



## **SECTION 26 24 19 - MOTOR-CONTROL CENTERS**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Motor control centers.

#### **1.2 REFERENCE STANDARDS**

- A. Institute of Electrical and Electronics Engineers:
  - 1. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
- B. National Electrical Manufacturers Association:
  - 1. NEMA FU 1 - Low Voltage Cartridge Fuses.
  - 2. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2,000 Volts AC or 750 Volts DC.
  - 3. NEMA ICS 2.3 - Instructions for the Handling, Installation, Operation, and Maintenance of Motor Control Centers.
  - 4. NEMA ICS 3 - Industrial Control and Systems: Factory Built Assemblies.
  - 5. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
  - 6. NEMA ICS 7 - Industrial Control and Systems: Adjustable Speed Drives.
  - 7. NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection, Installation, and Operation of Adjustable Speed Drive Systems.
  - 8. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- C. International Electrical Testing Association:
  - 1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- D. Underwriters Laboratories Inc.:
  - 1. UL 198E - Class R Fuses.
  - 2. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures.
  - 3. UL 508 - Industrial Control Panels.
  - 4. UL 845 - Motor Control Centers.



### **1.3 SUBMITTALS**

- A. **Product Data:** Submit electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings, and time-current curves of equipment and components.
- B. **Shop Drawings:** Indicate front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars for each phase, neutral, and ground; electrical characteristics including voltage, frame size and trip ratings, withstand ratings, and time and current curves of equipment and components.
- C. Submit shop drawings after Short Circuit and Overcurrent Protective Device Coordination Study is approved. Shop drawings without approved study will be returned and not reviewed.
- D. AIC ratings shown on the single line diagrams are approximate values only. The AIC ratings of all submitted equipment must conform to 130% of the values shown on the approved Short Circuit and Overcurrent Protective Device Coordination Study.
- E. The electrical contractor shall submit ¼"=1'0" scale drawings including interior elevations of all electrical rooms and areas including actual dimensions of all equipment in electrical rooms and indicate clearances per NEC, as well as door swings or other obstacles. These drawings shall be submitted along with or prior to shop drawing submittals. Shop drawing submittal without sketches will be returned and not reviewed. The equipment depicted on the plans and interior elevations shall match the equipment indicated on the shop drawings.
- F. **Test and Evaluation Reports:** Indicate field test and inspection procedures and test results.
- G. **Source Quality Control Submittals:** Indicate results of shop tests and inspections.
- H. **Field Quality Control Submittals:** Indicated results of Contractor furnished tests and inspections.

### **1.4 CLOSEOUT SUBMITTALS**

- A. **Operation and Maintenance Data:** Submit replacement parts list for controllers.
- B. **Project Record Documents:** Record actual locations, configurations, and ratings of motor control centers and major components.

### **1.5 QUALIFICATIONS**

- A. **Manufacturer:** Company specializing in manufacturing products specified in this section with minimum five years documented experience.

### **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver in 60 inch maximum width shipping splits, individually wrapped for protection, and mounted on shipping skids.



- B. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle in accordance with NEMA ICS 2.3. Lift only with lugs provided. Handle carefully to avoid damage to motor control center components, enclosure, and finish.

### **1.7 AMBIENT CONDITIONS**

- A. Conform to NEMA ICS 2 service conditions during and after installation of motor control centers.

### **1.8 EXISTING CONDITIONS**

- A. Verify field measurements prior to fabrication. Indicate field measurements on shop drawings.

## **PART 2 - PRODUCTS**

### **2.1 MOTOR CONTROL CENTER**

- A. Manufacturers:
  - 1. **Eaton.**
  - 2. **General Electric.**
  - 3. **Square D.**
  - 4. **Substitutions: Not Permitted.**
- B. Description: NEMA ICS 3, Class I, Type B heavy duty, industrial grade motor control center.
  - 1. Main Overcurrent Protection: Molded case circuit breaker.
  - 2. Feeder Tap Units: Molded case thermal-magnetic circuit breakers.
- C. Operation:
  - 1. Service Conditions: NEMA ICS 2.
  - 2. Voltage Rating: 480 or 120/208 volts, three phase, three or four wire, 60 Hertz.
  - 3. Integrated Equipment Short Circuit Rating: Equal to at least 130% of the available fault current as determined by the Short Circuit and Overcurrent Protective Device Coordination Study.
- D. Materials:
  - 1. Horizontal Bus: Copper, with continuous current rating indicated on Drawings. Include copper ground bus entire length of control center.
  - 2. Vertical Bus: Copper.
- E. Fabrication



1. Configuration: Units front mounting only, accessible from front only.
2. Enclosure: NEMA ICS 6, Type 1 or 3R, non-walk-in for wet locations.
3. Install all control wiring in Panduit wiring ducts.
4. Control Wiring: Stranded copper.

F. Finishes

1. Manufacturer's standard gray enamel.

## **2.2 FULL-VOLTAGE NON-REVERSING CONTROLLERS**

A. Manufacturers:

**1. Match manufacturer of Motor Control Center.**

- B. Description: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower.

C. Operation:

1. Control Voltage: 120 volts, 60 Hertz.

D. Materials:

1. Overload Relay: NEMA ICS 2; bimetal or melting alloy.
2. Product Options and Features:
  - a. Auxiliary Contacts: NEMA ICS 2, 2 2 each field convertible contacts in addition to seal-in contact.
  - b. Cover Mounted Pilot Devices: NEMA ICS 5, heavy duty oil tight type.
  - c. Pilot Device Contacts: NEMA ICS 5, Form Z, rated A150.
  - d. Pushbuttons: Unguarded type.
  - e. Indicating Lights: LED type.
  - f. Selector Switches: Rotary type.
  - g. Relays: NEMA ICS 5.
  - h. Control Power Transformers: 120 volt secondary, Furnish fused primary and secondary, and bond unfused leg of secondary to enclosure.

## **2.3 TWO-SPEED CONTROLLERS**

A. Manufacturers:

**1. Match manufacturer of Motor Control Center.**



- B. Description: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower. Include integral time delay transition between FAST and SLOW speeds.
- C. Operation:
  - 1. Control Voltage: 120 volts, 60 Hertz.
- D. Materials:
  - 1. Overload Relay: NEMA ICS 2; bimetal or melting alloy.
  - 2. Product Options and Features:
    - a. Auxiliary Contacts: NEMA ICS 2, 2 2 each field convertible contacts in addition to seal-in contact.
    - b. Cover Mounted Pilot Devices: NEMA ICS 5, heavy duty oil tight type.
    - c. Pilot Device Contacts: NEMA ICS 5, Form Z, rated A150.
    - d. Pushbuttons: Unguarded type.
    - e. Indicating Lights: LED type.
    - f. Selector Switches: Rotary type.
    - g. Relays: NEMA ICS 5.
    - h. Control Power Transformers: 120 volt secondary, Furnish fused primary and secondary, and bond unfused leg of secondary to enclosure.

## **2.4 FULL-VOLTAGE REVERSING CONTROLLERS**

- A. Manufacturers:
  - 1. Match manufacturer of Motor Control Center.**
- B. Description: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower. Include electrical interlock and integral time delay transition between FORWARD and REVERSE rotation.
- C. Operation:
  - 1. Control Voltage: 120 volts, 60 Hertz.
- D. Materials:
  - 1. Overload Relay: NEMA ICS 2; bimetal or melting alloy.
  - 2. Product Options and Features:
    - a. Auxiliary Contacts: NEMA ICS 2, 2 2 each field convertible contacts in addition to seal-in contact.
    - b. Cover Mounted Pilot Devices: NEMA ICS 5, heavy duty oil tight type.



- c. Pilot Device Contacts: NEMA ICS 5, Form Z, rated A150.
- d. Pushbuttons: Unguarded type.
- e. Indicating Lights: LED type.
- f. Selector Switches: Rotary type.
- g. Relays: NEMA ICS 5.
- h. Control Power Transformers: 120 volt secondary, Furnish fused primary and secondary, and bond unfused leg of secondary to enclosure.

## **2.5 MOLDED CASE CIRCUIT BREAKER**

### A. Manufacturers:

#### **1. Match manufacturer of Motor Control Center.**

### B. Description: NEMA AB-1, molded-case circuit breaker.

### C. Operation:

- 1. Field-Adjustable Trip Circuit Breaker: Circuit breakers with frame sizes 250 amperes and larger have mechanism for adjusting long time and short time continuous current, short time and long time pickup current setting for automatic operation. Provide interchangeable trip unit.
- 2. Field-Changeable Ampere Rating Circuit Breaker: Circuit breakers with frame sizes 200 amperes and larger have changeable trip units.

## **2.6 SOURCE QUALITY CONTROL**

- A. Shop inspect and perform standard productions tests for each controller in accordance with manufacturer's standards.
- B. Make completed motor control center available for inspection at manufacturer's factory prior to packaging for shipment. Notify LAWA at least seven days before inspection is allowed.
- C. Allow witnessing of factory inspections and tests at manufacturer's test facility. Notify LAWA at least seven days before inspections and tests are scheduled.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verify surfaces are suitable for motor control center installation.



### **3.2 DEMOLITION**

- A. Disconnect and remove abandoned motor control centers.
- B. Maintain access to existing motor control centers and other installations remaining active and requiring access.

### **3.3 INSTALLATION**

- A. Furnish concrete housekeeping pads.
- B. Install in accordance with NEMA ICS 2.3.
- C. Tighten accessible bus connections and mechanical fasteners after placing motor control center.
- D. Select and install heater elements in motor controllers to match installed motor characteristics.
- E. Install engraved plastic nameplates.
- F. Neatly type label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, voltage rating, and phase rating. Place label in clear plastic holder. Indicate method of identifying phase conductors.
- G. Ground and bond motor control centers.
- H. Provide wire markers or tags for all control wiring at all termination points. Provide side mounted, latched, pull-apart terminal blocks for all remote control wiring. Provide 25% spare terminals.
- I. No interlock for A-B motor configuration.
- J. Overload reset button shall be operable without wires blocking access.
- K. Attach wire ties with screws or epoxy. Do not use adhesive tape.
- L. Dual starters are not allowed. Provide one starter for only one motor.

### **3.4 REPAIR**

- A. Repair existing motor control centers to remain or are to be reinstalled.

### **3.5 FIELD QUALITY CONTROL**

- A. Inspect and test in accordance with NETA ATS.



**3.6 CLEANING**

- A. Clean existing motor control centers to remain or are to be reinstalled.

END OF SECTION 26 24 19