

SECTION 23 05 13
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions to the Construction Contract", "Special Conditions" and "Division 01 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. Section includes general requirements for electrically commutated motors, and for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on AC power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.
- B. Related Sections include the following:
 - 1. Division 23 Sections for application of motors and reference to specific motor requirements for motor-driven equipment.

1.3 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Listing and Labeling: Provide motors specified in this Section that are listed and labeled.
 - 1. Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.
- C. Minimum Efficiency: Conform to requirements of NEMA MG 1, Table 12-12, as per the Federal Energy Independence and Security Act of 2007 (EISA), and DOE 10 CFR 431, as applicable, for minimum energy efficiency ratings of motors.
- D. Source Quality Control: Perform the following routine tests according to NEMA MG 1:
 - 1. Measurement of winding resistance.
 - 2. No-load readings of current and speed at rated voltage and frequency.
 - 3. Locked rotor current at rated frequency.
 - 4. High-potential test.
 - 5. Alignment.

1.4 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.
- B. The Division 23 Contractor shall be responsible for any additional costs to the Division 26 Contractor such as larger VFDs and wiring resulting from providing motors with high inrush current ratings such as "super premium" AC induction motors or those with design A starting characteristics.
 - C. The Division 23 Contractor shall be responsible for any additional costs to the Division 26 Contractor such as larger VFDs and wiring resulting from any changes in motor sizes initiated by the Division 23 Contractor, from sizes scheduled on the Drawings due to a substitution from the Basis of Design equipment.
 - D. Coordinate with the variable frequency drive suppliers to perform drive settings and adjustments appropriate for each drive and control application.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one of the following:

1. 3-Phase Induction Motors:

- a. Lincoln Motors; Div. of Regal Rexnord
- b. Marathon Motors; Div. of Regal Rexnord
- c. General Electric Co.
- d. Toshiba
- e. Baldor / Reliance Electric Co.; Div. of ABB Motors and Mechanical Inc.
- f. US Motors; Div. of Nidec Motor Corp.
- g. WEG Electric Corp.
- h. Siemens
- i. TECO-Westinghouse Motor Co.
- j. Leroy-Somer; Div. of Emerson Industrial Automation
- k. Or equal as approved by the Professional.

2. Permanent Magnet Electrically Commutated Motors (ECMs):

- a. Baldor; a Div. of ABB Motors and Mechanical Inc.
- b. EBM-Papst
- c. Nidec Motor Corp.
- d. Regal Rexnord
- e. Zeihl-ABEGG
- f. Or equal as approved by the Professional.

2.2 GENERAL MOTOR REQUIREMENTS

- A. Comply with requirements in this Section except when stricter requirements are specified in HVAC equipment schedules or Sections.
- B. Comply with NEMA MG 1 unless otherwise indicated.

- C. Frequency Rating: 60 Hz.
- D. Voltage Rating: Determined by voltage of circuit to which motor is connected.
- E. Service Factor: According to NEMA MG 1, unless otherwise indicated.
- F. Enclosures: Open drip-proof (ODP), unless otherwise indicated. Use totally enclosed fan-cooled (TEFC) motors where installed at the exterior of the building or where installed in damp or wet locations.
- G. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.
- H. Overload Protection:
 - 1. All motors shall be provided with thermal overload protection at the manual or magnetic motor starter or variable frequency controller, as per NFPA 70.
 - 2. All single phase motors, and all three phase motors used with variable frequency controllers shall have integral thermal protective devices.

2.3 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
- B. 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 AC INDUCTION MOTORS

- A. Description: NEMA MG 1, medium induction motor.
 - 1. Design Characteristics: NEMA MG 1, Design B, unless otherwise indicated.
 - 2. Minimum Energy-Efficient Design: Conform to EISA requirements.
 - 3. Stator: Copper windings, unless otherwise indicated. Multispeed motors shall have separate winding for each speed.
 - 4. Rotor: Random-wound, squirrel cage.
 - 5. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
 - 6. Temperature Rise: Match insulation rating, unless otherwise indicated.
 - 7. Insulation: Class F, unless otherwise specified.
 - 8. All squirrel cage, three phase, induction motors 15 HP and larger shall have a maximum locked rotor starting KVA/HP no greater than that specified for NEMA Code "G" (5.6 to 6.3).
 - 9. Enclosure Material: Unless indicated otherwise in other Division 23 Sections, cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.
 - 10. Full Load Current Ratings: Shall not exceed NEC Table 430.250 - "Full Load Current, Three-Phase Alternating-Current Motors". If 6 and 8 pole motors with full load currents exceeding the values of this table are provided, the Division 23 Contractor shall be responsible for any additional costs to the Division 26 Contractor such as larger VFDs and input wiring.

2.5 SINGLE-PHASE MOTORS

- A. Type: As indicated or selected by manufacturer from one of the following, to suit starting torque and other requirements of specific motor application. Note that none of the motor types listed immediately below may be provided in substitution for a permanent magnet, electrically commutated motor (ECM).
 - 1. Permanent-split capacitor.
 - 2. Split-phase start, capacitor run.
 - 3. Capacitor start, capacitor run.
 - 4. Electrically commutated (see dedicated Article below).
- B. Shaded-Pole Motors: Do not use.
- C. Thermal Protection: Internal protection automatically opens power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal protection device automatically resets when motor temperature returns to normal range.
- D. Bearings: Ball-bearing type for all EC type motors, belt-connected motors, and other motors with high radial forces on motor shaft. Sealed, permanently prelubricated sleeve bearings are acceptable for other, single-phase motors.

2.6 ELECTRICALLY COMMUTATED MOTORS (ECMs)

- A. Synchronous, constant torque, brushless DC type, specifically designed for HVAC applications, with a permanent magnet rotor and integral solid state inverter circuitry to accept single or 3-phase AC power input and to control the power output and speed of rotation.
 - 1. Integral controllability down to 20% of full, rated speed. No external speed controller shall be required.
 - a. Speed shall be adjustable by integral potentiometer dial (for balancing purposes) and/or by external 0-10 VDC control signal, as required by the application and control sequence of operation. Motors serving fans and pumps indicated in the sequence of operation to have on-off and/or speed control shall receive an external binary and/or analog signal for this purpose. Note that for many EC motors, an analog speed control signal below a certain value is used to automatically de-energize the motor. Coordinate signal type requirements between the equipment supplier and the control system sub-contractor / supplier performing the work of Division 23 Section "Instrumentation and Control for HVAC". For bidding purposes, provide EC motors with both a manual dial and the ability to receive an analog speed signal.
 - 2. Minimum 85% efficiency over full speed range.
 - 3. Permanently lubricated ball bearings which are not dependent on motor speed for lubrication.
 - 4. Integrated power factor correction filter.
 - 5. Integrated motor protection verified by UL to protect the pump against over-/undervoltage, overtemperature of motor and/or electronics, overcurrent, locked rotor, and dry run (no-load condition).
- B. Provide ECMs where explicitly indicated, either in other Division 23 Sections, or on the Drawings.

PART 3 - EXECUTION

Not Applicable

END OF SECTION