

SECTION 15170

MOTORS, DRIVES AND ACCESSORIES

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Common requirements for electric motors furnished on equipment specified in other Sections, including single phase and three phase electric motors.
- B. Starters.
- C. Thermal Overload Protection.
- D. Belt Drives.

1.02 REFERENCES

- A. Section 01095 - References: Requirements for references and standards.
- B. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
- C. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.
- D. NEMA MG 1 - Motors and Generators.
- E. NFPA 70 - National Electrical Code.
- F. UL 674 - UL Standard for Safety Electric Motors and Generators for Use in Division 1 Hazardous (Classified) Locations.
- G. UL 1836 - UL Standard for Safety for Electric Motors for Use in Class I, Division 2 and Class II, Division 2 Hazardous (Classified) Locations.

1.03 REGULATORY REQUIREMENTS

- A. Conform to UL Component Recognition for appropriate sizes.
- B. Conform to NFPA 70 and local energy code.

1.04 DELIVERY, STORAGE, AND PROTECTION

- A. Section 01600 - Materials and Equipment: Transport, handle, store, and protect products.
- B. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS - MOTORS

- A. Century.

- B. Baldor.
- C. Westinghouse.

2.02 GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Motors Less Than 250 Watts, for Intermittent Service: Equipment manufacturer's standard and need not conform to these specifications.
- B. Motors shall have integral thermal overload protection.
- C. Single Phase Motors: PSC where available.
- D. Open drip-proof type except where specifically noted otherwise.
- E. Design for continuous operation in 40 degrees C environment.
- F. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
- G. Explosion-Proof Motors: UL approved for hazard classification.
- H. Visible Nameplate: Indicating manufacturer's name and model number, motor horsepower, RPM, frame size, voltage, phase, cycles, full load amps, insulation system class, service factor, maximum ambient temperature, temperature rise at rated horsepower, minimum efficiency.
- I. Motors controlled by variable frequency drive shall be labeled for use with VFD.

2.03 SINGLE PHASE POWER - SPLIT PHASE MOTORS

- A. Starting Torque: Less than 150 percent of full load torque.
- B. Starting Current: Up to seven times full load current.
- C. Breakdown Torque: Approximately 200 percent of full load torque.
- D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.
- E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.04 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

- A. Starting Torque: Exceeding one fourth of full load torque.
- B. Starting Current: Up to six times full load current.
- C. Multiple Speed: Through tapped windings.
- D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.05 SINGLE PHASE POWER - CAPACITOR START MOTORS

- A. Starting Torque: Three times full load torque.

- B. Starting Current: Less than five times full load current.
- C. Pull-up Torque: Up to 350 percent of full load torque.
- D. Breakdown Torque: Approximately 250 percent of full load torque.
- E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
- F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated bearings.
- G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.06 THREE PHASE POWER - SQUIRREL-CAGE MOTORS

- A. Starting Torque: Between 1 and 1-1/2 times full load torque.
- B. Starting Current: Six times full load current.
- C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.
- D. Design, Construction, Testing, and Performance: Conform to NEMA MG 1 for Design B energy-efficient motors.
- E. Insulation System: NEMA Class B or better.
- F. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.
- G. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum AFBMA 9, L-10 life of 200,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.
- H. Sound Power Levels: To NEMA MG 1.
- I. Part Winding Start Above 254T Frame Size: Use part of winding to reduce locked rotor starting current to approximately 60 percent of full winding locked rotor current while providing approximately 50 percent of full winding locked rotor torque.
- J. Weatherproof Epoxy Sealed Motors: Epoxy seal windings using vacuum and pressure with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.
- K. Nominal Efficiency: To NEMA MG 1, energy efficient for motor sizes 10 and larger.

2.07 ACCEPTABLE MANUFACTURERS - STARTERS AND OVERLOADS

- A. Cutler Hammer.
- B. Westinghouse.
- C. General Electric.
- D. Square D.

E. I.T.E.

2.08 STARTERS AND OVERLOADS

- A. Motor starters shall be furnished for motors provided under this Section of these specifications. Each 3 phase motor starter shall have a 3-pole type, three element overload device and shall have "ON-AUTO-OFF" switch in cover plate. They shall be general purpose NEMA rated for connected H.P. (definite purpose starters not acceptable) and shall have control power with fused transformers as required. Coordinate control voltage with Controls Contractor. Provide auxiliary contacts where required for interlocking of electrical equipment. Provide two-speed motor starters where indicated.
1. Single phase motors shall have one of the following factory wired methods of motor protection:
 - a. Integral thermal overload protection in motor and cord with plug and receptacle in unit casing.
 - b. Integral thermal overload protection in motor and disconnecting switch mounted in or on casing as specified with equipment.
 - c. Switch with thermal overload protection for unprotected motors with switch serving as disconnect device.
- B. Thermal overload devices shall be sized for motor nameplate full load amps or field measured amp draw, whichever is less. Replace elements as required by field measurements.
- C. For starters that are associated with equipment that is required to be shut down upon a fire alarm condition, provide input contacts within the starter enclosure to interface with the building's fire alarm system. Upon receipt of a signal from the building's fire alarm system, power to load side of the starter shall be turned off. Circuitry shall be provided to ensure that power is off whether the starter is in the "AUTO", "HAND" or "BYPASS" mode. If this feature is not available from the starter manufacturer, provide a contactor on the line side of the starter to accomplish the same function. The contactor shall meet the requirements of Division 16.

2.09 V-BELT DRIVES

- A. Provide self-aligning roller-bearings mounted in sealed housings with grease fittings and grease overflow valves. Fan wheels and shafts shall be designed for critical speed at least 20% higher than the maximum fan speed. The assembled fan shall be statically and dynamically balanced at the factory. Bearings shall be certified to have an average life per AFBMA of not less than 200,000 hours.
- B. Provide adjustable belt drives for motors. Belts and pulleys shall be designed for a minimum 1.5 safety factor. The base shall be constructed to allow adjustment of belt tension without having to loosen motor hold-down bolts.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Section 01400 - Quality Control: Manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION