
PART 1 GENERAL**1.1 RELATED DOCUMENTS**

- A. The requirements of the General Conditions, Supplementary Conditions and the following specification sections apply to all Work herein:
1. Section 26 00 10 - General Requirements
 2. Section 26 00 20 - Scope of Work
 3. Section 26 05 19 - Electrical Conductors - 600 Volts
 4. Section 26 05 26 - Grounding and Bonding
 5. Section 26 08 13 - Testing
 6. Section 26 28 13 - Fuses
 7. Section 28 00 10 - Fire Detection and Alarm General Requirements

1.2 SUMMARY

- A. Furnish and install individual motor controllers as specified herein for all motors except those with factory mounted motor controllers as integral parts. ??Factory mounted variable speed controllers for the typical floor air handling units shall be removed from the unit and mounted on an adjacent wall by the Electrical Subcontractor as shown on the Drawings. Certain other motor controllers, because of special requirements, will be furnished by others with the equipment and shall be installed and wired by the Electrical Subcontractor.

1.3 REFERENCE STANDARDS

- A. Each individual motor controller and all components shall be designed, manufactured and tested in accordance with the latest applicable industry standards including the following:
1. UL Standard 508 - Industrial Control Equipment
 2. UL Standard 489 - Molded Case Circuit Breakers
 3. Federal Specification W-C-375 - Molded Case Circuit Breakers
 4. NEMA ICS 1 - General Standards for Industrial Control and Systems
 5. NEMA ICS 2 - Industrial Control Devices, Controllers and Assemblies
 6. NEMA ICS 3 - Industrial Systems
 7. NEMA ICS 4 - Terminal Blocks for Industrial Control Equipment and Systems
 8. NEMA ICS 6 - Enclosures for Industrial Control Equipment and Systems
 9. NEMA KS 1 - Enclosed Switches
 10. NFPA 70 - National Electrical Code (NEC)
- B. All equipment and material to be furnished and installed on this Project shall be UL or ETL listed, in accordance with the requirements of the authorities having jurisdiction, and suitable for its intended use on this Project.

1.4 SUBMITTALS

- A. The following submittal data shall be furnished according to the General Conditions and Section 26 00 10 and shall include, but not be limited to:
1. Individual Motor Controllers* complete with physical dimensions, materials, connector details, nameplate data, voltage, current and short circuit ratings, factory test reports, installation details, accessories, etc.
- B. All items or equipment listed above with asterisks (*) shall be certified by the manufacturer using Manufacturer Certification "MCA" as set forth in Section 26 00 10. See Section 26 00 10 for certification requirements.

1.5 WARRANTY

- A. Comply with the requirements of the General Conditions and Section 26 00 10.

PART 2 PRODUCTS**2.1 ACCEPTABLE MANUFACTURERS**

- A. If it complies with these Specifications, individual motor controllers manufactured by one of the following manufacturers will be acceptable:
1. Allen-Bradley
 2. Cutler Hammer
 3. General Electric
 4. Siemens
 5. Square D

2.2 RATINGS

- A. Individual motor controllers shall be arranged for the voltage, current and horsepower capacity ratings indicated on the Drawings and assembled complete with circuit protective devices as indicated on the Drawings. Individual motor controllers shall have a short circuit withstand rating, which exceeds the available RMS symmetrical fault current values at the point of installation as indicated on the Drawings.

2.3 GENERAL

- A. All motor controllers shall be UL listed. The motor controllers shall be steel mounted and front wired with all terminals accessible for wiring directly from the front. No slate or ebony asbestos shall be permitted on any size controller from Size 00 through Size 8. All contacts shall be solid silver cadmium oxide alloy, which will not require any filing, dressing or cleaning throughout the life of the control equipment. Bare copper or silver flashed type shall not be permitted. Operating coils shall be pressure molded and so designed that if accidentally connected to excessive voltage they will not expand, bubble or melt. When a coil fails under over voltage conditions, the motor controller shall definitely drop out and not freeze the contacts in the "ON" position. See Section 26 05 19 titled "Electrical Conductors - 600 Volts" for termination and space requirements in the housing.
- B. Overload relays shall be solid state type and shall be ambient insensitive. The solid state circuit board shall be conformal coated for protection. The overload relay shall include the following protection:
1. A minimum 2:1 current adjustment with fine adjustment dial labeled in full load amps. Overload shall be specifically selected for the current rating of the motor being protected.
 2. Selectable NEMA Trip Class 10, 20 or 30 set to Class 10.
 3. Phase loss and current phase unbalance with adjustable sensitivity from 20 to 50% protection set at 30%. Contactor shall trip within 3 to 5 seconds of phase loss or phase unbalance.
- C. All three (3) phase full voltage magnetic motor controllers shall have overload protection in all three phases. All single phase full voltage magnetic motor controllers shall have overload protection in ungrounded phases. All two (2) speed full voltage magnetic motor controllers shall have overload protection in all six (6) legs of the controller. Overload relays shall be furnished for each phase and shall be of the hand reset trip free variety so that blocking the reset mechanism in the reset position will not prevent the motor controller from dropping out if the motor is overloaded. This specifically excludes those overload relays, which change to automatic reset from hand reset when the reset mechanism is blocked. Accidentally depressing the reset button or mechanism will not shutoff the motor. Circuit breaker disconnects for combination motor starters shall be thermal magnetic only.
- D. Motor Controllers shall be provided with auxiliary dry contacts as follows:
1. NEMA size 3 and larger: two (2) N.O. and two (2) N.C.
 2. NEMA size 2: two (2) N.O. and one (1) N.C.
 3. NEMA size 1 and 0: one (1) N.O. and one (1) N.C.

- E. Where required for interface with the Division 25 Building Control System, all motor controllers shall be provided with a separate box enclosure with a terminal strip and relays wired to the controller. Terminal strip requirements and relays shall be coordinated with Section 28 00 10 titled "Fire Detection and Alarm General Requirements" in Division 26 and with Division 25. Terminal strip and relay requirements generally are as follows:
1. Motor controllers controlled by Division 25, status indication by Division 25 and operation and status by the Fireman's Override Panel. Requirements are:
 - a. Terminal Strip (16 points minimum):
 - 1) Auxiliary contacts:
 - a) Eight (8) points for Auxiliary contacts.
 - b) Four (4) points for control of fireman's override relays.
 - 2) External safety controls:
 - a) Two (2) points for safety control wiring and adjustable freezestats, etc.
 - 3) Through "Auto" position of "HOA" (no "Off" position):
 - a) Two (2) points through auto position for automatic start.
 - b. Provide two (2) relays that will operate from the Fireman's Override panel and provide operation as specified. Relays shall be GE CR120E01102.
Most air handling units will have this control.
 2. Motor controllers controlled by Division 25 with no status and no operation or status from Fireman's Override Panel. Requirements are:
 - a. Terminal Strip (2 points minimum):
 - 1) "Off" position:
 - a) Two (2) points through auto position for automatic start.Miscellaneous ventilation fans, such as the penthouse ventilation fans have this control.
 3. Motor controllers controlled by Division 25, status indication by Division 25, but no operation or status from Fireman's Override Panel. Requirements are:
 - a. Terminal Strip (12 points minimum):
 - 1) Auxiliary contacts:
 - a) Eight (8) points for Auxiliary contacts.
 - 2) External safety controls:
 - a) Two (2) points for safety control wiring and adjustable freezestats, etc.
 - 3) Through "Auto" position of "HOA" (no "Off" position):
 - a) Two (2) points through auto position for automatic start.Generally pumps, etc., have this control.
- F. Any full voltage magnetic motor controllers indicated to be furnished under this Division shall be similar and approved equal to the following:
1. Individual three (3) phase motor controller: AB Bul. 509, GE #CR 306.
 2. Individual single phase motor controller: AB Bul. 509SP, GE #CR 306.
 3. Combination three (3) phase motor controller with circuit breaker: AB Bul. 513, GE #CR 307.
 4. Combination three (3) phase motor controller with nonfused switch: AB Bul. 512, GE #CR 308.
 5. Combination three (3) phase, two (2) speed, single (1) winding motor controller with circuit breaker: AB Bul. 523F, GE #CR 310.
 6. Combination three (3) phase, two (2) speed, two (2) winding motor controller with circuit breaker: AB Bul. 523E, GE #CR 310.
- G. In general, motor controller enclosures shall be NEMA Type 1, general purpose unless exposed to the weather or unless otherwise specified on the Drawings. Motor controllers exposed to the weather shall be NEMA Type 4X, watertight, stainless steel.
- H. Generally, holding coils in full voltage magnetic motor controllers shall be suitable for use on 120 Volts, AC control voltage. Each controller shall have a control power transformer with primary and secondary fuses. Control power transformer shall have at least 75 VA capacity over and above the standard capacity required for holding coil and LED pilot light duty. Sizing of control transformers shall be coordinated with the Division 25 Subcontractor.
- I. Manual motor controllers where indicated on the Drawings, required and/or specified, shall be similar and approved equal to Allen-Bradley Bul. 600 in NEMA Type 1 enclosure or as otherwise required for the location of the installation.

- J. Motor controller shall be provided to properly coordinate with the motors to be furnished by the Mechanical Subcontractor and by others as set forth in Section 26 00 10. See Division 23 for motor types, horsepower, etc.
- K. Motor controllers shall be provided with accessories such as H.O.A.'s, selector switches, LED pilot lights, etc. All internal wiring shall be copper.
- L. Two (2) speed motor controllers for two (2) speed motors shall have "decelerating relay" between high and low speed.
- M. Each motor controller shall be equipped with a 120V red running LED light and a hand-off-automatic or start-stop-push-button, as required by the Mechanical Subcontractor. Two (2) speed motor controllers shall have "fast-slow" LED lights as well as a fast-slow selector switch in conjunction with the HOA as required by the Mechanical Subcontractor. LED lights will be operated by an interlock on the motor controller not placed across the operating coil. In addition to the "holding interlock and LED light interlocks", each controller shall have four extra interlock contacts - two (2) normally open and two (2) normally closed.

PART 3 EXECUTION

3.1 INSTALLATION

- A. The Electrical Subcontractor shall install all individual motor controllers per the manufacturer's recommendations and as indicated on the Drawings.

3.2 FACTORY TESTING

- A. All standard factory tests shall be performed in accordance with the latest version of NEMA and UL Standards.

3.3 FIELD TESTING

- A. Refer to Section 28 08 13 for additional testing requirements for individual motor controllers.

END OF SECTION