CABINET OF MINISTERS OF UKRAINE

RESOLUTION

No. 151 of 27 February 2019
Kyiv

On Approval of the Technical Regulation on Ecodesign Requirements for Fans Driven by Motors with an Electric Input Power Between 125 W and 500 kW

In accordance with Article 5 of the Law of Ukraine 'On Technical Regulations and Conformity Assessment', the Cabinet of Ministers of Ukraine hereby **resolves**:

1. The Technical Regulation on Ecodesign Requirements for Fans Driven by Motors with an Electric Input Power Between 125 W and 500 kW shall be approved as attached.

2. The State Agency on Energy Efficiency and Energy Saving shall ensure the implementation of the Technical Regulation approved by this Resolution.

3. The attached amendment shall be introduced to the list of types of products subject to state market surveillance by state market surveillance authorities, approved by the Resolution of the Cabinet of Ministers of Ukraine No. 1069 of 28 December 2016 (Official Journal of Ukraine, 2017, No. 50, p. 1550).

4. This Resolution shall enter into force after six months following its publication.

Prime Minister of Ukraine **VOLODYMYR GROYSMAN**

Ind. 21

APPROVED
by the Resolution of the Cabinet of Ministers of Ukraine
No. 151 of 27 February 2019

TECHNICAL REGULATION on Ecodesign Requirements for Fans Driven by Motors with an Electric Input Power Between 125 W and 500 kW

General Provisions

1. This Technical Regulation establishes ecodesign requirements for placing on the market and for putting into service of fans driven by motors with an electric input power between 125 W and 500 kW (hereinafter referred to as 'fans') (including integrated in other energy-related products), covered by the Technical Regulation Establishing a Framework for the Setting of Ecodesign Requirements for Energy-Related Products, approved by the Resolution of the Cabinet of Ministers of Ukraine No 804 of 3 October 2018 (Official Journal of Ukraine, 2018, No 80, p. 2678).

This Technical Regulation is based on the Commission Regulation (EU) No. 327/2011 of 30 March 2011 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.

2. This Technical Regulation shall not apply to:

1) fans integrated in:

products with a sole electric motor of 3 kW or less where the fan is fixed on the same shaft used for driving the main functionality;

laundry and washer dryers ≤ 3 kW maximum electrical input power;

kitchen hoods < 280 W total maximum electrical input power attributable to the fans.

2) fans which are:

designed specifically to operate in potentially explosive atmospheres as defined in the Resolution of the Cabinet of Ministers of Ukraine of 28 December 2016 No. 1055 "On approval of the Technical Regulation for equipment and protective systems intended for use in potentially explosive atmospheres" (Official Journal of Ukraine, 2017, No. 8, p. 236);

designed for use in exceptional cases, at short-time duty, to fulfil the requirements of fire and technogenic safety legislation;

designed specifically to operate:

- where operating temperatures of the gaseous substance exceed 100 ºC;

- where operating ambient temperature for the motor, if located outside the gas stream, driving the fan exceeds 65 ºC;

- where the annual average temperature of the gaseous substance being moved and/or the operating ambient temperature for the motor, if located outside the gas stream, are lower than – 40 ºC;

- with a supply voltage > 1000 V AC or > 1500 V DC;

- in toxic, highly corrosive or flammable environments or in environments with abrasive substances;

- with optimal energy efficiency at 8000 rpm or more.

3. For the purpose of this Technical Regulation the terms shall have the following meaning:

‘fan’ means a rotary bladed machine that is used to maintain a continuous flow of gaseous substance, typically air, passing through it and whose work per unit mass does not exceed 25 kJ/kg, and which:

- is designed for use with or equipped with an electrical motor with an electric input power between 125 W and 500 kW (≥ 125 W and ≤ 500 kW) to drive the impeller at its optimum energy efficiency point;

- is an axial fan, centralized fan, cross flow fan or mixed flow fan;

- may or may not be equipped with a motor when placed on the market or put into service;

‘mixed flow fan’ means a fan in which the gas path through the impeller is intermediate between the gas path in fans of centrifugal and axial types;

‘cross flow fan’ means a fan in which the gas path through the impeller is in a direction essentially at right angles to its axis both entering and leaving the impeller at its periphery;

‘ventilation fan’ means a fan that is not used in the following energy-related products:

- laundry and washer dryers > 3 kW maximum electrical input power;

- indoor units of household air-conditioning products and indoor household air-conditioners, ≤ 12 kW maximum air flow output power;

- information technology products;

‘outlet guide vane’ is a vane positioned after the impeller to guide the gas stream from the impeller and which may or may not be adjustable;

‘centrifugal fan’ means a fan in which the gaseous substance enters the impeller(s) in an essentially axial direction and leaves it in a direction perpendicular to that axis. The impeller may have one or two inlets and may or may not have a housing;

‘centrifugal straight-bladed fan’ means a centrifugal fan where the outward direction of the blades of the impeller(s) at the periphery is radial relative to the axis of rotation;

‘centrifugal radial forward curved fan’ means a centrifugal fan where the outward direction of the blades of the impeller(s) at the periphery is forward relative to the direction of rotation;

‘centrifugal radial backward curved fan without housing’ means a centrifugal fan where the outward direction of the blades of the impeller(s) at the periphery is backward relative to the direction of rotation and which does not have a housing;

‘centrifugal radial backward curved fan with housing’ means a centrifugal fan with an impeller where the outward direction of the blades at the periphery is backward relative to the direction of rotation and which has a housing;

‘inlet guide vane’ is a vane positioned before the impeller to guide the gas stream towards the impeller and which may or may not be adjustable;

‘housing’ means a casing around the impeller which guides the gas stream towards, through and from the impeller;

‘short-time duty’ means working of a motor at a constant load, which is not long enough to reach temperature equilibrium;

‘axial fan’ means a fan that propels gaseous substance in the direction axial to the rotational axis of one or more impellers with a swirling tangential motion created by the rotating impeller(s). The axial fan may or may not be equipped with a cylindrical housing, inlet or outlet guide vanes or an orifice panel or orifice ring;

‘specific ratio’ means the stagnation pressure measured at the fan outlet divided by the stagnation pressure at the fan inlet at the optimal energy efficiency point of the fan;

‘orifice ring’ means a ring with an opening in which the fan sits and which allows the fan to be fixed to other structures;

‘orifice panel’ means a panel with an opening in which the fan sits and which allows the fan to be fixed to other structures;

‘impeller’ means the part of the fan that is imparting energy into the gas flow and is also known as the fan wheel.

Other terms used herein shall have meanings set out in the Laws of Ukraine ‘On Technical Regulations and Conformity Assessment’, ‘On State Market Surveillance and Control of Non-Food Products’, ‘On Standardization’, ‘On General Safety of Non-Food Products’ and in the Technical Regulation Establishing a Framework for the Setting of Ecodesign Requirements for Energy-Related Products, approved by the Resolution of the Cabinet of Ministers of Ukraine No. 804 of 3 October 2018 (Official Journal of Ukraine, 2018, No. 80, p. 2678).

Ecodesign Requirements

4. The ecodesign requirements for fans are set out in Annex 1.

5. Two years after this Technical Regulation has come into force all fans driven by motors with an electric input power between 125 W and 500 kW shall not have a lower target energy efficiency than as defined in Annex 1, Table 1.

6. The product information requirements on fans and how they must be displayed are as set out in Annex 1, point 3 and shall apply no later than two years after this Technical Regulation has come into force.

7. The fan energy efficiency requirements, set out in Annex 1, point 2, shall not apply to fans which are designed to operate:

in applications in which the ‘specific ratio’ is over 1,11;

as conveying fans used for the transport of non-gaseous substances in industrial process applications.

8. For dual use fans designed for both ventilation under normal conditions and emergency use, at short-time duty, to fulfil the requirements of fire and technogenic safety legislation, the values of the applicable efficiency grades set out in Annex 1 point 2 will be reduced by 5 % for Table 1.

9. Compliance with ecodesign requirements shall be measured and calculated in accordance with requirements set out in Annex 2.

Conformity Assessment

10. Conformity of fans with the requirements of this Technical Regulation shall be assessed by applying the internal design control procedure or the management system conformity assessment procedure set out, respectively, in Annexes 3 and 4 to the Technical Regulation establishing a framework for the setting of ecodesign requirements for energy-related products, approved by the Resolution of the Cabinet of Ministers of Ukraine No 804 of 3 October 2018 (Official Journal of Ukraine, 2018, No 80, p. 2678).

State Market Surveillance

11. Verification of fans conformity with the requirements of this Technical Regulation in the course of state market surveillance shall be made in accordance with the requirements set out in Annex 3.

Indicative Benchmarks

12. The indicative benchmarks for the best-performing fans available on the market are set out in Annex 4.

Correlation Table

13. The correlation table between the provisions of the Commission Regulation (EU) No. 327/2011 of 30 March 2011 implementing Directive 2005/125/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 this Technical Regulation is set out in Annex 5.

Annex 1
to the Technical Regulation

ECODESIGN REQUIREMENTS
for fans

1. In this Annex the terms below shall be used in the following meaning:

‘dynamic pressure’ means the pressure calculated from the mass flow rate, the average gas density at the outlet and the fan outlet area;

‘fan total pressure’ (p_f) means the difference between the stagnation pressure at the fan outlet and the stagnation pressure at the fan inlet (fan total pressure has been used to determine fan gas power in the efficiency equation for total efficiency);

‘measurement category’ means a test, measurement or usage arrangement that defines the inlet and outlet conditions of the fan to be tested;

‘measurement category A’ means an arrangement where the fan is measured with free inlet and outlet conditions;

‘measurement category B’ means an arrangement where the fan is measured with free inlet and with a duct fitted to its outlet;

‘measurement category C’ means an arrangement where the fan is measured with a duct fitted to its inlet and with free outlet condition;

‘measurement category D’ means an arrangement where the fan is measured with a duct fitted to its inlet and outlet;

‘efficiency category’ means the fan gas output energy form used to determine the fan energy efficiency, either static efficiency or total efficiency, where:

- ‘fan static pressure’ (p_{sf}) has been used to determine fan gas power in the efficiency equation for fan static efficiency;

- ‘total efficiency’ means the energy efficiency of a fan, based upon measurement of the ‘fan total pressure’ (p_f);

‘efficiency grade’ is a parameter in the calculation of the target energy efficiency of a fan of specific electric input power at its optimum energy efficiency point (expressed as parameter “N” in the calculation of the fan energy efficiency);

‘stagnation pressure’ means the pressure measured at a point in a flowing gaseous substance if it were brought to rest via an isentropic process;

‘overall efficiency’ is either ‘static efficiency’ or ‘total efficiency’, whichever is applicable;

‘static efficiency’ means the energy efficiency of a fan, based upon measurement of the ‘fan static pressure’ (p_{sf});

‘fan static pressure’ (p_{sf}) means the fan total pressure (p_f) minus the fan dynamic pressure corrected by the Mach factor;

‘target energy efficiency’ (η_{target}) is the minimum energy efficiency a fan must achieve in order to meet the requirements and is based on its electrical input power at its point of optimum energy efficiency, where η_{target} is the output value from the appropriate equation in point 3 of Annex 2 to the Technical Regulation on Ecodesign Requirements for Fans Driven by Motors with an Electric Input Power Between 125 W and 500 kW, using the applicable integer N of the efficiency grade (Table 1) and the electrical power input $P_{e(d)}$ of the fan expressed in kW at its point of optimum energy efficiency in the applicable energy efficiency formula;

‘variable speed drive’ means an electronic power converter integrated — or functioning as one system — with the motor and the fan, 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 characteristic of the load being driven by the motor, excluding variable voltage controllers where only the supply voltage for the motor is different;

‘Mach factor’ means a correction factor applied to dynamic pressure at a point, defined as the stagnation pressure minus the pressure with respect to absolute zero pressure which is exerted at a point at rest relative to the gaseous substance around it and divided by the dynamic pressure.

2. Energy efficiency requirements for fans are laid down in Table 1.

Table 1

Minimum energy efficiency requirements for fans

Fan types	Measurement category (A-D)	Efficiency category (static or total)	Power range P in kW	Target energy efficiency	Efficiency grade (N)
Axial fan	A, C	static	$0{,}125 \leq P \leq 10$	$\eta_{target} = 2{,}74 \bullet \ln(P) - 6{,}33 + N$	40
			$10 < P \leq 500$	$\eta_{target} = 0{,}78 \bullet \ln(P) - 1{,}88 + N$	
	B, D	total	$0{,}125 \leq P \leq 10$	$\eta_{target} = 2{,}74 \bullet \ln(P) - 6{,}33 + N$	58
			$10 < P \leq 500$	$\eta_{target} = 0{,}78 \bullet \ln(P) - 1{,}88 + N$	
Centrifugal forward curved fan and centrifugal radial straight-bladed fan	A, C	static	$0{,}125 \leq P \leq 10$	$\eta_{target} = 2{,}74 \bullet \ln(P) - 6{,}33 + N$	44
			$10 < P \leq 500$	$\eta_{target} = 0{,}78 \bullet \ln(P) - 1{,}88 + N$	
	B, D	total	$0{,}125 \leq P \leq 10$	$\eta_{target} = 2{,}74 \bullet \ln(P) - 6{,}33 + N$	49
			$10 < P \leq 500$	$\eta_{target} = 0{,}78 \bullet \ln(P) - 1{,}88 + N$	
Centrifugal radial backward curved fan without housing	A, C	static	$0{,}125 \leq P \leq 10$	$\eta_{target} = 4{,}56 \bullet \ln(P) - 10{,}5 + N$	62
			$10 < P \leq 500$	$\eta_{target} = 1{,}1 \bullet \ln(P) - 2{,}6 + N$	

Centrifugal radial backward curved fan with housing	A, C	static	$0{,}125 \leq P \leq 10$	$\eta_{target} = 4{,}56 \bullet \ln(P) - 10{,}5 + N$	61
			$10 < P \leq 500$	$\eta_{target} = 1{,}1 \bullet \ln(P) - 2{,}6 + N$	
	B, D	total	$0{,}125 \leq P \leq 10$	$\eta_{target} = 4{,}56 \bullet \ln(P) - 10{,}5 + N$	64
			$10 < P \leq 500$	$\eta_{target} = 1{,}1 \bullet \ln(P) - 2{,}6 + N$	
Mixed flow fan	A, C	static	$0{,}125 \leq P \leq 10$	$\eta_{target} = 4{,}56 \bullet \ln(P) - 10{,}5 + N$	50
			$10 < P \leq 500$	$\eta_{target} = 1{,}1 \bullet \ln(P) - 2{,}6 + N$	
	B, D	total	$0{,}125 \leq P \leq 10$	$\eta_{target} = 4{,}56 \bullet \ln(P) - 10{,}5 + N$	62
			$10 < P \leq 500$	$\eta_{target} = 1{,}1 \bullet \ln(P) - 2{,}6 + N$	
Cross flow fan	B, D	total	$0{,}125 \leq P \leq 10$	$\eta_{target} = 1{,}14 \bullet \ln(P) - 2{,}6 + N$	21
			$10 < P \leq 500$	$\eta_{target} = N$	

3. Product information requirements on fans:

1) the information on fans set out in subpoint 2 of this point shall be visibly displayed on:

the technical documentation of fans;

free access websites of manufacturers of fans;

2) the following information shall be displayed:

overall efficiency (η), rounded to one decimal place;

measurement category used to determine the energy efficiency (A-D);

efficiency category (static or total);

efficiency grade at optimum energy efficiency point;

if the calculation of fan efficiency assumed use of a variable speed drive, information on whether the variable speed drive is integrated within the fan or the variable speed drive must be installed with the fan;

year of manufacture;

manufacturer’s name or trade mark, commercial registration number and place of manufacturer;

product’s model number;

the rated motor power input(s) (kW), flow rate(s) and pressure(s) at optimum energy efficiency;

rotations per minute at the optimum energy efficiency point;

the ‘specific ratio’;

information relevant for facilitating disassembly, recycling or disposal at end of life;

information relevant to minimise impact on the environment and ensure optimal life expectancy as regards installation, use and maintenance of the fan;

description of additional items used when determining the fan energy efficiency, such as ducts, that are not described in the measurement category and not supplied with the fan.

4. The information in the technical documentation shall be provided in the order as presented in subpoint 2 of point 3 hereof. 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.

5. The information referred to in subpoint 2 of point 3, indents two to six hereof, shall be durably marked on or near the rating plate of the fan, where for the sixth indent of subpoint 2 of point 3 hereof one of the following forms of words must be used to indicate what is applicable:

‘a variable speed drive must be installed with this fan’,

‘a variable speed drive is integrated within the fan’.

Manufacturers shall provide information in the manual of instruction on specific precautions to be taken when fans are assembled, installed or maintained. If provision of point 3, subpoint 2, indent six hereof as regards the product information requirements indicates that a variable speed drive is installed together with the fan, manufacturers shall provide details on the characteristics of the variable speed drive to ensure optimal use after installation.

Annex 2
to the Technical Regulation

MEASUREMENTS AND CALCULATIONS

General provisions

1. In this Annex the terms below shall be used in the following meaning:

‘high-efficiency drive’ means a transmission using a belt whose width is at least three times the height of the belt, a toothed belt or using toothed gears;

‘compressibility factor’ is a dimensionless number that describes the amount of compressibility that the gas stream experiences during the test and is calculated as the ratio of the mechanical work done by the fan on the gaseous substance to the work that would be done on an incompressible fluid with the same mass flow, inlet density and pressure ratio, taking into account the fan pressure as ‘total pressure’ (k_p) or ‘static pressure’ (k_{ps});

k_{ps} means compressibility coefficient for the calculation of fan static gas power;

k_p means compressibility coefficient for the calculation of fan total gas power;

‘not final assembly’ means an assembly of fan parts, which consists of at least the impeller and needs one or more externally supplied components in order to be able to convert electric energy into fan gas power;

‘low-efficiency drive’ means a transmission using a belt whose width is less than three times the height of the belt or using some other form of transmission apart from a ‘high-efficiency drive’;

‘inlet stagnation volume flow rate’ (q) is the volume of gaseous substance that passes through the fan per unit of time (in cubic meters per second) and is calculated on the basis of the mass of gaseous substance moved by the fan (in kilograms per second) divided by the density of this gaseous substance at the fan inlet (in kilograms per cubic meter);

‘final assembly’ means a finished or assembled on-site assembly of a fan that contains all the elements to convert electric energy into fan gas power without the need to add more parts or components;

‘transmission’ means a driving arrangement for a fan which is not ‘direct drive’ as defined above. Such driving arrangements may include transmissions using a belt-drive, gearbox and intermediate coupling;

‘direct drive’ means a driving arrangement of a fan where the impeller is fixed to the motor shaft, either directly or with a co-axial coupling, and where the impeller speed is identical to the motor’s rotational speed.

Measurement method

2. For the purposes of compliance and verification of compliance with the requirements of the Technical Regulation on Ecodesign Requirements for Fans Driven by Motors with an Electric Input Power Between 125 W and 500 kW (hereinafter referred to as Technical Regulation), measurements and calculations must be made using state-of-the-art and reproducible methods, whose results are deemed to be of low uncertainty, including methods set out in the standards from the list of national standards, compliance with which provides a presumption of conformity of fans with the requirements of the Technical Regulation.

Calculation method

3. The methodology for calculating the energy efficiency of a specific fan is based on the ratio of gas power to electrical input power of the motor, where fan gas power is the product of gas volume flow rate and pressure difference across the fan. The pressure is either the static pressure or the total

pressure, which is the sum of static and dynamic pressure depending upon the measurement and efficiency category.

1) Where the fan is supplied as a 'final assembly', measure the gas power and the electric input power of the fan at its optimum energy efficiency point as follows:

a) where the fan does not include a variable speed drive, calculate the overall efficiency using the following equation:

$$\eta_e = P_{u(s)}/P_e,$$

where η_e is the overall efficiency;

$P_{u(s)}$ is the fan gas power, determined according to point 3 hereof, when the fan is operating at its optimal energy efficiency point;

P_e is the power measured at the mains input terminals to the motor of the fan when the fan is operating at its optimal energy efficiency point;

b) where the fan includes a variable speed drive, calculate the overall efficiency using the following equation:

$$\eta_e = (P_{u(s)}/P_{ed}) \bullet C_c,$$

where η_e is the overall efficiency;

$P_{u(s)}$ is the fan gas power, determined according to subpoint 3 of point 3 hereof, when the fan is operating at its optimal energy efficiency point;

P_{ed} is the power measured at the mains input terminals to the variable speed drive of the fan when the fan is operating at its optimal energy efficiency point;

C_c is a part load compensation factor.

For a motor with a variable speed drive: if $P_{ed} \geq 5$ kW, then $C_c = 1{,}04$.

For a motor with a variable speed drive: if $P_{ed} < 5$ kW, then $C_c = – 0{,}03 \ln (Ped) + 1{,}088$;

2) where the fan is supplied as 'not final assembly', the fan overall efficiency is calculated at the impeller's optimum energy efficiency point, using the following equation:

$$\eta_e = \eta_r \bullet \eta_m \bullet \eta_T \bullet C_m \bullet C_c,$$

where η_e is the overall efficiency;

η_r is the fan impeller efficiency according to $P_{u(s)}/P_a$,

where $P_{u(s)}$ is fan gas power determined at the point of optimal energy efficiency of the impeller and according to subpoint 3 of point 3 below;

P_a is the fan shaft power at the point of optimal energy efficiency of the impeller;

η_m is the nominal rated motor efficiency, which is calculated using the following values:

- if the recommended electric input power P_e is $\geq 0{,}75$ kW, then

$$\eta_m = 0{,}000278 \bullet (x^3) - 0{,}019247 \bullet (x^2) + 0{,}104395 \bullet x + 0{,}809761,$$

where õ = Lg ($Ð_{å}$) and $Ð_{å}$ is as defined in subpoint "à" of subpoint 1 of point 3 hereof;

- if the recommended motor input power P_e is < 0,75 kW, then

$$\eta_m = 0{,}1462 \bullet \ln(P_e) + 0{,}8381,$$

where P_e is as defined in subpoint 1 of point 3 hereof, where the electric input power P_e recommended by the manufacturer of the fan should be enough for it to reach its optimum energy efficiency point, taking into account losses from transmission systems if applicable;

η_T is the efficiency of the driving arrangement for which the following default values must be used:

for direct drive $\eta_T = 1$;

- if the transmission is a low-efficiency drive as defined in the seventh clause of point 1 hereof and

- $P_à \geq 5$ kW, then $\eta_Ò = 0,96$, or

- 1 kW < $P_à$ < 5 kW, then $\eta_T = 0,0175 \cdot P_à + 0,8725$, or

- $P_à \leq 1$ kW, then $\eta_Ò = 0,89$;

- if the transmission is a high-efficiency drive as defined in the second clause of point 1 hereof and

- $P_à \geq 5$ kW, then $\eta_Ò = 0,98$, or

- 1 kW < $P_à$ < 5 kW, then $\eta_Ò = 0,01 \cdot Ð_à + 0,93$, or

- $P_à \leq 1$ kW, then $\eta_Ò = 0,94$.

C_m is the compensation factor to account for matching of components and is equal to 0,9;

C_c is the part load compensation factor:

- for a motor without a variable speed drive $C_c = 1$;

- for a motor with a variable speed drive and $P_{ed} \geq 5$ kW, then $C_c = 1,04$;

- for a motor with a variable speed drive and $P_{ed} < 5$ kW, then $C_c = - 0,03 \ln(C_c) + 1088$;

3) the fan gas flow power, $P_{u(s)}$ (kW), is calculated according to the measurement category test method chosen by the fan supplier:

where the fan has been measured according to measurement category A, fan static gas power P_{us} is calculated using the following formula:

$$P_{us} = q \cdot p_{sf} \cdot k_{ps};$$

where the fan has been measured according to measurement category B, fan gas power P_u is calculated using the following formula:

$$P_u = q \cdot p_f \cdot k_p;$$

where the fan has been measured according to measurement category C, fan static gas power P_{us} is calculated using the following formula:

$$P_{us} = q \cdot p_{sf} \cdot k_{ps};$$

where the fan has been measured according to measurement category D, fan gas power P_u is calculated using the following formula:

$$P_u = q \cdot p_f \cdot k_p.$$

Methodology for calculating the target energy efficiency

4. The target energy efficiency is the energy efficiency a fan from a given fan type must achieve in order to comply with the requirements set out in this Technical Regulation (expressed in full

percentage points). The target energy efficiency is calculated by efficiency formulas that include the input power $P_{e(d)}$ and the minimum efficiency grade as defined in Annex 1. The complete power range is covered by two formulas: one for fans with an electric input power from 0,125 up to 10 kW and the other for fans above 10 kW up 500 kW.

5. There are three fan types for which energy efficiency formulas are developed to reflect the different characteristics of various fan types:

1) The target energy efficiency for axial fans, centrifugal forward curved fans and centrifugal radial bladed fans (axial fan within) is calculated using the following equations:

Power range P from 0,125 kW to 10 kW	Power range P from 10 kW to 500 kW
$\eta_{target} = 2,74 \cdot \ln(P) - 6,33 + N$	$\eta_{target} = 0,78 \cdot \ln(P) - 1,88 + N$

where the input power P is the input power $P_{e(d)}$ and N is the integer of the energy efficiency grades required;

2) The target energy efficiency for centrifugal backward curved fans without housing, centrifugal backward curved fans with housing and mixed flow fans is calculated using the following equations:

Power range P from 0,125 kW to 10 kW	Power range P from 10 kW to 500 kW
$\eta_{target} = 4,56 \cdot \ln(P) - 10,5 + N$	$\eta_{target} = 1,1 \cdot \ln(P) - 2,6 + N$

where the input power P is the input power $P_{e(d)}$ and N is the integer of the energy efficiency grades required;

3) the target energy efficiency for cross flow fans is calculated using the following equations:

Power range P from 0,125 kW to 10 kW	Power range P from 10 kW to 500 kW
$\eta_{target} = 1,14 \cdot \ln(P) - 2,6 + N$	$\eta_{target} = N$

where the input power P is the input power $P_{e(d)}$ and N is the integer of the energy efficiency grades required.

Applying the target energy efficiency

6. The fan overall efficiency η_e calculated according to point 3 of this Annex must be equal to or greater than the target value η_{target} set by the efficiency grade to meet the minimum energy efficiency requirements.

Annex 3
to the Technical Regulation

REQUIREMENTS
for verifying conformity of fans with the requirements of the Technical Regulation on Ecodesign Requirements Fans Driven by Motors with an Electric Input Power Between 125 W and 500 kW during state market surveillance

1. The verification tolerances referred to in this Annex relate only to the verification of the measured parameters by state market surveillance authorities and shall not be used by the manufacturer or importer as allowable tolerances to establish the values in the technical documentation or in interpreting these values with a view to achieving compliance or to communicate better performance by any means.

2. Conformity verification of fans with the requirements of the Technical Regulation on Ecodesign Requirements Fans Driven by Motors with an Electric Input Power Between 125 W and 500 kW (hereinafter referred to as Technical Regulation) is made by market surveillance authorities with regard for the following:

1) one fan per model shall be tested;

2) a fan model shall be considered to comply with the requirements of the Technical Regulation if:

performance indicators given in the technical documentation and the values used to calculate these indicators are not more favourable for the manufacturer or importer than the results of the corresponding measurements;

the declared indicators meet the requirements laid down in the Technical Regulation, and the necessary product information provided by the manufacturer or importer does not contain indicators that are more favourable for the manufacturer or importer;

when a fan is checked by market surveillance authorities, the readings of relevant parameters and values are within the allowable tolerances indicated in Table 1;

3) if the results referred to in the second or third indent of subpoint 2 of this point are not achieved, the model shall be considered not to comply with the requirements of the Technical Regulation;

4) if the result referred to in the fourth indent of subpoint 2 of this point is not achieved:

for models, produced in quantities of less than five units yearly, the model shall be considered not to comply with the requirements of the Technical Regulation;

for models, produced in quantities of five or more units yearly, state market surveillance authorities shall select three additional fans of the same model for testing. The model shall be considered to comply with the requirements of the Technical Regulation if the arithmetical mean for these three fans is within the allowable tolerances indicated in the Table 1;

5) if the result referred to in the third indent of subpoint 4 of this point is not achieved, the model shall be considered not to comply with the requirements of the Technical Regulation.

3. State market surveillance authorities shall use the measurement and calculation methods set out in Annex 2.

State market surveillance authorities shall use only allowable tolerances indicated in the Table 1, taking into account the requirements set out in subpoints 1 to 5 of point 2 of this Annex. No other tolerances, such as those set out in national standards that are identical to the European harmonised standards or in any other measurement method, shall be applied.

Table 1

Allowable tolerances

Parameters	Allowable tolerances
Overall efficiency value (ηå)	shall not be lower than 90% of the specified value

Annex 4
to the Technical Regulation

INDICATIVE BENCHMARKS

Indicative benchmarks for the best available technology on the market for fans are laid down in Table 1.

Table 1

Indicative benchmarks for fans

Fan types	Measurement category (A-D)	Efficiency category (static or total)	Efficiency grade
Axial fan	A, C	static	65
	B, D	total	75
Centrifugal forward curved fan and centrifugal radial bladed fan	A, C	static	62
	B, D	total	65
Centrifugal backward curved fan without housing	A, C	static	70
Centrifugal backward curved fan with housing	A, C	static	72
	B, D	total	75
Mixed flow fan	A, C	static	61
	B, D	total	65
Cross flow fan	B, D	total	32

Annex 5
to the Technical Regulation

CORRELATION TABLE
between the provisions of the Commission Regulation (EU) No. 327/2011 of 30 March 2011 implementing Directive 2005/125/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 the Technical Regulation on Ecodesign Requirements for Fans Driven by Motors with an Electric Input Power Between 125 W and 500 kW

Provisions of the Commission Regulation (EU)	Provisions of the Technical Regulation
Point 1 of Article 1	point 1
Point 2 of Article 1	subpoint 1 of point 2
Point 3 of Article 1	subpoint 2 of point 2
First indent of Article 2	first indent of point 3
Point 1 of Article 2	second indent of point 3
Point 2 of Article 2	twenty-fifth indent of point 3
Point 3 of Article 2	twenty-first indent of point 3
Point 4 of Article 2	eighteenth indent of point 3
Point 5 of Article 2	twelfth indent of point 3
Point 6 of Article 2	twenty-fourth indent of point 3
Point 7 of Article 2	twenty-third indent of point 3
Point 8 of Article 2	thirteenth indent of point 3
Point 9 of Article 2	fourteenth indent of point 3
Point 10 of Article 2	fifteenth indent of point 3
Point 11 of Article 2	sixteenth indent of point 3
Point 12 of Article 2	nineteenth indent of point 3

Point 13 of Article 2	seventeenth indent of point 3
Point 14 of Article 2	seventh indent of point 3
Point 15 of Article 2	sixth indent of point 3
Point 16 of Article 2	twentieth indent of point 3
Point 17 of Article 2	eighth indent of point 3
Point 18 of Article 2	twenty-seventh indent of point 3
Point 1 of Article 3	point 4
Point 2 of Article 3	point 5
Point 3 of Article 3	point 6
Point 4 Article 3	point 7
Point 5 of Article 3	point 8
Point 6 of Article 3	point 9
Article 4	point 10
Article 5	point 11
Article 6	point 12
Article 7	
Article 8	
Annex I	Annex 1
Annex II	Annex 2
Annex III	Annex 3
Annex IV	Annex 4

APPROVED
by the Resolution of the Cabinet of Ministers of Ukraine
No. 151 of 27 February 2019

AMENDMENT
to be introduced to the list of types of products subject to state market surveillance by state market surveillance authorities

The list shall be supplemented with point 50 to read as follows:

‘50. Fans driven by motors with an electric input power between 125 W and 500 kW	Resolution by the Cabinet of Ministers of Ukraine No. 151 of 27 February 2019 “On Approval of the Technical Regulation on Ecodesign Requirements for Fans Driven by Motors with an Electric Input Power Between 125 W and 500 kW”	State Service of Ukraine on Food Safety and Consumer Protection’.