

SECTION 15170

MOTORS

A. GENERAL CONSTRUCTION AND REQUIREMENTS

1. Motors shall comply with ASHRAE/IES 90.1, NEMA MG-1, and IEEE 112 for their application, characteristics, and testing.
2. Motors less than 250 Watts, for Intermittent Service: Equipment manufacturer's standard and need not conform to these standards.
3. Motor selection shall incorporate a minimum 10% safety factor between nominal motor horsepower and design brake horsepower. Consult with IU Engineering Services regarding instances where this requirement dictates an overly large motor.
4. Electrical Service:
 - a. Motors 1/2 HP and smaller: 120 volts, single phase, 60 Hz.
 - b. Motors 3/4 HP and larger: 208 or 480 volts, three phase, 60 Hz.
5. Type:
 - a. Open drip-proof except where specifically noted otherwise.
 - b. Motors: Design for continuous operation in 40 degree C environment.
 - c. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
 - d. Motors 1 HP and larger: Energy Efficient Type, having a minimum efficiency in accordance with NEMA 12.8 Column C.
6. Application:
 - a. Single phase motors for fans, pumps, blowers, air compressors: Capacitor start type.
 - b. Motors located outdoors: Totally enclosed, weatherproof, epoxy-sealed type.
 - c. Motors used with variable frequency drives: Drive duty motors designed for drive harmonic output, voltage peaks, and reduced operating speed. Ensure that motor is appropriate for inverter duty. Provide motor shaft grounding rings to protect bearings.

B. SINGLE PHASE POWER - CAPACITOR START MOTORS

1. 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.
2. Drip-proof Enclosure: Class A (50 degree C temperature rise) insulation, NEMA Service Factor, prelubricated ball bearings.
3. Enclosed Motors: Class A (50 degree C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

C. THREE PHASE POWER - SQUIRREL CAGE MOTORS

1. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.
2. Design, Construction, Testing, and Performance: Conform to NEMA MG 1 for Design B motors.
3. Insulation System: NEMA Class B or better.
4. Testing Procedure: In accordance with IEEE 112, test method B. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.
5. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.
6. 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.
7. 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; cast termination housing.
8. Nominal Efficiency: As scheduled at full load and rated voltage when tested in accordance with IEEE 112, test method B.
9. Nominal Power Factor: As scheduled at full load and rated voltage when tested in accordance with IEEE 112, test method B.