

EHPA Testing Regulation

Testing of Air/Air Heat Pumps

Terms, Test Conditions and Test Method based on EN 14825, EN 14511 and EN 12102-1

Additional requirements for granting the international quality label for heat pumps



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Revisions of the document

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1 Introduction

This regulation specifies the terms and definitions, the test conditions, the performance tests and other requirements for granting the EHPA Quality Label to air-to-air heat pumps for space heating with a **heating capacity $\leq 12 \text{ kW}$** , on the basis of the seasonal coefficient of performance SCOP.

The test conditions and testing methods described in this regulation are based on following European standards and Regulations:

- EN 12102-1,
- EN 14825,
- EN 14511 - Parts 1 to 4,
- COMMISSION REGULATION (EU) (EU) No 626/2011,
- COMMISSION REGULATION (EU) N 206/2012,
- COMMUNICATION 2018/C 092/03

and on additional specifications referenced herein.

Anything not defined in this test regulation shall be proceeded regarding the above mentioned standards and regulations.

A heat pump can be awarded with the International Heat Pump Quality Label once it is successfully tested in accordance with this regulation. The process is described in the “EHPA regulations for granting the international quality label for electrically driven heat pumps”.

This regulation has been adopted by the EHPA Quality Label Committee. Any change to it must be approved by the Committee.

2 Scope of regulation

This regulation applies to the testing of factory-made electrically driven air-to-air heat pumps for space heating with a **heating capacity $\leq 12 \text{ kW}$** , under the testing conditions given in **Chapter 7**.

For multisplit systems, the capacity ratio as defined in **EN 14511** shall be equal to 1 or as close as possible. A tolerance of $\pm 5\%$ is allowed for the capacity ratio.

Single duct and double duct air conditioners are not in the scope of this test regulation.

The performances of the heat pump shall be declared at least for the average climate defined in the EU regulations or in **EN 14825**, and optionally for the colder and/or warmer climates.

In order to qualify for the EHPA Quality Label, the heat pump submitted for testing must be from series production.

3 Reference documents

The latest edition of the reference standards (including any amendments) applies.

EN 14511:2018

Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling

- Part 1: Terms and definitions
- Part 2: Test conditions
- Part 3: Test method
- Part 4: Requirements

EN 14825:2018

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.

EN 12102-1: 2017

Air conditioners, heat pumps and dehumidifiers with electrically driven compressors – Measurement of airborne noise – Determination of the sound power level

COMMISSION DELEGATED REGULATION (EU) No 626/2011 of 4 May 2011 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of air conditioners

COMMISSION REGULATION (EU) No 206/2012 of 6 March 2012 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to Ecodesign requirements for air conditioners and comfort fans

COMMUNICATION 2018/C 092/03 of 9 March 2018: Publication of titles and references of harmonized standards for the implementation of COMMISSION REGULATION (EU) No 206/2012 and for the implementation of delegated Regulation (EU) No 626/2011.

4 Terms and definitions

The terms and definitions given in EN 14511-1, EN 14825, EN 12102-1, Regulation No 626/2011 and Regulation No 206/2012 apply.

5 Operating range

The operating range defined *by 2 boundary conditions* (upper and lower limits for the outdoor air inlet temperatures) shall be declared by the manufacturer.

6 Product information requirements

The product information required in Annex 1, clause 3 of Regulation No 206/2012 (or in Annex E of EN 14825 when revised version is published) shall be declared by the manufacturer at least for the average climate defined in the EU regulations, and optionally for the colder and/or warmer climates. This declaration includes for each climate:

- the design load, P_{designh}
- the seasonal performance, SCOP
- the operating limit temperature (TOL) and the bivalent temperature (T_{bivalent}), where applicable
- the declared capacity and COP at each test condition

7 Tests to be performed

To be granted the heat pump shall undergo the following tests:

- a. Performance tests and SCOP calculation (see **chapter 7.1**),
- b. Acoustic test (see **chapter 7.2**)
- c. Testing operating range (see **chapter 7.3**)
- d. Safety tests (see **chapter 7.4**)

7.1 Performance tests

Performance tests shall be made in accordance with **EN 14511** and **EN 14825** for the determination of the heating capacity and COP.

Test conditions are given in **Tables 1 to 3** and shall apply accordingly to the climate(s) declared by the manufacturer. Environmental conditions are as defined in **EN 14511-2**.

For all test conditions, the indoor side air wet bulb temperature shall be *maximum 15°C*.

Note:

For outdoor air dry bulb temperatures higher or equal to -7°C the wet bulb temperature equals the dry bulb temperature minus 1 K. For outdoor air dry bulb temperatures below -7°C, the wet bulb temperature is not defined.

7.1.1 Test conditions

Tests are mandatory for all conditions of **Table 1** (average climate).

Table 1 Part load conditions for reference SCOP and reference SCOPon calculation for the reference heating season "A" = average

Test condition	Part load ratio %	Outdoor air dry bulb (wet bulb) temperatures °C	Indoor air dry bulb temperature °C
A	88	-7(-8)	20
B	54	2(1)	20
C	35	7(6)	20
D	15	12(11)	20
E ¹	$(TOL-16)/(T_{designh}-16)$	TOL	20
F ¹	$(T_{bivalent}-16)/(T_{designh}-16)$	$T_{bivalent}$	20

¹ Applies if different from conditions A, B, C or D

If performances for the warmer climate are declared, tests in conditions of **Table 2** are mandatory as follows:

1. Fixed capacity unit : test conditions E and F, where applicable
2. Variable or staged capacity unit: two test conditions randomly chosen by the National Commission including test condition F where applicable

Table 2 Part load conditions for reference SCOP and reference SCOPon calculation for the reference heating season "W" = warmer

Test condition	Part load ratio %	Outdoor air dry bulb (wet bulb) temperatures °C	Indoor air dry bulb temperature °C
B	100	2(1)	20
C	64	7(6)	20
D	29	12(11)	20
E ¹	$(TOL-16)/(T_{designh}-16)$	TOL	20
F ¹	$(T_{bivalent}-16)/(T_{designh}-16)$	$T_{bivalent}$	20

¹ Applies if different from conditions B, C or D

If performances for the colder climate are declared, tests in conditions of **Table 3** are mandatory as follows:

1. Fixed capacity unit :
 - a. test conditions F and G, where applicable
2. Variable or staged capacity unit:
 - a. one test condition among A, B, C and D randomly chosen by the National Commission
 - b. test conditions F and G, where applicable

Table 3 Part load conditions for reference SCOP and reference SCOPon calculation for the reference heating season “C” = colder

Test condition	Part load ratio %	Outdoor air dry bulb (wet bulb) temperatures °C	Indoor air dry bulb temperature °C
A	61	-7(-8)	20
B	37	2(1)	20
C	24	7(6)	20
D	11	12(11)	20
E ¹	$(TOL-16)/(T_{designh}-16)$	TOL	20
F ¹	$(T_{bivalent}-16)/(T_{designh}-16)$	$T_{bivalent}$	20
G	82	-15	20

¹ Applies if different from conditions A, B, C, D or G

7.1.2 Electric power consumptions

The following electric power consumptions shall be measured according to **EN 14825**:

- electric power consumption during thermostat off mode
- electric power consumption during standby mode
- electric power consumption during crankcase heater mode
- electric power consumption during off mode

7.1.3 Determination of the degradation coefficient

If the manufacturer declares a degradation factor different from the default value $C_d = 0,25$, the degradation factor shall be determined according **EN 14825**.

7.1.4 Test method

The air-to-air heat pump performance shall be determined using the calorimeter room method and the testing shall be made according to **EN14511-3** with the additional following requirements.

7.1.4.1 Refrigerant charge

Prefilled units in factory can be delivered as produced, if no additional refrigerant charge is required for testing installation.

If the heat pump is delivered filled with nitrogen and shall be charged with refrigerant by the test laboratory, then the refrigerant type and charge shall be as specified in the technical data (nameplate or technical documentation) provided by the manufacturer.

7.1.4.2 Fixed capacity units

For fixed capacity units, the thermostat temperature shall be set at the highest value to force the unit to operate continuously with no On/Off cycling of the compressor.

7.1.4.3 Variable and staged capacity units

For variable and staged capacity units, the setting of the controls (stage, frequency of the compressor ...) shall be done for each test condition as specified by the manufacturer.

7.1.4.4 Maximum uncertainty regarding COP measurement

The COP for any test condition described above shall be measured with a maximum uncertainty of:

- $\pm 8\%$ if the measured capacity is greater than or equal to 2 kW;
- $\pm 10\%$ if the measured capacity is greater than or equal to 1 kW and lower than 2 kW;
- $\pm 15\%$ if the measured capacity is lower than 1 kW.

7.1.5 Calculation of SCOP

The heat pump being granted on the basis of the SCOP value, the test centre shall calculate the reference $SCOP_{on}$ and reference SCOP for the average climate and for the warmer/colder climate(s) where appropriate and report it (or them).

Calculations shall be made by using EHPA Excel tool, based on the calculation methodology as described in **EN 14825**.

7.1.6 Conditions and tolerances for granting EHPA Quality Label

For granting the EHPA Quality label to an air-to-air heat pump, the energy efficiency class of the unit for all climates declared by the manufacturer shall be at least A,

i.e. the SCOP value shall not be lower than 3.4.

In addition, the SCOP measured for the Average climate shall not differ by more than – 8% from the claimed value.

For other climates, COP measured in the test conditions described above shall not differ more than – 8% from the claimed value.

7.2 Commissioning and start of testing

Once the test item has been put into operation on the test bench, the manufacturer/customer approves the test personnel before the start of the test. This is documented in writing in the form of a signed handover protocol between manufacturer/customer and test personnel.

Minimum content of the test protocol:

- Manufacturer / type / serial number of the test specimen
- Firmware/Software Version of the controller
- Condition of test specimen
- Commissioning Operating point
- Date of transfer
- Confirmation that the manufacturer/customer has no access to the device under test (controller) and no access to the test room during the test
- Signatures

After the test item has been handed over and released for testing, it must be ensured that only the personnel of the accredited test centre have access to the test item (controller) and the test bench during the test and that the test room can only be entered by test personnel. Exceptions are incidents that occur during the test. Any access or entry that is not made by the test personnel must be documented in the test report.

Frequency of compressor should be sent to the test lab and guidance for the test.

7.3 Sound power level measurement

7.3.1 Test conditions

Measurement of the sound power level of the heat pump shall be performed according to the European standard **EN 12102-1** at the standard rating test condition defined in **EN 14511** using Class A method.

According to the type of heat pump, the following sound power levels shall be measured:

1. Package unit, outdoors installation
 - a. LW_o sound power level radiated by the outdoor side casing
 - b. LW_{di} sound power level through the discharge duct
2. Package unit, indoors installation
 - a. LW_{do} sound power level through the discharge duct, without duct end correction
 - b. LW_i or LW_{di} sound power level radiated by the indoor side casing or sound power level through the discharge duct
3. Split unit
 - a. LW_o sound power level radiated by the outdoor side casing
 - b. LW_i or LW_{di} sound power level radiated by the indoor side casing or sound power level through the discharge duct

For units having defrost cycles at the reference test condition, the acoustic test is performed with humidity control of the air inlet so that no cycling operation of the unit occurs during the test.

7.3.2 Tolerances for granting EHPA Quality Label

Sound measurements shall not differ by more than + 2 dB(A) from the claimed values.

7.4 Testing the operating range

The tests at the boundary limits are intended to show whether the heat pump is fully functional and operable in the warranted operating range stated by the manufacturer.

For checking the operating range, four boundary test conditions are defined, including the test conditions specified in **EN 14511-4** clause 4.2.1, as specified in **Table 7**:

7.3.1.1 **Table 7 – Boundary test conditions for testing the operating range**

Test condition n°	Recycled air inlet dry bulb temperature	Outdoor air inlet temperature
1	20 °C	Upper limit
2	20 °C	Lower limit

If the manufacturer declares a lower limit for the outdoor air inlet temperature below -20°C, then the test will be performed at the minimum temperature of -20°C.

In the test report, both the outdoor lower temperature declared by the manufacturer and the temperature used for the test shall be specified if different.

Test shall be conducted at nominal voltage.

The heat pump shall start and remain in operation for at least 30 minutes without external interference and without being shut off by a safety device.

During the tests, the permissible deviations as stated in **EN 14511-4** clause 4.2.1.1 table 1 apply.

There shall be no damage to the heat pump throughout the entire test.

7.5 Safety tests

The safety tests check if the safety devices respond correctly to operational malfunctions and protect the heat pump from damage.

The safety devices are tested by simulating operational malfunctions during normal heat pump operation, as follows:

- 1 Shutting off the heat transfer medium flows (see **EN 14511-4** clause 4.5)
- 2 Complete power supply failure (see **EN 14511-4** clause 4.6)
- 3 Condensate draining and enclosure sweat test (see **EN 14511-4** clause 4.7)
- 4 Defrosting 4.7 (see **EN 14511-4** clause 4.x)

Reference test conditions specified in **EN 14511-2** shall be used for the safety tests.

8 Test report Level 1 (disclosure status: private)

Production of this test report by the heat pump test centre is part of the overall test procedure. The report is sent only to the manufacturer or the customer who has ordered the tests.

The heat pump test centre is allowed to publish the test results only if the applicant has approved such publication with an authorized signature.

This test report level 1 shall specify the version of the testing regulation and of the related standards that have been applied.

It shall contain all test documents and fulfil the requirements in **EN 14825** and **EN 12102-1**.

8.1 General Information on the testing institute

- Date
- Name of the testing institute
- Test location
- Test supervisor
- Test number
- References for properties of fluids
- Test methods and reference to **EN standards**
- References to the **EHPA regulation** and version

8.2 Technical datasheet

- Name of the customer (usually the manufacturer)
- Machine type, designation
- Serial number (if not available, compressor serial number)
- Brief description of the design (including if indoor and outdoor sides are ducted or not)
- Information on the components, such as compressor type, heat exchanger type, expansion valve type, etc.
- Year of production
- Photos of the machine
- Dimensions and weight of the heat pump
- Type and charge of refrigerant:
- GWP value of the refrigerant (as required by the **EU Ecolabel, 2007/742/EC**)

8.3 Performance tests

The report shall include:

- a description of the heat pump tested including all settings, such as thermostat, fan and pump speeds and capacity control settings where applicable
- all data recorded as specified in **EN 14511-3** for the different test conditions given in Tables 1 to 3, where applicable
- SCOP values for the climates declared by the manufacturer

8.4 Sound measurement

- Specific requirements for installation of the tested model(s), where applicable
- acoustic test method
- measured sound power level(s)

8.5 Operating range and safety tests

- Operating range tests passed or failed
- Safety test passed or failed

9 Inspection of documentation provided by the manufacturer

9.1 Marking

Each heat pump shall have a durable, permanently fixed marking that is easily readable when the unit is in position for use, bearing at least the information required by the safety standards. If the heat pump consists in several parts the information shall be marked on each of these parts with the model designation of the complementary parts.

The nameplate shall include the following information:

- Manufacturer or supplier
- Model designation and serial number

9.2 Energy efficiency label and product fiche

The energy efficiency label delivered with the heat pump and the product fiche described in **Regulation (EU) No 626/2011** shall be checked against the requirements of the Regulation.

9.3 Documentation

The documentation shall be checked against the production information as described in **Chapter 0**.