Commission communication in the framework of the implementation of Commission Regulation (EU) No 1253/2014 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for ventilation units and of the implementation of Commission Delegated Regulation (EU) No 1254/2014 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of residential ventilation units

(Text with EEA relevance)

(2016/C 416/06)

1. Publication of titles and references of transitional methods of measurement and calculation ([1]) for the implementation of Commission Regulation (EU) No 1253/2014 of 7 July 2014 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for ventilation units, and of the implementation of Commission Delegated Regulation (EU) No 1254/2014 of 11 July 2014 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of residential ventilation units

2. **References**

2.1. **Types of units**

Under the Regulation 1253/2014, there are different types of units to be tested according to standards or transitional methods — both regarding RVUs (residential ventilation units) and NRVUs (non-residential ventilation units):

Type		**Recirculation**	**HRS (heat recovery system)**
Unidirectional	Ducted	Not relevant	No exchanger
	Non ducted	Not relevant	No exchanger
Bidirectional	Ducted	With recirculation (*) (option)	Plate heat exchanger
			Rotary heat exchanger
			Run around coils
			Heat pipes
			Alternating (regenerator) Regenerative heat exchanger with shifting direction of airflow
		Without recirculation (*)	Same as above
	Non ducted	With recirculation (*) (option)	Same as above
		Without recirculation (*)	Same as above

(*) : recirculation means that the circulating airflow on the inside (casing side) is greater than the fresh air supply.

([1]) It is intended that these transitional methods will ultimately be replaced by harmonised standard(s). When available, reference(s) to the harmonised standard(s) will be published in the *Official Journal of the European Union* in accordance with Articles 9 and 10 of Directive 2009/125/EC.

For most parameters, measurements can be conducted according to existing standards. However, in some cases, there is a need for a revision of the standards as they could be improved regarding the measured values, nomenclature, test setups and methods. To ensure that new terms, such as $SFP_{int,}$ are correctly applied, CEN/TC 156 is working on revision of a number of standards as well as a number of sub-standards. All measurements for RVUs and NRVUs (including references to other standards) will be addressed in the following standards:

RVUs: EN 13141-series (sub-number depending on type of unit)

EN 13142 (scoping standard)

NRVUs: EN 13053 (primarily for BVUs (bidirectional ventilation units) but UVUs (unidirectional ventilation units) can be measured similarly)

Non-ducted BVUs

If non-ducted BVUs are intended to be installed with wall penetrations (i.e. ducts), all performance tests must be performed with these wall penetrations and corresponding exhaust and supply air terminal devices. Alternatively the tests must be performed with ducts of equal diameter to the unit on the external side (EHA and ODA) of 0,5 m length and corresponding exhaust and supply air terminal devices (optional standard façade grill declared by the manufacturer). The tests are performed as usual in category A, where the wall penetrations and terminal devices are considered as an in integrated part of the unit.

Declaration of Non-residential BVUs

The declared nominal conditions refer to the airflow passing through the HRS (normally winter design conditions).

As the calculation of SFP_{int} for unbalanced airflows (different pressure drops etc.) requires values for both sides of the BVU, it is suggested that manufacturers declare values for both sides (SUP-side) and (EHA-side), in case of unequal flows.

2.2. **Residential ventilation units (RVUs)**

Measured/calculated parameter	Organisation	Reference/Title	Notes
SEC — Specific Energy Consumption for ventilation per m^2 heated floor area of a dwelling or building [kWh/(m^2.a)]	European Commission	Commission Regulation (EU) No 1253/2014 Annex VIII Commission Regulation (EU) No 1254/2014 Annex VIII	There are no standards describing SEC, but the equation is given in Regulation 1253/2014 and in Regulation 1254/2014.
Specific power input (SPI)	CEN (European Committee for Standardization)	EN 13142 and the EN 13141-series acc. to product type	The calculation of SPI is described in EN 13142: 2013 for BVUs and the test method for measured values is described in the EN 13141-series regarding type of unit. For UVUs the same definition and method can be used. However, it must be measured and calculated according to the reference flow and pressure described in Regulation 1253/2014. In Annex I (13) to Regulation 1253/2014, SPI is expressed in W/m^3/h, and in Annex VIII to Regulation 1253/2014, SPI is expressed in kW/m^3/h. As information requirement, SPI must be set out in W/m^3/h. For the calculation of SEC, SPI must be in kW/m^3/h.

Measured/calculated parameter	Organisation	Reference/Title	Notes
Effective (total) power input	CEN	EN 13141-series acc. to product type supplemented by EN ISO 5801	EN 13141-7 and 13141-6 refer to EN 13141-4 (6.1) which refers to EN ISO 5801 (Chapter 10, Power input). The definition in the standards is 'power input' or 'total power input' and not 'effective power input' as in Regulation 1253/2014. EN 13141-8 has no description of method or reference and lacks requirements for measurement uncertainty. BVUs: To be measured summarized for both fans and control equipment. The electric power consumption for auxiliaries is to be included e.g. BVUs with rotating HRS also include rotor motor.
External total pressure difference	CEN	EN 13141-series acc. to product type supplemented by EN ISO 5801	For ducted units to be measured in connected ducts in order that the consumers receive consistent pressure and flow values. External total pressure difference is, according to Regulation 1253/2014, the **static pressure** difference **for ducted RVUs** and **the total pressure** difference **for non-ducted** RVUs between inlet and outlet, for BVUs both airflows (if not equal, refer to supply). To which connection the pressure is delivered is not described in Regulation 1253/2014. The distribution is optional but it is suggested that for ducted RVUs to be distributed with 1/3 of the external total pressure difference on the outside (EHA and ODA) and 2/3 of the external total pressure difference (ETA and SUP) at the building side according to the EN 13141-series. For further description, see Chapter 3 of this document and DTI's document 'Transitional method for determination of internal specific fan power of ventilation units, SFPint' ([2]) **BVUs** The test is described in EN 13141-7 (6.2.2), which foresees that the test must be conducted in all 4 ducts. EN 13141-7 refers to EN 13141-4 (5.2.2) in which the installation of the ducts is defined.

([2]) 'Transitional method for determination of internal specific fan power of ventilation units, SFPint', ISBN: 978-87-998971-0-0, available at http://www.teknologisk.dk/ydelser/publikation-transitional-method-for-determination-of-internal-specific-fan-power-of-ventilation-units-sfpint/37051

Measured/calculated parameter	Organisation	Reference/Title	Notes
			UVUs (exhaust) Not described in EN 13141-6. Use EN ISO 5801 or EN 13141-4. **BVUs (single room non-ducted)** Overall description in EN 13141-8, Section 5.2.3 (and Annex A), which refers to EN 13141-4 and EN ISO 5801. **UVUs (supply systems)** The test is described in EN 13141-11 (6), which refers to EN 13141-4 and EN ISO 5801 How the pressure is measured in the duct (measurement ducts)/chamber and the permissible deviation is not described in all standards. This must be designed and tested according to EN ISO 5801.
Reference flow rate	CEN	EN 13141-series acc. to product type supplemented by EN ISO 5801	The standards do not describe the reference or maximum flow and pressure. Nor do they describe how to achieve these according to Regulation 1253/2014. They only describe how to measure the flow according to the design of the individual units (except EN 13141-8 regarding flow and EN 13141-11 regarding pressure). Se description in Chapter 3 of this document on how to declare reference flow rate for ducted units. A method is also specified for the case, where a unit is not capable of achieving a pressure at 100 Pa but is capable of achieving 50 Pa. The reference flow rate cannot be higher than the maximum flow rate. **BVUs** The test setup is described in EN 13141-7 (6.2.2). EN 13141-7 refers to EN 13141-4 (5.2.2) in which the installation of the ducts is defined. For BVUs; if the test is conducted with a numerical unbalanced airflow SUP-SIDE in relation to the EHA-SIDE it should be noted in the test report. For BVUs, the flow rate applies to the air supply outlet. **UVUs (exhaust)** Overall, the test setup is described in EN 13141-4/6. EN 13141-6 refers to airflow measurements according to ISO 5221 (which is withdrawn since 1984). EN ISO 5801 can be used instead.

Measured/calculated parameter	Organisation	Reference/Title	Notes
			UVUs and BVUs (single room non-ducted) Overall description in EN 13141-8 (3.1.9). Method in accordance with EN 13141-4 Section 5.2.3 and EN ISO 5801. **UVUs (supply systems)** The test is described in EN 13141-11 (3.6). Method description (6) refers to EN 13141-4 and EN ISO 5801.
Flow rate/pressure diagram	CEN	EN 13141-4 EN 13141-7 supplemented by EN ISO 5801	EN 13141-7 refers to BVUs but the method can also be applied to other products. EN ISO 5801 refers to fans, but the method can also be applied to other products.
Maximum flow rate	CEN	EN 13141-series acc. to product type supplemented by EN ISO 5801	For all products, see reference flow
Thermal Efficiency, η_t	CEN	EN 13141-7 and EN ISO 5801 EN 13141-8 and EN ISO 5801	Thermal efficiency can normally be measured according to EN 308 or EN 13141-7, EN 13141-8 and ISO 16494 for equal mass flows in-out and without condensation. **However, Regulation 1253/2014 states that the temperature difference between in and out shall be 13 K, therefore only the EN 13414-7 and EN 13141-8 can be used.** Must be measured with contribution from fan. For BVUs use EN 13414-7. For BVUs for single room installation use EN 13141-8. Flow measured according to EN ISO 5801. All other values are according to EN 13141-7 or EN 13141-8 depending on unit design. Temperature measuring points must be performed outside the unit, as contribution from fan must be included (in the ducts for ducted units). The ducts/connection box between the unit and measuring plane must be insulated with an insulation material with a thermal resistance of at least $1 m^2 K W^{-1}$ (approx. 50 mm insulation material). **EN 13141-7** sets only requirements on the leakage (no requirements for the heat balance), and can be used to this extent. However, it is suggested to follow the requirements in EN 308 (leakage 3 % and heat balance 5 %).

Measured/calculated parameter	Organisation	Reference/Title	Notes
			EN 13141-8 For units with alternating HRS there is an overall test model description in EN 13141-8 in section 5.4.7. Please note that it normally requires fast measuring equipment. It is recommended that necessary measures must be taken to ensure that outdoor and indoor mixing is reduced under test. **Notes regarding not applicable standards:** **EN 308** is normally used to assess the performance of the HRS alone where contribution for fans is deducted and the test is performed with a temperature difference of 20K, therefore it cannot be used for RVUs. **ISO 16494** describes a test procedure for an AHU with HRS, with specific demands regarding the static pressure in the inlets and outlets and fan settings. The test setup is equal to EN 14141-7 and EN 308. It refers to EN ISO 5801, ISO 3966 and EN ISO 5167-1 regarding airflow measurement method. ISO 16494 allows a large ambient temperature tolerance which influences the test results and it is not consistent with EN 13141 or EN 308.
Electric power input and effective power input	CEN	EN 13141-4 and EN 13141-7 supplemented by EN ISO 5801	EN 13141-7 (section 6.5) refers to EN 13141-4 (6.1) which refers to EN ISO 5801 (section 10). Definition in the standards is mostly 'power input' or 'total power input' and not 'electric power input' or effective power input as in Regulation 1253/2014. BVUs: To be measured summarised for both fans and control equipment
Sound Power Level (L_{WA})	CEN	EN ISO 9614-2 or EN ISO 3744 or EN ISO 3746 or EN ISO 3743-1 or EN ISO 3741 or ISO 13347 or EN ISO 9614-1 or EN ISO 3745 or EN ISO 3743-2	Can be measured according to EN ISO 9614-2 (sound intensity scanning) or EN ISO 3744 or EN ISO 3746 (sound pressure in free field). To reduce test costs, it is often preferred to use the sound intensity scanning method. Alternatively EN ISO 3743-1 or EN ISO 3741 sound power in reverberation room.

Measured/calculated parameter	Organisation	Reference/Title	Notes
			Because of different methodologies used in the different standards, the reproducibility of results between one methodology and another one cannot be always guaranteed.
Reference pressure difference in Pa;	CEN	13141-series acc. to product type supplemented by EN ISO 5801	For measuring method and notes, see 'External total pressure difference'.
Maximum internal and external leakage rates and carry over	CEN	EN 308 EN 13141-7 EN 1886 ISO 16494	**Leakage** Both internal and external leakage can be tested according to EN 308 and EN 13141-7 (EN 13141-series only valid for RVUs). EN 308 focuses originally only on the HRS component, but can and is usually also applied to the test of the complete unit. In EN 308, it is only measured in one point (same as the regulation). In EN 13141-7 it is measured in three points. EN 1886 can only be used for external leakage. The flow used to calculate the leakage and carryover (in the standard described as the nominal air mass flow rate indicated by the manufacturer) is the reference flow for RVUs and the nominal flow for NRVUs as defined in Regulation 1253/2014. **Carryover** Carryover can be tested according to EN 308. It should be indicated in which direction the leakage is. Leaks from dirty to clean air should be avoided (from EHA-side to SUP-side). At low flows, the purge zone needs more time for cleaning and the rotor rpm must be reduced. This has a significant impact on the leakage and must be taken into consideration. **Further description regarding leakage:** A further enlightening of the leakage test is set out in Annex V (NRVUs) of Regulation 1253/2014, where it is described that the test and calculation can be carried out according to either **a pressurisation test** (**acc. to the pressure set out in the definitions**) **or** with **tracer gas test method** at **declared system pressure** although this is not clarified under (in line with) the definitions.

Measured/calculated parameter	Organisation	Reference/Title	Notes
			The declared value is the specified leakage rate, complemented with information about the standard used. The test can either be carried out as a 'static pressure test' according to the pressure defined in the definitions, where the pressure is considered as a positive/negative applied pressure to the one side of the BVU (or inside/outside regarding external leakage) or as a 'dynamic test' (e.g. Extract Air Transfer Ratio — EATR) where the test pressure is the actual pressure difference inside the unit as a result of the reference/nominal configuration (external pressure). The tracer gas method is mentioned in EN 308 regarding leakage test but how to carry out the test is not described. The tracer gas method is described in ISO 16494 and EN 13141-7 and prEN 16798-3.
Mixing rate	CEN	EN 13141-8	EN 13141-8, (5.2.2.1) describes the test and calculation of the internal leakage and indoor and outdoor mixing. It is recommended that the measurement is carried out isothermally to reduce testing time, and the effect is not significant. Values for both indoor and outdoor mixing have to be declared. Mixing rate for alternating unit with combined discharge and intake ports are not possible to determine without contamination of the test room and consequently the mixing rate for these types of units is not to be declared before a revision of standards has developed a valid method.
Airflow sensitivity to pressure variations	CEN	EN 13141-8 Annex A and section 5.2.3	EN 13141-8 can be used.
Indoor/outdoor air tightness	CEN	EN 13141-8	EN 13141-8 describes the measurement and can be used.

2.3 **Non-residential ventilation units**

Measured/calculated parameter	Organisation	Reference/Title	Notes
Thermal efficiency of heat recovery η_{t_nrvu}	CEN	EN 13053 EN 308	**EN 13053** (section 6.5 and Annex A) refers to EN 308 regarding test setup and procedure. The only exception is the placing of the temperature sensors in the unit. Annex A3 of EN 13053 describes how the temperature sensors must be placed inside the unit and between the fan and HRS. EN 308 focuses originally only the HRS, but can and is normally also applied to test of the complete unit. **EN 13779** (section 6.6) refers to EN 13053 regarding description and classification of HRS. Refers to EN 308 regarding test setup and procedure. **ISO 16494** describes a test procedure for an AHU with HRS. Specific demands regarding the static pressure in the inlets and outlets and fan settings. Test setup equal to EN 13141-7 and EN 308. Refers to EN ISO 5801, ISO 3966 and EN ISO 5167-1 regarding airflow measurement method. **Regulation 1253/2014 states that the temperature difference between in and out has to be 20 K. This is why only EN 308/EN 13053 can be used.** Measured with no contribution from fan preferably inside the unit. If possible, the placing of the temperature sensors must be in accordance with EN 13053. If it is not possible to place the sensors inside the unit and between the fan and HRS, two test procedures are possible. 1. The fans are in operation and the heat contribution from the fan/motor must be taken into account in the calculation of ratios. 2. The fans are not in operation. The flow used for measurement and testing is the nominal NRVU flow rate which passes the heat exchangers (without recirculation or bypass, normally winter design conditions). Temperature measurement points must be radiation-protected. The requirement in EN 308 under section 6.4 '… The maximum allowed deviation in a measuring plane is equal to 0,05 (t22-t21)'. This cannot be fulfilled when measured inside a unit and should not be followed.

Measured/calculated parameter	Organisation	Reference/Title	Notes
Nominal NRVU flow rate in m^3/s q_{nom}	CEN	Preferred std.: EN 13053 EN ISO 5801 Alternative std.: EN 13141-4, - 5, - 6, - 7, - 8, - 11	Can be measured according to EN 13053 and EN ISO 5801. EN 13053 refers to EN ISO 5801, EN ISO 5167-1 or ISO 3966 (regarding fluids). Can also be measured according to EN 13141-4, - 5, - 6, - 7, - 8, - 11 regarding type of unit and EN ISO 5801. EN 13141 refers primarily to residential ventilation but is more detailed and can be used for areas where EN 13053 procedures are not specified yet. The value for q_{nom} used to calculate the η_{fan} for BVUs is with regard to the airflow side (SUP-side and EHA-side) and not the sum of both supply and extract airflow divided by two. The declared information value for q_{nom} is the sum of both supply and extract airflow divided by two.
Nominal external pressure Δps, ext in Pa	CEN	Preferred std.: EN 13053 EN ISO 5801 Alternative std.: EN 13141-4, - 5, - 6, - 7, - 8, - 11	Can be measured according to EN 13053 and EN ISO 5801. EN 13053 refers to EN ISO 5801 (5.2.3.1.1). Can also be measured according to EN 13141-4, - 5, - 6, - 7, - 8, - 11 regarding type of unit and EN ISO 5801. EN 13141 refers primarily to residential ventilation but is more detailed and can be used for areas where EN 13053 procedures are not specific yet. Overall, for BVUs the test is described in EN 13141-7 (6.2.2) (and the other standards in the 13141-series regarding type of unit). The test must be conducted in all four ducts. EN 13141-7 refers to EN 13141-4 (5.2.2), which defines the installation of the ducts. The external pressure must be set to design pressure condition. It is recommended that the internal pressure is taken in to consideration and that there is, in the supply air section just after the HRS, a higher pressure than the pressure in the extract air section just before the HRS, to avoid leakages. For ducted units the pressure must be measured in connected ducts so that the users receive consistent values of pressure and flow. The nominal external pressure is the static pressure difference between inlet and outlet. In case of BVUs for both airflows.

Measured/calculated parameter	Organisation	Reference/Title	Notes
			The pressure measured in the duct (measurement ducts) and the permissible deviation must be designed and tested according EN ISO 5801, as long as applicable. It is recommended that the pressure distribution applied to the each side of the unit is described by the manufacturer, as the performance of the unit can change according to the pressure distribution. For further descriptions, see Chapter 3 of this document and DTI's document 'Transitional method for determination of internal specific fan power of ventilation units, SFPint'.
Nominal electric power input (P) (W) and the effective electric power input	CEN	EN 13053 EN ISO 5801	The electric power consumption can be measured according to several harmonised standards (motors) and EN ISO 5801 and EN 13053 depending on the measurement uncertainty. EN 13053 describes that the electric power, voltage and current must be measured, but it does not refer to any standards or describes any methods (Table 2). There is a general test method reference to EN ISO 5801 (5.2.2). It can also be measured according to EN 13141-4, - 5, - 6, - 7, - 8, - 11 regarding type of unit and EN ISO 5801.The EN 13141-series refers primarily to residential ventilation but is more detailed regarding some product types and can be used for areas where EN 13053 procedures are not specified yet. In this case, use method from EN 13141-series and the measuring principle from EN 13053/EN ISO 5801. In general, use the measuring principle from EN ISO 5801. The nominal electric power input (P) must be expressed in kW and SFP_{int} in $W/m^3/s$.
SFP_{int} in $W/(m^3/s)$	DTI (Danish Technological Institute)	Transitional method for determination of internal specific fan power of ventilation units, SFPint	See description in DTI's document. The declared value for the SFP_{int} of unidirectional NRVUs not intended to be used with a filter must be 'not applicable'.

Measured/calculated parameter	Organisation	Reference/Title	Notes
'static pressure (psf)' 'total pressure (pf)' 'stagnation pressure'	CEN	EN ISO 5801/No relevant standard is adequate	EN ISO 5801 can be used for external measurements. For internal measurements, no relevant standard is adequate. Se description in DTI's document 'Transitional method for determination of internal specific fan power of ventilation units, SFPint' for measuring and calculation.
Face velocity in m/s at design flow rate	CEN	EN 13053 and EN ISO 5801	Face velocity is described in EN 13053. However, the measuring method and metrics according to area measurement are not described. The flow can be measured according to EN ISO 5801. Use EN 13053 and EN ISO 5801 for measuring of flow and velocity. The area for the calculation of the velocity shall be measured with an +/-3 % uncertainty. The area is the free unit area at the filter section or fan section. The declared value is the highest of SUP or EHA.
Internal pressure drop of ventilation components; (Δps, int) in Pa and Internal pressure drop of additional non-ventilation components ($\Delta p_{s,\ add}$)	DTI (Danish Technological Institute)	Transitional method for determination of internal specific fan power of ventilation units, SFPint	No relevant harmonised standard exists. — EN 13053 (6.1) refers to EN 13779 — EN 13779 (A.10.5) refers to EN 13053 — EN 1216 (7.2.3) Air pressure drop coils is measured with pitot tube traverse See description in DTI's document for measuring and calculation. The NRVU inlet and outlet losses must be included in the 'the internal pressure drop of ventilation components ($\Delta p_{s,\ int}$). If a ducted air-handling unit has full size openings (the internal cross section of the duct systems is equal to the cross section of the NRVU), it has no additional pressure losses at the inlet and outlet openings.
Fan efficiency (η_{fan})	CEN	External — EN ISO 5801 (for UVUs without filter/additional components) Internal — No relevant standard is adequate	For UVUs without filter use EN ISO 5801 and the external fan efficiency, measured at nominal flow rate and nominal external pressure. Please note that the operational point is not by definition the best efficiency point of the fan but the nominal conditions of the ventilation unit as stated in Annex 1, 2 (2).

Measured/calculated parameter	Organisation	Reference/Title	Notes
			The fan efficiency is the external static fan efficiency. For all other products no relevant harmonised standard exists, because the efficiency must be measured within the ventilation unit for the calculation of SFP_{int}, even though the following standards describe measuring of fan efficiency: — ISO 13348:2007 — EN ISO 12759:2015 — EN EN ISO 5801 — Com.reg. 327/2011 The primary issue is how to measure the pressure rise over the fan. The electric power consumption can be measured according to the relevant harmonised standards. The fan efficiency η_{fan} is the 'overall static efficiency drive' at nominal airflow and nominal external pressure drop to be measured at the fan section, in %, according to EN ISO 12759, but when the fan is placed in the intended casing, i.e. considering system effects. It is the **static efficiency** including motor and drive efficiency of the individual fan(s) in the ventilation unit (reference configuration) determined at nominal airflow and nominal **external pressure drop** (and internal and additional pressure drop). It is the ratio between the nominal airflow multiplied by the static pressure rise of the fan (equal to the sum of pressure drops of all ventilations components, clean and dry, and the nominal external pressure) divided by the electrical power of the fan drive. The placement of a fan in a casing will affect the fan pressure rise and the power consumption compared to an idealised performance outside of the unit. The fan efficiency must be measured/calculated in the BVUs and with the external (and internal and additional) pressure loss at nominal airflow (defined by the manufacturer) according to the definition of SFP even though the calculation of SFP_{int} only uses the internal pressure drop. For BVUs calculated and summarised for both airstreams respectively, the supply air stream (SUP) and the extract air stream (ETA) for determination of SFP_{int}. For UVUs calculated for one airstream.

Measured/calculated parameter	Organisation	Reference/Title	Notes
			For further description see DTI's document 'Transitional method for determination of internal specific fan power of ventilation units, SFPint'.
Declared maximum external leakage rate (%) of the casing of ventilation units; and declared maximum internal leakage rate (%) of bidirectional ventilation units or carry over	CEN	EN 308 (BVUs): EN 1886 and EN 308 (UVUs) ISO 16494	See description under RVUs regarding Maximum internal and external leakage rates and carry over. The flow used to calculate the leakage and carryover (in the standard described as the nominal air mass flow rate indicated by the manufacturer) is the reference flow for RVUs and the nominal for NRVUs as defined in Regulation 1253/2014.
The casing sound power level (LWA) *(in the case of NRVUs specified for use in-doors,)*	CEN	EN ISO 9614-2 or EN ISO 3744 or EN ISO 3746 or EN ISO 3743-1 or EN ISO 3741 or ISO 13347 or EN ISO 9614-1 or EN ISO 3745 or EN ISO 3743-2 or	It can be measured according to EN ISO 9614-2 (sound intensity-scanning) or EN ISO 3744 or EN ISO 3746 (sound pressure in free field). To reduce test costs it is often preferred to use the sound intensity-scanning method. Alternatively EN ISO 3743-1 or EN ISO 3741 sound power in reverberation room. The casing sound power level is defined according to the reference airflow. For NRVUs this is to be considered as the nominal airflow. Because of different methodologies used in the different standards, the reproducibility of results between one methodology and another one cannot be always guaranteed.
Filter performance	CEN	EN 779:2012 EN 1822:2009	Use description in Annex IX to Regulation 1253/2014 according to the relevant standards.

3. **Additional elements for measurements and calculations**

3.1. **Determination of the reference and maximum flow for ducted RVUs**

Please find here a standard example that describes the flow/pressure diagram and the method to determine the reference and maximum point/curve.

A ducted RVU must always be able to deliver 50 Pa, as this defines the reference flow rate and the reference point for calculation of the SEC. (situation 1 below).

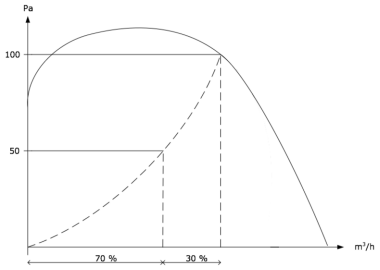
If the ducted RVU cannot deliver 100 Pa (situation 2 below) according to Article 2 (4) of Regulation 1253/2014, the maximum flow rate can be determined at the maximum external static pressure difference that the ducted RVU can deliver (between 50 and 100 Pa).

For such ducted RVU the maximum flow can be chosen above or equal to an external static pressure difference of 50 Pa.

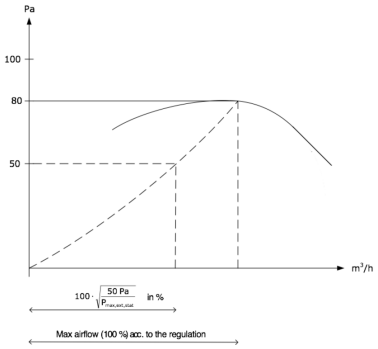
The reference flow rate can optionally be determined as the abscissa value to a point on a curve in the flow rate/pressure diagram which is the at or closest to a reference point at $100 \cdot \sqrt{\frac{50\ Pa}{P_{max,ext,stat}}}$ % of the maximum flow rate, where $P_{max,\ ext,\ stat}$ is the maximum external static pressure difference (between 50 and 100 Pa) (situation 2 below).

In case, the ducted RVU cannot deliver a higher pressure at a higher flow rate than the reference flow (situation 3 below), maximum and reference flow rates can be selected by the manufacturer, bearing in mind the reference external static pressure difference is kept.

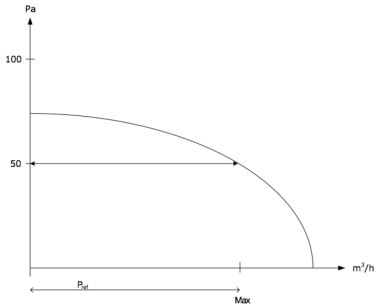
The reference external static pressure difference is always 50 Pa.



1: Normal determination



2: 100 Pa is not possible to achieve



3: Higher pressure at a higher flow rate than the reference flow (and reference pressure) is not possible to achieve

3.2. **Determination of reference and maximum flow for other ducted RVUs**

See prEN 13142 Annex A5.