EHPA Testing Regulation

Testing of Direct Exchange Ground Coupled/Water Heat Pumps

Terms, Test Conditions and Test Methods based on EN 15879-1, EN 14825 and EN 12102

Additional requirements for granting the international quality label for heat pumps

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Revisions of the document

Version	Date	Main changes	Clause	Page	Author
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	

Contents

1 Introduction

This regulation specifies terms and definitions, the test conditions, the performance tests and other requirements for granting the EHPA Quality Label for direct exchange ground coupled-to-water heat pumps for space heating (DX-to-water units).

The test conditions and testing method described in this regulation are based on the European standard EN 15879-1 and EN 12102 and on additional requirements referenced herein.
Even though DX-to-water heat pumps are not in the scope of EN 14825, the methodology and test procedure specified in this standard can be used for assessing the seasonal performance of DX-to-water heat pumps. Anything not defined in this regulation shall be proceeded regarding EN 15879-1 and EN 14825.

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 regulation

This regulation applies to the testing of electrically driven direct exchange ground coupled-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 15879-1: 2011
Testing and rating of direct exchange ground coupled heat pumps with electrically driven compressors for space heating and/or cooling – Part 1 : Direct exchange-to-water heat pumps

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 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 15879-1, EN 14825 and in EN 12102 apply with the followings:

Operating range
The working range for the heat pump as specified by the manufacturer and covered by full manufacturer warranty.

5 Performance data to be declared by the manufacturer

When applying for the EHPA Quality label for DX-to-water heat pumps, the manufacturer shall provide the performance data for all climates as defined in regulation 811/2013 where applicable to the unit, 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[1]	Brine bath temperature °C	Outlet water temperature °C	Declared capacity DC (kW)	Declared COP COP_d	Degradation coefficient Cdh[2]
A	-7	4/*				
B	2	4/*				
C	7	4/*				
D	12	4/*				
E	$T_{designh}$	4/*				
F	$T_{bivalent}$	4/*				

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 test and SCOP calculations (see chapter 7.2)
c) Acoustic test (see Chapter 7.5)
d) Testing operating range (see Chapter 7.6)
e) Safety tests (see Chapter 7.7)

6.1 Performance tests

Performance tests shall be made in accordance with EN 15879-1 for the determination of the heating capacity and COP at the test conditions specified in Table 2.

Environmental conditions are as defined in EN 15879-1.

[1] The outdoor temperature is defining the part load ratio to be used for the corresponding test condition
[2] where applicable, because of On/Off capacity cycling

Table 2 – Test conditions for performance tests

Temperature application	N°	Heat source	Heat sink	
		Brine bath temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)
Low temperature	1	4	30	35
Medium temperature	2	4	47	55

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

Performance test n°1 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°2 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 $T_{bivalent}$ is not fulfilling the tolerances given in 7.4.2, then it is considered that the declared data $P_{designh}$ and $T_{bivalent}$ 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, $SCOP_{on}$ 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 in Table 1

6.2.1.4 Colder climate – same temperature application as for average climate

If the manufacturer declares perform data, $SCOP_{on}$ 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 $T_{bivalent}$ and $T_{designh}$

2) Randomly selected by the test centre: One additional test conditions among A to F in Table 1

If the measured capacity at $T_{bivalent}$ is not fulfilling the tolerances given in 7.4.2, then it is considered that the declared data $P_{designh}$ and $T_{bivalent}$ 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_{TO}
- electric power consumption during standby mode, P_{SB}
- electric power consumption during crankcase heater mode, P_{CK}
- electric power consumption during off mode, P_{OFF}

6.2.3 Determination of the degradation coefficient

If the manufacturer declares a degradation coefficient different form the default value Cdh = 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 $SCOP_{on}$ 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 15879-1 and EN 14825 with the following additional requirements.

6.3.1 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.

6.3.2 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 in 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 $SCOP_{on}$ and SCOP calculations

Declared $SCOP_{on}$ 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 radiated by the casing of the heat pump module shall be performed according to EN 12102, using Class A method and EN 15879-1 in the following test conditions:

- Brine bath temperature : 4°C
- Heat sink temperature: highest temperature application for which the unit shall be granted

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

1. Package unit, outdoors installation
    a. *LW*o sound power level radiated by the outdoor side casing

2. Package unit, indoors installation
    a. *LW*i sound power level radiated by the indoor side casing

6.6 Testing operating range

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

Testing the operating range shall be performed according to EN 15879-1 clause 7.1 and at the test conditions given in the corresponding Table 8.

For each boundary test condition, the heat pump shall remain in operation for at least 60 minutes without external interference and without being shut off by a safety device.
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.

Safety tests shall be performed in accordance with EN 15879-1 clause 7.2.

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 given in EN 15879-1, EN 14825 where applicable 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 data sheet

- Name of the customer (usually the manufacturer)
- Machine type, designation
- Serial number (if not available, compressor serial number)
- Brief description of the design: Number and length of the ground loops, connecting lines, …
- 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 mass 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, pump speed and capacity control settings where applicable.
It shall include all data recorded as specified in EN 15879-1 Table 7 and EN 14825 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 test 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 as required in EN 15879-1 clause 9.