RS 15/C/001 - 2018

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RATING STANDARD
for the
CERTIFICATION
of
RESIDENTIAL AIR HANDLING UNITS

RS 15/C/001 - 2018

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No	Modifications	Section	Page
1	*Integration of the list of the modifications against last version*	*-*	*2*
2	*Replace participant by applicant/participant when the principle concerns both in all the document.*	*III*	*4*
3	*Evolution of Leakage measuring method and requirements according the standard - According the standard EN 13141-7 §5 Table 1, a unit with a leakage considered as "Not classified", having a leakage of maximum 10 % can be certified until 1st January 2019.*	*IV.1 a*	*7*
4	*Description of the use of the software/tool for additional point.*	*IV.1 b1*	*8*
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7	*Suppression of the publication on the website of the effective power input at reference point at cold climate*	*V Table 4*	*12*
8	*Alignment of the definition of ERP for CTRL : information about the sensor category*	*V Table 4*	*13*
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I. PURPOSE

The purpose of this Rating Standard is to prescribe rating procedures to be used in the Certification Programme for Residential Air Handling Units (RAHU) of Eurovent Certita Certification in accordance with the Operational Manual OM-16.

II. SCOPE

This Certification Programme applies to mechanical supply and exhaust ventilation units used in single dwelling as defined in EN 13141-7:2010.

- Only units with heat recovery systems
- Units with any type of heat recovery systems (including extract air / outdoor air heat pumps)
- the maximum flow rate as defined hereunder do not exceed 1000 m^3/h or is between 250 and 1000 m^3/h and the manufacturer does not declare its intended use exclusively for a non-residential ventilation application.

Non-ducted units (or “room ventilation units” or “local ventilation units”) are excluded from the scope.

III. DEFINITIONS

For the purposes of this document, the terms and definitions given in EN 13141-7:2010 and the following apply.

Heat recovery types:

The following heat recovery types are considered:

- Category I: Recuperative heat exchangers (e.g. air-to-air plate or tube heat exchanger) cross flow or counter flow
- Category II: Regenerative heat exchangers (e.g. rotary or reciprocating heat exchanger)
- Extract Air-to-Outdoor Air heat pump for extract air heat recovery

Declared maximum air volume flowrate $q_{v,max}$:

Air volume flow corresponding to the declared total pressure difference P_{tUd} of the unit at the maximum setting for standard air conditions (20 °C, 101325 Pa)

Declared minimum air volume flowrate $q_{v,min}$:

Air volume flow corresponding to $p_{tUd}/2$ at the minimum setting for standard air conditions (20 °C, 101325 Pa)

Intermediate (reference) airflow rate $q_{v,int}$:

Airflow rate (in m^3/s) within the operating range of airflows declared by the applicant/participant - including the reference point.

Reference point:

The reference point is defined at $p_{tUd}/2$ and 70 % of declared maximum air volume flow. If this point cannot be set, pressure shall remain at $p_{tUd}/2$ and airflow shall be adjusted just over.

Maximum flow reference pressure p_{tUd}:

Total unit pressure difference at which the maximum airflow rate is determined. It shall be 100 Pa. However, if it cannot be achieved, a total unit pressure difference at maximum flow rate shall be declared by the manufacturer.

Minimum and maximum setting:

Minimum and maximum Fan speed settings declared by the applicant/participant; for variable speed fan motor unit, the applicants/participants have to declare the corresponding setting (percentage, voltage, etc.)

Intermediate setting:

Intermediate Fan speed setting which include the reference point

Maximum air flow point:

Maximum air flow point shall be adjusted at p_{tUd} and declared maximum air volume flow. If this point cannot be set, pressure shall be adjusted just over p_{tUd}.

Airflow/pressure certified window:

All airflow/pressure points achievable on exhaust and supply side between 60% and 100% of the declared maximum air volume flowrate $q_{v,max}$ and with a total unit pressure difference equal or higher than $p_{tUd}/2$.

Technical documentation

Selection software and/or tables of data:

- available through a web address
- allowing retrieving all the points within the airflow/pressure certified window for both the exhaust and the supply side

Technical documentation often includes diagrams of the airflow/pressure performances of the unit and performances published on Eurovent Certified Performance website.

Effective power input

Electric power input in watts at the reference point. It includes the electrical demands:

- for fans,
- controls (including remote controls)
- safety devices
- any power input for defrosting, excluding additional electrical heating devices not used for defrosting;
- power input of the motor of the wheel for rotary heat echangers (the same speed as the one used for the thermal test shall be used)
- power input of the heat pump in heating mode at 20(12)°C indoor air and **7(6)°**C outdoor air

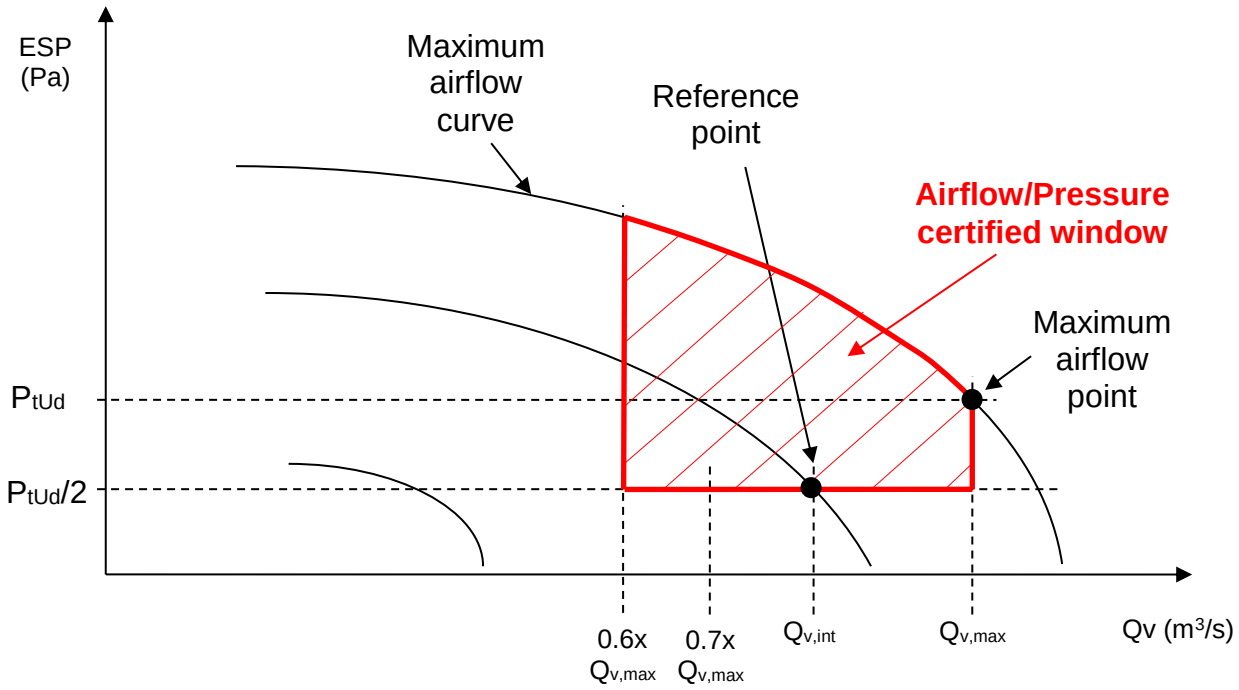

Figure 1: Illustration of the definitions

Disbalance ratio

The disbalance ratio is calculated by the result in pourcentage of the difference (in absolute value) between extract airflow and supply air airflow divided by the maximum value between airflow extract or airflow supply

IV. TESTING REQUIREMENTS

Verification of performance characteristics shall be carried out in accordance with the European Standard:

EN 13141 – 7 : 2010 or subsequently superseded: Performance testing of components / products for residential ventilation – Part 7: Performance testing of a mechanical supply and exhaust ventilation units (including heat recovery) for mechanical ventilation systems intended for single family dwellings.

The following order shall be respected by the testing laboratories: leakage, airflow-power consumption, thermal efficiency, cold climate and acoustic.

The following requirements shall be met.

IV.1 Performance testing of aerodynamic characteristics

a. Leakages

Tests have to be performed according to the standard EN 13141-7:2010.

For the category I heat exchanger unit (cross flow exchanger), the leakages are measured according to the pressurisation test method described on § 6.2.1.2 of EN 13141-7 using table 2 (Class A).

For the category II heat exchanger unit (rotary exchanger), the leakages are measured according to the in duct tracer gas method described on §6.2.1.3 of EN 13141-7 using table 5.

For the category II heat exchanger unit (rotary exchanger), in case the external leakage is higher than 2% with the measures according to table 5 of §6.2.1.3 in EN 13141-7, the internal leakage is measured using Table 4 — Leakage classification –chamber tracer gas method and the value of $R_{s,tot}$ is taken without correction of the external leakage.

According the standard EN 13141-7 §5 Table 1, a unit with a leakage considered as “Not classified”, having a leakage of maximum 10 % can be certified until 1st January 2019.

b. Air flow/pressure curve

1. Procedure

Tests have to be perfomed at the maximum point, at the reference point and at one additional point chosen by Eurovent Certita Certification within the airflow/pressure certified window for both the exhaust and supply side (6 measurements in total). If the unit in stepless, the additional point shall be chosen on the maximum airflow curve.

The following procedure shall be followed:

1. Maximum airflow point
    - the testing laboratory set the maximum speed of the unit according to manufacturer’s instructions
    - the testing laboratory set the total unit pressure difference at p_{tUd} (default is 100 Pa).
    - The laboratory measure the airflow obtained and compare with the declared maximum airflow:
        - If the deviation is within the tolerances defined in section VI, all tests that are to be performed at reference conditions shall be performed at the declared reference conditions
        - If the deviation is out of the tolerance defined in section VI, all tests that are to be performed at reference conditions shall be performed at the calculated reference conditions derived from the measured performances at the maximum airflow point
2. Reference airflow point
    - The testing laboratory shall follow the procedure given in standard EN 13141-7:2010 test the airflow/pressure performances at the reference point according to the standard EN 13141-7:2010

3. Additional point chosen by Eurovent Certita Certification

- The testing laboratory set the speed of the unit chosen by Eurovent Certita Certification
- The testing laboratory set the total unit pressure difference chosen by Eurovent Certita Certification
- The testing laboratory measure the airflow obtained

The values measured for the additional point shall be compared to the declared value given in the technical documentation.

The verification by Eurovent Certita Certification for the additional point on the software/tool of the manufacture is done by adjusting at least two parameters between the three parameters: total pressure, air flow rate or power consumption, and the third one will be read.

2. **Additional requirements**

The tests have to be performed with a pressure repartition of 2/3 indoor side and 1/3 outdoor side.

For each point the total unit pressure difference shall be set by the laboratory. The corresponding airflow shall be measured and compared to the declared value.

In case of multiple inlets and/or outlets, connexion boxes will be provided by the applicant/participant. Connection boxes shall be built according to EN 13141-4 : 2011 guidelines.

c. Filter bypass

No check is requested.

IV.2 Performance testing of thermal characteristics

According to the type of heat exchanger, the following performances shall be tested (cf. section 6.3.2.5 Table 6 in EN 13141-7:2010).

Table 1: Thermal performances to be tested

	Heat exchanger type			
	I[1]	***II[2]***	***Heat-pump***	
			HO[3]	***R[4]***
Temperature ratio at reference point on supply air side at point 1	X	X		
Temperature ratio at reference point on the exhaust side (or COP) at Cold climate condition	X[5]	X[5]	X[5]	X[5]
Effective power input at reference point at Cold Climate condition	X[5]	X[5]	X[5]	X[5]
Airflow at cold climate condition	X[5]	X[5]	X[5]	X[5]
Cold climate disbalance ratio (%)	X[5]	X[5]	X[5]	X[5]
COP at 20(12)°C indoor air, 7(6)°C outdoor air and reference point			X	X
COP at 20(12)°C indoor air, 2(1)°C outdoor air and reference point			X	X
COP at 20(12)°C indoor air, -7(-8)°C outdoor air and reference point			X	X
EER at 27(19)°C indoor air, 35(24)°C outdoor air and reference point				X
EER at 27(19)°C indoor air, 27(19)°C outdoor air and reference point				opt

[1] Category I: Recuperative heat exchangers – [2] Category II: Regenerative heat exchangers

[3] HO: Heating only heat-pump -[4] R: Reversible heat-pump (heating and cooling)

[5] Mandatory only if the unit is designed to operate at outdoor temperature below -15 °C

For rotary heat exchangers the speed of the wheel shall be set according to the manufacturer's intructions.

IV.3 Cold climate test

If the unit is designed to operate at outdoor temperatures -15°C or below that, the manufacturer shall declare the operational limit exhaust air temperature TOL and the corresponding heat recovery efficiency (exhaust air temperature ratio or COP).

The cold strategy is declared by the manufacturer.

The cold climate strategy consisting in stopping the supply fan is allowed.

In case of using electric heater, the measuring point in ODA (Outdoor air) side for measuring the efficiency at cold climate shall be placed before the electrical heater or combinations of heaters.

A test of the thermal characteristics in cold climate shall be performed at reference balanced air flow according to EN 13141-7:2010 table 6 point number 4 at -15°C outdoor and at +20°C indoor air temperature.

The starting temperatures of the cold climate test shall be according to the air condition, indoor 20(12)°C, outdoor 2°C.

From this point, the outdoor temperature of -15°C shall be reached within 2 to 4 hours.

The calculation of the efficiency has to be done for the last 2 hours of the test.

The test shall run for a minimum of 6 h up to maximum of 24 h to a point where the airflow and temperature is stabilised.

The influence of freezing and condensation on the operation of the heat recovery device, and the condensation water outlet shall be observed and reported.

Extract air flow rate shall not reduce more than 10 % on average and not more than 20% maximum from the reference air flow rate during the test due to freezing.

The supply air temperature shall not be lower than +10 °C during the test, or a heater of the unit shall be capable of fulfilling this requirement.

The airflow, heat-recovery efficiency (at least the average exhaust air temperature ratio or COP), minimum exhaust air temperature (-15°C), effective power input and the disbalance rate shall be reported.

The disbalanced ratio at cold climate condition is the average disbalanced ratio including the defrosting period.

The airflow at cold climate condition is the maximum air flow between supply and extract side.

IV.4 Performance testing of acoustic characteristics

The following acoustic performances shall be tested.

Table 2: Acoustic performances to be tested

Symbol	Name
$L_{WA,r}$	A-weighted sound power level at reference point radiated through the casing
$L_{WA,su}$	A-weighted sound power level at reference point in duct connections supply
$L_{WA,ext}$	A-weighted sound power level at reference point in duct connections extract
$L_{WA,exh}$	A-weighted sound power level at reference point in duct connections exhaust
$L_{WA,oa}$	A-weighted sound power level at reference point in duct connections outdoor air

Sound power levels by octave band between 63 Hz and 8000 Hz shall be reported in the test report.

For units equipped with heat-pump, the heat-pump shall be running in heating mode at 20(12)°C indoor air and +7(+6) outdoor air.

Sound power levels can tested with special acoustic ducts if these ducts are an integral part of the unit.

IV.5 Electric power input

The following performances shall be tested for heat-recovery types I and II.

Table 3: Electric power input performances to be tested

Symbol	Name
$P_{E,ref,1}$	Effective power input at reference point at point 1
$P_{E,ref,TOL}$	Effective power input at reference point at Cold Climate condition (only for units designed to operate at cold climate)
SPI	Specific electric Power Input at reference point

For units with rotary heat exchangers, the power input of the motor of the wheel shall be included in the calculation of the effective power input and the Specific Power Input (SPI).

The speed of the wheel shall be set according to manufacturers instructions.

The same speed shall be set between the thermal test and the airflow/pressure tests during which the effective power input is measured.

When applicable the heat-pump shall run in heating mode at 20(12)°C indoor air and +7(+6) outdoor air.

IV.6 Other checkings

The independent test laboratory shall check and report the following information in the test report:

- Filters manufacturer, model and filter class according to EN 779:2012 (each filter shall be marked with the filter class according to EN 779:2012). A declaration of conformity to the filter class shall be provided for each filter.
- Fans manufacturer, models and serial numbers
- Heat-exchanger (or heat-pump) manufacturer, model and serial number

V. CERTIFIED CHARACTERISTICS

The following performance characteristics shall be certified:

Table 4: Information published on Eurovent Certified Performance website or on technical documentation on manufacturer website for each certified model

	Heat exchanger type			
	I[1]	***II***[2]	***Heat-pump***	
			HO[3]	***R***[4]
Airflow/pressure curves for supply and exhaust side for air volume flowrates between 60% and 100% of the declared maximum air volume flowrate $q_{v,max}$ and for total unit pressure difference equal or higher than 50 Pa (or $p_{tUd}/2$ if p_{tUd} is different from 100 Pa) – see figure 2	X			
Internal leakage class	X			
Percentage of internal leakage[7]	X			
External leakage class	X			
Percentage of external leakage[7]	X			
Maximum flow reference pressure (p_{tUd})	X			
Maximum air volume flowrate ($q_{v,max}$)	X			
Total pressure difference at reference point on supply side ($p_{tUD}/2$)	X			
Air volume flow rate at reference point on supply side	X			
Effective power input at reference point	X			
Specific electric Power Input at reference point	X			
Temperature ratio at reference point on supply air side at point 1	X	X		
Disbalance ratio at nominal condition	X	X		
Temperature ratio at reference point on exhaust air side at -15°C or COP at 15°C [5]	X[5]	X[5]	X[5]	X[5]
Disbalance ratio at Cold climate condition	X[5]	X[5]	X[5]	X[5]
Airflow at Cold climate condition	X[5]	X[5]	X[5]	X[5]
SEC	X			
SEC Class	X			
AHS Average Climate	X			
AHS Cold Climate	X			
AHS Warm Climate				
MISC (general typology: for balanced unit = 1.1)	X			
CTRL (ventilation control) [6]	X			
x-value (motor & drive)	X			
COP at 20(12)°C indoor air and 7(6)°C outdoor air for reference point			X	X
COP at 20(12)°C indoor air and 2(1)°C outdoor air for reference point			X	X
COP at 20(12)°C indoor air and -7(-8)°C outdoor air for reference point			X	X

EER at 20(12)°C indoor air and 35(24) outdoor air for reference point				***X***
EER at 27(19)°C indoor air and 27(19)°C outdoor air for reference point				opt
A-weighted sound power level at reference point radiated through the casing			X	
A-weighted sound power level at reference point in duct connections supply			X	
A-weighted sound power level at reference point in duct connections extract			X	
A-weighted sound power level at reference point in duct connections exhaust			X	
A-weighted sound power level at reference point in duct connections outdoor			X	
Heat exchanger reference(s) / manufacturer(s)			X	
Fan reference(s) / manufacturer(s)			X	
Filter classes on supply and exhaust side			X	
Manufacturing place(s)			X	

[1] Category I: Recuperative heat exchangers - [2] Category II: Regenerative heat exchangers

[3] HO: Heating only heat-pump -[4] R: Reversible heat-pump (heating and cooling) – [5] Mandatory only for units designed to operate at outdoor temperatures below -15°C - [6] A local demand control for ducted BVUs means that at least two sensors are placed local in zones/rooms or in the airstream to/from the room/zones where the airflow to the individual rooms/zones is regulated according to the local demands measured by the sensors in/to/from the room/zone *a unit can use more than one sensor, the unit provides a 'local demand control'.* – [7] The leakage data have to be declared until 1st march 2018.

VI. TOLERANCES

When tested in Laboratory, the characteristics obtained shall not differ from the values claimed by the applicants/participants by more than:

Certified performance	***Tolerances***		
	Normal	**Intermediate**	**High**
Leakage	+ 1 %-point		>1 %-point
Airflow rate	-10%	-15%	-20%
Airflow rate at cold climate	-10%	-15%	-
Temperature ratio (except cold climate)	- 3 %-point	- 4 %-point	-6 %-point
Temperature ratio at cold climate	- 6 %-point	- 8 %-point	
Disbalance ratio	0	-	-
COP and EER	-8 %	- 12 %	- 15 %
A-weighted Sound Power Level	*+2 dB(A)*	*+ 4 dB(A)*	*+ 6 dB(A)*
Effective Power input	+7 %	+15 %	-
Specific Power Input	+7 %	+ 15 %	+ 20 %

For example:

- If the deviation on sound power level is =<2 dB(A) the result is passed
- If the deviation is >2 dB(A) and =<4 dB(A) the result is failed
- If the deviation is >4 dB(A) and =<6 dB(A) the result is failed and is failed also for the MVF calculation
- If the deviation is >6 dB(A) the result is failed, failed also for the MVF calculation and a penalty test will be scheduled during next test campaign.