

Draft Working Document Ventilation Units

(10.10.2012)

INTRODUCTION AND OVERVIEW

Ventilation units replace indoor air by fresh outdoor air in buildings by mechanical means ('fan-assisted') in order to guarantee an appropriate indoor air quality. This type of ventilation is also known as 'mechanical ventilation' to make a distinction to 'natural ventilation', where the same function is fulfilled by minimum infiltration openings, window airing and buoyancy ('passive stack'), possibly supplemented by small intermittently operating fans in the kitchen, bath and toilet.

Mechanical ventilation units, even without heat recovery, are an important instrument for energy saving through offering more control over the ventilation rate required. Compared to natural ventilation, mechanical ventilation reduces the total ventilation rate of a house (in m³/h or air changes per hour). Thereby the fresh air that needs to be heated by the space heating (and cooling) system is reduced and space heating energy saving is achieved. At the same time, being largely independent of unpredictable wind and pressure differences, mechanical ventilation systems do a better job in achieving good indoor air quality. In new buildings where building regulations prescribe a minimum air-tightness of the building shell, mechanical ventilation is indispensable. The mechanical ventilation unit is thus both an 'Energy-using Product' (EuP), in the sense that it consumes electricity, and an 'Energy-related Product' (ErP) that saves on space heating (and cooling) energy of the boiler (and chiller) with respect of a reference situation without mechanical ventilation, at equal performance in terms of indoor air quality, climate and boiler(chiller) efficiency.

Air-moving devices that are intended for other purposes e.g. flue gas extraction, convection enhancement, transportation of solids and liquids, transportation of (positive or negative) heating energy, induction of combustion air or process air and the operation of (pneumatic) equipment are thus implicitly excluded from the scope. Explicitly excluded from the scope are units for technical ventilation, i.e. where the performance requirements are predominantly determined by the special pollution characteristics and/or safety requirements of the processes that occur or may occur in the ventilated space. Examples are the ventilation of mines, operating theatres in hospitals, clean rooms as well as ventilation of potentially hazardous or explosive environments similar to those defined in the Fan Regulation.

Products relevant to this working document include unidirectional (exhaust, supply or reversible) units as well as balanced ventilation systems, with or without heat recovery system.

Based on nominal electric power input of the individual fans and in line with existing legislation such as the Fan Regulation, two main categories can be distinguished:

- ventilation units with individual fan electric power input less than 125 W, called RVUs (from Residential Ventilation Units after their most common application), and
- ventilation units with individual fan electric power input of 125 W or more, called NRVUs (from Non-Residential Ventilation Units, although they also include units applied in collective residential buildings).

An intermediate category are ventilation units with individual fan electric power input of 125 W or more, featuring a reference external pressure difference of 100 Pa or less, where the

manufacturer may choose to pertain either to the RVU or NRVU category. This allows to appropriately evaluate the large residential ventilation units and small commercial units with characteristics that are similar to RVUs.

Unidirectional fans with individual fan electric power input of less than 30 W or less are excluded from the (RVU) scope. The inclusion of these small, usually intermittently operating extraction or supply units (<30 W) does not bring much extra saving (max. ca. 10%) but would constitute a significant extra burden, given the large sales numbers and the diversity of application. It is thus proposed to exclude unidirectional ventilation units with power <30 W from the scope of the proposed measures.

The draft legislation in this WD employs, for each of the two main categories and in line with the current standardisation practice, a different set of requirements, technical definitions, test and calculation methods. The WD proposes specific minimum requirements under the Ecodesign directive 2009/125/EC for both categories. Energy labelling under directive 2010/30/EC is proposed only for RVUs; NRVUs are purchased by professional buyers and mandatory product information requirements under the Ecodesign directive can be just as effective.

The physical configuration of the products being regulated depends on the typical ‘package’ that is placed on the market. For unidirectional ventilation units the product is a casing plus one or more fans, including motor(s) and drive, with (RVU) or without (NRVU) specific controls for the indoor air quality (IAQ). For balanced ventilation units, always equipped with at least two fans, the RVU-package may also include the heat recovery system and filters; the NRVU-package includes filter-holders but not include filters; also control options are not included as they are typically realised at system level. Ductwork, silencers and air terminal units are not in the scope. Humidifiers/ dehumidifiers, (pre-)heating and (pre-)cooling coils are not in the scope, i.e. they are not included in the requirements and test & calculation methods. Defrosting energy is taken into account in the Energy Label calculations of annual energy consumption for cold and average climates, but there is no regulation of different defrosting methods foreseen as the optimal solution depends on the overall design of the unit.

Ventilation units were subject to preparatory studies ENER Lot 10¹ (Residential) and ENTR Lot 6² (Non-residential), who found ventilation units eligible for measures and proposed targets in accordance with Art. 15 of Directive 2009/125/EC. The main environmental and resources impact relates to the electricity consumption and the savings on space heating/cooling.

The Commission services, with external technical assistance³, also retrieved information through stakeholder consultation and additional research. In particular, a written consultation with a preliminary Working Document was conducted on residential ventilation units in December 2010.

The main findings for RVUs and NRVUs are presented below. Note that data availability for this dynamic sector is poor and many of the figures presented below are estimates.

¹ Riviere, Ph. (ARMINES) et. al., *Preparatory study on the environmental performance of residential room conditioning appliances* (airco and ventilation, Lot 10), *Study on residential ventilation*, ARMINES (F) with University of Porto (PT), Austrian Energy Agency (AT), BRE (UK) for the European Commission DG ENER, Final Report 2009.

² Kemna, R. (VHK) et al., *Ventilation systems*, Task-reports 1 to 7, part of preparatory study Lot 6: Air-conditioning and ventilation systems, Main contractor ARMINES (F), for the European Commission DG ENTR, 14 June 2012.

³ VHK technical assistance framework contract.

RVUs

Residential dwellings with whole-house mechanical ventilation represent 24% of the total residential building stock. Natural ventilation (windows and infiltration), often supplemented by small intermittently operating exhaust fans in bath/kitchen/toilet, represents 76%. Around 1,5% of EU dwellings in the scope have mechanical ventilation with heat recovery.



It is estimated that, even at the currently low market penetration rates, mechanical ventilation is saving around 256 PJ/a⁴ (2010) in EU space heating fuel for the residential sector. At the current annual market growth rate of 5-6% this figure will double before 2025, but the saving potential is much larger.

The electricity consumption of residential ventilation is estimated at 18,7 TWh/a, growing at 5-6% per year. Balancing the primary energy consumption from electricity ($2,5^5 * 3,6^6 * 18,7$ TWh= 168 PJ) against the fuel saving (256 PJ/a), the current park of residential ventilation units is producing a net primary energy saving of 88 PJ per year. This results in around 7 Mt CO₂ equivalent of net carbon emission savings.

⁴ 265 PJ/a represents the space heating fuel saving of mechanical ventilation with respect of natural ventilation, as calculated in Annex I of the delegated Regulation.

⁵ Primary energy conversion factor for power generation and distribution.

⁶ Conversion TWh (10^{12} Watt hour) to PJ (10^{15} Joules); 1 W= 1 J/s → 1 Wh= 3600 J.

In 2010, around 7,8 million residential ventilation units were sold at an industry annual revenue of €1 billion in units and €0,9 billion in additional installation-materials (grilles, ducts, etc.). Revenue to installers is over €2,5 billion per year. Between manufacturers (26%), OEM suppliers (7%), wholesale (3%) and installers (64%) the sector represents the equivalent of 56.000 full-time jobs.

In 2010, EU-consumers spent over €5,2 billion on the purchase and installation of residential ventilation units. Over the product life⁷, these consumers will be spending a further €2,5 billion on running costs (electricity, maintenance) but also saving some €10,7 billion on avoided space heating energy (gas, oil) because of more effective ventilation and ventilation heat recovery.

Two-thirds of residential ventilation unit sales and less than 15% of revenue relate to small local extraction ventilation units, that are mainly sold as a supplement to natural ventilation..

Whole-house ventilation systems represent one-third of unit sales and 85% of revenue, mainly in the form of central exhaust units (with natural air supply) and more-and-more central and local balanced heat recovery systems. The market for heat recovery units in Western and Northern Europe is achieving double digit growth rates. Southern and Eastern Europe are lagging behind.

The saving potential of energy efficient units is significant. Economical savings range between 10-20% for local exhaust fans, running up to 90% for central heat recovery ventilation units. For central exhaust systems a substantial saving can be realized through the use of room-based advanced controls.

The main market drivers for these ‘invisible’ installation products are government regulations. In large parts of the European Union, specific legislation is lacking or not fully implemented in practice. Market barriers relate to infrastructure and to installers and consumers being unfamiliar with the relatively new technologies. A major barrier for rapid retrofit of ducted (central) units is the substantial changes to the dwelling, limiting their application beyond new built dwellings. Renovation-friendlier (local) heat recovery solutions have recently become available but are still not well known. The same can be said about the more advanced control options (air-sensors, etc.), which have only recently become affordable for the residential sector.

Policy measures promoting energy-efficient residential ventilation units could combine all available instruments: minimum Ecodesign requirements, Energy Label and – possibly, but outside the scope of the underlying proposal – measures under the Energy Performance of Buildings Directive.

A realistic target is to keep the electricity consumption in 2025 at 2010 levels, which implies, given the current growth rate, an electricity efficiency improvement of about 40-50%. By 2020, around 30% electric efficiency improvement could be realized (about 7 TWh).

For the saving on space heating energy it is realistic to aim for a 50-60% increase beyond the ca. 500 PJ/a already expected in 2025 at a continuation of current trend. This means an extra saving of 300 PJ/a through the above measures.

All in all, the realization of both these targets should give an extra primary energy saving of over 360 PJ (100 TWh primary, for comparison: equivalent to around 40 TWh electric savings) and savings on greenhouse gas emissions of around 20 Mt CO₂.

NRVUs

⁷ 17 years.

In the non-residential and collective residential sector, a total of 40% of building volume is mechanically ventilated, with 19% exhaust or supply systems, 15% balanced systems without heat recovery and 7% balanced systems with heat recovery. The other 60% is using natural ventilation, including the use of small intermittently operating exhaust fans.

The market penetration of mechanical systems is strongest (68% of ventilated volume) in commercial buildings like retail, hotels or business offices and significantly lower (52%) in (semi-) public buildings for education, health care and public administration. Multi-family dwellings (35% penetration) mostly use exhaust units (e.g. 'rooftop' or 'boxed' ventilation units) and –for various reasons- the mechanical ventilation of warehouses, industrial and agricultural buildings is limited (17% of volume).

In 2010, NRVUs are saving an estimated 2210 PJ in EU space heating fuel in the non-residential and collective residential sector. This figure is expected to grow to approx. 3200 PJ in 2025 in the baseline scenario.

The electricity consumption of residential ventilation is estimated at 59 TWh/a (2010), expected. As with RVUs, balancing the primary energy consumption from electricity ($2,5^8 * 3,6^9 * 59 \text{ TWh} = 168 \text{ PJ}$) against the fuel saving (2210 PJ/a) yields a net primary energy saving of 1678 PJ per year. This results in around 100 Mt CO₂ equivalent of net carbon emission savings.

In 2010, around 1,1 million unidirectional (mainly exhaust) and 0,32 million balanced NRVUs were sold at €1,7 billion (market price strictly for the units); related revenues in installation products and services amount to around €20 billion. On average, end-users of NRVUs are spending €7,1 billion on electricity costs but also saving €22,7 billion on avoided space heating energy (gas, oil) because of more effective ventilation and ventilation heat recovery. Monetary savings thus amount to around €14 billion.

Current industry employment in the manufacturing the units is estimated at 15 000 jobs, while the employment in the installation sector –for more than 80% SMEs—is between 300 000 and 400 000 jobs.

The saving potential of energy efficient units is significant. Economical savings range between 10-20% for simple exhaust fans without controls, running up to 90% for central heat recovery ventilation units. For central exhaust systems a substantial saving can be realized through the use of room-based advanced controls.

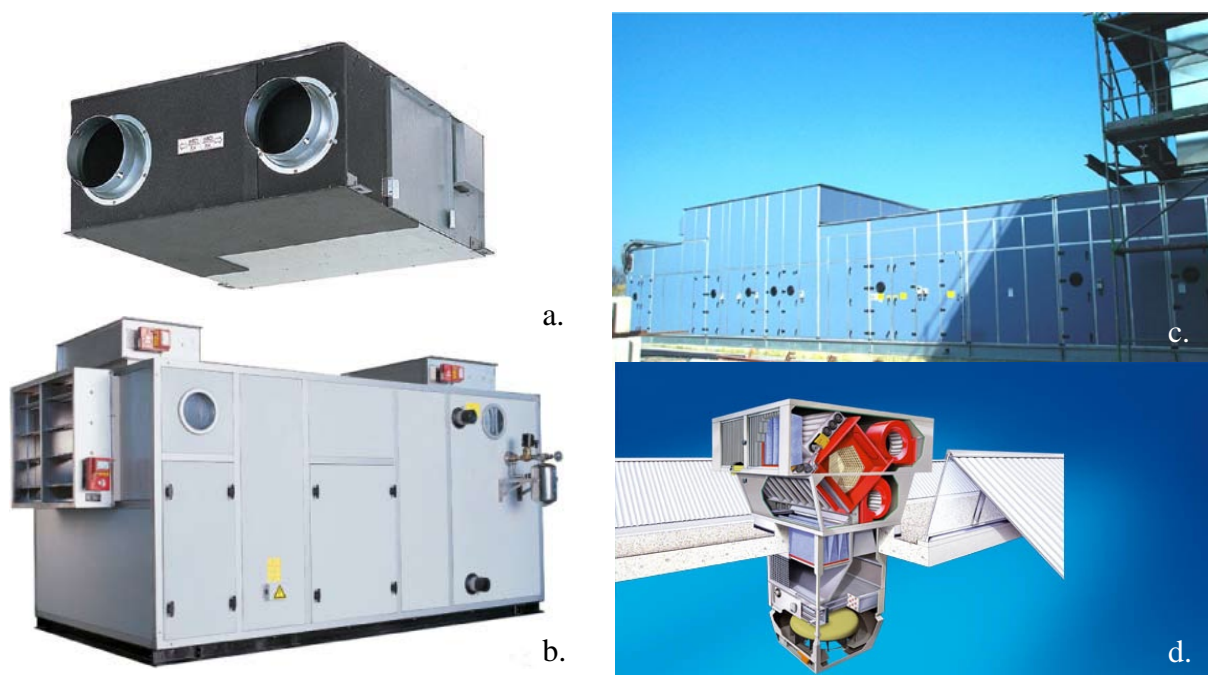
As with RVUs, the building regulations on energy performance (compare: EPBD) are an important market driver for efficient systems with demand-control ventilation (DCV) and heat recovery, but certainly also economic considerations (energy costs, higher labour productivity) play an important role. The main market failure occurs because the buyer is not the user. Mechanical ventilation systems are one of the last items to be added to a building, i.e. when budgets are tightening up and it is tempting to save some money on the quality of these systems. For renovation and retrofitting, lack of knowledge with the decision makers and also installation companies, very often leads to replacement with suboptimal solutions.

Last but not least, physical restrictions can play an important role with retrofits: Installation of ductwork for a central heat recovery system in an existing building is invasive and expensive and not everybody is convinced by the lower life cycle costs to make such an investment. But

⁸ Primary energy conversion factor for power generation and distribution.

⁹ Conversion TWh (10^{12} Watt hour) to PJ (10^{15} Joules); $1 \text{ W} = 1 \text{ J/s} \rightarrow 1 \text{ Wh} = 3600 \text{ J}$.

also in this context, know-how and creativity of planners and installers is important because very often solutions are available that are less invasive and expensive.



Examples of balanced non-residential ventilation units: a) ceiling mounted balanced unit (500-1000 m³/h) small commercial; b) floor-standing balanced unit (5000-12000 m³/h) medium-size office building; c) extra-large balanced air handling unit (>100 000 m³/h); d) rooftop non-ducted balanced unit for warehouses and industry.

In a Least Life Cycle Cost (LLCC) scenario the electricity consumption will increase less than 10% to 63 TWh/a in 2025. Given the expected growth in market penetration of NRVUs over the same period, this implies an electric efficiency improvement of about 30-40%. In other words, with respect to the baseline 2025 of 11 TWh/a is envisaged through the implementation of Ecodesign measures. Roughly half of these electricity savings can be attributed to measures under the Ecodesign Fan Regulation 327/2011. Technically, these improvements are projected to be realised through, amongst others, an increased application of EC motors, variable speed drives, more efficient fans, direct drives, smart controls, lower internal pressure drop of internal components.

The extra space heating savings in 2025, i.e. more than what will be realised in the baseline (BaU) scenario 2025, are estimated at more than 1000 PJ.¹⁰ These will be realised through better controls and a higher penetration of heat recovery.

Balancing electricity consumption, strictly due to the measures in this WD, and the extra space heating energy saving, it is estimated that the NRVU-measures will save around 900-950 PJ primary energy in 2025. This is comparable to saving the equivalent of 100 TWh electricity consumption and around 50 Mt CO₂ eq. greenhouse gas emissions.

¹⁰ Compared to the current situation (BAU 2010), the LLCC scenario saves almost 2000 PJ.

Manufacturer's revenue is expected to more than double over the 2010-2025 period with similar consequences for industry job creation. This does not mean that ventilation installation costs for builders in the non-residential sector will double, because the ventilation units constitute only 5-10% of total system costs. Installers, and the creation of installer jobs, are expected to benefit, but it is hard to make a detailed projection.

Conclusion

Adding up the RVU and NRVU categories, the measures proposed in this Working Documents lead to an energy saving versus the baseline of around 1300 PJ primary energy, equivalent to around 140 TWh electricity saving in 2025. The carbon emission saving, mostly from reduced space heating load, amounts to 70 Mt CO₂.

Working Document on a possible

COMMISSION REGULATION

implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for Ventilation Units

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 products¹¹, and in particular Article 15(1) thereof,

After consulting the Ecodesign Consultation Forum,

Whereas:

- (1) Under Directive 2009/125/EC ecodesign requirements should be set by the Commission for energy-related products representing significant volumes of sales and trade, having significant environmental impact and presenting significant potential for improvement in terms of their environmental impact without entailing excessive costs.
- (2) Article 16(2), first indent, of Directive 2009/125/EC provides that in accordance with the procedure referred to in Article 19(3) and the criteria set out in Article 15(2), and after consulting the Ecodesign Consultation Forum, the Commission shall, as appropriate, introduce an implementing measure for ventilation systems. The product group has been incurred in the indicative list of the Working Plan for the period 2009-2011 (COM 2008 660).
- (3) Fans are an important part of ventilation units. Generic minimum energy efficiency requirements have been established for fans in Commission Regulation (EU) No 327/2011 of 30 March 2011 with regard to ecodesign requirements for fans driven by motors with an electric input power between 125 W and 500 kW.⁽¹²⁾ However, many ventilation units covered by this Regulation are used in combination with fans not covered by Regulation (EU) No 327/2011.
- (4) For the purpose of synchronisation with Regulation (EU) No 327/2011 and following current differentiated test and calculation methods, this Regulation distinguishes between measures for residential and non-residential ventilation units, defined as a general rule on the basis of their individual fan electric power input. However, considering that they offer similar functionalities, this issue should be addressed again at review of the regulation.

¹¹ OJ L 285, 31.10.2009, p. 10–35

¹² OJ L 90, 6.4.2011, p. 8-21

- (5) Ventilation units with a single fan and nominal power input smaller than 30 W have particular application characteristics as a supplementary device, represent a considerable administrative burden in terms of market surveillance because of large sales numbers, contribute only to a small portion of the saving potential and should therefore be exempted from the scope of this Regulation. However, considering that they offer similar functionalities as other Ventilation Units, they should be addressed again at review of the measure.
- (6) Ventilation systems are installed in buildings. National legislation based on Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings ⁽¹³⁾, may set new stricter energy efficiency requirements on those ventilation systems. It is furthermore recognised that several Member States building regulations are bound upon a Specific Fan Power (SFP) approach. However, as product specific ecodesign requirements should be set independently from building configurations and the related external static pressure, this regulation does not consider SFP directly, but should be compatible to SFP and allow its application consistently.
- (7) 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 Community and third countries, and the results have been made publicly available.
- (8) The environmental aspect of the products covered, 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 Community in 2010. Indirectly, in the same year and area, products subject to this Regulation save 2570 PJ on space heating energy compared to a situation without these products, i.e. where natural ventilation through infiltration openings and airing needs to guarantee the same level of indoor air quality. In aggregate, using a primary energy factor of 2,5 for electricity, the energy balance is 1872 PJ primary energy of annual saving in 2010. Without specific measures, the aggregated saving is projected to grow to 2829 PJ in 2025. With specific measures, including energy labelling measures for residential ventilation units under Directive 2010/30/EU, the aggregated saving can increase by 1300 PJ (45%) to a level of 4130 PJ in 2025. The preparatory studies show that the energy consumption of products subject to this Regulation and related energy-using products can be significantly reduced.
- (9) The preparatory study shows that requirements regarding other ecodesign parameters referred to in Annex I, Part 1, of Directive 2009/125/EC are not necessary as energy consumption and sound power level of ventilation units in the use phase are by far the most important environmental aspect.
- (10) The energy consumption of products subject to this Regulation should be made more efficient by applying existing non-proprietary cost-effective technologies that can reduce the combined costs of purchasing and operating these products.
- (11) The ecodesign requirements should not affect functionality from the end-user's perspective and should not negatively affect health, safety or the environment. In

¹³ OJ L 153, 18.6.2010, p. 13

particular, the benefits of reducing energy consumption during the use phase should more than offset any additional environmental impacts during the production phase and the disposal.

- (12) 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 be such as to avoid negative impacts on the functionalities of equipment on the market, and to take into account cost impacts for end-users and manufacturers, in particular small and medium-sized enterprises, while ensuring timely achievement of the objectives of this Regulation.
- (10) Measurements of the relevant product parameters should be performed through reliable, accurate and reproducible measurement methods, which take into account the recognised state of the art measurement methods including, where available, harmonised standards adopted by the European standardisation bodies, as listed in Annex I to Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services¹⁴.
- (13) In accordance with Article 8 of Directive 2009/125/EC, this Regulation should specify the applicable conformity assessment procedures.
- (14) In order to facilitate compliance checks, manufacturers should provide information in the technical documentation referred to in Annexes V and VI of Directive 2009/125/EC insofar as this information relates to the requirements laid down in this Regulation.
- (15) Benchmarks for currently available ventilation unit types with high energy efficiency should be identified. This will help to ensure the wide availability and easy accessibility of information, in particular for small and medium-sized enterprises and very small firms, which will further facilitate the integration of best design technologies and facilitate the development of more efficient products for reducing energy consumption.
- (16) 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 establishes eco-design requirements for the placing on the market of electric mains-operated ventilation units that are placed on the market after [date to be inserted: 12 months after entry into force of the delegated Regulation].
- 2. This Regulation shall not apply to ventilation units which are:
 - (a) unidirectional (exhaust or supply) and equipped with one or more individual fans with a nominal electric power input less than 30 W

¹⁴ OJ L 204, 21.7.1998, p. 37.

- (b) designed specifically to operate in potentially explosive atmosphere as defined in Directive 94/9/EC of the European Parliament and of the Council ⁽¹⁵⁾;
- (c) designed for emergency use only, at short-time duty, with regard to fire safety requirements set out in Council Directive 89/106/EC ⁽¹⁶⁾;
- (d) designed specifically to operate:
 - (i) (a) where operating temperatures of the air being moved exceed 100 °C;
 - (b) where the operating ambient temperature for the motor, if located outside the air stream, driving the fan exceeds 65 °C;
 - (ii) where the annual average temperature of the air being moved and/or the operating ambient temperature for the motor, if located outside the air stream, are lower than -40 °C;
 - (iii) with a supply voltage > 1 000 V AC or > 1 500 V DC;
 - (iv) in toxic, highly corrosive or flammable environments or in environments with abrasive substances;
 - (v) in environments for the storage and/or handling of biological agents of risk groups 2, 3 or 4 as defined in Directive 2000/54/EC of the European Parliament and of the Council ⁽¹⁷⁾;
 - (vi) in sterile or clean manufacturing environments where the use of HEPA or ULPA filters as defined in Annex II mandatory.

Article 2

Definitions

In addition to the definitions set out in Article 2 of Directive 2009/125/EC, the following definitions shall apply for the purpose of this Regulation:

- (1) ‘Ventilation unit (VU)’ means an appliance equipped with at least a fan, motor and casing intended to replace utilised air by fresh air in a building or part of a building;
- (2) ‘Residential ventilation unit (RVU)’ means a ventilation unit where the nominal (maximum) power consumption of the individual fan(s) does not exceed 125 W or where the manufacturer has explicitly indicated in the product information requirements of Annex I (4) that the unit shall be classified as a RVU, and the (maximum) power consumption of the individual fan(s) does not exceed 250 W, and the maximum external pressure difference is less than 100 Pa as defined in Annex I (1) and (2);
- (3) ‘Non-residential ventilation unit (NRVU)’ means a ventilation unit where the nominal (maximum) power consumption of the individual fan(s) is more than 125 W except where the manufacturer complies with the stipulations of sub (2) and declares in the product information requirements of Annex I (4) that the unit shall be classified as a residential ventilation unit;

¹⁵ OJ L 100, 19.4.1994, p.1

¹⁶ OJ L 40, 11.2.1989, p. 12

¹⁷ OJ L 262, 17.10.2000, p. 21.

- (4) 'Unidirectional ventilation unit' means a ventilation unit producing an air flow only in one direction, either from indoors to outdoors (exhaust) or from outdoors to indoors (supply), operating in a building ventilation system where the mechanically produced air flow is balanced by natural air supply or extraction provisions;
- (5) 'Balanced ventilation unit' means a ventilation unit producing a balanced mass air flow between indoors and outdoors and which is equipped with both exhaust and supply fans;
- (6) 'ducted' or 'central' ventilation unit means a ventilation unit intended to ventilate multiple enclosed spaces in a building through the use of air-ducts, equipped with appropriate means for duct-connection.
- (7) 'non-ducted', 'room based' or 'local' ventilation unit means a ventilation unit intended to ventilate a single enclosed space in a building, not equipped with appropriate means for duct-connection.

Article 3

Ecodesign requirements

The specific ecodesign requirements for ventilation units are set out in Annex I point 2 for RVUs and Annex II point 3 for NRVUs.

Article 4

Conformity assessment

1. The conformity assessment procedure referred to in Article 8 of Directive 2009/125/EC shall be the internal design control system set out in Annex IV to that Directive or the management system set out in Annex V to that Directive.

2. For the purposes of conformity assessment pursuant to Article 8 of Directive 2009/125/EC, the technical documentation file shall contain a copy of the calculation set out in Annex III 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 equivalent Ventilation Units, or both, the technical documentation shall include details of such calculations or extrapolations, or both, and of tests undertaken by manufacturers to verify the accuracy of the calculations undertaken. In such cases, the technical documentation shall also include a list of all other equivalent Ventilation Unit models where the information included in the technical documentation was obtained on the same basis.

Article 5

Verification procedure for market surveillance purposes

When performing the market surveillance checks referred to in Article 3(2) of Directive 2009/125/EC for compliance with requirements set out in Annex I for RVUs or Annex II for NRVUs to this Regulation, the Member States authorities shall apply the verification procedure described in Annex III to this Regulation.

Article 6
Benchmarks

The indicative benchmarks for best-performing Ventilation Units available on the market at the time of entry into force of this Regulation are set out in Annex IV.

Article 7
Revision

The Commission shall review this Regulation in the light of technological progress no later than five years after its entry into force and present the result of this review to the Ecodesign Consultation Forum. The review shall in particular assess the verification tolerances set out in Annex III.

Article 8
Entry into force

1. This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.
2. The specific ecodesign requirements set out in point 1(1) of Annex I shall apply from [date to be inserted: [2] years after the entry into force of the Regulation].
The specific ecodesign requirements set out in point 1(2) of Annex I shall apply from [date to be inserted: [4] year after the entry into force of the Regulation]

This Regulation shall be binding in its entirety and directly applicable in all Member States.
Done at Brussels,

(1)

For the Commission

The

President

Ecodesign requirements for RVUs

1. Definitions for the purpose of Annex I, point 2,

1. *'Effective power input'* means the electric power input in W at reference flow rate and half the maximum flow reference pressure at standard RVU test conditions and includes the electrical demand for fans, controls (including remote controls) and (if integrated) any heat pump, whereby if there is no exact match between the reference flow rate and an actual unit flow rate then the electric power input is measured at the nearest higher actual unit flow rate at half the maximum flow reference pressure;
2. *'Flow rate'* in this regulation means the air volume flow rate in m³/s induced by the ventilation unit, which for balanced units refers to the indoor air supply side.
3. *'Maximum flow rate'* in m³/s is the maximum flow rate of an RVU that can be achieved with integrated and/or separately co-supplied controls at maximum flow reference pressure and at standard RVU test conditions, whereby if the maximum flow reference pressure cannot be achieved a declared maximum flow rate at a declared pressure is assessed and reported in the product information requirements;
4. *'Reference flow rate'* in m³/s means 70% of the maximum achievable flow rate, whereby for balanced ventilation units the reference flow rate applies to the indoor air supply outlet;
5. *'Pressure'* in this regulation means the static pressure for ducted RVUs and the total pressure for non-ducted RVUs, whereby for balanced ventilation units refers to the indoor air supply side;
6. *'Maximum flow reference pressure'* in Pa means the pressure at which the maximum flow rate is determined, which for ducted units is 100 Pa static pressure and for non-ducted units the minimum total pressure whereby if the measured minimum total pressure at maximum flow rate is lower than 10 Pa, a value of 10 Pa is assumed;
7. *'Standard RVU test conditions'* means testing of an RVU with integrated and/or separately co-supplied controls at standard air conditions 20 °C and 101325 Pa, whereby the unit is installed complete (e.g. including filters) and according to manufacturer instructions (e.g. with wall-ducts and grills for non-ducted units as appropriate);
8. *'Specific Power Input' (SPI)* in W/m³/h means the ratio of the effective power input in W and reference flow rate in m³/h.
9. *'Heat Recovery System' (HRS)* means the part of a Balanced Ventilation Unit equipped with a heat exchanger designed to transfer the heat contained in the (contaminated) exhaust air to the (fresh) supply air;
10. *'Thermal efficiency' (η_t)* of a HRS means the ratio of the supply air temperature gain and the exhaust air temperature loss, both with respect of the outdoor

temperature, measured under dry reference conditions and with balanced mass flow ;

11. ‘*Control factor*’ (*CTRL*) means a correction factor relating to the type of control that is part of the ventilation unit following the description in Table 1;
12. ‘*Control parameter*’ means a measurable parameter or set of measurable parameters that are assumed to be representative of the ventilation demand, such as the level of relative humidity (RH), carbon-dioxide (CO₂) or other gases, motion or occupancy detection from infrared body heat, motion or occupancy from reflection of ultrasonic waves, electric signals from human operation of electric lights or equipment;
13. ‘*Manual control*’ means any control type that does not use demand control;
14. ‘*Demand control*’ means a device or set of devices, part of the ventilation unit product package placed on the market, that measures a control parameter and uses the result to automatically regulate the flow rate of the ventilation unit and/or the flow rates of the air terminals that are part of the ventilation unit package placed on the market;
15. ‘*Clock control*’ means a clocked (daytime-controlled) human interface to control the fan speed/ flow-rate of the ventilation unit, with at least 7 weekday manual settings of the adjustable flow-rate for at least 2 or more setback periods, i.e. periods where a reduced or no flow rate applies.
16. ‘*Demand controlled ventilation*’ (*DCV*) means a ventilation unit that uses demand control;
17. ‘*Central demand control*’ means a demand control of a ducted ventilation unit that allows the regulation of its fan speed(s) and flow rate.
18. ‘*Local demand control*’ means a demand control of a ducted ventilation unit that allows the regulation of the overall fan speed(s) and the individual regulation of flow rates in at least three different enclosed spaces serviced by the ventilation unit.
19. ‘*Single variable demand control*’ means a demand control that is able to continuously detect the rate of deviation of a control parameter from a set value and regulate flow rate proportionally;
20. ‘*Multi-variable demand control*’ means a demand control that is able to continuously detect the rate of deviation of at least two different control parameters from set values, and regulate flow rate proportionally;
21. ‘*Multi-speed drive*’ means a fan motor that can be operated at 3 or more fixed speed steps plus zero (‘off’);
22. ‘*Variable speed drive*’ (*VSD*) 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-speed characteristic of the load being driven by the motor, excluding variable voltage controllers where only the supply voltage for the motor is varied.
23. ‘*Static pressure*’ (p_{sf}) means the total pressure (p_f) minus the fan dynamic pressure corrected by the Mach factor.

24. '*Total pressure*' (p_f) means the difference between the stagnation pressure at the fan outlet and the stagnation pressure at the fan inlet.
25. '*Stagnation pressure*' means the pressure measured at a point in a flowing gas if it were brought to rest via an isentropic process.
26. '*Dynamic pressure*' means the pressure calculated from the mass flow rate, the average gas density at the outlet and the unit outlet area.
27. '*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 gas around it and divided by the dynamic pressure.
28. '*Casing radiated sound power level*' noise radiated through the casing at reference air flow for non-ducted ventilation units.
29. '*In-duct radiated sound power level*' noise radiated from the duct connected to a ducted ventilation unit.
30. '*Recuperative heat exchanger*' means a heat exchanger intended to transfer thermal energy from one air stream to another without moving parts, such as plate or tubular heat exchangers with parallel flow, cross flow or counter flow or a combination of these as well as 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 as well as seals to reduce bypassing and leakage of air from one stream or another, with the characteristic that the regenerative heat exchangers have varying degrees of moisture recovery depending on the material used.
32. '*Internal leakage rate*' means the fraction of extract air in the supply air of ventilation units with HRS as a result of leakage between extract and supply air flows inside the casing when the unit is operated at reference air volume flow, measured at the ducts
33. '*External leakage rate*' means the fraction of reference air volume flow escaping from the casing of a unit when it is subject to a pressure test.
34. '*Mixing*' means the immediate recirculation or short-circuiting of airflows between discharge and intake ports at both the indoor and outdoor terminals and is thus not contributing to the effective ventilation of a building space, when operated at reference air volume rate .
35. '*Mixing rate*' means the fraction of extract air flow, as part of the total reference air volume, that is recirculating between discharge and intake ports at both the indoor and outdoor terminals and is thus not contributing to the effective ventilation of a building space, when operated at reference air volume. measured at 1 m distance from indoor supply duct reduced by the internal leakage rate.
36. '*Airflow sensitivity to pressure variations*' of a non-ducted RVU is the ratio of the maximum deviation from the maximum RVU flow rate at +20 Pa and at -20 Pa external total pressure difference.
37. '*Indoor/outdoor air tightness*' of a non-ducted RVU is the flow rate in m³/h between indoor and outdoor when the fan(s) is(are) switched off.

Table 1

Control factor (CTRL) classification

Ventilation unit control description	CTRL
manual control (no DCV)	1
clock control (no DCV)	0,9
ducted units: central, single variable DCV	0,85
ducted units: central, multi-variable DCV non-ducted units: single variable DCV	0,65
ducted units: local multi-variable DCV non-ducted units: multi-variable DCV	0,5

2. Specific ecodesign requirements

residential ventilation units shall comply with the following requirements:

- (1) From [date to be inserted: [2] year after the entry into force of the Regulation]:
 - all Ventilation Units shall be equipped with a multi-speed drive or VSD;
 - all Balanced Ventilation Units shall have a by-passable heat recovery system;
 - the thermal efficiency of heat recovery systems (HRS) shall be at least 75%;
 - the specific power input SPI shall be less than or equal to 0,23 W/m³/h for unidirectional ventilation units and 0,35 W/m³/h for balanced ventilation units;
 - Sound power level (L_{WA}), indoors shall be no more than 45 dB re 1pw at reference conditions (measured in duct for central units).
- (2) From [date to be inserted: [4] years after the entry into force of the Regulation]:
 - the thermal efficiency shall be more than or equal to 80% for local and 85% for central units with HRS;
 - the specific power input SPI shall be less than or equal to 0,18 W/m³/h for Exhaust Ventilation Units and 0,28 W/m³/h for Balanced Ventilation Units;
 - Ventilation Units shall have a control system with a control factor less than or equal to 0,9;
 - Sound power level (L_{WA}), indoors shall be no more than 40 dB re 1pw at reference conditions (measured in duct for central units).
 - Internal and external leakage for residential ducted balanced ventilation units with HRS using recuperative heat exchanger shall not be more than 10% when measured according to pressurisation test method at 100 Pa for internal leakage and 250 Pa for external leakage
 - Internal and external leakage for residential ducted balanced ventilation units with a HRS using a regenerative heat exchanger shall not be more than 6% when

measured according to the tracer gas chamber method or not more than 4% when measured according to the tracer gas in-duct method

- Internal and external leakage for residential non-ducted balanced ventilation units with HRS shall not be more than 10%, fraction of extract air in supply air, when measured according to pressurisation test method at 20 Pa for internal leakage and 50 Pa for external leakage .
- Mixing rate for a local balanced ventilation units with fixed air terminals shall not be more than 10%.
- The ventilation unit shall be equipped with a visual filter change warning signal.

The test parameters above are assessed in accordance with the definitions in par. 2, complemented by reliable, accurate and reproducible measurement procedures, which take into account the generally recognised state of the art measurement methods, including methods set out in documents the reference numbers of which have been published for that purpose in the Official Journal of the European Union.

3. Product information requirements on RVUs

1. The information on RVUs set out in points 2(a) to (u) shall be visibly displayed on:
 - (a) the technical documentation of RVUs;
 - (b) free access websites of RVU manufacturers.
2. The following information shall be displayed:
 - (a) supplier's name or trade mark.
 - (b) supplier's model identifier which means the code, usually alphanumeric, which distinguishes a specific residential ventilation unit model from other models with the same trade mark or supplier's name.
 - (c) declared typology in accordance with art. 2 of this Regulation (RVU or NRVU, unidirectional or balanced, ducted/central or non-ducted/local/room-based) ;
 - (d) type of drive installed (multi-speed drive or variable speed drive);
 - (e) type of heat recovery system (recuperative, regenerative, none);
 - (f) maximum flow rate in m³/s;
 - (g) reference flow rate in m³/s;
 - (h) maximum flow reference pressure in Pa;
 - (i) face velocity in m/s at design flow rate;
 - (j) power factor (cos phi);
 - (k) SPI in W/m³/h;
 - (l) thermal efficiency of heat recovery (in %), as appropriate (if 'none' then zero);

- (m) control factor and control typology in accordance with relevant definitions and classification in Annex I(1)
 - (n) internal and external leakage factors (%) for balanced ventilation units or external leakage factor (%) for ducted unidirectional ventilation units;
 - (o) mixing rate of local balanced ventilation units with fixed air terminals;
 - (p) sound power level (L_{WA}), indoors expressed in dB re 1 pW and rounded to the nearest integer at design flow rate, for ducted units determined from in-duct radiative sound power measurements and for unducted units determined as radiative sound power of the casing;
 - (q) position and description of visual filter warning for NRVUs intended to be used with filters, including text pointing out the importance of regular filter change for performance and energy efficiency of the unit;
 - (r) for unidirectional ventilation systems: instructions to install regulated supply/exhaust grilles in façade for natural air supply/extraction;
 - (s) electronic Internet address to (pre-) disassembly instructions on the free access manufacturer's website as set out in point 5;
 - (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.
3. One fiche may cover a number of models supplied by the same supplier.
 4. The information contained in the fiche may be given in the form of a copy of the label, either in colour or in black and white. Where this is the case, the information listed in point 1 not already displayed on the label shall also be provided.
 5. Detailed instructions including the required tools for the manual (pre-)disassembly from the ventilation unit 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 shall be available on the free access website of the manufacturer.

ANNEX II

Ecodesign requirements for NRVU

1. **Definitions for the purpose of Annex II, point 2, in addition to definitions in Annex I**
 1. 'Nominal power input' in kW means electrical power consumption at the nominal pressure external static pressure difference and the nominal airflow;
 2. 'Nominal flow rate' (q_v) in m³/s means the declared design flow rate of an NRVU at a nominal external static pressure difference that can be achieved at maximum rated fan speed and at standard air conditions 20 °C and 101325 Pa,

whereby the unit is installed complete (e.g. including filters) and according to manufacturer instructions .

3. 'Nominal pressure' (Δp_{stat}) in Pa means the declared design external static pressure difference at nominal flow rate. For balanced ventilation units the nominal pressure difference applies to the air supply outlet.
4. 'Energy efficiency of a HRS' (η_e) means the thermal efficiency of a HRS with a negative correction for extra electricity consumption of the ventilation unit for the pressure loss caused by the HRS, as indicated in the following section 2.1.
5. 'Filter efficiency' means the average gravimetric ratio between the dust fraction captured and the amount fed into the filter, under conditions as described in section 2.3.
6. 'Fan efficiency' (η_{fan}) means efficiency of the individual fan(s) in the ventilation unit as defined in and tested in accordance with Commission Regulation 327/2011.
7. 'Unit electric efficiency' means efficiency of an unidirectional ventilation unit, without possible provisions for thermodynamic air treatment or filters, as defined in and tested in accordance with Commission Regulation 327/2011.
8. 'Unit reference power consumption' (P_{mref}) in kW means reference power consumption of a balanced ventilation unit as derived from external static pressure difference and reference flow rate, measured without possible provisions for thermodynamic air treatment or filters, as defined in point 2(1) below.
9. 'Low energy consuming fine filter' means a filter that meets the conditions for filter efficiency and maximum pressure drop as defined in point 2(3) below.
10. 'High Efficiency Particulate Air filter' (HEPA filter) means a filter with an efficiency of separating at least 85% of 0.3 μm particles in an appropriate test procedure.
11. 'Ultra-Low Particulate Air filter' (ULPA filter) means a filter with an efficiency of separating at least 99,995% of 0,12 μm particles in an appropriate test procedure.

2. Test and calculation methods

2.1 Reference electric power consumption P_{mref} and maximum electric efficiency for balanced ventilation units

Calculation method P_{mref}

$$P_{mref} = \left(\frac{\Delta p_{stat}}{450} \right)^{0,925} * (q_v + 0,08)^{0,95}$$

where

- P_{mref} is the reference power consumption [kW];
- Δp_{stat} is nominal pressure [Pa];
- q_v is nominal airflow [m³/s].

2.2 Energy efficiency of a heat recovery system

Calculation method

$$\eta_e = \eta_t \cdot (1 - 1/\varepsilon)$$

where

- η_e is the energy efficiency of the heat recovery system HRS [-],
- η_t is the thermal efficiency of the HRS [-], where

$$\eta_t = (t_2'' - t_2') / (t_1' - t_2') \quad , \text{ with}$$

- 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]

- ε is the coefficient of performance [-], where

$$\varepsilon = Q_{HRS} / P_{el} \quad , \text{ with}$$

- Q_{HRS} is the capacity of the heat recovery system [W], where

$$Q_{HRS} = q_m \cdot c_{pA} \cdot (t_2'' - t_2') \quad , \text{ with}$$

- q_m is the mass flow of the air [kg/s] (air density, by convention: 1.2 kg/m³);
- c_{pA} is specific thermal capacity [kJ/kg K] (dry air ca. 1 kJ/kg K);
- $(t_2'' - t_2')$ is the difference between supply and outdoor air temperature [K]
- P_{el} is the electric power consumption attributed to the pressure loss of the heat recovery system [W], where

$$P_{el} = q_v \cdot \Delta p_{HRS} / \eta_D + P_{el\ aux} \quad , \text{ with}$$

- Δp_{HRS} is the sum of pressure loss [Pa] at supply side and exhaust side of the heat recovery system with $\Delta p_{HRS} = \Delta p_{supply} + \Delta p_{exhaust}$
- η_D is 0,6 is the efficiency [-] of electric power generation (EN 13053)
- $P_{el\ aux}$ is the auxiliary electric power consumption [W], e.g. of circulation pump in a run-around system.

Test methods

Thermal efficiency η_t is determined with reference testing conditions entailing dry exhaust ‘indoor’ air t_1 ’ at 25 °C dry bulb temperature (wet bulb temperature 18 °C for regenerative hygroscopic recovery devices, <14 °C for other types) and dry ‘outdoor’ air t_2 ’ supplied to the heat recovery system on the supply side at 5 °C dry bulb temperature (for regenerative hygroscopic recovery devices 3 °C wet bulb temperature) , with no influence of fan motor waste heat during the test. The test procedure consists of 7 tests at the following combinations of supply (q_{m^2}) and exhaust(q_{m1}) air flows:

q_{m^2}	q_{mn}	0,67 q_{mn}	1,5 q_{mn}	0,67 q_{mn}	q_{mn}	q_{mn}	1,5 q_{mn}
q_{m1}	q_{mn}	q_{mn}	q_{mn}	0,67 q_{mn}	0,67 q_{mn}	1,5 q_{mn}	1,5 q_{mn}

Where q_{mn} is the nominal air flow. Thermal efficiency is the non-weighted average of the test results.

The pressure drop of the heat recovery system Δp_{HRS} is the sum of supply side and exhaust side pressure drops Δp_2 and Δp_1 . Static pressure drops shall be measured, and dynamic pressure calculated, both sides of the recovery device for the 7 different air flow rate combinations mentioned above. The pressure drops Δp_2 and Δp_1 are the non-weighted averages of the individual 7 test results.

2.3 Definition ‘low energy consuming fine filter’

A ‘low energy consuming fine filter’ is an air filter for a ventilation unit that meets the conditions as described 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.

To determine whether a fine filter is ‘low energy consuming’, the pressure drop curve shall be recorded with at least five data points, during the course of dust loading. At final pressure drop, Final dust load should reach maximum of 100g. Through curve fitting a 4th order polynomial pressure difference equation is generated and from this the pressure drop after loading 100 g of test dust is derived. The determined pressure difference is used to calculate the yearly energy consumption of the filter under standardised conditions of operation (air

flow rate=0.944 m³/s, *time* = 6000 h and fan efficiency $\eta = 0.50$). The ‘low energy consuming fine filter’ should have a calculated yearly energy consumption below 1200 kWh, with average efficiency above 80% and minimum efficiency above 35%.

3. Specific ecodesign requirements

Non-residential ventilation units shall comply with the following requirements:

- (1) From [date to be inserted: [2] year after the entry into force of the Regulation]:
 - all Ventilation Units shall be equipped with a multi-speed drive or a variable speed drive;
 - all Balanced Ventilation Units shall have a by-passable heat recovery system;
 - the energy efficiency of heat recovery systems (HRS) shall be at least 64%;
 - the minimum fan efficiency for ventilation units is

$$4,56\% \cdot \ln(P) - 10,5\% + 53\% \text{ for } P \leq 10 \text{ kW and}$$

$$1,1\% \cdot \ln(P) - 2,6\% + 53\% \text{ for } P > 10 \text{ kW,}$$
 where P is the nominal electric power input of the fan (in kW);
 - the minimum efficiency of the unidirectional units (fan plus casing) is

$$4,56\% \cdot \ln(P) - 10,5\% + 45\% \text{ for } P \leq 10 \text{ kW and}$$

$$1,1\% \cdot \ln(P) - 2,6\% + 45\% \text{ for } P > 10 \text{ kW,}$$
 where P is the nominal electric power input of the fan (in kW);
 - the minimum electrical efficiency of balanced ventilation units is $0,001 \Delta p_{stat} \cdot q_v / 0,9 P_{mref}$ for the supply side, whereby P_{mref} , Δp_{stat} and q_v are as defined in point 2.1 above ;
 - the maximum face velocity V is 1,8 m/s with exemptions as set out in point (3) below;
 - if a filter module is required, the product shall be able to mount a low energy consuming fine filter, as defined in Annex II (1) and (2.3);
 - sound power shall be no more than 50 dBA re 1pw at reference conditions (measured in duct for central units);
- (2) From [date to be inserted: [4] years after the entry into force of the Regulation]:
 - the energy efficiency of heat recovery systems (HRS) shall be at least 71%;
 - the minimum fan efficiency of ventilation units is

$$4,56\% \cdot \ln(P) - 10,5\% + 57\% \text{ for } P \leq 10 \text{ kW and}$$

$$1,1\% \cdot \ln(P) - 2,6\% + 57\% \text{ for } P > 10 \text{ kW,}$$
 where P is the nominal electric power input of the fan (in kW);
 - the minimum electrical efficiency of unidirectional units (fan plus casing) is

$$4,56\% \cdot \ln(P) - 10,5\% + 50\% \text{ for } P \leq 10 \text{ kW and}$$

$1,1\% \cdot \ln(P) - 2,6\% + 50\%$ for $P > 10$ kW,

where P is the nominal electric power input of the fan (in kW);

- the minimum electrical efficiency of balanced ventilation is $0,001 \Delta p_{stat} \cdot q_v / 0,85 P_{mref}$ for the supply side, whereby P_{mref} , Δp_{stat} and q_v are as defined in point 2.1 above ;
- the maximum face velocity V is 1,6 m/s with exemptions as set out in point (3) below;
- in case a filter unit is part of the configuration the product shall be equipped with a visual signalling when the filter pressure drop exceeds the maximum allowable final pressure drop;
- Sound power shall be no more than 45 dBa re 1pw at reference conditions (measured in duct for central units).
- Internal and external leakage for non-residential ducted balanced ventilation units with HRS using recuperative heat exchanger shall not be more than 10% when measured according to pressurisation test method or 6% when measured according to the tracer gas in-duct method

(3) Exemptions on face velocity requirements

For retrofit situations where NRVUs, subject to the requirements regarding face velocity under points (2) and (3) above, cannot fulfil these requirements because of insufficient physical space to install the regulated NRVUs, the manufacturer can place ventilation units on the market with a higher face velocity of up to 2,2 m/s from [date to be inserted: [2] year after the entry into force of the Regulation] and 2 m/s from [date to be inserted: [4] year after the entry into force of the Regulation], under the condition that the manufacturer can convincingly demonstrate through documentation that indeed the physical space is insufficient, underpinned by a description of the situation, the performance requirements for the new installation (maximum flow rate, reference pressure difference), verification of these performance requirements against the requirements of site-specific building regulations and the smallest dimensions of an installation using a ventilation unit in the manufacturer's catalogue that would meet such performance requirements.

3. Product information requirements on NRVUs

1. The information on NRVUs set out in points 2(a) to (u) shall be visibly displayed on:
 - (c) the technical documentation of RVUs;
 - (d) free access websites of RVU manufacturers.
2. The following information shall be displayed:
 - (a) supplier's name or trade mark.

- (b) supplier's model identifier which means the code, usually alphanumeric, which distinguishes a specific residential ventilation unit model from other models with the same trade mark or supplier's name.
 - (c) declared typology in accordance with art. 2 of this Regulation (RVU or NRVU, unidirectional or balanced, ducted/central or non-ducted/local/room-based) ;
 - (d) type of drive installed (multi-speed drive or variable speed drive);
 - (e) type of heat recovery system (recuperative, regenerative, none);
 - (f) nominal flow rate in m³/s;
 - (g) nominal flow rate in m³/s;
 - (h) nominal pressure in Pa;
 - (i) nominal power input (kW);
 - (j) target efficiency of fans employed (%);
 - (k) unit electric efficiency for unidirectional units (%) or fraction of reference power requirement for balanced units (in decimal places);
 - (l) energy efficiency of heat recovery (in %), as appropriate (if 'none' then zero);
 - (m) face velocity in m/s at design flow rate;
 - (n) internal and external leakage factor (%) for balanced ventilation units and external leakage factor (%) ducted unidirectional ventilation units;
 - (o) sound power level (L_{WA}), indoors expressed in dB re 1 pW and rounded to the nearest integer at design flow rate, for ducted units determined from in-duct radiative sound power measurements and for unducted units determined as radiative sound power of the casing; .
 - (p) in case of NRVUs intended to be used with filters, position and description of visual filter warning for including text pointing out the importance of regular filter change for performance and energy efficiency of the unit;
 - (q) power factor (cos phi);
 - (r) for unidirectional ventilation systems: instructions to install regulated supply/exhaust grilles in façade for natural air supply/extraction;
 - (s) electronic Internet address to (pre-) disassembly instructions on the free access manufacturer's website as set out in point 5.
3. One set of information may cover a number of models supplied by the same supplier.
 4. The information contained in the technical documentation may be given in the form of a copy of the label, either in colour or in black and white. Where this is the case, the information listed in point 1 not already displayed on the label shall also be provided.
 5. Detailed instructions including the required tools for the manual (pre-)disassembly from the ventilation unit 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 shall be available on the free access website of the manufacturer.

ANNEX III

Verification procedure for market surveillance purposes

For the purposes of checking conformity with the requirements laid down in Annex I, Member State authorities shall test a single Ventilation Unit. If the measured parameters do not meet the declared values within the meaning of Article 4(2) of the manufacturer within the ranges set out in Table 1, the measurements shall be carried out on three more Ventilation Units. The arithmetic mean of the measured values of these three Ventilation Units shall meet the requirements within the ranges set out in Table 1.

Otherwise, the model and all other equivalent Ventilation Unit models shall be considered not to comply with the requirements laid down in Annex I.

Member States authorities shall use reliable, accurate and reproducible measurement procedures, which take into account the generally recognised state of the art measurement methods, including methods set out in documents the reference numbers of which have been published for that purpose in the Official Journal of the European Union.

Table 1 (illustrative/ to be discussed)

<u>Measured parameter</u>	<u>Verification tolerances</u>
SPI	The measured value shall not be greater than the rated value* of <i>SPI</i> by more than 7%.
Thermal efficiency	The measured value shall not be less than the rated value of η_t by more than 7%.
<u>[to be extended]</u>	

*'rated value' means a value that is declared by the manufacturer

ANNEX IV

Benchmarks

At the time of entry into force of this Regulation, the best available technology on the market for residential ventilation units, in terms of their specific power input SPI is 0,08 W/m³/h.

Residential ventilation units with heat recovery system are on the market with declared heat recovery thermal efficiencies up to 90%.

Non-residential ventilation units with heat recovery system are on the market with declared heat recovery energy efficiencies up to 85%.

Working Document on a possible

COMMISSION DELEGATED REGULATION

implementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of Residential Ventilation Units

THE EUROPEAN COMMISSION,

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

Having regard to Directive 2010/30/EU of the European Parliament and of the Council on the indication by labelling and standard product information of the consumption of energy and other resources by energy related products⁽¹⁸⁾, and in particular Article 11 thereof,

Whereas:

- (1) Directive 2010/30/EU requires the Commission to adopt delegated acts for the labelling of energy related products representing significant potential for energy savings and presenting a wide disparity in performance levels with equivalent functionality.
- (2) The energy used by residential ventilation units accounts for a significant part of total household energy demand in the European Union. In addition to the energy efficiency improvements already achieved, the scope for further reducing the energy consumption of residential ventilation units is substantial.
- (3) Unidirectional residential ventilation units with nominal power input smaller than 30 W have particular application characteristics as a supplementary device, represent a considerable administrative burden in terms of market surveillance because of large sales numbers, contribute only to a small portion of the saving potential and should therefore be exempted from the scope of this Regulation. However, considering that they offer similar functionalities as other Ventilation Units, they should be addressed again at review of the measure.
- (4) The information provided on the label should be obtained through reliable, accurate and reproducible measurement procedures, which take into account the recognised state of the art measurement methods including, where available, harmonised standards adopted by the European standardisation bodies, as listed in Annex I to Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations⁽¹⁹⁾.
- (5) The combined effect of energy labelling set out in this Regulation and of the Regulation implementing Directive 2009/125/EC of the European Parliament and of

¹⁸ OJ L 153, 18.6.2010, p. 1

¹⁹ OJ L 204, 21.7.1998, p. 37

the council with regard to ecodesign requirements for ventilation units () is expected to result in aggregated primary energy saving of over 360 PJ (100 TWh primary energy) and savings on greenhouse gas emissions of around 20 Mt CO₂ by 2025, compared to the situation if no measures are taken.

- (5) This delegated Regulation should specify a uniform design and content for the label for residential ventilation units.
- (6) In addition, this delegated Regulation should specify requirements as to the technical documentation and the fiche for residential ventilation units.
- (7) Moreover, this delegated Regulation should specify requirements as to the information to be provided for any form of distance selling, advertisements and technical promotional materials of Ventilation Units.
- (8) It is appropriate to provide for a review of the provisions of this delegated Regulation taking into account technological progress.

HAS ADOPTED THIS DELEGATED REGULATION:

Article 1
Subject matter and scope

1. This Regulation establishes eco-design requirements for the placing on the market of electric mains-operated ventilation units that are placed on the market after [date to be inserted: 12 months after entry into force of the delegated Regulation].
2. This Regulation shall not apply to ventilation units which are:
 - (a) unidirectional (exhaust or supply) and equipped with one or more individual fans with a nominal electric power input less than 30 W
 - (b) designed specifically to operate in potentially explosive atmosphere as defined in Directive 94/9/EC of the European Parliament and of the Council ⁽²⁰⁾;
 - (c) designed for emergency use only, at short-time duty, with regard to fire safety requirements set out in Council Directive 89/106/EC ⁽²¹⁾)
 - (d) designed specifically to operate:
 - (i) (a) where operating temperatures of the air being moved exceed 100 °C;
 - (b) where the operating ambient temperature for the motor, if located outside the air stream, driving the fan exceeds 65 °C;
 - (ii) where the annual average temperature of the air being moved and/or the operating ambient temperature for the motor, if located outside the air stream, are lower than -40 °C;

²⁰ OJ L 100, 19.4.1994, p.1

²¹ OJ L 40, 11.2.1989, p. 12

- (iii) with a supply voltage > 1 000 V AC or > 1 500 V DC;
- (iv) in toxic, highly corrosive or flammable environments or in environments with abrasive substances;
- (v) in environments for the storage and/or handling of biological agents of risk groups 2, 3 or 4 as defined in Directive 2000/54/EC of the European Parliament and of the Council ⁽²²⁾;
- (vi) in sterile or cleanroom environments where the use of HEPA or ULPA filters as defined in Annex II is mandatory by law or strict sector guidelines.

Article 2

Definitions

In addition to the definitions set out in Article 2 of Directive 2009/125/EC, the following definitions shall apply for the purpose of this Regulation:

- (1) ‘Ventilation unit (VU)’ means an appliance equipped with at least a fan, motor and casing intended to replace utilised air by fresh air in a building or part of a building;
- (2) ‘Residential ventilation unit (RVU)’ means a ventilation unit where the nominal (maximum) power consumption of the individual fan(s) does not exceed 125 W or where the manufacturer has explicitly indicated in the technical documentation of Annex I (4) that the unit shall be classified as a RVU, and the (maximum) power consumption of the individual fan(s) does not exceed 250 W, and the maximum external pressure difference is less than 100 Pa as defined in Annex I (1) and (2);
- (3) ‘Unidirectional ventilation unit’ means a ventilation unit producing an air flow only in one direction, either from indoors to outdoors (exhaust) or from outdoors to indoors (supply), operating in a building ventilation system where the mechanically produced air flow is balanced by natural air supply or extraction provisions;
- (4) ‘Balanced ventilation unit’ means a ventilation unit producing a balanced mass air flow between indoors and outdoors and which is equipped with both exhaust and supply fans;
- (5) ‘ducted’ or ‘central’ ventilation unit means a ventilation unit intended to ventilate multiple enclosed spaces in a building through the use of air-ducts, equipped with appropriate means for duct-connection.
- (6) ‘non-ducted’, ‘room based’ or ‘local’ ventilation unit means a ventilation unit intended to ventilate a single enclosed space in a building, not equipped with appropriate means for duct-connection.
- (7) ‘end-user’ means a consumer buying or expected to buy a Ventilation Unit;
- (8) ‘point of sale’ means a location where residential ventilation units are displayed and/or offered for sale, hire or hire-purchase.

²² OJ L 262, 17.10.2000, p. 21.

Article 3

Responsibilities of suppliers

1. Suppliers shall take action as described in points (a) to (g):

- (a) a printed label is provided for each residential ventilation unit respecting energy efficiency classes as set out in Annex II. The label shall comply with the format and content of information as set out in Annex III. The printed label must be provided at least in the packaging of unit;
 - (b) a product fiche, as set out in Annex IV, is made available. The product fiche must be provided at least in the packaging of unit;
 - (c) technical documentation as set out in Annex V is made available electronically on request to the authorities of the Member States and to the Commission;
 - (d) any advertisement for a specific model of a residential ventilation unit shall contain the energy efficiency class, if the advertisement discloses energy-related or price information. Information in the cases where end-users cannot be expected to see the product displayed is to be provided as set out in Annex VI;
 - (e) any technical promotional material concerning a specific model of a residential ventilation unit which describes its specific technical parameters shall include the energy efficiency class of that model as set out in Annex II;
 - (f) instructions for use are made available;
2. The energy efficiency class shall be determined as set out in Annex VII.
3. The format of the label for residential ventilation units shall be as set out in Annex III.
4. For the residential ventilation units the format of the label set out in Annex III shall be applied from [2 years after entry into force] .

Article 4

Responsibilities of dealers

Dealers shall ensure that:

- (a) residential ventilation units, at the point of sale, bear the label provided by suppliers in accordance with Article 3(1) on the outside of the front or top of the appliance, in such a way as to be clearly visible;
- (b) residential ventilation units offered for sale, hire or hire purchase where the end-user cannot be expected to see the product displayed, are marketed with the information provided by suppliers in accordance with Annexes V and VI;
- (c) any advertisement for a specific model of a residential ventilation unit contains a reference to the energy efficiency class, if the advertisement discloses energy-related or price information.;
- (d) any technical promotional material concerning a specific model which describes the technical parameters of an residential ventilation unit includes a reference to the energy efficiency class of the model and the instructions for use provided by the supplier;

Article 5
Measurement methods

The information to be provided under Articles 3 and 4 shall be obtained by reliable, accurate and reproducible measurement procedures, which take into account the recognised state of the art.

Article 6
Verification procedure for market surveillance purposes

When Member States assess the conformity of the declared energy efficiency class, SPI, temperature efficiency, annual energy consumption, and airborne acoustical noise emissions, they shall apply the procedure laid down in Annex VII.

Article 7
Revision

The Commission shall review this delegated Regulation in light of technological progress no later than five years after its entry into force.

Article 8
Transitional provision

Articles 3(1) point 4 and 4(2) shall not apply to printed advertisement and printed technical promotional material published before [date to be inserted: 16 months after the entry into force of the delegated Regulation].

Article 10
Entry into force

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

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

Done at Brussels, [...]

(2)

For the Commission

The President

ANNEX I
Energy efficiency classes and efficiency classes

1. TECHNICAL DEFINITIONS

1. Definitions for the purpose of Annexes I to VII:

1. *‘Effective power input’* means the electric power input in W at reference flow rate and half the maximum flow reference pressure at standard RVU test conditions and includes the electrical demand for fans, controls (including remote controls) and (if integrated) any heat pump, whereby if there is no exact match between the reference flow rate and an actual unit flow rate then the electric power input is measured at the nearest higher actual unit flow rate at half the maximum flow reference pressure;
2. *‘Flow rate’* in this regulation means the air volume flow rate in m³/s induced by the ventilation unit, which for balanced units refers to the indoor air supply side.
3. *‘Maximum flow rate’* in m³/s is the maximum flow rate of an RVU that can be achieved with integrated and/or separately co-supplied controls at maximum flow reference pressure and at standard RVU test conditions, whereby if the maximum flow reference pressure cannot be achieved a declared maximum flow rate at a declared pressure is assessed and reported in the product information requirements;
4. *‘Reference flow rate’* in m³/s means 70% of the maximum achievable flow rate, whereby for balanced ventilation units the reference flow rate applies to the indoor air supply outlet;
5. *‘Pressure’* in this regulation means the static pressure for ducted RVUs and the total pressure for non-ducted RVUs, whereby for balanced ventilation units refers to the indoor air supply side;
6. *‘Maximum flow reference pressure’* in Pa means the pressure at which the maximum flow rate is determined, which for ducted units is 100 Pa static pressure and for non-ducted units the minimum total pressure whereby if the measured minimum total pressure at maximum flow rate is lower than 10 Pa, a value of 10 Pa is assumed;
7. *‘Standard RVU test conditions’* means testing of an RVU with integrated and/or separately co-supplied controls at standard air conditions 20 °C and 101325 Pa, whereby the unit is installed complete (e.g. including filters) and according to manufacturer instructions (e.g. with wall-ducts and grills for non-ducted units as appropriate);
8. *Specific Power Input’ (SPI)* in W/m³/h means the ratio of the effective power input in W and reference flow rate in m³/h.
9. *‘Heat Recovery System’ (HRS)* means the part of a Balanced Ventilation Unit equipped with a heat exchanger designed to transfer the heat contained in the (contaminated) exhaust air to the (fresh) supply air;

10. '*Thermal efficiency*' (η_t) of a HRS means the ratio of the supply air temperature gain and the exhaust air temperature loss, both with respect of the outdoor temperature, measured under dry reference conditions and with balanced mass flow ;
11. '*Control factor*' (*CTRL*) means a correction factor relating to the type of control as given Annex VII, Table 1;
12. '*Control parameter*' means a measurable parameter or set of measurable parameters that are assumed to be representative of the ventilation demand, such as the level of relative humidity (RH), carbon-dioxide (CO₂) or other gases, motion or occupancy detection from infrared body heat, motion or occupancy from reflection of ultrasonic waves, electric signals from human operation of electric lights or equipment;
13. '*Manual control*' means any control type that does not use demand control;
14. '*Clock control*' means a clocked (daytime-controlled) human interface to control the fan speed/ flow-rate of the ventilation unit, with at least 7 weekday manual settings of the adjustable flow-rate for at least 2 or more setback periods, i.e. periods where a reduced or no flow rate applies.
15. '*Demand control*' means a device or set of devices, part of the ventilation unit product package placed on the market, that measures a control parameter and uses the result to automatically regulate the flow rate of the ventilation unit and/or the flow rates of the air terminals that are part of the ventilation unit package placed on the market;
16. '*Demand controlled ventilation*' (*DCV*) means a ventilation unit that uses demand control;
17. '*Central demand control*' means a demand control of a ducted ventilation unit that allows the regulation of its fan speed(s) and flow rate.
18. '*Local demand control*' means a demand control of a ducted ventilation unit that allows the regulation of the overall fan speed(s) and the individual regulation of flow rates in at least three different enclosed spaces serviced by the ventilation unit.
19. '*Single variable demand control*' means a demand control that is able to continuously detect the rate of deviation of a control parameter from a set value and regulate flow rate proportionally;
20. '*Multi-variable demand control*' means a demand control that is able to continuously detect the rate of deviation of at least two different control parameters from set values, and regulate flow rate proportionally;
21. '*Variable speed drive*' (*VSD*) 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-speed characteristic of the load being driven by the motor, excluding variable voltage controllers where only the supply voltage for the motor is varied.
22. '*Multi-speed drive*' means a fan motor that can be operated at 3 or more fixed speed steps plus zero ('off');

23. *'Static pressure'* (p_{sf}) means the total pressure (p_f) minus the fan dynamic pressure corrected by the Mach factor.
24. *'Total pressure'* (p_f) means the difference between the stagnation pressure at the fan outlet and the stagnation pressure at the fan inlet.
25. *'Stagnation pressure'* means the pressure measured at a point in a flowing gas if it were brought to rest via an isentropic process.
26. *'Dynamic pressure'* means the pressure calculated from the mass flow rate, the average gas density at the outlet and the unit outlet area.
27. *'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 gas around it and divided by the dynamic pressure.
28. *'Casing radiated sound power level'* noise radiated through the casing at reference air flow for non-ducted ventilation units.
29. *'In-duct radiated sound power level'* noise radiated from the duct connected to a ducted ventilation unit.
30. *'Recuperative heat exchanger'* means a heat exchanger intended to transfer thermal energy from one air stream to another without moving parts, such as plate or tubular heat exchangers with parallel flow, cross flow or counter flow or a combination of these as well as 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 as well as seals to reduce bypassing and leakage of air from one stream or another, with the characteristic that the regenerative heat exchangers have varying degrees of moisture recovery depending on the material used.
32. *'Internal leakage rate'* means the fraction of extract air in the supply air of ventilation units with HRS as a result of leakage between extract and supply air flows inside the casing when the unit is operated at reference air volume flow, measured at the ducts
33. *'External leakage rate'* means the fraction of reference air volume flow escaping from the casing of a unit when it is subject to a pressure test.
34. *'Mixing'* means the immediate recirculation or short-circuiting of airflows between discharge and intake ports at both the indoor and outdoor terminals and is thus not contributing to the effective ventilation of a building space, when operated at reference air volume rate .
35. *'Mixing rate'* means the fraction of extract air flow, as part of the total reference air volume, that is recirculating between discharge and intake ports at both the indoor and outdoor terminals and is thus not contributing to the effective ventilation of a building space, when operated at reference air volume. measured at 1 m distance from indoor supply duct reduced by the internal leakage rate.
36. *'Airflow sensitivity to pressure variations'* of a non-ducted RVU is the ratio of the maximum deviation from the maximum RVU flow rate at +20 Pa and at -20 Pa external total pressure difference.

37. 'Indoor/outdoor air tightness' of a non-ducted RVU is the flow rate in m³/h between indoor and outdoor when the fan(s) is(are) switched off.

ANNEX II

Energy efficiency classes

2. SPECIFIC ENERGY CONSUMPTION CLASSES

The specific energy consumption (*SEC*) class of residential ventilation units shall be determined on the basis of measurements and calculations set out in Annex VII.

Table 1

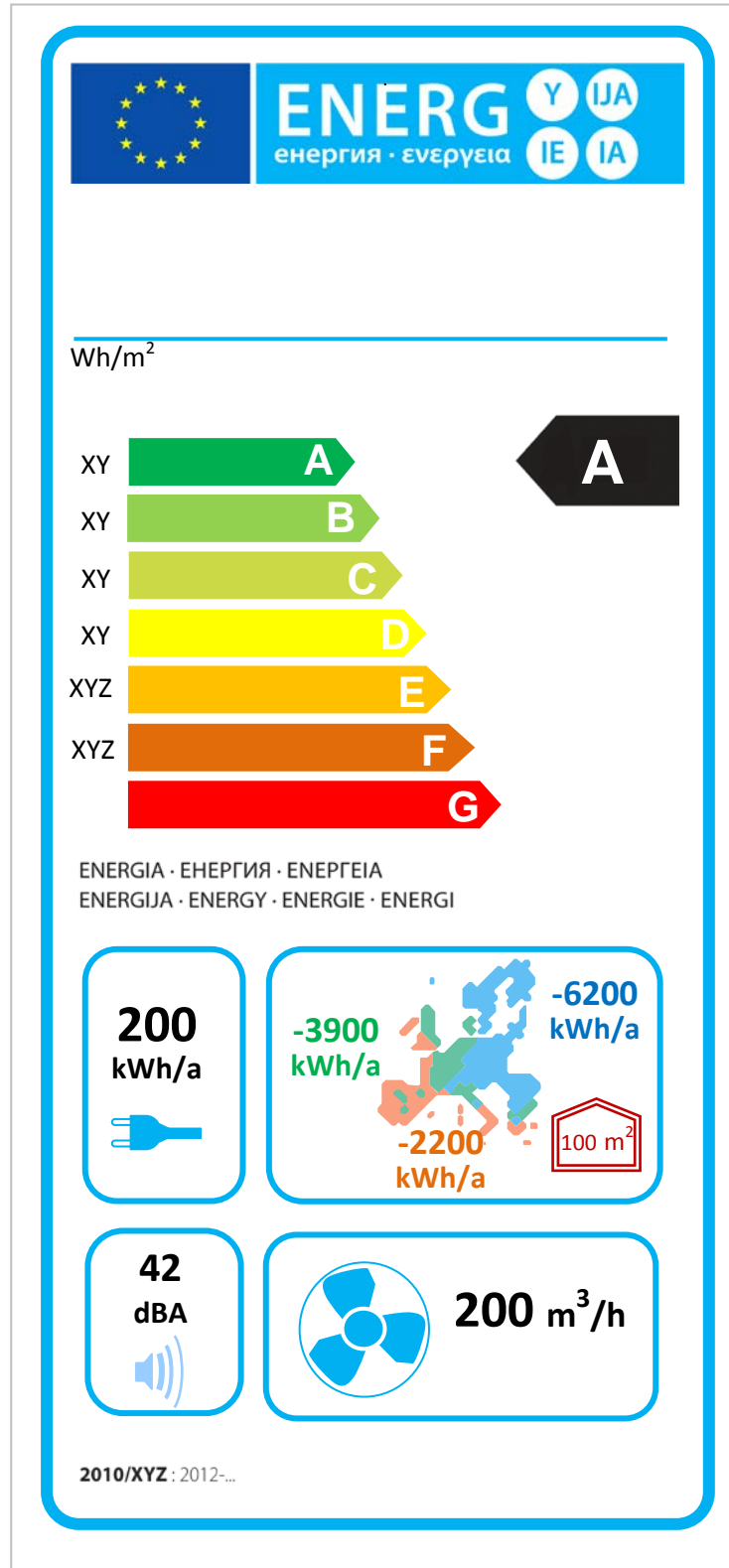
SEC classes for ventilation units

<i>SEC</i> Class	<i>SEC</i> in kWh/a.m ²
A (most efficient)	SEC < -40
B	-40 ≤ SEC < -30
C	-30 ≤ SEC < -20
D	-20 ≤ SEC < -10
E	-10 ≤ SEC < 0
F	0 ≤ SEC < 10
G (least efficient)	10 ≤ SEC

ANNEX III

The label

1. LABEL OF RESIDENTIAL VENTILATION UNITS



- (a) The following information shall be included in the label:
- I. supplier's name or trade mark;
 - II. supplier's model identifier;
 - III. maximum flow rate in m³/h, rounded to the nearest integer, accompanied by a fan symbol
 - IV. the 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 the Average climate.
 - V. annual electricity consumption AEC, expressed in kWh/a, rounded to the nearest integer;
 - VI. annual heating saved AHS, expressed in kWh/a, rounded to the nearest integer;
 - VII. sound power levels for indoor and outdoor units expressed in dB re1 pW, rounded to the nearest integer;
 - VIII. European map with a display of three indicative heating seasons and corresponding colour squares, accompanied by a 'house' symbol with the text '100 m²'.
- All the requested values shall be determined in accordance with Annex VII.
- (b) The design of the label shall be in accordance with point 1.5. By way of derogation, where a model has been granted an 'EU eco-label' under Regulation (EC) No 66/2010 of the European Parliament and of the Council (²³), a copy of the EU eco-label may be added.

[graphics section to follow]

²³ OJ L 27, 30.1.2010, p.1

ANNEX IV
Product fiche

1. The information on RVUs set out in points 2(a) to (x) shall be visibly displayed on:
 - (e) the technical documentation of RVUs;
 - (f) free access websites of RVU manufacturers.

2. The information in the product fiche of the residential ventilation units shall be given in the order specified in points (a) to (n).
 - (a) supplier's name or trade mark.
 - (b) supplier's model identifier which means the code, usually alphanumeric, which distinguishes 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/a.m² ;
 - (d) specific energy consumption (*SEC*) class, as defined in Annex I, table 1;
 - (e) declared typology in accordance with art. 2 of this Regulation (unidirectional or balanced, ducted/central or non-ducted/local/room-based) ;
 - (f) type of drive installed (multi-speed drive or VSD);
 - (g) type of heat recovery system (recuperative, regenerative, none);
 - (h) maximum flow rate in m³/s;
 - (i) reference flow rate in m³/h and dm³/s;
 - (j) maximum flow reference pressure in Pa;
 - (k) face velocity in m/s at design flow rate;
 - (l) power factor (cos phi);
 - (m) SPI in W/m³/h;
 - (n) thermal efficiency of heat recovery (in %), as appropriate (if 'none' then zero);
 - (o) control factor (decimal number) and control typology in accordance with relevant definitions and classification in Annex I(1)
 - (p) internal and external leakage factors (%) for balanced ventilation units and external leakage factor (%) for ducted unidirectional ventilation units;
 - (q) mixing rate of local balanced ventilation units with fixed air terminals;
 - (r) sound power level (L_{WA}), indoors expressed in dB re 1 pW and rounded to the nearest integer at design flow rate, , for ducted units determined from in-duct radiative sound power measurements and for unducted units determined as radiative sound power of the casing; .
 - (s) annual electricity consumption, in kWh electric/a, as indicated in Annex I;

- (t) annual heating energy saving consumption, in kWh GCV of fossil fuel/a, for average, warmer and colder climate, as indicated in Annex I;
- (u) for RVUs intended to be used with filters: position and description of visual filter warning, including text pointing out the importance of regular filter change for performance and energy efficiency of the unit;
- (u) for unidirectional ventilation systems: instructions to install regulated supply/exhaust grilles in façade for natural air supply/extraction;
- (v) electronic Internet address to (pre-) disassembly instructions on the free access manufacturer's website as set out in point 5.
- (w) for non-ducted units only, the airflow sensitivity to pressure variations at +20Pa and -20 Pa;
- (x) for non-ducted units only, the indoor/outdoor air tightness in m³/h.

Note that (c), (s) and (t) must be specified per climate (average, warmer, colder) in case of a unit with heat recovery function. Parameter (d) is established for an average climate.

3. One fiche may cover a number of models supplied by the same supplier.
4. The information contained in the fiche may be given in the form of a copy of the label, either in colour or in black and white. Where this is the case, the information listed in point 1 not already displayed on the label shall also be provided.
5. Detailed instructions including the required tools for the manual (pre-)disassembly from the ventilation unit 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 shall be available on the free access website of the manufacturer.

ANNEX V

Technical documentation

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

- (a) the name and address of the supplier;
- (b) a general description of the appliance model, sufficient for it to be unequivocally and easily identified;
- (c) where appropriate, the references for 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 VII:
 - (i) overall dimensions;
 - (ii) specification of the type of residential ventilation unit;
 - (iii) the energy efficiency class of the model as defined in Annex II;
 - (iv) the specific energy consumption SEC;
 - (v) sound power levels expressed in dB re1 pW, rounded to the nearest integer;
- (g) the results of calculations performed in accordance with Annex VII.

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

ANNEX VI

Information to be provided in the cases where end-users cannot be expected to see the product displayed

Information to be provided in the cases where end-users cannot be expected to see the product displayed

1. The information referred to in Article 4(b) shall be provided in the following order:
 - (a) The energy efficiency class of the model as defined in Annex II;
 - (b) the specific energy consumption SEC (in kWh/m².a);
 - (c) the maximum flow rate (in m³/h);
 - (d) the annual electricity consumption AEC (in kWh electricity/a);
 - (e) the annual heating saved AHS (in kWh primary energy/a) for Average, Warm and Cold climate;
 - (f) sound power levels expressed in dB(A) re1 pW, rounded to the nearest integer.
2. Where other information contained in the product information fiche is also provided, it shall be in the form and order specified in Annex IV.
3. The size and font in which all the information referred in this Annex is printed or shown shall be legible.

ANNEX VII

Measurements and calculations

1. For the purposes of compliance and verification of compliance with the requirements of this Regulation, measurements and calculations shall be made using harmonised standards the reference numbers of which have been published in the Official Journal of European Union, or other reliable, accurate and reproducible method, which takes into account the generally recognised state of the art methods, and whose results are deemed to be of low uncertainty.
2. 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];
- *q_{net}* is net ventilation rate demand per m² heated floor area [m³/h.m²];
- *q_{ref}* is the reference natural ventilation rate per m² heated floor area [m³/h.m²];
- *p_{ef}* is primary energy factor for electric power generation and distribution [-];
- *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 [kWh/m³]
- 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, with --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, and
- Δt_{defr} is the average difference in K between the outdoor temperature and -4°C during the defrosting period.

SPI and η_t are values derived from tests and calculation methods, as defined in Annex I. Other parameters and their defaults are given in Table 1. The SEC for label classification is based on the 'Average' climate.

3. The annual electricity consumption per 100 m² floor area AEC (in kWh/m².a electric per year) and the annual space heating saved per 100 m² floor area AHS (in kWh fuel gross calorific value per year) is calculated as follows, using the definitions in point 2. and the default values given in Table 1, for each of the three given climates Average, Warm and Cold

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

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

Table 1.

SEC calculation parameters

<u>general typology</u>	effective- ness	duct leakage	extra infiltration	MISC	
<u>Balanced ventilation units</u>					
central/ ducted	1	1,1	1	1,10	
local/ unducted	1,2	1	1	1,20	
<u>Unidirectional ventilation units</u>					
central/ ducted	1	1,1	1,1	1,21	
local/ unducted (>30W)	1,2	1	1,1	1,32	
<u>ventilation control</u>					
				CTRL	
Manual control (no DCV)				1	
Clock control (no DCV)				0,9	
Central DCV single variable (ducted units)				0,85	
Central DCV multi-variable (ducted units), Local DCV single variable (non-ducted units)				0,65	
Local DCV multi-variable (non-ducted units, ducted units with local flow rate control)				0,5	
<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
Warm	6552	14,5	1003	5,2	5,82
Average	5112	9,5	168	2,4	0,45
Cold	4392	5	-	-	-
* $Q_{defr}=t_{defr}*\Delta t_{defr}*c_{air}*q_{net}*pef$					
<u>defaults</u>					value
specific heat capacity of air, c_{air} in kWh/m ³					0,344 * 10⁻⁶
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, pef					2,5
space heating efficiency, η_h					75%

Working Document on a possible transitional measurement method (illustrative/ to be discussed)

DRAFT Commission communication in the framework of the implementation of the Commission Regulation (EC) No XX/20XX of implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for ventilation units, and

Commission Delegated Regulation (EC) No XX/20XX of implementing Directive 2010/30/EU of the European Parliament and of the Council with regard to ecodesign requirements for residential ventilation units

(1) Publication of titles and references of transitory measurement methods²⁴

The organisation publishing references with prefix 'EN' is CEN. References with prefix 'ISO' are published by ISO. Reference 'Eurovent 4/11' is published by Eurovent.

Measured parameter	Reference	Title
<i>non-residential unit performance</i>	EN 13053:2006 and EN13053/A1:2010.	Ventilation for buildings — Air handling units — Rating and performance for units, components and sections
<i>residential unit performance</i>	EN 13141-4:2004	Ventilation for buildings – Performance testing of components/products for residential ventilation – Part 4: Fans used in residential ventilation systems
	EN 13141-6:2004	Ventilation for buildings – Performance testing of components/products for residential ventilation – Part 6: Exhaust ventilation system packages used in a single dwelling
	EN 13141-7:2009	Ventilation for buildings – Performance testing of components/products for residential ventilation – Part 7: Performance testing of components/products of mechanical supply and exhaust ventilation units (including heat recovery) for mechanical ventilation systems intended for single family dwellings
	prEN 13141-8:2011	Ventilation for buildings — Performance testing of components/products for residential ventilation — Part 8: Performance testing of un-ducted mechanical supply and exhaust ventilation units (including heat recovery) for mechanical ventilation systems intended for a single room, CEN/TC 156, May 2011.
	prEN 13142:2010 (rev. V7)	Ventilation for buildings – Components/products for residential ventilation – Required and optional Performance Characteristics. January 2010
<i>heat recovery efficiency non-residential</i>	EN 308:1997	Heat exchangers - Test procedures for establishing performance of air to air and flue gases heat recovery devices

²⁴ These transitory measurement methods are meant to be replaced by harmonised standard(s). When available, the reference(s) of harmonised standard(s) will be published in the Official Journal of the European Union in accordance with Articles 9 and 10 of Directive 2005/32/EC.

<i>Low energy consuming fine filter definition</i>	EN 779:2012	Particulate air filters for general ventilation - Determination of the filtration performance
	Eurovent 4/11, Jan. 2011	Energy efficiency classification of air filters for general ventilation purpose
<i>HEPA, ULPA filter definition</i>	EN 1822:2009	High efficiency air filters (EPA, HEPA and ULPA) – Parts 1 to 5 (Part 1 : Determination of the filtration performance)
<i>Internal and external leakage</i>	EN 1886:2007	Ventilation for buildings - Air handling units - Mechanical performance. 2007
<i>SFP definition</i>	EN 13799: 2007	Ventilation for non-residential buildings; Performance requirements for ventilation and room-conditioning systems
<i>Fans</i>	EN ISO 13348:2007	Industrial fans - Tolerances, methods of conversion and technical data presentation
	ISO 12759:2010	Fans -- Efficiency classification for fans
	EN ISO 5801:2008	Industrial fans - Performance testing using standardized airways
<i>Acoustics</i>	EN ISO 3741:1999	Acoustics — Determination of sound power levels of noise sources using sound pressure — Precision methods for reverberation rooms
	EN ISO 3744:1994	Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane
	EN ISO 3746:1995	Acoustics — Determination of sound power levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane
	EN ISO 5136:2003	Acoustics — Determination of sound power radiated into a duct by fans and other air-moving devices — In-duct method
	EN ISO 10140:2010	Acoustics - Laboratory measurement of sound insulation of building elements. Parts 1 to 5, especially Part 2: Measurement of airborne sound insulation. Part 4: Measurement procedures and requirements(replaces EN 20140:1992 and ISO 140:1991)
<i>SEC calculation background (EPBD)</i>	EN 15665:2009	Ventilation in buildings – Determining performance criteria for residential ventilation systems
	EN 15251:2007	Indoor environmental input parameters for design and assessment of energy performance of buildings, addressing indoor air quality, thermal environment, lighting and acoustics
	EN 15242:2007	Ventilation for buildings – Calculation methods for the determination of air flow rates in buildings including infiltration
	EN 15241:2007	Ventilation for buildings – Calculation methods for energy losses due to ventilation and infiltration in commercial buildings
	EN 15243:2007	Ventilation for Buildings – Calculation of room temperatures and of load and energy for buildings with room conditioning systems
	CEN/TR 14788:2006	Ventilation for buildings – Design and dimensioning for residential ventilation systems
	EN 13465:2004	Ventilation for buildings – Calculation methods for the determination of air flow rates in dwellings
<i>Market surveillance</i>	EN 14134:2004	Ventilation for buildings - Performance testing and installation checks of residential ventilation systems.
	EN 12599 : 2000	Ventilation for buildings - Test procedures and measuring methods for handing over installed ventilation and air conditioning systems (standard under revision, Nov. 2010)

