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COMMISSION OF THE EUROPEAN COMMUNITIES

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Draft

**COMMISSION REGULATION**

**implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for electric motors and their variable speed drives**

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## COMMISSION REGULATION

**implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for electric motors and their variable speed drives**

**(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 ecodesign 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<sup>1</sup> and in particular Article 15(1) thereof,

After consulting the Ecodesign Consultation Forum,

Whereas:

- (1) Under Directive 2005/32/EC ecodesign 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 Ecodesign 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 ecodesign 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. To achieve the full cost-efficient energy saving potential, motors integrated in other products should be subject to the provisions of this Regulation.

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<sup>1</sup> OJ L 191, 22.7.2005, p. 29.

- (6) The Commission has carried out a preparatory study which analysed the technical, environmental and economic aspects of electric motors and their drives. 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 CO<sub>2</sub> 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 requirements regarding other ecodesign parameters referred to in Annex I, Part 1, of Directive 2005/32/EC are not necessary.
- (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) Ecodesign 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 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<sup>2</sup>.
- (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<sup>3</sup> 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 of Directive 2005/32/EC.
- (16) To increase the re-use and recycling of motors, manufacturers should provide information on the assembly and dismantling of motors.

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<sup>2</sup> OJ L 204, 21.7.1998, p. 37.

<sup>3</sup> 1TWh = 3,6 PJ.

- (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 ecodesign requirements for the placing on the market and for the putting into service of motors and their variable speed drives, including where integrated in other products.
2. This Regulation shall not apply to:
  - (a) motors in submersible pumps;
  - (b) motors integrated into a product (for example gear, pump, fan or compressor) where the motor cannot be physically separated from that product and its energy performance cannot be tested separately from the energy performance of that product;
  - (c) motors designed to operate:
    - (i) at altitudes exceeding 1 000 meters above sea-level;
    - (ii) where ambient air temperatures exceed 40 °C;
    - (iii) where ambient air temperatures are less than –15 °C for any machine or less than 0 °C for a machine with air cooling;
    - (iv) where the water coolant temperature at the inlet to a product, or the ambient water for submersible products, is less than 5 °C or exceeding 25 °C.

*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 a rated voltage of  $U_N$  up to 1000 V;
  - has a rated output  $P_N$  between 0,75 kW and 375 kW;
  - has either 2, 4 or 6 poles;
  - 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) 'Submersible pump' means a pump designed to operate under water.

### *Article 3*

#### ***Ecodesign requirements***

The ecodesign requirements for motors and their variable speed drives are set out in Annex I.

Each ecodesign requirement shall apply in accordance with the following timetable:

- (1) from 16 June 2011, motors shall meet 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 either meet 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) motors with a rated output of 0,75 – 375 kW shall either meet 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 and their drives are as set out in Annex I. Compliance with ecodesign requirements shall be measured 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 of that Directive or the management system for assessing conformity set out in Annex V of 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 Ecodesign Consultation Forum. The review will include resource efficiency, re-use and recycling.

*Article 8*  
**Entry into force**

This Regulation shall enter into force on the twentieth day following that of 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,

*For the Commission*

*Member of the Commission*

**ANNEX I**  
**Ecodesign requirements for motors and their drives**

**1. MOTOR EFFICIENCY REQUIREMENTS**

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

**Table 1: Nominal limits (%) for IE2 efficiency level (50 Hz)**

$P_N$ 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 limits (%) for IE3 efficiency level (50 Hz)**

$P_N$ 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 AND THEIR DRIVES

From 16 June 2011, information on motors shall be visibly displayed on

- (a) the packaging and technical documentation of motors;
- (b) the technical documentation of products in which motors are integrated, provided that the motor can be physically separated from the product and its energy performance be tested separately; and
- (c) motor manufacturer's free access websites.

The information does not need to be specified using the exact wording of the list below. It may be displayed using graphs, figures or symbols rather than text.

- (1) efficiency at the full rated load and voltage (%);
- (2) level of efficiency: 'IE2' or 'IE3';
- (3) the year of manufacture;
- (4) manufacturer's name or trade mark and place of manufacturer;

- (5) manufacturer's serial number or identification mark;
- (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 min<sup>-1</sup>);
- (11) information on assembly and dismantling.

The information referred to in points (1), (2) and (3) shall be durably marked on or near the rating plate of the motor.

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 name plate, technical documentation and packaging 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, in order to ensure that, when placed on the market or put into service, the motor and variable speed drive comply with the requirements of this Regulation.

### **3. DEFINITIONS FOR THE PURPOSES OF ANNEX I**

- (1) 'Phases' means the type of configuration of the mains electrical supply;
- (2) 'Pole' means the number of electrical winding sets in the motor. The number of poles determines the base speed of the motor.
- (3) 'Nominal limit' means the efficiency at full rated load and voltage without tolerances.
- (4) '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

For the purposes of compliance and verification of compliance with the requirements of this Regulation, measurements shall be made using a reliable, accurate and reproducible measurement procedure, which takes into account the generally recognised state of the art measurement methods.

The efficiency shall be determined at rated output power ( $P_N$ ), rated voltage ( $U_N$ ), and rated frequency ( $f_N$ ).

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 results of the motor efficiency ( $\eta$ ), the losses ( $1-\eta$ ) do not vary from the limit 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 and the manufacturer still wants to maintain the product on the market after the failure in the first verification test, it must provide three units for testing to the market surveillance authority of the Member State at its own cost. The market surveillance authority shall test these three additional units.
4. The same model shall be considered to comply with the provisions set out in this Regulation, if in the average efficiency ( $\eta$ ) of the three units referred to in point 3, the losses ( $1-\eta$ ) do not vary from the limit 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.
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, as defined in Annex I.