



RS-6/C/001A-2016

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RATING STANDARD
for the
CERTIFICATION
of

AIR CONDITIONERS

**Comfort air-cooled Air Conditioners and
air-to-air Heat Pumps, rated up to 12 kW**

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Modifications as against last version

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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 Performance Programme for Air Conditioners.

II. SCOPE

Are included in the scope:

- AC1: Comfort Air-cooled Air Conditioners and Air/Air heat pumps rated up to 12 kW cooling capacity, except double duct and single duct units.

III. DEFINITIONS

For the purpose of this procedure, definitions given in EN 14511-1:2013 and EN 14825:2013 apply.

LRcontmin:

LRcontmin is defined as the minimum continuous operation load ratio, i.e. the minimum continuous operation load heating (or cooling) capacity divided by the heating (or cooling) capacity measured in the standard rating test conditions.

IV. TESTING REQUIREMENTS

Standard ratings shall be established at the standard rating conditions specified in Section IV.3. All standard ratings shall be verified using the calorimeter room method by tests conducted in accordance with the following standards.

IV.1 Cooling and heating capacities

Test method: **EN 14511-3:2013** "Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling- Part 3: Test methods".

Test conditions: **EN 14825:2013** "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.2 Power consumption during off mode, thermostat off mode, standby mode and crankcase heater mode

EN 14825:2013 "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 TOL verification

EN 14511-4:2013 "Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling".

Note: The unit should be tested at the temperatures conditions indicated by the manufacturer as the lowest outdoor operating temperature and in accordance with the requirement set in the Commission Regulation (EU) No 206/2012 and the laboratory testing capacity.

IV.4 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 and installation of units for acoustical testing are defined in the RS 6/C/006.

V. RATING REQUIREMENTS

Rating requirements are in accordance with EN 14511:2013, EN14825:2013 and Commission Regulation (EU) No. 206/2012.

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.

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

V.1 Reference temperatures and hours

Reference design temperatures and operational hours used in the calculation of SEER and SCOP and the annual power consumption must be in accordance with Table 1 and Table 2.

Table 1: 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(-23)	20 (15 max)	-7 or lower	-15 or lower

^a For $T_{bivalent}$ and TOL higher or equal to -7°C the wet bulb temperature equals the dry bulb temperature minus 1°C . For $T_{bivalent}$ and TOL below -7°C , wet bulb temperature is not defined.

Table 2: Operational hours per type of appliance per functional mode

	Mode	Season	On mode [h]	Thermostat off mode [h]	Standby mode [h]	Off mode [h]	Crankcase heater mode [h]
			Cooling H_{CE} heating H_{HE}	H_{TO}	H_{SB}	H_{OFF}	H_{CK}
Cooling only	Cooling	-	350	221	2142	5088	7760
Reversible	Cooling	-	350	221	2142	0	2672
	Heating	Average	1400	179	0	0	179
		Warmer	1400	755	0	0	755
		Colder	2100	131	0	0	131
Heating only	Heating	Average	1400	179	0	3672	3851
		Warmer	1400	755	0	4345	4476
		Colder	2100	131	0	2189	2944

V.2 Temperatures

a. Heating mode +7°C

Table 3: Operating conditions for standard rating

	INDOOR UNIT		OUTDOOR UNIT	
	Air entering [°C]		Air entering [°C]	
	Dry bulb	Wet bulb	Dry bulb	Wet bulb
Comfort Air Conditioner - Heating mode	20	15 max	7	6

For capacity measurement at +7°C the standard rating conditions given in Table 3 shall be used.

b. Part-load rating conditions

Table 4: Part load conditions for reference SEER and reference SEER_{on} calculation of air-to-air units

	Targeted Part-load Ratio [%]	Outdoor heat exchanger	Indoor heat exchanger
		Outdoor air dry bulb temperature [°C]	Indoor air dry bulb (wet bulb) temperatures [°C]
A*	100	35	27(19)
B	74	30	27(19)
C	47	25	27(19)
D	21	20	27(19)

* Part-load condition A for cooling mode is coincident with the standard rating condition defined in EN 14511-2:2013

Table 5: Part-load conditions for reference SCOP reference SCOP_{on} and reference SCOP_{net} calculation of air-to-air units

	Targeted Part load ratio [%]			Outdoor heat exchanger	Indoor heat exchanger	
		Colder Climate	Average climate	Warmer climate	Air dry (wet) bulb T [°C]	Inlet air dry bulb T [°C]
G ^b	$(-15-16)/(T_{designh} -16)$	82			-15	20
A ^c	$(-7-16)/(T_{designh} -16)$	61	88		-7(-8)	20
B	$(+2-16)/(T_{designh} -16)$	37	54	100	2(1)	20
C	$(+7-16)/(T_{designh} -16)$	24	35	64	7(6)	20
D	$(+12-16)/(T_{designh} -16)$	11	15	29	12(11)	20
E ^d	$(TOL-16)/(T_{designh}-16)$				TOL ^a	20
F	$(T_{bivalent}-16)/(T_{designh}-16)$				Tbivalent ^a	20

^a For T_{bivalent} and TOL higher or equal to -7°C the wet bulb temperature equals the dry bulb temperature minus 1°C. For T_{bivalent} and TOL below -7°C, the wet bulb temperature is not defined.

^b Applicable only for rating at colder climate, if TOL < -20°C.

^c Not requested for rating at warmer climate.

^d If TOL < T_{designh}, then the test is performed with an outdoor air dry bulb temperature of T_{designh} (T_{designh} = -10°C for the avg climate)

For part-load measurements the standard rating conditions given in Table 4 and Table 5 shall be used.

V.3 LRcontmin test method

Two tests have to be performed:

- A heating (respectively cooling) capacity test at this load ratio to verify the continuous operation of the Air-conditioner (no cycling) and record the heating capacity and the COP (respectively EER) at LRcontmin.
- A heating (respectively cooling) capacity test at the standard rating conditions and record the capacity and the COP (respectively EER) in these standard rating conditions.

LRcontmin is the ratio of the capacity measured at minimum continuous operation divided by the heating capacity measured in the standard rating conditions.

CcpLRcontmin is then calculated and validated, as follows:

In cooling:

$$CcpLRcontminc = \frac{\text{EER at LRcontmin}}{\text{EER at standard rating conditions}}$$

In heating:

$$CcpLRcontminh = \frac{\text{COP at LRcontmin}}{\text{COP at standard rating conditions}}$$

V.4 LRcontmin test method for heating mode (Alternative method)

The only case in which “Part Load C” values (Ph and COP) could be used in the calculation of LRcontmin is when the 2 following requirements are met:

- Unit has to be declared with minimum compressor frequency for Part Load C.
- Capacity declared at such Part Load C (which corresponds to minimum compressor frequency) complies with standard tolerance (10%).

Otherwise, the test described in § V.2 is required.

The manufacturer shall inform Eurovent Certita which method is used regarding this declaration once the unit is selected for testing.

VI. CERTIFIED PERFORMANCE ITEMS

The following performance items of Comfort Air Conditioners with a rated capacity shall be verified by tests:

- Design load and EER_A in cooling mode
- Heating capacity and COP at +7°C standard rating condition
- Design load in Heating for reverse cycle units^{a,b}
- Seasonal Energy Efficiency Ratio SEER
- Seasonal Coefficient of Performance(s) SCOP^{a,b}
- Annual energy consumption in cooling
- Annual energy consumption in heating^b
- A-weighted sound power level indoor side (non-ducted units)
- A-weighted sound power level outdoor side (non-ducted units)
- A-weighted sound power level radiated from the duct (ducted units).

^a the SCOP, design load and power consumption in heating mode are certified and published on Eurovent Certified Performance website only for the bivalent temperature and the TOL declared by the participant.

^b for each declared climate zone

The published literature or computer programme for all products under the scope of this rating standard shall include all the certified performance items.

VII. TOLERANCES

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

- | | | |
|----|--|----------------|
| a) | Capacity in standard rating conditions (cooling and heating) | 5 % |
| b) | EER and COP in standard rating conditions and in tested part load condition | |
| | if the tested capacity is above or equal to 2 kW: | 8 % |
| | if tested capacity is below 2 kW: | -10 % |
| c) | Power consumption at off mode, thermostat off mode, crankcase heater mode and standby mode | +10 % |
| d) | A-weighted sound power level | + 0 dB |
| e) | LRcontmin | +/- 5% (point) |
| f) | CcpLRcontmin | < - 5% (point) |