have these features:

- a. Standard version (with maximum distance between two circuit breakers: up to 1200 mm if horizontally interlocked while up to 750 mm if vertically interlocked)
- b. Extended version (with distance between two circuit breakers: from 1200 mm up to 1600 mm if horizontally interlocked while from 750 up to 1000 if vertically interlocked)
- c. Extra-extended version (up to 2750 mm for horizontal version, between 2 circuit breakers only)
- d. IP54 transparent front protection with double key locks

For your notes

A series of horizontal dotted lines for writing notes.

Contact us

ABB

Electrification Products

8155 T&B Boulevard

Memphis, TN 38125

www.abb.us/lowvoltage

USA Technical Support: 888-385-1221

Customer Service: 888-862-3290

7:00 a.m. – 5:00 p.m., CST, Monday – Friday

lps.support@us.abb.com