



RS 6/C/008-2018

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RATING STANDARD
for the
CERTIFICATION
of
VARIABLE REFRIGERANT FLOW SYSTEMS

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Modifications as against previous version

No.	Modifications	Section	Page
1	Adding EN 14825:2016 standard in definitions	III	4
2	Adding EN 14825:2016 standard in testings	IV.2	4
3	Updating certified performances with seasonal efficiencies	VI	7

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I. PURPOSE

The purpose of this standard is to establish definitions and specifications to be used in connection with the Eurovent Certified Certification (ECP) certification programme for Variable Flow Refrigerant systems (VRF).

II. SCOPE

The scope of the programme is defined in OM-15.

III. DEFINITIONS

Definitions given in EN 14511-1:2013 and EN 14511-3:2013 Annex I apply.

Definitions given in EN 14825:2016

IV. TESTING REQUIREMENTS

Standard ratings shall be established at the standard rating conditions specified in Section V. All standard ratings shall be verified by tests conducted in accordance with the following standards:

IV.1 Reference standard regarding thermal performances

Performance testing using the calorimeter room method: EN 14511-3:2013 “Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling”.

Performance testing using the air enthalpy method: EN 14511-3:2013 “Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling”

IV.2 Reference standard regarding seasonal thermal performances

EN 14825:2016 “Air conditioners, liquid chilling packages and heat pumps, with electrically driven compressors, for space heating and cooling. Testing and rating at part load conditions and calculation of seasonal performance”.

IV.3 Additional requirements regarding thermal performances

The tests shall be carried out at 230 V for one phase units and 400 V for three phase units, with the rated frequency of 50 Hz.

The indoor units shall be verified against the values claimed by the Participant, preferably prior to the installation:

Indoor Power input + 10 %

Indoor Airflow (only for ducted units) + 10 %

If one of the measurements is out of these tolerances, the laboratory will immediately contact the manufacturer and solution shall be found by the manufacturer within 4 weeks.

The periodic refrigerant recovery function of the VRF system shall be disabled during the tests.

As 5 m or even 7.5 m might be too short for some VRF systems, the length on the refrigerant piping between the outdoor and each indoor unit shall fulfil the requirements of the manufacturer *or laboratory facilities* (i.e. the length can be greater than 7.5 m if required in the installation manual of the VRF system).

IV.4 Standard rating conditions for thermal performances

Tests according to EN14511:2013 standard shall be carried out at the following testing conditions.

Table 1: Operating conditions for standard rating air cooled unit

	INDOOR UNIT		OUTDOOR UNIT	
	Air entering °C		Air entering °C	
	Dry bulb	Wet bulb	Dry bulb	Wet bulb
Cooling mode	27	19	35	24-
Heating mode	20	15 max	7	6
Sound in cooling mode	27	19	35	-
<i>Sound in heating mode</i>	<i>20</i>	<i>15 max</i>	<i>7</i>	<i>6</i>

Table 2: Operating conditions for standard rating water cooled unit

	INDOOR UNIT		OUTDOOR UNIT	
	Air entering °C		Water°C	
	Dry bulb	Wet bulb	Inlet	Outlet
Cooling mode	27	19	30	35
Heating mode	20	15 max	20	17
<i>Sound in cooling mode</i>	<i>27</i>	<i>19</i>	<i>30</i>	<i>35</i>

IV.5 Reference standard regarding acoustical testing

EN 12102:2013 “Air conditioners, liquid chilling packages, heat pumps and dehumidifiers with electrically driven compressors for space heating and cooling - Measurement of airborne noise - Determination of the sound power level” with exception of the duct end correction method described in section 6.2.2 of this standard.

Specifications concerning temperature conditions of units for acoustical testing are defined in *Table 1* and *Table 2*, to be performed in cooling mode, *or in heating mode for air-cooled units*

IV.6 Additional requirements regarding acoustical testing - principles

Piping length shall be as close for the sound testing than for the cooling test. The VRF system shall be running in the same conditions of fan speed, water or air flow rates, compressor frequency, etc than during the measurement of the cooling capacity; this applies for the outdoor as well as for the indoor units.

Tests should be performed in a reverberation room (EN 12102 and EN ISO 3741) or anechoic chamber depending of the available facilities.

IV.7 Seasonal rating conditions for thermal performances

Tests shall be carried out according to EN14825:2016 standard.

V. RATING REQUIREMENTS

Rating requirements are in accordance with **EN 14511-2013, EN14825:2016 and Commission Regulation (EU) No. 2016/2281**

V.1 Standard ratings

Standard rating conditions in *Table 1* and *2* shall be used.

The corrections of the total cooling capacity or heating capacity due to the power input of fans for indoor units with duct connection described in EN 14511-3:2013 clause 4.1 shall not be carried out.

V.2 Reference temperatures and hours

For the heating application, declaration at warmer and colder climate is optional.

*Reference design temperatures and operational hours used in the calculation of SEER and SCOP must be in accordance with *Table 3* and *Table 4*.*

Table 3: Reference design temperatures

	Design Temperature [°C]		Bivalent temperature [°C]	Operating limit Temperature [°C]
	Outdoor	Indoor		
Cooling	35 (24)	27 (19)	n.a	n.a
Heating / Average	-10(-11)	20 (15 max)	+2 or lower	-7 or lower
Heating / Warmer	+2(1)	20 (15 max)	+7 or lower	+2 or lower
Heating / Colder	-22	20 (15 max)	-7 or lower	-15 or lower

For outdoor air dry bulb temperatures higher or equal to $-10\text{ }^{\circ}\text{C}$ the wet bulb temperature equals the dry bulb temperature minus 1 K. For dry bulb temperatures below $-10\text{ }^{\circ}\text{C}$, the wet bulb temperature is not defined

Table 4: Operational hours per type of appliance per functional mode

		Operational hours				
		On-mode	Thermostat Off mode	Standby mode	Off mode	Crankcase heater mode
		H_{CE} or H_{HE}	H_{TO}	H_{SB}	H_{OFF}	H_{CK}
Cooling (to calculate SEER & η_{sc})		600	659	1377	0	2036
Heating if reversible unit (to calculate SCOP & η_{sh})	Average	1400	179	0	0	179
	Colder	2100	131	0	0	131
	Warmer	1400	755	0	0	755

V.3 Part-load rating conditions

Conditions from EN 14825:2016 shall be used.

VI. CERTIFIED PERFORMANCE

The following performance items shall be verified by tests:

- Outdoor cooling capacity at standard conditions
- Outdoor Heating capacity at standard conditions
- Outdoor Energy Efficiency Ratio in cooling EER
- Outdoor Coefficient of Performances in heating COP

Note: All performance items are defined for a system capacity ratio equals to 100 %.

Seasonal Efficiencies for Cooling

- $P_{designc}$
- SEER & η_{sc}
- Auxiliaries (P_{to} , P_{ck} ..) for cooling mode
- Part loads (Capacities & Efficiencies)

Seasonal Efficiencies for Heating

- $P_{designh}$
- SCOP & η_{sh}
- Auxiliaries (P_{to} , P_{ck} ..) for heating mode
- Part loads (Capacities & Efficiencies)

Acoustics

- Sound power level in cooling
- Sound power level in heating (only for reversible units)
 - A-weighted outdoor side sound power
 - A-weighted sound power radiated from the duct (ducted units)

VII. TOLERANCES

When the connection ratio is below 1 the deviation on capacity is calculated with the following formula:

$$\text{Deviation} = \frac{\frac{\text{Measured capacity system}}{\text{Capacity ratio}} - \text{Declared capacity}}{\text{Declared capacity}}$$

When tested in the Eurovent Laboratory the characteristics obtained shall not differ from the values claimed in the Participant literature by more than:

		Tolerance	High deviation¹
		from 2016	
Outdoor Capacity (cooling & heating)		-8 %	- 12 %
Outdoor Efficiency (EER, COP) (including part loads)		-10 %	-12 %
SEER or SCOP (η_{sc} or η_{sh}) when all the part loads and auxiliaries are tested.		-8 %	- 12 %
A-weighted sound power level		+ 2 dB(A)	+ 3 dB(A)

	Tolerance
Weight	5 %
Dimensions of the casing (L x l x h)	5 %
Air flow	10 %
Number of rows and lines of the indoor heat exchanger	0

¹ leading to penalty tests, see OM-15, § dedicated to Failure treatment, Penalty tests.