EHPA Testing Regulation

Testing of Air/Water Heat Pumps

Terms, Test Conditions and Test Method based on EN 14511-1 through 4

Supplemental requirements for granting the international quality label for heat pumps

Version 1.3
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Contents

1 Introduction

The test conditions and testing method described in this regulation are based on the European standard EN 14511, Parts 1 through 4, Version 2007 and the additional standards and guidelines referenced therein. Anything not defined in this regulation should be proceeded regarding EN 14511.

By testing a heat pump according to this regulation and by fulfilling the corresponding requirement in the quality label regulation, one of the national EHPA-DACH Quality Label Commissions can grant the International Heat Pump Quality Label.

This regulation has been adopted by the EHPA-DACH Quality Label Committee, changes of this regulation must also be approved by the Committee.

2 Purpose

The purpose of this testing regulation is to specify the scope of the test, the testing conditions and the test method for testing electrically driven air/water heat pumps.

3 Scope of application

This test program applies to the testing of electrically driven air/water heat pumps under the testing conditions specified in chapter 5. In order to attain the international quality seal, the test specimen must be a heat pump manufactured in series production.

3.1 Scope of testing

The scope of the test comprises:
a) A performance test for different standardized points according to EN 14511 Parts 2 & 3 and other points according to this regulation (see chapter 6)
b) The testing of the usage limits as defined by the manufacturer (see chapter 7)
c) A safety test (see chapter 8)
d) A sound measurement according to EN 12102 (see chapter 9)
e) The testing of the electrical characteristic values (see chapter 10)

3.2 Testing methods

3.2.1 Performance testing

The performance test is performed under constant ambient conditions, i.e., during the test, the set conditions remain constant from the source and user sides. This is used to determine the heat output and the electrical power consumed, from which the performance figure for the heat pump is calculated.

3.2.2 Testing the warranted usage limits

The test of the warranted usage limit[1] is performed at the key points (max. 6 key points, see figure 1) in the usage range specified by the manufacturer. This is the range within which the planner of heating system may use the device and within which the full manufacturer's warranty applies. In essence, this involves testing if the test object can operate at the planned usage limit over a longer period of time.

[1] The usage limit is specified by the manufacturer.

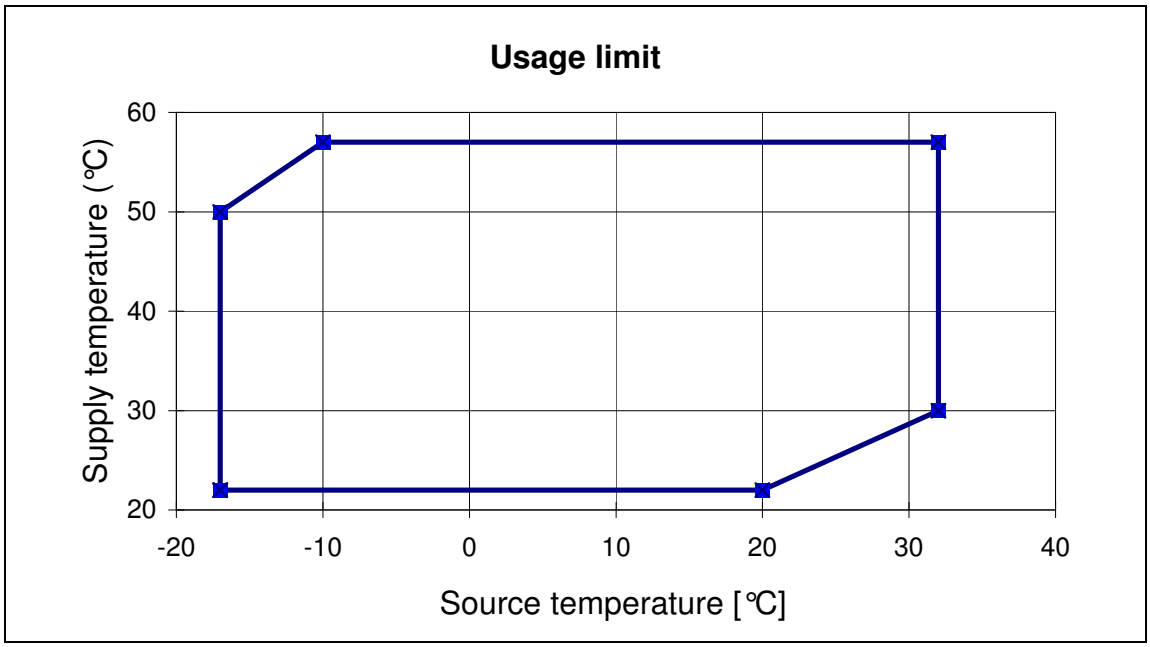


Figure 1: Example of the usage limit defined by the manufacturer

3.2.3 Allowable measurement inaccuracy of the measuring equipment

Measurement variables	Unit	Measuring inaccuracy (+/-) of the cited values
Air		
- Dry temperature	°C	0.2 K
- Humid temperature [1]	°C	0.3 K
- Relative humidity [1]	% H	2.5 % H
- Volume flow	m^3/s	5 %
- Static pressure difference	Pa	5%, min. 5 Pa
Water/brine		
- Temperature	°C	0.1 K
- Volume flow	m^3/s	1%
- Static pressure difference	Pa	5%
- Heat transfer medium (brine) concentration	%	2%
Electrical power	W	1%
Voltage	V	0.5%
Current	A	0.5%
Electrical work	kWh	1%
The heat output determined by the water side must be determined such that there is a maximum 5% measurement inaccuracy, regardless of the individual measurement inaccuracies.		

Table 1: Measurement inaccuracy (+/-) of the cited values according to EN 14511-3 Section 4.3

[1] According to EN 14511, the wet bulb temperature is given to define air humidity. The measurements can also be proceeded with specification on relative humidity. The measurement inaccuracies specified by EN 14511 must be adhered.

3.2.4 Safety test

The safety equipment is tested by simulating operational malfunctions during normal heat pump operation.

4 Terms and definitions

The following terms supplement the in EN 14511-1 defined terms and definitions.

4.1 Heat source system (HSS)

A heat source system is defined as an equipment for extracting heat from a heat source and transporting the heat transfer medium between the heat source and the cooler side of the heat pump, including all of the additional equipment. Heat sources are materials from which heat can be extracted.

4.2 Heat usage system (HUS)

A heat usage system (area heating, wash water, pool, etc.) consists of the equipment to transport the heat from the warm side of the heat pump to the heat consumers, including all of the additional equipment.

4.3 Thermal heat

Usable heat that is output by the heat pump on the warm side to the heat transfer medium during heating operation within a specific timeframe.

4.4 Heat capacity

The heat output is the usable *heat current* from the heat pump to the heat transfer medium on the warm side. It is the quotient from the thermal heat produced in a period of time.

4.5 Power demand of the heat source system

It's the electrical power demand of the heat source system during continuous operation for operating the heat source system, including all of the control, regulation and safety equipment. Only the fraction needed for transporting the heat source medium within the heat pump is included according the standard EN 14511.

4.6 Power demand of the heat usage system

It's the electrical power demand of the heat usage system during continuous operation for operating the heat source system, including all of the control, regulation and safety equipment. Only the fraction needed for transporting the medium within the heat pump is included according the standard EN 14511.

4.7 Warranted usage range

A working range for the heat pump specified by the manufacturer, limited by a maximum six vertices within which the heat pump is deemed usable, to have functioned error-free, to have met the warranted characteristics and for which the manufacturer's warranty applies.

4.8 Safety range

Range outside the warranted usage range in which the heat pump does not need to function any longer. The safety features must be able to engage, however, before the heat pump is damaged.

4.9 Acoustic power level

Ten times the logarithm for the base 10 of the ratio of the existing sound level for the reference acoustic power, given in decibels. The reference acoustic power is 1 pW ($=10^{-12}$W).

4.10 Defrosting

4.10.1 Defrosting system

Technical equipment on the heat pump that eliminates the ice or frost on the evaporator by supplying heat.

4.10.2 Defrost operation

Operating condition of the heat pump in heating mode during which the operating method is changed or reversed in order to defrost the heat source system.

4.10.3 Defrost time, defrost cycle

Time during which the heat pump is in defrost operation.

4.10.4 Working cycle with defrost time

Compressor operating time between two defrosting actions plus the defrost time.

4.10.5 Relative defrost time

The relative defrost time is the ratio of the defrost time to the time for a working cycle with defrost time.

5 Test conditions

5.1 Ambient conditions and electrical data

The ambient conditions and the electrical data for the performance and functional inspection are listed in Table 2.

Model:	**Measurement variable:**	**Limit values:**
Air/water heat pump with channel connection to the air intake and outlet side for inside setup	Ambient temperature	15 to 30 °C
	Electrical voltage	+/- 4% rated voltage[1]
Air/water heat pump with channel connection to the air intake side for inside setup	Ambient temperature	Any test conditions HSS at the test points per Tab. 3.
	Electrical voltage	+/- 4% rated voltage[1]
[1] Manufacturer's information		

Table 2: Ambient conditions and electrical connection data

5.2 Test conditions for the performance testing

Test conditions / testing points air/water heat pumps:

Test cond.	Standard	Type[1]	HSS on			HUS	
			T.db (°C)	T.wb(°C)	φ[2] (%)	T.out (°C)	T.in (°C)
A7/W35	EN 14511-2	N	7	6	89	35	30
A2/W35[3]	**EN 14511-2**	**QL**	**2**	**1**	**84**	**35**	**a**
A-7/W35	EN 14511-2	B	-7	-8	75	35	a
A-15/W35	EN 14511-2	B	-15	b	b	35	a
A7/W45	EN 14511-2	N	7	6	89	45	a
A7/W55	EN 14511-2	B	7	6	89	55	a
A-7/W55	EN 14511-2	B	-7	-8	75	55	a
A20/W55	DACH-EHPA	B	20	--	50	55	a

[1] Type name: N -> standard rated point, B -> operating rated point, QL -> Quality Label

[2] According to EN 14511, the air-side humidity is defined by information on the humid temperature T.f. Because in several test centers relative air humidities are used, these are listed as corresponding characteristic values. For the test points according to EHPA-DACH, the relative air humidity is specified.

[3] For the EHPA-DACH Quality label relevant test condition

a The test is conducted with the volume flows indicated for A7/W35

b No specification for air humidity

Table 3: Rated conditions for performance testing of air/water heat pumps

5.2.1 Air-side volume flow

The air-side volume flow is set at 20°C source temperature so that the following values result for the entire (intake-side and outlet-side) external static pressures:

Rated power up to 8 kW:	25 Pa
Rated power from 8 to 12 kW:	37 Pa
Rated power from 12 to 20 kW:	50 Pa
Rated power from 20 to 30 kW:	62 Pa

If this value exceeds the 80% value from the manufacturer's information on allowable residual supply pressure, then the external static pressure must be set to this 80% value.

If the evaporator blower can be run at multiple speeds, then the speed selected must be the one that meets the above pressure conditions and that results in a value as close as possible to the manufacturer's rated volume flow for the volume flow under normal air conditions.

After setting the external static pressure and the blower speed if needed, the volume flow is determined and recalculated for normal air conditions (20°C, 1013 mbar). The value determined in this way for the air-side volume flow is listed in the test report.

The air-side volume flow, the blower speed and the external static pressure is only set and measured at the above described measuring point. The settings found for this measuring point are adhered to for the other measuring points and tests and the resulting values determined are used for the evaluation of all other points.

5.3 Setting up and connecting the test object

The test object must be set up and connected for the test as recommended by the manufacturer in the installation and operating manual.

The length of each refrigerant pipe for split systems must be minimum 5 m and maximum 7.5m. The pipes are to be laid out without any significant difference in height (max. 1 m). The heat insulation of the lines must be set up in accordance with the manufacturer's instructions.

Heat pump start-up shall be performed by a manufacturer's representative.

In any case, the heat pump unit has to be delivered filled with nitrogen and shall be charged with refrigerant supplied by the test laboratory.

5.4 Requirements for the test facility

Different requirements apply during heating operation and the defrosting phases in regard to meeting the specified desired values.

5.4.1 Test conditions during heating operation

Measurement variable:	Max. permissible deviation (+/-) of arithmetic mean from target value	Max. permissible dev. individual measured values from target value
Air:		
Dry temperature	0.3 K	1 K
wet-bulb temperature	0.3 K	1 K
Relative humidity	3% H	7% H
Water/brine:		
Entry temperature	0.2 K	0.5 K
Exit temperature	0.3 K	0.6 K
Volume flow	2%	5%
Electrical voltage	4%	4%

Table 4 a: Permissible deviations (+/-) from the desired values during heating operation

5.4.2 Defrost cycle test conditions

The test conditions for the defrost cycle apply to the defrosting period and the 10-minute recovery phase after completion of the defrosting process.

Measurement variable:	Max. permissible deviation (+/-) of arithmetic mean from target value	Max. permissible dev. individual measured values from target value
Air:		
Dry temperature	1.5 K	5 K
Moist temperature	1 K	-
Relative humidity	9% H	-
Water/brine:		
Entry temperature	-	-
Exit temperature	-	-
Volume flow	2%	5%
Electrical voltage	4%	4%

Table 4 b: Permissible deviations (+/-) from the desired values during the defrost cycle and recovery period

6 Performance testing

6.1 General

During the entire test it must be ensured that there is no dripping or draining of water except from the provided drainage openings.

6.2 Performance measurement procedure

The measurement begins with a pretreatment period, during which the actual values over at least 10 minutes must lie within the tolerance limits defined in Table 4a (Region A in Graphs 1-3).

A defrost cycle with a 10-minute recovery phase occurs next, in which the defrosting is triggered automatically or manually by the test specimen control. During this period, deviations from the desired values according to Table 4b are permissible (Region B in Graphs 1-3).

Once the recovery phase has ended, the actual values must again be within the tolerance limits given in Table 4a. The equilibrium phase that follows lasts 60 minutes (Region C in Graphs 1-3). This is followed by the measurement period, which lasts 35 minutes or 3 hours, depending on the measurement conditions.

If defrosting occurs during the equilibrium phase and/or the measurement period, then the tolerance limits for the desired values during the defrost phases and the subsequent 10-minute recovery period according to Table 4b apply.

The measured values are recorded every 10 seconds throughout the entire measurement period.

6.2.1 Measurement according to steady state or transient test conditions

Basically the performance measurements have to be proceeded under transient test conditions if during the test a defrosting of the heat pump is possible.

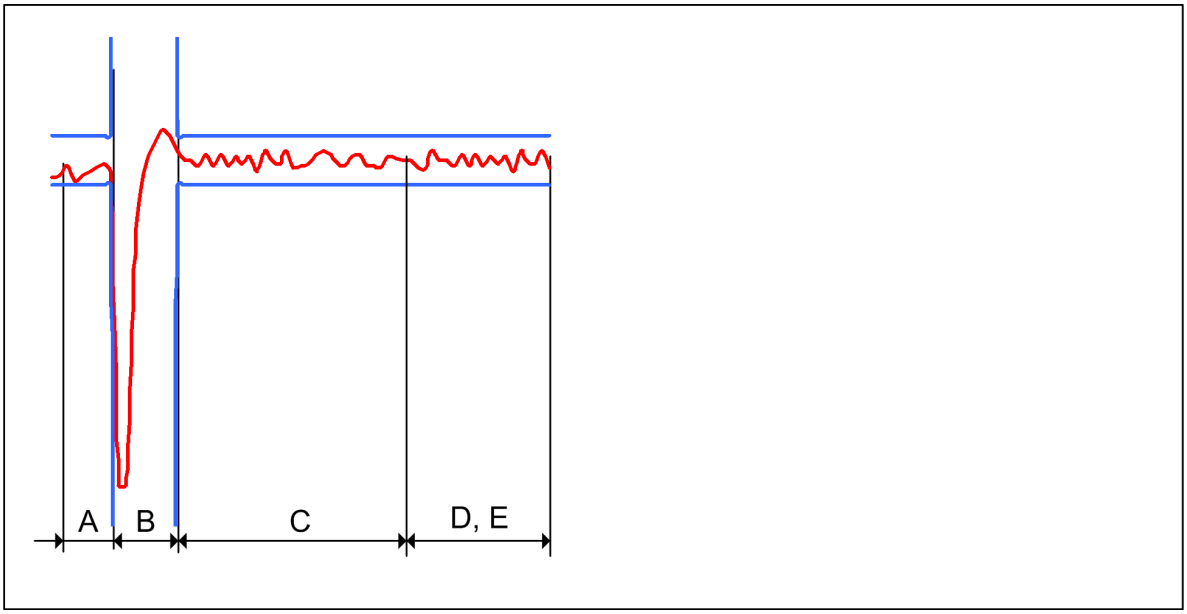
According to experiences this applies to all of the tests regarding table 3 which are proceeded with an air temperature less or equal +2 °C. All these tests have to be carried out under transient test conditions regarding chapter 6.4.

The measurement of the standard rated point A7/W35 is always preceded under transient test conditions. If during this measurement no defrosting of the evaporator occurs, the measurements of A7/W55 can be preceded under steady state conditions regarding chapter 6.3, otherwise the measurements have to be carried out regarding chapter 6.4.

The measurement under test conditions A20/W55 can always be carried out under steady state conditions (chapter 6.3).

6.3 Steady state conditions without defrosting the evaporator

Stationary measurement conditions are present if no defrosting processes occur during the equilibrium or measurement period (see graph 2).



A Pretreatment period: 10 minutes
B Defrost with recovery time: defrost time + 10 minutes
C Equilibrium period: 60 minutes
D Measurement period: 35 minutes
E Period for determining the performance

Graph 2: Testing and evaluation under stationary operating conditions without defrosting

The data from the entire measurement period is used to determine the measurement results (Regions E and D in graph 2).

6.4 Transient test conditions with defrosting of the evaporator

Transient test conditions are present if one or more defrosting cycles occur during the equilibrium or measurement period. The defrosting processes of the evaporator are triggered only by the defrost control of the test specimen.

To determine the outputs, all significant measured values are recorded every 10 seconds and an integral average is calculated.

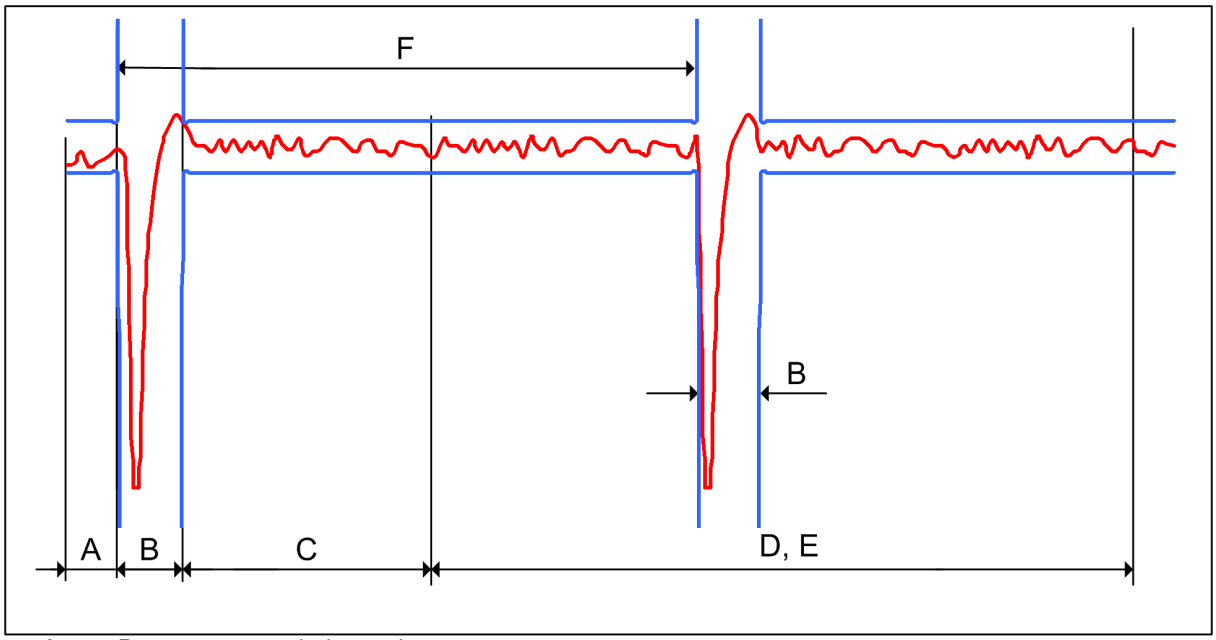
6.4.1 Performance determination with one defrost in the measurement period

If a defrosting process occurs during the measurement period, the measured values recorded during the entire measurement period are applied to determine the output data (see graph 3 Section E).

The length of a working cycle is determined from the time between the defrost cycle before the equilibrium period and the defrost cycle during the measurement period (graph 3, Region F “Working cycle with defrost”).

If an additional defrost is expected at the end of the 3-hour measuring period, the measuring periods can be extended by up to 30 minutes in order to take this second defrosting into account. The

performance data is then determined according to the performance specification for multiple defrostings in the measuring period as outlined in chapter 6.4.2.



A	Pretreatment period: 10 minutes
B	Defrost with recovery time: defrost time + 10 minutes
C	Equilibrium period: 60 minutes
D	Measurement period: minimum 3 hours
E	Period for determining output
F	Work cycle with defrost time

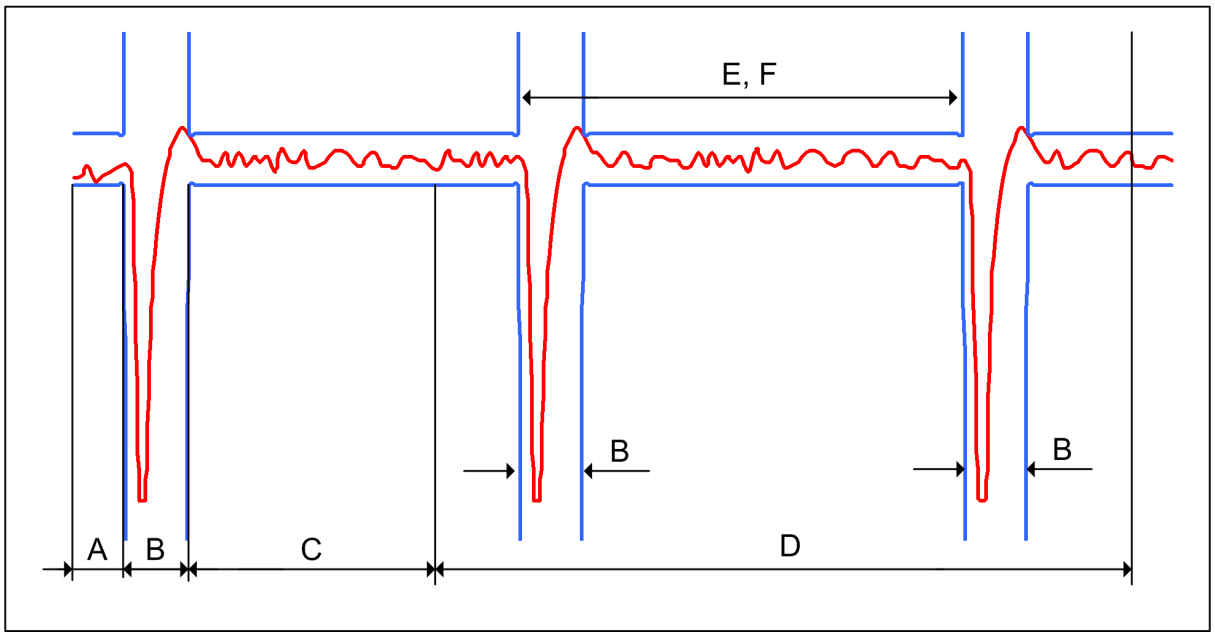
Graph 3: Transient operating conditions with one defrosting process in the measuring period

6.4.2 Performance determination for multiple defrosts in the measurement period

If two or more defrosting actions occur during the measurement period, then the measured values found in the period between the beginning of the first defrosting cycle and the beginning of the last defrosting cycle in the measurement period are used to calculate the output data (see Graph 3, Region E).

The length of a working cycle is determined from the time between the next-to-last and the last defrost cycle in the measurement period (graph 4, Region F “Working cycle with defrost”).

If a further defrost is expected at the end of the 3-hour measuring period, the measuring period can be extended by up to 30 minutes in order to take this additional defrosting into account in the analysis.



A Pretreatment period: 10 minutes
B Defrost with recovery time: defrost time + 10 minutes
C Equilibrium period: 60 minutes
D Measurement period: minimum 3 hours
E Period for determining output
F Work cycle with defrost time

Graph 4: Transient operating conditions with multiple defrosting cycles in the measuring period

6.5 Output measurement with variable-output heat pumps

6.5.1 General

Standard heat pumps, which are run in on/off mode, always provide full output during operation. Variable-output heat pumps, which can be run depending on need, provide reduced output during operation.

The measurements with partial load are taken with the source and drain volume flows determined from the full-load measurements found during continuous operation without shutting off the test specimens.

The usage limit test, safety test and sound measurement are always performed with maximum heat output.

6.5.2 Heat pumps with gradual output variation

For the present, all output points listed in Table 3 are measured with the maximum heat output, i.e., measurements are taken at maximum output. For test point A2/W35, an additional test is performed at the output level nearest to 50% of the rated heat output.

Other test points from Table 3 can be measured with the same output setting if desired by the applicant.

The output levels must be able to be adjusted manually during testing. This setting must not be able to be self-adjusting during the test.

6.5.3 Heat Pumps with continuous output variation

All output points listed in Table 3 are measured with the maximum heat output. For test point A2/W35, an additional test is performed at 50% of the rated heat output. The heat pump is set so that its output is 50% of the heat output measured at this test point with full load.

Other test points from Table 3 can also be measured if desired by the applicant using the same output settings from the 50% output measurement at A2/W35.

The output level must be able to be set manually during testing. This setting must not be able to be self-adjusting during the test.

6.6 Analysis

6.6.1 Calculation of heat output

The heat output of the test object is calculated as follows:

$$\dot{Q}_{WP.mittel} = \frac{Q_{WP}}{t_{Prüfdauer}} \quad [W] \quad (1)$$

where:

$$Q_{WP} = \sum_{i=1}^{n-1} \frac{\dot{Q}_{WP.i} + \dot{Q}_{WP.i+1}}{2} \cdot \Delta t \quad [J] \quad (2)$$

where

$$\dot{Q}_{WP} = \dot{V}_W \cdot \rho_W(T_R) \cdot cp \cdot (T_v - T_R) \quad [W] \quad (3)$$

Definitions:

$\dot{Q}_{WP.mittel}$	Average heat output in [W]
Q_{WP}	Heat energy given off during the test in [J]
$\dot{Q}_{WP.i}$	Heat output for the i^{th} measurement in [W]
$\dot{Q}_{WP}$	Present heat output in [W]
$t_{Prüfdauer}$	Test duration in [s]
n	Number of measuring intervals
Δt	Duration of a measuring interval in [s]
$\dot{V}_W$	Volume flow from the heat transfer medium on the warm side in [m³/s]
$\rho_W(T_R)$	Density of the heat transfer medium at return temperature in [kg/m³]
c_{pW}	Specific heat capacity of the heat transfer medium in [J/(kg K)]
T_V, T_R	Temperature of the heat transfer medium (outflow and return, respectively) in [K]

The indices V and R correspond to outflow and return, respectively.

6.6.2 Calculation of power consumption

The effective power consumption of the heat pump can be calculated from the power consumption of the blower, the compressor and all electrical mechanisms of the heat pump that function during heat mode.

The power consumption figures for the delivery apparatus of the heat pump are considered only to such an extent that they are required to overcome the internal static pressure differentials.

The power consumption of the heat pump is calculated as follows:

$$P_{WP.mittel} = \frac{E_{el}}{t_{Prüfdauer}} \quad [W] \quad (4)$$

where:

$$E_{el} = \sum_{i=1}^{n-1} \frac{P_{WP.i} + P_{WP.i+1}}{2} \cdot \Delta t \quad [J] \quad (4)$$

where:

$$P_{WP} = P_V + P_{UP} + P_E - P_K \quad [W] \quad (6)$$

where:

$$P_{UP} = \frac{\dot{V}_W \cdot \Delta p}{\eta_{UP}} \quad [W] \quad (7)$$

where:

$$P_K = \frac{\dot{V}_K \cdot \Delta p_K}{\eta_V} \quad [W] \quad (8)$$

Definitions:

$P_{WP.mittel}$	Average electrical power consumption in [W]
P_{WP}	Electrical power consumption of the entire heat pump in [W]
$P_{WP.i}$	Electrical power consumption for the i^{th} measurement in [W]
P_V	Electrical power consumption of the compressor in [W]
P_{UP}	Proportional electrical power consumption of the circulating pump in [W]
P_K	Proportional electrical power consumption of the blower for the external pressure drop in [W] (only if Δp_K > 25 Pa)
P_E	Electrical power consumption of all additional mechanisms in [W]
E_{el}	Electrical energy consumed during the test in [J]
$t_{Prüfdauer}$	Test duration in [s]
n	Number of measuring intervals
Δt	Duration of a measuring interval in [s]
$\dot{V}_W$	Volume flow from the heat transfer medium on the warm side in [m³/s]
$\dot{V}_K$	Volume flow from the heat transfer medium on the cool side in [m³/s]
Δp	Static pressure drop in the heat exchanger via the heat pump in [Pa]
Δp_K	Maximum external static pressure drop for heat pumps with channel interface in [Pa]
η_{UP}	Efficiency of the circulating pump = 0.3 per EN 14511
η_V	Efficiency of the blower = 0.3 per EN 14511

6.6.3 Determining the Coefficient Of Performance (COP)

The COP (coefficient of performance) corresponds to the quotient of the heat output and electrical power consumption as measured or calculated in the output test. The average COP is determined by dividing the thermal heat gained during the test by the corresponding electrical work consumed.

The average COP is calculated as follows:

$$\varepsilon_{WP} = \frac{Q_{WP}}{E_{el}} \qquad [-] \qquad (9)$$

Definitions:

ε_{WP}	COP of the heat pump
Q_{WP}	Heat energy given off during the test in [J]
E_{el}	Electrical energy consumed during the test in [J]

6.6.4 Calculation of relative defrost time

The relative defrost time is calculated as follows:

$$\tau_{rel} = \frac{\tau_A}{\tau_H} \cdot 100 \qquad [\%] \qquad (10)$$

Definitions:

τ_{rel}	Relative defrost time in %
τ_A	Length of the defrost phases during the working cycles in [h]
τ_H	Length of the working cycles with defrosting during the working cycles in [h]

7 Testing the usage limit

7.1 Purpose

The test at the vertices of the warranted usage range is intended to show whether the heat pump is fully functional and operable in the warranted usage range indicated by the manufacturer.

7.2 Test conditions

The definition of the vertices is explained in Section 3.2.2. The values given by the manufacturer are set as target values for the source temperatures. The values given by the manufacturer are set as target values for the flow temperatures.
In heat mode, the permissible deviation defined in Table 4a must be met; in defrost mode plus the 10-minute recovery phase, the permissible deviations in Table 4b must be observed.

The test is performed with the same source volume flow used for the output measurement. For the drain side, the volume flow calculated at test point A7/W35 must be set.

The humidity relative to the source temperatures of the maximum 6 vertices are determined as follows (rounded to 1%):

$T_{Q.Eckpunkt}$ (°C)		Relative humidity [%]	
	< = -7°C	Not defined	
> -7°C	< = 7°C	$\varphi_L = T_{Q.Eckpunkt} + 82$	(11)
> 7°C	< = 20°C	$\varphi_L = -3.0 * T_{Q.Eckpunkt} + 110$	
> 20°C		50	

Definitions:

φ_L Relative humidity in [%]

$T_{Q.Eckpunkt}$ Source temperature (air temperature) of the respective vertex in °C

7.3 Test sequence

The test object must remain in operation under the specified operating conditions for at least 60 minutes without external interference.

If experience from the output measurement indicates that a defrost cycle can be expected at the corresponding usage limit and a defrost cycle does not automatically occur during the 1-hour test period, a defrost cycle must be triggered by manual control. The test is finished only when the actual values are within the tolerance limits defined in Table 4a for at least 10 minutes after defrosting.

The test specimen must remain in operation during the entire test period without being shut off by a safety device. There must be no damage to the test specimen throughout the entire test.

8 Safety test

8.1 Purpose

The safety test checks if the safety devices respond correctly in case of operational malfunctions and protect the heat pump from damage. This test is carried out in addition to the tests according to EN 14511-4.

8.2 General

a) This test is performed at A7/W35 under the conditions given in Table 3. If this test point cannot be started with the test object, then the test must be performed at a different test point according to Table 3.
When starting the test point, the limit values per Table 4a must be met.

b) To check the safety devices of the heat pump, a series of operating states and malfunctions are simulated. Before and after each simulated state or malfunction, the test object must reach the steady-state condition of normal operation under the indicated test condition for the procedure.

c) The simulated malfunctions a) and b) must be maintained for at least 2 hours. The test object must not suffer any damage throughout the entire sequence of tests and must be fully functional after testing.
The test specimen must not switch on and off more than 4 times during the last 60 minutes of the test. If a safety device puts the test specimen permanently out of operation (locking malfunction), it is considered to have passed the test and the test is ended.

d) For the safety tests, those control devices on the heat pump that do not serve as overload protection or safety devices must be disabled. Any time delays that may be found must also be considered in the test periods in the test sequence. (This is done in coordination with the respective manufacturer.)

8.3 Malfunctions to be simulated

a) Blocking the heat transfer medium flow of the heat source system (the blower is switched off on the source side).

b) Blocking the heat transfer medium flow of the heat usage system (the circulating pump is switched off on the user side).

c) Complete power failure of at least 5 seconds. The test object must return to a stable operating state no later than 20 minutes after starting the compressor.

9 Sound measurement

For the sound measurement the heat pump is operated at test point A7/W35 according to table 3. For set up see standard EN 12102. The sound level is to be measured by one of the following methods:

- Live room method in accordance with EN ISO 3741 and EN ISO 3743
- Free field method in accordance with EN ISO 3744 and EN ISO 3745
- Intensity method in accordance with EN ISO 9614-2
- EN ISO 3746
- EN ISO 3747, provided that the test environment meet the requirements for engineering method (grade 2)

10 Test of electrical characteristic values

The electrical characteristic values for the start and operation of each phase are recorded using a voltage analyzer. It is up to the individual heat pump manufacturers whether to equip their machines with soft-start devices. Only the measured state is given in the test report.

This test is performed at the standard test point A7/W35 according to table 3.

11 Inspection of documentation provided by the manufacturer

11.1 Name plate

Each heat pump must have a name plate securely and permanently attached. It must be applied such that it is easily readable and accessible. It must include the following information:

- Manufacturer or supplier
- Type
- Serial or production number
- Coefficient of performance (COP) and heat output in kW with at least 3 significant figures for A2/W35 and A7/W35
- Type and filling weight of the refrigerant

12 Test report

12.1 General

Three different supplementary test reports are worked out:

a) Test report stage 1:
   This test report lists the essential information and the most important measured values for the respective machines. This test report serves mainly as the basis for general publications.

b) Test report stage 2:
   This is a more detailed version of test report 1 and is used for the application of the EHPA-DACH Quality Label.

c) Test report stage 3:
   This dossier contains all test documents. This test report is part of the test and is sent only to the manufacturer or potential testing customer.

The heat pump test centers only publish the test results if the customer has approved them for publication with an authorized signature.

12.2 Contents of the test reports

12.2.1 General Information on the testing institute

- Date:
- Testing institute:
- Test site:
- Tester:
- Test number
- Test duration with or without defrost

12.2.2 Machine-specific information

- Customer (usually the manufacturer)
- Machine type, designation
- Serial number (if not available, compressor serial number)
- Brief description of the design
- Refrigerant filling (type and quantity)
- Rated volume flow on user side with which the measurements were taken.
- Blower speed, air volume flow and maximum permissible external static pressure drop
- Information on design, such as compressor type, heat exchanger type, expansion valve type, etc.
- Dimensions and weight of the heat pump

12.3 Test results

12.3.1 Output measurement

The stage 1 and stage 2 test reports contain a summary of the following points:
- Average heat output (chapter 6.6.1)
- Average electrical power consumption (chapter 6.6.2)
- COP (chapter 6.6.3)
- Hydraulic pressure drop in user system (stage 2 only)

12.3.2 Usage limits and safety test

- Extreme points tested and reached
- Safety test passed or failed

12.3.3 Electrical measurements

- Max. start current with or without soft starter
- Output factor (mean)

12.3.4 Sound measurement

For the noise measurement, the sound output level is listed in dB(A) as well as the measurement precision (standard deviation in dB).