

WORKING DOCUMENT (DRAFT)

Draft elements, for consideration by the Consultation Forum, of a possible future Commission Regulation implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for fans driven by motors with an electric input power between 125 W and 500 kW and repealing Regulation (EU) No 327/2011 – Update May/June 2023.

Foreword:

Significant comments were received by the Commission following the Consultation Forum of 1 April 2022. These were all analysed, leading to adaptations of the Working Document. The purpose of this document is not to cover all aspects that were subject to comments or modifications, but to focus on a certain number of elements for which the Commission services would like to get endorsement/feedback from the members of the Consultation Forum. This document focuses on the following aspects:

- Possible suppression of the concepts of ‘complete fan’ and ‘incomplete fan’ following legal issues that will be explained at the CF.
- Proposal to regulate jet fans down to 750 W instead of 5 kW with new equations. Use of P_r (impeller power) instead of P_e (electric input power) in the equation.
- Proposed solution for fans equipped with permanently fitted protective guards that cannot be removed without making the fan ineffective.
- Circumvention and software updates: proposal to use standard wording agreed in Regulatory Committee for tumble dryers (April 2023).
- Some new/modified definitions, in particular attempt to better align the definitions related to flow and pressure with the relevant standards.
- Some reworded exemptions.
- Entry into application in one tier (2 years in general; 3 years for information requirements on partial load or at specified duty).
- Repeal, and transitional provisions for fans integrated into other products (one year transition).
- Resource Efficiency Requirements (alignment with more recent Regulations).

Article 1

Subject matter and scope

1. This Regulation establishes ecodesign requirements for the placing on the market or putting into service of fans with an electric input power ≥ 125 W and ≤ 500 kW at their best efficiency point, including where they are integrated in other products.
2. This Regulation shall not apply to:
 - (a) fan-impellers mounted on the shaft of electric motors with the sole purpose of cooling the motor itself;
 - (b) fans integrated in laundry and washer dryers with maximum electric input power ≤ 3 kW;
 - (c) fans integrated in kitchen hoods with total maximum electric input power attributable to the fan(s) < 280 W;
 - (d) fans with a best energy efficiency point at 8000 revolutions per minute or more;
 - (e) jet fans with maximum impeller power < 750 W.
3. This Regulation shall not apply to fans which are specified to operate exclusively and are clearly marketed as such:
 - [...]
 - j) for material transport, characterised by handling substances with a solid particle concentration of more than 10 mg/m^3 and particles with an average size of at least 0,1 mm and a hardness of at least 2 Mohs, while having an average backward curved blade angle of $50^\circ - 90^\circ$;
 - k) as spare part fan intended to replace a corresponding existing defect fan placed on the market before entry into application of this Regulation and integrated into a product, for a period of 7 years after the entry into application date, to the extent that the corresponding compliant fan is not fit to be used as a replacement e.g. because its size exceeds the available physical space, with equal or superior efficiency of the fan it intends to replace and where packaging and product information clearly indicate that the fan shall only be used for the purpose for which it is specified;

[...]

Article 2

Definitions

In addition to the definitions set out in Directive 2009/125/EC, the following definitions shall apply:

- (1) 'fan' means a rotary-bladed machine that receives energy and utilizes it by means of one or more impellers to maintain a continuous flow of air or other gas passing through it and, with a pressure-increase ratio lower than 1.1 and an output air velocity lower than 65 m/s, which is an axial fan, centrifugal fan, cross flow fan, mixed flow fan or jet fan,

and includes at least an impeller, a motor, a stator any other significant elements that are supplied with the fan.

- (5) ‘electric motor’ or ‘motor’ means a device that converts electrical input power into mechanical output power in the form of a rotation with a rotational speed and torque that depends on factors including the frequency of the supply voltage and number of poles of the motor as applicable;
- (6) ‘inlet cone’, also known as venturi inlet, inlet bell, inlet radius, means a device that steers the air into the impeller and reduces the vena contracta and turbulence that would occur at the entrance of the impeller;
- (7) ‘inlet guide vanes’ means vanes positioned before the impeller to guide the gas stream towards the impeller and which may or may not be adjustable;
- (8) ‘outlet guide vanes’ means vanes positioned after the impeller to guide the gas stream from the impeller and which may or may not be adjustable;
- (9) ‘diffuser’ means a device that influences the fan performance through static recovery;
- (10) ‘protective guard’ means a grid placed at fan inlet designed to prevent the ingestion of relatively large foreign bodies and/or to prevent human body elements such as hand or finger to reach the rotating impeller;
- (11) ‘transmission’ means a driving arrangement for a fan which is not direct drive. Such driving arrangements may include transmissions using a belt-drive, gearbox or slipping coupling;
- (12) ‘variable speed drive’ (VSD) means an electronic power converter that continuously adapts the electric power supplied to a single motor, or multiple motors, to control the motor’s mechanical power output according to the torque-speed characteristic of the load driven by the motor, by adjusting the power supply to a variable frequency and voltage supplied to the motor, including EC (electronically commutated) motors with an internal control. It includes all protection devices and auxiliaries which are integrated in the VSD;
- (13) ‘jet fan’ means a fan that produces a high velocity jet of air in a space (thrust), unconnected to any ducting, where the jet of air entrains movement of the surrounding air, creating an overall air flow through the space. It is designed for operation with open inlets and outlets rather than operating against pressure [and is capable of achieving at least an efficiency of 35%, assessed in accordance with Annex III, point 4];
- (14) ‘equivalent model’ means a model which has the same technical characteristics relevant for the technical information to be provided, but which is placed on the market or put into service by the same manufacturer, importer or authorised representative as another model with a different model identifier;
- (15) ‘model identifier’ means the code, usually alphanumeric, which distinguishes a specific product model from other models with the same trade mark or the same manufacturer’s, importer’s or authorised representative’s name;

Article 3

Ecodesign requirements

The ecodesign requirements for fans are set out in Annex II and shall apply from the dates indicated therein.

Article 4

Conformity assessment

1. The conformity assessment procedure referred to in Article 8 of Directive 2009/125/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.
2. For the purposes of the conformity assessment pursuant to Article 8 of Directive 2009/125/EC, the technical documentation shall contain a copy of the product information provided in accordance with points 2, 3 and 4 of Annex II to this Regulation, and the details and results of calculations set out in Annex III to this Regulation, and where applicable Annex II.1.
3. Where the information included in the technical documentation for a particular model has been obtained:
 - (a) from a model that has the same technical characteristics relevant for the technical information to be provided but is produced by a different manufacturer; or
 - (b) by calculation on the basis of design or extrapolation from another model of the same or a different manufacturer, or both,

The technical documentation shall include the details of such calculation, the assessment undertaken by the manufacturer to verify the accuracy of the calculation and, where appropriate, the declaration of identity between the models of different manufacturers.

The technical documentation shall include a list of all equivalent models, including the model identifiers.

4. A fan to which a VSD is added is not to be considered a different fan requiring a new conformity assessment if:
 - (a) the VSD is physically located as not to interfere with the air stream;
 - (b) the VSD can be removed from the product for verification without damaging the product.

Article 6

Circumvention

1. Manufacturers, importers or authorised representatives shall not place on the market or put into service products designed to alter their behaviour or properties when being tested, to achieve a more favourable result for any declared value of the parameters regulated in this Regulation. That includes, but is not limited to, products designed to detect they are being tested by recognising the test conditions or test cycle and to automatically alter their behaviour or properties in response, and products pre-set to alter their behaviour or properties at the time of testing.
2. Manufacturers, importers or authorised representatives shall not prescribe specific test instructions which alter the behaviour or the properties of products to achieve a more favourable result for any of the declared value of the parameters regulated in

this Regulation. That includes, but is not limited to, prescribing a manual alteration of a product in preparation for the test which alters the product's behaviour or properties compared with when it is in normal use and operated by the end-user.

3. Manufacturers, importers or authorised representatives shall not place on the market or put into service products designed to alter their behaviour or properties within a short period of being put into service in a way that worsens any declared value for the parameters regulated in this Regulation.

Article 7

Software updates

1. Software or firmware updates shall not worsen any declared value for the parameters of a fan when measured using the testing method applicable at the time of it being placed on the market or put into service [except with the explicit consent of the end-user prior to the update].
2. No change of any declared value for the parameters of a fan when measured using the testing method applicable at the time of it being placed on the market or put into service shall occur as a result of rejecting the update.

Article 10

Repeal and transitional provisions

Commission Regulation (EU) No 327/2011 is repealed as from two year after entry into force of this regulation, except for Annexes I, II and III, which are repealed as from three years after entry into force of this regulation, only in relation to fans integrated into other products.

Article 11

Entry into force and application

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

It shall apply from two years after entry into force of this Regulation. However, Article 6 shall apply from the date of entry into force of this Regulation.

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

Annex I
Definitions applicable for the Annexes

- (8) 'fan efficiency' (η) is the ratio of the fan gas power output P_u and the electric input power P_e , both expressed in W and determined at bep, multiplied with correction factors for power conversion C_p , part load compensation C_c , and guard compensation C_{guard} , following the expression:

$$\eta = C_p \cdot C_c \cdot C_{\text{guard}} \cdot P_u / P_e$$

with a distinction between 'static' or 'total' efficiency depending on whether the fan gas power P_u has been determined with respectively the fan static pressure or fan pressure;

- (9) 'power conversion correction' C_p , is a correction factor for power conversion losses with a default value of 0,9 for fans equipped with a DC current motor with a rated voltage lower than 100 V, when the converter transforming AC current into the DC current is **not** part of the fan;
- (10) 'impeller power' P_r , in W, is the mechanical power supplied to the impeller of the fan;
- (11) 'guard compensation' C_{guard} is a correction factor that may be applied when calculating fan efficiency in case the fan is equipped by permanently fitted safety guards that cannot be removed without making the fan ineffective. The of value C_{guard} is:
1 for a fan without a protective guard, with removable protective guard, or a protective guard with opening $e > 30$;
1.02 for a fan equipped with a protective guard with opening $20 < e \leq 30$;
1.06 for a fan equipped with a protective guard with $10 < e \leq 20$;
1.09 for a fan equipped with a protective guard with opening $8 < e \leq 10$;
1.15 for a fan equipped with a protective guard with opening $e \leq 8$,
where 'e' is the dimension of the opening, corresponding to the side of a square opening, the diameter of a round opening and the narrowest dimension of a slot opening, as defined in section 4.2.4.1 of standard EN ISO 13857:2019.
- 'fan flow rate' q_v , in m³/s, is the gas volume displaced per unit of time by the fan and is derived from the mass flow rate, typically with standard air with a density ρ at default 1,200 kg/m³;
- (12) 'total pressure' (p_{tot}), in Pa, is the pressure calculated from the absolute pressure and the dynamic pressure;
- (13) 'absolute pressure' (p), in Pa, is the pressure measured with respect to absolute zero pressure;
- (14) 'dynamic pressure' (p_d), in Pa, is the pressure calculated from the velocity and the density;
- (15) 'fan dynamic pressure' (p_{fd}), in Pa, is the dynamic pressure of the fan, defined at the fan outlet with the average velocity;
- (16) 'fan static pressure' (p_{fs}), in Pa, is the omnidirectional force per unit surface area exerted at the fan outlet and is typically assessed by measuring the stagnation pressure in a (cylindrical) hole of appropriate geometry and dimensions, in duct wall or appropriate measurement instrument perpendicular to the direction of the gas flow. It is the difference between the static pressure at the fan outlet and the stagnation pressure at the

fan inlet or when the compressibility phenomenon is not a factor then the difference between the static pressure at the fan outlet and the total pressure at the fan inlet;

- (17) 'fan pressure' (p_f), in Pa, is the directional force per unit surface area exerted at the fan outlet and is typically assessed by measuring the stagnation pressure in a (cylindrical) hole of appropriate geometry dimensions facing the direction of the gas flow. It is the difference between the stagnation pressures at the fan outlet and the fan inlet or when compressibility phenomenon is not a factor then difference between the total pressures at the fan outlet and the fan inlet;
- (18) 'stagnation pressure' (p_{sg}), in Pa, means the pressure measured at a point in a flowing gas if it were brought to rest via a process where there is no transfer of heat or matter;
- (19) 'professional repairer' means an operator or undertaking which provides services of repair and professional maintenance of fans;
- (20) 'manufacturer-authorized professional repairer' means a professional repairers authorised by the manufacturer, importer or authorised representative to repair safety critical fans they place on the market.
- (21) 'guarantee' means any undertaking by the manufacturer, importer or authorised representative to the consumer, to: (a) reimburse the price paid; or (b) replace, repair or handle fans in any way if they do not meet the specifications set out in the guarantee statement or in the relevant advertising;
- (22) 'safety critical fan' means ...

ANNEX II

Ecodesign requirements for fans

All fans in scope shall comply with the ecodesign requirements laid out in this annex two or three years after entry into force as applicable, except for fans integrated into other products which are placed on the market within the first year after entry into application, provided those fans meet the requirements of Annex I of Regulation (EU) 327/2011, using the calculation methods in annex II to that Regulation, to be verified by market surveillance authorities according to annex III to that Regulation.

1. MINIMUM FAN EFFICIENCY REQUIREMENTS

Two years after entry into force, all fans in scope except jet and cross flow fans shall comply with the minimum fan efficiency (η_{min}) values, which are a function of the electric input power P_e (in kW) and efficiency grade N following the equations:

- for fans with $P_e < 10$ kW: $\eta_{min} = 4,56 \text{ LN}(P_e) - 10,5 + N [\%]$
- for fans with $P_e \geq 10$ kW: $\eta_{min} = 1,1 \text{ LN}(P_e) - 2,6 + N [\%]$

Jet fans shall comply with the minimum jet fan efficiency ($\eta_{r,min}$) values, which are a function of the impeller power P_r (in kW) and efficiency grade N following the equations:

- for jet fans with $P_r \geq 750$ W and < 10 kW: $\eta_{r,min} = 6,85 \text{ LN}(P_r) - 1,58 + N [\%]$
- for jet fans with $P_r \geq 10$ kW: $\eta_{r,min} = 1,1 \text{ LN}(P_r) - 2,6 + N [\%]$

where values of efficiency grade N are set out in Table 1 below per fan type, efficiency category (static or total) and measurement category (A to E) as appropriate, subject to the following conditions:

- The calculation of the efficiency grade N for mixed flow fans involves the fan flow angle α , in degrees rounded to the nearest integer, assessed in accordance with the measurement method in Annex III, point 1.
- For dual use fans designed for both ventilation under normal conditions and emergency use as set out in Art. 1, 3 (b), the values of the minimum efficiency grades set out in Table 1 will be multiplied by a factor 0,90.
- For reversible fans the values of the minimum efficiency grades set out in Table 1 will be multiplied by a factor 0,85.
- For low noise fans the values of the minimum efficiency grades set out in Table 1 will be multiplied by a factor 0,90.
- For centrifugal fans with specific speed $\sigma_{bep} < 0,12$, electric input power $P_e < 10$ kW, measurement category B or D and efficiency category ‘total’ the minimum fan efficiency (η_{min}) is a function of σ_{bep} as follows:

$$\eta_{min} = 2,95 * \sigma_{bep} + 0,2$$

Table 1 — Minimum efficiency grades

Fan type	Measurement category	Efficiency category (pressure)	Minimum efficiency grades (N) <i>2 years after entry into force</i>
Axial fans	A, C	static	50
	B, D	total	64
Forward curved <5kW and backward inclined centrifugal fans	A, C	static	52
	B, D	total	57
Other centrifugal fans	A, C	static	64
	B, D	total	67
Mixed flow fans	A, C	static	$57+7 \cdot (\alpha - 45)/25$
	B, D	total	67
Jet fans ≥ 750 W	E		50

For cross flow fans, the minimum total efficiency (B,D) is 0,21 (21%) over the full power range.

3. INFORMATION REQUIREMENTS ON PARTIAL LOAD OR AT SPECIFIED DUTY

(1) For all fans, except custom fans:

Three years after entry into force, the partial-load operational performance of the fan shall be provided for all fans, except custom fans. This shall be described by a minimum of three performance curves at different speeds: one at the stated inherent speed, one at a lower speed of between 40% and 50% of the maximum speed, plus an additional one in the middle ($\pm 5\%$) of the other two. More than three curves can be provided, including at any speeds including ones lower than 40%.

Performance curves shall comprise a sufficient number of test points to permit the characteristic curve to be plotted over the normal operating range.

The information on the curves can be in digital form such as selection software or online catalogue. However, the values of volume flow, pressure, energy consumption and efficiency shall be provided for the individual test points.

This information shall be available on:

- (a) the technical data sheet or user manual supplied with the fan, unless an internet link or a QR code to that information is supplied with the product, and
- (b) the technical documentation for the purposes of conformity assessment pursuant to Article 4, and
- (c) the free access websites of the manufacturer of the fan, its authorised representative or the importer.

(2) For custom fans:

Three years after entry into force, the performance or performance curve of custom fans at the specified operating point(s) or operating range(s) shall be provided. A performance curve shall comprise a sufficient number of test points to permit the characteristic curve to be plotted over the normal operating range. The values of volume flow, pressure, energy consumption and efficiency shall be provided for the individual test points.

This information shall be available on:

- (a) the technical data sheet or user manual supplied with the fan, unless an internet link or a QR code to that information is supplied with the product, and
- (b) the technical documentation for the purposes of conformity assessment pursuant to Article 4.

4. RESOURCE EFFICIENCY REQUIREMENTS:

For fans that are specifically designed and marketed exclusively to be integrated in specific energy-related products covered by ecodesign requirements with respect to spare part availability, the specific provisions of the concerned implementing regulation do apply, for the duration specified therein, in place of the requirements below.

For all other fans shall, the following requirements shall apply, two years after entry into force:

1. Availability of spare parts:

- (1) For all models, units of which are placed on the market as from date of entry into application of this Regulation, manufacturers, importers or authorised representatives of fans, other than 1° safety critical fans, 2° fans that are specifically designed and marketed exclusively to be integrated in specific energy-related products covered by ecodesign requirements with respect to spare part availability, and 3° custom fans for which spare part availability is addressed in the contract, shall make available to professional repairers at least the following spare parts, if part of the fan, as individual elements or integrated as originally supplied:
 - a) motors and motor brushes;
 - b) impellers;
 - c) stator elements;
 - d) mechanical drive components;
 - e) variable speed drives;
 - f) sensors; and
 - g) wearing parts (sacrificial elements);
 - h) joints and fixtures required to install these spare parts;
- (2) For all models, units of which are placed on the market as from date of entry into application of this Regulation, manufacturers, importers or authorised representatives of safety critical fans shall make available to manufacturer-authorised professional repairers at least the following spare parts, if part of the fan, as individual elements or integrated as originally supplied:

- a) motors and motor brushes;
- b) impellers,
- c) stator elements;
- d) mechanical drive components;
- e) variable speed drives;
- f) sensors; and
- g) wearing parts (sacrificial elements)
- h) joints and fixtures required to install these spare parts;

(3) availability of spare parts referred to in point (1) and (2) shall be ensured for a minimum period starting at the latest two years after entry into application of this regulation or two years after the placing on the market of the first unit of the model, whichever is the later date, and ending at least 7 years after placing on the market the last unit of the model concerned. For that purpose, the list of spare parts, the procedure for ordering them and the repair instructions shall be publicly available on the free access website of the manufacturer, importer or authorised representative, at least during the same period and starting at the date referred to in this point;

(4) Maximum delivery time of spare parts:

During the period mentioned under the previous point, the manufacturer, importer or authorised representatives shall ensure the delivery of the spare parts with the following timeframe:

- for fans incorporated into another product covered by another ecodesign regulation: the period defined in the end-product regulation;
- if not, as specified in a contract, where a contract exists between the manufacturer and the end user of the fan;
- if not, as defined in the product information of the fan and made available on free access websites;
- if not, then 8 weeks after having received the order;

2. Access to repair and maintenance information :

(a) During the period referred to in point 1. (3) the manufacturer, importer or authorised representative shall provide access to the appliance repair and maintenance information to professional repairers.

The manufacturer's, importer's or authorised representative's website shall indicate the process for professional repairers to request access to information. In order to accept such a request, the manufacturers, importers or authorised representatives may only require the professional repairer to demonstrate that:

(i) the professional repairer has the technical competence to repair fans and complies with the applicable regulations for repairers of electrical equipment in the Member States where it operates. Reference to an official registration system as professional repairer, where such system is in place in the Member States concerned, shall be accepted as proof of compliance with this point;

- (ii) the professional repairer is covered by insurance covering liabilities resulting from its activity regardless of whether this is required by the Member State;
- (b) manufacturers, importers or authorised representatives shall accept or refuse the request referred to in point (a) within 5 working days;
- (c) manufacturers, importers or authorised representatives may charge reasonable and proportionate fees for access to the repair and maintenance information or for receiving regular updates. A fee is reasonable if it does not discourage access by failing to take into account the extent to which the professional repairer uses the information;
- (d) once the request is accepted, a professional repairer shall have access to the requested repair and maintenance information within one working day. The information may be provided for an equivalent model or model of the same family, where relevant;

The repair and maintenance information shall include:

- (a) the unequivocal appliance identification;
 - (b) a disassembly map or exploded view allowing to visualise at least the spare parts made available;
 - (c) technical manual of instructions for repair;
 - (d) list of necessary repair and test equipment;
 - (e) component and diagnosis information (such as minimum and maximum theoretical values for measurements);
 - (f) wiring and connection diagrams;
 - (g) diagnostic fault and error codes (including manufacturer-specific codes, where applicable);
 - (h) instructions for installation of relevant software and firmware including reset software; and
 - (i) information on how to access data records of reported failure incidents stored on the product (where applicable).
3. Requirements for dismantling for material recovery and recycling while avoiding pollution:
- (1) manufacturers, importers or authorised representatives shall ensure that fans are designed in such a way that the materials and components referred to in Annex VII to Directive 2012/19/EU can be removed with the use of commonly available tools;
 - (2) manufacturers, importers and authorised representatives shall fulfil the obligations laid down in Point 1 of Article 15 of Directive 2012/19/EU.
4. Manufacturers, importers or authorised representatives of fans shall make available software and firmware updates for a minimum of 10 years after the placing of the last unit of a model on the market and these software and firmware updates shall be provided free of charge.

5. MATERIAL EFFICIENCY PRODUCT INFORMATION REQUIREMENTS

Two year after entry into force, user and installer instructions shall be provided in the form of a user manual on a free access websites of manufacturers, importers and authorised representatives, and shall include the following information:

- (1) How to access to professional repair services (internet webpages, addresses, contact details);
- (2) relevant information for ordering spare parts, directly from the manufacturer or through other channels;
- (3) the minimum period during which spare parts, necessary for the repair of the appliance, are available;
- (4) the minimum duration of the guarantee of the fan in years;
- (5) details of any proprietary tool required for repair;
- (6) correct installation;
- (7) maintenance;
- (8) identification of errors, the meaning of the errors, and the action required, including identification of errors requiring professional assistance; and
- (9) information on any implications of self-repair or non-professional repair for the safety of the user and for the guarantee.

Verification procedure for market surveillance purposes

[...]

<i>Table 2 — Verification tolerances</i>	
<i>Parameters</i>	<i>Verification tolerances</i>
Fan efficiency (η)	The determined value shall not be lower than the value representing 93% of the corresponding declared value at bep, and not be lower than the value representing 90% of the corresponding declared value at partial load
Electric motor input power (P_e) at bep	The determined value shall not be lower than the value representing 95% of the corresponding declared value at bep, and not be lower than the value representing 90% of the corresponding declared value at partial load
Flow rate (q_v) at bep	The determined value shall not be lower than the value representing 95% of the corresponding declared value at bep, and not be lower than the value representing 90% of the corresponding declared value at partial load
Pressure difference (Δp) at bep	The determined value shall not be lower than the value representing 95% of the corresponding declared value at bep, and not be lower than the value representing 90% of the corresponding declared value at partial load.

[...]