

SECTION 16180

STARTERS, RELAYS, SWITCHES, CIRCUIT BREAKERS AND TRANSIENT VOLTAGE SURGE SUPPRESSORS

PART 1 - GENERAL

1.1 Description: This Section includes relays, switches, circuit breakers, and surge suppressors for equipment.

1.2 References

1. National Fire Protection Association (NFPA)

2. National Electrical Code (NEC)

3. National Electrical Manufacturers Association (NEMA)

250 - Enclosures for Electrical Equipment (1,000V maximum).

KS1 - Enclosed Switches.

AB1 - Molded-Case Circuit Breakers.

ICS - Industrial Controls and Systems.

4. Underwriters Laboratories (UL)

50 - Electrical Cabinets and Boxes.

98 - Enclosed and Dead-Front Switches.

489 - Molded-Case Circuit Breakers and Circuit Breaker Enclosures.

508 - Electrical Industrial Control Equipment.

869 - Electrical Service Equipment.

977 - Fused Power Circuit Devices.

1449 - Transient Voltage Surge Suppressors.

5. National Electrical Safety Code

6. **Standard for Electrical Safety in the Workplace – NFPA 70E**
7. **Occupational Safety and Health Administration, OSHA.**
8. All electrical and control equipment and material shall bear the recognized Underwriters Laboratories, Inc. (UL) seal of approval. It is Vendor's responsibility to obtain local inspection approval for all non-UL labeled equipment and pay all fees in connection with the same.

1.3 Submittals

- . Submit as specified in Section 1330.
- A. Includes, but not limited to, the following:
 1. Enclosure details.
 2. Schematic diagrams.

PART 2 - MATERIALS

2.1 Acceptable Manufacturers

- A. Allen-Bradley Company.
- B. Cutler-Hammer/Westinghouse Incorporated.
- C. General Electric Company.
- D. Benshaw Inc.
- E. Siemens Energy & Automation.
- F. National Lightning Protection Corp.
- G. Current Technology

2.2 Design Requirements

- A. Provide equipment with the rated enclosures as indicated in the Contract Drawings.

- B. Phenolic nameplate on cover of each unit with wording as approved by Engineer.
- C. All enclosures housing variable speed controller to be equipped with A/C unit to keep operating equipment within design parameters with an exterior ambient temperature of 120°F (50°C).

2.3 Magnetic Starters

- A. Full-voltage, nonreversing, reversing or two speed with disconnect switch, thermal-magnetic circuit breaker or motor circuit protector circuit breaker as specified or indicated.
- B. Three overload heaters in 3-phase units to match motor nameplate data.
- C. Built-in 120V control transformer of adequate capacity for all control devices as indicated on wiring diagrams.
- D. Necessary auxiliary contacts as required by means of starter or relay.
- E. Low-voltage protection.
- F. Starter shall be provided with 2 auxiliary contacts.

2.4 Disconnect Switches

- A. Provide as required by NEC, specified or indicated.
- B. Positive quick-make, quick-break mechanism, visible blades, and line terminal shield.
- C. Fused type where indicated with time delay fuses.
- D. Coordinate fuses with the ratings of the switch.
- E. Furnish heavy-duty type.

2.5 Circuit Breakers

- A. Rated 480 VAC, 3-phase, (240VAC, 1-phase for individual loads) 60-hertz, with interrupting rating as indicated on drawings.

- B. External handle which clearly indicates when breaker is "ON," "OFF," or "TRIPPED" and is lockable in the "OFF" position.
- C. Molded-case, manually-operated, 3-pole.
- D. Trip-free from handle.
- E. Inverse time thermal element overload protection.
- F. Instantaneous magnetic short-circuit protection on all poles.
- G. Coordinate trip ratings with magnetic starter ratings and overload relays.
- H. Circuit breakers used as service equipment to be labeled and rated "suitable for use as service entrance equipment".

26 Push Buttons and Selector Switches

- A. Heavy-duty oil-tight type.

2.7 Auxiliary Relays

- A. Coils rated 120-VAC.
- B. Contacts rated 6 A up to 300V.
- C. Contacts as required for control of associated equipment.
- D. General Electric CR120A 300V industrial or CR2810 600V machine-tool type relays.

2.8 Time Delay Relays

- A. Solid state type.
- B. Adjustable timing range.
- C. On delay, off delay, or on-and-off delay as indicated.
- D. Contact arrangement as indicated.

- E. Contacts rated 5 amperes continuous at 75% power factor at 120Vac, and 5 amperes make or break at 24Vdc, except as indicated otherwise.
- F. Operating voltage as indicated.
- G. Repeat accuracy "1% for constant voltage and temperature.
- H. Operating temperature range: -10°C to +55°C.
- I. Transient protection: 2,000V for 100 microseconds.
- J. Enclosure for bolted mounting or plug-in type as indicated.
- K. Timing indication provided by LED which flashes during timing, glows steadily after timing, and is off when timer is deenergized.
- L. Furnish relays as manufactured by Eagle Signal Co., Agastat, Allen Bradley, General Electric Co., or Potter & Brumfield.

2.9 Transient Voltage Surge Suppressors

- A. Main Service Protector
 - 1. UL 1449 listed.
 - 2. Provide NEMA 4 enclosure capable of being rack mounted .
 - 3. Surge capacity minimum: 160 KA independent of load current.
 - 4. 25% threshold above nominal line voltage.
 - 5. Replaceable fuse for each phase.
 - 6. Failure mode indicator for each protected phase.
 - 7. Terminal strip connectors.
 - 8. Relative humidity, 0 to 95% noncondensing.
 - 9. Temperature: -40 to 85°C.
 - 10. For operation on 480VAC, 3 phase, 3 wire system.

11. Integral deadfront disconnect.
12. Furnish Model, as manufactured by Current Technology, or approved equal.
13. Install and connect as indicated to equipment to be protected.

PART 3 - EXECUTION

3.1 Installation

- A. Install relays, switches, and circuit breakers at locations indicated or as follows:
 1. Mount on equipment rack not to exceed 6 feet in height above the ground when possible.
 2. Arrange with proper clearances from other equipment and material to obtain accessibility for operation and maintenance.
 3. Provide engraved phenolic nameplates on cover of each device identifying the loads connected.
 4. Ground all neutral buses to the ground system.

3.2 Field Testing: Specified in Section 16950.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Measurement

- A. No measurement will be made for this item.

4.2 Payment

- A. Payment will be made at the contract lump sum price bid and shall be considered full payment for providing labor and materials to perform this work.

**** END OF SECTION 16180 ****