



EUROPEAN
COMMISSION

Brussels, 11.7.2014
C(2014) 4653 final

ANNEXES 1 to 9

ANNEXES

to the

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

**supplementing Directive 2010/30/EU of the European Parliament and of the Council
with regard to energy labelling of residential ventilation units**

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supplementing Directive 2010/30/EU of the European Parliament and of the Council
with regard to energy labelling of residential ventilation units

ANNEX I

Definitions applicable for Annexes II to IX

- (1) '*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;
- (2) '*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;
- (3) '*multi-speed drive*' means a fan motor that can be operated at three or more fixed speeds plus zero ('off');
- (4) '*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;
- (5) '*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;
- (6) '*thermal efficiency of a residential HRS (η_t)*' 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;
- (7) '*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 at 100 Pa;
- (8) '*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;
- (9) '*external leakage rate*' means the fraction of reference air volume flow escaping from the casing of a unit when it is subjected to a pressure test, the test shall be performed at 250 Pa for both under and over pressure;
- (10) '*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;

- (11) '*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.
- (12) '*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);
- (13) '*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);
- (14) '*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;
- (15) '*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;
- (16) '*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;
- (17) '*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;
- (18) '*manual control*' means any control type that does not use demand control;
- (19) '*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;
- (20) '*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;
- (21) '*demand controlled ventilation (DCV)*' means a ventilation unit that uses demand control;
- (22) '*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;

- (23) '*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;
- (24) '*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;
- (25) '*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;'
- (26) '*static pressure (p_{sf})*' means the total pressure minus the fan dynamic pressure;
- (27) '*total pressure (p_f)*' means the difference between the stagnation pressure at the fan outlet and that at the fan inlet.
- (28) '*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.
- (29) '*dynamic pressure*' means the pressure calculated from the mass flow rate and the average gas density at the outlet and the unit outlet area;
- (30) '*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;
- (31) '*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;
- (32) '*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;
- (33) '*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.

ANNEX II
Specific energy consumption classes

Specific energy consumption (SEC) classes of residential ventilation units calculated for average climate:

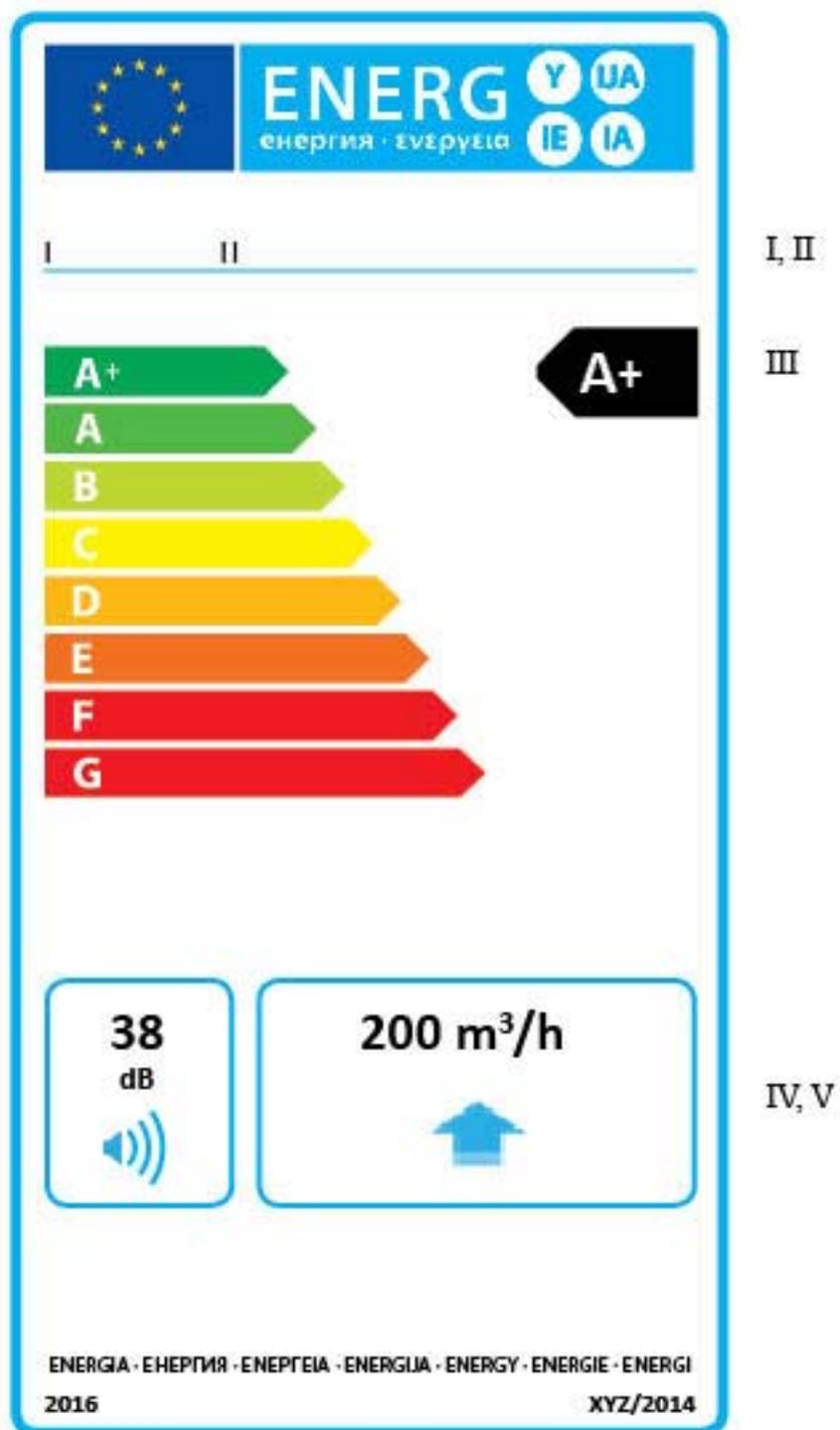
Table 1

<i>Classification from 1 January 2016</i>	
<i>SEC class</i>	<i>SEC in kWh/a.m²</i>
A+ (most efficient)	$SEC < -42$
A	$-42 \leq SEC < -34$
B	$-34 \leq SEC < -26$
C	$-26 \leq SEC < -23$
D	$-23 \leq SEC < -20$
E	$-20 \leq SEC < -10$
F	$-10 \leq SEC < 0$
G (least efficient)	$0 \leq SEC$

ANNEX III

The label

1. Label for UVUs marketed after 1 January 2016:

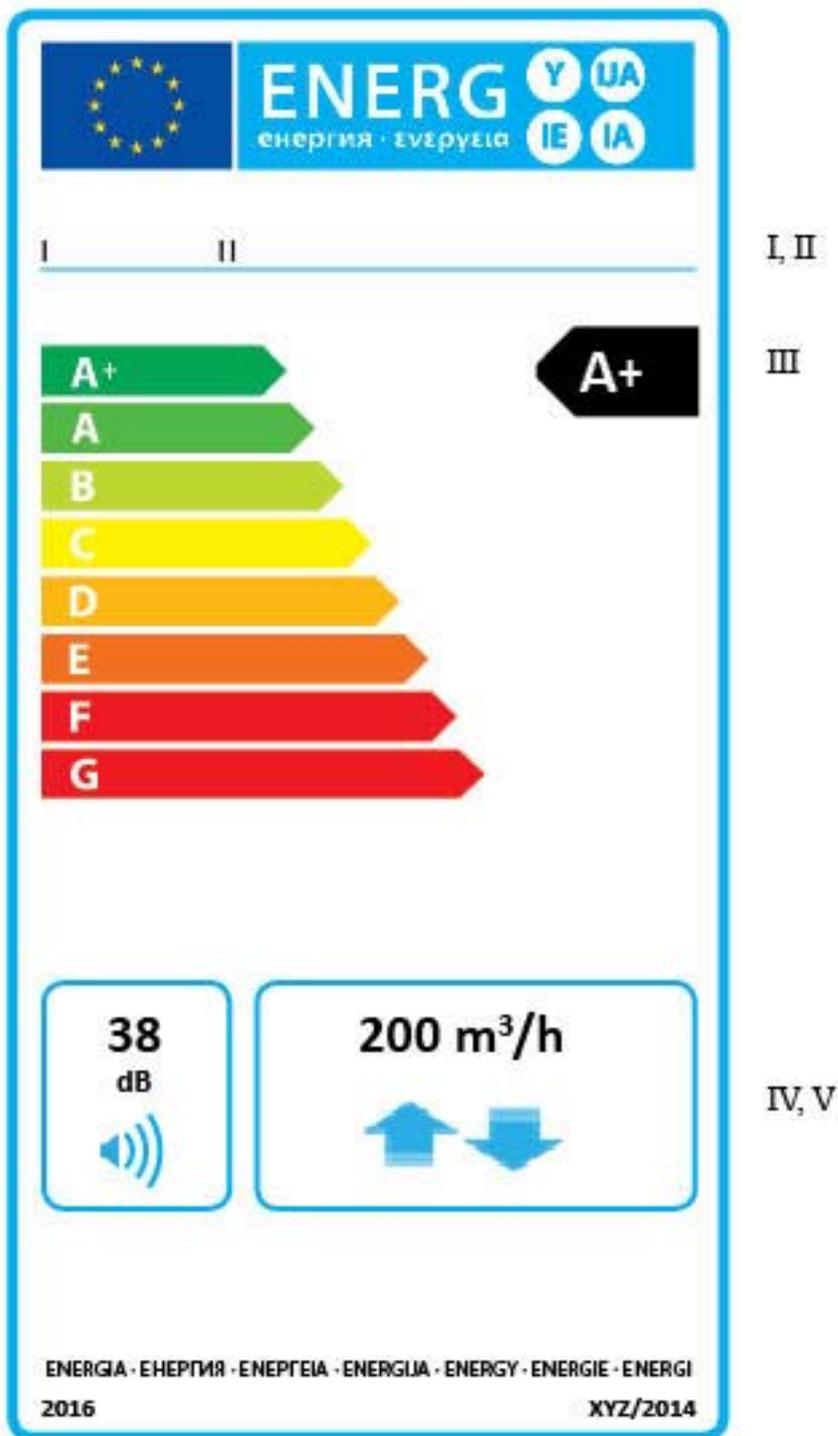


The label shall provide the following information:

- I supplier's name or trade mark;
- II supplier's model identifier;

- III energy efficiency; the head of the arrow containing the energy efficiency class of the appliance shall be placed at the same height as the head of the arrow of the relevant energy efficiency class. Energy efficiency is indicated for an 'average' climate;
- IV sound power level (L_{WA}) in dB rounded to the nearest integer
- V maximum flow rate in m^3/h rounded to the nearest integer, accompanied by one arrow representing UVUs;

2. Label for BVUs marketed after 1 January 2016:

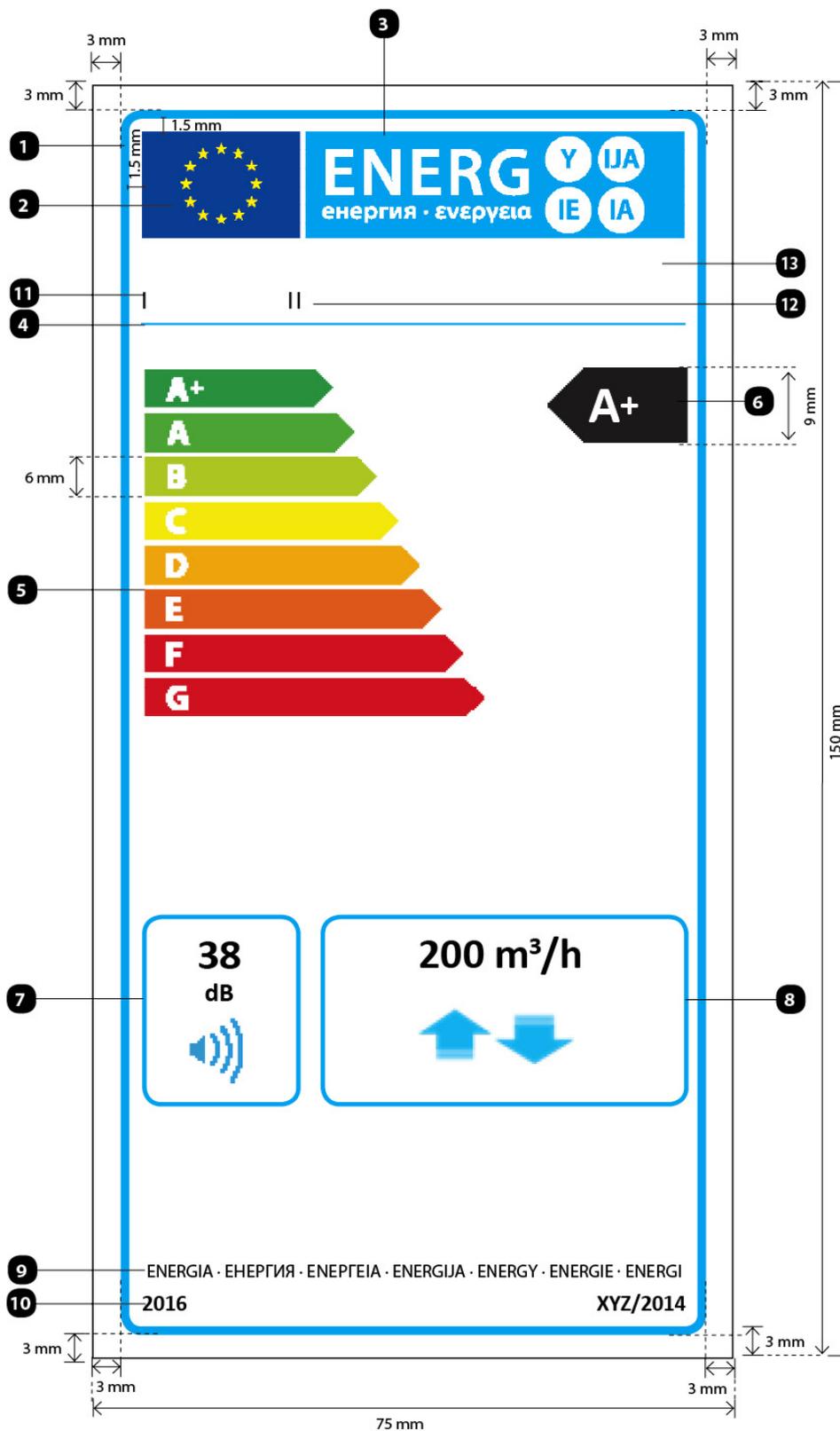


The label shall provide the following information:

- I supplier's name or trade mark;
- II supplier's model identifier;
- III energy efficiency; the head of the arrow containing the energy efficiency class of the appliance shall be placed at the same height as the head of the arrow of the relevant energy efficiency class. Energy efficiency is indicated for an 'average' climate;

- IV sound power level (L_{WA}) in dB rounded to the nearest integer;;
- V maximum flow rate in m^3/h rounded to the nearest integer, accompanied by two arrows in opposite directions representing BVUs.

3. The design of the labels for residential ventilation units set out in points 1 to 2 shall be the following:



Whereby:

The label shall be at least 75 mm wide and 150 mm high. Where the label is printed in a larger format, its content shall nevertheless remain proportionate to the specifications above.

The background shall be white.

Colours are coded as CMYK — cyan, magenta, yellow and black, following this example: 00-70-X-00: 0% cyan, 70% magenta, 100% yellow, 0% black.

The label shall fulfil all of the following requirements (numbers refer to the figure above):

❶ **EU label border stroke:** 3.5 pt – colour: Cyan 100% – round corners: 2.5 mm.

❷ **EU logo:** Colours: X-80-00-00 and 00-00-X-00.

❸ **Energy logo:** Colour: X-00-00-00.

Pictogram as depicted: EU logo + energy logo: width: 62 mm, height: 12 mm.

❹ **Sub-logos border:** 1 pt – colour: cyan 100% – length: 62 mm.

❺ **A+-G scales:**

Arrow: height: 6 mm, gap: 1 mm – colours:

Highest class: X-00-X-00

Second class: 70-00-X-00,

Third class: 30-00-X-00,

Fourth class: 00-00-X-00,

Fifth class: 00-30-X-00,

Sixth class: 00-70-X-00,

Seventh class 00-X-X-00

Last class: 00-X-X-00,

– **Text:** Calibri bold 13 pt, capitals, white.

❻ **Specific energy consumption class**

– Arrow: width: 17 mm, height: 9 mm, 100% black;

– Text: Calibri bold 18.5 pt, capitals, white; '+' symbols: Calibri bold 11 pt, white aligned on a single row.

❼ **Sound power level in dB:**

– Border: 1.5 pt – colour: cyan 100% – round corners: 2.5 mm;

– Value: Calibri bold 16 pt, 100% black;

– 'dB': Calibri regular 10 pt, 100% black.

❽ **Maximum flow rate in m³/h:**

– Border: 1.5 pt – colour: cyan 100% – round corners: 2.5 mm;

– Value: Calibri bold 16 pt, 100% black;

– 'm³/h': Calibri bold 16 pt, 100 % black;

– One or two arrows

– each width: 10 mm, each height: 10 mm.

– Colour: cyan 100%.

❾ **Energy:**

– Text: Calibri regular 6 pt, capitals, black.

❿ **Reference period:**

– Text: Calibri bold 8 pt.

⑪ **Supplier's name or trademark**

⑫ **Supplier's model identifier**

⑬ The suppliers' name or trade mark and model identifier shall fit in a space of 62 x 10 mm

ANNEX IV
Product fiche

The information in the product fiche of the residential ventilation unit referred to in Article 3(1) (b) shall be given in the following order and shall be included in the product brochure or other literature provided with the product:

- (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 (, 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 pre-/dis-assembly instructions;
- (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;

- (v) the annual electricity consumption (AEC) (in kWh electricity/a);
- (w) the annual heating saved (AHS) (in kWh primary energy/a) for each type of climate ('average', 'warm', 'cold').

ANNEX V
Technical documentation

The technical documentation referred to in Article 3(1) (c) shall include at least the following:

- (a) the name and address of the supplier;
- (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) where appropriate, the references of the harmonised standards applied;
- (d) where appropriate, the other calculation methods, measurement standards and specifications used;
- (e) identification and signature of the person empowered to bind the supplier;
- (f) where appropriate, the technical parameters for measurements, established in accordance with Annex VIII;
- (g) overall dimensions;
- (h) specification of the type of RVU;
- (i) the specific energy consumption class of the model as defined in Annex II;
- (j) the specific energy consumption (SEC) for each applicable climate zone;
- (k) sound power level (L_{WA});
- (l) the results of calculations carried out in accordance with Annex VIII.

Suppliers may include additional information at the end of the above list.

ANNEX VI

Information to be provided where end-users cannot be expected to see the product displayed, except on the internet

1. Where end-users cannot be expected to see the product displayed, except on the internet, the information shall be provided in the following order:
 - (a) the specific energy consumption class of the model as defined in Annex II;
 - (b) the specific energy consumption (SEC) in kWh/(m².a) for each applicable climate zone;
 - (c) the maximum flow rate (in m³/h);
 - (d) sound power level (L_{WA}) in dB(A) rounded to the nearest integer.
2. Where other information contained in the product information fiche is provided, it shall be in the form and order specified in Annex IV.
3. The size and font in which the information referred in this Annex is printed or shown shall be such that it is legible.

ANNEX VII

Information to be provided in the case of sale, hire or hire-purchase through the internet

1. For the purpose of points 2 to 5 of this Annex, the following definitions shall apply:
 - (a) ‘display mechanism’ means any screen, including tactile screen, or other visual technology used for displaying internet content to users;
 - (b) ‘nested display’ means a visual interface where an image or data set is accessed by a mouse click, mouse roll-over or tactile screen expansion of another image or data set;
 - (c) ‘tactile screen’ means a screen responding to touch, such as that of a tablet computer, slate computer or smartphone;
 - (d) ‘alternative text’ means text provided as an alternative to a graphic, allowing information to be presented in non-graphical form where display devices cannot render the graphic or as an aid to accessibility such as input to voice synthesis applications.
2. The appropriate label made available by suppliers in accordance with Article 3(1) (a) shall be shown on the display mechanism near the price of the product in accordance with the timelines indicated in Article 3 (2) and (3). The size of the label shall be such that it is clearly visible and legible and shall be proportionate to the size specified in Annex III. The label may be displayed using a nested display, in which case the image used for accessing it shall comply with the specifications in point 3 of this Annex. If nested display is applied, the label shall appear on the first mouse click, mouse roll-over or tactile screen expansion on the image.
3. The image used for accessing the label in the case of nested display shall:
 - (a) be an arrow in the colour corresponding to the energy efficiency class of the product on the label;
 - (b) indicate the energy efficiency class of the product in white in the same font size as that used for the price; and
 - (c) be in one of the following two formats:

4. In the case of nested display, the sequence of display of the label shall be as follows:
 - a) the image referred to in point 3 of this Annex is shown on the display mechanism in proximity to the price of the product;
 - b) the image links to the label;
 - c) the label is displayed after a mouse click, mouse roll-over or tactile screen expansion on the image;
 - d) the label is displayed by pop-up, new tab, new page or inset screen display;
 - e) for magnification of the label on tactile screens, the device conventions for tactile magnification apply;
 - f) display of the label is closed by means of a close option or other standard closing mechanism;

- g) the alternative text for the graphic, to be displayed on failure to display the label, is the energy efficiency class of the product in the same font size as that used for the price.
- 5. The appropriate product fiche made available by suppliers in accordance with Article 3(1) (b) shall be shown on the display mechanism near the price of the product. The size shall be such that the product fiche is clearly visible and legible. The product fiche may be displayed using a nested display, in which case the link used for accessing it shall clearly and legibly indicate 'Product fiche'. If nested display is used, the fiche shall appear on the first mouse click, mouse roll-over or tactile screen expansion on the link.

ANNEX VIII
Measurements and calculations

1. The specific energy consumption (SEC) is calculated using 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 the 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 the 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 the 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 the 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 exchangers, *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. The SEC for label classification is based on the ‘average’ climate.

2. The annual electricity consumption per 100 m² floor area (AEC) (in kWh/ a electric per year); and the annual heating saved ((AHS), which means the annual saving in consumption of energy for heating (in kWh fuel gross calorific value per year) are calculated as follows, using the definitions in point 1, and the default values given in Table 1, for each type of climate (average, warm and cold):

$$AEC = t_a \cdot q_{net} \cdot MISC \cdot CTRL^x \cdot SPI + Q_{defr};$$

$$AHS = t_h \cdot \Delta T_h \cdot \eta_h^{-1} \cdot c_{air} \cdot (q_{ref} - q_{net} \cdot CTRL \cdot MISC \cdot (1 - \eta_v)).$$

Table 1.
SEC calculation parameters

<u>general typology</u>						MISC
Ducted ventilation units						1.1
Non-ducted ventilation units						1.21
<u>ventilation control</u>						CTRL
Manual control (no DCV)						1
Clock control (no DCV)						0.95
Central demand control						0.85
Local demand control						0.65
<u>motor & drive</u>						x-value
on/off & single speed						1
2-speed						1.2
3-speed						1.5
variable speed						2
<u>Climate</u>	t_h in h	ΔT_h in K	t_{defr} in h	ΔT_{defr} in K	Q_{defr}^* 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 $Q_{defr} = t_{defr} \cdot \Delta T_{defr} \cdot c_{air} \cdot q_{net} \cdot p_{ef}$. For unidirectional units or units with regenerative heat exchangers, $Q_{defr} = 0$						
<u>Defaults</u>						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

Verification procedure for market surveillance purposes

For the purposes of checking conformity with the requirements laid down in Annex II, Member State authorities shall test a single RVU. 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 3, subject to the tolerances in Table 1, measurements shall be carried out on three other 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 Annex II.

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 in Annex VIII.

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	The measured value shall be no less than 0.93 times the minimum declared value.
Sound power level	The measured value shall be no more than the maximum declared value plus 2 dB.

The verification tolerances defined in this Annex relate only to the verification of the measured parameters by Member State authorities and shall not be used by the supplier as an allowed tolerance to establish values in the technical documentation. The values and classes on the label or in the (electronic) product fiche shall not be more favourable for the supplier than the values reported in the technical documentation.