

REMA Guide to the new LV Motor Efficiency Standards

Introduction

As part of the Ecodesign Directive¹, the European Commission has passed a regulation that stipulates the minimum efficiency levels for LV electric motors that can be sold within Europe². The Regulation has its first effect in June of 2011 after which motors have to be of an efficiency class IE 2 or higher. In 2015, the minimum rises to IE3 or IE2 if combined with a VSD.

The Ecodesign Directive is a measure that has been introduced to raise the energy efficiency of a wide range of energy using products, ranging from light bulbs to refrigerators to electric motors. According to studies carried out for the Commission, these higher efficiency products should save consumers money in the long term due to their lower operating costs.

Motors are one of the first products to be regulated, reflecting their significance in the energy consumption mix. The regulations have already been passed into UK law and stipulate that:

From 16th June 2011 only LV motors of efficiency class IE2 or greater can be put onto the market in Europe.

What is the new IE efficiency classification system?

The new measuring methods in accordance with IEC EN 60034-2-1:2007 (Standard methods for determining losses and efficiency from tests) apply for all motors described by IEC 60034-1. These methods help to generate more exact data regarding stray load loss. The new standard replaces the previous European standard IEC 60034-2:1996, which expired on November the 1st 2010.

EFF motors were tested to IEC 60034-2:1996

IE Motors are tested to IEC 60034-2-1:2007

Motors that are marked according to the new efficiency class system (IE-code) must be measured using the new measurement methods. The IE classes IE1 to IE3 are defined in IEC 60034-30: 2008.

How do the new IE efficiency classes compare with the old EFF efficiency classes?

There is a rough relationship between the IE and EFF and NEMA levels as is shown in Figure 1.

¹ Ref Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products

² Commission Regulation (EC) No 640/2009 of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for electric motors

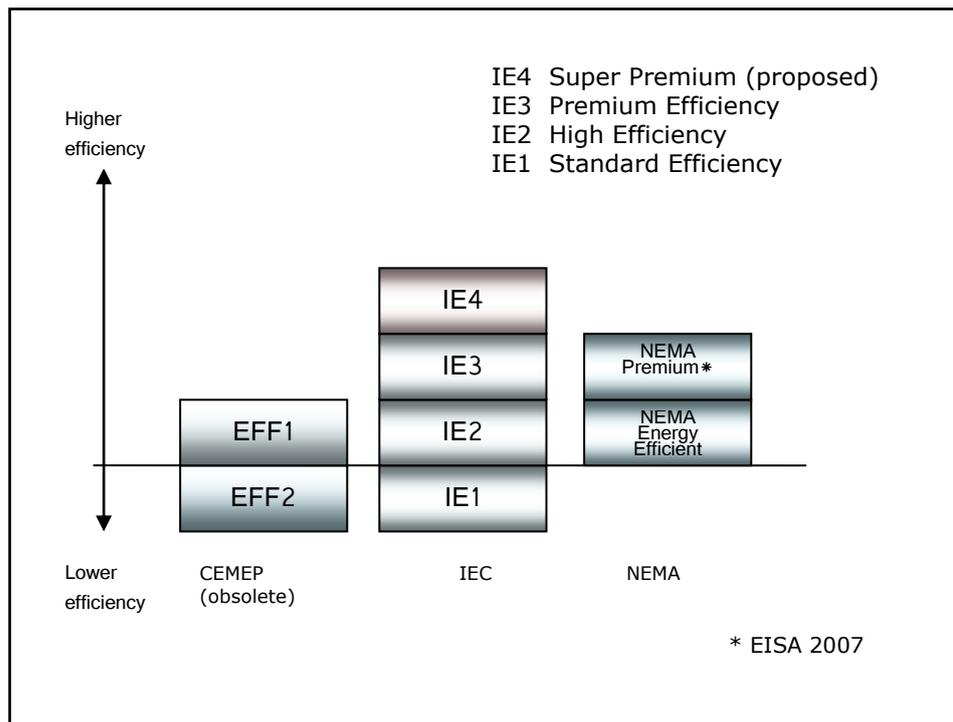


Figure 1

The main difference between the efficiency classes (EFF and IE) lies in the method used to determine them. In a direct comparison of both measuring methods for the same motor, it is expected that the new method of determining efficiency levels will show a reduction in the measured efficiency level for the motor.

For example, an EFF1 motor with a 91.0% efficiency is physically identical to an IE2 motor with 89.8% efficiency.

What motors are in the Scope of the Efficiency Standard?

The efficiency class system specified under IEC 60034-30 is valid for low voltage three phase cage-induction motors with the following specifications:

Rated voltage up to 1000V

Rated output between 0.75kW and 375kW

2, 4, or 6 poles

Rated on the basis of continuous duty (S1) or intermittent periodic duty (S3) with a cyclic duration factor of 80% or higher

Capable of operating direct on-line

Rated for operating conditions in accordance with IEC 60034-1 (temperature, installation altitude.etc.)

Motor with feet, flanges and/or shafts with mechanical dimensions different from IEC 60072-1 are covered by this standard.

The following are exemptions to the classification system

Motors for short-time duty (S2) or switching operation (S3<80% to S10)

Motors that were designed exclusively for converter operation (VSD) and which cannot be operated online.

Motors that have a highly specialised design, customised for one particular application in such a way that it is not possible to measure the motor on its own (for example pump motors with wet rotors).

What is the scope of the EcoDesign Motors Regulations?

Standards are not legally binding, however they may become so as a result of legal regulations or through contracts in which compliance is made mandatory. They often serve to clarify undefined legal terms- for example the term “state of the art” – thereby gaining legal significance.

In Europe, commission Regulation 640/2009 specifies the minimum requirements for LV motors. The Regulation references the standard IEC 60034-30:2008 for its definitions of efficiency classes. However the scope of the standard is not the same as the scope of the Regulations; which is more limited. Figure 2 below illustrates the differences in scope.

	Which motor falls under which scope?	Standard IEC 60034-30: 2008 Class markings for IE1, IE2, IE3	EuP directive/Regulation 640/2009 Legal minimum requirement
1.	Standard three-phase induction motor 0.75 – 375 kW 2, 4, 6 pole, continuous duty S1 <i>(Note, Also applies if the motor is integrated in a machine)</i>	Yes <i>Note: Also S3 operating mode (cyclic duration factor ≥80%)</i>	Yes
2.	Standard three-phase induction motor with auxiliary devices (shaft seals, back stops, speed sensors etc.) 0.75 – 375 kW, 2, 4, 6 pole, continuous duty S1 <i>(Note: Measurement of efficiency without auxiliary devices)</i>	Yes <i>Note: Also S3 operating mode (cyclic duration factor ≥80%)</i>	Yes
3.	Geared motors	Yes	Yes
4.	Explosion-protected motors	Yes	No
5.	Brake motor: A motor equipped with an electro-mechanical brake unit operating directly on the motor shaft without couplings.	Yes	No
6.	Motors completely integrated into a machine (for example, pump, ventilators, gear or compressor) of which the efficiency cannot be tested independently from the machine.	No	No

7.	Other types of motors (e.g. permanent magnet motors, pole-changing motors, motors for switching operations e.g. servomotors)	No	No
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Figure 2 (Courtesy CEMEP)

What do the Regulations specify?

The requirements will come into effect in accordance with the following Schedule

From 16th of June 2011, motors placed for the first time on the market shall have a minimum efficiency class of IE2

From January 2015: motors with a rated output between 7.5-375kW shall have a minimum efficiency class of IE3, or minimum IE2 if they are operated/equipped with electronic speed control (VSD)

From 1 January 2017: motors with a rated output between 0.75-375kW shall have a minimum efficiency class of IE3, or minimum IE2 if they are operated/equipped with electronic speed control (VSD).

What does “placed on the market for the first time” mean?

First use is when the manufacturer (or Importer) first makes the motor available for sale (separately or integrated into a product). From 16th June 2011 motors must be IE2 or higher. After this date an IE1, EFF2 or EFF1 motor can be sold by someone who bought it before that date either as a motor for stock or integrated into a product.

Who is going to enforce the Regulations?

The UK Government has set up the UK Market Surveillance Authority (MSA). This body takes over responsibility from Trading Standards and will provide a National scheme to monitor all products that come under the EcoDesign Directive. The National Measurement Office has been appointed to operate the MSA. You can find their web site at:

<http://www.rohs.gov.uk/EUP/>

How are the Regulations going to be enforced?

The MSA will test sample products to ensure that they comply with the manufacturer’s (or economic operator’s, as it includes importers) declaration on the label. If the products do not comply then the MSA has a range of sanctions available to it.

1 - Compliance Notice

A compliance notice is a written notice which requires an economic operator to take actions to bring products into compliance with the law and/or return to compliance within a specified period.

2 - Variable Monetary Penalty

A variable monetary penalty is a monetary penalty designed to eliminate financial gain or benefit which may be imposed for moderate to serious offences.

3 - Stop Notice

A stop notice is a written notice which requires the economic operator to take immediate action to remove a non-compliant product from the market or to cease placing non-compliant products on the market. It can be used either to stop the placing of the product onto the market until the economic operator has taken the steps specified in the notice, or it may be issued where the economic operator may be likely to put a non-compliant product onto the market.

The stop notice is designed to encourage compliance by prohibiting the economic operator from carrying on with the activity until all the steps needed to secure compliance with the law have been taken.

4 - Enforcement Undertaking

An enforcement undertaking is a voluntary agreement driven by an economic operator to undertake specific actions that would make amends for non-compliance and its effects within a specified timeframe.

Although in practice it may be the economic operator that brings the non-compliance to the attention of the MSA, it is for the MSA to decide whether or not to accept the enforcement undertaking.

How will the Manufacturer put things right?

When a product is found not to comply with its declared efficiency level, then the MSA and manufacturer will agree appropriate Enforcement Undertakings (EU)

An EU is a voluntary agreement by a business to undertake specific actions that would make amends for non compliance and its effects within a specified timeframe.

For illustrative purposes only, the following is a list of actions which COULD be considered appropriate by the MSA:

- A manufacturer could agree to advertise the breach in the model's compliance and agree to undertake specific action in order to ensure compliance in the future;
- A manufacturer or retailer could offer to consumers a reimbursement of costs for the product or offer a replacement model;
- A manufacturer or retailer could reimburse customers' electricity costs based on the difference between the expected and the actual performance of the model;
- A manufacturer could agree to change the labelling of further products, upgrade the models energy efficiency, and/or improve quality assurance procedures or in-house testing procedures and provide evidence of this to the MSA.

What motors are affected?

All 3 phase LV induction motors between 750 W and 375 kW. There are a number of exclusions. The full scope is given in the Table 1

Can EFF1 motors simply be relabeled as IE2 without re-testing?

No – IE and EFF ratings are not the same or equivalent. Motors that have been given an EFF rating will have to be re-tested before being given an IE rating.

Are motors with an IP rating above IP55 in scope?

IP ratings are not mentioned in the scope – so the IP rating does not provide a basis for putting motors in or out of scope.

Why has the efficiency of my motor changed?

The new test standard (BS EN 60034-2-1: 2007) has been changed to be more accurate and consistent and now uses different test methods so the same motors will have different efficiency figures depending on which test standard is used. Also, IEC 60034 – 2 -1996 and the new 60034-2-1 (2007) have different definitions which are not exactly the same. This means that the same motor could probably have different efficiency levels under the two standards.

If an OEM has IE1 or EFF2 motors in stock in June 2011 when can they no longer supply a pump fitted with an EFF2 motor?

First placing on the market refers to when the manufacturer (or Importer) first sells the motor (separately or integrated into a product). From 16th June 2011 manufacturers and importers must supply IE2 or higher motors. After this date an IE1, EFF1 or EFF2 motor can only be sold by someone who bought it before that date either as a motor for stock or integrated into a product.

Will OEM's still be able to buy and / or sell EFF2 motors for use on their export projects in the Middle East etc (i.e. outside of the EU)?

Yes, the CEMEP Guide states that:

“Placing on the market is considered not to take place where a product is: manufactured or imported into in a Member State with a view to exporting it to a third country;”

It must be clear at purchase that the motors are going to be exported and will not be sold into the EEA.

Would a supplier be allowed to import an IE1 motor into Europe for use on this basis?

Yes, so long as the motor is subsequently exported outside the EEA.