SECTION 16430 –X.X

LOW-VOLTAGE AC POWER CIRCUIT PROTECTOR

1.1 LOW-VOLTAGE AC CIRCUIT PROTECTOR

A. General:

Low-voltage ac power circuit protectors shall comply with the requirements of UL 977. All low-voltage ac circuit protectors shall be three-pole, 100% rated and shall be manufactured by Siemens Industry, type WL AC Power Circuit Protector or approved equal.

B. Ratings:

The low-voltage ac power circuit protectors shall meet or exceed the following performance requirements:

1. Short-circuit interrupting ratings of 200 kA at 600 Vac or below.

2. Frame sizes: Manufacturer shall have low-voltage ac circuit protectors available in 800 A, 1200 A, 1600 A, 2000 A, 3000 A, 4000 A, and 5000 A frame sizes, each 100% rated when enclosed at the manufacturer's minimum volume enclosure volume or larger sized electrical equipment.

3. High-current switching: The switching element shall be capable of interrupting a minimum of 12x the frame size's maximum rated current at 600 Vac at least three times without maintenance.

4. Overload switching: The switching element shall be capable of a minimum of 50 overload switching operations at 600 Vac and 2x the frame size's maximum rated current without maintenance.

5. Electrical endurance: The switching element shall be capable of a minimum of 15 000 switching operations for 800 A – 3000 A frame sizes and a minimum of 10 000 switching operations for 4000 A – 5000 A frame sizes at 600 Vac and at the maximum rated current with maintenance.

C. Operating Mechanism:

The switching device of the low-voltage ac circuit protector shall be mechanically and electrically trip-free, including a stored-energy operating mechanism with the following features:

1. Integral [, padlockable] manual stored energy charging handle.

2. Push-button mechanical open and close buttons with optional [padlockable] [tool-accessible] covers to prevent unauthorized manual operation of the switching device.

3. Normal Closing Speed: independent of both control and operator speed.

4. Field installable electrical operating accessories, supplementing standard manual operator.

5. Optional field installable mechanical operation counter.

6. Integrated contact wear indicator.

Circuit beaker protector element shall have open and closed status indicators, ready-to-close indicator, and a stored energy spring charged/discharged indicator. All of which shall be visible to the operator with the dead front cover or compartment door closed.

D. Fuses:

Fuses shall be applied to provide short-circuit protection of downstream loads and or operators within the defined arc-flash boundary of any downstream electrical equipment.

1. Low-voltage ac circuit protectors rated 800 A – 3000 shall include fuse mounting provisions for UL Listed NEMA Class L fuses of any manufacturer rated up to and including 4000 A.

2. Low-voltage ac circuit protectors rated 4000 A – 5000 shall include fuse mounting provisions for UL Listed NEMA Class L fuses of any manufacturer rated up to and including 6000 A.

3. Blown-Fuse Trip Device: Low-voltage ac circuit protectors shall have available blown fuse lockout devices to prevent closing the switching device if a fuse is blown or not present. Open-fuse status is indicated at the front of the low-voltage ac circuit protector with the dead-front cover closed.

4. Alarm switch: Low-voltage ac circuit protector shall have the option for a manually resettable alarm indication of a blown fuse condition. The alarm status shall also be communicated over any field installed communications modules.

5. Interlocks shall be provided to prevent access to the fuses unless the switching device has been opened.

E. Overload and Short-Circuit Protection:

Each low-voltage ac power circuit protector frame size shall have an option for an integrally mounted, self-powered, microprocessor-based trip-device to sense overload and short-circuit conditions. The device shall measure true RMS current. The tripping system shall consist of Rogowski coils sensors on each phase, a release mechanism, and the following features:

1. Field installable and interchangeable so that any trip unit can be used with any frame size circuit protector. And can be upgraded for future expansion in functionality, such as power metering, protective relay functionality, and communication.

2. Functions: Long time, short-time and instantaneous protection function shall be provided. Each shall have an adjustable pick-up setting. In addition, long-time and short-time bands shall each have adjustable time delay. Short-time function shall include a switchable I^2t ramp and optionally I^4t to improve co-ordination with fuses or inverse relays. Manufacturer shall not compromise selectivity by employing a making current release.

3. Integrated Dynamic Arc-Flash Sentry active arc-flash mitigation system in compliance with NFPA 70 Article 240.67 and NFPA 70 Article 240.87. The user must be able to activate and deactivate the active arc-flash mitigation system from outside of the calculated arc-flash boundary.

4. The option to remotely switch protection settings shall be provided whenever the power source transitions to a source requiring alternative protection characteristics (i.e. transitioning from utility power to a generator) is part of the power distribution system or if load shedding is required.

5. A software program shall be made available free of charge to support system coordination. The software will allow time current curves to be generated for the chosen settings. Time current curves shall reflect the total clearing time of the switching device.

6. Individual LEDs shall indicate an overcurrent, short circuit or ground fault trip condition. The data shall be maintained for a minimum of 48 hours without the need for a separate battery.

7. Time-current characteristics shall be field adjustable locally or optionally remotely via [ModBus RTU] [Modbus TCP] [Profibus] [Profinet IO].

8. Current Adjustability: [Dial settings], [keypad] and rating plugs on trip units.

9. Field installable ground-fault protection with at least five time-delay bands; adjustable current pickup and an I^2t ramp, configurable to provide residual, direct-sensing, modified differential, and zone selective interlocking protection for [three-wire] [four-wire] solidly grounded or ungrounded service.

10. Field installable zone selective interlocking: Connections will be made between main, tie and feeder circuit breakers to ensure that the circuit protector closest to the fault trips for short time and/or ground fault conditions.

11. Field Installable Communications [ModBus RTU] [Modbus TCP] [Profibus] [Profinet IO] and metering functions shall be provided per schedule

12. LCD display shall be available as an option to simplify settings and viewing data locally.

13. Field installable configurable [analog], [digital] output relays shall be available to connect directly to the trip unit.

14. The trip unit display shall feature a ammeter function for representation of current load information and most recent trip.

15. Estimated contact wear shall be capable of being communicated remotely in addition to a local mechanical indication flag.

16. Manufacturer shall supply a sealable cover with each low-voltage ac circuit protector with integral overload protection to restrict access of the user interface for setting adjustments.

17. The trip unit shall include a self-test function for testing the trip system, both with and without tripping the switching device.

F. Active Arc Flash Mitigation

Manufacturer shall supply an integrated Dynamic Arc-Flash Sentry active arc-flash mitigation system in compliance with NFPA 70 Article 240.67 and NFPA 70 Article 240.87.

1. The user must be able to activate and deactivate the active arc-flash mitigation system from outside of the calculated arc-flash boundary.

2. The Dynamic Arc-Flash pickup point shall be adjustable by 1 ampere increments.

3. Manufacturer shall supply an annunciation contact to be connected to an indicator lamp or supervisory system to provide confirmation when the active arc-flash mitigation system is armed.

G. Metering:

Each low-voltage ac power circuit protector frame size shall have an option for an integral metering. including the ability to alarm or trip on the following functions:

1. The ability to alarm or trip on the following functions:
   a. Independently alarm for overcurrent conditions in any of the phase, neutral, or ground conductors
   b. Current imbalance between phases
   c. Total harmonic distortion of voltage and current
   d. Voltage imbalance
   e. Undervoltage and overvoltage
   f. Underfrequency and overfrequency
   g. Power factor per phase or total power factor
   h. Phase rotation
   i. Active power in normal or reverse direction
   j. Energy in normal or reverse direction

2. Manufacturer must have the ability to capture, record, and display waveforms on the trip unit display as well as provide the data to the supervisory system.

3. All metered data available to the supervisory system field installable communications [ModBus RTU] [Modbus TCP] [Profibus] [Profinet IO].

4. Configuration of the metering settings can be manually input at the trip unit interface or via a free software program to input, upload, or recover all settings and stored data.

5. Protective relaying and metering alarms and trips shall directly interface with the field installable configurable [analog], [digital] output relays shall be available to connect directly to the trip unit.

H. Alarm Switches:

Each low-voltage ac circuit protector shall have the option for a manually resetable alarm indication of an overload or short-circuit tripping event initiated by the trip unit.

I. Auxiliary Switches:

Each low-voltage ac circuit protector shall be equipped with [2*a* + 2*b*] [4*a* + 4*b*] internally mounted auxiliary switches reflecting open and closed status of the switching device.

J. Secondary Disconnect Terminal Blocks:

Secondary Disconnect Terminal Block Connections shall be pull-apart style for ease of wiring and front mounted and available in three versions [Tension Spring Terminal], [Screw Type Terminal.], [Ring Tongue Terminal].

K. Padlocking Provisions:

For installing at least three padlocks on each circuit protector to prevent closing of the switching device (trip-free). Padlock provisions shall be accessible with the dead front cover or compartment door closed.

L. Key Interlock:

Integrally mounted key interlock shall hold the low-voltage ac circuit protector trip-free when the key is removed. Mounting provision and hardware are included where future installation of key-interlock devices is indicated. Key interlock provisions shall be accessible with the dead front cover or compartment door closed.

M. Shunt-Trip:

Shunt-trip devices must be field installable, [Intermittent-duty (3-cycle)] [100% duty (electrical interlock)], operated by [24 Vdc] [48 Vdc] [125 Vdc or 120 Vac] [250 Vdc or 240 Vac] nominal control voltage.

N. Close-coil:

Close-coil devices must be field installable, [Intermittent-duty (3-cycle)] [100% duty (electrical interlock)], operated by [24 Vdc] [48 Vdc] [125 Vdc or 120 Vac] [250 Vdc or 240 Vac] nominal control voltage.

O. Undervoltage Trip Device:

Undervoltage trip devices must be field installable, [Instantaneous] [Adjustable time-delay] acting, sealing-in with [24 Vdc] [48 Vdc] [125 Vdc or 120 Vac] [250 Vdc or 240 Vac] nominal control voltage and dropping out when the applied current drops below 80% of nominal current.

P. Motor operator:

Motor operators must be field installable, operated by [24 Vdc] [48 Vdc] [125 Vdc or 120 Vac] [250 Vdc or 240 Vac] nominal control voltage, with an option disconnect switch to prevent continuous charging of the stored energy mechanism.

1.2 PRODUCTION TESTING

A. Perform production tests in compliance with ANSI C37.50 with available certified test report documenting results of primary injection testing, dielectric testing, electromechanical accessory testing, and mechanical accessory testing.

1.3 ACCESSORIES

A. Modular communication and relaying accessories are to be available for retrofitting by the clients chosen engineer. It shall not be necessary for the manufacturer’s personnel to retrofit accessories.

B. Handheld portable test set for testing trip unit and current sensors without removal from the electrical equipment which the ac circuit protector is installed within.

C. The following items must be capable of being changed in the field; main contacts, arc chutes, current sensors, trip units, all internal and external accessories.

END OF SECTION 16430 –X.X

Issued 29th August 2025