

Electric Motors
NEMA Premium® General Purpose Specification

Totally Enclosed Fan Cooled Motor 1 - 700 HP

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NEMA Premium® General Purpose Motor Specification

TEFC - Totally Enclosed Fan Cooled Motor 1 - 700 HP

1.0 Purpose

The intent of this specification is to work in partnership with Electric Motor suppliers to supply quality motors that consistently perform with the highest efficiency, improved life cycle and lowest maintenance cost. The motors shall be built to provide: (1) safe operation; (2) reliability in an application which may be corrosive and wet; (3) minimum maintenance requirements due to the design and quality of materials and workmanship; (4) low noise.

2.0 Scope

This specification covers three-phase, TEFC (Totally Enclosed Fan Cooled), 1 to 700 horsepower squirrel-cage induction motors in integral horsepower frames 143T and larger.

3.0 Motor Requirements

3.1 Applicable Codes and Regulations

General Purpose NEMA Premium Efficiency motors shall meet the demanding application requirements. The standard TEFC motors shall be cast iron construction with enclosures rated IP55 to handle both wet and dirty environments. Motor paint plan shall exceed 200hrs corrosion resistance per ASTM B117 standard for salt spray test. All motors shall meet or exceed NEMA MG1 Table 12-12 levels of efficiency. All motor designs shall be tested according to IEEE 112 std., method 'B' and their efficiency values shall be certified by UL or CSA Labs (CSA C390). Motors shall meet NEMA Design 'B'.

3.2 Enclosures

3.2.1 Motor enclosure shall be TEFC with IP55 degree of protection, NEMA T frame, NEMA F1 assembly for horizontal applications and designed for the environment prescribed according to the application specifications. This specification concerns the manufacture of standard NEMA Premium Efficiency General Purpose motors. Where special enclosures or assembly are required, it will be specified on the motor data sheet.

3.2.2 Frames, Endshields, and Conduit boxes shall be high strength cast iron construction.

3.2.3 Lifting eyebolts must be furnished for frames 182T and above for handling safety and convenience. Eyebolts shall be forged steel, shouldered, and threaded into blind holes to exclude water entry into the frame.

3.2.4 Motor fans must be designed for bi-directional operation and shall be spark-proof, abrasion and corrosive resistant and made of durable plastic or metal. Frames greater than 505 shall have metal fans. Fans must be keyed or pinned to the shaft on all frames.

3.2.5 Motor nameplates shall be stainless steel material with laser etching on high contrast background and affixed to frame with four rivets. Nameplates shall comply with information as described in NEMA MG-1 Part 1.70 in addition to bearing lubrication data and VFD operational range capabilities.

3.2.6 Motor connection diagram must be included on nameplate.

3.3 Motor Terminal Boxes and Leads

3.3.1 Terminal boxes shall be oversized, cast iron, rotatable in 90° increments, and fitted with rubber sealing gasket glued in place.

3.3.2 Motors to be provided with a single ground connection point on frames 143T to 326T, and with a double ground connection points on frames 364T and larger.

3.4 Electrical and Mechanical Design Requirements

3.4.1 NEMA Premium Efficiency motors shall meet NEMA Design B Torque characteristics (normal starting torque, full voltage starting), squirrel cage, induction type. Where other designs are required, they will be specified on the Motor Data Sheet.

3.4.2 All frames 324T and larger must utilize lamination steel incorporating a C4 or C5 inorganic inter-laminar insulation capable of withstanding temperatures of 500C, to insure the designed efficiencies are achieved and can be maintained in the future if rewinding is required.

3.4.3 Per NEMA Premium[®] Nominal Efficiency levels, for TEFC motors shall be equal to or greater than those shown in NEMA MG1 Table 12-12

3.4.4 Motors manufactured for 200, 230, 460, 230/460 or 575-volt, three-phase, 60-hertz, shall have 1.25 service factor through 100HP and 1.15SF > 100HP.

3.4.5 Insulation system shall be suitable for sine wave and Variable Frequency Drive applications. Windings shall be manufactured to include corona resistant enameled wire, insulating films, non-hygroscopic varnish impregnation system. The motor insulation system shall comply with NEMA MG1- Part 31.4.4.2. All coils shall have phase insulation using adequate phase paper and laced on both ends for strength.

3.4.6 NEMA Premium Efficiency General Purpose motors shall have insulation Class F for all frames. Temperature rise at 1.0 service factor to be limited to class B.

3.4.7 The insulation resistance of the complete stator winding shall be greater than 100 megohms when measured at 25° C with a megohm bridge having 1000 Volts direct current.

3.4.8 Motors shall be fitted with anti-friction ball bearings. 254T and larger motors shall have grease fittings and relief plugs for external lubrication while machine is in operation. Fittings and reliefs must be plugged. 215T and smaller shall be lubricated for life.

3.4.9 The D.E. bearing on Ball bearing motors and O.D.E. bearing on Roller bearing motors must be locked to limit axial shaft movement on motors 254T and larger, and any motor with a Flange mounting

3.4.10 Bearing cavities and grease passages must be cleared of all contamination before lubricating. Motors shall be factory lubricated with Polyrex™ EM grease.

3.4.11 Rotor assemblies shall be die cast aluminum. Rotors shall pressed onto the shaft with tight interference fit or keyed to the shaft. Assembled motor should not exceed vibration limits of .08"/sec.

4.0 Special Application Requirements

4.1 Adjustable Speed Use

4.1.1 NEMA Premium Efficiency General Purpose motors shall be suitable to operate with inverter duty applications according to the table below:

Motor Rated Voltage	Voltage Spikes Motor Terminals (phase-phase)	dV/dt at motor terminals (phase-phase)	Rise Time*	MTBP
$V_{NOM} \leq 460 \text{ V}$	$\leq 2000 \text{ V}$	$\leq 5200 \text{ V}/\mu\text{s}$	$\geq 0,1 \mu\text{s}$	$\geq 6 \mu\text{s}$
$460 \text{ V} < V_{NOM} \leq 575 \text{ V}$	$\leq 2100 \text{ V}$	$\leq 6500 \text{ V}/\mu\text{s}$		
$575 \text{ V} < V_{NOM} \leq 690 \text{ V}$	$\leq 2200 \text{ V}$	$\leq 7800 \text{ V}/\mu\text{s}$		

4.2.1 Standard NEMA Premium motors 200HP and below must be capable of 20:1 Constant torque(CT) operation and 1000:1 Variable torque(VT) operation without exceeding Class F temperature rise at full torque. Motors between 201HP and 500HP shall be capable of 4:1CT and 1000:1 VT operation.

4.3.1 Motors operated on VFD Power shall have shaft current protection on frames 447T and larger.

4.3.1.1 Motors on frames 447T and larger shall incorporate ODE insulated bearing housings or insulated bearings.

5.0 Testing & Final Inspection

5.1 Electrical Tests

Each motor shall receive a factory acceptance test according to IEEE112 latest edition testing method to include the following:

- Insulation Resistance
- Winding electric resistance measurement
- Dielectric
- No load (at rated voltage) to determine:
 - o Input Power
 - o Current

6.0 Vendor Drawings and Data

6.1 Data sheet

6.1.1 The supplier will furnish a data sheet including:

6.1.2 Motor rated voltage, frequency, full load current, horsepower and rated speed.

6.1.3 Motor weight.

6.1.4 Bearing size and type data.

6.1.5 Efficiency and power factor at full load, 75% load, 50% load

6.1.6 Noise level.

6.1.7 Speed / Torque Curves

6.2 Outline drawings

6.3 Motor installation and maintenance instructions.

6.4 Standard Documentation should be available online, and via APP based on Motor Material # or Serial #

7.0 Shipping

Motors from 143 and 215T frames may be crated or cardboard boxed. Larger frame motors shall be packed in crates.

8.0 Limited Warranty

Warranty Period

Warranty shall be at least 36 months from the invoice date for stock products and 18 months from shipment on custom products.