SPECIFICATION

PREMIUM ENERGY-EFFICIENT NEMA MOTORS
Extra Severe Duty Applications
Exceeds IEEE Std 841
March 2016

- **1-500 HP**
- **TEFC/TENV**
- **143T- 588/9 FRAMES**
- **600 VOLTS AND BELOW**

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1.0 SCOPE

This specification details the mechanical and electrical requirements for Premium energy–efficient, totally enclosed fan–cooled and totally enclosed non–ventilated squirrel–cage induction motors, NEMA frame size 143T through 588/9.

It is the intent of this specification to define premium quality motors which will provide energy efficient operation with high mechanical integrity under severe environment operating conditions for maximum life and minimum life cycle costs. Motors shall be WEG IEEE 841 or approved equal.

2.0 GENERAL

2.1 All motors covered by this specification shall conform to the latest applicable requirements of NEMA MG1, IEEE-Std 841, ANSI, and NEC standards.

2.2 Motors are to be designed for continuous duty for 3–phase, 60 HZ, 200, 230, 460 or 575 volt operation, (Where system voltages are typically 208, 240, 480, or 600V) NEMA design B. *Design A motors are acceptable only if locked rotor KVA/HP remains in the same code letter as Design B .*

2.3 Ratings to be based on a 40^0 C ambient, 3,300 feet (1000m) altitude or lower operation, with a maximum temperature rise of 80^0 C by resistance at 1.0 service factor, (and 90^0 C rise 1.15SF thru 150HP). Motors applied on Variable Frequency Drives (VFD) Shall not exceed Class F rise at any speed under the defined load.

2.4 Motors to be furnished with Class F insulation, 1.25 service factor through 100HP and 1.15SF 125HP and larger(1.0SF on VFD operation) but shall be selected for operation within their full load rating without applying the service factor.

2.5 Motors shall be of a NEMA Premium® efficient design.

2.6 Motors shall be evaluated on conformance to this specification and total costs including initial cost and operating life–cycle cost. Life–cycle cost to be based on motor efficiency evaluation at a stated dollar penalty per kilowatt of motor losses based on specific operating conditions.

3.0 MECHANICAL

3.1.0 Bearings and Lubrication

3.1.1 Bearings shall be ball, open, single row, deep groove, Conrad type, and shall have a Class 3 internal fit conforming to ANSI/ABMA Std. 20-1996. For belted duty applications, drive end bearing may be cylindrical roller type.

3.1.2 Bearing shall be selected to provide L10 rating life of 40,000 hours minimum for belted applications, 100,000 hours minimum for flexible direct coupled applications. Calculations shall be based on external loads using NEMA belted applications limits per MG1–2011–14.42 and typical sheave weights and internal loads defined by the manufacturer including magnetic pull and rotating assembly weight.

3.1.3 Bearing temperature rise at rated load shall not exceed 50^0C 3600 RPM or 45^0C 1800 RPM and slower. Temperature rise is to be measured by RTD or thermocouple at bearing outer race.

3.1.4 Bearing identification/size number shall be stamped on motor nameplate.

3.1.5 Motor lubrication system shall consist of a grease inlet on motor bracket with capped grease fitting on inlet, grease relief plug 180 degree from inlet(120degrees on Fan end and extended through the fan cover to allow access), grease reservoir in bracket and grease reservoir in cast bearing inner cap. Grease inlet extension tubes shall be made of seamless stainless steel for long term durability. Outer bearing caps shall be provided on frames 364T and larger to allow examination of the bearings and lubricant without disassembly of the motor.

3.1.6 To insure good relubrication, the grease path through the bearing should enter on the inner cap side and exit on the opposite side to flush grease through the bearing cavity such as the WEG Positive Pressure Lubrication System (PPLS).

3.1.7 Motor to be greased by manufacturer with a premium moisture resistant polyurea thickened grease containing rust inhibitors and suitable for motor operation over temperatures from -30^0C to 80^0C. Polyrex EM or equal

3.1.8 Both bearings shall be protected by INPRO/SEAL® bearing isolators.

3.1.9 The opposite drive end (ODE) bearing shall be insulated on all frames L449T and larger

3.2.0 Enclosures

3.2.1 Motor enclosure including frame with integrally cast feet, end brackets, bearing inner caps, fan guard, and conduit box and cover shall be cast iron, ISO FC200 grade or better.

3.2.2 Motor conduit box shall be cast iron construction, rotatable in 90 degree increments, diagonally split with tapped NPT threaded conduit entrance hole. Neoprene conduit box cover gasket and neoprene lead seal gasket shall be furnished. Provision for grounding shall be provided in the conduit box utilizing a mounted clamp–type lug.

3.2.3 External cooling fan shall be corrosion–resistant, non–sparking, bi–directional, keyed, clamped and shouldered on the motor shaft.

3.2.4 Motor rotor construction shall be die cast aluminum or fabricated copper or their respective alloys. Rotating assembly shall be dynamically balanced to ISO G1 level. Balance weights, if required, shall be secured to the rotor resistance ring by peened integrally cast sprues. Machine screws and nuts are prohibited. The rotating assembly shall be coated with a corrosion–resistant epoxy.
Vibration readings shall not exceed the levels specified in IEEE Std 841-2009 at all frequencies or .04"/sec overall velocity.

3.2.5 Stainless steel automatic breather drains shall be provided in the lowest part of both end brackets to allow drainage of condensation.

3.2.6 All mounting hardware shall be hex head, SAE Grade 5 (ISO 8.8) or better, plated for corrosion protection. Screwdriver slot fasteners are prohibited. Forged steel shouldered eyebolt(s) shall be provided on all frames. Eyebolt receptacle shall be threaded and designed to prevent moisture or foreign material from entering motor when eyebolt is removed.

3.2.7 Corrosion–resistant stainless steel nameplate shall be affixed to motor frame with stainless steel or brass drive pins. Nameplate(s) shall include all required NEMA data, bearing size, relubrication type, frequency and amount, and connection diagram for motors with more than three leads.

3.2.8 Frame to end bracket fits shall be protected and sealed by application of thick corrosion–resistant material to the machine surfaces prior to assembly.

3.2.9 The machined surface of the motor feet as well as shaft and flange mounting surfaces shall be free of paint and protected by easily removable rust inhibitor to ensure ease of mounting and alignment. The foot flatness shall not exceed .005"

3.2.10 All motor parts including frame, brackets, fan guard, and conduit box shall receive application of high grade epoxy paint. Motor assembly must satisfactorily withstand salt spray tests for corrosion per ASTM B–117 for 240 hours.

4.0 ELECTRICAL

4.1 All motors shall successfully operate under power supply variations per NEMA MG1–2009–12.44.

4.2 All motors shall be NEMA Design B with torque and starting currents in accordance with NEMA MG1–2009–12.35 and 12.38 except in special applications requiring higher starting torques where NEMA Design C is permitted. *Design A motors are acceptable only if locked rotor KVA/HP remains in the same code letter as Design B.*

4.3 Motors shall have copper windings.

4.4 Stators and rotors should be constructed of high quality silicon electrical lamination steel. All frames 254T and larger 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.

4.5 Motor insulation system shall be Class F minimum, utilizing materials and insulation systems evaluated in accordance with IEEE 117 classification tests. Magnet Wire and Varnish resins should meet a minimum of Class H requirements.

4.6 Motor leads shall be non-wicking type, Class F temperature rating or better and permanently numbered for identification.

4.7 Entire wound and insulated stator shall receive a coating of epoxy paint on air gap surfaces to protect against moisture and corrosion.

4.8 Motor windings should be suitable for use on Variable Frequency controllers and meet the requirements of NEMA MG1 part 31.4.4 for voltage spike resistance. Magnet wire shall include corona resistant technology to extend life on VFD service.

5.0 NOISE

5.1 The no–load sound pressure level, based on the A–weighted scale at 3 feet when measured in accordance with IEEE Std. 85 should not exceed 85 dBA.

6.0 EFFICIENCY

6.1 All motors shall be of an energy–efficient design, different from manufacturer's standard product through the use of premium materials, design and improved manufacturing process. Nominal efficiencies shall exceed NEMA MG1–2009 Table 12–12. NEMA Premium® ratings shall be used where they can be supplied as Design B.

6.2 Motor efficiency shall be determined in accordance with NEMA MG1–2009–12.58.1 and full load efficiency labeled on motor nameplate in accordance with NEMA MG1–2009–12.58.2.

7.0 Testing

7.1 Each completed and assembled motor shall receive a routine factory test per IEEE Standard 841 requirements.