



SECTION 23 05 14 – MOTOR STARTERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including the Conditions of the Contract (General, Supplementary, and other Conditions) and Division 00 and 01 as appropriate, apply to the Work specified in this Section.
- B. Refer to all Sections, as well as the Specifications for the other various trades and materials and be thoroughly familiar with all provisions regarding all work.

1.2 SCOPE OF WORK

- A. All motor starters specified under this section shall be provided by the same manufacturer.
- B. All motor starters installed in return air plenums shall be plenum rated.
- C. Extent of motor starter work is indicated by drawings and schedules. All motors and mechanical equipment provided with motors supplied by the Division 23 Contractor shall be also provided with Motor Starters and/or Variable Frequency Drives. It is the responsibility of the Division 23 Contractor to ensure that all Motor Starters/VFDs are sized and suitable for the intended purpose of the mechanical equipment provided.
- D. Disconnecting means unless integral to the Starter/VFD shall be provided by the Division 26 Contractor.
- E. Types of motor starters specified in this section include the following:
 - 1. Magnetic.
 - 2. Manual.

1.3 QUALITY ASSURANCE

- A. Manufacturers: Firms regularly engaged in manufacturer of motor starters, of types, ratings and characteristics required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects utilizing motor starters similar to that required for the project.
- C. NEC Compliance: As a minimum, comply with NEC as applicable to wiring methods, construction, and installation of motor starters.
- D. NFPA Compliance: As a minimum, comply with applicable requirements of NFPA 70E "Standard for Electrical Safety Requirements for Employee Workplaces".
- E. UL Compliance: As a minimum, comply with applicable requirements of UL 468A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors", and UL 508, "Electrical Industrial Control Equipment", pertaining to installation of motor starters.
- F. IEE Compliance: As a minimum, comply with applicable requirements of IEE STD 241, "Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to motor starters.
- G. NEMA Compliance: As a minimum, comply with applicable portions of NEMA Standard ICS 2, "Industrial Control Devices, Controllers and Assemblies", Maximum), pertaining to motor controllers/starters and enclosures.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data on motor starters.

- B. Shop Drawings: Submit layout drawings of motor starters showing accurately scaled equipment locations and spatial relationships to associated motors.
- C. Wiring Diagrams: Submit wiring diagrams for motor starters showing connections to electrical power panels, feeders, and equipment. Clearly differentiate between portions of wiring that are manufacturer-installed and portions to be field-installed.
- D. Maintenance Stock - Fuses: For types and ratings required, furnish additional fuses, amounting to one set for every 10 installed units, but not less than 5 sets of each.

1.5 DELIVERY & STORAGE

- A. Motor Starter(s) shall be stored and handled per manufacturer's recommendations.
 - 1. Deliver motor starter(s) from the factory properly secured, crated, and protected with factory plastic shrink wrap or other protective wrap.
 - 2. Lift and support motor starter(s) with the manufacturer's designated lifting or supporting points.
 - 3. Disassemble and reassemble motor starter(s) as required for movement into the final location following manufacturer's written instructions.
 - 4. Deliver motor starter(s) as a factory-assembled unit to the extent allowable by shipping limitations, with protective crating and covering.
 - 5. Store motor starter(s) to prevent damage to starter(s). Store units out of the elements and maintain factory protective covering until ready for installation.
- B. Lift and support motor starter(s) with the manufacturer's designated lifting or supporting points.
- C. Disassemble and reassemble motor starter(s) as required for movement into the final location following manufacturer's written instructions.
- D. Deliver motor starter(s) as a factory-assembled unit to the extent allowable by shipping limitations, with protective crating and covering.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with requirements, manufacturers offering motor starters which may be incorporated in the work are as follows:
 - 1. Allen-Bradley Co.
 - 2. Cutler Hammer Products, Eaton Corp.
 - 3. General Electric Co.
 - 4. GTE Products Corp.
 - 5. Gould, Inc.
 - 6. Square D Co.
 - 7. Westinghouse Corp.
 - 8. Siemens, Inc.

2.2 MOTOR STARTERS

- A. General: Except as otherwise indicated, provide motor starters and ancillary components which as a minimum, comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation.
- B. Magnetic Starter Requirements: Provide magnetic starters for motors 3/4 hp and larger, and for smaller motors where interlock or automatic operation with other equipment is indicated. Include the following accessories for all starters:
 - 1. Provide UL Listing as a unit. Starters assembled with only UL components will not be acceptable.
 - 2. Maintained-contact push buttons and pilot lights, properly arranged for single-speed or multi-speed operation as indicated.

3. Trip-free thermal adjustable overload relays, each phase.
 4. Interlocks, pneumatic switches, and similar devices as required for coordination with control requirements of Section 230900 – “Building Automation System” sections.
 5. Built-in 120-volt control circuit transformer with fused secondary, fused from line inside, where service exceeds 240 volts.
 6. Pilot Light; Red - “On”
 7. Pilot Light; Green - “Off”
 8. Auxiliary Contact Block
 9. Externally operated manual “Reset” overload relay button mounted on door/cover of the unit.
 10. 2-Point terminal strip with “H-O-A” Selector switch
 11. Hinged cabinet cover. Lift cover is not acceptable.
 12. Enclosure - Rated for exposure indicated on plans unless otherwise specifically indicated.
 13. Under-voltage release or protection.
 14. Lockable Handle “OFF” position switch.
- C. AC Fractional HP Manual Starters: Provide manual single-phase fractional HP manual motor starters, of sizes and ratings indicated. Equip with manually operated quick-make, quick-break toggle mechanisms; and with one-piece melting alloy type thermal units. Starter to become inoperative when thermal unit is removed. Provide starters with double break silver alloy contacts, visible from both sides of starter; green pilot lights, and switch capable of being padlocked “OFF”. Enclose starter unit in NEMA Type 1, 12, 4X, or 3R general purpose enclosure suitable for surface mounting according to the environment in which the starter is installed. Coat with manufacturer's standard color finish.
- D. Full Voltage Non-Reversing Starters: Starters for three phase motors 10 horsepower and below.
1. Provide combination type starter/disconnect, full voltage non- reversing (FVNR), with magnetic NEMA rated contactors rated for horsepower of motor served.
 2. Adjustable trip magnetic circuit breaker disconnect (motor circuit protector) capable of being padlocked in the open position (power off).
 3. 10K AIC minimum fault rating with higher rating, when necessary, due to available fault levels.
 4. Starters shall have a fused 100VA minimum control transformer (120V, unless required otherwise).
 5. Provide HOA switch, push to test operating pilot light, solid state overload relays set for actual motor nameplate full load amps, and phase failure and phase reversal protection relays.
 6. Provide minimum two (2) N.O. and two (2) N.C. auxiliary contacts and terminal blocks factory pre-wired for field wiring.
 7. Starters shall be housed in a NEMA 1 enclosure for indoor applications and NEMA 3R enclosure for outdoor or wet locations. NEMA 12 enclosures shall be provided for installation in return air plenums or dirty/dusty indoor locations. NEMA 4X Stainless Steel enclosures shall be installed in corrosive environments.
 8. Coat with manufacturer's standard color finish.

PART 3 - EXECUTION

3.1 INSTALLATION OF MOTOR STARTERS

- A. Install motor starters, in accordance with equipment manufacturer's written instructions and with recognized industry practices; complying with applicable requirements of NEC, UL, and NEMA standards, to ensure that products fulfill requirements.
- B. Coordinate with other work including motor and electrical wiring/cabling work, as necessary to interface installation of motor starters with other work.
- C. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Std 486A.
- D. Install fuses in fusible disconnects, if any.

3.2 ADJUSTING AND CLEANING

- A. Inspect electrical starter's operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.
- B. Touch-up scratched or marred surfaces to match original finish.

3.3 FIELD QUALITY CONTROL

- A. Subsequent to connecting wire/cables, energize motor starter circuitry and demonstrate functioning of equipment in accordance with requirements; where necessary correct malfunctioning units, and then retest to demonstrate compliance. Ensure that direction of rotation of each motor fulfills requirements.

3.4 TRAINING & DEMONSTRATION

- A. Demonstration Services: Arrange and pay for a factory-authorized service representative to train Owner's maintenance personnel on the following:
 - 1. Procedures and schedules related to start-up and shut down, troubleshooting, servicing, preventative maintenance, and how to obtain replacement parts.
 - 2. Familiarization with contents of Operating and Maintenance Manuals specified in Division 01, Section 017780 - "Closeout Submittals" and Division 23, Section 230020 - "Basic Mechanical Requirements."
 - 3. Provide Service Manual for each motor starter specified.
- B. Provide three (3) hours of factory authorized training.
 - 1. Refer to Section 230010 - "Mechanical General Provisions" for video taping requirements.
 - 2. Schedule training with Owner's Representative with at least seven (7) days notice.

END OF SECTION 23 05 14