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Delegations will find attached Commission document D030784/02.

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[...] (2014) **XXX** draft

COMMISSION REGULATION (EU) No .../..

of **XXX**

laying down ecodesign requirements for ventilation units

(Text with EEA relevance)

COMMISSION REGULATION (EU) No .../..

of **XXX**

laying down ecodesign requirements for ventilation units

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products¹, and in particular Article 15(1) thereof,

Whereas:

- (1) Under Directive 2009/125/EC energy-related products representing significant volumes of sales and trade, having significant environmental impact within the Union and presenting significant potential for improvement in terms of their environmental impact, without entailing excessive costs, are to be covered by an implementing measure or a self-regulation measure regarding ecodesign requirements.
- (2) The Commission has assessed the technical, environmental and economic aspects of ventilation units. The assessment showed that ventilation units are placed on the Union market in large quantities. The energy consumption in the use phase is the most significant environmental aspect of ventilation units, presenting significant potential for cost-effective energy savings and greenhouse gas emission reduction.
- (3) Fans are an important part of ventilation units. Generic minimum energy efficiency requirements for fans have been established in Commission Regulation (EU) No 327/2011². The power consumption of the ventilation functions of fans which are part of ventilation units is covered by the minimum energy performance requirements of that Regulation, but many ventilation units use fans not covered by it. It is therefore necessary to introduce implementing measures for ventilation units.
- (4) A distinction should be made between measures applying to residential ventilation units and those applying to non-residential ventilation units on the basis of their individual air flow rate because two different sets of measurement standards are used in practice.
- (5) Small ventilation units with an electric power input of less than 30 W per air stream should be exempted from the requirements of this Regulation, except for information requirements. Those units are designed for many different applications, predominantly working intermittently and with supplementary functions only, for example in bathrooms. Including those would represent a considerable administrative burden in

¹ OJ L 285, 31.10.2009, p. 10.

² 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 (OJ L 90, 6.4.2011, p. 8).

terms of market surveillance because of large sales numbers, while contributing only to a small share of the energy saving potential. However, considering that they offer similar functionalities to other ventilation units, their possible inclusion should similarly be addressed in the review of this Regulation. Furthermore, ventilation units specifically designed to operate exclusively for emergency purposes or in exceptional or hazardous environments should also be exempted, as they are used rarely and for a short time. The exemptions also clarify that multifunctional units which predominantly heat or cool and kitchen range hoods are excluded. The Commission has carried out preparatory studies to analyse the technical, environmental and economic aspects of residential and non-residential ventilation units. The studies have been developed together with stakeholders and interested parties from the Union and third countries, and the results have been made publicly available.

- (6) The environmental parameter of the products covered which has been identified as the most significant for the purposes of this Regulation is energy consumption in the use phase. The annual electricity consumption of products subject to this Regulation was estimated at 77.6 TWh in the Union in 2010. At the same time, these products save 2 570 PJ on energy for heating space. In aggregate, using a primary energy conversion coefficient of 2.5 for electricity, the energy balance is 1 872 PJ primary energy of annual saving in 2010. Without specific measures, the aggregate saving is projected to grow to 2 829 PJ in 2025.
- (7) The preparatory studies show that the energy consumption of products subject to this Regulation can be significantly reduced. The combined effect of the ecodesign requirements set out in this Regulation and in Commission Delegated Regulation (EU) No ...³ is expected to result in an aggregate increase in savings by 1 300 PJ (45%) to a level of 4 130 PJ in 2025.
- (8) The preparatory studies show that requirements regarding the other ecodesign parameters referred to in Part 1 of Annex I to Directive 2009/125/EC are not necessary for ventilation units as energy consumption in the use phase is by far the most important environmental parameter.
- (9) The ecodesign requirements should be introduced gradually in order to provide a sufficient timeframe for manufacturers to re-design products subject to this Regulation. The timing should take into account the impact on costs for end-users and manufacturers, in particular small and medium-sized enterprises, while ensuring that the environmental performance of ventilation units is improved without unnecessary delay.
- (10) Product parameters should be measured and calculated using reliable, accurate and reproducible methods which take into account recognised state-of-the-art measurement and calculation methods, including, where available, harmonised standards adopted by the European standardisation bodies following a request by the Commission, in accordance with the procedures laid down in Regulation (EU) 1025/2012 of the European Parliament and of the Council⁴.

³ Commission Delegated Regulation (EU) No ... of ... supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of residential ventilation units (OJ [...] [...], [...], [...]).

⁴ Regulation (EU) 1025/2012 of the European Parliament and of the Council of 25 October 2012 on European standardisation (OJ L 316, 14.11.2012, p. 12).

- (11) Benchmarks for currently available ventilation unit types with high energy efficiency should be identified in the implementing measure on the basis of information gathered during the preparation of the measure, in order that manufacturers can make use of this assessment to evaluate alternative design solutions and the achieved environmental performance of the product against benchmarks. This will help to ensure a 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 and facilitate the development of more efficient products for reducing energy consumption.
- (12) The Consultation Forum referred to in Article 18 of Directive 2009/125/EC has been consulted.
- (13) The measures provided for in this Regulation are in accordance with the opinion of the Committee established by Article 19(1) of Directive 2009/125/EC.

HAS ADOPTED THIS REGULATION:

Article 1

Subject matter and scope

1. This Regulation applies to ventilation units and establishes ecodesign requirements for their placing on the market or putting into service.
2. This Regulation shall not apply to ventilation units which:
 - (a) are unidirectional (exhaust or supply) with an electric power input of less than 30 W, except for information requirements;
 - (b) are bidirectional, with a total electric power input for the fans of less than 30 W per air stream, except for information requirements;
 - (c) are axial or centrifugal fans only equipped with a housing in terms of Regulation 327/2011;
 - (d) are exclusively specified as operating in a potentially explosive atmosphere as defined in Directive 94/9/EC of the European Parliament and of the Council⁵;
 - (e) are exclusively specified as operating for emergency use, for short periods of time, and which comply with the basic requirements for construction works with regard to safety in case of fire as set out in Regulation (EU) No 305/2011 of the European Parliament and of the Council⁶;
 - (f) are exclusively specified as operating:
 - (i) where operating temperatures of the air being moved exceed 100 °C;
 - (ii) where the operating ambient temperature for the motor, if located outside the air stream, driving the fan exceeds 65 °C;

⁵ Directive 94/9/EC of the European Parliament and the Council of 23 March 1994 on the approximation of the laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres (OJ L 100, 19.4.1994, p. 1).

⁶ Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC (OJ L 88, 4.4.2011, p. 5).

- (iii) where the temperature of the air being moved or the operating ambient temperature for the motor, if located outside the air stream, are lower than $-40\text{ }^{\circ}\text{C}$;
 - (iv) where the supply voltage exceeds $1\ 000\ \text{V AC}$ or $1\ 500\ \text{V DC}$;
 - (v) in toxic, highly corrosive or flammable environments or in environments with abrasive substances;
- (g) include a heat exchanger and a heat pump for heat recovery or allowing heat transfer or extraction being additional to that of the heat recovery system, except heat transfer for frost protection or defrosting;
- (h) are classified as range hoods covered by Commission Regulation (EU) No xxx/xxxx on kitchen appliances.

Article 2

Definitions

For the purposes of this Regulation the following definitions shall apply:

- (1) ‘ventilation unit (VU)’ means an electricity driven appliance equipped with at least one impeller, one motor and a casing and intended to replace utilised air by outdoor air in a building or a part of a building;
- (2) ‘residential ventilation unit’ (RVU) means a ventilation unit where:
 - (a) the maximum flow rate does not exceed $250\ \text{m}^3/\text{h}$;
 - (b) the maximum flow rate is between 250 and $1\ 000\ \text{m}^3/\text{h}$, and the manufacturer declares its intended use as being exclusively for a residential ventilation application;
- (3) ‘non-residential ventilation unit’ (NRVU) means a ventilation unit where the maximum flow rate of the ventilation unit exceeds $250\ \text{m}^3/\text{h}$, and, where the maximum flow rate is between 250 and $1\ 000\ \text{m}^3/\text{h}$, the manufacturer has not declared its intended use as being exclusively for a residential ventilation application;
- (4) ‘maximum flow rate’ is the declared maximum air volume flow rate of a ventilation unit that can be achieved with integrated or separately co-supplied controls at standard air conditions ($20\text{ }^{\circ}\text{C}$) and $101\ 325\ \text{Pa}$, where the unit is installed complete (e.g. including clean filters) and according to the manufacturer’s instructions, for ducted RVUs the maximum flow is related to the air flow at $100\ \text{Pa}$ of external static pressure difference, and for non-ducted RVUs to the air flow at the lowest achievable total pressure difference to be chosen from a set of values of 10 (minimum)- 20 - 50 - 100 - 150 - 200 - $250\ \text{Pa}$, whichever is equal or just below the measured pressure difference value);
- (5) ‘unidirectional ventilation unit’ (UVU) means a ventilation unit producing an air flow in one direction only, either from indoors to outdoors (exhaust) or from outdoors to indoors (supply), where the mechanically produced air flow is balanced by natural air supply or exhaust;
- (6) ‘bidirectional ventilation unit’ (BVU) means a ventilation unit which produces an air flow between indoors and outdoors and is equipped with both exhaust and supply fans;

- (7) ‘equivalent ventilation unit model’ means a ventilation unit with the same technical characteristics according to the applicable product information requirements, but placed on the market as a different ventilation unit model by the same manufacturer, authorized representative or importer.

For the purposes of Annexes II to IX, additional definitions are set out in Annex I.

Article 3

Ecodesign requirements

1. From 1 January 2016 RVUs shall comply with the specific ecodesign requirements set out in Annex II, point 1.
2. From 1 January 2016 NRVUs shall comply with the specific ecodesign requirements set out in Annex III, point 1.
3. From 1 January 2018 RVUs shall comply with the specific ecodesign requirements set out in Annex II, point 2.
4. From 1 January 2018 NRVUs shall comply with the specific ecodesign requirements set out in Annex III point 2.

Article 4

Information requirements

1. From 1 January 2016 manufacturers, their authorized representatives and importers of RVUs shall comply with the information requirements set out in Annex IV.
2. From 1 January 2016 manufacturers, their authorized representatives and importers of NRVUs shall comply with the information requirements set out in Annex V.

Article 5

Conformity assessment

1. Manufacturers of ventilation units shall carry out the conformity assessment laid down in Article 8 of Directive 2009/125/EC using the internal design control system set out in Annex IV to that Directive or the management system set out in Annex V to that Directive.

For the purposes of the conformity assessment of RVUs, calculation of the specific energy consumption requirement shall be carried out in accordance with Annex VIII to this Regulation.

For the purposes of the conformity assessment of NRVUs, measurements and calculations for the specific ecodesign requirements shall be carried out in accordance with Annex IX to this Regulation.

2. The technical documentation file compiled in accordance with Annex IV to Directive 2009/125/EC shall contain a copy of the product information set out in Annexes IV and V to this Regulation.

Where the information included in the technical documentation for a particular ventilation unit model has been obtained by calculation on the basis of design, or extrapolation from other ventilation units, or both, the technical documentation shall include the following information:

- (a) details of such calculations or extrapolations, or both;

- (b) details of tests undertaken by manufacturers to verify the accuracy of the calculations and extrapolations;
- (c) a list of any other ventilation unit models where the information included in the technical documentation was obtained on the same basis;
- (d) a list of equivalent ventilation unit models.

Article 6

Verification procedure for market surveillance purposes

The authorities of the Member States shall apply the verification procedure set out in Annex VI when performing the market surveillance referred to in Article 3(2) of Directive 2009/125/EC to ensure compliance with the requirements set out for RVUs in Annex II to this Regulation and for NRVUs in Annex III to this Regulation.

Article 7

Benchmarks

The benchmarks referred to in point (2) of Part 3 of Annex I to Directive 2009/125/EC, which are to be applied to ventilation units, are set out in Annex VII to this Regulation.

Article 8

Review

The Commission shall assess the need to set requirements on air leakage rates in the light of technological progress and present the results of this assessment to the Consultation Forum no later than 1 January 2017.

The Commission shall review this Regulation in the light of technological progress and present the results of this review to the Consultation Forum no later than 1 January 2020.

The review shall include an assessment of the following:

- (a) the possible extension of the scope of this Regulation to cover unidirectional units with an electric power input of less than 30 W, and bidirectional units, with a total electric power input for the fans of less than 30 W per air stream;
- (b) the verification tolerances set out in Annex VI;
- (c) the appropriateness of taking into account the effects of low-energy consuming filters on the energy efficiency;
- (d) the need to set a further tier with tightened ecodesign requirements.

Article 9

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
On behalf of the President*

[Position]



Brussels, **XXX**
[...] (2014) **XXX** draft

ANNEXES 1 to 9

ANNEXES

to the COMMISSION REGULATION (EU) No.../...

of

laying down ecodesign requirements for ventilation units

ANNEXES
to the COMMISSION REGULATION (EU) No.../...
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ANNEX I
Definitions

Definitions applicable for the purposes of Annexes II to IX to this Regulation:

3. Definitions:

- (8) ‘*specific energy consumption (SEC)*’ (expressed in kWh/(m².a)) means a coefficient to express the energy consumed for ventilation per m² heated floor area of a dwelling or building, calculated for RVUs in accordance with Annex VIII;
- (9) ‘*sound power level (L_{WA})*’ means the casing-radiated A-weighted sound power level expressed in decibels (dB) with reference to the sound power of one picowatt (1pW), transmitted by the air at reference airflow;
- (10) ‘*multi-speed drive*’ means a fan motor that can be operated at three or more fixed speeds plus zero (‘off’);
- (11) ‘*variable speed drive (VSD)*’ means an electronic controller, integrated or functioning as one system or as a separate delivery with the motor and the fan, which continuously adapts the electrical power supplied to the motor in order to control the flow rate;
- (12) ‘*heat recovery system (HRS)*’ means the part of a bidirectional ventilation unit equipped with a heat exchanger designed to transfer the heat contained in the (contaminated) exhaust air to the (fresh) supply air;
- (13) ‘*thermal efficiency of a residential HRS (η_i)*’ means the ratio between supply air temperature gain and exhaust air temperature loss, both relative to the outdoor temperature, measured under dry conditions of the HRS, and standard air conditions, with balanced mass flow, at reference flow rate, an indoor-outdoor temperature difference of 13 K, no correction for thermal heat gain from fan motors;
- (14) ‘*internal leakage rate*’ means the fraction of extract air present in the supply air of ventilation units with HRS as a result of leakage between extract and supply airflows inside the casing when the unit is operated at reference air volume flow, measured at the ducts; the test shall be performed for RVUs at 100 Pa, and for NRVUs at 250 Pa;
- (15) ‘*carry over*’ means the percentage of the exhaust air which is returned to the supply air for a regenerative heat exchanger according to the reference flow;
- (16) ‘*external leakage rate*’ means the leakage fraction of the reference air volume flow to or from the inside of the casing of a unit to or from the surrounding air when it is subjected to a pressure test; the test shall be performed at 250 Pa for RVUs and at 400 Pa for NRVUs, for both under and over pressure;
- (17) ‘*mixing*’ means the immediate recirculation or short-circuiting of airflows between discharge and intake ports at both the indoor and outdoor terminals so that they do

not contribute to the effective ventilation of a building space, when the unit is operated at reference air volume rate;

- (18) '*mixing rate*' means the fraction of extract airflow, as part of the total reference air volume, that recirculates between discharge and intake ports at both the indoor and outdoor terminals and thus does not contribute to the effective ventilation of a building space, when the unit is operated at reference air volume (measured at 1 m distance from the indoor supply duct), less the internal leakage rate;
- (19) '*effective power input*' (expressed in W) means the electric power input at reference flow rate and corresponding external total pressure difference and includes the electrical demand for fans, controls (including remote controls) and the heat pump (if integrated);
- (20) '*specific power input (SPI)*' (expressed in W/(m³/h)) means the ratio between the effective power input (in W) and the reference flow rate (in m³/h);
- (21) '*flow rate/pressure diagram*' means a set of curves for flow rate (horizontal axis) and pressure difference of a unidirectional RVU or the supply side of a bidirectional RVU, where each curve represents one fan speed with at least eight equidistant test-points and the number of curves is given by the number of discrete fan speed options (one, two or three) or, in the case of a variable fan speed drive, includes at least a minimum, maximum and appropriate intermediate curve close to the reference air volume and pressure difference for SPI testing;
- (22) '*reference flow rate*' (expressed in m³/s) is the abscissa value to a point on a curve in the flow rate/pressure diagram which is on or closest to a reference point at 70% at least of the maximum flow rate and 50 Pa for ducted units and at a minimum pressure for non-ducted units. For bidirectional ventilation units, the reference air volume flow rate applies to the air supply outlet;
- (23) '*control factor (CTRL)*' means a correction factor for the SEC calculation depending on the type of control that is part of the ventilation unit, according to the description in Annex VIII Table 1;
- (24) '*control parameter*' means a measurable parameter or set of measurable parameters that are assumed to be representative of the ventilation demand, e.g. the level of relative humidity (RH), carbon dioxide (CO₂), volatile organic compounds (VOC) or other gases, presence, motion or occupancy detection from infrared body heat or from reflection of ultrasonic waves, electrical signals from human operation of lights or equipment;
- (25) '*manual control*' means any control type that does not use demand control;
- (26) '*demand control*' means a device or set of devices, integrated or as a separate delivery, that measures a control parameter and uses the result to regulate automatically the flow rate of the unit and/or the flow rates of the ducts;
- (27) '*clock control*' means a clocked (daytime-controlled) human interface to control the fan speed/flow rate of the ventilation unit, with at least seven weekday manual settings of the adjustable flow rate for at least two setback periods, i.e. periods in which a reduced or no flow rate applies;
- (28) '*demand controlled ventilation (DCV)*' means a ventilation unit that uses demand control;

- (29) *'ducted unit'* means a ventilation unit intended to ventilate one or more rooms or enclosed space in a building through the use of air ducts, intended to be equipped with duct connections;
- (30) *'non-ducted unit'* means a single room ventilation unit intended to ventilate a single room or enclosed space in a building, and not intended to be equipped with duct connections;
- (31) *'central demand control'* means a demand control of a ducted ventilation unit that continuously regulates the fan speed(s) and flow rate based on one sensor for the whole ventilated building or part of the building at central level;
- (32) *'local demand control'* means a demand control for a ventilation unit that continuously regulates the fan speed(s) and flow rates based on more than one sensor for a ducted ventilation unit or one sensor for a non-ducted unit;
- (33) *'static pressure (p_{sf})'* means the total pressure minus the fan dynamic pressure;
- (34) *'total pressure (p_f)'* means the difference between the stagnation pressure at the fan outlet and that at the fan inlet.
- (35) *'stagnation pressure'* means the pressure measured at a point in a flowing gas if it were to be brought to rest by means of an isentropic process.
- (36) *'dynamic pressure'* means the pressure calculated from the mass flow rate and the average gas density at the outlet and the unit outlet area;
- (37) *'recuperative heat exchanger'* means a heat exchanger intended to transfer thermal energy from one air stream to another without moving parts, such as a plate or tubular heat exchanger with parallel flow, cross flow or counter flow, or a combination of these, or a plate or tubular heat exchanger with vapour diffusion;
- (38) *'regenerative heat exchanger'* means a rotary heat exchanger incorporating a rotating wheel for the purpose of transferring thermal energy from one air stream to the other, including material allowing latent heat transfer, a drive mechanism, a casing or frame, and seals to reduce bypassing and leakage of air from one stream or another; such heat exchangers have varying degrees of moisture recovery depending on the material used;
- (39) *'airflow sensitivity to pressure variations'* of a non-ducted RVU is the ratio between the maximum deviation from the maximum RVU flow rate at +20 Pa and that at -20 Pa external total pressure difference;
- (40) *'indoor/outdoor air tightness'* of a non-ducted RVU is the flow rate (expressed in m³/h) between indoors and outdoors when the fan(s) is(are) switched off;
- (41) *'dual use unit'* means a ventilation unit designed for ventilation purposes as well as fire or smoke extraction, complying with the basic requirements for construction works with regard to safety in case of fire as set out in Regulation (EU) No 305/2011;
- (42) *'thermal by-pass facility'* means any solution that circumvents the heat exchanger or controls automatically or manually its heat recovery performance, without necessarily requiring a physical airflow bypass (for example: summer box, rotor speed control, control of air flow);

4. Definitions for NRVU, in addition to the definitions in Annex I Part 1:

- (43) '*nominal electric power input (P)*' (expressed in kW) means the effective electric power input of the fan drives, including any motor control equipment, at the nominal external pressure and the nominal airflow;
- (44) '*fan efficiency (η_{fan})*' means the static efficiency including motor and drive efficiency of the individual fan(s) in the ventilation unit (reference configuration) determined at nominal air flow and nominal external pressure drop;
- (45) '*reference configuration of a BVU*' means a product configured with a casing, at least two fans with variable speed or multi-speed drives, a HRS, a clean fine filter on the inlet-side and a clean medium filter on the exhaust-side;
- (46) '*reference configuration of an UVU*' means a product configured with a casing and at least one fan with variable speed or multi-speed drive, and – in case the product is intended to be equipped with a filter on the inlet-side – this filter shall be a clean fine filter;
- (47) '*minimum fan efficiency (η_{vu})*' is the specific minimum efficiency requirement for VUs within the scope of this Regulation;
- (48) '*nominal flow rate (q_{nom})*' (expressed in m³/s) means the declared design flow rate of an NRVU at standard air conditions 20 °C and 101325 Pa, whereby the unit is installed complete (for example, including filters) and according to the manufacturer instructions;
- (49) '*nominal external pressure ($\Delta p_{s, ext}$)*' in (expressed in Pa) means the declared design external static pressure difference at nominal flow rate;
- (50) '*maximum rated fan speed ($v_{fan, rated}$)*' (expressed in rounds per minute – rpm) is the fan speed at nominal flow rate and nominal external pressure;
- (51) '*internal pressure drop of ventilation components ($\Delta p_{s, int}$)*' (expressed in Pa) means the sum of the static pressure drops of a reference configuration of a BVU or an UVU at nominal flow rate;
- (52) '*internal pressure drop of additional non-ventilation components ($\Delta p_{s, add}$)*' (expressed in Pa) means the remainder of the sum of all internal static pressure drops at nominal flow rate and nominal external pressure after subtraction of the internal pressure drop of ventilation components ($\Delta p_{s, int}$);
- (53) '*thermal efficiency of a non-residential HRS ($\eta_{t, nrvu}$)*' means the ratio between supply air temperature gain and the exhaust air temperature loss, both relative to the outdoor temperature, measured under dry reference conditions, with balanced mass flow, an indoor-outdoor air temperature difference of 20 K, excluding thermal heat gain from fan motors and from internal leakages;
- (54) '*internal specific fan power of ventilation components (SFP_{int})*' (expressed in W/(m³/s)) is the ratio between the internal pressure drop of ventilation components and the fan efficiency, determined for the reference configuration;
- (55) '*maximum internal specific fan power of ventilation components ($SFP_{int, limit}$)*' (expressed in W/(m³/s)) is the specific efficiency requirement for SFP_{int} for VUs within the scope of this Regulation;
- (56) '*run-around HRS*' is a heat recovery system where the heat recovery device on the exhaust side and the device supplying the recovered heat to the air stream on the supply side of a ventilated space are connected through a heat transfer system where the two sides of the HRS can be freely positioned in different parts of a building;

- (57) '*Face velocity*' (expressed in m/s) is the larger of supply and extract air velocity. The velocities are the air velocities in the VU based on the inside unit area for supply respectively extract air flow of the VU. The velocity is based on the area of the filter section of the respective unit, or if no filter is installed, based on the area of the fan section;
- (58) '*efficiency bonus (E)*' is a correction factor taking account of the fact that more efficient heat recovery causes more pressure drops requiring more specific fan power;
- (59) '*filter correction (F)*' (expressed in Pa) is a correction value to be applied if a unit deviates from the reference configuration of a BVU;
- (60) '*fine filter*' means a filter that meets the relevant conditions described in Annex IX;
- (61) '*medium filter*' means a filter that meets the relevant conditions described in Annex IX;
- (62) '*filter efficiency*' means the average ratio between the dust fraction captured and the amount fed into the filter, under the conditions described for fine and medium filters in Annex IX.

ANNEX II

Specific ecodesign requirements for RVUs, as referred to in Article 3(1) and 3(3)

5. From 1 January 2016:
 - SEC, calculated for average climate, shall be no more than 0 kWh/(m².a).
 - Non-ducted units including ventilation units intended to be equipped with one duct connection on either supply or extract air side shall have a maximum L_{WA} of 45 dB.
 - All VUs, except dual use units, shall be equipped with a multi-speed drive or variable speed drive.
 - All BVUs shall have a thermal by-pass facility.
6. From 1 January 2018:
 - SEC, calculated for average climate, shall be no more than -20 kWh/(m².a).
 - Non-ducted units including ventilation units intended to be equipped with one duct connection on either supply or extract air side shall have a maximum L_{WA} of 40 dB.
 - All VUs, except dual use units, shall be equipped with a multi-speed drive or variable speed drive.
 - All BVUs shall have a thermal by-pass facility.
 - Ventilation units with a filter shall be equipped with a visual filter change warning signal.

ANNEX III

Specific ecodesign requirements for NRVUs, as referred to in Article 3(2) and 3(4)

7. From 1 January 2016:
- All ventilation units, except dual use units, shall be equipped with a multi-speed drive or a variable speed drive.
 - All BVUs shall have a HRS.
 - The HRS shall have a thermal by-pass facility.
 - The minimum thermal efficiency η_{t_nrvu} of all HRS except run-around HRS in BVUs shall be 67% and the efficiency bonus $E = (\eta_{t_nrvu} - 0.67) * 3000$ if the thermal efficiency η_{t_nrvu} is at least 67%, otherwise $E = 0$.
 - The minimum thermal efficiency η_{t_nrvu} of run-around HRS in BVUs shall be 63% and the efficiency bonus $E = (\eta_{t_nrvu} - 0.63) * 3000$ if the thermal efficiency η_{t_nrvu} is at least 63%, otherwise $E = 0$.
 - The minimum fan efficiency for UVUs (η_{vu}) is
 - 6.2% * $\ln(P)$ + 35.0% if $P \leq 30$ kW and
 - 56.1% if $P > 30$ kW. The maximum internal specific fan power of ventilation components (SFP_{int_limit}) in W/(m³/s) is
 - for a BVU with run-around HRS
 - 1700 + E – $300 * q_{nom} / 2 - F$ if $q_{nom} < 2$ m³/s and
 - 1400 + E – F if $q_{nom} \geq 2$ m³/s;
 - for a BVU with other HRS
 - 1200 + E – $300 * q_{nom} / 2 - F$ if $q_{nom} < 2$ m³/s and
 - 900 + E – F if $q_{nom} \geq 2$ m³/s;
 - 250 for an UVU intended to be used with a filter.
8. From 1 January 2018:
- All ventilation units, except dual use units, shall be equipped with a multi-speed drive or a variable speed drive.
- All BVUs shall have a HRS.
- The HRS shall have a thermal by-pass facility.
- The minimum thermal efficiency η_{t_nrvu} of all HRS except run-around HRS in BVUs shall be 73% and the efficiency bonus $E = (\eta_{t_nrvu} - 0.73) * 3000$ if the thermal efficiency η_{t_nrvu} is at least 73%, otherwise $E = 0$.
 - The minimum thermal efficiency η_{t_nrvu} of run-around HRS in BVUs shall be 68% and the efficiency bonus $E = (\eta_{t_nrvu} - 0.68) * 3000$ if the thermal efficiency η_{t_nrvu} is at least 68%, otherwise $E = 0$.
 - The minimum fan efficiency for UVUs (η_{vu}) is
 - 6,2% * $\ln(P)$ + 42,0% if $P \leq 30$ kW and
 - 63,1% if $P > 30$ kW.

- The maximum internal specific fan power of ventilation components (SFP_{int_limit}) in $W/(m^3/s)$ is
 - for a BVU with run-around HRS
 - 1 600 + E – 300* $q_{nom}/2$ – F if $q_{nom} < 2 m^3/s$ and
 - 1 300 + E – F if $q_{nom} \geq 2 m^3/s$;
 - for a BVU with other HRS
 - 1 100 + E – 300* $q_{nom}/2$ – F if $q_{nom} < 2 m^3/s$ and
 - 800 + E – F if $q_{nom} \geq 2 m^3/s$;
 - 230 for an UVU intended to be used with a filter.
- If a filter unit is part of the configuration the product shall be equipped with a visual signalling or an alarm in the control system which shall be activated if the filter pressure drop exceeds the maximum allowable final pressure drop.

ANNEX IV

Information requirements for RVUs as referred to in Article 4(1)

9. From 1 January 2016, the following product information shall be provided:
- (a) supplier's name or trade mark;
 - (b) supplier's model identifier i.e. the code, usually alphanumeric, used to distinguish a specific residential ventilation unit model from other models with the same trade mark or supplier's name;
 - (c) specific energy consumption (SEC) in kWh/(m².a) for each applicable climate zone; and SEC class;
 - (d) declared typology in accordance with Article 2 of this Regulation (RVU or NRVU, unidirectional or bidirectional);
 - (e) type of drive installed or intended to be installed (multi-speed drive or variable speed drive);
 - (f) type of heat recovery system (recuperative, regenerative, none);
 - (g) thermal efficiency of heat recovery (in % or 'not applicable' if the product has no heat recovery system);
 - (h) maximum flow rate in m³/h;
 - (i) electric power input of the fan drive, including any motor control equipment, at maximum flow rate (W);
 - (j) sound power level (L_{WA}), rounded to the nearest integer;
 - (k) reference flow rate in m³/s
 - (l) reference pressure difference in Pa;
 - (m) SPI in W/(m³/h);
 - (n) control factor and control typology in accordance with the relevant definitions and classification in Annex VIII Table 1;
 - (o) declared maximum internal and external leakage rates (%) for bidirectional ventilation units or carry over (for regenerative heat exchangers only), and external leakage rates (%) for ducted unidirectional ventilation units;
 - (p) mixing rate of non-ducted bidirectional ventilation units not intended to be equipped with one duct connection on either supply or extract air side;
 - (q) position and description of visual filter warning for RVUs intended for use with filters, including text pointing out the importance of regular filter changes for performance and energy efficiency of the unit;
 - (r) for unidirectional ventilation systems, instructions to install regulated supply/exhaust grilles in the façade for natural air supply/extraction;
 - (s) internet address for disassembly instructions as referred to in point 3;
 - (t) for non-ducted units only: the airflow sensitivity to pressure variations at +20Pa and -20 Pa;
 - (u) for non-ducted units only: the indoor/outdoor air tightness in m³/h;

10. The information listed in point 1.) shall be available:
 - in the technical documentation of RVUs; and
 - on free access websites of manufacturers, their authorised representatives, and importers.
11. The manufacturer's free access website shall make available detailed instructions inter alia identifying the required tools for the manual disassembly of permanent magnet motors, and of electronics parts (printed wiring boards/printed circuit boards and displays >10 g or > 10 cm²), batteries and larger plastic parts (>100 g) for the purpose of efficient materials recycling, except for models of which less than 5 units per year are produced.
12. .

ANNEX V

Information requirements for NRVUs as referred to in Article 4(2)

13. From 1 January 2016, the following product information shall be provided:
- (a) manufacturer's name or trade mark;
 - (b) manufacturer's model identifier, i.e. the code, usually alphanumeric, used to distinguish a specific non-residential ventilation unit model from other models with the same trade mark or supplier's name;
 - (c) declared typology in accordance with Article 2 (RVU or NRVU, UVU or BVU,);
 - (d) type of drive installed or intended to be installed (multi-speed drive or variable speed drive);
 - (e) type of HRS (run-around, other, none);
 - (f) thermal efficiency of heat recovery (in % or not applicable' if the product has no heat recovery system);;
 - (g) nominal NRVU flow rate in m³/s;
 - (h) effective electric power input (kW);
 - (i) SPF_{int} in W/(m³/s);
 - (j) face velocity in m/s at design flow rate;
 - (k) nominal external pressure ($\Delta p_{s, ext}$) in Pa;
 - (l) internal pressure drop of ventilation components ($\Delta p_{s, int}$) in Pa;
 - (m) optional: internal pressure drop of non-ventilation components ($\Delta p_{s, add}$) in Pa;
 - (n) static efficiency of fans used in accordance with Regulation (EU) No 327/2011;
 - (o) declared maximum external leakage rate (%) of the casing of ventilation units; and declared maximum internal leakage rate (%) of bidirectional ventilation units or carry over (for regenerative heat exchangers only); both measured or calculated according to the pressurisation test method or tracer gas test method at declared system pressure;
 - (p) energy performance, preferably energy classification, of the filters (declared information about the calculated annual energy consumption);
 - (q) description of visual filter warning for NRVUs intended for use with filters, including text pointing out the importance of regular filter changes for performance and energy efficiency of the unit;
 - (r) in the case of NRVUs specified for use indoors, the casing sound power level (L_{WA}), rounded to the nearest integer;
 - (s) internet address for disassembly instructions as referred to in point 3.
14. The information listed in point 1. (a) to (s) shall be available:
- in the technical documentation of NRVUs; and

- on free access websites of manufacturers, their authorised representatives, and importers.
15. The manufacturer's free access website shall make available detailed instructions inter alia identifying the required tools for the manual pre-/dis-assembly of permanent magnet motors, and of electronics parts (printed wiring boards/printed circuit boards and displays >10 g or > 10 cm²), batteries and larger plastic parts (>100 g) for the purpose of efficient materials recycling, except for models of which less than 5 units per year are produced.

ANNEX VI

Verification procedure for market surveillance purposes

For the purposes of checking conformity with the requirements laid down in Annexes II to V, Member State authorities shall test a single ventilation unit. If the measured values or values calculated on the basis of measured values do not match the manufacturer's declared values within the meaning of Article 5, subject to the tolerances in Table 1:

- for models that are produced in lower quantities than 5 per year, the model shall be considered not to comply with this Regulation,
- for models that are produced in quantities of 5 or more per year, the market surveillance authority shall randomly test 3 additional units.

If the arithmetic mean of the measured values for these units does not meet the requirements, subject to the tolerances in Table 1, the model and all other equivalent models shall be considered not to comply with the requirements of Annexes II to V.

The Member State authorities shall provide the test results and other relevant information to the authorities of the other Member States and to the Commission within one month of the decision being taken on the non-compliance of the model.

Member State authorities shall use the measurement and calculation methods set out in Annexes VIII and IX and apply only those tolerances that are set out in Table 1.

Table 1

<u>Parameter</u>	<u>Verification tolerances</u>
SPI	The measured value shall be no more than 1.07 times the maximum declared value.
Thermal efficiency RVU and NRVU	The measured value shall be no less than 0.93 times the minimum declared value.
SFP _{int}	The measured value shall be no more than 1.07 times the maximum declared value.
Fan efficiency UVU, non-residential	The measured value shall be no less than 0.93 times the minimum declared value.
Sound power level RVU	The measured value shall be no more than the maximum declared value plus 2 dB.
Sound power level NRVU	The measured value shall be no more than the maximum declared value plus 5 dB.

The verification tolerances shall not be used by the manufacturer or importer in establishing the values in the technical documentation or in interpreting these values with a view to achieving compliance.

ANNEX VII **Benchmarks**

Residential ventilation units:

- (a) SEC: -42 kWh/(m².a) for BVUs, and -27 kWh/(m².a) for UVUs.
- (b) Heat recovery η_i : 90% for BVUs.

Non-residential ventilation units:

- (a) SFP_{int} : 150 W/(m³/s) below the Tier 2 limit for NRVUs with flow rate ≥ 2 m³/s, and 250 W/(m³/s) below the Tier 2 limit for NRVUs with flow rate < 2 m³/s
- (b) Heat recovery η_{i_nrvu} : 85%, and with run-around heat recovery systems 80%.

ANNEX VIII

Calculation of the specific energy consumption requirement

The specific energy consumption SEC is calculated with the following equation:

$$SEC = t_a \cdot p_{ef} \cdot q_{net} \cdot MISC \cdot CTRL^x \cdot SPI - t_h \cdot \Delta T_h \cdot \eta_h^{-1} \cdot c_{air} \cdot (q_{ref} - q_{net} \cdot CTRL \cdot MISC \cdot (1 - \eta_t)) + Q_{defr}$$

where

- *SEC* is Specific Energy Consumption for ventilation per m² heated floor area of a dwelling or building [kWh/(m².a)];
- *t_a* is annual operating hours [h/a];
- *p_{ef}* is primary energy factor for electric power generation and distribution [-];
- *q_{net}* is net ventilation rate demand per m² heated floor area [m³/h.m²];
- *MISC* is an aggregated general typology factor, incorporating factors for ventilation effectiveness, duct leakage and extra infiltration [-];
- *CTRL* is ventilation control factor [-];
- *x* is an exponent that takes into account non-linearity between thermal energy and electricity saving, depending on motor and drive characteristics [-];
- *SPI* is Specific Power Input [kW/(m³/h)];
- *t_h* is total hours heating season [h];
- ΔT_h is the average difference in indoor (19°C) and outdoor temperature over a heating season, minus 3K correction for solar and internal gains [K];
- η_h is the average space heating efficiency [-];
- *c_{air}* is the specific heat capacity of air at constant pressure and density [kWh/(m³ K)];
- *q_{ref}* is the reference natural ventilation rate per m² heated floor area [m³/h.m²];
- η_t is the thermal efficiency of heat recovery [-];
- *Q_{defr}* is the annual heating energy per m² heated floor area [kWh/m².a] for defrosting, based on a variable electric resistance heating.

$$Q_{defr} = t_{defr} \cdot \Delta T_{defr} \cdot c_{air} \cdot q_{net} \cdot p_{ef},$$

where

- *t_{defr}* is the duration of defrosting period, i.e. when the outdoor temperature is below -4°C [h/a], and
- ΔT_{defr} is the average difference in K between the outdoor temperature and -4°C during the defrosting period.

Q_{defr} applies only to bidirectional units with recuperative heat exchanger; for unidirectional units or units with regenerative heat exchanger is *Q_{defr}*=0.

SPI and η_t are values derived from tests and calculation methods.

Other parameters and their defaults are given in Table 1.

Table 1.

SEC calculation parameters

<i>general typology</i>						MISC
<u>Ducted units</u>						1,1
<u>Non-ducted units</u>						1,21
<i>ventilation control</i>						CTRL
Manual control (no DCV)						1
Clock control (no DCV)						0,95
Central demand control						0,85
Local demand control						0,65
<i>motor & drive</i>						x-value
on/off & single speed						1
2-speed						1,2
multi-speed						1,5
variable speed						2
<i>Climate</i>	t_h	ΔT_h	t_{defr}	ΔT_{defr}	Q_{defr}^*	
	in h	in K	in h	in K	in kWh/a.m ²	
Cold	6552	14,5	1003	5,2	5,82	
Average	5112	9,5	168	2,4	0,45	
Warm	4392	5	-	-	-	
* Defrosting applies only to bidirectional units with recuperative heat exchanger and is calculated as $Q_{defr} = t_{defr} * \Delta T_{defr} * c_{air} * q_{net} * p_{ef}$. For unidirectional units or unit with regenerative heat exchanger is $Q_{defr} = 0$						
<i>Defaults</i>						value
specific heat capacity of air, c_{air} in kWh/(m ³ K)						0,000344
net ventilation requirement per m ² heated floor area, q_{net} in m ³ /h.m ²						1,3
reference natural ventilation rate per m ² heated floor area, q_{ref} in m ³ /h.m ²						2,2
annual operating hours, t_a in h						8760
primary energy factor electric power generation & distribution, p_{ef}						2,5
space heating efficiency, η_h						75%

ANNEX IX

Measurements and calculations for NRVUs

NRVUs shall be tested and calculated using a 'reference configuration' of the product.

Dual use units shall be tested and calculated in the ventilation mode. 1. *Thermal efficiency of a non-residential heat recovery system*

The thermal efficiency of a non-residential heat recovery system is defined as

$$\eta_{t_nrvu} = (t_2'' - t_2') / (t_1' - t_2')$$

where

- η_t is the thermal efficiency of the HRS [-];
- t_2'' is temperature of the supply air leaving the HRS and entering the room [°C];
- t_2' is temperature of the outside air [°C];
- t_1' is temperature of the exhaust air, leaving the room and entering the HRS [°C].

2. *Filter corrections*

In case one or both filters are missing in comparison to reference configuration, the following filter correction shall be used:

From 1 January 2016:

F=0 in case the reference configuration is complete;

F=160 if the medium filter is missing;

F=200 if the fine filter is missing;

F=360 if both the medium and the fine filters are missing.

From 1 January 2018

F=150 if the medium filter is missing;

F=190 if the fine filter is missing;

F=340 if both the medium and the fine filters are missing.

'*fine filter*' means a filter that meets the conditions for filter efficiency in the following test and calculation methods, to be declared by the filter supplier. Fine filters are tested at air flow of 0,944 m³/s and filter face 592x592 mm (installation frame 610x610 mm) (face velocity 2,7 m/s). After proper preparation, calibration and checking the airstream for uniformity, initial filter efficiency and pressure drop of the clean filter are measured. The filter is progressively loaded with appropriate dust up to a final filter pressure drop of 450 Pa. At first 30 g is loaded in the dust generator subsequently there must be at least 4 equidistant dust loading steps before reaching the final pressure. The dust is fed to the filter at a concentration of 70 mg/m³. Filter efficiency is measured with droplets in the size range 0,2 to 3 µm of a test aerosol (DEHS DiEthylHexylSebacate) at a rate of about 0,39 dm³/s (1,4 m³/h), Particles are counted 13 times, successively upstream and downstream of the filter at minimum 20 seconds with an optical particle counter (OPC). Incremental filter efficiency and pressure drop values are established. Average filter efficiency over the test for the various particle size classes is

calculated. To qualify as a 'fine filter' the average efficiency for particle size 0,4 µm should be more than 80% and the minimum efficiency should be more than 35%. The minimum efficiency is the lowest efficiency among the discharged efficiency, initial efficiency and the lowest efficiency throughout the loading procedure of the test. The discharge efficiency test is largely identical to the average efficiency test above, except that the flat sheet of filter media sample is electrostatically discharged with isopropanol (IPA) before testing.

'medium filter' means a filter that meets the following conditions for filter efficiency: A 'medium filter' is an air filter for a ventilation unit with performance tested and calculated as for the fine filter, but meeting the conditions that the average efficiency for particle size 0,4 µm should be more than 40%, to be declared by the filter supplier.

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