

US DoE Integral Horsepower Motor Rule for low voltage motors



The USA has been at the forefront in requiring minimum efficiency levels for low voltage motors. The current Energy Independence and Security Act (EISA) was signed into law on December 19, 2007, revised in 2010 and replaced by the Integral Horsepower Motor Final Rule (10 CFR Part 431), issued by the Department of Energy (DoE) in June 2016.

The Integral Horsepower Rule (IHP) builds on the previous Acts, updating the mandated efficiency standard for almost all three-phase AC industrial motors from 1 to 500 HP (0.75 to 373 kW).

IHP applies to both NEMA and IEC motors manufactured or imported for sale in the United States.

The minimum energy efficiency requirements for these motors can be found in 10CFR431 Table 5, which is the same as NEMA MG-1:2014 Table 12-12 and also equivalent to the IE3 level of the IEC 60034-30-1 standard.

Not covered by IHP:

- Two-digit frames (NEMA 42 – 56 / IEC 63 – 80 and for power 0.25 – 3 HP / 0.18 – 2.2 kW) (may be covered by the Small Motor Rule for ODP)
- Multi-speed motors
- Medium voltage motors
- Totally enclosed air over rated motors (TEAO)
- Submersible motors
- Water-cooled motors
- Intermittent duty S2 to S8 (motors not capable of continuous duty operation)
- Stator-rotor sets
- Design D motors
- VSD-only driven motors (MG1 Part 31), which cannot be DOL-driven 'without no line start'
- Synchronous motors (SynRM, permanent magnet, roller table)
- Smoke extraction motors over 400 °C, air over rated
- IEC frame TEFC 80 and below
- Servo motors

Efficiency values for NEMA Premium

NEMA MG1: 2014, Table 12-12. Nominal full load efficiencies of NEMA design A, B and C motors at 60 Hz

Rated		2 pole		4 pole		6 pole		8 pole	
HP	kW	Enclosed	Open	Enclosed	Open	Enclosed	Open	Enclosed	Open
1	0.75	77.0	77,0	85.5	85.5	82.5	82.5	75.5	75.5
1.5	1.1	84.0	84,0	86.5	86.5	87.5	86.5	78.5	77,0
2	1.5	85.5	85.5	86.5	86.5	88.5	87.5	84,0	86.5
3	2.2	86.5	85.5	89.5	89.5	89.5	88.5	85.5	87.5
5	3.7	88.5	86.5	89.5	89.5	89.5	89.5	86.5	88.5
7	5.5	89.5	88.5	91.7	91,0	91,0	90.2	86.5	89.5
10	7.5	90.2	89.5	91.7	91.7	91,0	91.7	89.5	90.2
15	11	91,0	90.2	92.4	93,0	91.7	91.7	89.5	90.2
20	15	91,0	91,0	93,0	93,0	91.7	92.4	90.2	91,0
25	18.5	91.7	91.7	93.6	93.6	93,0	93,0	90.2	91,0
30	22	91.7	91.7	93.6	94.1	93,0	93.6	91.7	91.7
40	30	92.4	92.4	94.1	94.1	94.1	94.1	91.7	91.7
50	37	93,0	93,0	94.5	94.5	94.1	94.1	92.4	92.4
60	45	93.6	93.6	95,0	95,0	94.5	94.5	92.4	93,0
75	55	93.6	93.6	95.4	95,0	94.5	94.5	93.6	94.1
100	75	94.1	93.6	95.4	95.4	95,0	95,0	93.6	94.1
125	90	95,0	94.1	95.4	95.4	95.0	95,0	94.1	94.1
150	110	95,0	94.1	95.8	95.8	95.8	95.4	94.1	94.1
200	150	95.4	95,0	96.2	95.8	95.8	95.4	94.5	94.1
250	186	95.8	95,0	96.2	95.8	95.8	95.8	95,0	95,0
300	224	95.8	95.4	96.2	95.8	95.8	95.8		
350	261	95.8	95.4	96.2	95.8	95.8	95.8		
400	298	95.8	95.8	96.2	95.8				
450	336	95.8	96.2	96.2	96.2				
500	373	95.8	96.2	96.2	96.2				

Efficiency testing method

Similarly to EAct92 and EISA, IHP also requires that the test procedures for determining a motors' efficiency must be as specified in NEMA MG1-2006 according to IEEE standard 112, Test Method B or CSA 390-10. The requirement is to have motor manufacturers' test facilities accredited by a third party to assure that they do indeed adhere to the standard. ABB has CSA-accredited test laboratories.

Compliance, verification and registration

The US Department of Energy (DOE) will expect motor manufacturers to self-certify their motor efficiencies supported by tests or computer correlation programs (AEDM). All nameplates for motors that are covered will be labeled with a DoE-approved code, that includes the motor manufacturer's specific Compliance Certification number issued by the DOE. Each motor nameplate will also display the NEMA nominal efficiency value as a percentage.

Motors must be registered to the Department of Energy.

Penalties

Importation of motors not meeting the EISA Department of Energy requirement is subject to strict penalties. Motor manufacturers are not allowed any leeway with the tolerances. The Rule

states that the efficiency indicated on the rating plate must be equal to or exceed the minimum nominal efficiency level.

Small motors to be covered (Small Motor Rule)

DOE also specified efficiencies for general purpose small motors, defined as follows:

- 1/4 HP to 3 HP
- Open drip proof
- Single- and three-phase
- CSCR and CSIR
- Frame sizes 42, 48, 56 and IEC equivalents

ABB and NEMA Premium

ABB offers a full range of NEMA motors under the Baldor brand and a wide range of IEC motors. Available products can be found by using sales tools Motsize and Optimizer.

Ordering IHP-compliant ABB motors

Motors subject to IHP and destined for final use in the US must be ordered with variant code "509 IHP NEMA Premium efficiency requirements". If only 60 Hz data is needed or the output power is in HP, they can be ordered with variant codes "002 Restamping", "209 Special winding" and "142 Manilla winding". For HP ratings a second rating plate will be provided.