



Preliminary Analysis Public Meeting Supplementary Handout

ENERGY EFFICIENCY PROGRAM

FOR COMMERCIAL EQUIPMENT:

ENERGY CONSERVATION STANDARDS FOR ELECTRIC MOTORS

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U.S. Department of Energy

Assistant Secretary

Office of Energy Efficiency and Renewable Energy

Building Technologies Program

Appliances and Commercial Equipment Standards

Washington, DC 20024

Table 1 - Electric Motors Considered for Minimum Energy Efficiency Standards

Motor Type	New Definition Considered for CFR¹?	Test Procedure Revision Necessary?	Currently Subject to Minimum Energy Efficiency Standards?	Would be Subject to Minimum Energy Efficiency Standards Under Planned Approach?
Air-Over Electric Motor	Yes	No	No	No
Component Set of an Electric Motor	Yes	No	No	No
Electric Motor with Customer Defined Endshields or Special Flanges	Yes	No	No	Yes
Electric Motor with Single or Double Shafts of Non-Standard Dimensions or Additions	No	No	Some	Yes
Electric Motor with Non-Standard Base or Mounting Feet	No	No	Some	Yes

¹ Code of Federal Regulations.

Motor Type	New Definition Considered for CFR ¹ ?	Test Procedure Revision Necessary?	Currently Subject to Minimum Energy Efficiency Standards?	Would be Subject to Minimum Energy Efficiency Standards Under Planned Approach?
Electric Motor with Sleeve Bearings	No	No	No	Yes
Electric Motor with Thrust Bearings	No	Yes	No	Yes
Encapsulated Electric Motor	Yes	No	No	Yes
IEC Design N Electric Motor	Yes	No	Yes	Yes
Immersible Electric Motor	Yes	Yes	No	Yes
Integral Brake Electric Motor	Yes	Yes	No	Yes
Inverter-Capable Electric Motor	Yes	Yes	Yes	Yes
Inverter-Only Electric Motor	Yes	No	No	No

Motor Type	New Definition Considered for CFR ¹ ?	Test Procedure Revision Necessary?	Currently Subject to Minimum Energy Efficiency Standards?	Would be Subject to Minimum Energy Efficiency Standards Under Planned Approach?
Liquid-Cooled Electric Motor	Yes	No	No	No
NEMA Design A Electric Motor	Yes	No	Yes	Yes
NEMA Design C Electric Motor	Yes	No	Yes	Yes
Non-Integral Brake Electric Motor	Yes	Yes	Yes	Yes
Partial Electric Motor	Yes	Yes	No	Yes
Submersible Electric Motor	Yes	No	No	No
Totally Enclosed, Non-Ventilated Electric Motor	Yes	Yes	No	Yes
Vertical Hollow-Shaft Electric Motor	No	Yes	No	Yes

Motor Type	New Definition Considered for CFR¹?	Test Procedure Revision Necessary?	Currently Subject to Minimum Energy Efficiency Standards?	Would be Subject to Minimum Energy Efficiency Standards Under Planned Approach?
Vertical Solid-Shaft Electric Motor	No	Yes	Yes	Yes

Table 2 - Planned Definitions

Motor Type	New Definition
Air-Over Electric Motor	...means an electric motor designed for cooling by a ventilating means external to and not supplied with the motor.
Component Set of Electric Motor	...means a combination of motor parts that require more than the addition of two endshields to create an operable motor. These parts may consist of any combination of a stator frame, wound stator, rotor, shaft, or endshields.
Electric Motor with Customer Defined Endshields or Special Flanges	...means an electric motor with customized flanges which do not conform to NEMA MG1–2011 paragraphs 1.63.1, 1.63.2, or 1.63.3.
Encapsulated Electric Motor	...means an electric motor that has an insulation system which, through the use of materials, processes, or a combination of materials and processes, results in windings and connections that are sealed against contaminants. This type of machine is intended for environmental conditions and shall be capable of passing the conformance test in NEMA MG1-2011 section 12.62.
IEC Design N Electric Motor	...means a three-phase cage induction motor intended for direct-on-line starting, having 2, 4, 6, or 8 poles, rated from 0.4 kW to 1600 kW and conforming to the IEC60034-12 edition 2.1 torque characteristics in section 6.1, locked rotor apparent power in section 6.2, and starting requirements in section 6.3.
Immersible Electric Motor	...means an electric motor designed to withstand complete immersion in liquid for a limited amount of time.
Integral Brake Electric Motor	...means an electric motor containing a brake mechanism either inside of the motor endshield or between the motor fan and endshield such that removal of the brake component would require extensive disassembly of the motor or motor parts.
Inverter-Capable Electric Motor	...means an electric motor that can run continuously when directly connected to a polyphase, sinusoidal bus, but is also capable of handling continuous operation on an inverter drive.
Inverter-Only Duty Electric Motor	...means an electric motor designed such that it can only be run continuously when operated through an inverter drive.

Motor Type	New Definition
Liquid-Cooled Electric Motor	...means an electric motor that is cooled by circulating liquid, with the liquid or liquid conductors coming into direct contact with the machine parts.
NEMA Design A Electric Motor	...means a squirrel-cage motor designed to withstand full-voltage starting and developing locked-rotor torque as shown in NEMA MG1-2011 12.38, pull-up torque as shown in NEMA MG1-2011 12.40, breakdown torque as shown in NEMA MG1-2011 12.39, with locked-rotor current higher than the values shown in 12.35.1 for 60 hertz and 12.35.2 for 50 hertz and having a slip at rated load of less than 5 percent for motors fewer than 10 poles.
NEMA Design C Electric Motor	...means a squirrel-cage motor designed to withstand full-voltage starting, developing locked-rotor torque for special high-torque applications up to the values shown in NEMA MG1-2011 12.38, pull-up torque as shown in NEMA MG1-2011 12.40, breakdown torque up to the values shown in NEMA MG1-2011 12.39, with locked-rotor current not to exceed the values shown in 12.35.1 for 60 hertz and 12.35.2 for 50 hertz, and having a slip at rated load of less than 5 percent.
Non-Integral Brake Electric Motor	...means an electric motor containing a brake mechanism attached externally in such a manner that it could be readily detached from the motor without extensive disassembly of the motor or motor components.
Partial Electric Motor	...means an electric motor necessitating only the addition of one or two endshields with bearings to create an operable motor. Included under this definition are integral motors and partial $\frac{3}{4}$ motors.
Submersible Electric Motor	...means an electric motor designed for continuous operation while submersed in liquid. Such a motor is unable to operate continuously if not submersed in liquid.
Totally Enclosed, Non-Ventilated (TENV) Electric Motor	...means an electric motor that is a frame-surface-cooled, totally enclosed machine which is only equipped for cooling by free convection.

Table 3 - Planned Test Procedure Language Additions

Motor Type	Planned Test Procedure Language Addition
Electric Motor with Sleeve Bearings	Electric motors with sleeve bearings are to be tested without removing the sleeve bearings, and testing the motor in the same manner as a general purpose electric motor.
Electric Motor with Thrust Bearings	Electric motors with thrust bearings are to be tested with the motor mounted horizontally on the test bench and with the thrust bearings removed and replaced with rolling element, deep-groove radial ball bearings.
Immersible Electric Motor	Immersible electric motors are to be tested with the seals removed during testing.
Integral Brake Electric Motor	Integral brake electric motors are to be tested with the integral brake component attached to the motor, with the brake component energized as it would be during field-application duty.
Inverter-Capable Electric Motor	Inverter-capable electric motors are to be tested with no inverter drive connected to the motor.
Non-Integral Brake Electric Motor	Non-integral brake electric motors are to be tested with the brake component physically removed prior to testing, including any electrical connections the brake component has to the electric motor.
Partial Electric Motor	Partial electric motors are to be tested with endplate(s) and the necessary rolling element, deep-groove radial ball-bearing(s) attached to either the drive-end, non-drive end, or both ends of the motor. Endplates may either be fabricated by the NIST-certified motor testing laboratory performing the testing or supplied by the motor manufacturer.
Totally Enclosed, Non-Ventilated Electric Motor	Totally enclosed, non-ventilated electric motors are to be tested in the same manner as a general purpose electric motor.
Vertical Hollow-Shaft Electric Motor	Vertical hollow-shaft electric motors are to be tested with the motor mounted horizontally on a test bench. A shaft extension shall be attached to the hollow-shaft portion of the motor in a manner that allows the motor to attach to a dynamometer. Thrust bearings not capable of operating in a horizontal orientation are to be removed and replaced with rolling element, deep-groove radial ball bearings.

Motor Type	Planned Test Procedure Language Addition
Vertical Solid-Shaft Electric Motor	Vertical solid-shaft electric motors are to be tested with the motor mounted horizontally on the test bench. Thrust bearings not capable of operating in a horizontal orientation are to be removed and replaced with rolling element, deep-groove radial ball bearings.