

SECTION 26 29 13.03 – MANUAL MOTOR CONTROLLERS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Manual motor controllers.
 - 2. Enclosures.
 - 3. Identification.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For magnetic controllers to include in operation and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include following:
 - a. Manufacturer's written instructions for setting field-adjustable overload relays.
 - b. Load-Current and Overload-Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.
 - c. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that switch settings for motor-running overload protection suit actual motors to be protected.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Control Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than 2 of each size and type.
2. Indicating Lights: Two of each type and color installed.
3. Auxiliary Contacts: Furnish one spare for each size and type of magnetic controller installed.
4. Power Contacts: Furnish 3 spares for each size and type of magnetic contactor installed.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

1.8 FIELD CONDITIONS

- A. Ambient Environment Ratings: Rate equipment for continuous operation under ambient temperature not less than 23 degrees F and not exceeding 104 degrees F.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by qualified testing agency, and marked for intended location and use.
- B. UL Compliance: Fabricate and label magnetic motor controllers to comply with UL 508 and UL 60947-4-1.
- C. NEMA Compliance: Fabricate motor controllers to comply with ICS 2.

2.2 MANUAL MOTOR CONTROLLERS

- A. Motor-Starting Switches (MSS): "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off or on.
 1. Motor-starting switches shall be manufactured by ABB, Eaton, Schneider Electric, or Siemens.
 2. Standard: Comply with NEMA ICS 2, general purpose, Class A.
 3. Configuration: Non-reversing.
 4. Surface mounting.
 5. Red pilot light.
- B. Fractional Horsepower Manual Controllers (FHPMC): "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.
 1. Fractional horsepower manual controllers shall be manufactured by ABB, Eaton, Schneider Electric, or Siemens.

2. Configuration: Non-reversing.
 3. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button; bimetallic type.
 4. Pilot Light: Red.
- C. Integral Horsepower Manual Controllers (IHPMC): "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.
1. Integral horsepower manual controllers shall be manufactured by ABB, Eaton, Schneider Electric, or Siemens.
 2. Configuration: Non-reversing.
 3. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button; bimetallic type.

2.3 ENCLOSURES

- A. Comply with NEMA 250, type designations as indicated on Drawings, complying with environmental conditions at installed location.
- B. The construction of enclosures shall comply with NEMA ICS 6.
- C. Controllers in hazardous (classified) locations shall comply with UL 1203.

2.4 IDENTIFICATION

- A. Controller Nameplates: Laminated acrylic or melamine plastic signs, as described in Section 260553 "Identification" for each compartment, mounted with corrosion-resistant screws.
- B. Arc-Flash Warning Labels: Comply with requirements in Section 260573.19 "Arc-Flash Hazard Analysis." Produce 3.5-by-5-inch self-adhesive equipment label for each work location included in analysis.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and space conditions for compliance with requirements for motor controllers, their relationship with motors, and other conditions affecting performance of Work.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Wall-Mounted Controllers: Install magnetic controllers on walls with tops at uniform height indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted

to wall. For controllers not at walls, provide freestanding racks complying with Section 260529 "Hangers and Supports" unless otherwise indicated.

- C. Maintain minimum clearances and workspace at equipment per manufacturer's written instructions and NFPA 70.
- D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
- E. Setting of Overload Relays: Select and set overloads on basis of full-load current rating as shown on motor nameplate. Adjust setting value for special motors as required by NFPA 70 for motors that are high-torque, high-efficiency, and so on.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Comply with provisions of NFPA 70B, "Testing and Test Methods" Chapter.
 - 2. Visual and Mechanical Inspection:
 - a. Compare equipment nameplate data with drawings and specifications.
 - b. Inspect physical and mechanical condition.
 - c. Inspect anchorage, alignment, and grounding.
 - d. Verify unit is clean.
 - e. Inspect contactors:
 - 1) Verify mechanical operation.
 - 2) Verify contact gap, wipe, alignment, and pressure are per manufacturer's published data.
 - f. Motor-Running Protection:
 - 1) Verify overload element rating is correct for its application.
 - 2) If motor-running protection is provided by fuses, verify correct fuse rating.
 - g. Inspect bolted electrical connections for high resistance using one of 2 following methods:
 - 1) Use low-resistance ohmmeter. Compare bolted connection resistance values with values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.

- 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method per manufacturer's published data or NETA ATS Table 100.12. Bolt-torque levels shall be per manufacturer's published data. In absence of manufacturer's published data, use NETA ATS Table 100.12.
 - h. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
3. Electrical Tests:
 - a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Insulation-resistance values shall be per manufacturer's published data or NETA ATS Table 100.1. In absence of manufacturer's published data, use Table 100.5. Values of insulation resistance less than those of this table or manufacturer's recommendations shall be investigated and corrected.
 - b. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
 - c. Test motor protection devices per manufacturer's published data.
 - d. Test circuit breakers as follows:
 - 1) Operate circuit breaker to ensure smooth operation.
 - 2) For adjustable circuit breakers, adjust protective device settings per coordination study. Comply with coordination study recommendations.
 - e. Perform operational tests by initiating control devices.
4. Infrared Inspection: Perform survey during periods of maximum possible loading. Remove necessary covers before inspection.
 - a. Comply with recommendations of NFPA 70B, "Testing and Test Methods" Chapter, "Infrared Inspection" Article.
 - b. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of electrical power connections of each motor controller.
 - c. Follow-up Infrared Scanning: Perform additional follow-up infrared scan of each motor controller 11 months after date of Substantial Completion.
 - d. Report of Infrared Inspection: Prepare certified report that identifies testing technician and equipment used, and lists following results:
 - 1) Description of equipment to be tested.
 - 2) Discrepancies.
 - 3) Temperature difference between area of concern and reference area.
 - 4) Probable cause of temperature difference.
 - 5) Areas inspected. Identify inaccessible and unobservable areas and equipment.
 - 6) Load conditions at time of inspection.
 - 7) Photographs and thermograms of deficient area.
 - 8) Recommended action.

- e. Equipment: Inspect distribution systems with imaging equipment capable of detecting minimum temperature difference of one degree C at 30 degrees C. Equipment shall detect emitted radiation and convert detected radiation to visual signal.
 - f. Act on inspection results and recommended action, and considering recommendations of NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Owner's operations permit. Retest until deficiencies are corrected.
- C. Motor controller will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.5 SYSTEM FUNCTION TESTS

- A. System function tests shall prove correct interaction of sensing, processing, and action devices. Perform system function tests after field quality control tests have been completed and components have passed specified tests.
- 1. Develop test parameters and perform tests for purpose of evaluating performance of integral components and their functioning as complete unit within design requirements and manufacturer's published data.
 - 2. Verify correct operation of interlock safety devices for fail-safe functions in addition to design function.
 - 3. Verify correct operation of sensing devices, alarms, and indicating devices.
- B. Motor controller will be considered defective if it does not pass system function tests and inspections.
- C. Prepare test and inspection reports.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain manual motor starters.

END OF SECTION