

Seasonal Efficiencies for Rooftop units

After almost 20 years, Eurovent Certita Certification is well recognized on the European market for heating, ventilation and air-conditioning products. Currently 66% of the HVAC sold on the EU market are certified by Eurovent Certita Certification with the Mark “Eurovent Certified Performance” (ECP).

Launched in 2007, the rooftops certification programme was the thirteenth programme of Eurovent Certita Certification. The current certified products and their performances are available 24h/24 on the ECP website.

Since the beginning of the programme, performances of rooftops used to be compared at fixed conditions, also named “Standard Rating Conditions” or “Nominal Conditions”

However, these conditions do not represent the usual operating conditions of the equipment over a season, which becomes especially important for the calculation of the energy efficiency.

From January 2013, the European Commission implemented step by step seasonal efficiencies for several types of heating and cooling devices:

- Residential Air Conditioners below 12 kW since 1st of January 2013;
- Air-to-water & water-to-water Heat pumps below 400 kW since 15th of September 2015.

From 1st of January 2018, the European Commission will require that seasonal efficiencies be applied also to:

- Air-conditioners above 12 kW
- Variable Refrigerant Fluid systems
- Chillers
- **Rooftops units.**

Consequently, Eurovent Certita Certification has updated its rooftops programme in accordance with this new Regulation.



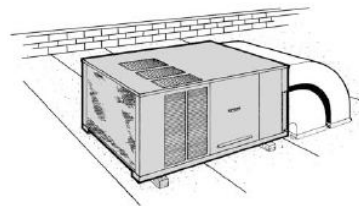
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Scope of the programme

This certification programme concerns air-to-air and water-to-air rooftops below 200 kW (nominal capacity in cooling mode). It also applies to units intended for both cooling and heating by reversing the cycle.



Rooftop units are defined by the following features:

- Single packaged unit assembled in factory
- Common single frame
- Direct expansion system
- For Air-to-air unit, the outdoor side heat exchanger (condenser / evaporator) allows heat transfer with 100% outdoor (ambient) air.
- Designed to operate permanently outdoor
- The rooftop is designed to permanently handle 100% recycled air with the possibility of mixing partly the fresh air. Nevertheless, the rooftops are excluded from the ventilation unit regulation N° 1253/2014 (according to EVIA/Eurovent Guidance Document on Ecodesign requirements for ventilation units)
- The outdoor fan from an air-to-air rooftop could be ducted but for the certification tests, the unit must be not ducted.
- Rooftops could be equipped with 2, 3 or 4 dampers depending on heat recovery system included or not, even if the heat recovery mode is currently outside the certification programme.

Nevertheless, the following features are not certified:

- gas burners,
- pre-heaters,
- heaters,
- additional internal coil,
- heat recovery (plate, wheels, thermodynamic systems),
- exhaust fans.

Process of Certification:

The programme is split into three sub-programmes:

- One mandatory sub-programme: Air-to-air units up to 100 kW
- Two optional sub-programmes:
 - Air-to-air units from 100 kW to 200 kW
 - Water-to-air units up to 200 kW

The purpose of all Eurovent Certification Programmes is to encourage honest competition and to assure customers that equipment is correctly rated on the market. The purpose is achieved by verifying the accuracy of ratings claimed by manufacturers by continuing

testing of production models, randomly selected, in independent laboratories.

One particularity of rooftop programme is to apply the “Certify-all” principle.

All standard products of the relevant certification programme manufactured or sold by a Participant inside the defined scope must be certified. “All products inside the defined scope presented, at least, on the European market”.

“Certify-all” brings clarity and transparency and therefore increases the value of the whole system.

From standard rating conditions to Seasonal efficiencies

Performances of rooftops used to be compared at a fixed condition, also named “Standard Rating Condition” according the standard EN 14511.

Table 1. Operating conditions for standard rating (EN 14511:2013).

	INDOOR SIDE		OUTDOOR SIDE			
	Air entering °C		Air entering °C		Water °C	
	Dry bulb	Wet bulb	Dry bulb	Wet bulb	In	Out
Cooling	27	19	35	24	30	35
Heating	20	15 max	7	6	20*	
SOUND**	27	19 (±2)	20-35	-	30	35

* For units designated for cooling mode, the water flow rate obtained during the test at standard rating conditions in cooling is used.

** Same airflow and same available pressure as for the thermal test shall be used.

Commission Regulation (EU) No 2016/2281 of 30 November 2016 implementing Directive 2009/125/EC of the European Parliament and of the Council establishing a framework for the setting of ecodesign requirements for rooftops introduced on the European market after the 1st January 2018.

The Directive defines minimum energy efficiency for air-to-air rooftops as shown in **Table 2**.

Table 2. Requirements for minimum energy efficiency.

	Tier 1 from 1 st of January 2018	Tier 2 from 1 st of January 2021
Heating η_{sh}	115%	125%
Cooling η_{sc}	117%	138%

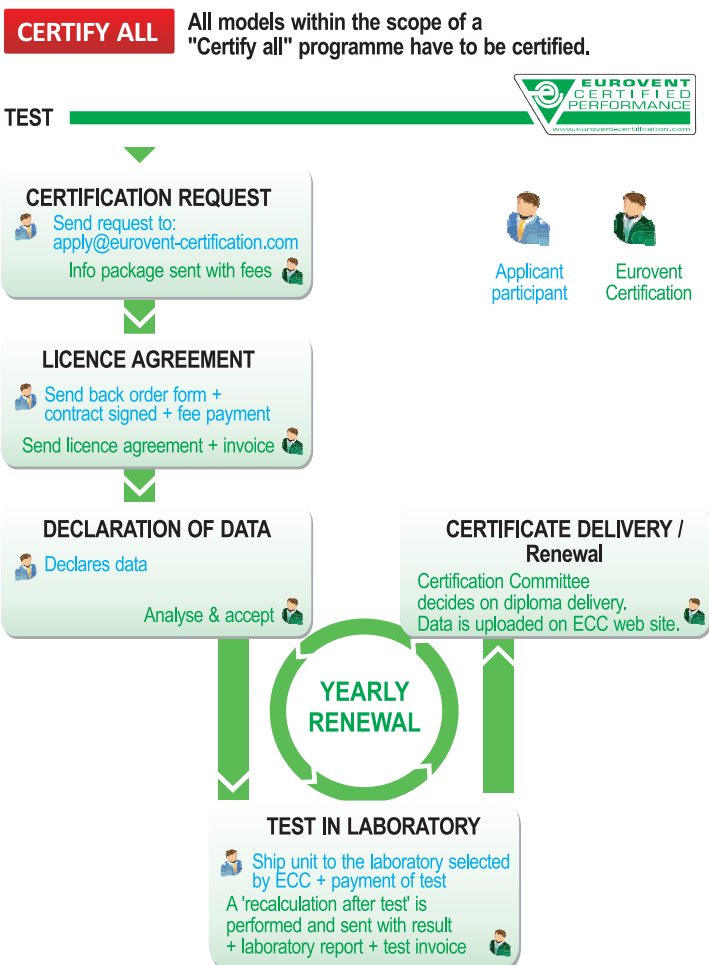


Figure 1. Steps in the certification process of the product performance.

The seasonal efficiency is expressed by:

- η_{sh} for the heating mode [%],
- η_{sc} for the cooling mode [%].

These new performances come from SCOP & SEER mentioned in the EN14825 standard and given by the following formula:

$$\eta_{sh} = 100 \times \frac{SCOP}{2.5} - 3\%$$

$$\eta_{sc} = 100 \times \frac{SEER}{2.5} - 3\%$$

where:

- SCOP: Seasonal Coefficient of Performance for heating mode
- SEER: Seasonal Energy Efficiency Ratio for cooling mode
- 2.5 is the coefficient for power generation efficiency
- -3% is the correction that accounts for a negative contribution to the seasonal energy efficiency ratio due to adjusted contributions of temperature controls (for water-cooled units, an addition correction is required: -5%)

New Energy Efficiency Ratio and Standard for Rooftops

The η_{sh} and η_{sc} , mentioned in the Directive, represent the usual operating conditions of the equipment over a season. This operating condition can be better assessed by comparing equipment at representative reduced capacities.

Standard EN 14825 provides part-load conditions and calculation methods for calculating the SEER and SCOP of such units when they are used to fulfil the cooling and heating demands.

Other energy consumptions can occur when the unit is not used to fulfil the cooling and heating demands such as those from a crank case heater or when the unit is on standby. These consumptions are considered in the calculation methods for SEER and SCOP.

Cooling mode	Heating mode
Performances in Standard rating conditions (according EN 14511 standard)	
Cooling Capacity @ 35°C	Heating Capacity @ 7°C
EER @ 35°C	COP @ 7°C
Seasonal Performances (according EN 14825 standard)	
Cooling Capacity @ 35°C	Heating Capacity @ 7°C
EER @ 35°C	COP @ 7°C
η_{sc}	η_{sh}
Sound Power Level (according EN 12102 standard)	

Certification for Rooftops

All the conditions involved in the calculation of η_{sc} and η_{sh} are continuously tested by Eurovent certita Certification. In case of failure on any condition, the seasonal efficiency will be rerated according the result. The models in the same group (same overall dimension as the tested model) will be rerated by the deviation found on the tested model.

These Seasonal Energy Efficiency Ratio for cooling mode (η_{sc} & SEER) and Seasonal Coefficient of Performance for heating mode (η_{sh} & SCOP) came in addition to the well-known Energy Efficiency Ratio (EER and COP) and Sound Power Levels (Outside & Indoor sides), already certified.

Table 3. Part load conditions used for calculation of seasonal efficiencies η_{sc} and η_{sh} .

Cooling mode			Heating mode for Average Climate		
Conditions	Outdoor T°	Part load ratio	Conditions	Outdoor T°	Part load ratio
A	35°C	100%	A	-7°C	84%
B	30°C	74%	B	2°C	54%
C	25°C	47%	C	7°C	35%
D	20°C	21%	D	12°C	15%
			Bivalent	between -10°C and 2°C	100%

Existing Eurovent Energy labelling

The purpose of Eurovent Energy Efficiency Classes is to simplify the selection of the best units for each type of Rooftops. The classification is entirely voluntary, not related to any European Directive. The energy efficiency of Rooftops is designated by “Eurovent Certita Certification Class A” or “Eurovent Certita Certification Class B” in catalogues and in the Eurovent Certita Certification Directory of Certified Products.

The current Eurovent Energy Labelling has been defined according to the EER & COP at standard Rating conditions (EN14511).

The switch to Seasonal efficiencies will impact the Eurovent labelling. In the coming months, the New Eurovent Efficiency Classes will be based on η_{sc} & η_{sh} .

Data publication

Making the certified data easily available for end-users and consultants has always been a priority for Eurovent Certita Certification. Our directory of certified data, available since the creation of the company, and launched as an interactive website around 2001, brings reliable data to end-users. In addition to the certified data a dedicated description page for each certification programme containing the outline of the programme, definitions and rating conditions is made accessible and constantly

updated to help visitors understand the value of certified data (<http://www.eurovent-certification.com>)

Conclusion

The usual energy efficiencies achieved at full load* are going to disappear gradually in order to be replaced by new performances which will allow specifying these units on a more representative way in terms of energy consumption.

The implementation of seasonal efficiencies and minimum requirements for rooftops will force the current market to change. The less efficient products will disappear progressively. With these new requirements, the verification of the published data by a third-party body, as Eurovent Certita Certification, remains a useful added value to verify the announce performance as a complement to the market surveillance, and to help comparing the products thanks to its online database.

In parallel to this regulation implementation, Eurovent Certita Certification is working on several topics of rooftops as the creation on a specific seasonal efficiency taking into account the free cooling and the certification of 3 & 4 damper rooftops including the heat recovery mode. ■

* Rating Standards Conditions according to EN 14511

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NATHALIE WOUTERS – Office and Membership Manager

- Office management, HR
- Membership liaison
- REHVA Student competition
- REHVA Awards
- REHVA Board meetings' secretariat
- REHVA Newsletter, Bulletin publication
- REHVA Annual meetings, General Assembly secretary
- EC, AC secretary
- MoU-s: follow-up and coordination

CHIARA GIRARDI – Publication and Promotion Officer, RJ Editor Assistant

- Publication of REHVA Guidebooks and Journal (as Editor Assistant)
- REHVA website content management
- REHVA promotional services and sales
- Supporters Contact
- REHVA Dictionary and App development
- REHVA presence at events and fairs, events management and promotion of REHVA events
- SC, PMC, COP secretary



ANITA DERJANECZ – Managing Director

- REHVA office executive management
- REHVA Legal representative
- Business development
- EU policy and public affairs
- Commissioning certification scheme project
 - EU project development and implementation
 - ERC, TRC secretary

TIZIANA BUSO – Project Officer

- TRC secretary, support of Task Forces, and technical publications
- EU project implementation
- EU proposal writing
- Supporting REHVA technical seminars
- Commissioning certification scheme project

GIULIA MARENGHI – Project Assistant

- Administrative support of general office management
- Financial and administrative reporting of EU projects
- EU project implementation – communication activities
- Reception and secretarial support