PEP ecopassport® PROGRAM

PSR

SPECIFIC RULES FOR VENTILATION, AIR TREATMENT, FILTRATION AND MECHANICAL SMOKE EXHAUST EQUIPMENT

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According to PSR-modele-ed1-EN-2015 03 20

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1. Introduction

This reference document complements and explains the Product Category Rules (PCR) of Product Environmental Profiles (PEP) defined by the PEP ecopassport® program (PEP-PCR ed.3-EN-2015 04 02), available at www.pep-ecopassport.org.

It defines the additional requirements applicable to ventilation, air treatment, filtration or mechanical smoke exhaust equipment. compliance with these requirements is necessary to:

- Qualify the environmental performance of these products on an objective and consistent basis.
- Publish PEPs compliant with the PEP ecopassport® program and international reference standards.[1]

This reference document was drawn up in compliance with the open, transparent rules of the PEP ecopassport® program with the support of stakeholders and professionals in the ventilation, air treatment, filtration or mechanical smoke exhaust equipment market.

PEP ecopassport®	www.pep-ecopassport.org
PSR reference	PSR-0008-ed2.0-EN-2018 02 09
Critical review	The third-party Critical review was carried out by EVEA The declaration of conformity published on 16/01/2018 can be found in the Appendices.
Availability	The Critical review report is available on request from the P.E.P. Association contact@pep-ecopassport.org
Scope of validity	The critical review report and the declaration of conformity remain valid within 5 years or until the PEP Drafting Rules, or the normative reference texts to which they refer, are modified.

With the publication of the PCR edition 3 (PEP-PCR-ed 3-EN-2015 04 02), this PSR was the object of an impact study which led to an editorial revision. This PSR also incorporated modifications to facilitate the use of the PEP to perform an LCA for a building in accordance with EN 15978.

[1] ISO 14025, ISO 14040 and ISO 14044 standards

2. Scope

In accordance with the general instructions of the PEP ecopassport® program (PEP-General instructions-ed 4.1-EN-2015 04 02) and additional to the PCR, "PRODUCT CATEGORY RULES", (PEP-PCR ed.3-EN-2015 04 02) of the PEP ecopassport® eco-declaration program, this document sets out the specific rules for ventilation, air treatment, filtration or mechanical smoke exhaust equipment and defines the product specifications to be adopted by manufacturers in the development of their Product Environmental Profiles (PEPs) particularly with regard to:

- the technology and its type of application,
- the reference lifetime taken into account for the Life Cycle Assessment (LCA),
- the conventional use scenarios to be adopted during the product use stage.

The main purpose of these specific rules is to provide manufacturers of ventilation, air treatment, filtration and mechanical smoke exhaust equipment with a common base for the development of their product life cycle assessments. The various ventilation, air treatment, filtration and mechanical smoke control/exhaust systems available are described below.

2.1. Definition of the product families concerned

The product families concerned are designated by the following terminology: ventilation, air treatment, filtration or mechanical smoke exhaust equipment

These include all devices that provide ventilation and/or air filtration and/or mechanical smoke extraction from within a home or a residential or commercial building.

Two families of ventilation and air treatment equipment are considered:

- **Active equipment (family 1)**: products that use electrical power to operate.

- **Passive equipment (family 2)**: products that do not use electrical power to operate.

Family 1: Active equipment	
Equipment	**Technical data**
Unidirectional ventilation unit for dwelling	• Function: Ventilation • Type: unidirectional extraction or supply • Flow rate, electrical power input
Bidirectional ventilation unit for dwelling	• Function: Ventilation, filtration with optional pre-heating or pre-cooling • Type: bidirectional • Flow rate, electrical power input
Unidirectional ventilation unit, collective or commercial exhaust fan or roof fan	• Application: collective or commercial • Function: Ventilation only, ventilation and smoke exhaust • Type: unidirectional exhaust, unidirectional supply with or without filtration • Flow rate, electrical power input
Air handling unit, modular or not, collective or commercial	• Application: collective or commercial • Function: ventilation, filtration, and at least one additional function (heating, cooling, recovery, humidification, dehumidification, preheating, precooling) • Battery: with or without electrical or water batteries • Exchanger: with or without an exchanger and the type of exchanger (wheel or plate...) • Type: unidirectional exhaust, unidirectional supply with or bidirectional • Flow rate, electrical power input
Powered air supply, air exhaust grilles or air diffusers	• Type: powered (power supply, batteries, etc.) • Function: air transfer • Connection cross-section
Powered smoke exhaust fan or roof fan (1)	• Type: exhaust • Function: smoke exhaust only • Flow rate

Table 1 – Categories of active equipment covered by the PSR (family 1)

(1) Powered smoke fan will be tested annually according to regulations and in compliance with the safety regulations governing fire and panic hazards in ERP regulations specified by the modified decrees of 25 June 1980 and 22 June 1980. The energy consumed during the annual test is negligible in comparison to the other environmental impacts (for 250 Pa and 10,000 m^3/h, Pelec = 3 kW i.e. C = 3 * 1(h) = 3 kWh). These devices are therefore considered to be active equipment that does not consume energy during the use stage.

Family 2: Passive equipment	
Equipment	**Technical data**
Air supply, air exhaust grilles or air diffusers, fire dampers, terminal fire dampers, dampers and smoke control damper	• Type: circular or rectangular • Function: Air transfer • Material: metal or other (to be specified) • Connection cross-section
Air filters	• Type of filter • Quality of filtration • Function: air filtration • Dimensions, filtration area
Air inlets	• Type: fixed, self-adjustable or demand control ventilation • Function: Air transfer • Maximum air flow at 20 Pa
Safety boxes for powered smoke fans (2)	• Type: non-powered • Current • Smoke exhaust only, smoke exhaust comfort , 1 or 2 speeds
Air ducts and components	• Type: rigid or semi-flexible or flexible, circular or rectangular, insulated or not • Function: air transfer • Length, thermal resistance if insulated • Diameter

Table 2 – Categories of active equipment covered by the PSR (family 2)

(2) The safety boxes are used to control a powered smoke fan. When used with a fan, safety boxes are considered to be components of the ventilation system in which only the fan consumes electrical power. When safety boxes are sold on their own, they can only be used for smoke extraction if they are installed with a fan. This equipment is therefore considered to be passive equipment that does not consume energy during the use stage.

2.2. Consideration of the functions and technologies not included in this document

the specific rules for ventilation, air treatment, filtration or mechanical smoke exhaust equipment will take account of all technological advances, provided that such advances form part of a request to the P.E.P. association to include them in the specific rules for ventilation, air treatment, filtration or mechanical smoke exhaust equipment; the P.E.P. association will then decide whether the new technology can be included and whether the performance claims are justified.

In view of the specific features of each equipment categories described below, only the results for products sharing the same functional unit can be compared.

3. Reference Product life cycle assessment

3.1. Functional unit and reference flow description

These specific rules are additional to section 2.1 "Functional unit and reference flow description" of the current PCR.

3.1.1. Functional unit

3.1.1.1. Functional unit of active equipment (family 1)

3.1.1.1.1. Functional unit of ventilation units, air handling units, exhaust fans or roof fans

The functional unit associated with active devices such as ventilation units, exhaust fans or roof fans, air handling units and smoke extraction ventilators, exhaust fans or roof fans as defined in Section 2.1 "Definition of the product families concerned" of the present specific rules is:

"Transfer 1 m^3 of air per hour for the ventilation and/or air treatment and/or smoke exhaust and/or filtration of a building over the reference lifetime of X years. "

The reference lifetime is as specified in section 3.1.2 “Reference product and reference flow description” of these specific rules.

3.1.1.1.2. Functional unit of powered air supply or air exhaust grilles or air diffusers

The functional unit associated with active devices such as powered air supply or air exhaust grilles or air diffusers as defined in Section 2.1 "Definition of the product families concerned" of the present specific rules is:

"To transfer air for ventilation and/or air filtration and/or smoke exhaust of a building, for a connection cross-section of 1 dm^2, over the typical product lifetime of X years".

The reference lifetime is as specified in section 3.1.2 “Reference product and reference flow description” of these specific rules.

3.1.1.2. Functional unit of passive equipment (family 2)

3.1.1.2.1. Functional unit of air supply or air exhaust grilles or air diffusers, fire dampers, terminal fire dampers, dampers and smoke control dampers

The functional unit associated with passive devices such as air supply or air exhaust grilles or air diffusers, fire dampers, terminal fire dampers, dampers and smoke control dampers as defined in Section 2.1 "Definition of the product families concerned" of the present specific rules, is:

"To transfer air for ventilation and/or air filtration and/or smoke exhaust of a building, for a connection cross-section of 1 dm², over the typical product lifetime of X years".

The reference lifetime is as specified in section 3.1.2 “Reference product and reference flow description” of these specific rules.

3.1.1.2.2. Air filters functional unit

The functional unit associated with air filters, as defined in Section 2.1, "Definition of the product families concerned" of the present specific rules, is:

"Filter air in a building for a flow area (free area) of 1 dm² over the product lifetime of X years".

The reference lifetime is as specified in section 3.1.2 “Reference product and reference flow description” of these specific rules.

3.1.1.2.3. Air inlets functional unit

The functional unit associated with air inlets, as defined in Section 2.1, "Definition of the product families concerned" of the present specific rules, is:

"To transfer 1 m3 of air par hour for the ventilation of a building over the typical product lifetime of X years"

The reference lifetime is as specified in section 3.1.2 “Reference product and reference flow description” of these specific rules.

3.1.1.2.4. Functional unit of safety boxes

The functional unit associated with passive equipment such as safety boxes, as defined in Section 2.1, "Definition of the product families concerned" of the present specific rules, is:

"Control a smoke exhaust fan, current strength oh 6 A, over a reference lifetime of X years. "

The reference lifetime is as specified in section 3.1.2 “Reference product and reference flow description” of these specific rules.

3.1.1.2.5. Functional unit of air ducts and components

The functional unit associated with passive equipment such as air ducts and components, as defined in Section 2.1, "Definition of the product families concerned" of the present specific rules, is:

"Transfer air via 1 m of air duct, diameter 160 mm, over the product lifetime of X years".

The reference lifetime is as specified in section 3.1.2 “Reference product and reference flow description” of these specific rules.

3.1.2. Reference product and reference flow description

For each of equipment categories defined, the analysis carried out includes the following reference flows:

- ventilation, air treatment, filtration and mechanical smoke exhaust equipment with a specific reference lifetime and whose energy consumption in the use stage is expressed in kWh/(m^3/h) according to the use scenario described in section 3.5.4.1 “Energy consumption of active equipment (family 1)” of these specific rules for active equipment (family 1); for passive equipment (family 2), no energy consumption is required in the use stage.
- its packaging
- any products or components required for installation.

In the context of a PEP for a range of products, extrapolation rules will apply to all the reference products, as described in section 3.6 “Rules for extrapolation to a homogeneous environmental family”. In this case, the analysis will be carried out on the reference product, which is defined as follows:

Family 1: Active equipment		
Equipment	**Reference product**	**Reference lifetime**
Unidirectional ventilation unit for dwelling	• Four-room single-family dwelling (1 WC, 1 bathroom): Self-adjustable configuration: Q = 105/180 m^3/h DCV configuration: Q average = 59 m^3/h	17 years
Bidirectional ventilation unit for dwelling	• Four-room single-family dwelling (four rooms, 2 bathrooms, 1 WC): Q = 135/210 m^3/h • Heat recovery: efficiency to be specified in the PEP • Specify the supply and extraction filter efficiency in the PEP.	
Unidirectional ventilation unit, collective or commercial exhaust fan or roof fan	• Collective building: Self-adjustable configuration: Q = 1000/1800 m^3/h DCV configuration: Q = 600/1800 m^3/h • Commercial building: Q = 3400 m^3/h	
Air handling unit, modular or not, unidirectional supply for collective building	• Collective building: Self-adjustable configuration: Q = 1000/1800 m^3/h DCV configuration: Q = 600/1800 m^3/h • Specify the energy-efficiency classification and class of the filter in the PEP	

Family 1: Active equipment		
Equipment	**Reference product**	**Reference lifetime**
Air handling unit, modular or not, unidirectional supply for commercial building	• Commercial building: Q = 3400 m^3/h • Specify the energy-efficiency classification and class of the filter in the PEP	17 years
Air handling unit, modular or not, bidirectional supply for collective building	• Collective building: Self-adjustable configuration: Q = 1000/1800 m^3/h DCV configuration: Q = 600/1800 m^3/h • Specify the filtration quality in the PEP • Heat recovery: efficiency to be specified in the PEP	
Air handling unit, modular or not, bidirectional supply for commercial building	• Commercial building: Q = 3400 m^3/h • Specify the filtration quality in the PEP • For bidirectional unit, heat recovery: efficiency to be specified in the PEP • Heating water battery • Cooling water battery	
Powered smoke exhaust fan or roof fan	• Q = 10000 m^3/h	
Powered air supply, air exhaust grilles or air diffusers	• Air inlets • Fixed air outlets • Diffuser, reference diameter = 125	

Table 3 – Characteristics of reference product for active equipment (family 1)

Family 2: Passive equipment		
Equipment	**Reference product**	**Reference lifetime**
Air supply, air exhaust grilles or air diffusers	• Connection cross-section 0.2 m^2 (or 160 mm diameter)	17 years
Fire dampers, terminal fire dampers, dampers, and smoke control damper	• Connection cross-section 0.2 m^2 (or 160 mm diameter)	30 years
Air filters	• High-efficiency filter • Dimensions 594 mm * 594 mm	1 year
Air inlets	• Maximum air flow at 20 Pa of the reference product to be specified in the PEP	17 years
Safety boxes	• Mechanical Smoke exhaust fan only • 1 speed • 6 A	10 years
Air ducts and components	• Hydraulic diameter 160 mm • Specify the leakage class of the product according to EN 12237 – Ventilation for buildings. Ductwork. Strength and leakage of circular sheet metallic ducts	30 years

Table 4 – Characteristics of reference product for passive equipment (family 2)

The list of functions handled by the product(s) and the options proposed must be mentioned in the PEP.

If no product corresponds to the above definition, the product with the most similar characteristics in the product range will be used.

Any other definition of the reference product rule should be justified in the LCA report and in the PEP.

3.2. System boundaries

These specific rules are additional to section 2 "System boundaries" of the current PCR.

3.2.1. Manufacturing stage

All components supplied with the product and contributing to its proper operation must be included in the scope of the study.

3.2.2. Distribution stage

For this stage, the rules defined in the current PCR apply.

3.2.3. Installation stage

Conventionally, the installation of a ventilation unit, air handling unit, filtration or mechanical smoke extraction may involve:

- Modifications to the structure (e.g. masonry work, electrical connection, addition of cladding for better aesthetic integration of the product in the building). Any modification to the structure and/or addition of elements not anticipated by the manufacturer is excluded from the scope of the study. The impact of these operations must be calculated by the user of the declaration if desired according to the installation elements used during the worksite phase.
- The sanitary installation (condensate evacuation, taps, etc.) and the associated structure modifications.
- The treatment of packaging waste is, however, included. The packaging waste produced during the installation phase should be disposed of by the installer once the equipment has been installed.

3.2.4. Use stage

The use stage of VENTILATION, AIR TREATMENT, FILTRATION AND MECHANICAL SMOKE EXHAUST EQUIPMENT includes, once the component is installed:

- Energy consumption (applicable to active devices only)
- Liquid discharge (applicable only to bidirectional ventilation units and air handling units with plate heat exchangers or equipped with chilled water cooling coils or expansion).
- Service operations for maintenance of the device.

3.2.5. End-of-life stage

For this stage, the rules defined in the current PCR apply.

3.3. Cut-off criteria

The specific rules specified in section 2.3 "Cut-off criteria" of the current PCR apply.

3.4. Specific allocation rule

These specific rules are additional to section 2.4 "Rules for allocation between co-products" of the current PCR.

Where manufacturing primary data are shared with specific rules, the impact calculation is determined according to the mass of appliances manufactured.

3.5. Development of scenarios (default scenarios)

These specific rules are additional to section 2.5 on "Development of scenarios (default scenarios)" of the PCR.

3.5.1. Manufacturing stage

Ventilation, air treatment, filtration and mechanical smoke exhaust equipment is composed of components supplied by the manufacturer:

- components directly made by the manufacturer
- or components ready to be fitted together.

The rules defined in section 3.8 "Requirements for collecting primary and secondary data" of these specific rules apply.

3.5.1.1. Waste generated during the manufacturing stage

Waste generation and treatment are included in the manufacturing stage.

Manufacturers can dispose of manufacturing waste themselves or arrange for it to be disposed of. The LCA report shall specify how the manufacturer, or any person working for him or on his behalf fulfils the requirements of these stages, by distinguishing between hazardous manufacturing waste and non-hazardous manufacturing waste and providing evidence of such claims.
When the disposal processes are known (waste-to-energy recovery, burying, incineration without recovery), they shall be presented and justified in the LCA report and the associated environmental impacts shall be taken into account.
For material recovery (recycling, re-use or incineration as fuel for energy production), environmental impacts must be considered in the life cycle analysis for ventilation, air treatment, filtration or mechanical smoke exhaust equipment, as shown in section 2.5.6 “End of life treatment scenarios” from the current PCR.
Justification of the disposal processes shall then be accompanied by a report indicating the disposal systems and the recovery rate for each type of waste.

When the manufacturer does not provide evidence of the processes used to dispose of the waste generated during the manufacturing stage of the device in question, the disposal process shall be calculated by default as follows:

- For nonhazardous waste: Mass of raw product x 0.30 = 50% of incinerated waste and 50% of buried waste.
- For hazardous waste: Bare product mass x 0.30 = 100% incinerated waste.

When the worst performer value is used by default, no waste-to-energy recovery will be taken into account. The production of this lost material must be taken into account.

By sector-based agreement, the transport stage for this waste shall be taken into account, assuming that it is trucked over a distance of 100 km.

3.5.2. Distribution stage

The rules specified in section 2.5.3 "Transport scenarios" of the current PCR apply.

3.5.3. Installation stage

The installation phase includes any process, component, energy or consumption and/or emission required to install a device.
The installation conditions do not imply that particular consumables and/or products.

3.5.3.1. Waste generated during the installation phase

The packaging waste from ventilation, air treatment, filtration and mechanical smoke exhaust equipment produced during the installation stage is classed as non-hazardous waste and, in principle, shall be disposed of by the installer once the equipment has been installed.

Its removal is calculated as follows, by default[2]:

On the packaging mass	Cardboard, wood, corn starch, cellulose	Plastic and other products considered as non-hazardous waste
Percentage of packaging recycled at end of life	89%	21%
Percentage of packaging recovered for energy production at end of life	8%	32%
Percentage of packaging incinerated (50%) and buried (50%) without recovery at end of life	3%	47%

Table 5 – Default treatment of waste produced during the installation stage

Any other packaging material must be considered as buried.

Plastic film, straps, packing notes, labels or any other paper on or inside the package are considered to be insignificant and will not be included in the life cycle assessment for packaging waste if these items represent in total less than 50% of the total mass of the packaging.

By sector-based agreement, the transport stage for this waste shall be taken into account, assuming that it is trucked over a distance of 100 km.

3.5.4. Use stage of ventilation units, air handling units, exhaust fans or roof fans

3.5.4.1. Energy consumption

The use stage of ventilation units, air handling units, exhaust fans or roof fans after installation of the product involves:

- energy consumption,
- functions for optimising energy consumption.

For each product that consumes energy during use, a typical use scenario for calculating the environmental impacts related to such energy consumption has been defined. The use scenario shall be determined for each product category, as defined in section 3.1.2 “Reference product and reference flow description” of these specific rules.

[2] Extract from the ADEME "Industrial, commercial and household packaging" report, 2008, and the "Recycling report 1999-2008: Materials and recycling itemised by sector", 2010, in particular pages 102 & 113.

The following formula is used to calculate the total energy consumption necessary during the reference lifetime of the device:

$$\boldsymbol{C = \left[\left(\frac{Pelec * t}{1000}\right) + \left(C_{battery}\right)\right] * (1 - F) * RLT}$$

Where:

- C = Total energy consumption over the reference lifetime of the product, expressed in kWh.
- $C_{battery}$ = energy consumption of the battery as defined in Section 3.5.4.2 of these specific rules.
- P_{elec} = Electrical power absorbed by the fan(s) expressed in W t = average annual operating time in hours By default, t is equal to:

	Description of the typical use scenario	**Average annual operating time[3]**
Single-family dwelling, ventilation unit	Continuous operation 24 hours a day, 365 days a year	**8,760 hours**
Individual or collective dwelling, self-adjustable exhaust outlets	Continuous operation 24 hours a day, 365 days a year with time delay, 1 hour/day, high flow rate and without time delay, 2 hours/day, high flow rate	**8,760 hours**
Individual or collective dwelling, DCV exhaust outlets	Continuous operation 24 hours a day, 365 days a year with time delay, 1 hour/day, high flow rate in kitchen and 2 h/day high flow rate in bathroom and WC, without time delay 2 hours/day, high flow rate in kitchen and 4 h/day, high flow rate in WC or bathroom (scenarios taken from CSTB SIREN software)	**8,760 hours**
Individual dwelling, self-adjustable exhaust outlets	Continuous operation 24 hours a day, 365 days a year with time delay, 1 hour/day, high flow rate and without time delay, 2 hours/day, high flow rate	**8,760 hours**
Commercial building with AHU without Heating/Cooling batteries	Occupation scenario from RT 2012	**2,600 hours**
Commercial building with AHU equipped with Heating/Cooling batteries	Occupation scenario from RT 2012	**3,000 hours**

Table 6 – Operating time values for the typical use scenarios

For devices that cannot achieve these operating times, the assumption applied must be justified and stated in the PEP.

[3] Operating times obtained from RT 2012 scenarios

- F: Energy-saving functions, to deduct from P_{elec}:
  - Adjustment of the operating pressure based on real needs - see ERP regulation Fans 327/2011EC Annex II Article 3.1 b):
    - for a motor with a variable speed drive and P ed ≥ 5 kW on a C c = 1.04
      - This results in an energy saving of 4%
    - for a motor with a variable speed drive and P ed < 5 kW on a C c = – 0.03 ln(P ed) + 1.088.
      - This results in an energy saving of between 4% (for P ed = 5 kW) and 8.8 % (for P ed = 1 kW).
    - With P ed = electrical power input at the variable speed drive
  - Holiday mode (manual control): 1% more energy savings This mode shall be justified in the LCA report (see section 6.1 Justification of bonus values for energy-saving functions)

- RLT = reference lifetime of the product in years as defined in section 3.1.2 “Reference product and reference flow description” of these specific rules.

- **The electrical power (P_{elec}) is determined according to the following conventions:**

- For a ventilation unit operating in self-adjustable or DCV mode (except in case of individual or commercial DCV ventilation), the absorbed electrical power of the reference product is defined as follows:

  - **With time delay:** P_{elec} = P elec_Qbase * 23/24 + P elec_Qpeak * 1/24

  - **Without time delay:** P_{elec} = P elec_Qbase * 22/24 + P elec_Qpeak * 2/24

- At the following extracted air flow rates (in m3/h)[4]:

	Basic extracted air flow Qbase	**Peak extracted air flow Qpeak**	**Average extracted air flow**
Individual dwelling in self-adjustable mode	105 m3/h	180 m3/h	-
Individual dwelling in DCV mode	/	/	59 m^3/h [5]
Collective dwelling in self-adjustable mode	1000 m3/h	1800 m3/h	-
Collective dwelling in DCV mode	600 m3/h	1800 m3/h	-
Commercial building	/	/	3400 m^3/h [6]

Table 7– Values of extracted air flows considered "Q" for the typical use scenarios

[4] Flow and pressure loss from the average product on the French market by building type or taken from the standards

[5] Flow rate corresponding to the four-room configuration (1 bathroom, 1 WC) in DCV mode type B in the technical notices

[6] Corresponding to the test flow rate of the filters

- For a pressure loss ΔP. In the absence of primary data, the following values[6] are used.

	Pressure loss ΔP.
Single-family dwelling	80 Pa
Collective building	160 Pa
Commercial building	250 Pa

Table 8 – Pressure loss values for the typical use scenarios

For devices that cannot achieve these pressure values, the assumption applied must be justified and stated in the PEP.

In the absence of primary data, P_{elec} is equal to:

	Electrical power, P_{elec}	
	Unidirectional	**Bidirectional**
Single-family dwelling	0.05 kW	0.12 kW
Collective building	0.5 kW	1.2 kW
Commercial building	1.7 kW	5 kW

Table 9 – Default electrical power values for the typical use scenarios

Any other hypothesis for calculating final energy consumption shall be justified in the LCA report and mentioned in the PEP.

The consumption of ventilation, air treatment, filtration and mechanical smoke exhaust equipment is defined by its energy requirements and the losses generated by the device.

A PEP can accept different application perimeters (individual / collective / tertiary buildings, etc.). The declaring party can then cover them in a single PEP and present the extrapolation coefficients to be applied for each possible application topology.

For this purpose, the device consumption of each of these applications shall be calculated according to the formula shown in this section, in accordance with the various scenarios and hypotheses.
The calculation will be based on the worst performer product.

In addition, the PEP shall specify the following information for each application covered:
- Type of building: individual, collective, tertiary
- Air flow rate
- Loss of pressure
- P_{elec}

An extrapolation coefficient shall be used as soon as one of the above-mentioned items changes. If several items change, several extrapolation coefficients shall be used.

The applicable methodology is described in section 6.1 “Product extrapolation rules applicable to different perimeters” of these specific rules.

Example of calculation of the electrical consumption of a self-adjustable bidirectional ventilation unit (family 1, active equipment), assuming the following specific characteristics:
- P_{elec} electrical power input by default = 0.12 kW = 120 W (generic data)
- Operating time t = 8760 hours (generic data)
- Energy-saving function F – Holiday mode = 1% (generic data)

- Air flow rate Q = 100 m^3/h (data similar to generic data)
- Reference lifetime (RLT) = 17 years (generic data)

C = [((P_{elec} * t) / 1000) * (1 – F) * RLT]

C = [((120 W * 8760 h)/1000) * (1 – 1%) * 17 years]

C = (1051.2 * 0.99 * 17)

C = 17,692 kWh

3.5.4.2. Consideration of electrical batteries

In unidirectional flow, the electrical power absorbed by the electrical batteries must be taken into account with an operating time of 400 hours:

$$C_{\text{battery SF}} = \frac{\text{Pelec\_battery x 400}}{1000}$$

Pelec_battery is defined as the electrical power required to heat the air from 5° (inlet temperature) to 20° (outlet temperature).

In bidirectional flow with exchanger, the electrical power absorbed by the electrical batteries must be taken into account with an operating time of 400 hours:

$$C_{\text{battery DF}} = \frac{\text{Pelec\_battery x 400}}{1000}$$

Pelec_battery is defined as the electrical power required to heat the air from 16° (inlet temperature) to 20° (outlet temperature).

The energy consumption related to the preheating battery is not taken into account because of the difficulty of defining a typical scenario.

3.5.4.3. Consideration of liquid waste

Only bidirectional ventilation units and air handling units with plate heat exchangers or chilled water cooling coils or direct expansion are considered to generate condensates during their use stage. By sector-based agreement, for lack of detailed data justified by the manufacturer, the following values will be used:

- In individual installation: 300 litres / year
- In collective or commercial installation: 367 litres / week

Any other quantity of liquid waste shall be justified in the LCA report.

The quantity of liquid waste for a specific device shall be calculated according to the following principle, which is given as an example:

With the following hypotheses:
Condensation = 2 g/kg of air and air mass density = 1.2 kg/m^3

For continuous operation over 1 year, i.e. 8760 hours and 168 hours per week, we obtain:

- For a water flow rate of 1 m^3/h = 2 g/kg x 1.2 kg/h x 1 m3/ h = 2.4 g/h
- Water flow rate over one week = 2.4 g/h x 168 h/week = 403.2 g/week = 0.4032 kg/week
- For a flow rate of 1000 m^3/h = 0.4*1000 = 400 kg/week

We conclude that for an operation corresponding to 2600 hours per year, i.e. 50 hours per week, 120L/week is obtained.

Liquid discharge is taken into account by modelling the treatment of waste water. The ELCD inventory data concerning the treatment of domestic waste water (Waste water treatment; domestic waste water according to the Directive 91/271/EEC concerning urban waste water treatment; at waste water treatment plant; EU-27) is recommended for the modelling of end-of-life treatments of liquid discharge. There is no discharge production to be modelled.

3.5.5. Use stage for powered inlets and outlets

3.5.5.1. Energy consumption

The total energy consumption of a powered inlet or outlet required during the reference lifetime of the device is determined according to the type of application. The following formulae are to be applied:

- For an individual or collective residential application, the energy consumption can be considered as negligible. A calculation note must be added to the report to justify this assumption.
- For a commercial building application, the calculation assumptions for the consumption are justified in the report and mentioned in the PEP.

$$C = \left(\frac{P_{elec} \times t}{1000}\right) \times RLT$$

Where:

- Pelec = Electrical power expressed in W absorbed by the powered inlet or outlet
- RLT = reference lifetime of the product in years as defined in section 3.1.2 “Reference product and reference flow description” of these specific rules.
- t = annual average operating time in hours.

3.5.5.2. Consideration of batteries

In the case where batteries are required for the proper operation of the device during its reference lifetime, the manufacture, distribution and end of life of the replacement batteries must be counted in the use stage. The autonomy and lifetime of the batteries must be justified in the LCA report.

3.5.6. Maintenance stage

If parts are to be replaced during the service life of the product, in compliance with the manufacturer's specifications, the impact of their manufacture, distribution and installation will have to be taken into account during the maintenance stage. The replacement of parts due to malfunction will not be taken into account.

For lack of available information, ventilation, air treatment, filtration or mechanical smoke exhaust equipment requires maintenance based on the following considerations:

Family 1: Active equipment		
Equipment	**Type of intervention over the RLT**	**Frequency over the RLT**
Unidirectional ventilation unit for dwelling	-	-
Bidirectional ventilation unit for dwelling	Filters	Once a year
Unidirectional ventilation unit for collective or tertiary buildings	Complete blower motor, or component replacement (motor, bearings, etc.) Belt Filters	Once Three times Once a year
Unidirectional or bidirectional air handling unit, or bidirectional ventilation unit for collective or tertiary buildings	Complete blower motor, or component replacement (motor, bearings, etc.) Belt Filters	Once Three times Once a year
Powered air supply, air exhaust grilles, air diffusers	Battery	Twice a year
Powered smoke exhaust fan or roof fan	Motor Belt Maintenance	Once Five times Once a year

Table 6 – Maintenance scenarios for active equipment (family 1)

Family 2: Passive equipment		
Equipment	**Type of intervention over the RLT**	**Frequency over the RLT**
Air supply, air exhaust grilles, air diffusers, fire dampers, terminal fire dampers, dampers, smoke control dampers	-	
Air filters	-	
Air inlets	-	
Safety boxes	-	
Air ducts and components	-	-

Table 7 – Maintenance scenarios for passive equipment (family 2)

The treatment of any other waste generated by the maintenance stage, which is essential for the ventilation, air treatment, filtration and mechanical smoke exhaust equipment to operate correctly and which is not specified in the above table, shall be taken into account and justified in the LCA report.

If a new product on the market requires maintenance or consumables not taken into account in this document, these items will be included in the analysis. These maintenance operations shall be the part of a life cycle assessment.

By sector-based agreement, the transport stage for this waste shall be taken into account, assuming a 100 km round trip by van.

3.5.6.1. Waste generated during the maintenance stage

The manufacture of the elements required for maintenance and the end of life of the waste generated in the maintenance stage are included in the use stage.

The material components, as specified in Table 11 of Section 3.5.6 "Maintenance stage" of the present document on the "type of intervention", must be considered as "waste generated during the maintenance stage" and their end-of-life must be considered here.

All of these elements are considered as WEEE, except filters, whose end-of-life treatment is described in Section 3.5.7 of these specific rules.

By sector-based agreement, the transport stage for this waste shall be taken into account, assuming that it is trucked over a distance of 100 km.

3.5.7. End-of-life stage

Within the European Union, some ventilation, air treatment, filtration or mechanical smoke exhaust equipment waste is classed as WEEE (Waste Electrical and Electronic Equipment).

The following equipment is considered as WEEE.

- Active family 1 equipment, as described in section 2.1 “Definition of the product families concerned” of these specific rules
- Some passive family 2 equipment, as described in section 2.1 “Definition of the product families concerned” of these specific rules: safety boxes, fire dampers, terminal fire dampers, dampers and smoke control dampers.

Passive equipment as described in section 2.1 “Definition of the product families concerned” of these specific rules (excluding safety boxes, fire dampers, terminal fire dampers, dampers and smoke control dampers) is not included in the WEEE. If the end-of-life treatment of this equipment has not been justified, it will be treated be as for case 4 below.

The LCA report will explain the organisation of known disposal and/or recovery systems, the associated environmental impacts and how the manufacturer meets these requirements, if applicable. These items will determine the applicable end-of-life treatment (case 1, 2 or 3 explained below).

With regard to recovery processes, the analysis will focus on all the stages of the system, up to intermediate storage prior to reuse in accordance with the stock method.

For lack of specific justified information, the values specified below will be used:

On the bare product mass	**Case 1: recovery of at least 80% (of which 75% is recycling/reuse)[7]**	**Case 4: recovery of less than 80% (of which 75% is recycling/reuse)[2]**	**Case 3: No evidence of recovery[4]**	**Case 4: equipment not covered by the WEEE[8]**
Percentage of product recycled at end of life	75%	40%	20%	60 %
Percentage of product recovered for energy production at end of life	5%	0%	20%	20 %
Percentage of product incinerated without recovery at end of life	10%	30%	30%	10 %
Percentage of product buried without recovery at end of life	10%	30%	30%	10 %

Table 8 – Default treatment of waste produced during the end-of-life stage

By sector-based agreement, the transport stage for this waste shall be taken into account, assuming that it is trucked over a distance of 100 km.

[7] Extract from the ADEME "Recycling report 1999-2008", 2010.

[8] See justification in section 7.2 – Justification of end-of-life waste treatment of non-WEEE equipment - of these specific rules.

3.5.7.1. Special case of end-of-life of air filters

100% of these filters are incinerated without waste-to-energy recovery. 100% of filters containing classified particulates or pollutants are buried without waste-to-energy recovery.

3.6. Rules for extrapolation to a homogeneous environmental family

These rules are additional to section 2.6 "Rule(s) for extrapolation to a homogeneous environmental family" of the PCR.

A homogeneous environmental family means devices from the same range satisfying the following characteristics:

- Identical function
- Same product standard
- Similar manufacturing technology: identical type of materials and identical manufacturing processes

To develop a valid PEP for a range of ventilation, air treatment, filtration and mechanical smoke exhaust equipment, environmental impact weighting factors are applied to all the reference products in the same product range, as specified in section 3.1.2 “Reference product and reference flow description” of these specific rules.

The extrapolation rule or the tables indicating the extrapolation coefficients applicable to the various stages of the life cycle and to each product in the range covered must be stated in the PEP.

When the product range contains none of the reference devices defined in section 3.1.2 “Reference product and reference flow description” of these specific rules, the calculation is performed on the device with the most similar characteristics.

3.6.1. Extrapolation rule applied during the manufacturing stage

For the manufacturing stage, the extrapolation rule to be used for any other product from the same range is calculated according to the total mass of the product (with packaging). The weight of the device corresponds to its global mass, expressed in kilograms (kg), as supplied to the customer, packaging included.

For devices providing an air transfer function at 1 m3/h (ventilation unit, air handling unit, exhaust fan or roof fan):

The mass extrapolation coefficient to be used on the PEP results for any other product in the same product range is as follows:

Coefficient on the FU scale	$\left(\frac{Total\ mass\ of\ the\ product\ considered, with\ packaging\ (kg)}{Total\ mass\ of\ the\ reference\ product\ of\ the\ range, with\ packaging\ (kg)}\right) \times \left(\frac{Transmitted\ air\ flow\ of\ the\ reference\ product\ (m3/h)}{Transmitted\ air\ flow\ of\ the\ product\ considered\ (m3/h)}\right)$
Coefficient on the scale of the declared product (additional information)	$\left(\frac{Total\ mass\ of\ the\ product\ considered, with\ packaging\ (kg)}{Total\ mass\ of\ the\ reference\ product\ of\ the\ range, with\ packaging\ (kg)}\right)$

For air ducts and components:
The mass extrapolation coefficient to be used on the PEP results for any other product in the same product range is as follows:

Coefficient on the FU scale	$\left(\frac{Total\ mass\ of\ the\ product\ considered, with\ packaging\ (kg)}{Total\ mass\ of\ the\ reference\ product\ of\ the\ range, with\ packaging\ (kg)}\right) \times \left(\frac{Length\ of\ the\ reference\ product\ (m)}{Length\ of\ the\ product\ considered\ (m)}\right)$
Coefficient on the scale of the declared product (additional information)	$\left(\frac{Total\ mass\ of\ the\ product\ considered, with\ packaging\ (kg)}{Total\ mass\ of\ the\ reference\ product\ of\ the\ range, with\ packaging\ (kg)}\right)$

For other devices:
The mass extrapolation coefficient to be used on the PEP results for any other product in the same product range is as follows:

Coefficient on the FU scale	$\left(\frac{Total\ mass\ of\ the\ product\ considered, with\ packaging\ (kg))}{Total\ mass\ of\ the\ reference\ product\ of\ the\ range, with\ packaging\ (kg)}\right)$
Coefficient on the scale of the declared product (additional information)	$\left(\frac{Total\ mass\ of\ the\ product\ considered, with\ packaging\ (kg)}{Total\ mass\ of\ the\ reference\ product\ of\ the\ range, with\ packaging\ (kg)}\right)$

The extrapolation rule shall be mentioned in the PEP and cover the whole product range under consideration.

3.6.2. Extrapolation rule applied during the distribution stage

For the distribution stage, the extrapolation rule to be used for any other product from the same range is calculated according to the total mass of the product (with packaging). The weight of the device corresponds to its global mass, expressed in kilograms (kg), as supplied to the customer, packaging included.

For devices providing an air transfer function at 1 m3/h (ventilation unit, air handling unit, exhaust fan or roof fan):

The mass extrapolation coefficient to be used on the PEP results for any other product in the same product range is as follows:

Coefficient on the FU scale	$\left(\frac{Total\ mass\ of\ the\ product\ considered, with\ packaging\ (kg)}{Total\ mass\ of\ the\ reference\ product\ of\ the\ range, with\ packaging\ (kg)}\right) \times \left(\frac{Transmitted\ air\ flow\ of\ the\ reference\ product\ (m3/h)}{Transmitted\ air\ flow\ of\ the\ product\ considered\ (m3/h)}\right)$
Coefficient on the scale of the declared product (additional information)	$\left(\frac{Total\ mass\ of\ the\ product\ considered, with\ packaging\ (kg)}{Total\ mass\ of\ the\ reference\ product\ of\ the\ range, with\ packaging\ (kg)}\right)$

For air ducts and components:

The mass extrapolation coefficient to be used on the PEP results for any other product in the same product range is as follows:

Coefficient on the FU scale	$\left(\frac{Total\ mass\ of\ the\ product\ considered, with\ packaging\ (kg)}{Total\ mass\ of\ the\ reference\ product\ of\ the\ range, with\ packaging\ (kg)}\right) \times \left(\frac{Length\ of\ the\ reference\ product\ (m)}{Length\ of\ the\ product\ considered\ (m)}\right)$
Coefficient on the scale of the declared product (additional information)	$\left(\frac{Total\ mass\ of\ the\ product\ considered, with\ packaging\ (kg)}{Total\ mass\ of\ the\ reference\ product\ of\ the\ range, with\ packaging\ (kg)}\right)$

For other devices:

The mass extrapolation coefficient to be used on the PEP results for any other product in the same product range is as follows:

Coefficient on the FU scale	$\left(\frac{Total\ mass\ of\ the\ product\ considered, with\ packaging\ (kg)}{Total\ mass\ of\ the\ reference\ product\ of\ the\ range, with\ packaging\ (kg)}\right)$
Coefficient on the scale of the declared product (additional information)	$\left(\frac{Total\ mass\ of\ the\ product\ considered, with\ packaging\ (kg)}{Total\ mass\ of\ the\ reference\ product\ of\ the\ range, with\ packaging\ (kg)}\right)$

The extrapolation rule shall be mentioned in the PEP and cover the whole product range under consideration.

3.6.3. Extrapolation rule applied during the installation stage

For the installation stage, the extrapolation rule to be used for any other product from the same range is calculated according to the mass of the product packaging expressed in kilograms (kg).

For devices providing an air transfer function at 1 m3/h (ventilation unit, air handling unit, exhaust fan or roof fan):

The mass extrapolation coefficient to be used on the PEP results for any other product in the same product range is as follows:

Coefficient on the FU scale	$\left(\frac{Mass\ of\ the\ packaging\ of\ the\ product\ considered\ (kg)}{Mass\ of\ the\ packaging\ of\ the\ reference\ product\ of\ the\ range\ (kg)}\right) \times \left(\frac{Transmitted\ air\ flow\ of\ the\ reference\ product\ (m3/h)}{Transmitted\ air\ flow\ of\ the\ product\ considered\ (m3/h)}\right)$
Coefficient on the scale of the declared product (additional information)	$\left(\frac{Mass\ of\ the\ packaging\ of\ the\ product\ considered\ (kg)}{Mass\ of\ the\ packaging\ of\ the\ reference\ product\ of\ the\ range\ (kg)}\right)$

For air ducts and components delivered in packaging:

The mass extrapolation coefficient to be used on the PEP results for any other product in the same product range is as follows:

Coefficient on the FU scale	$\left(\frac{Mass\ of\ the\ packaging\ of\ the\ product\ considered\ (kg)}{Mass\ of\ the\ packaging\ of\ the\ reference\ product\ of\ the\ range\ (kg)}\right) \times \left(\frac{Length\ of\ the\ reference\ product\ (m)}{Length\ of\ the\ product\ considered\ (m)}\right)$
Coefficient on the scale of the declared product (additional information)	$\left(\frac{Mass\ of\ the\ packaging\ of\ the\ product\ considered\ (kg)}{Mass\ of\ the\ packaging\ of\ the\ reference\ product\ of\ the\ range\ (kg)}\right)$

For other devices:

The mass extrapolation coefficient to be used on the PEP results for any other product in the same product range is as follows:

Coefficient on the FU scale	$\left(\frac{Mass\ of\ the\ packaging\ of\ the\ product\ considered\ (kg)}{Mass\ of\ the\ packaging\ of\ the\ reference\ product\ of\ the\ range\ (kg)}\right)$
Coefficient on the scale of the declared product (additional information)	$\left(\frac{Mass\ of\ the\ packaging\ of\ the\ product\ considered\ (kg)}{Mass\ of\ the\ packaging\ of\ the\ reference\ product\ of\ the\ range\ (kg)}\right)$

The extrapolation rule shall be mentioned in the PEP and cover the whole product range under consideration.

3.6.4. Extrapolation rule applied during the use stage (excluding maintenance)

Section 3.6.2 "Extrapolation rule applied in the use stage" applies to active devices only (Family 1) such as ventilation units, air handling units, exhaust fans or roof fans.

In the use stage, active equipment can:

- Cover different reference products in the same scope of application (e.g.: a range of collective ventilation units applicable to collective dwellings).
- Include one or more reference products within several different perimeters (for example: unidirectional ventilation unit designed for both collective and commercial buildings - and with different flow rates)

Two extrapolation rules are defined below. If applicable, the extrapolation coefficients for these two rules are cumulated.

3.6.4.1. Extrapolation rule during the use stage applied to products within a given perimeter

The extrapolation rule to be used on the PEP results for any other product from the same range of devices in Family 1 such as ventilation units, air handling units, exhaust fans or roof fans is as follows:

Coefficient on the FU scale	$\left(\frac{Energy\ consumption\ of\ the\ product\ considered\ (kWh)}{Energy\ consumption\ of\ the\ reference\ product\ of\ the\ range\ (kWh)}\right) \times \left(\frac{Transmitted\ air\ flow\ of\ the\ reference\ product\ (m3/h)}{Transmitted\ air\ flow\ of\ the\ product\ considered\ (m3/h)}\right)$
Coefficient on the scale of the declared product (additional information)	$\left(\frac{Energy\ consumption\ of\ the\ product\ considered\ (kWh)}{Energy\ consumption\ of\ the\ reference\ product\ of\ the\ range\ (kWh)}\right)$

To calculate the energy consumption, the absorbed electrical power is determined as follows:

Commercial building	Pelec = Pelec $_{Qmax\ at\ 250\ Pa}$
Self-adjustable individual dwelling	Q base = Q $_{max\ at\ 80\ Pa}$ / 1.8 P elec = • Without time delay: Pelec $_{Q\ base}$* 22/24 + Pelec $_{Q\ max}$ * 2/24 • With time delay: Pelec $_{Q\ base}$* 23/24 + Pelec $_{Q\ max}$ * 1/24 •
DCV individual dwelling	Pelec at the use configuration in force (since data available in the technical notices)

Self-adjustable collective dwelling	Q max = $Q_{\text{max at 160 Pa}}$ Q base = Q max / 1.8 Q av = • Without time delay: Q base * 22/24 + Q max * 2/24 • With time delay: Q base * 23/24 + Q max * 1/24 Pelec = $Pelec_{Q\,av}$
DCV collective dwelling	Q max = $Q_{\text{max at 160 Pa}}$ Q base = $Q_{\text{max at 160 Pa}}$ / 3 Q av = • Without time delay: Q base * 22/24 + Q max * 2/24 • With time delay: Q base * 23/24 + Q max * 1/24 Pelec = $Pelec_{Q\,av}$

The ratios 1.8 and 3 correspond to the ratio of the peak flows and basic flows of the reference product in self-adjusting and DCV mode respectively. Application examples are available in the appendix (Section 5.3 "Examples of application of the extrapolation rules in the use stage").

The extrapolation rule shall be mentioned in the PEP and cover the whole product range under consideration.

3.6.4.2. Extrapolation rule during the use stage for applicable products within different perimeters

A PEP can cover active equipment (family 1) that can apply to different perimeters (different building, different configuration, etc.).
If applicable, the environmental impacts of the use stage (excluding maintenance and consumables) will be directly and homothetically correlated with the consumption of the device.

The extrapolation rule to be used on the PEP results for a different perimeter is as follows:

Coefficient on the FU scale	$\left(\frac{Energy\ consumption\ of\ the\ product\ considered\ (kWh)}{Energy\ consumption\ of\ the\ reference\ product\ of\ the\ range\ (kWh)}\right) \times \left(\frac{Transmitted\ air\ flow\ of\ the\ reference\ product\ (m3/h)}{Transmitted\ air\ flow\ of\ the\ product\ considered\ (m3/h)}\right)$
Coefficient on the scale of the declared product (additional information)	$\left(\frac{Energy\ consumption\ of\ the\ product\ considered\ (kWh)}{Energy\ consumption\ of\ the\ reference\ product\ of\ the\ range\ (kWh)}\right)$

An extrapolation rule calculated from the consumption of the equipment in the use stage will then be specified in the PEP.
If applicable, the PEP will specify for each application / perimeter adopted and covered by this declaration:

- the different application typologies
- the assumptions applied to the consumption calculations (Pelec, t, RLT, flow rate Q)
- the consumption of the equipment
- the extrapolation coefficient to be applied, based on the formula: Device consumption covered by the PEP / Consumption of the reference device

3.6.5. Extrapolation rule applied during the maintenance stage

The environmental impacts produced during the maintenance stage are due to the travel of one operator and the replacement of the maintenance parts. These parts are considered as identical within the homogeneous family.

For the maintenance stage, the environmental impacts of the reference product are considered as identical to any other product from the same range.

3.6.6. Extrapolation rule applied during the end-of-life stage

For the end-of-life stage, the extrapolation rule to be used for any other product from the same range is calculated according to the total mass of the product expressed in kg.

For devices providing an air transfer function at 1 m3/h (ventilation unit, air handling unit, exhaust fan or roof fan):
The mass extrapolation coefficient to be used on the PEP results for any other product in the same product range is as follows:

Coefficient on the FU scale	$\left(\frac{Total\ mass\ of\ the\ product\ considered\ (kg)}{Total\ mass\ of\ the\ reference\ product\ of\ the\ range\ (kg)}\right) \times \left(\frac{Transmitted\ air\ flow\ of\ the\ reference\ product\ (m3/h)}{Transmitted\ air\ flow\ of\ the\ product\ considered\ (m3/h)}\right)$
Coefficient on the scale of the declared product (additional information)	$\left(\frac{Total\ mass\ of\ the\ product\ considered\ (kg)}{Total\ mass\ of\ the\ reference\ product\ of\ the\ range\ (kg)}\right)$

For air ducts and components:
The mass extrapolation coefficient to be used on the PEP results for any other product in the same product range is as follows:

Coefficient on the FU scale	$\left(\frac{Total\ mass\ of\ the\ product\ considered\ (kg)}{Total\ mass\ of\ the\ reference\ product\ of\ the\ range\ (kg)}\right) \times \left(\frac{Length\ of\ the\ reference\ product\ (m)}{Length\ of\ the\ product\ considered\ (m)}\right)$
Coefficient on the scale of the declared product (additional information)	$\left(\frac{Total\ mass\ of\ the\ product\ considered\ (kg)}{Total\ mass\ of\ the\ reference\ product\ of\ the\ range\ (kg}\right)$

For other devices:
The mass extrapolation coefficient to be used on the PEP results for any other product in the same product range is as follows:

Coefficient on the FU scale	$\left(\frac{Total\ mass\ of\ the\ product\ considered\ (kg)}{Total\ mass\ of\ the\ reference\ product\ of\ the\ range\ (kg)}\right)$
Coefficient on the scale of the declared product (additional information)	$\left(\frac{Total\ mass\ of\ the\ product\ considered\ (kg)}{Total\ mass\ of\ the\ reference\ product\ of\ the\ range\ (kg)}\right)$

The extrapolation rule shall be mentioned in the PEP and cover the whole product range under consideration.

3.7. Rules applying to joint environmental declarations

This PSR is complementary to PCR section 2.7 “Rules applying to joint environmental declarations”.
For joint environmental declarations, the study shall be conducted on a typical product, as defined is paragraph 3.1.2 “Reference product and reference flow description” of this PSR.

3.8. Requirements concerning the collection of primary and secondary data

These rules are additional to the sections 2.9 "Requirements for the collection of primary data" and 2.10 "Requirements for secondary data" of the PCR (PEP-PCR-ed3-EN-2015 04 02).

As far as possible, the primary data (i.e. all the data associated with the manufacturing stage of the reference product and specific to an organisation) is to be preferred and shall be justified in the LCA report, specifying:

1) primary data from a single supplier,
2) in case of procurement from several suppliers, the primary data to be taken into account is the data provided by major suppliers representing at least 50% of the procurement (with regard to the total quantity bought). For example, for ten suppliers providing 10% of the procurement, at least five suppliers shall be considered in order to obtain an overall view of the primary information provided. Any other distribution rule should be mentioned in the LCA report and in the PEP.

If primary data are shared with other products than those referred to these specific rules, the calculation of impacts will be done in proportion to the mass of the devices manufactured.

This information is not always available to manufacturers of ventilation, air treatment, filtration or mechanical smoke exhaust equipment: for lack of primary data, secondary data, i.e. data obtained from the life cycle assessment software database shall be used. PCR explains how to select the LCI modules. If no transport information is available, the information in the PCR section 2.5.3 – "Transport scenarios" are used.

3.9. Data quality evaluation

The specific rules specified in section 2.11 "Data quality evaluation" in the current PCR (PEP-PCR-ed3-EN-2015 04 02) apply.

3.10. Calculation of environmental impact

To ensure consistency of the results of environmental impacts between the functional unit and the reference product, the PEP shall show the environmental impacts of the manufacturing, distribution, installation, use (including maintenance) and end-of-life stages as follows:

For devices providing an air transfer function (ventilation unit, air handling unit, exhaust fan or roof fan):

Environmental impacts from the PEP (for 1 m^3/h) =
Environmental impacts of the reference product / Reference average air flow, Q (in m^3/h)

The reference average air flow is defined under the conditions given in Table 7 of Section 3.5.4.1 of the present rules.

For air ducts and components:

Environmental impacts from the PEP (for 1 m) =
Environmental impacts of the reference product / Duct length (m)

For other types of equipment covered by these rules, the impacts given on the functional unit scale are those of the reference product:

Environmental impacts from the PEP =
Environmental impacts of reference product

4. Drafting of the Product Environmental Profile

4.1. General information

The specific rules specified in section 4.1 "General information" of the current PCR apply.

The PEP must specify:

- The product sub-category and characteristics to be declared according to Section 3.1.2.
- The list of functions handled by the product(s) and the options proposed
- The use profile considered in the use stage according to Section 3.5.4
- Any scenario other than the default scenarios
- In case of a PEP applicable to a range of products or to a different perimeter, the extrapolation rules

4.2. Constituent materials

The rules specified in section 4.2 "Constituent materials" of the current PCR apply.

4.3. Additional environmental information

These specific rules are additional to section 4.3 "Additional environmental information" of the PCR.

In the context of performing Life Cycle Analyses on the scale of a building, the environmental impacts of the equipment must be considered on the scale of the product and the impacts related to energy consumption in the use stage must be treated separately.

To facilitate the use of the PEP in conducting a building LCA, the PEP may include:

- The table of environmental impacts of the reference product expressed on the product scale (or declared unit) in addition to the table on the functional unit scale. The values must then be indicated in numerical values, expressed in the appropriate units to three significant figures (and, optionally, as a percentage) for each stage of the life cycle, and the total for each indicator of the complete life cycle analysis.

  The following details must be included in the PEP, to ensure clarity and transparency for the user:
  For devices providing an air transfer function such as a ventilation unit, air handling unit, exhaust fan or roof fan:
  - For environmental impacts expressed per functional unit, the following wording must be included: "per m^3/h corresponding to the functional unit"
  - For environmental impacts expressed per declared product, the following wording must be included: "per device corresponding to the reference product"

  For air ducts and components:
  - For environmental impacts expressed per functional unit, the following wording must be included: "per m corresponding to the functional unit"
  - For environmental impacts expressed per declared product, the following wording must be included: "per device corresponding to the reference product"

  For other devices, when the impacts given on the functional unit scale are identical to those of the reference product, the following statement must be included: "the environmental impacts expressed per functional unit are identical on the product (or declared product) scale".

- The results of the environmental impacts in the use stage according to a breakdown of Module B (B1 to B7) in compliance with standards EN 15978 and EN 15804.

PEP ecopassport®	Manufacturing stage (Section 3.5.1)			Distribution stage (Section 3.5.2)	Installation stage (Section 3.5.3)	Use stage (Sections 3.5.4, 3.5.5 and 3.5.6)							End-of-life stage (Section 3.5.7)				Benefits
EN 15978 / 15804	Production stage			Construction stage		Use stage							End-of-life stage				Benefits
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Supply of raw materials	Transport	Manufacture	Transport	Installation process	Use	Maintenance	Repair	Replacement	Rehabilitation	Energy use during use of the building	Water use during use of the building	Demolition/Deconstruction	Transport	Waste treatment	Disposal	Benefits beyond the system boundaries

Table 9 – Lookup table showing breakdown of life cycle by stage or by module

- The extrapolation rules on the scale of the declared product.

4.4. Environmental impacts

For devices providing an air transfer function:

The table of environmental impacts represents the environmental impact of the functional unit, i.e. air transfer of 1 m^3/h air for ventilation, and/or air treatment, and/or smoke evacuation, and/or filtering in a building.

Thus, the total impact of the product installed in a real situation must be calculated by the user of the PEP by multiplying the impact concerned by the average exhaust air flow.

The following details must be completed and included in the PEP, to ensure clarity and transparency for the user:
The PEP was drawn up on the basis of 1 m^3/h air transfer. The real impact of the life cycle of the product installed in a real situation must be calculated by the user of the PEP by multiplying the impact concerned by the average exhaust air flow from the use profile in m^3/h (value of Q defined in the use stage).

When extrapolation rules are used, the following statement must be included:
Extrapolation coefficients are given for the environmental impact of the functional unit, i.e. 1m^3/h air transfer. For each stage of the life cycle, the environmental impacts of the product concerned are calculated by multiplying the impacts of the declaration corresponding to the reference product by the extrapolation coefficient. The "Total" column should be calculated by adding the environmental impacts of each stage of the life cycle.

For air ducts and components:

The table of environmental impacts represents the environmental impact of the functional unit, i.e. 1 metre of equipment.

Thus, the total impact of the product installed in a real situation must be calculated by the user of the PEP by multiplying the impact concerned by the total installed length.

The following details must be completed and included in the PEP, to ensure clarity and transparency for the user:
The PEP was drawn up on the basis of 1 metre of equipment. The real impact of the stages of the life cycle of a product installed in an actual situation is calculated by the user of the PEP by multiplying the impact concerned by the total length of the installed product.

When extrapolation rules are used, the following statement must be included:
Extrapolation coefficients are given for the environmental impact of the functional unit, i.e. 1 metre of equipment. For each stage of the life cycle, the environmental impacts of the product concerned are calculated by multiplying the impacts of the declaration corresponding to the reference product by the extrapolation coefficient. The "Total" column should be calculated by adding the environmental impacts of each stage of the life cycle.

For other devices:

The table of environmental impacts represents the environmental impact of the functional unit, but also the impacts on the scale of the product (or declared product).

The following details must be completed and included in the PEP, to ensure clarity and transparency for the user:
The environmental impacts represent the data on the scale of the functional unit, corresponding to the impact on the scale of the product (or declared product).

5. Appendices

5.1. Justification of bonuses for energy-saving functions

The Holiday mode (manual control) gives an energy saving of 1% * in the use stage.

* Source: generally measured saving – sector-based agreement.

5.2. Justification of end-of-life waste treatment of non-WEEE equipment

The provisions of case 4 apply only to equipment not subject to the WEEE Directive. The recyclability or non-recyclability rates shall be justified by the composition of the equipment referred to. For example, the composition of a square air supply or exhaust diffuser is as follows:

Indicate **raw materials and intermediate goods** used in the manufacture of the product		☐ Not relevant
Raw material/intermediate goods	Quantity and unit	Comments
Steel (not stainless)	98.3%	
Stainless steel	0.24%	Including spring steel
Aluminium	0.004%	
Various polymers/plastics	0.93%	Airfelt, ABS, UHMW, PVC, PA66, POM and PE foam.
Rubber	0.23%	EPDM, HR, NBR

5.3. Examples of application of the extrapolation rules

For all the extrapolation coefficient calculation examples below, product D is the reference product corresponding to a DCV collective ventilation unit.

Note: The example uses a ventilation unit without time delay.

Example 1: Manufacturing, distribution, installation, and end-of-life stages (excluding use)

Ventilation unit	A	B	C	D	E	F
Total mass of product (including packaging) in kg	26	28	32	32	35	48
Extrapolation coefficient on the scale of the declared product.	**0.81**	**0.88**	**1.00**	**1.00**	**1.09**	**1.50**
Extrapolation coefficient on the scale of the functional unit	**2.80**	**1.58**	**1.29**	**1.00**	**0.96**	**1.19**

To calculate the extrapolation coefficient for the non-use stages, a mass ratio is calculated.

Example 2: Identical perimeter - Extrapolation to the whole DCV collective range in the use stage

The characteristics of product D are the characteristics of the reference product (black frame).

Collective DCV (reference)	A	B	C	D	E	F
Max. flow of the ventilation unit at 160 Pa	523	1000	1400	1800	2044	2863
Pabs at Qmax	77	290	278	437	677	820
Min. flow of ventilation unit =Max. flow/3 (ratio 1800/600 DCV)	174	333	467	600	681	754
Pabs at Qmin	32	77	71	105	129	98
Average flow (11/12)	203	389	544	700	795	880
Pelec average (W)	36	94	88	133	175	158
t (hour)	8760	8760	8760	8760	8760	8760
Cc	7%	9%	10%	11%	11%	12%
Holidays	0%	0%	0%	0%	0%	0%
F=Cc+Holidays	7%	9%	10%	11%	11%	12%
TLT (year)	17	17	17	17	17	17
Consumption C (kWh) during TLT	4969	12778	11815	17612	23089	20776

Example 3: Different perimeter - Extrapolation of the range in self-adjustable mode in the use stage

Collective self-adjustable	A	B	C	D	E	F
Max. flow of the ventilation unit at 160 Pa	523	1000	1400	1800	2044	2263
Pabs at Qmax	77	290	278	437	677	820
Min. flow of ventilation unit =Max. flow/1.8 (ratio 1800/1000 self-adjustable)	291	556	778	1000	1136	1257
Pabs at Qmin	50	116	113	175	193	128
Average flow (22/24)	310	593	830	1067	1211	1341
Pelec average (W)	52	131	127	197	233	186
t (hour)	8760	8760	8760	8760	8760	8760
Cc	8%	10%	11%	12%	12%	13%
Holidays	0%	0%	0%	0%	0%	0%
F=Cc+Holidays	8%	10%	11%	12%	12%	13%
TLT (year)	17	17	17	17	17	17
Consumption C (kWh) during TLT	7127	17422	16731	25761	30405	24109

Example 4: Different perimeter - Extrapolation of the range in commercial mode in the use stage

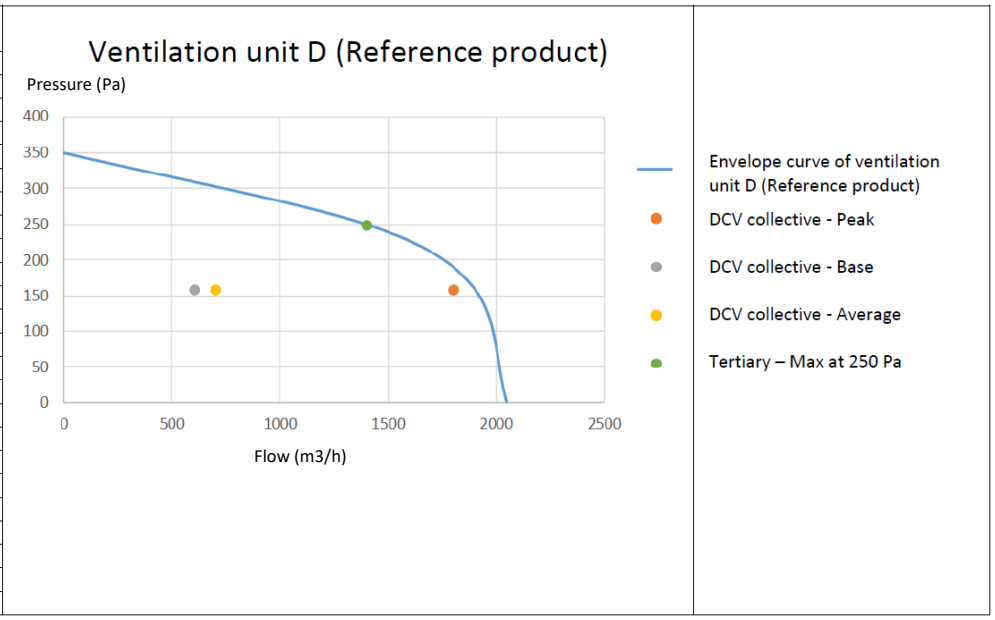
Commercial	A	B	C	D	E	F
Max. flow of the ventilation unit at 250 Pa	500	725	1191	1400	1898	2550
Pelec (kW)	75	230	278	425	643	750
t (hour)	2600	2600	2601	2600	2600	2600
Cc	4%	8%	8%	9%	11%	11%
Holidays	0%	0%	0%	0%	0%	0%
F=Cc+Holidays	4%	8%	8%	9%	11%	11%
TLT (year)	17	17	17	17	17	17
Consumption C (kWh) during TLT	3177	9402	11299	17027	25408	29484

Example 5: Summary of the extrapolation coefficients to be provided

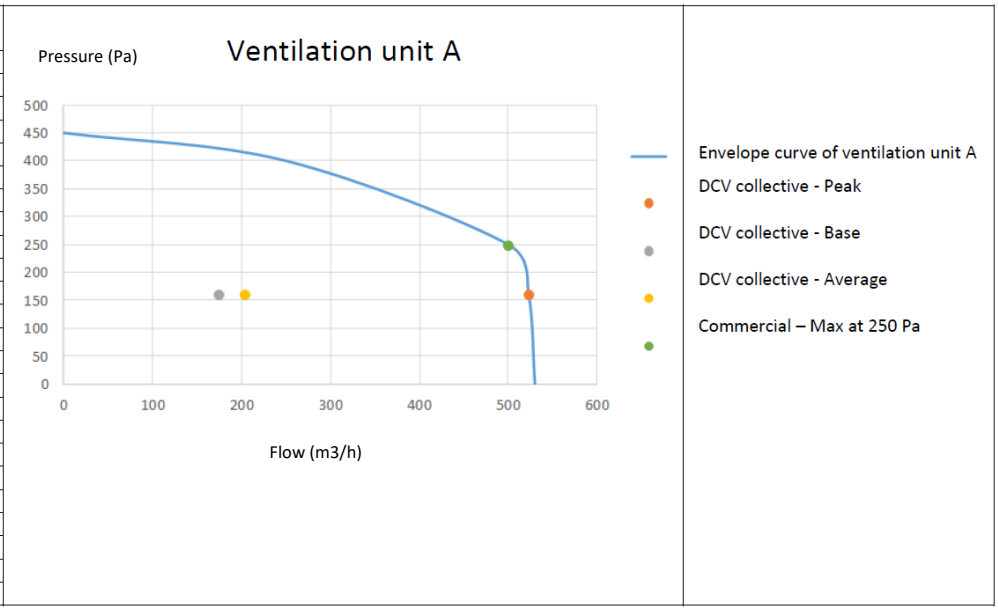
Extrapolation coefficient in the use stage on the scale of the functional unit	**A**	**B**	**C**	**D**	**E**	**F**
Collective self-adjustable	**0.91**	**1.17**	**0.80**	**0.96**	**1.00**	**0.71**
Collective DCV	**0.27**	**0.71**	**0.67**	**1.00**	**1.32**	**1.19**
Commercial	**0.25**	**0.52**	**0.38**	**0.48**	**0.53**	**0.46**
Extrapolation coefficient in the use stage on the scale of the declared unit	**A**	**B**	**C**	**D**	**E**	**F**
Collective self-adjustable	**0.40**	**0.99**	**0.95**	**1.46**	**1.73**	**1.37**
Collective DCV	**0.28**	**0.73**	**0.67**	**1.00**	**1.31**	**1.18**
Commercial	**0.18**	**0.53**	**0.64**	**0.97**	**1.44**	**1.67**

Examples of ventilation unit flow/pressure graphs: illustration of characteristics for the calculation of energy consumption

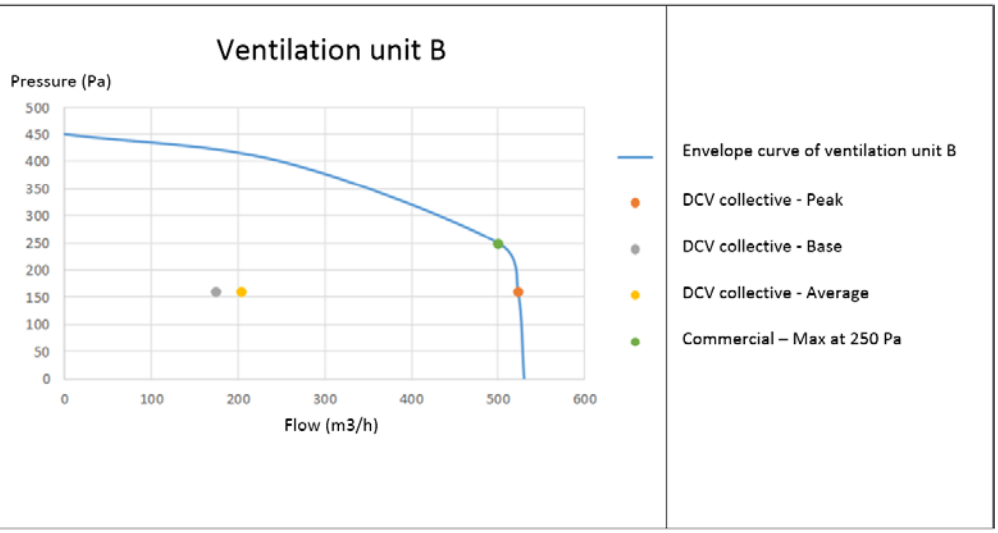
Envelope curve of ventilation unit D	
Pressure (PA)	Flow (m3/h)
350	0
250	1400
160	1900
0	2050
DCV collective - Peak	
Pressure (PA)	Flow (m3/h)
160	1800
DCV collective - Base	
Pressure (PA)	Flow (m3/h)
160	600
DCV collective - Average	
Pressure (PA)	Flow (m3/h)
160	700
Commercial – Max at 250 Pa	
Pressure (PA)	Flow (m3/h)
250	1400



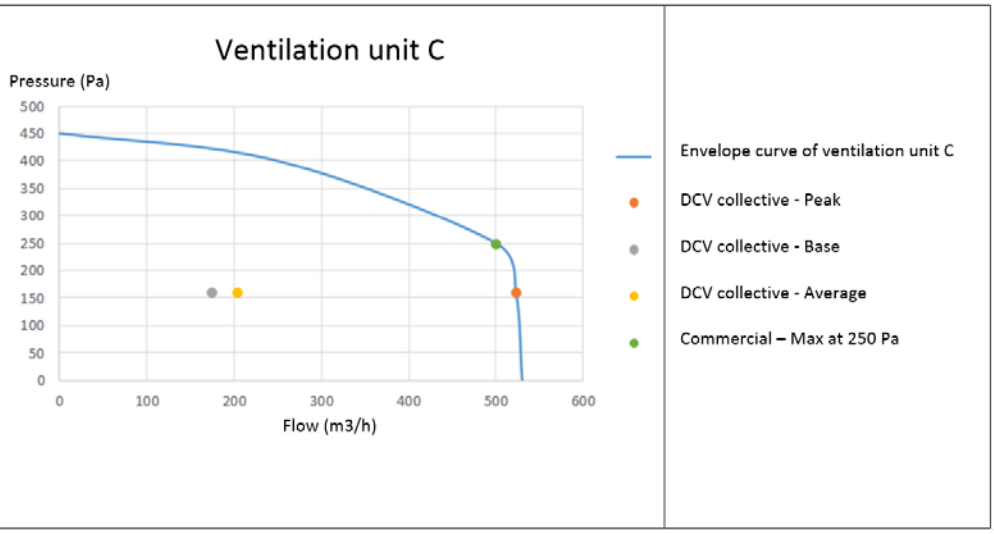
Envelope curve of ventilation unit A	
Pressure (PA)	Flow (m3/h)
450	0
400	250
250	500
160	523
0	530
DCV collective - Peak	
Pressure (PA)	Flow (m3/h)
160	523
DCV collective - Base	
Pressure (PA)	Flow (m3/h)
160	174
DCV collective - Average	
Pressure (PA)	Flow (m3/h)
160	203
Commercial – Max at 250 Pa	
Pressure (PA)	Flow (m3/h)
250	500



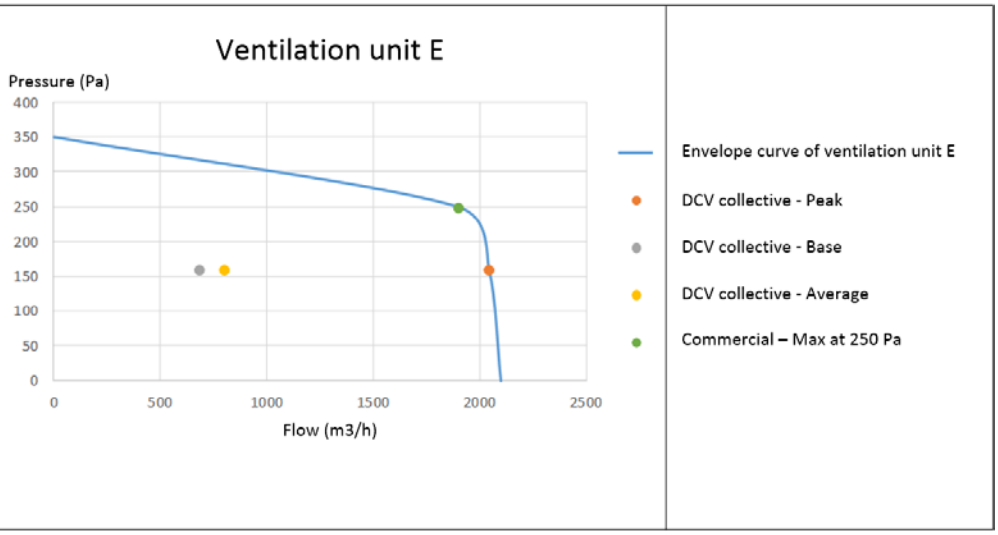
Envelope curve of ventilation unit B	
Pressure (PA)	Flow (m3/h)
300	0
250	725
160	1000
0	1300
DCV collective - Peak	
Pressure (PA)	Flow (m3/h)
160	1000
DCV collective - Base	
Pressure (PA)	Flow (m3/h)
160	333
DCV collective - Average	
Pressure (PA)	Flow (m3/h)
160	389
Commercial – Max at 250 Pa	
Pressure (PA)	Flow (m3/h)
250	725



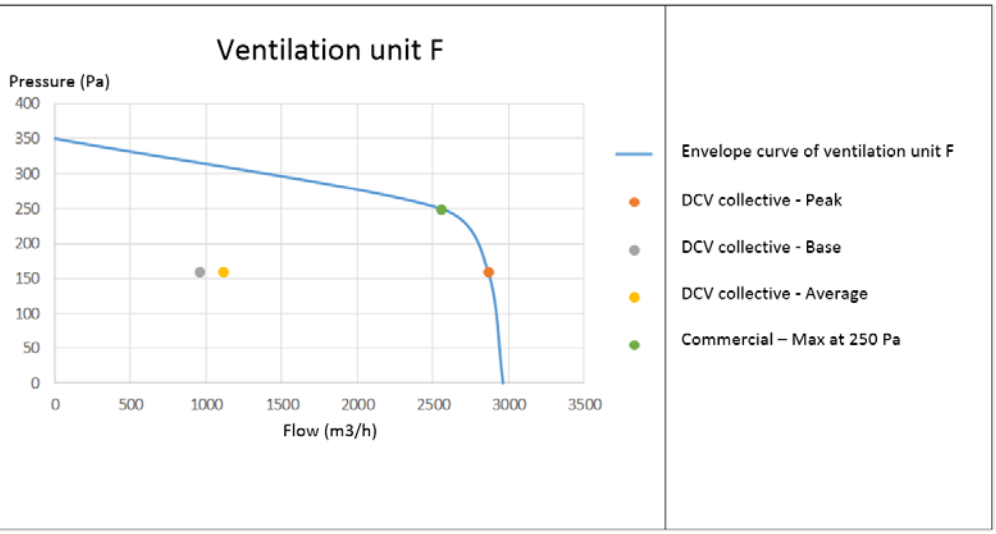
Envelope curve of ventilation unit C	
Pressure (PA)	Flow (m3/h)
350	0
250	1191
160	1400
0	1600
DCV collective - Peak	
Pressure (PA)	Flow (m3/h)
160	1400
DCV collective - Base	
Pressure (PA)	Flow (m3/h)
160	467
DCV collective - Average	
Pressure (PA)	Flow (m3/h)
160	544
Commercial – Max at 250 Pa	
Pressure (PA)	Flow (m3/h)
250	1191



Envelope curve of ventilation unit E	
Pressure (PA)	Flow (m3/h)
350	0
250	1898
160	2044
0	2100
DCV collective - Peak	
Pressure (PA)	Flow (m3/h)
160	2044
DCV collective - Base	
Pressure (PA)	Flow (m3/h)
160	681
DCV collective - Average	
Pressure (PA)	Flow (m3/h)
160	795
Commercial – Max at 250 Pa	
Pressure (PA)	Flow (m3/h)
250	1898



Envelope curve of ventilation unit F	
Pressure (PA)	Flow (m3/h)
350	0
250	2550
160	2863
0	2963
DCV collective - Peak	
Pressure (PA)	Flow (m3/h)
160	2863
DCV collective - Base	
Pressure (PA)	Flow (m3/h)
160	954
DCV collective - Average	
Pressure (PA)	Flow (m3/h)
160	1113
Commercial – Max at 250 Pa	
Pressure (PA)	Flow (m3/h)
250	2550



5.4. Glossary

AHU	Air handling unit
C	Final energy consumption
EPA	Efficient Particulate Air filter
HEPA	High Efficiency Particulate Air filter
kg	Kilogram
kWh	Kilowatt hour
LCA	Life cycle analysis
LCI	Life cycle inventory
m	Metre
mm	Millimetre
Pa	Pascal
PCR	Product category rules
PEP	Product environmental profile
Primary data	Actual data measured by the manufacturer or supplier
PSR	Product specific rules
RLT	Reference lifetime
Secondary data	Generic data from a database or according to sector-based agreement
ULPA	Ultra-Low Penetration Air
VMC	Controlled mechanical ventilation
WEEE	Waste Electrical and Electronic Equipment.
Wh	Watt hour

5.5. References

Chapter	Subject	Source
2.1 – Definition of the product families concerned	Filter definitions	EN 1822 - High-efficiency air filters (EPA, HEPA and ULPA) NF EN ISO 16890-1 May 2017 - Air filters for general ventilation - Part 1: Technical specifications, requirements and classification system based upon particulate matter efficiency (ePM) - Air filters for general ventilation - Part 1: Technical specifications, requirements and classification system based upon particulate matter (PM)
3.1 – Functional unit and reference flow description	Definition of leakage class of air ducts and components	EN 12237 - Ventilation for buildings - Ductwork - Strength and leakage of circular sheet metallic ducts
3.6.1 – Extrapolation rule applied during the manufacturing, distribution, installation, maintenance and end-of-life stages	Extrapolation Rule	EN 13141-4 - Performance testing of components/products for residential ventilation - Part 4: Fans used in residential ventilation systems

5.6. Declaration of conformity

Programme PEP Ecopassport®

Attestation de revue critique des règles additionnelles sectorielles pour équipements de ventilation, de traitement d'air, de filtration ou de désenfumage mécanique

Document revu : PSR0008 - REGLES SPECIFIQUES AUX EQUIPEMENTS DE VENTILATION, DE TRAITEMENT D'AIR, DE FILTRATION OU DE DESENFUMAGE MECANIQUE version 16/01/2018 (date de réception)
Etabli par : Uniclima : le syndicat des industries thermiques, aérauliques et frigorifiques

Uniclima, le syndicat des industries thermiques, aérauliques et frigorifiques, a demandé à EVEA, en tant que cabinet conseil spécialisé en Analyse du Cycle de Vie, la revue critique des règles additionnelles sectorielles pour les équipements de ventilation.

Référentiels :
L'objectif de cette revue critique est de vérifier la conformité de ce document avec les référentiels suivants :

- Le PCR référence PEP-PCR ed.3-FR-2015 04 02, disponible sur www.pep-ecopassport.org établit par le programme PEP Ecopassport®,
- Les normes NF EN ISO 14020 - 2002 et NF EN ISO 14025 -2010,
- Les normes NF EN ISO 14040 et 14044 – 2006.

Conclusion :
Le document revu ne présente pas de non-conformité avec les référentiels précités. Par conséquent le PSR relatif aux équipements de ventilation est conforme aux exigences de ces référentiels.

Jean Baptiste Puyou
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Tim Osmond
Vérificateur PEP Ecopassport® EVEA

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