

Energy Independence & Security Act (EISA) 2014 Expansion Ruling Raises Motor Efficiency Requirements

Energy savings, lowering operating costs, and protecting the environment are all important to NORD. This is precisely why NORD supports legislative efforts to increase energy efficiency not only in the US but globally.

In May 2014, the U.S. Department of Energy (DOE) announced a revision to the 2007 EISA regulations. The amended energy conservation legislation covering commercial and industrial electric motors is under subpart B of Title 10 of the Code of Federal Regulations, Part 431 (10 CFR Part 431). Effective June 1, 2016, almost all continuous duty, general purpose motors, must meet NEMA Premium Efficiency levels per NEMA MG 1 Table 12-12 or Part 20, Table A or B.

The new law has removed many exemptions that had been part of the previous EISA regulations. With the old regulations certain motors were allowed to operate within previous EPAAct guidelines meaning they were allowed to meet energy efficiency levels per NEMA MG 1 Table 12-11 and certain motors were exempt from any efficiency requirements.

The US motor efficiency laws and regulations only apply to motors that will be installed in the United States. Other countries also have laws that mandate motor efficiency levels, but this paper only address the US laws and regulations.

Why Improving Motor Efficiency Matters

Mandating higher motor efficiency levels is about managing resources and protecting the environment. Improving motor operating efficiencies contributes to a number of societal benefits including, saving fossil fuels, reducing harmful air emission, improving air quality, reducing acid rain and reducing the human impact on climate change. It has been reported that industrial electric motor driven systems used in production account for nearly 680 billion kWh, or about 23% of all the electricity sold in the USA. Motors used in industrial space heating, cooling and ventilation systems use an additional 68 billion kWh.

Efficient use of energy is also about improving operating cost-efficiencies and increasing profitability for business and investors. Motor systems are said to account for approximately 60-70% of the total energy used in industrialized areas. Studies have shown that for many motor applications the combined costs of purchasing, installing and maintaining these motors only represents about 5% or less of the cost of ownership whereas the operating energy costs represent nearly 95% of the cost of ownership.

What the 2014 EISA Law Includes

Excerpt from Title 10 of the Code of Federal Regulations, Part 431 (10 CFR Part 431) §431.12 Definitions.

The 2104 EISA Expansion Ruling includes general purpose motors defined as follows:

- (1) Is a single-speed, induction motor;
- (2) Is rated for continuous duty (MG1) operation or for duty type S1 (IEC);
- (3) Contains a squirrel-cage (MG1) or cage (IEC) rotor;
- (4) Has foot-mounting that may include foot-mounting with flanges or detachable feet;
- (5) Is built in accordance with NEMA T-frame dimensions or their IEC metric equivalents, including a frame size that is between two consecutive NEMA frame sizes or their IEC metric equivalents;
- (6) Has performance in accordance with NEMA Design A (MG1) or B (MG1) characteristics or equivalent designs such as IEC Design N (IEC);
- (7) Operates on polyphase alternating current 60-hertz sinusoidal power, and:
 - (i) Is rated at 230 or 460 volts (or both) including motors rated at multiple voltages that include 230 or 460 volts (or both), or
 - (ii) Can be operated on 230 or 460 volts (or both); and
- (8) Includes, but is not limited to, explosion-proof construction.

FAQ 040

EISA 2014 What NORD will do?

Motors with their efficiency level increased to Premium Efficient in the 2014 EISA regulations:

- Gearmotors (motors)
- Brakemotors
- Partial electric motors
- U-Frame
- NEMA design C
- Close-coupled pump motors
- Footless motors
- 8-pole motors, and
- Special shaft/special flange motors

How this affects NORD and NORD's customers:

Continuous duty motors for integral gearmotors must be Premium Efficient level as defined in NEMA MG 1-2009 Table 12-12 (enclosed motors) from 1 to 500hp effective June 1, 2016. In the past motors for gearmotors did not have a legally mandated efficiency level.

Another point to the law is the efficiency requirement only applies to motors for "Continuous Duty" according to the NEMA MG1 or "S1" according to IEC standards. NORD will provide motors rated for intermittent operation for non-continuous applications.

One disadvantage to higher efficiency motors, like Premium Efficient, is that they have more rotating mass (or inertia). This increased inertia takes energy to start and stop. In many dynamic or high cycling applications the Premium Efficient motor can actually consume more electrical energy than a low inertia lower efficient design. As a result, NORD will continue to provide a low inertia, lower efficient motor as an option for our customers. However these motors will not be rated for continuous duty and are not to be used on continuous duty applications.

The rated motor efficiencies do not tell the whole story about energy consumption. The correct perspective for energy savings is to focus on the consumed energy for a system and not on the motor rated efficiency alone. A higher rated motor efficiency does not ensure lower energy usage in an actual application.

Continuous Duty vs Intermittent Duty

A critical factor for determining if a motor needs to be Premium Efficient is deciding if the application requires a motor rated for continuous operation or if the application is intermittent in nature and an intermittent rated motor can be applied.

The basic decision for Continuous or Intermittent is rather easy. If the motor is switched on and runs continuously then the motor should be rated for continuous duty. If the motor is switched on for a short time or has a cyclic operation then the motor can be rated intermittent operation and the motor has no efficiency requirement. If it is not clear if the motor is continuous or intermittent the motor operation time can be evaluated. If the motor is running more than one hour continuously with no switching on or off during that time, then, in general, the application is continuous and a continuous duty motor is required. If the motor runs for less than an hour continuously then the application can be considered intermittent and the motor can be an intermittent duty motor.

Typical continuous applications

- Bucket elevators
- Bulk material handling conveyors
- Continuous flow pumps
- Continuous mixers

Typical intermittent applications

- Crane drives (travel & hoist)
- Doors
- Hoists & lifts
- Indexing systems
- Machine tools
- Metering pumps
- Packaging equipment
- Palletizing
- Punch presses
- Short time or batch mixing
- Slide gates
- Sortation conveyors
- Theatrical (hoists & winches)
- Turntables
- Valve actuators
- Winches
- Winders & coilers
- Zone control conveyors

In the new regulations general purpose motors are defined as according to the IEC duty class S1 (continuous duty). This means the other IEC duty classes S2 – S10 are not general purpose motors and therefore are not covered by efficiency level requirements.

NORD Motor Offerings

In order to satisfy the 2014 EISA Expansion Ruling, NORD will offer two standard motors.

Continuous Duty - NORD will continue to offer Premium Efficient (IE3) motors and brakemotors that meet the latest energy efficiency mandates. These motors are intended for continuous duty applications and they offer high starting torque and peak performance in the most difficult applications including inverter or vector duty applications.

Intermittent Duty - In addition, NORD will offer a motor specifically for intermittent duty applications from 1 to 40 hp. These motors will be labeled 60-Min duty. These NORD motors offer high cycling capacity, lower motor rotor inertia and reduced current requirements upon startup making them perfectly suited for many areas including: cranes, hoists, winches, machine tools and punch presses, winders and coilers, slide gates and valve actuators, feeding devices, and many conveyor systems. These NORD motors are also Inverter Duty rated and produce improved dynamic performance when paired with a high performance AC drive. It is possible to have the motors labeled intermittent ratings other than "60MIN" but this will be done on a case by case basis.

Conclusion

With energy efficient gearing, AC Drives and high performance motors, NORD provides a complete product portfolio that can be incorporated into intelligent energy saving systems. NORD can be your partner in selecting a motor to match each application condition and is ideally suited for performance and maximum energy savings.

FAQ 040

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Abbreviations & Definitions

NEMA	National Electrical Manufactures Association
NEMA MG 1	Motors and Generators (<i>US motor standard</i>)
Premium Efficient	Motors with efficiencies according to table 12-12 in NEMA MG 1
Energy Efficient	Motors with efficiencies according to table 12-11 in NEMA MG 1
60MIN	Motor rating for intermittent operation according to NEMA MG 1. Maximum continuous operating time of 60 minutes.
EISA	Energy Independence & Security Act (<i>US law that includes motor efficiency requirements</i>)
EPAct	Energy Policy Act (<i>Older US law that includes motor efficiency requirements</i>)
DOE	US Department of Energy
IEC	International Electrotechnical Commission (<i>international standards organization</i>)
IEC 60034-1	Rotating electrical machines - Part 1: Rating and performance (<i>international motor standard</i>)
S1	Motor for continuous duty per IEC 60034-1
S2-S10	Other motor duty class ratings per IEC 60034-1