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 eco-design requirements for electric motors
Text with EEA relevance

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(Text with EEA relevance)

THE COMMISSION OF THE EUROPEAN COMMUNITIES,
Having regard to the Treaty establishing the European Community,
Having regard to Directive 2005/32/EC of the European Parliament and of the Council of 6 July 2005 establishing a framework for the setting of eco-design requirements for energy-using products and amending Council Directive 92/42/EEC and Directives 96/57/EC and 2000/55/EC of the European Parliament and of the Council [1] and in particular Article 15(1) thereof,
After consulting the Eco-design Consultation Forum,
Whereas:
(1) Under Directive 2005/32/EC eco-design requirements are to be set by the Commission for energy-using products representing significant volumes of sales and trade, having a significant environmental impact and presenting significant potential for improvement in terms of their environmental impact without entailing excessive costs.
(2) Article 16(2) first indent of Directive 2005/32/EC provides that in accordance with the procedure referred to in Article 19(3) and the criteria set out in Article 15(2), and after consulting the Eco-design Consultation Forum, the Commission shall, as appropriate, introduce an implementing measure for products used in electric motor systems.
(3) Electric motors are the most important type of electric load in industries within the Community where motors are used in the production processes. The systems in which these motors are operated account for about 70 % of the electricity consumed by the industry. There is a total potential for cost-effective improvement of the energy efficiency of these motor systems by about 20 % to 30 %. One of the major factors in such improvements is the use of energy efficient motors. Consequently, motors in electric motor systems represent a priority product for which eco-design requirements should be established.
(4) Electric motor systems include a number of energy-using products, such as motors, drives, pumps or fans. Motors and variable speed drives are an important part of these products. This is why this Regulation requires that certain types of motors be equipped with variable speed drives.
(5) Many motors are integrated in other products without being separately placed on the market or put into service in the meaning of Article 5 of Directive 2005/32/EC and of Directive 2006/42/EC of the European Parliament and of the Council [2]. To achieve the full cost-efficient energy saving potential, motors integrated in other products should be subject to the provisions of this Regulation.
(6) The Commission has carried out a preparatory study which analysed the technical, environmental and economic aspects of electric motors. The study has been developed together with stakeholders and interested parties from the EU and third countries, and the results have been made publicly available.
(7) The preparatory study shows that electric motors are placed on the Community market in large quantities, with their use-phase energy consumption being the most significant environmental aspect of all life-cycle phases, and their annual electricity consumption amounting to 1067 TWh in 2005, corresponding to 427 Mt of CO2 emissions. In the absence of measures to limit this consumption, it is

predicted that energy consumption will increase to 1252 TWh in 2020. It has been concluded that the life-cycle energy consumption and the use-phase electricity consumption can be improved significantly, in particular if motors in variable speed and load applications are equipped with drives.
(8) The preparatory study shows that electricity consumption in use is the only significant eco-design parameter related to product design as referred to in Annex I, Part 1, to Directive 2005/32/EC.
(9) Improvements in the electricity consumption of electric motors should be achieved by applying existing non-proprietary cost-effective technologies that can reduce the total combined costs of purchasing and operating them.
(10) Eco-design requirements should harmonise power consumption requirements for motors throughout the Community, thus contributing to the functioning of the internal market and to the improvement of the environmental performance of these products.
(11) An appropriate timeframe should be provided for manufacturers to redesign products. The timing should be such that negative impacts on the functionalities of motors are avoided, and cost impacts for manufacturers, in particular small and medium-sized enterprises, are taken into account, while ensuring timely achievement of the objectives of this Regulation.
(12) Power consumption should be determined through reliable, accurate and reproducible measurement methods, which take into account the recognised state of the art including, where available, harmonised standards adopted by the European standardisation bodies, as listed in Annex I to Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services [3].
(13) This Regulation should increase the market penetration of technologies that improve the life-cycle environmental impact of electric motors, leading to estimated life-cycle energy savings of 5500 PJ [4] and electricity savings of 135 TWh by 2020, compared to the situation where no measures are taken.
(14) In accordance with Article 8 of Directive 2005/32/EC, this Regulation should specify the applicable conformity assessment procedures.
(15) In order to facilitate compliance checks, manufacturers should be requested to provide information in the technical documentation referred to in Annexes IV and V to Directive 2005/32/EC.
(16) In order to further limit the environmental impact of motors manufacturers should provide relevant information on disassembly, recycling or disposal at end-of-life.
(17) Benchmarks for currently available technologies with high energy efficiency should be identified. This will help to ensure the wide availability and easy accessibility of information, in particular for small and medium-sized enterprises and very small firms, which will further facilitate the integration of best design technologies for reducing energy consumption.
(18) The measures provided for in this Regulation are in accordance with the opinion of the Committee established by Article 19(1) of Directive 2005/32/EC,
HAS ADOPTED THE FOLLOWING REGULATION:

Article 1

Subject matter and scope

1. This Regulation establishes eco-design requirements for the placing on the market and for the putting into service of motors, including where integrated in other products.
2. This Regulation shall not apply to:
(a) motors designed to operate wholly immersed in a liquid;
(b) motors completely integrated into a product (for example gear, pump, fan or compressor) of which the energy performance cannot be tested independently from the product;
(c) motors specifically designed to operate:
(i) at altitudes exceeding 1000 metres above sea-level;
(ii) where ambient air temperatures exceed 40 °C;

(iii) in maximum operating temperature above 400 °C;
(iv) where ambient air temperatures are less than – 15 °C for any motor or less than 0 °C for a motor with air cooling;
(v) where the water coolant temperature at the inlet to a product is less than 5 °C or exceeding 25 °C;
(vi) in potentially explosive atmospheres as defined in Directive 94/9/EC of the European Parliament and of the Council [5];
(d) brake motors;
except as regards the information requirements of Annex I, points 2(3) to (6) and (12).

Article 2

Definitions

In addition to the definitions set out in Directive 2005/32/EC, the following definitions shall apply:
1. "Motor" means an electric single speed, three-phase 50 Hz or 50/60 Hz, squirrel cage induction motor that:
- has 2 to 6 poles,
- has a rated voltage of UN up to 1000 V,
- has a rated output PN between 0,75 kW and 375 kW,
- is rated on the basis of continuous duty operation.
2. "Variable Speed Drive" means an electronic power converter that continuously adapts the electrical power supplied to the electric motor in order to control the mechanical power output of the motor according to the torque-speed characteristic of the load (being driven by the motor), by adjusting the three-phase 50 Hz power supply to a variable frequency and voltage supplied to the motor.
3. "Squirrel cage motor" means an electric motor with no brushes, commutators, slip rings or electrical connections to the rotor.
4. "Phase" means the type of configuration of the mains electrical supply.
5. "Pole" means the total number of magnetic north and south poles produced by the rotating magnetic field of the motor. The number of poles determines the base speed of the motor.
6. "Continuous duty operation" means the capability of an electric motor with an integrated cooling system to operate at nominal load without interruption below its rated maximum temperature rise.
7. "Brake motor" means a motor equipped with an electro-mechanical brake unit operating directly on the motor shaft without couplings.

Article 3

Eco-design requirements

The eco-design requirements for motors are set out in Annex I.
Each eco-design requirement shall apply in accordance with the following timetable:
1. from 16 June 2011, motors shall not be less efficient than the IE2 efficiency level, as defined in Annex I, point 1;
2. from 1 January 2015:
(i) motors with a rated output of 7,5-375 kW shall not be less efficient than the IE3 efficiency level, as defined in Annex I, point 1, or meet the IE2 efficiency level, as defined in Annex I, point 1, and be equipped with a variable speed drive.
3. from 1 January 2017:
(i) all motors with a rated output of 0,75-375 kW shall not be less efficient than the IE3 efficiency level, as defined in Annex I, point 1, or meet the IE2 efficiency level, as defined in Annex I, point 1, and be equipped with a variable speed drive.
The product information requirements on motors are as set out in Annex I. Compliance with eco-design requirements shall be measured and calculated in accordance with requirements set out in Annex II.

Article 4

Conformity assessment

The conformity assessment procedure referred to in Article 8 of Directive 2005/32/EC shall be the internal design control system set out in Annex IV to that Directive or the management system for assessing conformity set out in Annex V to that Directive.

Article 5

Verification procedure for market surveillance purposes

When performing the market surveillance checks referred to in Article 3(2) of Directive 2005/32/EC, the authorities of the Member States shall apply the verification procedure set out in Annex III to this Regulation.

Article 6

Indicative Benchmarks

The indicative benchmarks for the best-performing motors currently available on the market are identified in Annex IV.

Article 7

Revision

The Commission shall review this Regulation in the light of technological progress on both motors and drives no later than seven years after its entry into force and present the result of this review to the Eco-design Consultation Forum. The review will include resource efficiency, re-use and recycling and the level of measurement uncertainty.

Article 8

Entry into force

This Regulation shall enter into force on the 20th day following its publication in the Official Journal of the European Union.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 22 July 2009.

For the Commission

Andris Piebalgs

Member of the Commission

[1] OJ L 191, 22.7.2005, p. 29.

[2] OJ L 157, 9.6.2006, p. 24.

[3] OJ L 204, 21.7.1998, p. 37.

[4] 1 TWh = 3,6 PJ.

[5] OJ L 100, 19.4.1994, p. 1.

ANNEX I

ECO-DESIGN REQUIREMENTS FOR MOTORS

1. MOTOR EFFICIENCY REQUIREMENTS

The nominal minimum efficiency requirements for motors are set out in Tables 1 and 2.

Table 1

Nominal minimum efficiencies (η) for IE2 efficiency level (50 Hz)

Rated output power (kW)	Number of poles		
	2	4	6
0,75	77,4	79,6	75,9
1,1	79,6	81,4	78,1
1,5	81,3	82,8	79,8
2,2	83,2	84,3	81,8
3	84,6	85,5	83,3
4	85,8	86,6	84,6
5,5	87,0	87,7	86,0
7,5	88,1	88,7	87,2
11	89,4	89,8	88,7

15 | 90,3 | 90,6 | 89,7 |
18,5 | 90,9 | 91,2 | 90,4 |
22 | 91,3 | 91,6 | 90,9 |
30 | 92,0 | 92,3 | 91,7 |
37 | 92,5 | 92,7 | 92,2 |
45 | 92,9 | 93,1 | 92,7 |
55 | 93,2 | 93,5 | 93,1 |
75 | 93,8 | 94,0 | 93,7 |
90 | 94,1 | 94,2 | 94,0 |
110 | 94,3 | 94,5 | 94,3 |
132 | 94,6 | 94,7 | 94,6 |
160 | 94,8 | 94,9 | 94,8 |
200 up to 375 | 95,0 | 95,1 | 95,0 |
Table 2
Nominal minimum efficiencies (η) for IE3 efficiency level (50 Hz)
Rated output power (kW) | Number of poles |
2 | 4 | 6 |
0,75 | 80,7 | 82,5 | 78,9 |
1,1 | 82,7 | 84,1 | 81,0 |
1,5 | 84,2 | 85,3 | 82,5 |
2,2 | 85,9 | 86,7 | 84,3 |
3 | 87,1 | 87,7 | 85,6 |
4 | 88,1 | 88,6 | 86,8 |
5,5 | 89,2 | 89,6 | 88,0 |
7,5 | 90,1 | 90,4 | 89,1 |
11 | 91,2 | 91,4 | 90,3 |
15 | 91,9 | 92,1 | 91,2 |
18,5 | 92,4 | 92,6 | 91,7 |
22 | 92,7 | 93,0 | 92,2 |
30 | 93,3 | 93,6 | 92,9 |
37 | 93,7 | 93,9 | 93,3 |
45 | 94,0 | 94,2 | 93,7 |
55 | 94,3 | 94,6 | 94,1 |
75 | 94,7 | 95,0 | 94,6 |
90 | 95,0 | 95,2 | 94,9 |
110 | 95,2 | 95,4 | 95,1 |
132 | 95,4 | 95,6 | 95,4 |
160 | 95,6 | 95,8 | 95,6 |
200 up to 375 | 95,8 | 96,0 | 95,8 |
2. PRODUCT INFORMATION REQUIREMENTS ON MOTORS
From 16 June 2011, the information on motors set out in points 1 to 12 shall be visibly displayed on:
(a) the technical documentation of motors;
(b) the technical documentation of products in which motors are incorporated;
(c) free access websites of manufacturers of motors;
(d) free access websites of manufacturers of products in which motors are incorporated.
As regards to the technical documentation, the information must be provided in the order as presented in points 1 to 12. The exact wording used in the list does not need to be repeated. It may be displayed using graphs, figures or symbols rather than text.
1. nominal efficiency (η) at the full, 75 % and 50 % rated load and voltage (UN);
2. efficiency level: "IE2" or "IE3";

3. the year of manufacture;
4. manufacturer's name or trade mark, commercial registration number and place of manufacturer;
5. product's model number;
6. number of poles of the motor;
7. the rated power output(s) or range of rated power output (kW);
8. the rated input frequency(s) of the motor (Hz);
9. the rated voltage(s) or range of rated voltage (V);
10. the rated speed(s) or range of rated speed (rpm);
11. information relevant for disassembly, recycling or disposal at end-of-life;
12. information on the range of operating conditions for which the motor is specifically designed:
(i) altitudes above sea-level;
(ii) ambient air temperatures, including for motors with air cooling;
(iii) water coolant temperature at the inlet to the product;
(iv) maximum operating temperature;
(v) potentially explosive atmospheres.
The information referred to in points 1, 2 and 3 shall be durably marked on or near the rating plate of the motor.
The information listed in points 1 to 12 does not need to be published on motor manufacturer's free access website for tailor-made motors with special mechanical and electrical design manufactured on the basis of client request. Information on the mandatory requirement to equip motors, which do not meet the IE3 efficiency level with a variable speed drive, shall be visibly displayed on the rating plate, technical documentation of the motor:
(a) from 1 January 2015 for motors with a rated output of 7,5-375 kW;
(b) from 1 January 2017 for motors with a rated output of 0,75-375 kW.
Manufacturers shall provide information in the technical documentation on any specific precautions that must be taken when motors are assembled, installed, maintained or used with variable speed drives, including information on how to minimise electrical and magnetic fields from variable speed drives.
3. DEFINITIONS FOR THE PURPOSES OF ANNEX I
1. "Nominal minimum efficiency" (η) means the efficiency at full rated load and voltage without tolerances.
2. "Tolerance" means the maximum allowable variation in test measurement result of any given motor compared to the declared value on the rating plate or in the technical documentation.

ANNEX II
MEASUREMENTS AND CALCULATIONS
For the purposes of compliance and verification of compliance with the requirements of this Regulation, measurements and calculations shall be made using a reliable, accurate and reproducible method, which takes into account the generally recognised state-of-the-art methods, and whose results are deemed to be of low uncertainty, including methods set out in documents the reference numbers of which have been published for that purpose in the Official Journal of the European Union. They shall fulfil all of the following technical parameters.
The energy efficiency is the ratio of mechanical output power to the electrical input power.
The efficiency level of the motor, as specified in Annex I, shall be determined at rated output power (PN), rated voltage (UN), and rated frequency (fN).
The difference between the output mechanical power and the input electrical power is due to losses occurring in the motor.
The determination of total losses shall be carried out by one of the following methods:
- measurement of total losses, or
- determination of separate losses for summation.

ANNEX III

VERIFICATION PROCEDURE

When performing the market surveillance checks referred to in Article 3(2) of Directive 2005/32/EC, the authorities of the Member States shall apply the following verification procedure for the requirements set out in Annex I.

1. The authorities of the Member State shall test one single unit.

2. The model shall be considered to comply with the provisions set out in this Regulation, if in the nominal motor efficiency (η), the losses (1-η) do not vary from the values set out in Annex I by more than 15 % on power range 0,75-150 kW and 10 % on power range > 150-375 kW.

3. If the result referred to in point 2 is not achieved the market surveillance authority shall randomly test three additional units, except for motors that are produced in lower quantities than five per year.

4. The same model shall be considered to comply with the provisions set out in this Regulation, if in the average of the nominal efficiency (η), the losses (1-η) of the three units referred to in point 3 do not vary from the values set out in Annex I by more than 15 % on power range 0,75 to 150 kW and 10 % on power range > 150-375 kW.

5. If the results referred to in point 4 are not achieved, the model shall be considered not to comply with this Regulation.

For the purposes of checking conformity with the requirements of this Regulation, Member States shall apply the procedure referred to in Annex II and reliable, accurate and reproducible measurement methods, which take into account the generally recognised state of the art, including methods set in standards the reference numbers of which have been published for that purpose in the Official Journal of the European Union.

ANNEX IV

INDICATIVE BENCHMARKS REFERRED TO IN ARTICLE 6

At the time of adoption of this Regulation, the best available technology on the market for motors was identified as the IE3 level, or an IE3 motor equipped with a variable speed drive, as defined in Annex I.