

SECTION 23 05 13 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

1.4 SUBMITTALS

- A. All motors provided by the Contractor shall be of the same manufacturer unless they are an integral part of the piece of equipment to which they are attached.
- B. Product Data: Provide the following information for each motor:
 - 1. Manufacturer.
 - 2. Rated full load horsepower.
 - 3. Rated volts.
 - 4. Number of Phases.
 - 5. Insulation Class.
 - 6. Frequency in Hertz.
 - 7. Full load amperes (FLA).
 - 8. Locked rotor amperes (LRA) at rated voltage or NEMA code letter.
 - 9. Nominal speed at full load (rpm).
 - 10. Service factor.
 - 11. NEMA design letter.
 - 12. NEMA machine type (ODP, WP-I, TEFC, etc.).
- C. For motors one horsepower and larger, include the following additional information:
 - 1. NEMA frame size.

2. NEMA insulation system classification. For motors required to be installed outdoors, include information showing compliance for outdoor application.
3. Maximum ambient temperature for which motor is designed.
4. Time rating.
5. Bearing size and type data.
6. Guaranteed efficiency and power factor at full load, 75% load, 50% load, 25% load and 0% load.

D. For motors 20 horsepower and larger, include the following additional information:

1. No load amperes.
2. Safe stall time.
3. Guaranteed efficiency and power factor at full load, 75% load, 50% load, 25% load and 0% load.
4. Motor manufacturer's recommended maximum power factor correction capacitor (kvar) that can safely be switched with the motor.
5. Expected value of corrected power factor at no load, 50 percent, 75 percent and full load.
6. Full load amperes with corrected power factor.
7. Maximum guaranteed slip at full load.

E. Operation and Maintenance Data:

1. Submit operation and maintenance data including assembly Drawings, bearing data including replacement sizes, and lubrication instructions.

F. Alternate Motors:

1. If a motor horsepower rating larger than indicated is offered as a substitute and accepted, provide required changes in size of conductors, conduits, motor controllers, overload relays, fuses, circuit breakers, switches and other related items at no change in the Contract price.

1.5 WARRANTY

- A. Provide minimum one-year manufacturer's warranty including coverage for motors one horsepower and larger.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ABB (Baldor-Reliance)
 2. Nidec (Emerson, US Motor)
 3. Seimens
 4. Toshiba
 5. Weg

2.2 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.
- B. Comply with IEEE 841 for severe-duty motors.

2.3 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
 - 1. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.4 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Premium efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.
- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Multispeed Motors: Separate winding for each speed.
- F. Rotor: Random-wound, squirrel cage.
- G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- H. Temperature Rise: Match insulation rating.
- I. Insulation: Class F.
- J. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.
- K. Enclosure Material: Cast iron for motor frame sizes 284T and larger; rolled steel for motor frame sizes smaller than 284T.

2.5 ADDITIONAL REQUIREMENTS FOR POLYPHASE MOTORS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width-modulated inverters.
 - 2. Inverter-Duty Motors: Class B temperature rise; Class H insulation.
 - 3. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
 - 4. Shaft Grounding:
 - a. Helwig Carbon BPK Series carbon brush shaft grounding.
 - b. AEGIS Grounding Rings
- C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.6 SINGLE-PHASE MOTORS

- A. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- B. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- C. Motors 1/20 HP and Smaller: Shaded-pole type.
- D. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.
- E. ECM, where required in equipment specifications:
 - 1. Variable-speed, DC, brushless motors specifically designed for use with single phase, 120 or 277 volt, 60 hertz electrical input.
 - 2. Operated by a single phase integrated controller/inverter that operates the wound stator and senses rotor position to electronically commutate the stator.
 - 3. Designed for synchronous rotation.
 - 4. Permanent magnet type motor rotor with near zero rotor losses.
 - 5. Able to be mounted with shaft in horizontal or vertical orientation.
 - 6. Permanently lubricated with ball bearings.
 - 7. Direct coupled to the blower.
 - 8. Integral thermal overload protection.
 - 9. Minimum of 70 percent efficiency over its entire operating range.
 - 10. Anti-back rotation system or provide a motor that is designed to overcome reverse rotation and not affect life expectancy.
 - 11. Inductors to minimize harmonic distortion and line noise.

12. Motor control module:

- a. Built-in soft start and soft speed change ramps.
- b. Electronics and built-in surge protectors to protect the solid state controls from line transients.
- c. Variable speed mode to receive a variable control voltage signal from a DDC system in response to external PID outputs.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Motors located in exterior locations and in direct drive axial fans, roll filters, humidifiers and draw-through air units shall be totally enclosed weatherproof epoxy-sealed type.
- B. Motors installed indoors must be open drip-proof (ODP) unless otherwise specified.

3.2 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with manufacturer's published recommendations.
- C. Properly install and align motors after installation on the driven equipment.
- D. Motor feeders shall be free of splices. In special cases when splice-free feeders are impractical, splices may be allowed given prior written approval from the Owner.
- E. Use crimp-on, solderless copper terminals on the branch circuit conductors. For motors 20 horsepower and larger, use 5300 Series 3M motor lead splicing kit or approved equal.
- F. When the motor and equipment are installed, the motor's nameplate must be in full view.
- G. Where motor grease fittings are not accessible, extend 1/8" steel or copper tubing from fitting to an accessible location.

END OF SECTION