

# EHPA Testing Regulation

## Testing of Water (Brine) /Water Heat Pumps

**Terms, Test Conditions and Test Methods based on  
EN 14825, EN 14511-1 to 4 and EN 12102**

**Additional requirements for granting the international  
quality label for heat pumps**



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## Revisions of the document

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2.0	July 2015	Initial version		-	M. Mondot
2.1	April 2016	Table of modifications	-	page 2	M. Mondot
		Suppression of the transitional period		page 4	
		Dates of the applicable standards	3	page 4	
		Clarification of the determination of water flow rates	6.1	page 6	

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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 water-to-water and brine-to-water heat pumps for space heating.

The test conditions and testing methods and requirements described in this regulation are based on the European standards EN 12102, EN 14825 and EN 14511 - Parts 1 to 4 and on additional specifications referenced herein. Anything not defined in this test regulation shall be considered regarding EN 14825, EN 14511 and EN 12102.

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 changes to them must be approved by the Committee.

## 2 Scope of the regulation

This regulation applies to the testing of factory-made electrically driven water(brine)-to-water heat pumps for space heating.

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 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

### **EN 14511: 2013**

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 12102: 2013**

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

## 4 Terms and definitions

The terms and definitions given in EN 14825, EN 14511-1 and EN 12102 apply.

## 5 Performance data to be declared by the manufacturer

When applying for the EHPA Quality label for water(brine)-to-water heat pumps, the manufacturer shall provide the performance data for all climates which are declared for the Energy Labelling, i.e.;

- Average, colder and warmer,

- or
- Average and warmer.

The performance data to be declared on the application form are as follows:

1. Temperature application : low-temperature and/or medium temperature
2. Fixed water flow / variable water flow
3. Fixed outlet temperature / variable outlet temperature
4. Electric power consumptions in other modes than active mode :  $P_{OFF}$ ,  $P_{SB}$ ,  $P_{TO}$  and  $P_{CK}$
5. Per Climate
  - a.  $P_{designh}$  at  $T_{designh}$
  - b. Bivalent temperature,  $T_{bivalent}$ , where applicable
  - c. Type of back up heater : electric or fossil fuel, where applicable
  - d. Performance data for test conditions A to F according to Table 1
  - e.  $SCOP_{on}$  and SCOP

**Table 1 – Performance data for each climate / temperature application to be declared by the manufacturer**

Test condition	Climate Outdoor temperature °C <sup>1</sup>	Water source temperature °C	Brine source temperature °C	Outlet water temperature °C	Declared capacity DC (kW)	Declared COP COP <sub>d</sub>	Degradation coefficient C <sub>dh</sub> <sup>2</sup>
A	-7	10/*	0/*				
B	2	10/*	0/*				
C	7	10/*	0/*				
D	12	10/*	0/*				
E	$T_{designh}$	10/*	0/*				
F	$T_{bivalent}$	10/*	0/*				

<sup>1</sup> The outdoor temperature is defining the part load ratio to be used for the corresponding test condition

<sup>2</sup> where applicable, because of On/Off capacity cycling

## 6 Tests to be performed

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

- a) Performance tests (see chapter 7.1)
- b) Seasonal performance tests and SCOP calculations (see chapter 7.2),
- b) Acoustic test (see chapter 7.5)
- c) Testing operating range (see chapter 7.6)
- d) Safety tests (see chapter 7.7).

### 6.1 Performance tests

Performance tests shall be made in accordance with EN 14511 for the determination of the heating capacity and COP at the test conditions given in Table 2.

**Table 2 – Test conditions for performance tests**

Temperature application	N°	Test condition	Heat source		Heat sink	
			Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)
Low temperature	1	W10/W35	10	7	30	35
	2	B0/W35	0	-3	30	35
Medium temperature	3	W10/W55	10	7	47	55
	4	B0/W55	0	-3	47	55

Performance test n°1 or n°2 is required for fulfilling the minimum COP requirement of the EHPA Quality Label.

Performance test n°1 or n°2 is required for units with fixed flow rate to determine the water flow rate for seasonal performance tests at low temperature application.

Performance test n°3 or n° 4 is required for units with fixed flow rate to determine the water flow rate for seasonal performance tests at medium temperature application, where applicable.

### 6.2 Seasonal performance tests and SCOP calculation

#### 6.2.1 Declared capacity and COP

##### 6.2.1.1 Average climate – One temperature application

The seasonal performance tests shall be performed in all the A to F conditions, where applicable, as specified in Table 1 and in accordance with EN 14825.

##### 6.2.1.2 Average climate – Other temperature application

If the manufacturer declares the heat pump space heater to operate at both low-temperature and medium temperature application, then additional tests shall be performed on a random basis for the second temperature application.

The tests shall include:

- 1) Performance tests according to Table 2, to determine the water flow rate where applicable
- 2) Test at  $T_{bivalent}$ , where applicable
- 3) Randomly selected by the test centre: one additional test conditions among A, B, C, D and  $T_{designh}$  from Table 1 and different from  $T_{bivalent}$ , or two test conditions if no  $T_{bivalent}$ .

If the measured capacity at  $T_{\text{bivalent}}$  is not fulfilling the tolerances given in 7.4.2, then it is considered that the declared data  $P_{\text{designh}}$  and  $T_{\text{bivalent}}$  are not consistent and the tests are stopped.

### 6.2.1.3 Warmer climate – same temperature application as for average climate

The manufacturer shall declare performance data,  $SCOP_{\text{on}}$  and SCOP for warmer climate, and additional tests are performed on a random basis to grant the label for this climate, as follows:

- 1) Randomly selected by the test centre: one test conditions among A to F from Table 1

### 6.2.1.4 Colder climate – same temperature application as for average climate

If the manufacturer declares perform data,  $SCOP_{\text{on}}$  and SCOP for colder climate, additional tests are performed on a random basis to grant the label for this climate, as follows:

- 1) Randomly selected by the test centre: One test conditions among  $T_{\text{bivalent}}$  and  $T_{\text{designh}}$
- 2) Randomly selected by the test centre: One additional test conditions among A to F from Table 1

If the measured capacity at  $T_{\text{bivalent}}$  is not fulfilling the tolerances given in 7.4.2, then it is considered that the declared data  $P_{\text{designh}}$  and  $T_{\text{bivalent}}$  are not consistent and the tests are stopped.

## 6.2.2 Electric power consumptions

For average climate, the following electric power consumptions shall be measured according to EN 14825:

- electric power consumption during thermostat off mode,  $P_{\text{TO}}$
- electric power consumption during standby mode,  $P_{\text{SB}}$
- electric power consumption during crankcase heater mode,  $P_{\text{CK}}$
- electric power consumption during off mode,  $P_{\text{OFF}}$

### 6.2.3 Determination of the degradation coefficient

If the manufacturer declares a degradation coefficient different from the default value  $C_{\text{dh}} = 0,9$  the degradation coefficient shall be determined according EN 14825.

### 6.2.4 SCOP calculations

The heat pump being granted on the basis of the SCOP values, the test centre shall calculate the  $SCOP_{\text{on}}$  and SCOP for the average climate and for the warmer/colder climate 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.

## 6.3 Test methods

Testing shall be made according to EN 14825 and EN 14511-3 with the additional following requirements:

### 6.3.1 Refrigerant charge

Prefilled units in factory can be delivered as produced, if no additional refrigerant charge is required for testing installation. This is valid only if the factory has a control procedure for the refrigerant charging.

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.

### 6.3.2 Fixed capacity units

For fixed capacity units, the thermostat temperature shall be set at the highest value to force the unit to operate continuously, except in case of cycling tests for the determination of the degradation coefficient.

### 6.3.3 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.

## 6.4 Tolerances on performance data

### 6.4.1 Performance data

The declared performance data, as specified in Table 2, shall be considered valid if the values are not deviating by more than +5% from the measured capacity and COP values.

In case of larger deviations, the measurements for SCOP calculation are not performed.

### 6.4.2 Seasonal performance data

For the conditions A to F from Table 1 to be tested, the declared capacities and COP shall not differ by more than +8% from the measured values.

For climates and/or temperature application for which only random tests are performed, all declared performance data shall be considered valid if the above requirement is fulfilled.

### 6.4.3 SCOP<sub>on</sub> and SCOP calculations

Declared SCOP<sub>on</sub> and SCOP values for any climate and/or temperature application shall not deviate by more than 8% from the calculated values.

## 6.5 Sound power level measurement

Measurement of the sound power level of the heat pump shall be performed according to the European standard EN 12102, using Class A method, at the highest temperature application for which the unit shall be granted.

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

1. Package unit, outdoors
  - a.  $LW_o$  sound power level radiated by the outdoor side casing
2. Package unit, indoors
  - a.  $LW_i$  sound power level radiated by the indoor side casing
3. Split unit
  - a.  $LW_o$  sound power level radiated by the outdoor side casing
  - b.  $LW_i$  sound power level radiated by the indoor side casing, only if the compressor is part of the indoor unit.

The manufacturer shall declare both sound power levels of the unit when using water and brine as heat source, where applicable.

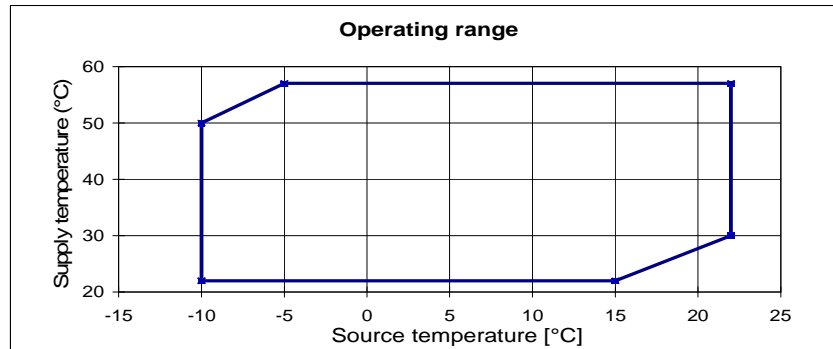
If the unit is declared to operate either with brine or water as heat source, the test centre will randomly choose one or the other heat source for performing the acoustic test.



## 6.6 Testing the operating range

The operating range defined by a maximum of 6 boundary conditions shall be declared by the manufacturer.

Figure 1 provides an example of an operating range declared by the manufacturer.



**Figure 1: Example of operating range defined by the manufacturer**

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 units that are designed to use either water or brine as heat source, testing the operating range is only required with brine as heat source.

The manufacturer shall specify that the unit includes a safety device to prevent freezing of the evaporator when the heat pump operates with water as heat source.

### 6.6.1 Test conditions

For checking the operating range, three boundary test conditions are defined, including the test conditions specified in EN 14511-4 clause 4.2.1, as specified in Table 3:

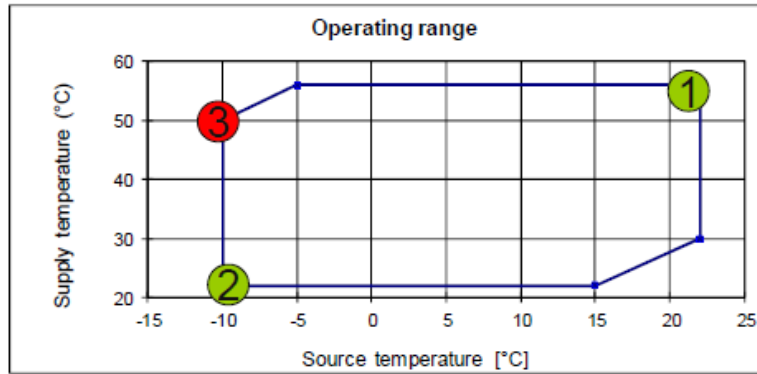
**Table 3 – Boundary test conditions for testing the operating range**

Test condition n°	Inlet water (brine) temperature at the outdoor heat exchanger	Outlet water temperature at the indoor heat exchanger (*)	Water (brine) flow rate at the outdoor heat exchanger	Water flow rate at the indoor heat exchanger
1	Upper limit	Upper limit	Max.	Max.
2	Lower limit	Lower limit	Min.	Min.
3	Lower limit	Upper limit	Min	Max.

(\*) limited by the given air inlet temperature upper or lower limit.

Test shall be conducted at nominal voltage.

Minimum and maximum water and brine flow rates shall be declared by the manufacturer, accordingly with EN 14511-4 clause 6.4.



**Figure 2: Example of the three boundary limits to be tested for a given operating range**

### 6.6.2 Test sequence

For the boundary test condition n°2, 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.

For the boundary test conditions n°1 and 3, the heat pump shall start and remain in operation for at least 60 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 apply.

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

### 6.7 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 4.4)
- 2 Complete power supply failure (see EN 14511-4 clause 4.5).

Test conditions for low temperature applications, as specified in Table 1, shall be used for the safety tests.

Safety tests shall be performed in accordance with EN 14511-4 procedures given in Clause 4.4 and 4.5.

For units that are designed to use either water or brine as heat source, the safety tests are only required on the unit with brine as heat source.

## 7 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 14511-3, EN 14825 and EN 12102.

## 7.1 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

## 7.2 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
- 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)

## 7.3 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. It shall include all data recorded as specified in EN 14511-3 Table 6, and EN 14825 for the different test conditions given in Tables 1 and 2, where applicable.

## 7.4 Sound power level measurement

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

## 7.5 Operating range and safety tests

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

# 8 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.

The nameplate shall include the following information:

- Manufacturer or supplier
- Model designation and serial number
- Type and filling weight of the refrigerant

As heating capacities and COPs are dependant of the test conditions and of the different possible matching of the two parts of a split unit, these performances shall be indicated in the technical documentation of the manufacturer.