



Shop Tech Talk December 2010



Energy Independence and Security Act of 2007 (EISA)

By December 19, 2010, Federal regulators will require that certain motors*sold in the United States exhibit specific energy-efficiency performance under the Energy Independence and Security Act (EISA) of 2007 (Public Law 110-140 consisting of 311 pages, only 2 pages to do with electric motor, Section 313)

This means there will be new Federal minimum standards for nominal full-load motor efficiencies, effective for motors manufactured after Dec. 19, 2010.

Beginning on December 19, 2010, motor manufacturers may not sell motors built after December 19, 2010 with a lower nameplate efficiency than EISA allows.

EISA applies to both NEMA and IEC motors with features described in the details of the law.

EISA allows motors that are considered “finished goods” or are shipped from the factory before December 19, 2010 to be sold after December 19, 2010.

*Certain Motors:

1. General Purpose NEMA and IEC motors that today need to meet EAct efficiency, will need to meet the NEMA Premium efficiency levels beginning on December 19, 2010.

2. General Purpose NEMA and IEC motors that were exempt from EAct because of voltage, mounting etc. Will need to meet EAct efficiency beginning on December 19, 2010.

3. NEMA and IEC motors that are not considered “General Purpose” (i.e. Motors that cannot be used in most applications, such as special shafts, blowers or nonstandard frequencies, nonstandard volts/Hz remain exempt from EISA regulations for efficiency.

Some thoughts to keep in mind

1. **Electric motor systems account for 23% of all electricity consumed in the U.S. and 70% of all electrical energy in the manufacturing sector.**

2. **When considering purchasing a new electric motor remember that only about 2% of the life cycle cost of a motor is in its purchase price so even though a NEMA Premium motor will cost more up front than a non-Premium motor, that cost is quickly offset by its lower electric consumption.**

3. **Much greater savings will be made when replacing older pre EAct motors.**

4. **Always consider the total drive train i.e. speed reducers, belt drives, VSDs etc when looking for maximum total possible savings.**

What follows are notes provided by Baldor Electric and Marathon Electric.

Together they should answer most questions.

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An Overview of the Energy Independence & Security Act of 2007 (EISA)

What is EISA?

The Energy Independence and Security Act of 2007 (EISA) was passed by Congress and signed into law on December 19, 2007. EISA builds upon the previous EPCA (Energy Policy Act of 1992) updating mandated efficiency standards for general purpose, three-phase AC industrial motors from 1 to 500 horsepower which are manufactured for sale in the United States. The U.S. Department of Energy (DOE) is responsible for establishing the rules to implement and enforce EPCA.

When is the effective date for EISA?

EISA applies to motors manufactured after December 19, 2010.

What are the efficiency standards under EISA?

For each general-purpose rating (Subtype I) from 1 to 200 horsepower that was previously covered by EPCA, the law specifies a nominal full-load efficiency level based on NEMA Premium® efficiency as shown in NEMA MG 1, Table 12-12. All motors currently under EPCA, manufactured after December 19, 2010, must meet or exceed this efficiency level.

General Purpose Electric Motors (Subtype II) not previously covered by EPCA will be required to comply with Energy Efficient efficiencies as defined by NEMA MG 1, Table 12-11. The term 'general purpose electric motor (subtype II)' means motors incorporating the design elements of a general purpose electric motor (subtype I) that are configured as 1 of the following:

- U-Frame Motor.
- Design C Motor.
- Close-coupled pump motor.
- Footless motor.
- Vertical solid shaft normal thrust motor (as tested in a horizontal configuration).
- An 8-pole motor (900 rpm).
- A poly-phase motor with voltage of not more than 600 volts (other than 230 or 460 volts).
- 201 – 500 horsepower motors not previously covered by EPCA will be required to comply with Energy Efficient efficiencies as defined by NEMA MG 1, Table 12-11.

Are fractional HP and 48 or 56 frame motors included in EISA?

Only 1 – 500 HP motors with 3-digit frame NEMA numbers (143T-up) included in EISA. This also includes equivalent IEC frame designations.

How do the efficiency levels of EISA compare to the efficiencies of Baldor's standard motors and Super-E® motors?

Generally, the mandated efficiency levels of EISA for Subtype I motors fall at the present efficiencies of Baldor's Baldor's Super-E® NEMA Premium® efficient motors for general-purpose 1 – 200 HP motors.

The Subtype II 1 – 200 HP and general purpose 201 – 500 HP motors may require Baldor to raise efficiency of some designs to comply with MG 1, Table 12-11, however many Standard-E® designs presently comply. Super-E® motors will meet or exceed the EISA requirements for either of these motor types.

What Motors are not covered by EISA?

- Design D with high slip
- Adjustable speed with optimized windings
- Customized OEM mounting
- Intermittent duty
- Integral with gearing or brake where motor cannot be used separately
- Submersible motors

Does EISA apply to every three-phase electric motor from 1 to 500 horsepower?

Not every configuration, but almost all motors except some special OEM designs with proprietary mounting configurations. The following motor configurations are exempt from EISA compliance:

- Integral garmotors
- Integral brake motors
- Inverter duty motors with windings optimized for ASD use that cannot be line-started
- Design D high-slip motors

How about motors included in OEM equipment that require listing or certification?

EISA will require that any custom motors that fall within the guidelines of the act will comply with the efficiency levels for that type of motor. Baldor urges each OEM to prepare for the changes well before December of 2010 and develop designs immediately, particularly when UL or CSA approvals are required.

How about duty-cycle rated motors?

EISA makes no distinction for duty cycle rating. Again, one has to look at the EPA definition of “electric motors” and “general purpose” to determine if a particular design falls under the requirements.

Does EISA include IEC frame motors?

Yes, the DOE considers motors built to IEC metric frame dimensions equivalent to NEMA T-frame dimension to fall under EISA.

Does EISA apply to both stock and custom motors?

Yes. EISA makes no distinction between stock or custom motors. The determining factor under EISA is whether a particular motor meets the law’s definition of “electric motor”.

Does EISA apply to motors manufactured outside of the United States and imported for use?

Yes. The requirements of EISA include imported electric motors. This also includes the electric motors “as a component of another piece of equipment”.

How about electric motors for export outside of the United States?

EISA does not apply to motors exported outside the United States, including motors mounted on equipment. The DOE will require these motors or their boxes to be specifically marked “Intended for Export”. Countries outside of the United States are enacting their own Minimum Efficiency Performance Requirements (MEPS) that may require compliance.

Does EISA require any motors in use to be replaced?

No, EISA does not contain any requirement to replace electric motors in use.

How about electric motors in inventory?

EISA does not affect any inventories of electric motors. The law only applies to motors manufactured after December 19, 2010. Motors in inventory on that date can be sold or used as before the law.

Does EISA apply to rebuilt, repaired or rewound motors?

No, EISA only applies to new motors manufactured after the effective date.

How is full-load nominal efficiency determined?

Like EPCAct, EISA specifies that the test procedures for determining a motor's efficiency shall be as specified in NEMA MG1-2006 and IEEE Standard 112, Test Method B or CSA 390. The full-load nominal efficiencies of all Baldor motors are and have been determined in accordance with these standards.

What are the labeling requirements under EISA?

Like EPCAct, EISA requires that an electric motor's nameplate include the nominal full-load efficiency for that motor rating. All Baldor motors produced today already include this information. EPCAct and EISA also require that product catalogs and literature include motor efficiency information.

The Energy Independence and Security Act of 2007

Motor Types	Efficiency Requirements
<p>General-purpose rating from 1 to 200 horsepower that was previously covered by EAct.</p> <p>Foot-mounted 3-digit frame sizes</p> <p>As above with C-face and foot mount</p> <p>Includes ODP, TEFC, explosion-proof, etc.</p>	<p>Requires NEMA Premium Efficiency NEMA MG-1 Table 12-12</p>
<p>U-Frame Motor.</p> <p>Design C Motor.</p> <p>Close-coupled pump motor.</p> <p>Footless motor.</p> <p>Vertical solid shaft normal thrust motor (as tested in a horizontal configuration).</p> <p>An 8-pole motor (900 rpm).</p> <p>A poly-phase motor with voltage of not more than 600 volts (other than 230 or 460 volts.</p> <p>201 – 500 horsepower motors not previously covered by EAct</p>	<p>Requires Energy Efficient NEMA MG-1 Table 12-11</p>
<p>Design D with high slip</p> <p>Adjustable speed with optimized windings</p> <p>Customized OEM mounting</p> <p>Intermittent duty</p> <p>Integral with gearing or brake where motor cannot be used separately</p> <p>Submersible motors</p>	<p>No Efficiency Requirements</p>

NEMA MG-1 Table 12-12 Full-Load Efficiencies for 60 Hz NEMA Premium® Efficient Electric Motors Rated 600 Volts or less (Random Wound)

Motor Horsepower	Nominal Full-Load Efficiency					
	Open Motors			Enclosed Motors		
	2 Pole	4 Pole	6 Pole	2 Pole	4 Pole	6 Pole
1	77.0	85.5	82.5	77.0	85.5	82.5
1.5	84.0	86.5	86.5	84.0	86.5	87.5
2	85.5	86.5	87.5	85.5	86.5	88.5
3	85.5	89.5	88.5	86.5	89.5	89.5
5	86.5	89.5	89.5	88.5	89.5	89.5
7.5	88.5	91.0	90.2	89.5	91.7	91.0
10	89.5	91.7	91.7	90.2	91.7	91.0
15	90.2	93.0	91.7	91.0	92.4	91.7
20	91.0	93.0	92.4	91.0	93.0	91.7
25	91.7	93.6	93.0	91.7	93.6	93.0
30	91.7	94.1	93.6	91.7	93.6	93.0
40	92.4	94.1	94.1	92.4	94.1	94.1
50	93.0	94.5	94.1	93.0	94.5	94.1
60	93.6	95.0	94.5	93.6	95.0	94.5
75	93.6	95.0	94.5	93.6	95.4	94.5
100	93.6	95.4	95.0	94.1	95.4	95.0
125	94.1	95.4	95.0	95.0	95.4	95.0
150	94.1	95.8	95.4	95.0	95.8	95.8
200	95.0	95.8	95.4	95.4	96.2	95.8
250	95.0	95.8	95.4	95.8	96.2	95.8
300	95.4	95.8	95.4	95.8	96.2	95.8
350	95.4	95.8	95.4	95.8	96.2	95.8
400	95.8	95.8	95.8	95.8	96.2	95.8
450	95.8	96.2	96.2	95.8	96.2	95.8
500	95.8	96.2	96.2	95.8	96.2	95.8

NEMA MG-1 Table 12-11 Full-Load Efficiencies of Energy Efficient Motors

Motor Horsepower	Nominal Full-Load Efficiency							
	Open Motors				Enclosed Motors			
	2 Pole	4 Pole	6 Pole	8 Pole	2 Pole	4 Pole	6 Pole	8 Pole
1	-	82.5	80.0	74.0	75.5	82.5	80.0	74.0
1.5	82.5	84.0	84.0	75.5	82.5	84.0	85.5	77.0
2	84.0	84.0	85.5	85.5	84.0	84.0	86.5	82.5
3	84.0	86.5	86.5	86.5	85.5	87.5	87.5	84.0
5	85.5	87.5	87.5	87.5	87.5	87.5	87.5	85.5
7.5	87.5	88.5	88.5	88.5	88.5	89.5	89.5	85.5
10	88.5	89.5	90.2	89.5	89.5	89.5	89.5	88.5
15	89.5	91.0	90.2	89.5	90.2	91.0	90.2	88.5
20	90.2	91.0	91.0	90.2	90.2	91.0	90.2	89.5
25	91.0	91.7	91.7	90.2	91.0	92.4	91.7	89.5
30	91.0	92.4	92.4	91.0	91.0	92.4	91.7	91.0
40	91.7	93.0	93.0	91.0	91.7	93.0	93.0	91.0
50	92.4	93.0	93.0	91.7	92.4	93.0	93.0	91.7
60	93.0	93.6	93.6	92.4	93.0	93.6	93.6	91.7
75	93.0	94.1	93.6	93.6	93.0	94.1	93.6	93.0
100	93.0	94.1	94.1	93.6	93.6	94.5	94.1	93.0
125	93.6	94.5	94.1	93.6	94.5	94.5	94.1	93.6
150	93.6	95.0	94.5	93.6	94.5	95.0	95.0	93.6
200	94.5	95.0	94.5	93.6	95.0	95.0	95.0	94.1
250	94.5	95.4	95.4	94.5	95.4	95.0	95.0	94.5
300	95.0	95.4	95.4	-	95.4	95.4	95.0	-
350	95.0	95.4	95.4	-	95.4	95.4	95.0	-
400	95.4	95.4	-	-	95.4	95.4	-	-
450	95.8	95.8	-	-	95.4	95.4	-	-
500	95.8	95.8	-	-	95.4	95.8	-	-

from Marathon Electric

A summary of EISA requirements follows:

<u>Description</u>	<u>Efficiency*</u>
1-200HP, T frame, 2/4/6-Pole, 230 or 460V, 3-Ph, 60 Hz, open	NEMA MG1 Table 12-12
1-200HP, T frame, 2/4/6-Pole, 230 or 460V, 3-Ph, 60 Hz, enclosed	NEMA MG1 Table 12-12
1-200HP, T frame, 2/4/6-Pole, 230 or 460V, 3-Ph, 60 Hz, explosion proof	NEMA MG1 Table 12-12
201-500 HP, 2/4/6-Pole, <600V, open or enclosed	NEMA MG1 Table 12-11
U frame	NEMA MG1 Table 12-11
Design C	NEMA MG1 Table 12-11
Close-coupled pump	NEMA MG1 Table 12-11
Fire Pump motors	NEMA MG1 Table 12-11
Footless motors	NEMA MG1 Table 12-11
Vertical Solid Shaft, normal thrust	NEMA MG1 Table 12-11
8-Pole (900 RPM @ 60 Hz)	NEMA MG1 Table 12-11
Multi-speed (based on highest HP & associated pole/RPM)	NEMA MG1 Table 12-11
3-Ph, 60 Hz, with voltages less than 600 but not 230 or 460	NEMA MG1 Table 12-11
Intermittent duty	NEMA MG1 Table 12-11
3-Ph, 50 Hz, all voltages	Not subject to EISA
60/50 Hz rated motors subject to EISA if operated at 60 Hz	
TEBC and DPFV not subject to EISA	

*NEMA Table 12-12 refers to NEMA Premium; Table 12-11 generally refers to EPAct levels.