TECHNICAL CERTIFICATION RULES OF THE EUROVENT CERTIFIED PERFORMANCE MARK

CONDENSING UNITS

Identification: ECP -27 CDU

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(This version cancels and replaces any previous versions)

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The purpose of this Technical Certification Rules is to prescribe procedures for the operation of the Eurovent Certified Performance (ECP) certification programme for Condensing units (CDU), in accordance with the Certification Manual.

Modifications as against last version:

No.	Modifications	Section	Page
1	New structure	All	All
2	Update of the admission audit rule	III.1.3.1	15
3	Addition of remote audits in case of force majeure	III.1.3.1	15
4	Update of the surveillance audit rule	III.2.1.1	21
5	Evolutions of the test standards versions: EN 13487 and EN 13215	All	All

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I. GENERAL INFORMATION

I.1. Scope

I.1.1. General

The programme scope covers air-cooled and water-cooled stationary condensing units designed for low (LT) and/or medium (MT) temperature applications in the field of commercial and industrial refrigeration.

The certification programme is applicable to condensing units using the following refrigerants:

- R134a and list of alternatives (MT) (see appendix D)
- R290 and list of alternatives defined (MT and LT) (see appendix D)
- R448A and list of alternatives defined (MT and LT) (see appendix D)
- R410A and list of alternatives defined (MT and LT) (see appendix D)
- R744 (MT and LT)

The scope is limited to the following refrigerating capacities comprised between

- 0.1 and 20 kW included (LT)
- 0.2 and 50 kW included (MT)

The condensing units covered by the CDU certification correspond to the following product types:

- Air-cooled condensing unit (ACCDU)
- Water-cooled condensing unit (WCCDU)

The following products are specifically excluded from the certified scope:

- Condensing units specifically designed for other applications than those specified here above;
- Condensing units operating for any other fluid than those specified here above;
- Air-cooled condensing units that do not comply with regulation 2015/1095;
- Condensing units equipped with a screw compressor;
- Condensing units integrating an evaporator (Monobloc or split)
- Condensing Units integrated into Refrigerated Display Cabinets (semi plug-in units)
- Air-cooled condensing units equipped with a centrifugal fan;
- Condensing units involving a dual temperature system

I.1.2. Certify-all principle

Whenever a company participates in the programme for CDU, all Condensing Units that are promoted by the applicant/participant to end-users, specifiers, trading companies, contractors by means of paper or electronic catalogue, price list or software within the scope of the programme, shall be certified, in accordance with the relevant technical certification rules (TCR). This includes all models in modular ranges. For the CDU programme, the certify-all requirement as defined in the Certification Manual is applicable to the European market (see European market definition in the Certification Manual).

I.2. Certified performances

The following performance characteristics declared by the applicant/participant shall be verified by tests (see appendix A) :

- Rated refrigerating capacity [kW]
  - at rating point A (P_A) for Air-cooled CU
  - at rating point W1 (P_{W1}) or W2 (P_{W2}) for Water-cooled CU
- Sound power level [dB(A)]
  - at rating point A (L_{W_A}) for Air-cooled CU
  - and at rating point C (L_{W_C}) for Air-cooled CU with continuous capacity control
  - at rating point W1 (L_{W_W1}) or W2 (L_{W_W2}) for Water-cooled CU
- Coefficient of Performance (COP) at full load
  - at rating point A (COP_A) for Air-cooled CU
  - at rating point W1 (COP_{W1}) or W2 (COP_{W2}) for Water-cooled CU
- Seasonal Energy Performance Ratio (SEPR) for Air-cooled CU

I.3. Definitions

For definitions regarding the certification scheme refer to Certification Manual.

Basic model group

Within a range, it is considered that models of a given product type (air-cooled i.e. ACCDU, or water-cooled i.e. WCCDU) can be gathered into a basic model group (BMG) provided that:

- they belong to the same temperature application (MT or LT or both)
- and that they present the same refrigerant categories as defined in present TCR.
- and that they present the same capacity control (on/off; stepwise; continuous using an inverter, continuous using another unloading system)
- and that they present the same compressor type (reciprocating hermetic, reciprocating semi-hermetic, scroll or rotary)
- and that they present the same casing configuration (bare unit or enclosed unit)

Coefficient of Performance (COP)

The coefficient of Performance (COP) is defined as the ratio of the refrigerating capacity to the power absorbed.

Compressor

The compressor is the part of the refrigerating system which purpose is to mechanically increase the pressure of a refrigerant vapour.

A “motor compressor” is defined in standard EN 378-1:2016 as a fixed combination of electrical motor and compressor in one unit. In this configuration the motor is an integral part of the unit. On the contrary, when the motor is not an integral part of the unit, the latter can be referred to as an “externally driven compressor”.

Positive displacement compressors types covered by the CDU programme are the following:

- reciprocating compressors featuring a reciprocating movement to create compression
- compressors featuring a rotational movement to bring about compression such as:
  - rotary vane compressors, simply referred to as “rotary” compressors
  - scroll compressors

Reciprocating compressors can present the following construction types:

- “hermetic”: combination of a compressor and electrical motor, both of which are enclosed in the same housing, with no external shaft or shaft seals.
- “semi hermetic” (or “accessible hermetic”): combination consisting of a compressor and electrical motor, both of which are enclosed in the same housing, having removable covers for access, but having no external shaft or shaft seals.

Condenser

A “condenser” is defined in standard EN 378-1:2016 as a heat exchanger in which refrigerant vapour is liquefied by removal of heat.

Condensing unit

In the present CDU programme the definition from regulation 2015/1095 applies: product integrating at least one electrically driven compressor and one condenser[1] ,capable of cooling down and continuously maintaining low or medium temperature inside a refrigerated appliance or system, using a vapour compression cycle once connected to an evaporator and an expansion device.

Dual temperature system

A dual temperature system, or “cascade system”, is defined in EN 378-1:2016 standard as the assembly of two (2) or more independent refrigeration circuits where the condenser of one circuit rejects heat directly to the evaporator of another unit.

Such a system is called “subcritical cascade” when the first vapour compression cycle operates with R744 and the other one(s) with another refrigerant.

When R744 is used as direct refrigerant in both LT and MT circuits the system is referred to as “transcritical booster”.

Dual temperature systems are excluded from the scope.

Evaporator

An “evaporator” is defined in standard EN 378-1:2016 as a heat exchanger in which liquid refrigerant is vaporised by absorbing heat from the substance to be cooled.

Gas cooler

A “gas cooler” is defined in standard EN 378-1:2016 as a heat exchanger in a transcritical system in which supercritical refrigerant is cooled by removal of heat.

Low temperature application (LT)

Is referred to as “low temperature application” or LT an application where the condensing unit is capable of delivering its rated refrigerating capacity at a saturated evaporating temperature of -35 °C.

Medium temperature application (MT)

Is referred to as “medium temperature application” or MT an application where the condensing unit is capable of delivering its rated refrigerating capacity at a saturated evaporating temperature of -10 °C.

Part load operation

Standard EN 13771-2:2017 defines the part load operation as an operation with active capacity control at reduced capacity for compressors with capacity control mechanism.

Part load ratio

The refrigerating demand ratio – or part load ratio – can be defined as the refrigerating capacity demand corresponding to the temperature T_x of the rating point x to be tested $Q_{dm,x}$ divided by the rated refrigerating capacity Q_{RA} [kW] , and multiplied by 100 to be expressed in percentage [%].

[1] In transcritical operation the condenser operates as gas cooler.

It is calculated as follows:

- for LT applications

$$q_{LT,Tx} = 80\% + 20\% \times \frac{T_x - T_D}{T_A - T_D}$$

- for MT applications

$$q_{MT,Tx} = 60\% + 40\% \times \frac{T_x - T_D}{T_A - T_D}$$

For instance, for rating point B:

$$q_{LT,T_B} = 80\% + 20\% \times \frac{25 - 5}{32 - 5} = 95\%$$

$$q_{MT,T_B} = 60\% + 40\% \times \frac{25 - 5}{32 - 5} = 90\%$$

Part load ratios for all relevant rating points appear in table 2 appendix A.

When the compression is obtained by changing the internal volume of the compression chamber the compressor is called a “positive displacement compressor”.

Power absorbed

As explained in standard EN 13215:2016+A1:2020 the power demand to drive the condensing unit is referred to as power absorbed.

Range

In the present CDU programme a range designates a family of condensing units models grouped under the same commercial name.

Rated refrigerating capacity

Is referred to as “rated refrigerating capacity” the refrigerating capacity delivered by the condensing unit at full load and for the following temperature constraint (see also table 2 appendix A) :

- +32 °C ambient temperature (rating point A) for air-cooled condensing units;
- +40 °C condensing temperature, +30 °C water inlet temperature and a fouling factor of 5 x 10^{-5} $m^2.K.W^{-1}$ (rating point W1) for water-cooled condensing units operating with refrigerants other than R744;
- +32 °C gas cooler outlet temperature, +30 °C water inlet temperature and a fouling factor of 5 x 10^{-5} $m^2.K.W^{-1}$ (rating point W2) for water-cooled condensing units operating with R744;

Refrigerating capacity

In the present CDU programme the definition from standard EN 13215:2016+A1:2020 applies: product of the mass flow of refrigerant through the condensing unit and the difference between the specific enthalpy of the refrigerant at the condensing unit inlet (including superheat whenever the case) and the specific enthalpy of the liquid refrigerant at the condensing unit outlet.

Refrigerating capacity demand

The refrigerating capacity demand $Q_{dm,x}$ for a given rating point x to be tested is the product of the corresponding part load ratio q_x , expressed in percentage [%], and the rated refrigerating capacity Q_{RA} [kW], divided by 100 to be expressed in [kW].

Seasonal Energy Performance Ratio (SEPR)

The Seasonal Energy Performance Ratio (SEPR) is defined in standard EN 13215:2016+A1:2020 as the reference annual refrigeration demand divided by the annual electrical energy demand.

It is to be calculated based on Coefficient of Performance (COP) values determined for operation at several rating conditions (see appendix A) in accordance with standard EN 13215:2016+A1:2020.

Sound power level

The definition from standard ISO 3741:2010 applies: Ten times the logarithm to the base 10 of the ratio of the sound power radiated by the sound source under test to the reference sound power, noted L_W and expressed in decibels. The reference sound power is 1 pW (10^{-12} W).

Sound pressure level

The definition from standard ISO 3741:2010 applies: Ten times the logarithm to the base 10 of the ratio of the square of the sound pressure to the square of the reference sound pressure, noted L_p and expressed in decibels. The reference sound pressure is 20 µPa ($2x10^{-5}$ Pa).

Subcritical operation

Standard EN 13771-2:2017 defines the subcritical operation as an operating condition with condensing unit outlet pressure below the critical pressure of the refrigerant (see Figure 1).

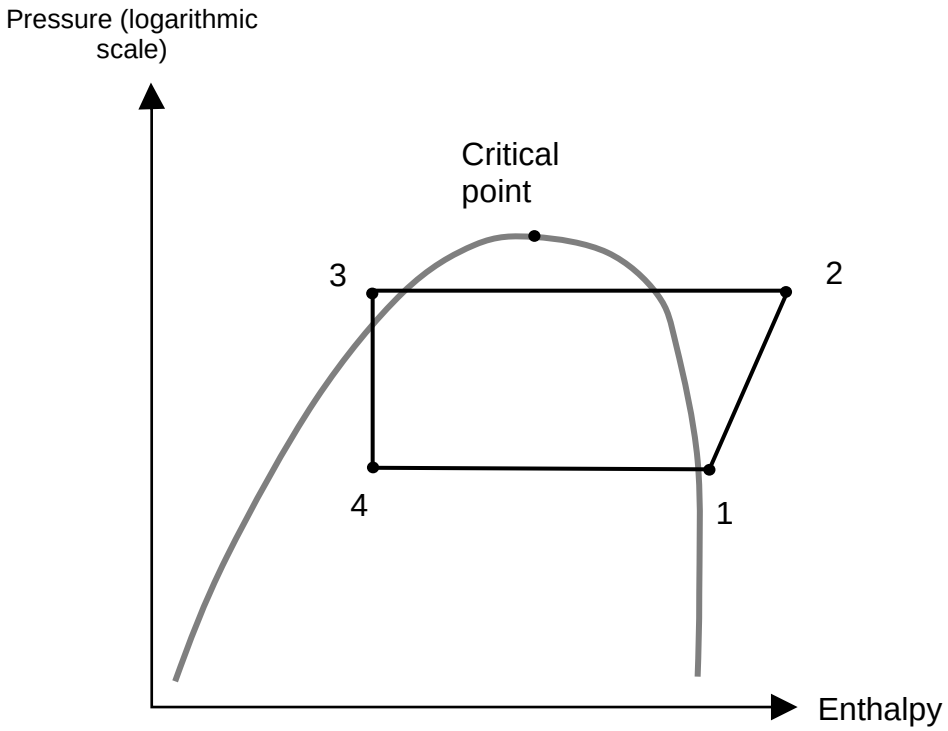


Figure 1: Subcritical cycle illustration (1-2 Compression; 2-3 Condensation; 3-4 Expansion; 4-1 Evaporation)

Transcritical CO2 booster system

"Transcritical CO_2 booster system" designation refers to a system where R744 is used as direct refrigerant in both LT and MT circuits, operating respectively in subcritical and transcritical mode.

Transcritical operation

Standard EN 13771-2:2017 defines the transcritical operation as an operating condition with condensing unit outlet pressure above the critical pressure of the refrigerant (see Figure 2).

I.4. Contributors

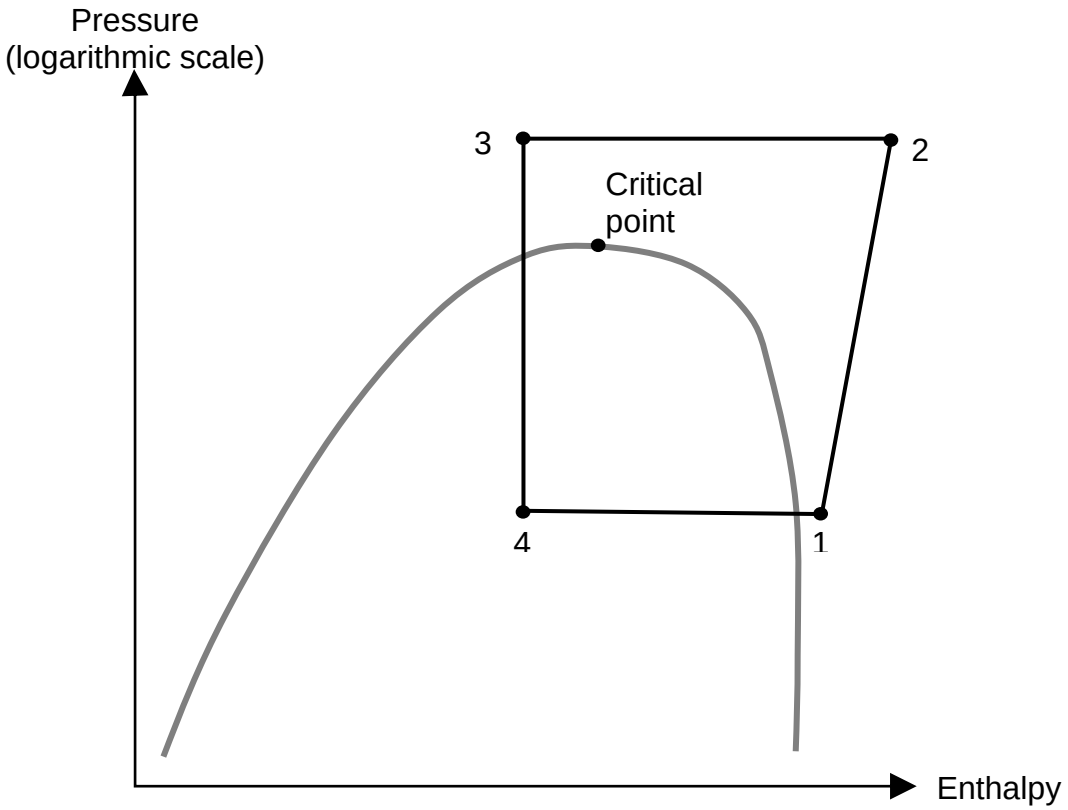


Figure 2: Transcritical cycle illustration (1-2 Compression ; 2-3 Gas cooling ; 3-4 Expansion ; 4-1 Evaporation)

The lists of contributors are given for information and may be modified by EUROVENT CERTITA CERTIFICATION whenever necessary.

I.4.1. audit body

The audit functions are performed by the following body(ies), called audit body:

EUROVENT CERTITA CERTIFICATION SAS
48/50 rue de la Victoire
F- 75009 PARIS
Tel : + 33 1 75 44 71 71
www.eurovent-certification.com

I.4.2. Independent laboratory / test body

When the checks carried out involve product tests, these are performed at the request of EUROVENT CERTITA CERTIFICATION by the following laboratories, known as Independent laboratory:

TÜV SÜD Industrie Service GmbH
Center of Competence für Kälte-und Klimatechnik Olching
Geiselbullacher Straße 2
82140 Olching
Deutschland / Germany

II. REQUIREMENTS OF THE REFERENCE DOCUMENT

II.1 Reference documents

II.1.1. Product and test standards

The test procedure is detailed in the technical appendix A and in the product and test standards.

The applicable standards are as follow (non-exhaustive list):

- **EN 13771-2:2017** Compressors and condensing units for refrigeration. Performance testing and test methods. Condensing units
- **EN 13215:2016+ A1:2020** Condensing units for refrigeration - Rating conditions, tolerances and presentation of manufacturer's performance data
- **ISO 9614-2:1996** Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 2: Measurement by scanning

II.2 Specific requirements

1. <u>Preliminary checks</u>

Before testing, the laboratory shall check that the condensing unit delivered corresponds to the selection.

The laboratory personnel therefore proceed to a verification of:

- the name plate data:
  - Manufacturer name
  - Manufacturing place address
  - Condensing unit model designation or reference
  - Condensing unit serial number
- the condensing unit characteristics:
  - capacity control type (on/off; stepwise; continuous using an inverter; continuous using another unloading system)
  - casing configuration (bare unit or enclosed unit)
  - refrigerant designation
- the fan(s) characteristics (ACCDU):
  - Number of fans
  - Fan reference
  - Fan impeller manufacturer
  - Fan motor manufacturer
  - Fan diameter
  - Fan number of blades
- the compressor(s) characteristics:
  - Number of compressors
  - Compressor model reference
  - Compressor type (reciprocating hermetic; reciprocating semi-hermetic; scroll; rotary)
  - Number of capacity control steps for the compressor(s)

- the heat exchanger(s) characteristics:
    - number of heat exchanger(s)
    - in case of brazed plate heat exchanger(s) (WCCDU):
        - Number of heat exchange plates (no deviation allowed)
        - Plate pack length ± 2%
        - Plate height ± 5 mm
        - Plate width ± 5 mm
    - in case of tube-in-tube heat exchanger(s) (WCCDU):
        - Overall dimensions ± 10 mm
    - in case of shell and tube heat exchanger(s) (WCCDU):
        - Overall dimensions ± 10 mm
    - in case of coil(s) (ACCDU):
        - Finned length ± 0,5 %, with at least ± 5 mm
        - Finned height of the coil ± 5 mm
        - Finned depth (width) of the coil ± 5 mm
        - Total number of fins ± 4 %, with at least ± 2 fins
        - Diameter of (expanded) tube outside the coil ± 1 mm

If the unit is not compliant to any of the aforementioned checks, the laboratory shall not perform the test and contact Eurovent Certita Certification who shall ask the applicant/participant to send a new unit for testing.

2. Determination of the refrigerant mass flow

The determination of the refrigerant mass flow shall be conducted in accordance with the following methods as per EN 13771-2:2017:

- Method E as primary method
- Method B as confirming method

3. COP and SEPR determination for ACCU

To enable the systematic calculation of the SEPR for air-cooled condensing units (ACCU), the COP values shall be determined according to Annex A of standard EN 13215:2016+A1:2020 as follows:

- for fixed speed units (i.e. units without capacity control)
    - COP_A shall be determined directly from the rated refrigerating capacity $Q_{R,A}$ and power absorbed P_A measured for rating point A (no correction)
        - $COP_{B,cor}$, $COP_{C,cor}$ and $COP_{D,cor}$ shall be determined applying a corrective coefficient using formula (A.1)[2]
- for staged units (i.e. with stepwise capacity control) COP values shall be determined
    - either by linear interpolation between the two capacity control steps on either side of the refrigerating capacity demand (no correction) using formula (A.4)[2]
    - or, if the smallest control step of the unit is higher than the refrigerating capacity demand, by interpolation between a given capacity control

[2] see corresponding formulas in Annex A of standard EN 13215:2016+A1:2020

step (generally the smallest one) and the off mode applying a corrective coefficient using formula (A.1)[2]

- for continuous capacity control units (i.e. units with quasi stepless capacity control) COP values shall be determined
  - if the refrigerating capacity demand is achieved within ±10% , directly (no correction) from the refrigerating capacity Q and power absorbed P values measured for the rating point in question
  - otherwise as for staged units (see above).

4. Refrigerating capacity demand achievement criteria

The refrigerating capacity demand $Q_{dm,j}$ can be determined by multiplying the full load value ($Q_{R,A}$) with the part load ratio q_j for each corresponding bin j using formulas (A.10)[2] and (A.12)[2] for LT and MT respectively.

The part load ratio to be tested shall be set according to the instructions of the manufacturer. The manufacturer shall provide laboratories with the necessary information on the setting of the unit for operating at the required capacity conditions. For inverter type control units, if the manufacturer gives instructions for the setting of the frequency for each rating condition, this setting shall be done.

For continuous capacity control units, the declared ("rated") refrigerating capacity Q_R and the corresponding COP shall be determined at the closest capacity control step - or increment - of the unit to reach the refrigerating capacity demand Q_{dm}. If this step allows to reach the refrigerating capacity demand within ± 10 % (e.g. between 8,1 kW and 9,9 kW for a target value of 9 kW), the refrigerating capacity demand is considered as achieved and the measured COP can be used without correction.

If the unit cannot achieve the refrigerating capacity demand within ±10% by means of capacity modulation, interpolations between capacity control steps are necessary.

5. Water cooled condensing units testing

Tests on WCCDU shall be conducted with pure water

II.1.2. Quality management systems standards

EN ISO 9001:2015, Quality management system – Requirements.

II.3. Marking

It is highly recommended that the participating company indicates participation in the EUROVENT CERTIFIED PERFORMANCE (ECP) programme for Condensing units as laid down in the Certification Manual.

II.3.1 Display of Eurovent Certified Performance logo on production units

In addition to the provisions laid down in the Certification Manual, the following requirements apply.

Each Participant is entitled to display the Eurovent Certified Performance mark on each production unit of models which have been certified. The Participant may affix the certification mark at any location thereon satisfactory to him. The Eurovent Certified Performance mark may be applied as part of nameplate of certified models providing it meets the requirements stated in Certification Manual.

Whenever the participant applies the Eurovent Certified Performance mark on the product or its packaging, it shall be done in compliance with the design, minimum size and proportions presented in the Certification Manual. Also, the Eurovent Certified Performance mark shall include in the dedicated area (see Certification Manual) the name of the relevant programme the product is certified for, i.e. "Condensing units" or the corresponding short name "CDU".

II.3.2 Display of Eurovent Certified Performance logo on technical documentation

In addition to the provisions laid down in the Certification Manual, the following requirements apply.

When used in technical documentation as defined in the Certification Manual (electronic and printed catalogues, websites, specification sheets), carrying ratings or claiming certification of certified models, the Eurovent Certified Performance mark shall be used only for certified products. Non-certified products shall be clearly distinguished or presented in a separate document.

Whenever displayed on technical documentation, the ECP mark shall include in the dedicated area (see Certification Manual) the name of the relevant programme the product is certified for, i.e. “Condensing units” or the corresponding short name “CDU”.

The ECP mark alone may be used in literature without certified performance data (general leaflets, advertising etc.).

Following the admission procedure, the basic documentation literature shall be submitted for approval to Eurovent Certita Certification. It shall be the responsibility of the participant to ensure compliance of other published literature.

III. CERTIFICATION PROCESS

III.1 Admission procedure

III.1.1 Declaration of data

In addition to the provisions laid down in the Certification Manual, the following requirements apply:

The Applicant, after signing the Certification Agreement, shall send to EUROVENT CERTITA CERTIFICATION all information required for the admission, declaration file and relevant literature.

All characteristics shall be expressed in SI units.

The following data shall be rounded up or down to the nearest integer:

- Sound power level [dB(A)]
- Sound pressure level measured at 10 meters [dB(A)]
- Refrigerating capacity when strictly lower than 1kW [W]

The following data shall be rounded up or down to the nearest second decimal:

- Refrigerating capacity when higher than or equal to 1kW [kW]
- Power absorbed [kW]
- Volume flow rate, when expressed in [l/s] or [m^3/h]
- Mass flow rate, when expressed in [kg/s]
- COP
- SEPR

Submittal of data shall be made by filling in the forms provided by EUROVENT CERTITA CERTIFICATION as .xls or .xlsx files. The forms shall be sent by e-mail to EUROVENT CERTITA CERTIFICATION within the time limits specified in Certification Schedule (see Appendix B – Campaign schedule).

For Water-cooled condensing units the performance data shall be filled in considering operation with pure water.

- Declaration file CDU-1 will be used
    - for manufacturing companies (Original Equipment Manufacturer – OEM) to declare ranges, Basic Model Groups (BMG), performance ratings and technical data.
    - for Brand Name (BN) companies to identify the corresponding models number of the original equipment manufacturer
- Technical data sheet CDU-2 will be used to complete technical description of all raw material or incoming goods for the units selected.

Confidentiality of certification data: All data submitted to Eurovent Certita Certification will be held confidential except for information authorised to be published in the Eurovent Certified Performance website.

Traceability: To ensure the traceability of the products each certified product shall be marked to ensure traceability with respect to the plant (e.g. serial number) and factory address location. Information shall be reported in the declaration list too.

III.1.2 Admissibility of the application

In addition to the provisions laid down in the Certification Manual, the following requirements apply:

Once the application is completed, the admission procedure is articulated as follows:

• For Brand Name (BN) companies, applicable steps of the audit procedure shall be conducted.

• For Original Equipment Manufacturers (OEM), Eurovent Certita Certification proceeds to remote selection of units to be tested (see Appendix A) based on the declaration file CDU-1 provided by the applicant. Then, Eurovent Certita Certification requests the selected products manufacturing and schedules the production site(s) auditing (see Appendix A). During the audit, the auditor appointed by Eurovent Certita Certification verifies that the selected products were manufactured as per the regular process. The selected products are then identified and sealed by the auditor so that they can be authenticated by the independent laboratory personnel before testing. The selected products shall be sent to the laboratory together with the related technical datasheet. The independent laboratory staff proceeds to product performance testing on the selected units according to the procedure detailed in appendix A.

If the aforementioned checks prove all the ranges compliance with the requirements specified in this document, the certification is granted. If not, the procedure for failure treatment shall be applied.

When the applicant’s product ranges cover several refrigerant categories (see Appendix D) then the conduction of the admission tests shall be completed within maximum three (3) years.

The tested category(ies) of refrigerants will appear on the certificate until admission is fully completed.

When certified, the ranges are published on the Eurovent Certified Performance (ECP) website. Once the certificate is received, the participant is entitled to use the certification mark according to applicable requirements.

III.1.3 Implementation of checking operations

The provisions of the Certification Manual apply.

III.1.3.1 Initial admission audit

In addition to the provisions laid down in the Certification Manual, the following requirements apply:

a. **General**

General audit requirements are stated in the Certification Manual.

All the production sites declared by the applicant shall be audited.
The audit will consist of the verification that the applicable requirements are fulfilled.
The duration of the site audit is one day (including audit preparation, the audit itself, the report writing and the management of the corrective actions, if relevant). This duration can be adjusted in the case of carrying out a joint audit with other certifications. The audits shall be performed annually.

Whenever necessary, Eurovent Certita Certification has the right to ask an auditor to conduct an additional audit to the applicant/participants' factory as well as to collect data directly from customer.

If audits are not conducted within the time limitations specified in the notification received from Eurovent Certita Certification, it is considered as non-application of procedures.

In case of force majeure (e.g. accidents, labour disputes, natural events, acts of war) which would not allow ECC to perform the audit, ECC can decide to perform a remote audit. The requirements of performing the remote audit are explained in the certification Manual.

b. Audit requirements

During the audit, the auditor will:
• check that the ECP mark is displayed on the production units and on the documentation in compliance with the requirements specified in paragraph II.3.
• check that the units manufactured for testing are consistent with regular production, by comparing them to similar models taken from the production line and/or stock, and/or by comparing production records.
• check that the products in the sales record and/or production line and/or stock are compliant with the declaration file CDU-1
For OEM, in case the products under manufacturing at the audit date do not fall into the certification programme scope, the auditor shall at least check the stock to verify that the raw material or incoming goods under common use in the factory are the same as that appearing in the declaration file CDU-1 and technical datasheet.
• check that the corrective actions plan is completed or under implementation.

The auditor will also perform a complete review of the quality management system to check that:
• the suppliers are regularly evaluated and that the corresponding evaluations are recorded.
• the key components (fan, compressor and condenser/gas cooler) are controlled at their reception and/or during the manufacturing process;
• the products conformity with the bill of material (BOM) specifications is regularly evaluated and the corresponding evaluations are recorded;
• the manufacturing process key steps are submitted to a validation check which results are recorded with in particular:

- performing a leak test is required on each production unit. This test can be conducted by the OEM or by the condenser supplier. The testing method is to be made available by the manufacturer and its relevance shall be documented;

- performing an electrical safety test is required on each production unit. The testing method is to be made available by the manufacturer and its relevance shall be documented;

• the factory personnel is qualified to perform the specific tasks if any;
• every product traceability is ensured;
• calibration of measuring devices is performed on a regular basis;
• production non-conformities are recorded and corrective actions initiated;
• customer complaints are registered and treated;
• internal audits are conducted.

c. Audit non-conformity

After evaluation, a non-conformity is classified as critical when, on the basis of objective evidence, the following cases are identified:

• there is a significant risk to the product conformity with respect to specified requirements.
• there is a significant risk regarding the quality management system ability to control the product conformity to specified requirements;
• there is systematic or repeated non-conformity to a specified requirement;
Otherwise the non-conformity is classified as not critical.

The applicant/participant shall resolve the non-conformity within the time limitation agreed in the corrective actions report.

In case of critical non-conformity, the certification may be suspended/not granted until the critical non-conformity resolution and the corresponding verification.

III.1.3.2 Selection of units to be tested

In addition to the provisions laid down in the Certification Manual, the following requirements apply:

EUROVENT CERTITA CERTIFICATION shall select units to be tested based on its evaluation of the declaration file CDU-1 communicated by the applicant.

The number of condensing units to be selected for admission tests, comprised between two (2) and six (6), is driven by the number of refrigerant categories covered by the applicant's technical documentation. The selection shall be conducted in accordance with the following tables.

Table 1 : Number of units to be selected in case of 1 refrigerant category

Number of refrigerant categories	Number of units to be selected per refrigerant category	Total number of units to be tested for qualification	Number of years allowed to complete qualification
1	2	2	1

Table 2 : Number of units to be selected in case of 2 refrigerant categories

Number of refrigerant categories	Number of units to be selected per refrigerant category	Total number of units to be tested for qualification	Number of years allowed to complete qualification
2	2	4	2

Table 3 : Number of units to be selected in case of 3 refrigerant categories

Number of refrigerant categories	Number of units to be selected per refrigerant category	Total number of units to be tested for qualification	Number of years allowed to complete qualification
3	2	6	3

Table 4 : Number of units to be selected in case of 4 refrigerant categories

Number of refrigerant categories	Number of units to be selected per refrigerant category	Total number of units to be tested for qualification	Number of years allowed to complete qualification
4	Category A: 2 Category B: 2 Category C: 1 Category D: 1	6	3

Table 5 : Number of units to be selected in case of 5 refrigerant categories

Number of refrigerant categories	Number of units to be selected per refrigerant category	Total number of units to be tested for qualification	Number of years allowed to complete qualification
5	Category A: 2 Category B: 1 Category C: 1 Category D: 1 Category E: 1	6	3

In table 4 and table 5, the categories A and B are the refrigerant categories to be tested in priority. The priority order shall be defined by Eurovent Certita Certification in consistency with the corresponding number of BMG. but also, upon consultation with the applicant, according to its relevance from a market point of view (upcoming obsolescence, etc.).

Eurovent Certita Certification shall ensure that the list of selected units cover the variations declared as extensively as possible. For instance, if both LT and MT applications are covered in the manufacturer's technical documentation at least one unit of each shall be selected.

Besides, whenever possible, priority shall be given to the following variations:

- Air-cooled CDU over Water-cooled CDU
- MT application over LT application
- Continuous capacity control over staged and fixed capacities
- Reciprocating compressors (hermetic or semi-hermetic) over scroll and rotary compressors
- Enclosed units over bare units

III.1.3.3. Tests at the independent laboratory

1. **General**

Within the programme, tests may be conducted under the following procedures:

- Scheduled tests in admission procedure
- Scheduled tests in surveillance procedure
- Penalty test in surveillance procedure
- Challenge procedure test[1]

Tests shall be performed at the independent laboratory selected by Eurovent Certita Certification.

The laboratory shall have the responsibility of uncrating, handling, testing and recrating the unit for shipment.

Before testing, the laboratory shall check the product against the technical datasheet to ensure that the unit corresponds to the selection.

The laboratory shall not perform the test and contact Eurovent Certita Certification who shall ask the applicant/participant to send a new unit in the following cases:

- one of the dimensions is not compliant with the technical datasheet (see paragraph A.IV of the appendix A)
- one of the units appears damaged (see § paragraph III.1.3.3.d for initial test failure definition)

Units shall be assembled and installed in the test facility by the laboratory personnel in accordance with the manufacturer's published installation instructions. The applicant/participant shall therefore provide the laboratory with full information about the installation.

Upon justified request the applicant/participant's staff may be allowed by Eurovent Certita Certification to attend the preparation and installation of units but not the test itself.

No applicant/participant's personnel shall be present in the laboratory test facility during the tests.

If the test establishes that the unit fails to meet one or more of the requirements, the laboratory shall promptly notify Eurovent Certita Certification to receive instructions regarding further actions (see § paragraph III.1.3.3.c unit failure).

a. Time limitation of acquisition and recovery of units

The provisions of the Certification Manual apply.

Deadline for delivery of units to the laboratory, together with the technical data sheet completed and the payment, is defined in the campaign Schedule (appendix B). For the admission procedure the deadline is specified in the notification received from Eurovent Certita Certification.

If elements are not delivered within the time limitations, it is considered as non-application of procedures.

Eurovent Certita Certification has discretion not to discontinue the certification when the applicant/participant provides a definite and acceptable date of supply.

The applicant/participant has to recover the products maximum six (6) working weeks after receiving the test reports and results. If the products are not recovered after this delay, the laboratory can destroy them, and the corresponding invoice will be sent by Eurovent Certita Certification to the applicant/participant.

b. Test conditions

The tests shall be conducted at the conditions stated in Appendix A.

c. Test report and test results

Upon completion of the tests on each unit, the laboratory will send the complete report as a .pdf file to Eurovent Certita Certification. For each test, a performance item fails when the declared value and the measurement differ by more than the acceptance criteria (see paragraph A.IV of the appendix A). When one or more performance items fail, the test status is considered FAILED and the failure treatment corresponding to unit failure shall be applied. Eurovent Certita Certification will forward a copy of the report together with the test report result sheet (see appendix C) and, if applicable, the test rerate form to the applicant/participant.

d. Failure treatment

When a unit fails to comply with the requirements of the Appendix A, failure treatment shall be applied. For each test, a performance item fails when the difference between the declared value and the measurement is not within the allowable acceptance criteria. A test fails when one or more performance(s) fail. In case of failure, Eurovent Certita Certification shall promptly

notify the applicant/participant. The applicant/participant shall examine the reason(s) of the failure.

Initial test failure

In case of initial test failure (see definition in Certification Manual), the laboratory shall immediately inform Eurovent Certita Certification who will notify the applicant/participant. The applicant/participant shall deliver within six (6) working weeks a new copy of the same model, which then shall be tested according to the availability of the laboratory.

Unit failure

For each failed test, the applicant/participant has four (4) working weeks from the notification of failure to select between the following alternatives:

- Re-rate all products in accordance with test results following the re-rating procedure described below. Penalty tests will be required as described below. The Participant shall correct his catalogues, website, and any other commercial support within 8 weeks. ECC will continuously check Participant's documentation.
- Ask for a second test on the same unit (already tested and kept in the laboratory). If the second test is unsuccessful, the Participant/Applicant shall re-rate all products in line with the second test results according to the re-rating procedure.

- Ask for a second test on a new unit, the manufacturer can ask for a second test on a new unit (same model), in specific cases, after analysis of the non-conformity and implementation of actions if applicable. When the second test is carried out on another unit that the one already tested, then one penalty test will be required during the next campaign, whatever the result of the second test is. A tested unit which comes back to the participant and is sent again for test is considered as a new unit.

Penalty tests

In case of established failure, one (1) unit has to be selected for penalty test if the measured value is beyond twice the accepted deviation . The penalty tests are full tests and shall be performed during the following surveillance test campaign, in addition to scheduled surveillance tests. Penalty tests following an admission procedure shall be performed during the first surveillance test campaign, in addition to scheduled surveillance tests.

Rerating procedure

General Rerating procedure requirements are stated in the dedicated paragraph of the Certification Manual.

For the CDU programme the following applies:

- In case on failure on the refrigerated capacity, the tested model shall be re-rated according to the deviation measured. The following models shall be re-rated according to the deviation measured as well:
  - same BMG
  - and same compressor manufacturer
  - and same impeller blade type
  - and same fan (impeller) manufacturer
  - and same fan motor technology
  - and same fan (motor) manufacturer
  - and same heat exchanger technology

[1] See challenge procedure in the Certification Manual

- In case on failure on the COP, the tested model shall be re-rated according to the deviation measured. The following models shall be re-rated according to the deviation measured as well :
  - same BMG
  - and same compressor manufacturer
  - and same impeller blade type
  - and same fan (impeller) manufacturer
  - and same fan motor technology
  - and same fan (motor) manufacturer
  - and same heat exchanger technology

- In case on failure on the SEPR, the tested model shall be re-rated according to the deviation measured. The following models shall be re-rated according to the deviation measured as well:
  - same BMG
  - and same compressor manufacturer
  - and same impeller blade type
  - and same fan (impeller) manufacturer
  - and same fan motor technology
  - and same fan (motor) manufacturer
  - and same heat exchanger technology

In case on failure on the sound power level, the tested model shall be re-rated according to the deviation measured. The following models shall be re-rated according to the deviation measured as well :

- same BMG
- and same compressor manufacturer
- and same impeller blade type
- and same fan (impeller) manufacturer
- and same fan motor technology
- and same fan (motor) manufacturer
- and same heat exchanger technology

III.1.4. Evaluation and decision

In addition to the provisions laid down in the Certification Manual, the following requirements apply:

The certification is granted on condition that:

• The aforementioned checks prove all the ranges compliance with the requirements specified in Appendix A,

• All the other requirements from the present Technical Certification Rules are fulfilled,

• The audit has been performed by the auditor and is successful or the corrective actions plan is considered satisfactory,

• All fees have been settled.

If not, the procedure for failure treatment shall be applied.

III.2. Surveillance procedure

The provisions of the Certification Manual apply.

III.2.1. Implementation of surveillance operations

III.2.1.1. Surveillance audit

Audits shall be conducted annually according to the certification Schedule and to the rules below:

- The production sites already audited by ECC during the admission procedure will be audited in turn (1 site audited per year)
- Any new production site declared by the participant shall be audited as extra

III.2.1.2. Selection of units to be tested

In addition to the provisions laid down in the Certification Manual, the following requirements apply:

For the surveillance procedure, Eurovent Certita Certification shall select two (2) units for testing. If possible, a configuration different from that previously tested shall be selected, from a different Basic Model Group (BMG) from one year to another for example.

Selection for penalty tests

Eurovent Certita Certification shall select units for penalty tests from the range which failed.If this range is no longer produced in year N+1 (status “deleted” or “obsolete”) then the selection will be made from the range which is the most similar to the one that failed.

III.2.1.3. Surveillance tests

For the surveillance procedure, the surveillance tests follow the same rules as the admission tests (see III.1.3.3).

III.2.1.6. Technical and commercial documentation check

The provisions of the Certification Manual apply.

III.2.2. Evaluation and decision

In addition to the provisions laid down in the Certification Manual, the following requirements apply. Every year, Eurovent Certita Certification checks whether the performances of the products still meet the requirements.

- For Brand Name (BN) companies, applicable steps of the audit procedure shall be conducted annually
- For Original Equipment Manufacturers (OEM), surveillance tests in the independent laboratory and factory audit shall be conducted annually in compliance with the campaign Schedule (see appendix B)

For the surveillance procedure the certification is renewed at the date specified in the Certification Schedule (see Appendix B) on condition that:

• The previous test campaign (N-1) has been successfully completed

• The audit scheduled during the previous campaign has been performed by the auditor and is successful or the corrective actions plan is considered satisfactory.

• The product delivery together with the technical datasheet and the payment have been completed

The company receives a renewed certificate and the display of data is maintained on the Eurovent Certified Performance (ECP) website. If not, failure treatment shall be applied

III.3 Declaration of modifications

The provisions of the Certification Manual apply.

III.3.1. Changes concerning the participant

The provisions of the Certification Manual apply.

III.3.2. Changes concerning production entities

The provisions of the Certification Manual apply.

III.3.3. Changes concerning the quality organization of the manufacturing and/or marketing process

The provisions of the Certification Manual apply.

III.3.4. Additional admission for a new model and/or new range

The provisions of the Certification Manual apply.

III.3.5. Changes concerning the certified product

In addition to the provisions laid down in the Certification Manual, the following requirements apply:

The applicant/participant shall inform Eurovent Certita Certification of any modification of the product portfolio by updating the declaration file (CDU-1). Non-compliance of the applicant/participant is considered as non-application of procedures .

EUROVENT CERTITA CERTIFICATION decides whether the modification is significant for the certified performance data or not. In the case of significant modifications EUROVENT CERTITA CERTIFICATION is entitled to request adequate tests to check the influence on performance data. This test shall not be considered as a surveillance one.

III.3.6. Temporary or permanent cessation of production of a certified product

The provisions of the Certification Manual apply.

III.4. Suspension/cessation conditions

The provisions of the Certification Manual apply.

APPENDIX A. *TECHNICAL APPENDIXES*

A.I. Purpose

The purpose of these technical appendixes is to establish definitions and specifications for testing and rating of condensing units for the related Eurovent Certified Performance Programme, in accordance with these Technical Certification Rules

A.II. Testing requirements

A.II.1 Test standards

Tests shall be conducted in accordance with:

• EN 13771-2:2017 Compressors and condensing units for refrigeration. Performance testing and test methods. Condensing units

• EN 13215:2016+A1:2020 Condensing units for refrigeration - Rating conditions, tolerances, and presentation of manufacturer's performance data

• ISO 9614-2:1996 Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 2: Measurement by scanning

A.II.2 Particular specifications for testing

The following specifications are applicable for admission tests and surveillance tests.

a. Preliminary checks

Before testing, the laboratory shall check that the condensing unit delivered corresponds to the selection.

The laboratory personnel therefore proceed to a verification of:

• the name plate data:
  - o Manufacturer name
  - o Manufacturing place address
  - o Condensing unit model designation or reference
  - o Condensing unit serial number
• the condensing unit characteristics:
  - o capacity control type (on/off; stepwise; continuous using an inverter; continuous using another unloading system)
  - o casing configuration (bare unit or enclosed unit)
  - o refrigerant designation
• the fan(s) characteristics (ACCDU):
  - o Number of fans
  - o Fan reference
  - o Fan impeller manufacturer
  - o Fan motor manufacturer
  - o Fan diameter
  - o Fan number of blades
• the compressor(s) characteristics:
  - o Number of compressors
  - o Compressor model reference
  - o Compressor type (reciprocating hermetic; reciprocating semi hermetic; scroll; rotary)
  - o Number of capacity control steps for the compressor(s)

- the heat exchanger(s) characteristics:
  - o number of heat exchanger(s)
  - o in case of brazed plate heat exchanger(s) (WCCDU):
    - ▪ Number of heat exchange plates (no deviation allowed)
    - ▪ Plate pack length ± 2 %
    - ▪ Plate height ± 5 mm
    - ▪ Plate width ± 5 mm
  - o in case of tube-in-tube heat exchanger(s) (WCCDU):
    - ▪ Overall dimensions ± 10 mm
  - o in case of shell and tube heat exchanger(s) (WCCDU):
    - ▪ Overall dimensions ± 10 mm
  - o in case of coil(s) (ACCDU):
    - ▪ Finned length ± 0,5 %, with at least ± 5 mm
    - ▪ Finned height of the coil ± 5 mm
    - ▪ Finned depth (width) of the coil ± 5 mm
    - ▪ Total number of fins ± 4 %, with at least ± 2 fins
    - ▪ Diameter of (expanded) tube outside the coil ± 1 mm

If the unit is not compliant to any of the aforementioned checks, the laboratory shall not perform the test and contact Eurovent Certita Certification who shall ask the applicant/participant to send a new unit for testing .

b. Determination of the refrigerant mass flow

The determination of the refrigerant mass flow shall be conducted in accordance with the following methods as per EN 13771-2:2017:

- Method E as primary method
- Method B as confirming method

c. COP and SEPR determination for ACCU

To enable the systematic calculation of the SEPR for air-cooled condensing units (ACCU), the COP values shall be determined according to Annex A of standard EN 13215:2016+A1:2020 as follows:

- for fixed speed units (i.e. units without capacity control)
  - o COPA shall be determined directly from the rated refrigerating capacity QR,A and power absorbed PA measured for rating point A (no correction)
  - o COPB,cor, COPC,cor and COPD,cor shall be determined applying a corrective coefficient using formula (A.1)[2]
- for staged units (i.e. with stepwise capacity control) COP values shall be determined
  - o either by linear interpolation between the two capacity control steps on either side of the refrigerating capacity demand (no correction) using formula (A.4)[2]
  - o or, if the smallest control step of the unit is higher than the refrigerating capacity demand, by interpolation between a given capacity control step (generally the smallest one) and the off mode applying a corrective coefficient using formula (A.1)[2]
- for continuous capacity control units (i.e. units with quasi stepless capacity control) COP values shall be determined

o if the refrigerating capacity demand is achieved within ±10% ,directly (no correction) from the refrigerating capacity Q and power absorbed P values measured for the rating point in question
o otherwise as for staged units (see above).

d. capacity demand achievement criteria

The refrigerating capacity demand Qdm,j can be determined by multiplying the full load value (QR,A) with the part load ratio qj for each corresponding bin j using formulas (A.10)[2] and (A.12)[2]for LT and MT respectively.
The part load ratio to be tested shall be set according to the instructions of the manufacturer. The manufacturer shall provide laboratories with the necessary information on the setting of the unit for operating at the required capacity conditions. For inverter type control units, if the manufacturer gives
instructions for the setting of the frequency for each rating condition, this setting shall be done.
For continuous capacity control units, the declared ("rated") refrigerating capacity QR and the corresponding COP shall be determined at the closest capacity control step - or increment - of the unit to reach the refrigerating capacity demand Qdm. If this step allows to reach the refrigerating capacity demand within ± 10 % (e.g. between 8,1 kW and 9,9 kW for a target value
of 9 kW), the refrigerating capacity demand is considered as achieved and the measured COP can be used without correction.
If the unit cannot achieve the refrigerating capacity demand within ±10% by means of capacity modulation, interpolations between capacity control steps are necessary.

e. Water cooled condensing units testing

Tests on WCCDU shall be conducted with pure water.

A.III. Rating requirements

A.III.1 Rating points

Test shall be conducted for one or several (see Table 1) of the rating points (see Table 2) defined in standard EN 13215:2016+A1:2020.
Rating points in brackets are optional.

Table 1: Rating points to be tested

Application	Condenser cooling media	Rated capacity in kW	Tested points
MT	Air	[0.2 ; 5]	A, B, C, D, (2), (3)
		]5 ; 50]	A, B, C, D, (3)
	Water	[0.2 ; 50]	W1 or W2
LT	Air	[0.1 ; 2]	A, B, C, D, (2), (3)
		]2 ; 20]	A, B, C, D, (3)
	Water	[0.1 ; 20]	W1 or W2

Table 2: Rating points description (sources: EN 13215:2016+A1:2020 and Transitional method for determination of the SEPR for Air-cooled Condensing units draft dated 19 March 2012)

Condenser cooling media	Rating point	Part load ratio		Reference temperature(s) in °C
		LT	MT	
Air	A	100%		+32 ambient
	2	100%		+25 ambient
	3	100%		+43 ambient
	B	95%	90%	+25 ambient
	C	87%	75%	+15 ambient
	D	80%	60%	+5 ambient
Water	W1	100%		+40 condensing; +30 water inlet
	W2	100%		+32 gas cooler outlet; +30 water inlet

A.III.2 Sound data

Sound pressure levels at 10 m distance shall be calculated in accordance with EN 13487:2019 from the corresponding sound power level values. Even though sound pressure levels data is given for informative purposes only, consistency with certified sound power levels shall be ensured.

The sound pressure level at 10 m distance Lp10 is calculated from the sound power level Lw as follows:

$$L_{p10} = L_w - 10 \cdot \log\left(\frac{S_{10}}{S_0}\right)$$

Where:

Lp10 Average sound pressure level [dB] on an enveloping area in the shape of a parallelepiped at the distance of 10 meters from the reference box

Lw Sound power level of the tested object

S10 Area of the measurement surface [m^2] arranged at a 10 meters distance around the reference box

S0 Reference area [m^2] equal to 1 square meter. S0 =1 m2

Sound performance ratings shall be declared for:

- rating condition A for all ACCDU
- rating condition C for ACCDU with continuous capacity control
- rating condition W1 or W2 for WCCDU.

A.IV. Acceptance criteria

When tested in the laboratory the obtained performance data shall not differ from the declared values by more than the following accepted deviations:

- Rated refrigerating capacity [kW] -10 % (relative deviation)
- Sound power level [dB(A)] + 3 dB(A)
- Coefficient of Performance (COP) at full load -10 % (relative deviation)
- Seasonal Energy Performance Ratio (SEPR) -10 % (relative deviation)

The relative deviation (in %) between the measured value X_{meas} and the declared value X_{decl} is calculated as follows:

$\Delta_{rel} = (X_{meas} - X_{decl}) / X_{decl}$

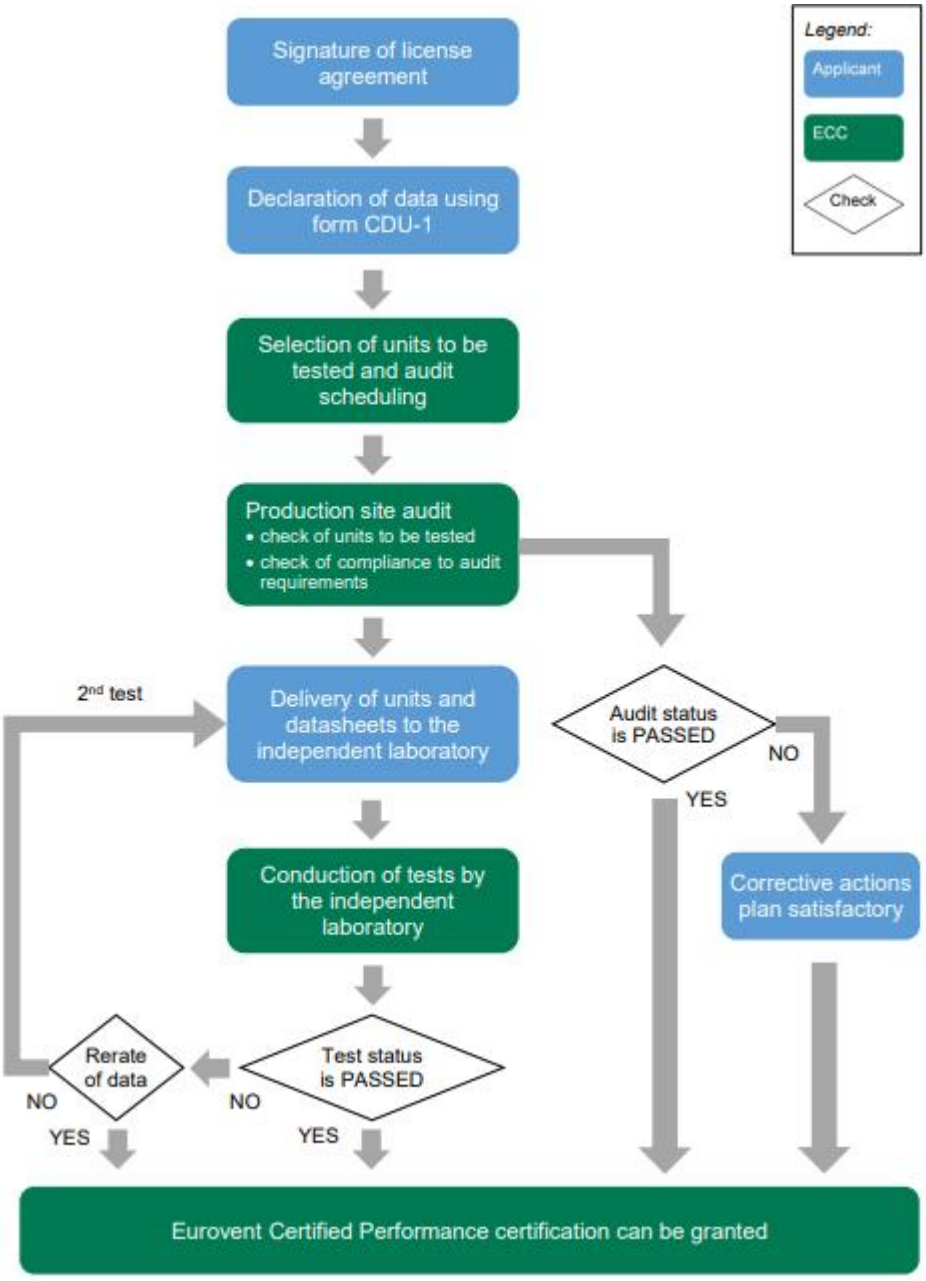
The absolute deviation between the measured value X_{meas} and the declared value X_{decl} is calculated as follows:

$\Delta_{abs} = X_{meas} - X_{decl}$

If any of individual points of measurement shows a deviation larger than the acceptable criteria, the failure shall be declared, and the failure procedure applied.

APPENDIX B. CERTIFICATION PROCESS AND SCHEDULE

B.I. Admission process



B.II. Surveillance Campaign Schedule

Certification step	Deadline
Eurovent Certita Certification asks for update of declaration file from the participant.	30/09/n-1
The participant sends the updated declaration file.	15/11/n-1
Eurovent Certita Certification sends the list of selected models to the participant and schedules the audit(s).	15/12/n-1
All payments are completed by the participant.	31/01/n
The auditor audits the participant's production site(s) and checks the units selected for testing.	31/03/n
Selected units delivery + technical datasheet transmission are completed by the participant	15/04/n
The participant sends the non-conformity corrective actions plan whenever applicable.	Deadline set up by the auditor
The auditor evaluates the corrective actions plan relevance	31/05/n
Eurovent Certita Certification sends the diploma if all requirements are fulfilled.	30/06/n
Diploma validity	30/06/n+1
All regular tests, and penalty tests when applicable, are completed and test report(s) sent by the independent laboratory to Eurovent Certita Certification	30/06/n
Eurovent Certita Certification forwards the test report together with the test report result sheet, and the test rerate form when applicable, to the participant	15/08/n
The participant can ask for second tests before	15/09/n
Rerated data is published on the ECP website (when applicable)	30/09/n
Product delivery + technical datasheet transmission + payment for second tests are completed by the participant (when applicable)	15/10/n
Second tests are completed and test report(s) sent by the independent laboratory to Eurovent Certita Certification (when applicable)	30/11/n
Eurovent Certita Certification forwards the second test report together with the test report result sheet to the participant (when applicable)	15/12/n

APPENDIX C. FORMS

C.I. Form CDU-1: Product list declaration file

The form CDU -1 (declaration file) to be filled in shall be sent by Eurovent Certita Certification to:
•applicants who have signed the license agreement,
•participants on an annual basis before the deadline specified in the Certification schedule.

A template will be available for information and upon request.

C.II. Form CDU-2: Technical Data Sheet (TDS)

The form CDU-2 (Technical Data Sheet) to be filled in shall be sent by Eurovent Certita Certification to applicants/participants who have returned the forms CDU-1 duly completed. A template will be available for information and upon request.

C.III. Form CDU-3: Test report result sheet

The form CDU-3 (Test report result sheet) shall be sent by Eurovent Certita Certification to applicants/participants together with the test report. A template will be available for information and upon request

APPENDIX D. REFRIGERANTS COVERED BY THE SCOPE

The refrigerants covered by the scope are defined in Table 6 below. The safety classification and general information about these refrigerants can be found in standard ISO 817:2014+A1:2017 and in related electronic insert(s) available on the ISO Standards maintenance portal[1].

Table 6: List of refrigerants covered by the CDU programme

Category	Reference refrigerant	Alternative refrigerants
R134a group	R134a	R1234yf; R1234ze; R450A; R451A; R451B; R513A
R290 group	R290	R1270
R448A group	R448A	R404A; R407A; R407C; R407F; R407H; R449A; R452A; R454C; R455A
R410A group	R410A	R32; R452B; R454B
R744	R744	

[1] https://standards.iso.org/iso/817/ed-3/en/

Performances on line
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