EU Ecodesign Regulation for motors and drives

For a more sustainable future

START

Raising efficiency to reduce emissions

There is rapidly growing demand worldwide for more efficient products to cut energy consumption, reduce emissions and help to build a more sustainable future. The EU's Ecodesign legislation is an effective way to improve the environmental performance of products by setting minimum energy efficiency requirements.

The European Union's Ecodesign Regulation (EU) 2019/1781 sets efficiency requirements for low voltage induction motors and variable speed drives. The objective is to boost energy efficiency and reduce CO2 emissions.

Implementation is in two steps:

- Step 1 effective from July 1, 2021.
- Step 2, with a wider scope and increased requirements for motors, effective from July 1, 2023.

Ecodesign

Direct-on-line low voltage motors

Low voltage variable speed drives

Ecodesign Regulation timeline

2009 — 2011 — 2015 — 2017 — 2019 — 2021 — 2023

October 2009

The EU adopted framework Directive 2009/125/EC. Requirements for motors were introduced by Commission Regulation EC 640/2009, which entered into force from 2011 to 2017.

16 June 2011
Stage 1:

Motors must be IE2 compliant.

1 January 2015
Stage 2:

Motors with a rated output of 7.5 to 375 kW must be EITHER IE3 compliant (driven direct-on-line) OR IE2 compliant if fitted with a variable speed drive.

1 January 2017
Stage 3:

Motors with a rated output of 0.75 to 375 kW must be EITHER IE3 compliant (driven direct-on-line) OR IE2 compliant if fitted with a variable speed drive.

October 2019

The EU adopted Ecodesign Regulation (EU) 2019/1781. Implementation is in two steps, in 2021 and 2023.

July 1, 2021
Ecodesign Regulation Step 1:

Motors with a rated output of 0.75 to 1000 kW must be IE3 compliant. The option of IE2 with a VSD is no longer available. Motors rated from 0.12 to below 0.75 kW must be IE2 compliant. The scope is expanded from the previous regulations (see next page).

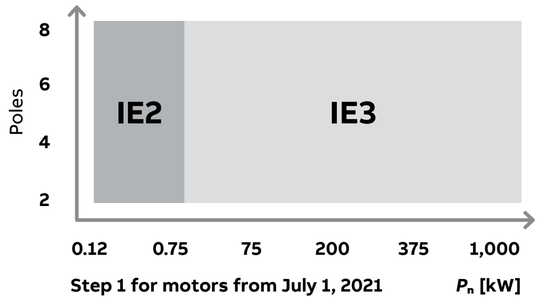
Drives rated from 0.12 to 1000 kW must be IE2 compliant.

July 1, 2023
Ecodesign Regulation Step 2:

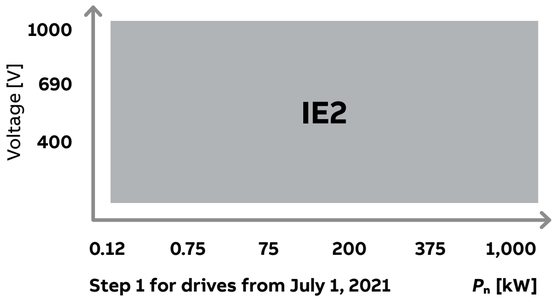
Motors rated from 75 kW to 200 kW must be IE4 compliant. Motors with protection type Ex eb and 1-phase motors must be IE2 compliant.

Drives: No changes from Step 1.

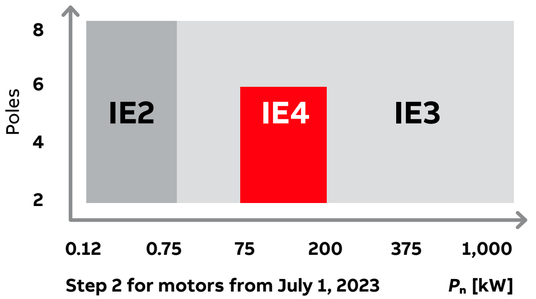
ABB has long promoted the benefits of efficient motors, and welcomes the new Ecodesign Regulation, which now includes variable speed drives for the first time.



Step 1 for motors from July 1, 2021



Step 1 for drives from July 1, 2021



Step 2 for motors from July 1, 2023

Step 2: Requirement for electric motors from July 1, 2023

The Ecodesign Regulation covers three-phase single-speed motors rated up to 1000 V, 50 Hz, 60 Hz, 50/60 Hz for direct-on-line operation with continuous duty defined as S1, S3 ≥ 80% and S6 ≥ 80%.

IE4 efficiency class mandatory for motors:

- 3-phase 2, 4 and 6 pole, single speed motors with rated output from 75 kW up to 200 kW. Excluded brake motors, Ex eb increased safety motors, or other explosion-protected motors (Ex ec, Ex d, Ex de, Ex t)

IE3 efficiency class mandatory for motors:

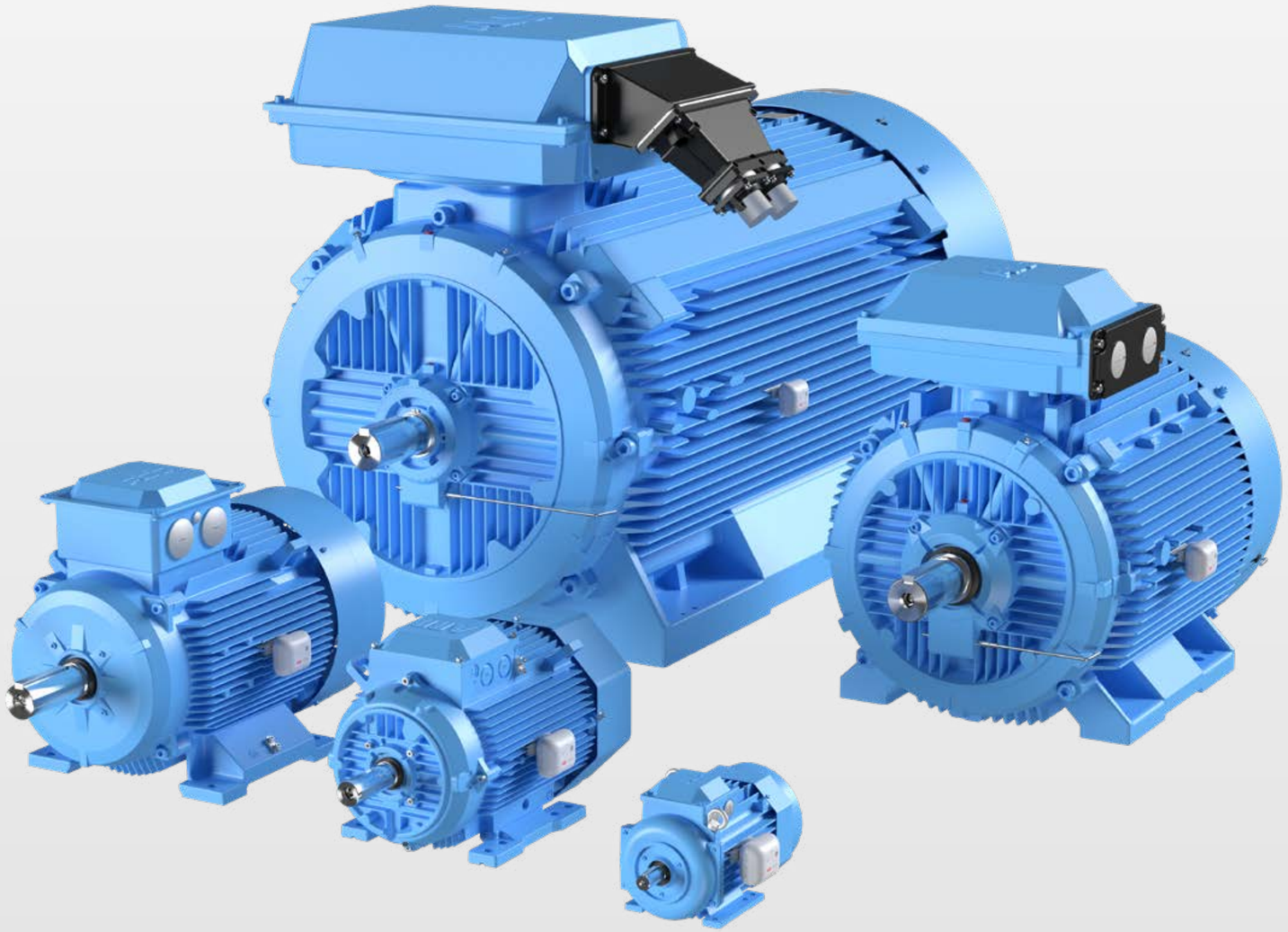
- 3-phase 2, 4, 6 or 8 pole, single speed motors with rated output from 0.75 kW up to 1000 kW except 2, 4, 6 poles motors with rated output from 75 kW up to 200 kW
- Protection types Ex ec, Ex d, Ex de, Ex t
- Brake motors with external brake
- TEAO (Totally Enclosed Air Over)
- Ambient temperatures between -30°C and +60°C

IE2 efficiency class mandatory for motors:

- 3-phase rated output from 0.12 kW and below 0.75 kW
- Ex eb increased safety motors from 0.12 to 1000 kW
- Single-phase motors from 0.12 to 1000 kW

For more information on how the regulation affects motors, click here.

For more information about ABB's IEC LV motors offering, click here.



Step 2: Requirement for AC drives from July 1, 2023

Step 2 of the Ecodesign Regulation does not make any changes to the requirements for drives. The Step 1 requirements, effective from 01.07.2021, cover three-phase drives with a diode rectifier rated from 0.12 to 1000 kW.

IE2 efficiency class mandatory for AC drives:

- 3-phase drives in power range 0.12 – 1000 kW (diode rectifier)

Exclusions:

- Cabinets containing a module that has already been conformity assessed
- Regenerative drives
- Low harmonic drives (THD <10%)
- Single phase drives
- AC drives with multiple AC outputs
- Medium voltage drives, DC drives and traction drives

For more information about ABB's drives offering, click here.

FAQ

What does the Ecodesign Regulation mean for induction motors rated for direct-on-line (DOL) operation?

When motors rated for sinusoidal supply with 50 Hz, 60 Hz or 50/60 Hz frequency are used with a DOL supply, they must meet the minimum efficiency requirements specified in the regulation.

Induction motors can additionally have a rating plate showing their performance characteristics in variable speed drive (VSD) controlled applications. This additional information on VSD duty has no relation to the energy efficiency requirements or IE classification. This is because the regulation applies only to motors rated for DOL use.

How does the Ecodesign Regulation affect motors specified for operation exclusively with a variable speed drive?

Motors specified for operation exclusively with a variable speed drive are outside the scope of the regulation. Hence the regulation does not cover motors such as synchronous reluctance, permanent magnet and DC motors.

Application and industry specific induction motors for VSD duty, that cannot be DOL connected, such as roller table, high speed and servo motors, belong to this category. These types of motor can also be labelled ‘VSD only’ or ‘Inverter Duty’ motors. These motors may also have an IE class according to EN IEC TS 60034-30-2.

Are direct-on-line (DOL) duties and VSD duty affected?

The scope of the regulation covers induction motors rated for continuous duty, i.e., duty class S1, S3≥80% and S6≥80% as defined in the regulation.

Restamping an induction motor for S9 duty does not put it outside the scope of the regulation. If a motor is rated for DOL and continuous operation then it is covered by the regulation.

However, induction motors that are not rated for 50 Hz or 60 Hz, but are rated for duty cycle S9, e.g., ‘VSD duty only’, may have some non-standard and specific features meeting the conditions to be specifically designed for VSD duty.

What does IE2 mean for drives?

The regulation covers 3-phase drives with a diode rectifier in the range 0.12 kW ≤ Pn < 1000 kW. Since July 1, 2021 the power losses of these drives may not exceed the maximum power losses corresponding to the IE2 efficiency level.

Drive manufacturers must declare power losses in terms of percentage of rated apparent output power at eight different operating points, as well as standby losses. The International Efficiency (IE) level is given at the nominal point.

Which drives are excluded from the regulation?

The following types of low voltage AC drives are excluded from the regulation: regenerative drives, low harmonic drives (THD < 10%), multidrives (multiple AC output drives) and 1-phase drives.

A drive cabinet containing a drive module that has already been assessed does not need to be reassessed.

Several other types of drive are excluded, including medium voltage drives, DC drives, integrated drives and traction drives.

Does the Ecodesign Regulation affect motor and drive systems?

The Ecodesign Regulation does not include minimum efficiency requirements for Power Drive Systems (PDSs). IEC 61800-9-2 defines IES efficiency classes for motor-drive systems, which it refers to as PDSs. The IES class does not need to be marked on products.

FAQ

What is the difference between Step 1 and Step 2 of the regulation?

Step 2 covers the same criteria as Step 1, but with the difference that the IE4 efficiency level is now mandatory for 3-phase 2-, 4- or 6-pole motors with a rated output equal to or above 75 kW and equal to or below 200 kW. Brake motors and Ex motors are excluded from this requirement and must therefore continue to meet the IE3 efficiency level as a minimum, as per Step 1.

Step 2 also extends coverage to two types of motor previously excluded from the requirements. Single-phase motors with a rated output equal to or above 0.12 kW shall meet at least the IE2 efficiency level. Ex eb increased safety 2-, 4-, 6- or 8-pole motors with a rated output equal to or above 0.12 kW and equal to or below 1000 kW must meet the IE2 efficiency level as a minimum.

How does the regulation affect the CE mark?

Motors and drives covered by the regulation must also meet the efficiency requirements in order to be CE marked.

If a motor or drive covered by the regulation does not fulfill the efficiency requirements, it shall not be labelled with the CE mark and consequently shall not be placed on the European market. Such a motor or drive (without the CE mark) can be delivered outside Europe, provided that it meets local requirements in the target market.

How can I check the data provided by my variable speed drive supplier?

The regulation specifies for market surveillance that three methods are available to manufacturers to determine losses:

- Direct method
- Calorimetric method
- Single loss determination method

The only practical way to check the manufacturer's data is to use the direct input/output method. This requires sophisticated equipment and suitable conditions to perform testing.

Will ATEX certificates be revised?

There is no need to revise ATEX certificates for ABB's existing product designs due to the regulation.

What tolerances are allowed for the efficiency classes?

The efficiency level (IE class) of a design or product type must be guaranteed by the manufacturer and on request a test report showing or exceeding the minimum required efficiency value shall be provided.

The efficiency value shall be obtained as a band or average of the population of tested or verified samples. Normal variations in production processes, materials and test results shall be considered during the design process by the manufacturer.

Does the regulation apply to motors that have two or more stated speeds for one frequency?

Yes, in the case of single speed motors operating at 50 Hz or 60 Hz DOL that have two or more rated voltages and speeds.

No, in the case of multi-speed or pole-changing motors with two or more speeds per frequency, regardless of design.

See also **CEMEP/CAPIEL - 2nd Edition May 2021.**

Are marine motors affected by the regulation?

Yes, motors must comply with the regulation if their power rating and pole number are within the scope.

Only motors designed specifically for the traction of electric vehicles are outside the scope.

Are servo drives affected by the regulation?

Drives designed for use with both induction and servo motors must meet the minimum requirement of IE2 compliance.

Drives not rated to operate with induction motors are outside the scope of the regulation and do not require Ecodesign marking. However, they are subject to other CE marking requirements.

Summary & more information

Ecodesign Regulation (EU) 2019/1781 is the next logical step in the EU's efforts to reduce greenhouse gas emissions by ensuring that electrical equipment meets minimum efficiency requirements. It builds on the results achieved by the first framework Directive, which was adopted in 2009. The new regulation increases the requirements and expands the scope, not only bringing in more types of motor but also covering drives.

ABB is ready to help motor and drive users with a range of high efficiency products that are fully compliant with the new requirements.

Click here for more information on Ecodesign for motors and drives.

Link to our website

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