Minimum Efficiency Performance Standards for electric motors

NEXT

Intro

By making the decision to use energy efficient motors, you can lower your energy costs and have a positive effect on the environment. ABB's energy efficient motors are designed and labeled to comply with international IEC standards and local MEPS requirements.

MEPS (Minimum Energy Performance Standards) for low voltage motors have played an important role in helping countries to meet their energy efficiency and carbon dioxide emissions targets. For motor users, MEPS have led to an overall increase in motor efficiency and made it easier to compare efficiency levels between manufacturers.

These benefits have prompted many countries around the world to adopt their own MEPS. However, the actual requirements vary between the different MEPS.

Overview

Europe

- EU, EEA & EFTA countries, Switzerland, Turkey and UK

Americas

- Canada
- USA
- Argentina
- Brazil
- Chile
- Colombia
- Ecuador
- Mexico
- Peru

Asia

- China
- India
- Indonesia
- Japan
- Kingdom of Saudi-Arabia
- Singapore
- South Korea
- Taiwan
- Vietnam

Australia & Oceania

- Australia & New Zealand
- Fiji

Europe

EU MEPS

Regulation (EU)2019/1781 and amending (EU)2021/341

EU MEPS – Commission Regulation (EU) 2019/1781 amended by (EU) 2021/341 under Ecodesign Directive 2009/125/EC defines the scope for direct-on-line operated low voltage induction motors and variable speed drives.

European countries that are not members of the EU have adopted all the relevant directives and regulations in their own legislation, which means that the CE mark is recognized in those countries.

EU MEPS REGULATION

UK MEPS REGULATION

SWISS MEPS REGULATION

READ MORE

Scope	Induction motors rated for direct-on-line operation. IC418 (TEAO), Ex motors with protection types Ex ec, Ex db, Ex dc, Ex tb and Ex tc are covered.
Output	From 0.12 kW to 1000 kW
Speed	2-, 4-, 6- and 8-pole motors
Voltage & Frequency	From 50 V up to 1000 V, rated for 50 Hz, 60 Hz and 50/60 Hz sinusoidal voltage
Duty type	Continuous duty (S1, S3 ≥80%, S6 ≥80%)
Motor efficiency	0.12 kW – IE2 – 0.75 kW – IE3 – 75 kW – **IE4** – 200 kW – IE3 (2, 4, 6 poles)
Ambient temperatures	-30°C…+60°C
Marking	CE (all relevant directives to be fulfilled)
Registration	Self declaration
Explosive atmospheres	ATEX directive and certification

BACK OVERVIEW NEXT

EEA & EFTA countries, Switzerland, Turkey and UK

Adoption of the EU Regulations

European countries that are not EU members have adopted all or most of the EU directives and regulations in their own legislation. As a result, the CE mark is recognized in those countries.

- EEA & EFTA countries: Iceland, Liechtenstein and Norway.
- Switzerland MRA with EU.
- Turkey via Customs Union Agreement SGM-2019/1781/AB & SGM: 2021/16.
- The UK is an exception: Statutory Instruments (SI) and the UKCA mark shall be applied.

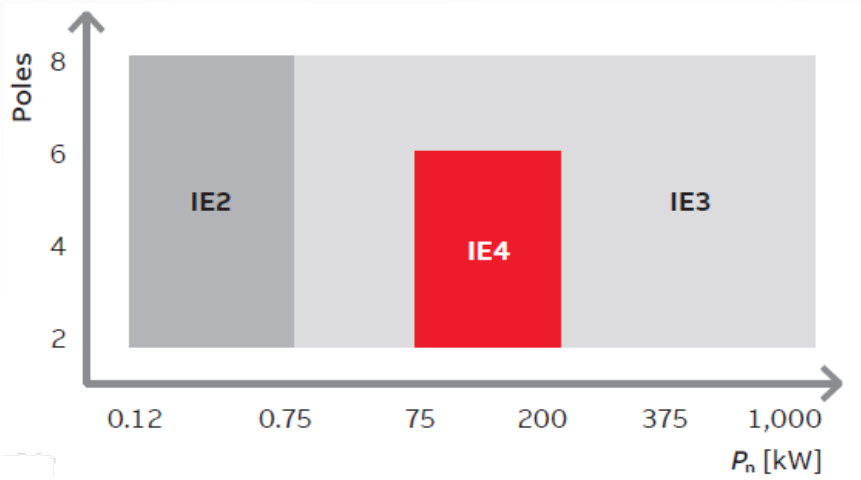
EU MEPS

Regulation (EU) 2019/1781 after July 1, 2023

2-, 4-, and 6- pole single speed motors from 75 kW to 200 kW shall be IE4 compliant.

Note: the IE4 requirement does not apply to Ex motors with protection types Ex ec, Ex db, Ex dc, Ex tb and Ex tc.

Ex motors with protection type Ex eb to be IE2 compliant.



EU MEPS

Regulation (EU) 2019/1781 and the amending (EU)2021/341

Exempted

- IC410 (TENV) motors
- Motors wholly immersed in liquid
- Motors completely integrated into a product
- Motors specified to operate exclusively
  - at altitudes exceeding 4000 m above sea level
  - in maximum operating temperature above 400°C
  - where the water coolant temperature at the inlet to a product is less than 0°C or exceeds 32°C
- Multi-speed motors
- Motors designed specifically for the traction of electric vehicles
- Brake motors ‘forming an integral part of the inner construction and can neither be removed nor powered by a separate power source’
- Motors with an integrated variable speed drive (compact drives) whose energy performance cannot be tested independently from the variable speed drive
- Motors specifically qualified for the safety of nuclear installations, as defined in Article 3 of Council Directive 2009/71/EURATOM
- Explosion-protected motors specifically designed and certified for mining, according to Directive 2014/34/EU (ATEX)

READ MORE

Americas

Canada

Energy Efficiency Act and Energy Efficiency Regulations

The Energy Efficiency Regulations published in 2016, along with a Regulatory Impact Analysis Statement, define the scope and requirements for the energy efficiency of electric motors.

In addition to the scope, the following designs are covered;

- NEMA design A, B or C with a three- or four-digit NEMA frame number,
- enclosed NEMA design A, B or C with a NEMA frame number of 56, or
- IEC design N or H with an IEC shaft height of 80 or more.

CAN MEPS REGULATION

Scope	Single speed, three-phase, cage induction motors.
Output	Nominal power from 1 hp up to 500 hp (or equivalent kW rating)
Speed	2 -, 4-, 6- and 8-pole motors
Voltage & Frequency	Not more than 600 VAC, 50Hz, 50/60Hz or 60Hz
Duty type	Continuous operation S1
Motor efficiency	Premium efficiency equivalent to IE3
Ambient temp.	Not limited
Marking	NEMA Nom.Eff and ENERGY
Registration	NRCan registration
Explosive atmospheres (HazLoc)	CEC Class & Division or IECEx with certification.

Canada

Energy Efficiency Act and Energy Efficiency Regulations

Exempted

- Motors cooled by air that is forced over the motor by a fan or blower which is not an integral part of the motor
- Liquid-cooled motors
- Inverter-only motors
- Motors designed to operate continuously only while immersed
- Fire pump motors
- Motors with IEC frame 71 and below

USA

10 CFR Subpart B - Electric Motors
Integral Horsepower Motor Final Rule (IHP)

Almost all motors are covered by the IHP Rule and must fulfil Premium Efficiency levels as per the Table 5 in the 10 CFR 431 (Code of Federal Regulations). The Table 5 is identical with the NEMA MG 1 Table 12-12.

Scope	Single speed induction motors with cage operating at 60Hz sinusoidal line power. NEMA design A, B or C electric motor or an IEC design N or H electric motor.
Output	Nominal power from 1 hp up to 500 hp (or equivalent kW rating)
Speed	2 -, 4-, 6- and 8-pole motors
Voltage & Frequency	Up to 600 V and 60Hz
Duty type	Continuous operation S1
Motor efficiency	Premium efficiency equivalent to IE3
Ambient temp.	Not limited
Marking	NEMA Nom. Eff. and the CC number
Registration	DOE registration
Explosive atmospheres (HazLoc)	US NEC 500 Class & Division and certification.

USA MEPS REGULATION

USA

10 CFR Subpart B - Electric Motors
Integral Horsepower Motor Final Rule (IHP)

Exempted

- Two digit frames (NEMA 42 – 56 / IEC 63 – 80)
- Multi-speed motors
- TEAO motors
- Submersible motors
- Water-cooled motors
- Intermittent duty, S2…S8, motors not capable of continuous duty operation
- Design D motors
- VSD only driven motors (MG1 Part 31) that cannot be DOL driven “with no line start”
- Synchronous motors
- Permanent magnet motors
- Servo motors
- Smoke extraction motors over 400°C
- Stator-rotor sets

READ MORE

Argentina

Safety Certificate for motors up to 5kW and Energy Efficiency certificate for motors in the scope ie. from 0,75 kW up to 30 kW from third party authority is mandatory when delivered as standalone and for general use.

Exempted
- Motors integrated in machines
- Duty type different than S1
- Motors manufactured specifically designed for VSD

Scope	Single speed, three-phase, cage induction motors.
Output	Nominal power from 0,75kW to 30kW
Speed	2 -, 4-, 6- and 8-pole motors
Voltage & Frequency	Up to 600 VAC, 50Hz or 60Hz
Duty type	S1
Motor efficiency	IE1
Ambient temp.	Not limited
Marking	Country of origin 'MADE IN XXXX' + IRAM 62405 labeling
Registration	-
Explosive atmospheres	IECEx

Brazil

Portaria Interministerial No. 533

The requirement are based on the standard ABNT NBR 17094-1:2018 standard introducing IR3 energy efficiency levels. The standard covers cooling methods IC410 and IC411 as well as hazardous location motors with the protection type Ex nA/Ex ec.

Scope	Single speed, three-phase squirrel cage induction motors according to ABNT NBR 17094-1.
Output	Nominal power from 0.12 kW up to 370 kW or 0.16 hp up to 500 hp.
Speed	2 -, 4-, 6- and 8-pole motors
Voltage & Frequency	Up to 1000 V, for 50/60Hz or 60 Hz operation
Duty type	S1 or S3 ≥80%,
Motor efficiency	IR3
Ambient temp.	Not limited
Marking	PROCEL sticker
Registration	INMETRO
Explosive atmospheres	INMETRO certification.

Brazil

Portaria Interministerial No. 533

Exempted

- VSD only motors
- Special application motors
- Intermittent or variable speed operation, duty cycles S2, S3(<80%), S4…S10 acc. to ABNT NBR 17094-1: 2018
- Ex e, Ex d(e) and Ex t (DIP) motors for explosive atmospheres
- Water cooled motors
- Motors for marine and offshore

READ MORE

Chile

The efficiency and safety tests must be certified by a local certification entity (CESMEC, LENOR) and the efficiency tests must be performed by an ILAC accredited laboratory.

Exempted
- Motors manufactured specifically designed for VSD
- Brake motors

Scope	Single speed, three-phase, cage induction motors.
Output	Nominal power from 0,75kW to 7,5kW
Speed	2 -, 4-, 6-pole motors
Voltage & Frequency	Up to 690V, rated for 50 Hz
Duty type	S1
Motor efficiency	IE2
Ambient temp.	Not limited
Marking	Efficiency and safety label
Registration	-
Explosive atmospheres	IECEx

Colombia

Motors must have both RETIE (safety) and RETIQ (efficiency) certificates.

Motors designed to be operated only from VSD are excluded from RETIQ

Scope	Single speed, three-phase, cage induction motors.
Output	Nominal power from 0,18kW to 373kW
Speed	2 -, 4-, 6- and 8-pole motors
Voltage & Frequency	Up to 600 V, rated for 60 Hz
Duty type	S1
Motor efficiency	IE2 (C) for motors with rated power 0.18 – 0.74kW IE3 (B) for motors having rated power equal or above 0.75 kW
Ambient temp.	Not limited
Marking	Efficiency label
Registration	-
Explosive atmospheres	IECEx

Ecuador

There is no mandatory regulation nor labeling scheme in place in Ecuador.

IE2 efficiency is recommended by the authorities but not mandatory.

Scope	Single speed, three-phase, cage induction motors.
Output	Nominal power from 0,75kW to 375kW
Speed	2 -, 4-, 6-, 8-pole motors
Voltage & Frequency	Up to 1000 V, rated for 60 Hz
Duty type	S1 or S3 >80%
Motor efficiency	IE2
Ambient temp.	Not limited
Marking	IE
Registration	-
Explosive atmospheres	IECEx

Mexico

NOM-016-ENER-2016

MEPS in Mexico is based on the NORMA OFICAL MEXICANA, NOM-016-ENER-2016.

Importing company must have the NOM certificate for motors.

Exempted

- VSD only driven motors that cannot be DOL driven
- Duty service other than S1
- Two or more speed motors

Scope	Single speed, three-phase, cage induction motors.
Output	Nominal power from 0,746kW to 373kW
Speed	2 -, 4-, 6-, 8-pole motors
Voltage & Frequency	Up to 600 V, rated for 60 Hz
Duty type	S1
Motor efficiency	IE3
Ambient temp.	Not limited
Marking	NOM certification
Registration	-
Explosive atmospheres	IECEx

Peru

Motors intended for general purpose applications and covered by the scope are subject to mandatory labeling scheme in Peru.

Exempted
- Motors for explosive atmospheres
- Two speed motors
- Brake motors
- Motors for non general purpose applications

Scope	Single speed, three-phase, cage induction motors.
Output	Nominal power from 0,75kW to 375kW
Speed	2 -, 4-, 6-, 8-pole motors
Voltage & Frequency	Up to 600 V, rated for 60 Hz
Duty type	S1, S3>80%
Motor efficiency	IE1
Ambient temp.	Not limited
Marking	Efficiency label
Registration	-
Explosive atmospheres	IECEx

Asia

China

China Energy Label 007-2021 and the GB18613-2020

Standard GB18613-2020 defines the minimum allowable energy efficiency levels for low voltage motors. The scope includes motors with output powers from 0.12 kW to 1000 kW and introduces efficiency Grades 1 to 3. Grade 3 efficiency is the minimum level and is equivalent to IE3.

The China Energy Label regulation requires motor registration and use of the CEL sticker on 2-8 pole motors with outputs from 0.75 kW to 375 kW.

Scope	Applicable to all low voltage fan cooled (TEFC) motors, also including Ex motors.
Output	0.75 kW to 375 kW
Speed	2-, 4-, 6- and 8-pole motors
Voltage & Frequency	Up to 1000 V, rated for 50 Hz or 50/60 Hz sinusoidal voltage
Duty type	S1 or S3 ≥80%
Motor efficiency	Grade 3
Ambient temperatures	–15°C to +40°C
Marking	CEL label (CEL scope)
Registration	CEL registration
Explosive atmospheres	CCC certification (not mining)

China

China Energy Label 007-2021 and the GB18613-2020

Exempted

- Motors
  - with an electromagnetic brake inside
  - specified to operate wholly immersed in a liquid
  - operated in a special environment and conditions, e.g. motors operated at high altitude (>1000 m) or high ambient temperatures as smoke extraction motors (temperature class over 250°C)
  - rated for 60 Hz only
  - designed for ambient temperatures above +40°C or below -15°C
- Water cooled motors
- Two-/multi-speed motors
- Marine motors
- VSD motors (permanent magnet, SynRM)
- Motors completely integrated into a machine (e.g. pump, fan or compressor) that cannot be tested separately from the machine

India

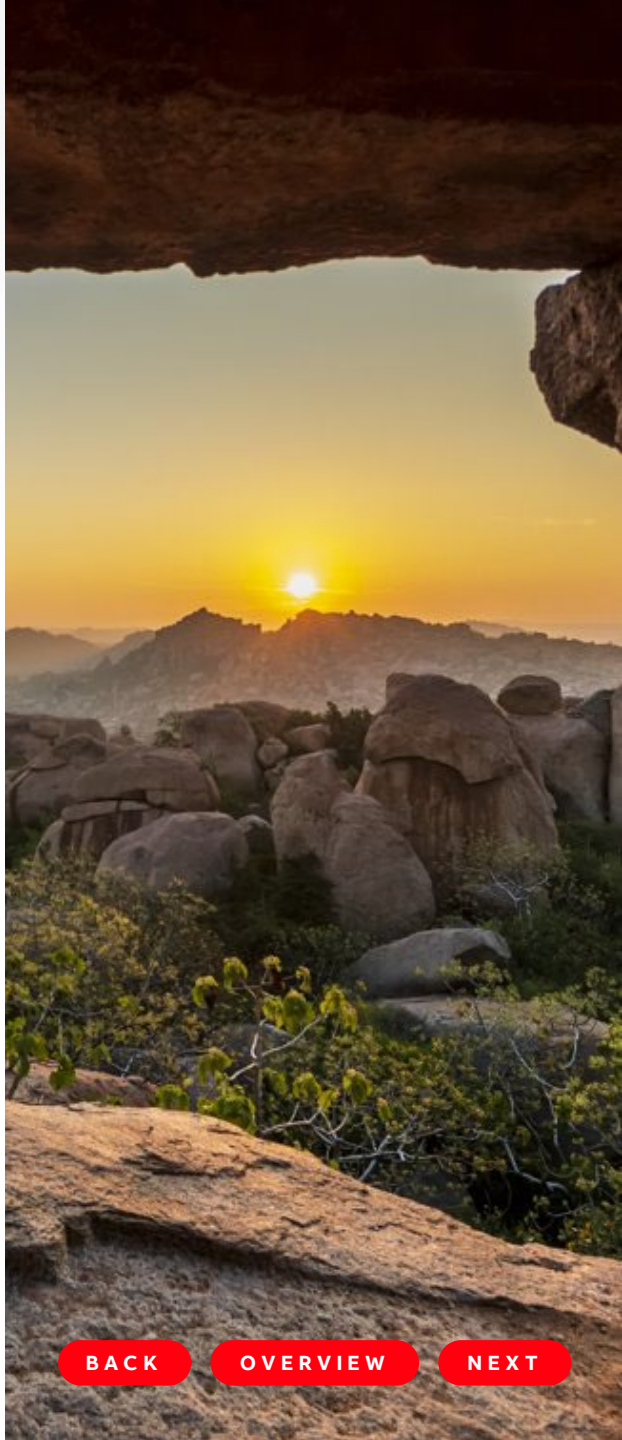
Motors shall be designed based on the IS 12615 standard and having IE2 level as minimum. Motors must be labeled with the ISI mark.

The BIS license (Bureau of Indian Standards) is a factory specific approval to produce motors for Indian market.

Exempted:

IE2 efficiency is not mandatory for Ex motors.

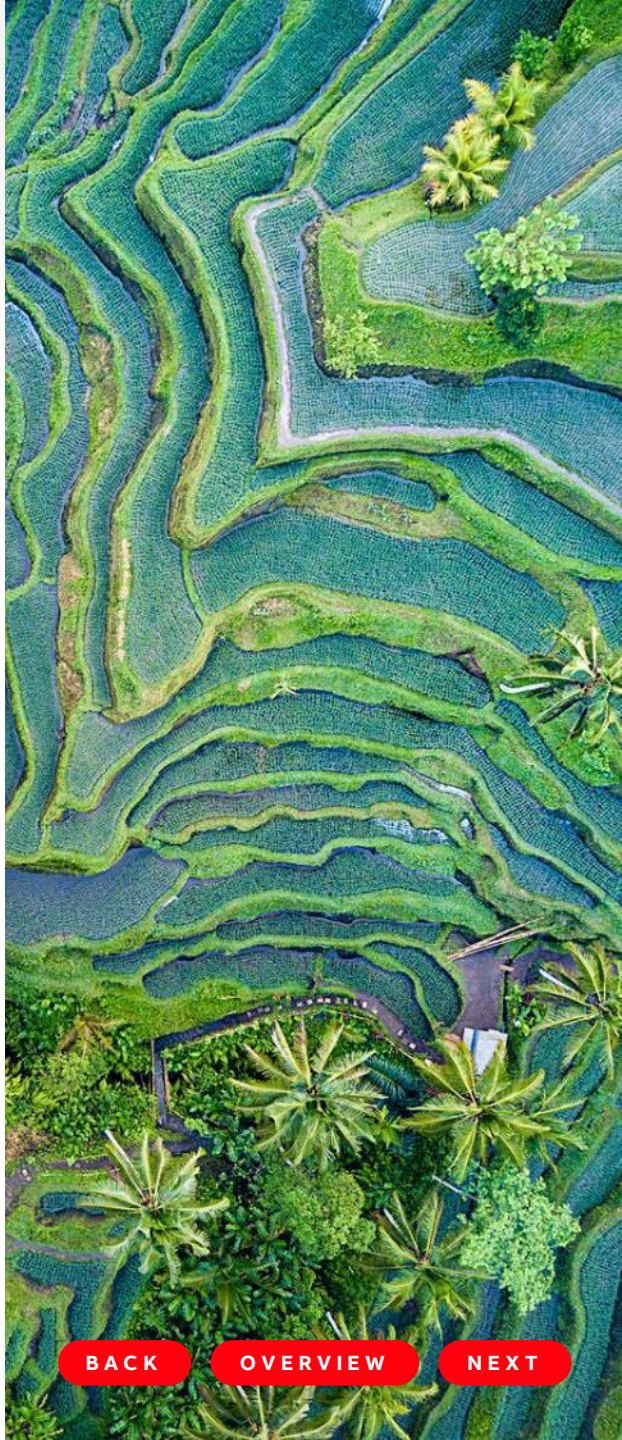
Scope	Single speed three-phase 50 Hz induction motors
Output	0.12 kW to 1000 kW
Speed	2-, 4-, 6, 8-pole motors
Voltage & Frequency	Up to 1000 V, rated for 50 Hz or 50/60 Hz
Duty type	S1 or S3 ≥80%
Motor efficiency	IE2
Ambient temperatures	-
Marking	ISI
Registration (License)	BIS
Explosive atmospheres	PESO



Indonesia

There is no regulation in place in Indonesia. Generally, motors are recommended to be as minimum with IE1 efficiency.

Scope	Single speed three-phase induction motors
Output	0.375 kW to 75 kW
Speed	2-, 4-, 6-pole motors
Voltage & Frequency	Up to 1000 V, rated for 50 Hz or 50/60 Hz
Duty type	S1 or S3 ≥80%
Motor efficiency	IE1
Ambient temperatures	-
Marking	-
Registration	-
Explosive atmospheres	IECEx



Japan

Japanese MEPS is a part of the Top Runner Program introduced by Ministry of Economy, Trade and Industry (METI), under the Energy Savings Act.

There is no requirement for product registration.

Exempted:

Motors with insulation class H, N or R

Explosion-proof motors

Motors designed to operate within liquids

Water cooled motors

Marine motors

Scope	Single speed three-phase induction motors
Output	0.75 kW to 375 kW
Speed	2-, 4-, 6-pole motors
Voltage & Frequency	Up to 1000 V, rated for 50 Hz, 60 Hz or 50/60 Hz
Duty type	S1 or S3 ≥80%
Motor efficiency	IE3
Ambient temperatures	-20 °C<
Marking	-
Registration	-
Explosive atmospheres	JPEx (TIIS)

Kingdom of Saudi Arabia

The standard SASO 2893 sets the IE3 as a minimum efficiency level for motors

It is the responsibility of the importer to apply the CoC (Certificate of Conformity) from a third party for the customs clearance purposes for all motors imported to the Kingdom of Saudi Arabia.

In Scope	Single speed three-phase induction motors
Output	0.75 kW to 375 kW
Speed	2-, 4-, 6, 8-pole motors
Voltage & Frequency	From 50 V up to 1000 V, rated for 60 Hz or 50/60 Hz
Duty type	S1
Motor efficiency	IE3
Ambient temperatures	From -20 °C to +60 °C
Marking	-
Registration	SASO (”In Scope” & ”Exempted” motors)
No registration	”Out of Scope” motors
Explosive atmospheres	IECEx

Kingdom of Saudi Arabia

Exempted

- Brake motors
- Wound rotor motors
- High torque motors
- Smoke Extraction motors operating temperature above +300°C
- Ex motors
- Totally enclosed air-over motors, TEAO (IC418)
- Submersible motors
- Motors with specific air-cooling methods (e.g. IC5Ax)
- Motors with liquid cooling methods

Out of Scope

- Variable speed or two speed motors
- Other than three phase motors
- Other than induction motors
- Motor is not capable of operating DOL
- Integrated motors
- Motor is rated for 50Hz only

Singapore

Any importer intending to supply regulated products to Singapore must be registered by National Environment Agency (NEA) as a registered supplier.

The registered supplier must also register the regulated products before supplying them to Singapore.

Scope	Single speed three-phase 50 Hz induction motors
Output	0.75 kW to 375 kW
Speed	2-, 4-, 6-pole motors
Voltage & Frequency	Up to 1000 V, rated for 50 Hz or 50/60 Hz
Duty type	S1, S3 ≥80% or S6 ≥80%
Motor efficiency	IE3
Ambient temperatures	From -30 °C up to +60 °C
Marking	-
Registration	NEA
Explosive atmospheres	IECEx

Singapore

Exempted

- Motors with maximum operating temperature above 400°C
- Designs where the water coolant temperature at the inlet to a product is less than 0°C or exceeding 32°C
- Ex-motors
- Motors specified to operate wholly immersed in a liquid
- Multi-speed motors
- Brake motors
- High torque motors
- Motors that are completely integrated into a product
- Motors to be re-exported outside of Singapore
- Motors exempted by the Director-General of Environmental Protection of the National Environment Agency
- Marine and offshore applications

South Korea

Motors imported to South Korea must be registered to KEA (Korea Energy Agency) by the importer and provided with a specific sticker.

Scope	Single speed three-phase induction motors
Output	0.75 kW to 375 kW
Speed	2-, 4-, 6-, 8-pole motors
Voltage & Frequency	From 50 V up to 1000 V, rated for 60 Hz or 50/60 Hz
Duty type	S1
Motor efficiency	IE3
Ambient temperatures	Max +40 °C
Marking	Korean MEPS sticker
Registration	KEA
Explosive atmospheres	KCs

South Korea

Exempted

- IC410 motors
- IC418 motors
- Thrust and sleeve bearing motors
- Motors intended for re-export
- Water cooled motors
- Marine motors if used outside Korea
- Very high starting torque applications (design C and D)
- Synchronous motors that can be supplied only from VSD
- Short time duty (S2)

Taiwan (Chinese Taipei)

In Taiwan, CNS 14400 defines the requirements on the energy efficiency for low voltage three-phase induction motors.

IE3 is not mandatory but it is recommended by authorities.

Scope	Single speed three-phase induction motors
Output	0.75 kW to 200 kW
Speed	2-, 4-, 6- pole motors
Voltage & Frequency	Up to 690 V, rated for 60 Hz or 50/60 Hz
Duty type	S1
Motor efficiency	IE3
Ambient temperatures	-
Marking	-
Registration	-
Explosive atmospheres	ITRI

Vietnam

In Vietnam, the standard TCVN 7540-1:2013, Part 1: “Energy efficiency” defines the minimum energy efficiency levels.

It is the responsibility of the importer to register the motors to the MOIT

Scope	Single speed three-phase induction motors
Output	0.75 kW to 150 kW
Speed	2-, 4-, 6- pole motors
Voltage & Frequency	up to 1000 V, rated for 50Hz, 60 Hz or 50/60 Hz
Duty type	S1
Motor efficiency	IE1
Ambient temperatures	-
Marking	-
Registration	MOIT
Explosive atmospheres	Local Ex certification

Australia & Oceania

Australia, New Zealand and Fiji

Australian MEPS

The Greenhouse and Energy Minimum Standards Determination 2019 is the requirement for motors to be registered in Australia. Both ‘Minimum efficiency’ (IE2) and ‘High efficiency’ (IE3) levels, as aligned with IEC 60034-30-1, are recognized.

New Zealand and Fiji have adopted the same regulation as well as the registration system.

Scope	Induction motors rated for direct-on-line operation and inverter duty motors that can be DOL operated.
Output	From 0.73 kW up to but not including 185 kW
Speed	2-, 4-, 6- and 8-pole motors
Voltage & Frequency	Up to 1100 V, rated for 50 Hz and/or 60 Hz sinusoidal voltage
Duty type	S1 or S3 ≥80%
Motor efficiency	IE2 or IE3
Ambient temperatures	Not limited
Marking	IE
Registration	GEMS registration
Explosive atmospheres	IECEx (not mining)

AUS MEPS REGULATION

NZ MEPS REGULATION

Australia, New Zealand and Fiji

Australian MEPS

Exempted

- Motors for re-export business
- Integrated motors that cannot operate as a motor if separated from the driven unit
- Submersible (sealed) motors
- Multi-speed motors
- Motors for use only for short-time duty cycle applications
- VSD motors that cannot be DOL operated

Read more

Optimizer

Tool to select MEPS compliant motors, calculate the total cost of ownership and find relevant documents.

OPTIMIZER

9AKK108440 Rev D, EN 07-2023