




Heat Pump KEYMARK

Annex A
HP-KEYMARK testing conditions and rating rules


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Date	Description of modification	Revision number
14/12/2015	Initial version	1
10/03/2017	Addition of air/air Editorial changes Annex E included in Annex A – reference to prEN12102-2 suppressed – Reference to EN 15979-1 is added – rating process chart was added – one testing point is added for periodic control test – periodic control test selection has been modified	2
12/09/2017	SCOP tool usage details Editorial changes Safety test for domestic hot water heat pumps Periodic surveillance process and rating rules have been modified	3
07/03/2018	Addition of “one off admission testing approach” Precisions on 4 way valves in type definition Addition of nominal point for air/air heat pumps Safety tests have been renamed “operating test” Addition of operating test in the surveillance process Operating tests EN14511-4 have been updated according EN14511-4 revision Clarification of admission sample process Correction of Pes tolerance Clarification of surveillance test matrix table 4 Chart 1 is deleted	4
13/09/2018	Addition of space cooling testing requirements for water-based heat pumps Addition of non-heated space air heat source for domestic hot water heat pumps Update of EN12102-1 standard	5
19/03/2019	Re-organisation: other sections than test description and rating rules are moved to scheme rules Hours to be considered for SEER calculation for water based heat pumps Operating test for DHW heat pump for surveillance test is corrected Introduction of testing conditions for gas heat pumps and hybrid heat pumps	6
24/09/2019	Addition of part D: CO ₂ heat pumps Addition of bin hours for the cooling mode	7
17/03/2021	Addition of part E with specific requirements for models within the same subtype not showing the same performance Clarification of acoustic test Errors in the rating rules are corrected +	8

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	Clarification of DHW testing standards for hybrid heat pumps Addition of tolerance on $P_{dh}(T_j)$	
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PART A: Electrically driven heat pump

1. Tests description

1.1. Space heating tests

1.1.1. All types except air to air type

1.1.1.1. Space heating low temperature application

The testing points to be performed are the following:

- a) A7/W35; A20/W35; B0/W35; W10/W35 according to EN 14511-2 and E4/W35 according to EN 15879-1.
- b) Bivalent temperature condition according to EN 14825 for average climate
- c) One other testing condition to be chosen by the certification body according to EN 14825 for average climate
- d) For any other climate, bivalent temperature condition shall be tested according to EN 14825

For water (brine)/water type, in case brine and water as heat source are declared, only one heat source shall be tested. The heat source to be tested is chosen by the certification body.

For exhaust air heat pump, the applicant shall declare the exhaust air volume flow that shall be used for space heating test.

1.1.1.2. Space heating medium temperature application

The testing points to be performed are the following:

- a) A7/W55; A20/W55; B0/W55; W10/W55 according to EN 14511-2 and E4/W55 according to EN 15879-1.
- b) Bivalent temperature condition according to EN 14825 for average climate
- c) One other testing condition to be chosen by the certification body according to EN 14825 for average climate
- d) For any other climate, bivalent temperature condition shall be tested according to EN 14825

For water (brine)/water type, in case brine and water as heat source are declared, only one heat source shall be tested. The heat source to be tested is chosen by the certification body.

For exhaust air heat pump, the applicant shall declare the exhaust air volume flow that shall be used for space heating test.


1.1.2. Air to air type

The testing points to be performed are the following:

- a) Bivalent temperature condition according to EN 14825 for average climate
- b) One other testing condition to be chosen by the certification body according to EN 14825 for average climate
- c) For any other climate, bivalent temperature condition shall be tested according to EN 14825
- d) As an option, A7/A20 according to EN 14511-2 can also be tested

1.2. Space cooling tests

1.2.1. All type except air to air

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SEER and $P_{designc}$ for +7°C/+12°C and/or +18°C/+23°C applications can be certified as an option.

The testing points to be performed for the certified application are the following:

- a) "A" testing condition according to EN 14825;
- b) One other testing condition to be chosen by the certification body according to EN 14825

If both +7°C/+12°C and/or +18°C/+23°C applications are certified, the test shall be performed as described above for both applications.

If both water and brine as heat source are certified, tests shall be carried out with either brine or water as heat source; the heat source being chosen by the certification body.

For exhaust air heat pump, the applicant shall declare the exhaust air volume flow that shall be used for space cooling test.

1.2.2. Air to air type

The testing points to be performed are the following:

- a) Test condition "A" according to EN 14825
- b) One other testing condition to be chosen by the certification body according to EN 14825

1.3. Sound power level tests

1.3.1. All types of space heater except air to air type

Tests shall be performed according to EN 12102-1 for average climate at the certified highest temperature application.

For combination heat pumps certified for brine and water as heat source, the acoustic test is carried out using brine.

In case the heat pump is made of an indoor and an outdoor units, both outdoor and indoor units shall be tested.

1.3.2. Air to air type

Tests shall be performed according to EN 12102-1. Both outdoor and indoor units shall be tested where relevant. For package units, both outdoor and indoor sound power levels shall be measured.

1.3.3. Heat pump for hot water only

Tests shall be performed for average climate according to EN 12102-2 and with the same heat source as for performance tests.

Both outdoor and indoor units shall be tested where relevant.


1.4. Hot water tests

1.4.1. Combination heat pump

Tests shall be performed according to EN 16147 for average climate.

Tests may also be performed according to EN 16147 for any other declared climate.

The tests shall be performed for the load profiles as declared by the applicant for each declared climate.

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For water (brine)/water type, in case brine and water as heat source are declared, only one heat source shall be tested. The heat source to be tested is chosen by the certification body.

For exhaust air heat pump, the applicant shall declare the exhaust air volume flow that shall be used for hot water test.

1.4.2. Heat pump for hot water only

Tests shall be performed according to EN 16147 for average climate.

Tests may also be performed according to EN 16147 for any other declared climate.

The tests shall be performed for the load profiles as declared by the applicant for each declared climate.

For hot water heat pumps that can operate with several air sources (outdoor air, exhaust air; indoor air; brine, water) only one heat source shall be tested. The heat source to be tested is chosen by the certification body.

As an option, heat pump for domestic hot water can also be tested using non-heated space air conditions, i.e. +15°C (+12°C). The test under non-heated space air condition shall be conducted in addition to the test performed using a heat source defined in regulation 814/2013.

For exhaust air heat pump, the applicant shall declare the exhaust air volume flow that shall be used for hot water test.

1.5. Operating tests

1.5.1. Space heating and cooling heat pump

Operating tests shall be performed according to EN 14511-4 as follows:

- Starting and operating tests
- shutting off the heat transfer medium flows,
- Complete power supply failure.

In case the heat pump can be used with brine or water, only one heat source (brine or water) shall be tested.

For direct exchange type, operating tests shall be carried out according to EN 15879-1 sections as follows:

- chapter 7.1 starting tests according to Table 8
- chapter 7.2.2 pressure drop
- chapter 7.2.3 shutting off the heat transfer medium flow
- chapter 7.2.4 complete power supply failure

1.5.2. Heat pump for hot water only

Operating test shall be performed according to EN 16147:

- 8.1.: temperature operating range
- 8.3.: safety devices checking test
- 8.4.: condensate draining

1.6. SCOP and SEER calculations

For SCOP and/or SEER calculations, certification bodies shall use the calculation tools approved by the HPSG.



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For water based heat pump also certified in cooling mode, the following hours shall be used for the SEER calculation:

j #	T _j °C	h _j h
1	17	205
2	18	227
3	19	225
4	20	225
5	21	216
6	22	215
7	23	218
8	24	197
9	25	178
10	26	158
11	27	137
12	28	109
13	29	88
14	30	63
15	31	39
16	32	31
17	33	24
18	34	17
19	35	13
20	36	9
21	37	4
22	38	3
23	39	1
24	40	0

Mode	Symbol	Hours
Active mode	H _{HE}	600
Off mode	P _{off}	0
Thermostat off mode	P _{to}	659
Standby mode	P _{sb}	1377
Crankcase heater mode	P _{ck}	2036

2. Tests to be performed at admission

2.1. All types except air to air type

2.1.1. Low temperature heat pump

- Space heating tests for low temperature application
- Sound power level tests
- Operating tests
- Cooling tests shall be performed in case cooling performance are to be certified

2.1.2. Medium temperature heat pump



- Space heating tests for low and for medium temperature applications
- Sound power level tests.
- Operating tests
- Cooling test shall be performed in case cooling performance are to be certified

2.1.3. Combination heat pump

- Space heating tests for medium temperature application
- Hot water tests
- Sound power level tests
- Operating tests
- Space heating tests for low temperature application in case the low temperature application is to be certified
- Cooling tests shall be performed in case cooling performance are to be certified

2.1.4. Heat pump for hot water only

- Hot water tests
- Sound power level tests
- Operating tests

2.2. Air to air type

2.2.1. Air to air heat pump for space heating only

- Space heating tests
- Sound power level tests in heating mode for average climate
- Operating tests in heating mode

2.2.2. Air to air heat pump for space cooling only

- Space cooling tests
- Sound power level tests in cooling mode
- Operating tests in cooling mode

2.2.3. Air to air heat pump for space heating and cooling

- Space cooling tests
- Space heating tests
- Sound power level tests in cooling mode
- Operating tests in cooling mode

3. Test to be performed for surveillance tests

3.1. All types except air to air type

3.1.1. Low temperature heat pump

- Space heating tests for low temperature application
- Sound power level tests
- Operating tests: The test is to be chosen by the certification body among the two following tests: "Shutting off the heat transfer medium flow" and "complete power supply failure"
- Cooling tests shall be performed in case cooling performance are certified. In case both +7°C/+12°C and +18°C/+23°C applications are certified, only one of them is tested

3.1.2. Medium temperature heat pump

- Space heating tests for low OR for medium temperature application



- Sound power level tests
- Operating tests: The test is to be chosen by the certification body among the two following tests: “Shutting off the heat transfer medium flow” and “complete power supply failure”
- Cooling tests shall be performed in case cooling performance are certified. In case both +7°C/+12°C and +18°C/+23°C applications are certified, only one of them is tested

3.1.3. Combination heat pump

- In case only medium temperature application is certified: space heating tests for medium temperature application
- In case both low and medium applications are certified: space heating tests for low OR for medium temperature application
- Hot water tests
- Sound power level tests
- Operating tests: The test is to be chosen by the certification body among the two following tests: “Shutting off the heat transfer medium flow” and “complete power supply failure”.
- Cooling tests shall be performed in case cooling performance are certified. In case both +7°C/+12°C and +18°C/+23°C applications are certified, only one of them is tested

3.1.4. Heat pump for domestic hot water only

- Hot water tests
- Sound power tests
- Operating tests: the test is to be chosen by the certification body among the two following tests: “Safety devices checking test” and “condensate draining”.

3.2. Air to air type

3.2.1. Air to air heat pump for space heating only


- Space heating tests
- Sound power level tests in heating mode for average climate
- Operating tests in heating mode: The test is to be chosen by the certification body among the two following tests: “Shutting off the heat transfer medium flow” and “complete power supply failure”.

3.2.2. Air to air heat pump for space cooling only

- Space cooling test
- Sound power level tests in cooling mode
- Operating tests in cooling mode: the test is to be chosen by the certification body among the two following tests: “Shutting off the heat transfer medium flow” and “complete power supply failure”.

3.2.3. Air to air heat pump for space heating and cooling

- Space cooling tests
- Space heating tests
- Sound power level tests in cooling mode
- Operating tests in cooling mode: “Shutting off the heat transfer medium flow” and “complete power supply failure”.

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4. Rerating rules

Rerating rules only apply to heat pump certified under periodic testing approach.

Rerating rules only apply where measured performance are lower than declared performance, unless specify differently. In case measured performance are higher than declared performance, unless specify differently, the test is passed and the declared performance remain unchanged.

4.1. General rules

- When a performance test is “failed” the rerating rules apply to the corresponding performance of all the models in the sub-type in which the tested unit belongs to.
 - For the performances non-listed in the Scheme Rules clause 7 that are tested (eg: EN 14511-2 performances), in case measured data don't match with declared data, the rerating rules apply to all the models in the sub-type in which the tested unit belongs to.
 - Several operating modes are tested during surveillance tests: acoustic, heating, cooling and DHW. Rerating rules apply independently to each mode and to the characteristics for which the tolerances are set in the scheme rules clause 7. that has failed within this mode
- ⇒ E.g.: failure on outdoor unit sound power level test leads to rerating of sound power level of the outdoor unit of the models of the considered sub-type.

4.2. Space heating/cooling performances rerating rules

4.2.1.1. Performances according to EN 14511-2 or to EN 15879-1

Tolerance on heating capacity and COP measured at standard rating conditions according to EN 14511-2 is equal to -8% of the declared value.

If both the measured heating capacity and COP are not lower than 8% compared to declared values, then the EN 14825 tests shall be performed according the flowrate declared by the applicant.

If an observed deviation between declared and measured heating capacity or COP exceeds - 8 %, then EN 14825 tests shall be performed according to the measured flowrate and the EN 14511-2 declared performances shall be rerated as follows:

- Rerating of tested model

$$\text{rerated heating capacity} = \text{measured capacity} \times (1 + 0.08) \quad \text{Equation 1}$$

$$\text{rerated COP} = \text{measured COP} \times (1 + 0.08) \quad \text{Equation 2}$$

- Rerating of the other models of the sub-type

Same relative deviation in between declared and rerated heating capacity of the tested model shall be applied to the heating capacity of the other models of the sub-type.

Same relative deviation in between declared and rerated COP of the tested model shall be applied to the COP of the other models of the sub-type.


- Input power rerating for all models

$$\text{rerated input power} = \frac{\text{rerated heating capacity}}{\text{rerated COP}} \quad \text{Equation 3}$$

4.2.1.2. Performances according to EN 14825

Space heating

The rerating rules apply independently to each declared climate

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In case a test in heating mode is “failed” and in case of two heat sources are declared, both heat sources shall be rerated unless the certificate holder asks for a full test on both heat sources for all the declared temperature applications for the failed climate. A full test means: test according to EN 14511-2, test according to EN 14825 at every part load conditions and test of an auxiliary mode chosen by the certification body.

For the space heating test to be considered as “passed” the space heating tests for all declared climates need to be “passed”.

4.2.1.2.1. Test at bivalent temperature condition

Bivalent temperature condition shall be tested first. If the measured heating capacity at T_{biv} fulfils the following criteria:

$$P_j[T_{biv}] = \frac{T_{biv}-16}{T_{designh}-16} P_{declared} P_{designh} \pm 10\% \quad \text{Equation 4}$$

then the test continues. If not, the test is interrupted. The certificate holder shall provide a new complete set of declared values to the certification body and to the recognised testing laboratory within two weeks after the interrupted test. The tests may then be restarted from the beginning and the $P_{designh}$ shall be rerated as follows:

- Rerating of the tested model:

$$\text{rerated } P_{designh} = P_j[T_{biv}] \times \frac{T_{designh}-16}{T_{biv}-16} \quad \text{Equation 5}$$

- Rerating of the other models of the sub-type and of the other heat source when relevant:

Same relative deviation between declared and rerated $P_{designh}$ of the tested model shall be applied to all other models of the sub-type and to the other heat source when relevant.

When test at bivalent temperature condition has been completed, the other selected part loads shall be tested; if any.

Rules described in paragraph b) of 4.2.2.1.2. apply to COP measured at T_{biv} .

4.2.1.2.2 Test at other part load conditions

- a) Heating capacity

- Part load condition where the temperature is below T_{biv}

At each part load condition where the temperature is below T_{biv} , the measured heating capacity shall not be lower than -8% nor be higher than +8% of the declared heating capacity $P_{dh}(T_j)$. If the measured heating capacity is not within $\pm 8\%$ of $P_{dh}(T_j)$, then $P_{dh}(T_j)$ shall be rerated as follow:

- Rerating of the tested model

$$\text{rerated } P_{dh}(T_j) = \text{measured } P_{dh}(T_j) \times (1 + 0.08) \quad \text{Equation 6}$$

If the measured heating capacity is below the declared capacity, or


$$\text{rerated } P_{dh}(T_j) = \text{measured } P_{dh}(T_j) \times (1 - 0.08) \quad \text{Equation 7}$$

If the measured capacity is above the declared capacity.

The rerated heating capacity is the one to be considered for the SCOP calculation.

- Rerating of the other models of the sub-type and of the other heat source when relevant:

Same relative deviation in between declared and rerated $P_{dh}(T_j)$ of the tested model shall be applied to the $P_{dh}(T_j)$ (corresponding to the tested part load) of all other models of the sub-type and the other heat source when relevant.

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- Part load condition where the temperature is above or equal T_{biv}

At each part load condition where the temperature is above or equal to T_{biv} , if the measured heating capacity is below -10% of the heating load $P_h(T_j)$ the test is interrupted and the certificate holder shall provide a new complete set of declared values to the certification body and to the recognised testing laboratory within two weeks after the interrupted test. The test is restarted from the start.

If the measured heating capacity is not below -10% of the heating load $P_h(T_j)$ and if the measured heating capacity is within $\pm 8\%$ of the declared heating capacity $P_{dh}(T_j)$, then $P_{dh}(T_j)$ is considered as being valid and is used for the calculation of the SCOP.

If the measured heating capacity is not within $\pm 8\%$ of $P_{dh}(T_j)$, then $P_{dh}(T_j)$ shall be rerated as follow:

- Rerating of the tested model

$$\mathbf{rerated} P_{dh}(T_j) = \mathbf{measured} P_{dh}(T_j) \times (\mathbf{1} + \mathbf{0.08}) \quad \text{Equation 8}$$

If the measured heating capacity is below the declared capacity, or

$$\mathbf{rerated} P_{dh}(T_j) = \mathbf{measured} P_{dh}(T_j) \times (\mathbf{1} - \mathbf{0.08}) \quad \text{Equation 9}$$

If the measured capacity is above the declared capacity.

The rerated heating capacity is the one to be considered for the SCOP calculation.


- Rerating of the other models of the sub-type and of the other heat source when relevant:

Same relative deviation in between declared and rerated $P_{dh}(T_j)$ of the tested model shall be applied to the $P_{dh}(T_j)$ (corresponding to the tested part load) of all other models of the sub-type and the other heat source when relevant.

b) Declared COP and SCOP

At each part load condition, measured COP shall not be lower than -8% compared to the declared COP.

- If each measured COP is within the tolerance, the declared COP for each part load condition and the declared auxiliary mode consumptions are used for the calculation of the SCOP. If the calculated SCOP is not lower than -8% compared to the declared SCOP, then the test is over and nor SCOP nor η are rerated. If the calculated SCOP is lower than -8% compared to the declared SCOP, the declared SCOP and η shall be rerated. The rerated SCOP and η shall be equalled to the calculated ones. SCOP and η for each models of the sub-type for each declared applications and each declared climates shall be calculated according the declared part load data and auxiliary modes consumption. Each SCOP being lower than the calculated value -8% shall be replaced by the calculated SCOP and η shall be recalculated accordingly
- If at least one of the measured COP is lower than -8% compared to the declared COP then, all the non-tested part load conditions and one auxiliary mode condition (chosen by the certification body) shall be tested. SCOP is calculated using the declared COP and/or declared heating capacities when they are within the 8% tolerance (rules for heating capacities as described in the above paragraph apply), otherwise using the measured heating capacities and/or COP. For the calculation, the measured auxiliary mode consumption and the declared values for the modes that have not been tested shall be considered

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- If the calculated SCOP is not lower than -8% compared to the declared SCOP, SCOP and η are not rerated and the COP at part load remain unchanged.
- If the calculated SCOP is lower than -8% compared to the declared SCOP then, SCOP and η shall be rerated and all the other declared applications shall be fully tested at every part load conditions and one auxiliary mode chosen by certification body. The same rerating procedure applies to each application

- **Rerating of tested model**

$$\mathbf{rerated\ SCOP = measured\ SCOP \times (1 + 0.08)} \qquad \text{Equation 10}$$

Rerated η is recalculated according rerated SCOP.

The COP at each part load shall be rerated as well and correspond to the measured COP at each part load condition. Auxiliary mode consumptions remain unchanged except for the one being tested and if the measured value is not within the tolerance with the declared value.

Rerating of all other models of the sub-type and of the other heat source when relevant Same relative deviation in between declared and rerated SCOP of the tested model shall be applied to the SCOP of all other models of the sub-type and the other heat source when relevant.

η is recalculated according rerated SCOP.

The declared COP at each part load shall be revised to ensure consistency with the rerated SCOP.

Heating test is “passed” if none of the $P_{designh}$, heating capacity at part load and η for all tested applications has been rerated.

4.2.1.3. Space cooling

a) Condition A test

Condition A is tested. If cooling capacity measured under condition A does not deviate from $P_{designc}$ from more than -8% then the test continues. If not, the test is interrupted. The certificate holder shall provide a new complete set of declared values to the certification body and the chosen recognised testing laboratory within two weeks of the interrupted test. The tests may then be restarted from the beginning and the $P_{designc}$ shall be rerated as follows:

- For the tested model:

$$\mathbf{rerated\ } P_{designc} = P_{dc}(35) \qquad \text{Equation 11}$$


- For the other models of the sub-type, same deviation in between declared and rerated $P_{designc}$ of the tested model shall be applied.

When test at A temperature condition is completed, the other selected part load condition shall be tested.

b) Test at other part load conditions

At each of the part load conditions, measured EER shall not be lower than -8% compared to the declared EER.

- If all measured EER values are within the tolerance, SEER is calculated using the declared EER values for all part load conditions and declared auxiliary modes consumptions.

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- If at least one of the measured EER is lower than -8% compared to the declared EER then, all non-tested part load conditions and one auxiliary mode condition (chosen by the certification body) shall be tested. SEER is then calculated using the declared EER values when they are within the 8% tolerance, otherwise using the measured values and the measured auxiliary mode consumption and the other declared auxiliary mode consumptions for those not tested.

If the calculated SEER is not lower than -8% compared to the declared SEER, SEER is not rerated

If the calculated SEER is lower than -8% compared to the declared SEER then, SEER shall be rerated.

- Rerating of tested model

rerated SEER = measured SEER

Equation 12

The EER at each part load shall be rerated as well and correspond to the measured EER at each part load condition. Auxiliary mode consumptions remain unchanged except for the one being tested and if the measured value is not within the tolerance with the declared value.

- Rerating of the other models of the sub-type

Same relative deviation in between declared and rerated SEER of the tested model shall be applied to the SEER of all other models of the sub-type.

Cooling test is “passed” if neither $P_{designc}$ nor SEER has been rerated.

4.3. Domestic hot water performances rerating rules

The rerating rules apply independently to each declared climate.

In case the test is “failed” and in case several heat sources are declared, all heat sources shall be rerated unless the certificate holder asks for a full performance test on the non-tested heat source.

If the test cannot fulfil the requirements of EN 16147 in term of water temperature; the certificate holder shall provide a new complete set of declared values: load profile; η_{DHW} and V_{40} (only for DHW heat pumps) to the certification body and the chosen recognised testing laboratory within two weeks of the interrupted test. The tests may then be restarted from the beginning.

DHW test is “passed” if for each declared climate the test has been performed for the declared load profile and if neither η_{DHW} nor V_{40} has been rerated, otherwise the test is “failed”.

4.3.1.1. η_{DHW}

If an observed deviation between declared and measured η_{DHW} exceeds -8 % of the declared value, then η_{DHW} shall be rerated.


- Rerating of tested model

rerated η_{DHW} = measured η_{DHW} × (1 + 0.08)

Equation 13

- Rerating of the other models of the sub-type and of the other heat source when relevant

Same relative deviation in between declared and rerated η_{DHW} of the tested model shall be applied to the η_{DHW} of all other models of the sub-type and for the other heat source when relevant.

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4.3.1.2. V_{40} – only for domestic hot water heat pumps

If an observed deviation between declared and measured V_{40} exceeds -3 % of the declared value, then V_{40} shall be rerated.

- Rerating of tested model

$$\text{rerated } V_{40} = \text{measured } V_{40} \times (1 + 0.03) \quad \text{Equation 14}$$

- Rerating of the other models of the sub-type and of the other heat source when relevant
 Same relative deviation in between declared and rerated V_{40} of the tested model shall be applied to the V_{40} of all other models of the sub-type and for the other heat source when relevant.

4.3.1.3. Heating up period

If an observed deviation between declared and measured heating up period exceed +15 min of the declared value, then the heating up period shall be rerated.

- Rerating of tested model

$$\text{rerated heating up period} = \text{measured heating up period} - 15 \text{ minutes} \quad \text{Equation 15}$$

- Rerating of all other models of the sub-type and of the other heat source when relevant
 Same deviation (in minutes) in between declared and rerated heating up period of the tested model shall be applied to the heating up period of all other models of the sub-type and for the other heat source when relevant.

4.3.1.4. P_{es}

Tolerance is equal to +10% of the declared value.

- Rerating of tested model

$$\text{rerated } P_{es} = \text{measured } P_{es} \times (1 - 0.1) \quad \text{Equation 16}$$

- Rerating of all other models of the sub-type and of the other heat source when relevant
 Same relative deviation in between declared and rerated P_{es} of the tested model shall be applied to the P_{es} of all other models of the sub-type and for the other heat source when relevant.

4.3.1.5. Reference temperature

If an observed deviation between declared and measured reference temperature exceed -1K of the declared value, then the reference temperature shall be rerated.

- Rerating of tested model

$$\text{rerated reference temperature} = \text{measured reference temperature} + 1 \quad \text{Equation 17}$$


- Rerating of all other models of the sub-type and for the other heat source when relevant

Same deviation (in Kelvin) in between declared and reference temperature of the tested model shall be applied to the reference temperature of all other models of the sub-type and for the other heat source when relevant.

4.3.1.6. V_{40} (for combination heat pump)

If an observed deviation between declared and measured V_{40} exceed -3% of the declared value, then the V_{40} shall be rerated.

- Rerating of tested model

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$$\text{rerated } V_{40} = \text{measured } V_{40} \times (1 + 0.03) \quad \text{Equation 18}$$

○ Rerating of all other models of the sub-type and of the other heat source when relevant
 Same relative deviation in between declared and rerated V_{40} of the tested model shall be applied to the V_{40} of all other models of the sub-type and for the other heat source when relevant.

4.4. Sound power level rerating rules

The rerating rules apply independently to indoor and outdoor units.

In case the test is “failed” and in case several heat sources are declared, all heat sources shall be rerated unless the certificate holder asks for a full test on the non-tested heat source.

Sound power level test is “passed” if neither indoor unit (when relevant) nor outdoor unit (when relevant) has been rerated.

If measured sound power level is higher than declared sound power level is more than 2 dB(A) higher than the declared value, the following rerating rules apply:

- Rerating of tested model


$$\text{rerated sound power level} = \text{measured sound power level} - 2 \quad \text{Equation 19}$$

○ Rerating of all other models of the sub-type and for the other heat source when relevant
 Same absolute deviation in between declared and rerated sound power level of the tested model shall be applied to the sound power level of all other models of the sub-type and for the other heat source when relevant.

Sound power test is “passed” if neither outdoor nor indoor unit, where relevant, sound power level has been rerated; otherwise, the test is “failed”.

4.5. Operating tests

In case operating test failed, certificate holder shall provide the certification body with corrective actions within one month after the failed test was performed.

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PART B: Hybrid heat pumps

Hybrid heat pump application shall be conducted using one-off admission testing approach.

Admission test description

1. Space heating hybrid heat pump (cooling in option)

1.1. Space heating tests

Space heating test shall be performed according to the combined test method described in EN 14825. In the scope of the HP-KEYMARK certification, the separate test method cannot be applied.

If both water and brine as heat sources are certified, tests shall be carried out with both heat sources.

For each low and medium temperature applications, the following tests shall be performed:

- a) A7/W35/55; A20/W35/55; B0/W35/55; W10/W35/55; according to EN 14511-2 and E4/W35/55 according to EN 15879-1
- b) Design temperature condition for average climate (-10°C)
- c) Switch temperature boiler off condition according to EN 14825 for average climate
- d) One other testing condition to be chosen by the certification body according to EN 14825 for average climate
- e) For any other climate, switch temperature boiler off condition shall be tested according to EN 14825

1.2. Sound power level tests

Tests shall be performed according to EN 12102-1 for average climate at medium temperature application.

For heat pumps certified for brine and water as heat sources, the sound power level test is performed using brine.

1.3. Operating tests

Operating tests shall be performed according to EN 14511-4 as follows:

- Starting and operating tests
- shutting off the heat transfer medium flows
- Complete power supply failure.


In case the heat pump can be used with brine or water, only one heat source (brine or water) shall be tested.

For direct exchange units operating tests shall be performed according to EN 15879-1 clauses as follows:

- chapter 7.1 starting test according to Table 8
- chapter 7.2.2 pressure dropchapter 7.2.3 shutting of the heat transfer medium flowchapter 7.2.4 complete power supply failure

1.4. Air flow for exhaust air hybrid heat pumps

The applicant shall declare the exhaust air volume flow that shall be used for space heating test.

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1.5. Space cooling tests

SEER and $P_{designc}$ for +7°C/+12°C and/or +18°C/+23°C applications can be certified as an option.

The testing points to be performed for the certified application are the following:

- a) "A" testing condition according to EN 14825;
- b) One other testing condition to be chosen by the certification body according to EN 14825

If both +7°C/+12°C and/or +18°C/+23°C applications are certified, the test shall be performed as described above for both applications.

If both water and brine as heat sources are certified, tests shall be carried out with either brine or water as heat source; the heat source being chosen by the certification body.

For exhaust air heat pump, the applicant shall declare the exhaust air volume flow that shall be used for space cooling test.

2. Combination hybrid heat pump

2.1. Space heating test

If both water and brine as heat sources are certified, tests shall be carried out with both heat sources.

- a) A7/W55; A20/W55; B0/W55; W10/W55 according to EN 14511-2 and E4/W55 according to EN 15879-1.
- b) Design temperature condition for average climate (-10°C)
- c) Switch temperature boiler off condition according to EN 14825 for average climate
- d) One other testing condition to be chosen by the certification body according to EN 14825 for average climate
- e) For any other climate, Switch temperature boiler off condition shall be tested according to EN 14825

Low temperature application can be certified as an option; in this case, testing at low temperature application shall be performed as follows:

- a) A7/W35; A20/W35; B0/W35; W10/W35 according to EN 14511-2 and E4/W35 according to EN 15879-1.
- b) Design temperature condition for average climate (-10°C)
- c) Switch temperature boiler off condition according to EN 14825 for average climate
- d) One other testing condition to be chosen by the certification body according to EN 14825 for average climate
- e) For any other climate, Switch temperature boiler off condition shall be tested according to EN 14825


2.2. Sound power level tests

Tests shall be carried out according to EN 12102-1 for medium temperature application for average climate.

For heat pumps certified for brine and water as heat sources, the acoustic test is carried out using brine.

2.3. Domestic hot water tests

Tests shall be performed for average climate according to EN 16147 in case the domestic hot water is produced by the heat pump only, and to EN13203-5 in case the boiler is contributing to the domestic hot water production..

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For any other declared climate, test may also be performed by using the relevant standard, EN 16147 or EN 13203-5, depending on any contribution of the boiler or not.

The tests shall be performed for the load profiles as declared by the applicant for each climate where relevant.

For water (brine)/water type, in case brine and water as heat sources are declared, only one heat source shall be tested. The heat source to be tested is chosen by the certification body.

2.4. Operating tests

Operating tests shall be performed according to EN 14511-4 as follows:

- Starting and operating tests
- shutting off the heat transfer medium flows,
- Complete power supply failure.

In case the heat pump can be used with brine or water, only one heat source (brine or water) shall be tested.

For direct exchange units operating tests shall be performed according to EN 15879-1 clauses as follows:

- chapter 7.1 starting tests according to Table 8
- chapter 7.2.2 pressure drop
- chapter 7.2.3 shutting off the heat transfer medium flow
- chapter 7.2.4 complete power supply failure

2.5. Space cooling tests

SEER and $P_{designc}$ for +7°C/+12°C and/or +18°C/+23°C applications can be certified as an option.

The testing points to be performed for the certified application are the following:

- a) "A" testing condition according to EN 14825;
- b) One other testing condition to be chosen by the certification body according to EN 14825

If both +7°C/+12°C and/or +18°C/+23°C applications are certified, the test shall be performed as described above for both applications.

If both water and brine as heat sources are certified, tests shall be carried out with either brine or water as heat source; the heat source being chosen by the certification body.

For exhaust air heat pump, the applicant shall declare the exhaust air volume flow that shall be used for space cooling test.

3. SCOP and SEER calculations

For SCOP and SEER calculations, certification bodies shall use the calculation tool approved by the HPSG.

For the SCOP calculation, hours defined in EN14825 annex B shall be used.

For heat pump also certified in cooling mode, the following hours shall be used for the SEER calculation:

j	T_j	h_j
#	°C	h
1	17	205
2	18	227




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3	19	225
4	20	225
5	21	216
6	22	215
7	23	218
8	24	197
9	25	178
10	26	158
11	27	137
12	28	109
13	29	88
14	30	63
15	31	39
16	32	31
17	33	24
18	34	17
19	35	13
20	36	9
21	37	4
22	38	3
23	39	1
24	40	0

Mode	Symbol	Hours
Active mode	H_{HE}	600
Off mode	P_{off}	0
Thermostat off mode	P_{to}	659
Standby mode	P_{sb}	1377
Crankcase heater mode	P_{ck}	2036

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PART C: Gas heat pumps

Gas heat pump application shall be conducted using one-off admission testing approach.

Admission test description

1. Space heating tests for low temperature heat pumps

If both water and brine as heat sources are certified, tests shall be carried out with both heat sources.

- a) A7/W35; A20/W35; B0/W35; W10/W35 according to EN 12309-4, EN 16905-4; EN 16905-4 or EN 16905-3
- b) Bivalent temperature condition for average climate according EN 12309-4, EN 12309-6, EN 16905-4 or EN 16905-3 for gas heat pumps
- c) One other testing condition for average climate to be chosen by the certification body according to EN 12309-4; EN 12309-6, EN 16905-4 or EN 16905-3 for gas heat pumps
- d) For any other climate, bivalent temperature condition shall be tested according to EN 12309-4, EN 12309-6, EN 16905-4 or EN 16905-3 for gas heat pumps

2. Space heating tests for medium temperature heat pump

If both water and brine as heat sources are certified, tests shall be carried out with both heat sources.

For each low and medium temperature application, the following tests shall be performed:

- a) A7/W35/55; A20/W35/55; B0/W35/55; W10/W35/55; according to EN 12309-4, EN 12309-6, EN 16905-4 or EN 16905-3
- b) Bivalent temperature condition for average climate according to EN 12309-4, EN 12309-6, EN 16905-4 or EN 16905-3
- c) One other testing condition for average climate to be chosen by the certification body according to EN12309-4, EN12309-6, EN16905-4 or EN16905-3
- d) For any other climate, bivalent temperature condition shall be tested according to EN12309-4, EN12309-6, EN16905-4 or EN16905-3

3. Sound power level tests

Tests shall be performed according to EN 12102-1 for average climate at the certified highest temperature application.

For heat pumps certified for brine and water as heat sources, the sound power level test shall be performed using brine.

4. Air flow for exhaust air heat pumps

The applicant shall declare the exhaust air volume flow that shall be used for space heating test.

5. Space cooling tests

SPERc and P_{designc} for +7°C/+12°C and/or +18°C/+23°C applications can be certified as an option.

If both water and brine as heat sources are certified, tests shall be carried out with either brine or water as heat source; the heat source being chosen by the certification body.

- Only one cooling application is certified



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- a) "A" testing condition according to EN12309-4, EN12309-6, EN16905-4 or EN16905-3
b) One other testing condition to be chosen by the certification body to EN12309-4, EN12309-6, EN16905-4 or EN16905-3

- Both cooling applications are certified

- a) "A" testing condition according to EN12309-4, EN12309-6, EN16905-4 or EN16905-3
b) One other testing condition from one of the 2 applications to be chosen by the certification body according to EN12309-4, EN12309-6, EN16905-4 or EN16905-3


6. $SPER_h$ and $SPER_c$ calculations

$SPER_h$ shall be calculated using the hours defined in the corresponding standard.

For heat pump also certified in cooling mode, the following hours shall be used for the $SPER_c$ calculation:


j	T_j	h_j
#	°C	h
1	17	205
2	18	227
3	19	225
4	20	225
5	21	216
6	22	215
7	23	218
8	24	197
9	25	178
10	26	158
11	27	137
12	28	109
13	29	88
14	30	63
15	31	39
16	32	31
17	33	24
18	34	17
19	35	13
20	36	9
21	37	4
22	38	3
23	39	1
24	40	0

Mode	Symbol	Hours
Active mode	H_{HE}	600
Off mode	P_{off}	0
Thermostat off mode	P_{to}	659
Standby mode	P_{sb}	1377
Crankcase heater mode	P_{ck}	2036

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7. NOx emissions

NOx emissions shall be measured according the appropriate standard.

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PART D: CO₂ Heat pump for domestic hot water

CO₂ heat pump application shall be conducted using one-off admission testing approach.

This section applies to CO₂ heat pumps designed for domestic hot water production placed on the market without a storage tank.

Admission test description

1. Performance test

If both water and brine as heat sources are certified, tests shall be carried out with both heat sources.

The test shall be conducted following the EN14511-3 test procedure and using the following set of conditions depending on the heat source:

Table D.1. – Test conditions for performance test of CO₂ heat pumps

Heat source		inlet water temperature	Outlet water temperature		
Type	Temperature				
	Average	Colder	Warmer		
Air (dry bulb/wet bulb)	7°C(6°C)	2°C(1°C)	14°C(13°C)	15°C	60°C
Water	10°C				
Brine	0°C				
Exhaust air	20°C (12°C)				

The test shall be conducted for each declared climate.

For heat pump using exhaust air as heat source; the applicant shall declare the exhaust air volume flow that shall be used for the performance test.

2. Sound power level test

Tests shall be performed according to EN 12102-1 for average climate at the inlet and outlet water temperature conditions defined in the above Table D.1.


For heat pumps certified for brine and water as heat sources, the sound power level test is performed using brine.

3. Operating tests

Operating tests shall be performed according to EN 14511-4 as follows:

- Starting and operating tests
- shutting off the heat transfer medium flows,
- Complete power supply failure.

In case the heat pump can be used with brine or water, only one heat source (brine or water) shall be tested.

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Part E: Models within the same subtype having non identical performance

1. Background

Applicant may declare several models within a single subtype which have non-identical performance. The deviation is between two or more models may concern:

- The performance according to EN14511-2 (heating and/or cooling mode)
- The performance according to EN14825 (heating and/or cooling mode)
- The performance according to EN16147 (non-identical tapping profile)
- The performance according to EN12102-1
- Some models may be certified only for average climate whereas other models are certified also for colder and/or warmer climates.

The consequence arising from the above described situations is that testing one model does not allow to verify the declared performance of the other models.

2. Admission test

2.1. Certification of a new subtype

This section applies if the following four conditions are occurring simultaneously:

- The subtype is not yet certified
- A test is needed for the admission process of the new subtype
- The subtype encompasses several models
- The models do not show identical performance.

Model A is being selected for the test. Model A is tested according the procedure described in part A of this document. For every additional model not showing identical performance to these of model A, additional tests are to be performed:

Non identical performance	EN14511-2	EN14825	EN12102-1	EN16147	Colder / warmer climate	Space cooling or space heating
Model x		One test at T_{biv} (application to be chosen by the CB)	x	x	In case model A is not certified for these climates, the test procedure according to part A for colder and warmer climate applies	In case model A is not certified for space cooling or space heating, the test procedure according to part A for cooling or heating mode applies

As all models have the same refrigerating circuit, the additional tests are performed on model A using the setting corresponding to model X.

For heat pumps being certified for both brine and water as heat source, only one heat source, chosen by the certification body, shall be tested.

2.2. Addition of a model to an existing subtype

This section applies if the following three conditions are occurring simultaneously:

- The subtype is already certified



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- The model(s) to be added to the subtype does not show identical performance with the model(s) already certified
- A test is needed for the certification. When a model showing non identical performance is to be added to an already certified subtype, the sampling rules as described in the scheme rules apply to the model.

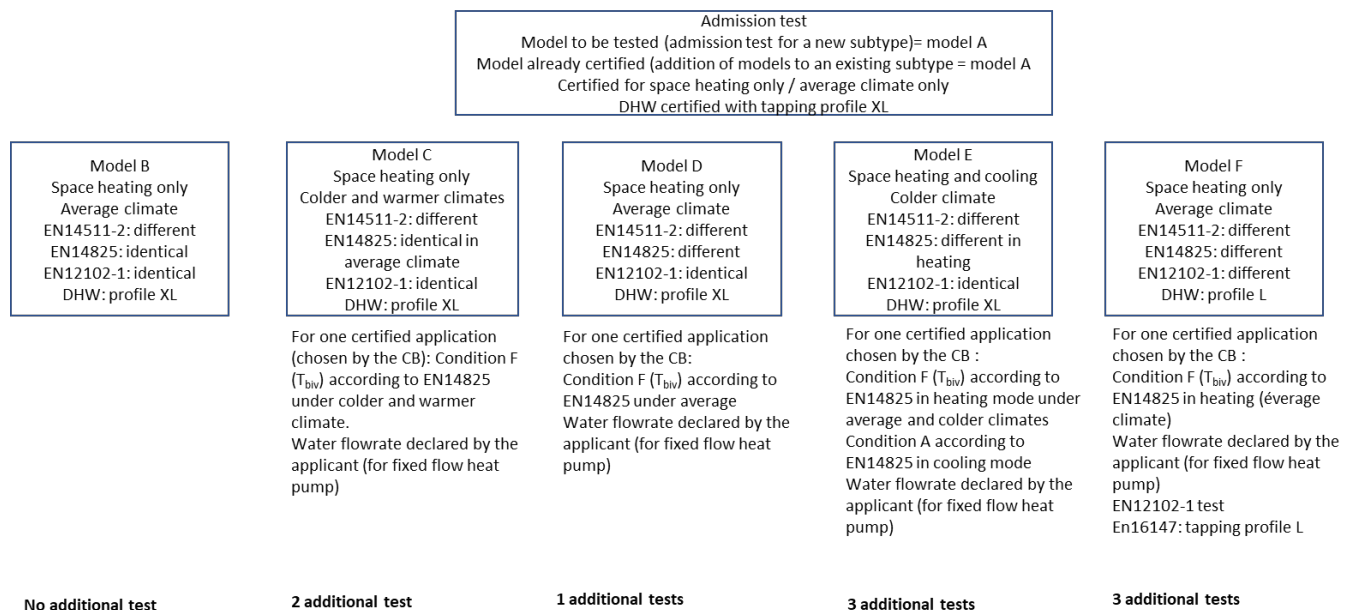
The model(s) to be added do not show the identical performance with the model A already certified. For every additional model not showing identical performance to these of model A, additional tests are to be performed:


Non identical performance	EN14511-2	EN14825	EN12102-1	EN16147	Colder / warmer climate	Space cooling or space heating
Model x		One test at T_{biv} (application to be chosen by the CB)	x	x	In case model A is not certified for these climates, the test procedure according to part A for colder and warmer climate applies	In case model A is not certified for space cooling or space heating, the test procedure according to part A for cooling or heating mode applies

As all models have the same refrigerating circuit, the additional tests are performed on model x using the setting corresponding to the other model(s) to be added to the subtype.

For heat pumps being certified for both brine and water as heat source, only one heat source, chosen by the certification body, shall be tested.

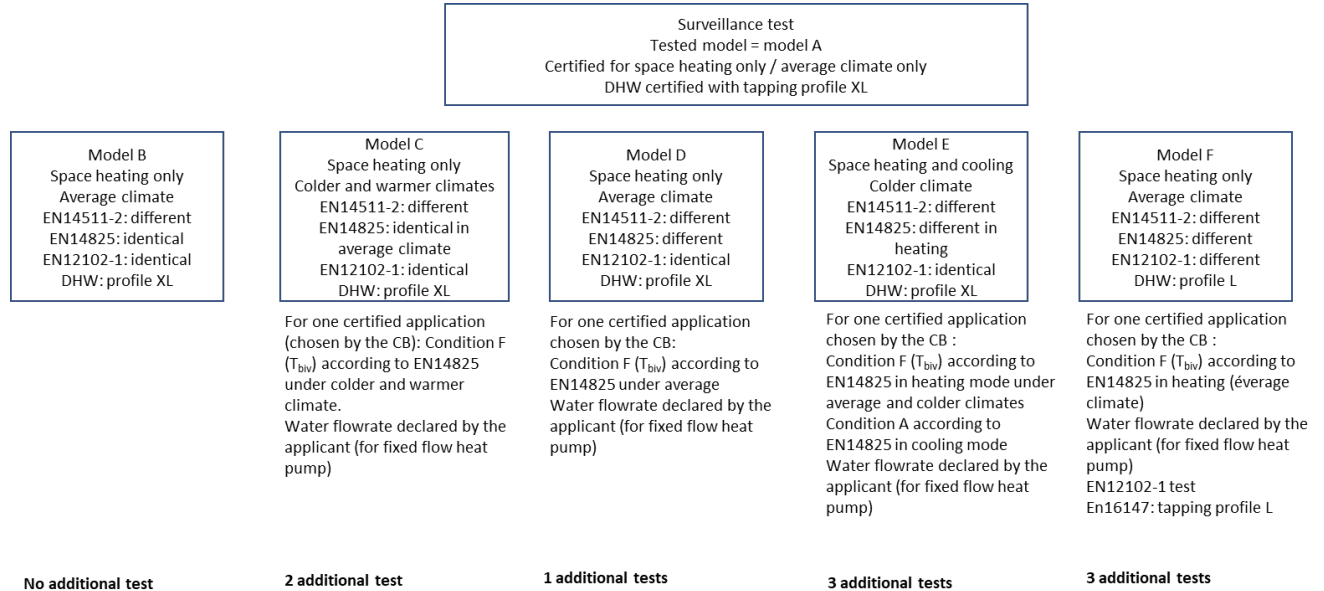
2.3. Example of test to be performed



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3. Surveillance tests

Same test rules as of admission tests apply. In case two applications are certified, tests are performed according to the application chosen by the certification for tests performed on model A.



As all models have the same refrigerating circuit, then the additional tests are performed on model A using the setting corresponding to the other models.

For heat pumps being certified for both brine and water as heat source, only one heat source, chosen by the certification body, shall be tested.

4. Rerating rules

Each tested performance of each model will be rerated independently. In case EN12102-1, EN14511-1 (space heating and/or cooling mode), EN14825 (space heating and/or cooling mode), EN16147 surveillance test failed: all model showing identical performance are rerated for the corresponding application and climate.