





Test Report issued under the responsibility of:



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| <p>TEST REPORT EHPA-DACH Testing Regulation Supplemental requirements for granting the international quality label for heat pumps Testing of Air/Water Heat Pumps Testing of Water/Water and Brine/Water Heat Pumps</p> <p>DIN EN 14511-1, DIN EN 14511-2, DIN EN 14511-3, DIN EN 14511-4 Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling DIN EN 14511-1:2007 Terms and definitions DIN EN 14511-2:2007 Test conditions DIN EN 14511-3:2007 Test methods DIN EN 14511-4:2007 Requirements</p> | |
| Report Reference No. | 413300-2600-0008/142795 |
| Date of issue | 2010-11-11 |
| Total number of pages | 57 |
| Testing Laboratory | VDE Testing and Certification Institute |
| Address | Merianstraße 28, D-63069 Offenbach |
| Applicant's name | Vaillant GmbH |
| Address | Berghauser Straße 40, 42859 Remscheid |
| Test specification: | |
| Standard | <input checked="" type="checkbox"/> EHPA-DACH Testing Regulation Testing of Water/Water and Brine/Water Heat Pumps, Version 1.3, Release 15.02.2010 Test Method based on EN 14511-1 through 4 <input type="checkbox"/> EHPA-DACH Testing Regulation Testing of Air/Water Heat Pumps, Version 1.3, Release 15.02.2010 Test Method based on EN 14511-1 through 4 <input checked="" type="checkbox"/> EN 14511-1:2007 (DIN EN14511-1:2008-02), EN 14511-2:2007 (DIN EN 14511-2:2008-02), EN 14511-3:2007 (DIN EN 14511-3:2008-02), EN 14511-3:2007/AC:2008 (DIN EN 14511-3 Corrigendum 2008-10) EN 14511-4:2007 (DIN EN 14511-4 :2008-02) |
| Test procedure | EHPA |
| Non-standard test method | N/A |

| | |
|---|--|
| Test Report Form No. | EHPA_DACH_Ver_1_3, Release 2010-02-15 |
| Test Report Form(s) Originator. | VDE Testing and Certification Institute |
| Master TRF..... | Dated 2010-06 |
| Test item description | Brine – Water Heat Pump |
| Trade Mark |  |
| Manufacturer | Vaillant GmbH; Berghauser Straße 40, 42859 Remscheid |
| Model/Type reference | VWS 61/3, VWS 81/3, VWS 101/3*), VWS 141/3 VWS 171/3*), *) Test sample |
| Ratings | <u>VWS 101/3:</u> 3 AC 400 V, 50 Hz, Refrigerant R 407 C, 2,05 kg, max. rated pressure 29 bar <u>VWS 171/3:</u> 3 AC 400 V, 50 Hz, Refrigerant R 407 C, 3,05 kg, max. rated pressure 29 bar |
| Description of design: | |
| <p>Heat pump systems consist of separate circuits in which liquids or gases transport the heat from the heat source to the heating system. As these circuits operate with differing media (brine/water, coolant and heating water), they are coupled to one another by means of heat exchangers. In these heat exchangers the heat passes from a medium at a high temperature to a medium at a lower temperature. The Vaillant geoTHERM heat pump can be supplied from different heat sources such as, e.g. geothermal heat (geoTHERM VWS) or ground water (geoTHERM VWW). The system consists of separate circuits which are coupled to one another by means of heat exchangers. These circuits are:</p> <ul style="list-style-type: none"> - The heat source circuit, by means of which the energy from the heat source is transported to the coolant circuit. - The coolant circuit, which releases its heat to the heating water circuit by means of evaporation, compression, liquefaction and expansion. - The heating water circuit, which supplies the heating and the hot water generation for the domestic hot water cylinder. <p>The coolant circuit is connected by means of the evaporator to the environmental heat source, from which it extracts thermal energy. At the same time, the physical state of the coolant changes; it evaporates. The coolant circuit is connected by means of the condenser to the heating system, to which it releases the heat again. In so doing, the coolant becomes liquid again; it condenses. As thermal energy can only pass from a body at a higher temperature to a body at a lower temperature, the coolant in the evaporator must have a lower temperature than the environmental heat source. On the other hand, the temperature of the coolant in the condenser must be higher than that of the heating water in order to be able to release the heat to it.</p> | |

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| Testing procedure and testing location: | |
| <input checked="" type="checkbox"/> CB/CCA Testing Laboratory: | VDE Testing and Certification Institute |
| Testing location/ address | Merianstrasse 28, D-63069 Offenbach , Germany |
| <input type="checkbox"/> Associated CB Laboratory: | -- |
| Testing location/ address | |
| Tested by (name + signature).....: | |
| Approved by (+ signature).....: | |
| <input checked="" type="checkbox"/> Testing procedure: TMP | |
| Tested by (name + signature).....: | Thomas Hofmann |
| Approved by (+ signature).....: | Stephan Richter  |
| Testing location/ address | Vaillant GmbH Berghauser Strasse 40, D-42859 Remscheid |

| | |
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| Summary of testing: | |
| Tests performed (name of test and test clause): | Testing location: |
| All tests were conducted in manufacturer laboratory. | Vaillant GmbH Berghauser Strasse 40, D-42859 Remscheid |

| Summary of compliance with National Differences: | | | | | | | | | | | | | | | | | | |
|---|--------------------------|--|--|------------------------------------|---------|--------|-----|---|---|---|-----|-------|---|---|-----|-------|---|---|
| Remark according EHPA regulations for granting the international quality label for electrically driven heat pumps Version 1.3 Release 2010-02-15: A model range is characterised by uniform main components. The following number of units must be examined from each model range: | | | | | | | | | | | | | | | | | | |
| Table 2.1 | | | | | | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th rowspan="2">n_{HP} serie</th> <th rowspan="2">Ratio Q_{max} / Q_{min}</th> <th colspan="2">Q_{max}-Q_{min}</th> </tr> <tr> <th>≤ 30 kW</th> <th>>30 kW</th> </tr> </thead> <tbody> <tr> <td>≤ 4</td> <td>-</td> <td>1</td> <td>2</td> </tr> <tr> <td>> 4</td> <td>≤ 3.0</td> <td>2</td> <td>2</td> </tr> <tr> <td>> 4</td> <td>> 3.0</td> <td>2</td> <td>3</td> </tr> </tbody> </table> | n _{HP} serie | Ratio Q _{max} / Q _{min} | Q _{max} -Q _{min} | | ≤ 30 kW | >30 kW | ≤ 4 | - | 1 | 2 | > 4 | ≤ 3.0 | 2 | 2 | > 4 | > 3.0 | 2 | 3 |
| n _{HP} serie | | | Ratio Q _{max} / Q _{min} | Q _{max} -Q _{min} | | | | | | | | | | | | | | |
| | ≤ 30 kW | >30 kW | | | | | | | | | | | | | | | | |
| ≤ 4 | - | 1 | 2 | | | | | | | | | | | | | | | |
| > 4 | ≤ 3.0 | 2 | 2 | | | | | | | | | | | | | | | |
| > 4 | > 3.0 | 2 | 3 | | | | | | | | | | | | | | | |
| n _{HP} serie -> number of heat pumps in a serie | | | | | | | | | | | | | | | | | | |
| According section 2.1 of EHPA – Regulation only one type of the model range must be tested. Type VWS 171/3 S was the selected test sample by VDE Testing and Certification Institute. The model series includes also type see table. | | | | | | | | | | | | | | | | | | |

| | |
|----------------------|---|
| Manufacturer: | Vaillant GmbH |
| Types: | VWS 61/3; VWS 81/3; VWS 101/3; VWS 141/3; VWS 171/3 |
| | VWS 62/3; VWS 82/3; VWS 102/3 |
| | VWS 63/3; VWS 83/3; VWS 103/3 |
| | VWS 64/3; VWS 84/3; VWS 104/3 |
| | VWW 61/3; VWW 81/3; VWW 101/3; VWW 141/3; VWW 171/3 |
| | VWW 62/3; VWW 82/3; VWW 102/3 |

Possible test case verdicts:

- test case does not apply to the test object.....: N/A
- test object does meet the requirement.....: P(Pass)
- test object does not meet the requirement.....: F(Fail)

Testing:

Date of receipt of test item: 2010-03-22

Date (s) of performance of tests: 2010-03-22 to 2010-03-26

General remarks:

The test results presented in this report relate only to the object tested.

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"(See Enclosure #)" refers to additional information appended to the report.

"(See appended table)" refers to a table appended to the report.

Throughout this report a comma is used as the decimal separator.

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[Table 18](#)

General product information:

Test item particulars:**Testing of Air/Water Heat Pumps**

Machine-specific information:

| | |
|--|-----|
| - Manufacturer.....: | N/A |
| - Machine type (Test sample).....: | N/A |
| - Serial number test sample | N/A |
| - manufacturer compressor and type | N/A |
| - Serial number motor compressor.....: | N/A |
| - Refrigerant filling (type and quantity) | N/A |
| - Rated volume flow on user side with which the measurements were taken.....: | N/A |
| - Blower speed, air volume flow and maximum permissible external static pressure drop.....: | N/A |
| - Heat exchanger type.: | N/A |
| - Evaporator.....: | N/A |
| - Expansion valve type | N/A |
| - Dimensions and weight of the heat pump | N/A |
| - Description of the design.....: | N/A |

Output measurement: A2 / W35

| | |
|--|-----|
| - Average heat output (clause 6.6.1).....: | N/A |
| - Average electrical power consumption (clause 6.6.2).....: | N/A |
| - COP (clause 6.6.3).....: | N/A |
| - min. required COP at A2/W35.....: | N/A |
| - Hydraulic pressure drop in user system (delta p): | N/A |

Usage limits and safety test:

| | |
|--|-----|
| - Extreme points tested and reached.: | N/A |
| - Safety test passed or failed.....: | N/A |

Electrical measurements:

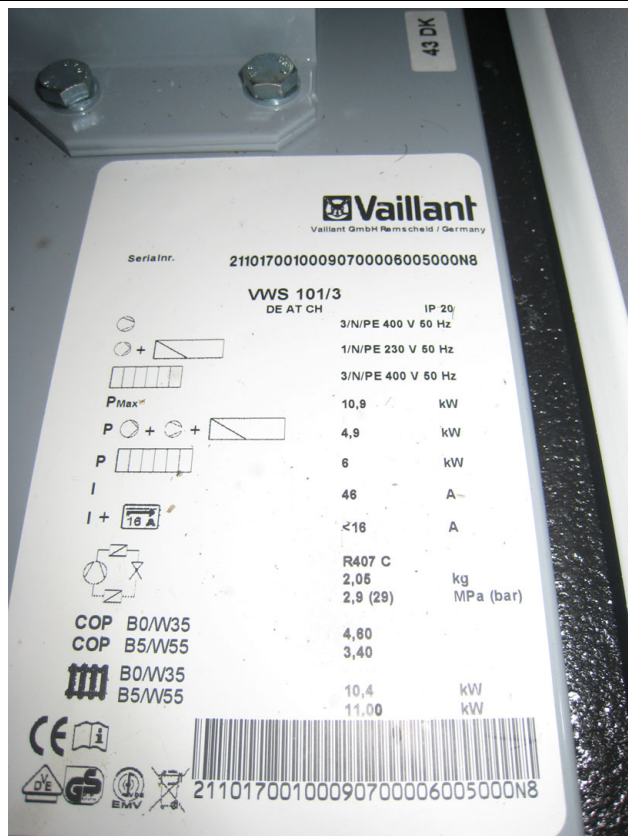
| | |
|---|-----|
| - Max. start current <u>with</u> or without soft start.: | N/A |
| - Output factor (mean value) | N/A |

Sound measurement:

| | |
|---|-----|
| - Sound output is given in dB(A).....: | N/A |
| - Measurement precision (standard deviation in dB).....: | N/A |

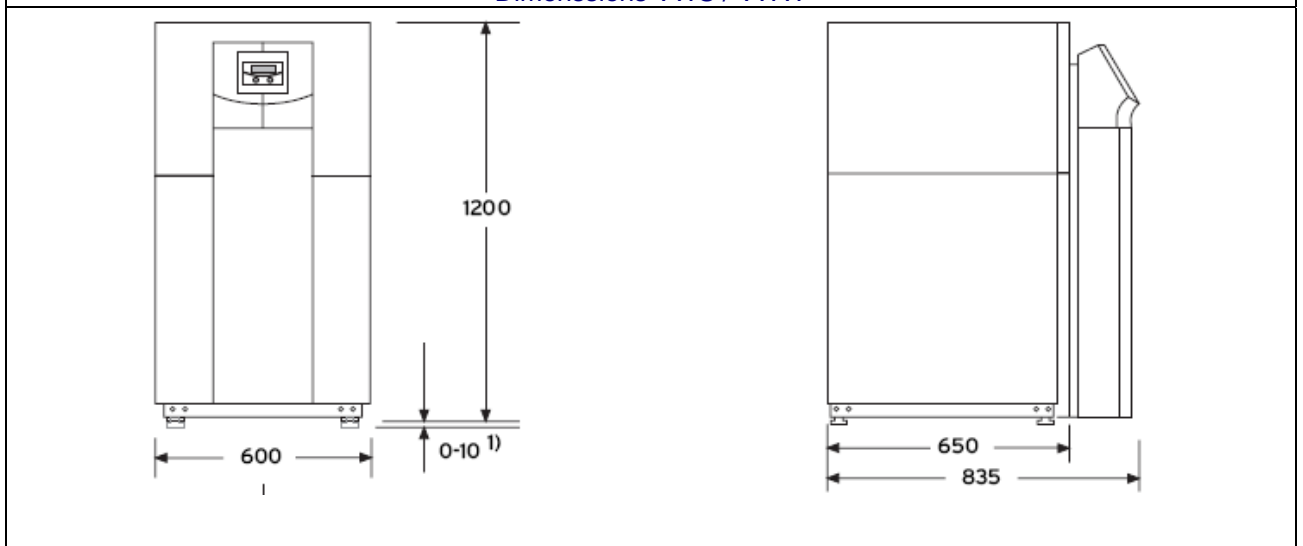
Copy of marking plate:

Marking plate (Test sample)

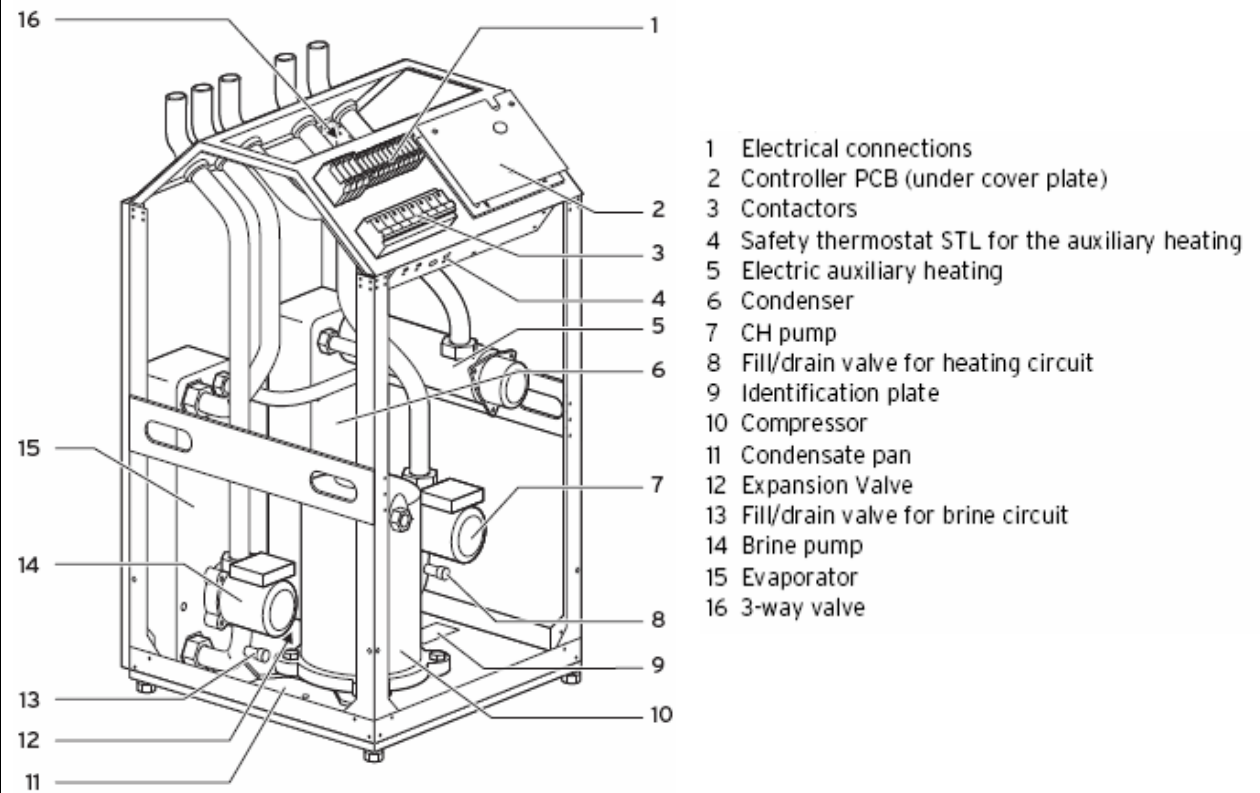


| Vaillant | |
|---|------------------------------|
| Vaillant GmbH Remscheid / Germany | |
| Serial-No. 21100100200752150006005000N6 | |
| VWL 171/3 S | |
| DE AT CH | |
| | IP 25 |
| | 3/N/PE 400V 50Hz |
| | 1/N/PE 230V 50Hz |
| | 3/N/PE 400V 50Hz |
| P | 13,5 kW |
| P | 7,5 kW |
| P | 6 kW |
| I | 74 A |
| I + | <25 A |
| | --- I |
| | --- MPa (bar) |
| | R407 C |
| | 3,05 kg |
| | 2,9 (29) MPa (bar) |
| COP | A2/W35 3,90 |
| COP | A7/W35 4,30 |
| | A2/W35 16,20 kW |
| | A7/W35 18,10 kW |
| | |
| | 21100100200752150006005000N6 |
| | |
| | |
| | |

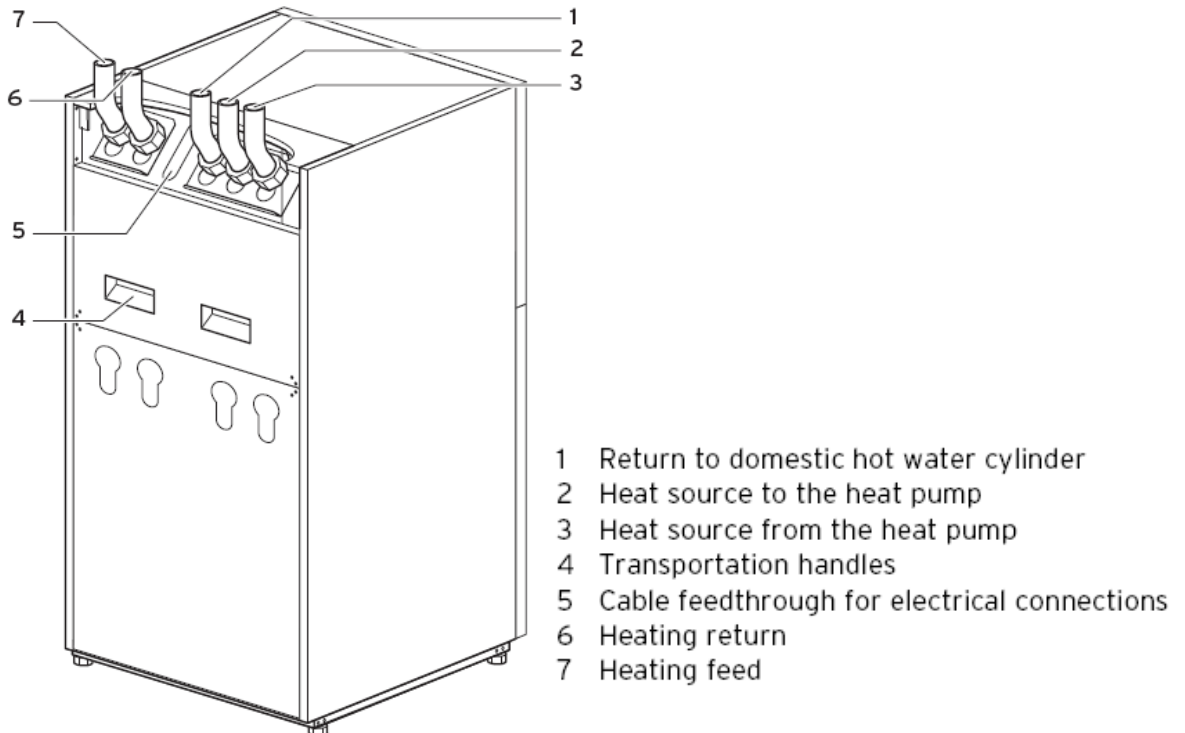
Dimensions VWS / VWW

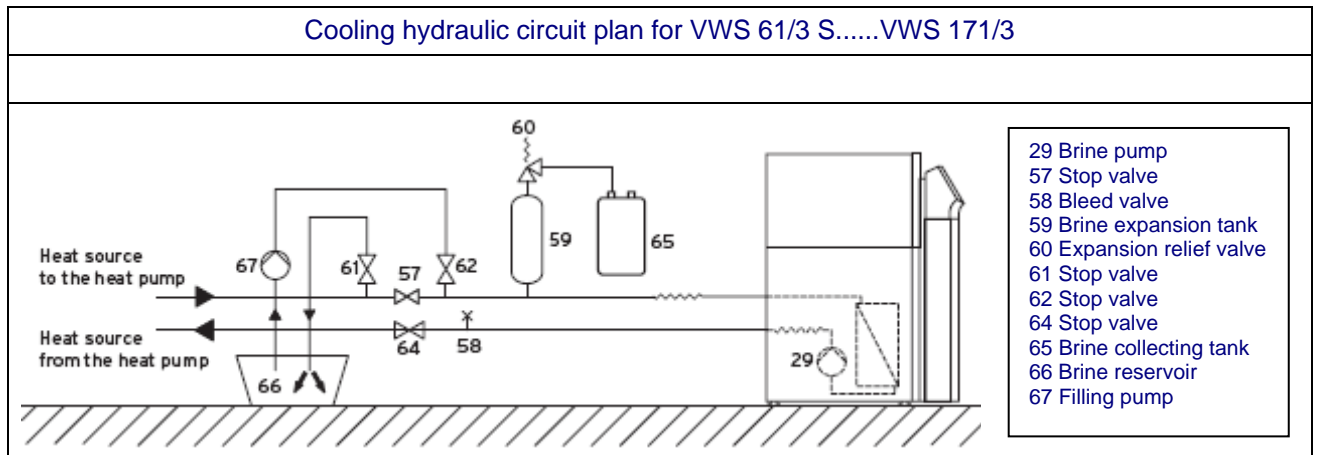


Component groups – VWS 6x, 8x, 10x, 141x, 171/3



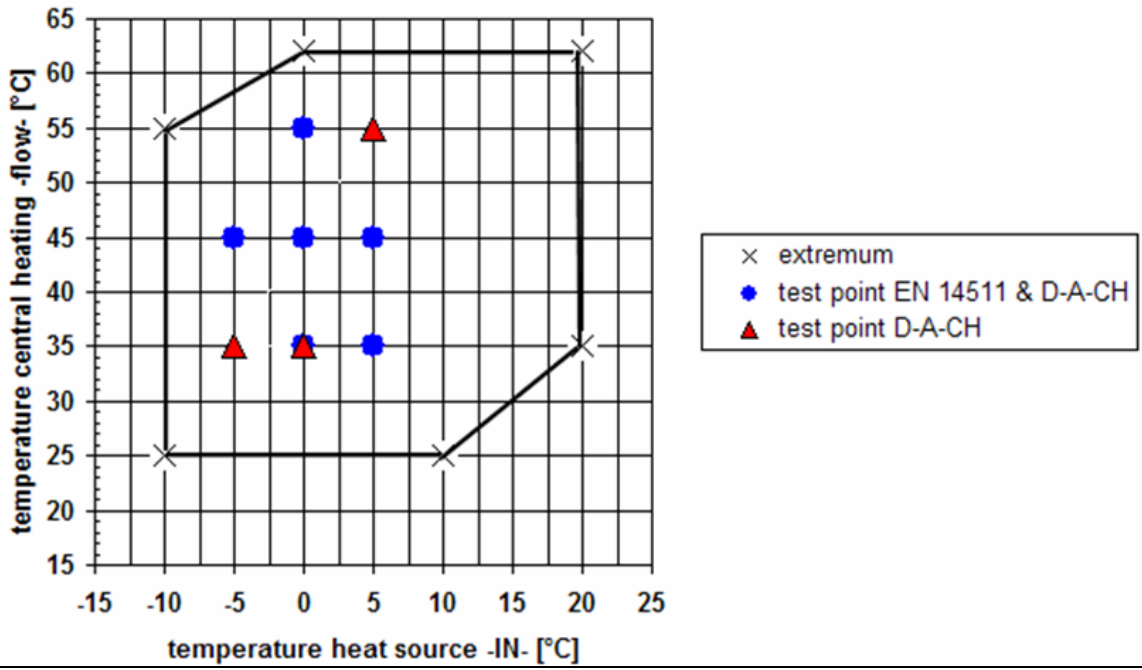
Rear view VWS / VWW



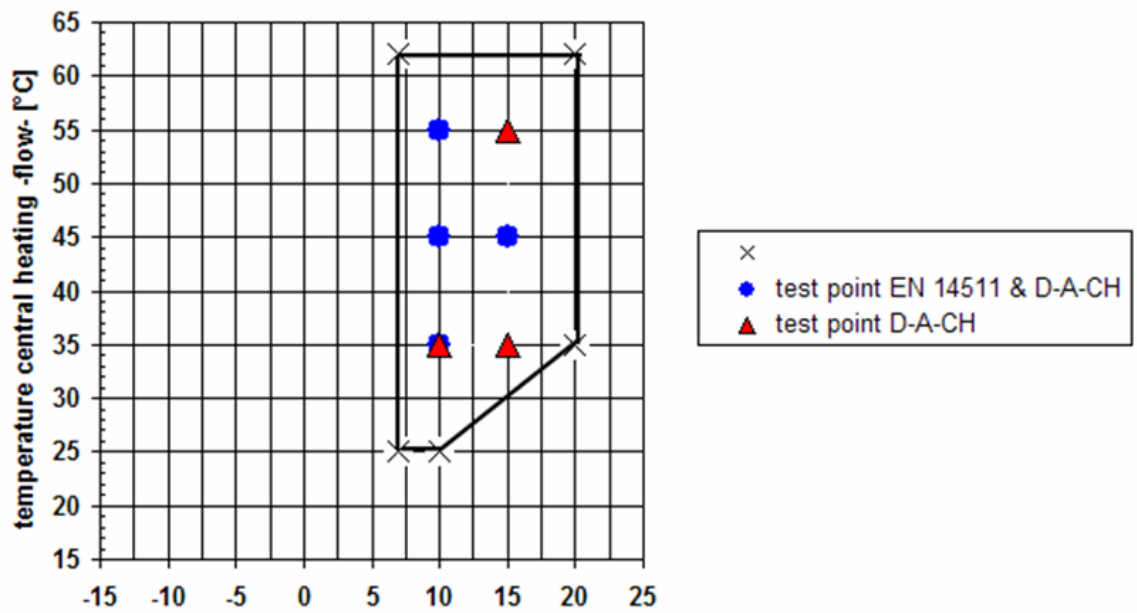


| Main components Vaillant VWS 61/x - 171/x | | |
|--|---------------------|--|
| | Manufacturer | Specification |
| Refrigerant | | R 407C |
| Compressor VWS 61/3 VWS 62/3 VWS 63/3 VWS 64/3 VWW 61/3 VWW 62/3 | Copeland | ZH15K4E-TFD Scroll mass: 1,9 kg |
| Compressor VWS 81/3 VWS 82/3 VWS 83/3 VWS 84/3 VWW 81/3 VWW 82/3 | Copeland | ZH21K4E-TFD Scroll mass: 2,2 kg |
| Compressor VWS 101/3 VWS 102/3 VWS 103/3 VWS 104/3 VWW 101/3 VWW 102/3 | Copeland | ZH26K4E-TFD Scroll mass: 2,05 kg |
| Compressor VWS 141/3 VWW 141/3 | Copeland | ZH38K4E-TFD Scroll mass: 2,9 kg |
| Compressor VWS 171/3 VWW 171/3 | Copeland | ZH45K4E-TFD Scroll mass: 3,05 kg |
| Evaporator | Swep | Heat exchanger |
| Condenser | Swep | Heat exchanger |
| Internal heat exchanger | Packless Industries | HRX |
| Collector | Danfoss | DML |
| Expansion-Valve | Danfoss | TUBE |

Usage limits all VWS types



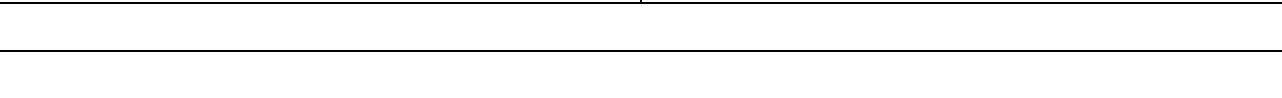
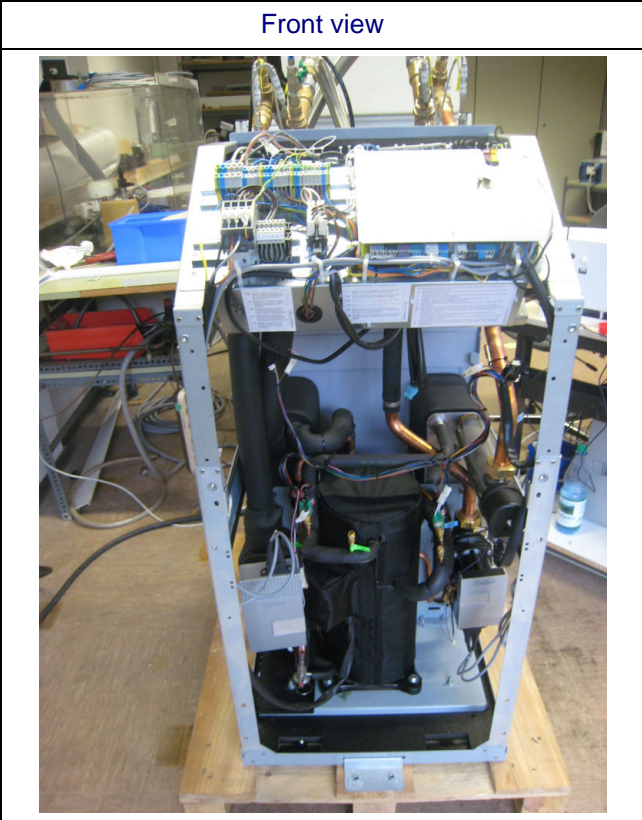
Usage limits all VWW types



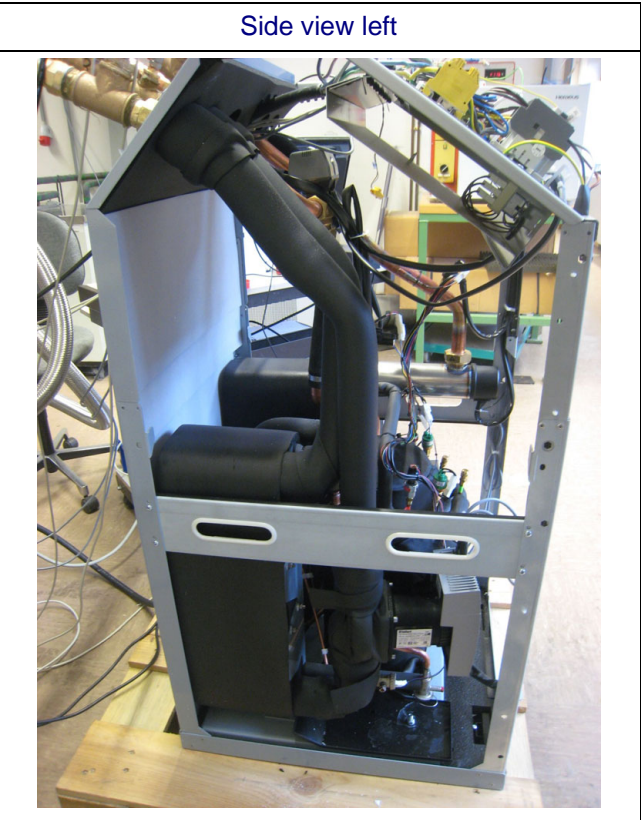
Photographs:



Front view



Side view left



Side view right



Photographs:

VWS 101/3



Compressor: Scroll ZH26K4E-TFD-XXX



VWS 171/3

Compressor: Scroll ZH45K4E-TFD-XXX



| Source circuit pump | Heat circuit pump |
|---|--|
|  <p>Vaillant WAG Typ: Stratos PARA 25/1-12 T6 VA VAL.-Nr.: 0020084142 / 1001 1~230V 50Hz P: 16-310 W I: 0.16-1.37 A Class F IP x4 PN 10 Tmax. 110°C Made by WIL0 WIL0 SE Nortkirchenstr. 100 44263 Dortmund Germany</p> |  <p>Vaillant WAG Typ: Stratos PARA 25/1-8 T6 VA VAL.-Nr.: 0020084146 / 1001 1~230V 50Hz P: 8-140 W I: 0.09-1.50 A Class F IP x4 PN 10 Tmax. 110°C Made by WIL0 WIL0 SE Nortkirchenstr. 100 44263 Dortmund Germany</p> |

| Testing of Water/Water and Brine/Water Heat Pumps | | | |
|--|--------------------|-----------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |

| | | | |
|----------|--|--|----------|
| 1 | INTRODUCTION | | — |
| | The test conditions and testing method for the EHPA Quality Label are based on the European standard EN 14511, Parts 1 to 4, version 2007. It applies for space heating, additionally requirements according EHPA Quality Label can be found in the text (they are also summarized in Annex A). Anything not defined in this test regulation should be handled in line with EN 14511 | | P |
| | A heat pump can be awarded 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" | | P |
| | This regulation has been adopted by the EHPA Quality Label Committee. Any changes to them must be approved by the Committee. | | P |

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| 2 | SCOPE OF TESTING REGULATION | | — |
| | The scope of this testing regulation is to specify the testing conditions and the test method for testing electrically driven water/water and brine/water heat pumps. In order to qualify for the EHPA Quality Label, the heat pump submitted for testing must be from series production. | | P |
| 2.1 | Scope of testing | | — |
| | The scope of the test comprises: | | — |
| | a) A performance test for different standardized points as specified in EN 14511 Parts 2 & 3 and other points as defined in Chapter 5, | | P |
| | b) The testing of the operating range as defined by the manufacturer (see chapter 3.5 and 6.3), | | P |
| | c) A safety test (see chapter 6), | | P |
| | d) Sound measurement in accordance with EN 12102 (see chapter 7), | | P |
| | e) Testing the electrical characteristic values (see chapter 8). | | P |

| Testing of Water/Water and Brine/Water Heat Pumps | | | |
|--|--|----------------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| 2.2 | Testing methods | | — |
| 2.2.1 | Performance testing | | — |
| | Perform the test under constant ambient conditions, i.e., during the test, the set conditions (e.g. software and control devices) on both source and user sides must remain constant. This test determines the heat output and the electrical power consumed, from which the performance figure for the heat pump is calculated. | | P |
| 2.2.2 | Testing the operating range | | — |
| | The operating range (max. 6 key points, see chapter 3.5 and figure 1 in Chapter 6) is declared by the manufacturer and describes the operating range for the heat pump which is covered by the full manufacturer's warranty. Testing is performed to evaluate whether the heat pump can operate at the limits of the operating range for an extended period of time. | | P |
| 2.2.3 | Uncertainties of measurement for indicated values | | |
| | Uncertainty of measurement (\pm) of the cited values in accordance with EN 14511-3 Section 4.3 | (See appended table) | P |
| 2.2.4 | Safety test | | |
| | The safety of equipment is tested by simulating operational malfunctions during normal heat pump operation. | | P |
| 3 | TERMS AND DEFINITIONS | | — |
| | The following terms supplement the terms and definitions defined in EN 14511-1. | | P |
| 3.1 | Heat source system | | — |
| | A heat source system is extracting the heat from the heat source (e.g. air, water, soil). | | P |
| 3.2 | Heat sink system | | — |
| | A heat sink system is distributing the heat from the warm side (heat sink, condenser) of the heat pump to the heat distribution system (space heating, domestic hot water, swimming pools, etc.). | | P |
| 3.3 | Heating capacity, PH | | — |
| | Heat delivered by the heat pump to the heat transfer medium. | | P |
| 3.4 | Effective power input, PE | | — |
| | The average electrical power input of the unit within the defined interval of time obtained for operating the heat source system including all control, regulation and safety equipment. | | P |

| Testing of Water/Water and Brine/Water Heat Pumps | | | |
|--|---|---|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| 3.5 | Operating range | | — |
| | The working range for the heat pump as specified by the manufacturer, limited by a maximum of six points (see figure 1, in Chapter 6), and covered by full manufacturer warranty. | Usage limits see page 12 | P |
| 3.6 | Safety range | | — |
| | The safety range are the conditions outside the operating range at which the safety devices prevent the heat pump from being damaged. | | P |
| 3.7 | Acoustic power level | | — |
| | The acoustic power level is expressed in decibels, dB(A), as defined in EN 12012. | | P |
| 4 | TEST CONDITIONS | | — |
| 4.1 | Ambient conditions and electrical data | | — |
| | The ambient conditions and the electrical data for the performance and functional inspection are listed in Table 2. | (See appended table) | P |
| 4.2 | Test conditions for performance testing | | — |
| | Test conditions / testing points Table 3a and 3b | (See appended table) | P |
| 4.3 | Setting up and connecting the test object | | — |
| | The heat pump must be set up and connected for the test as recommended by the manufacturer in the installation and operating manual. | | P |
| | Heat pump start-up shall be performed by a manufacturer's representative otherwise the test laboratory shall charge the unit according to the specification of the manufacturer, which shall include: | | — |
| | - the quantity of refrigerant, | | P |
| | - the suction pressure and the superheating temperature | | P |
| | - and the expansion device or other component setting for achieving a correct operation of the heat pump. | | P |
| | Compact units automatically filled with refrigerant at the manufacturer's site can be delivered as produced. The manufacturer has to confirm that a control system documenting the filling is used. If such a system does not exist the heat pump must be delivered filled with nitrogen and shall be charged with refrigerant defined by the manufacturer at the test laboratory. The refrigerant type and charge must be in line with the technical data (marking plate) presented by the manufacturer. | Heat pumps were charged with refrigerant R407 by test laboratory immediately before start up the tests. | P |
| 4.4 | Requirements for the test facility | | — |
| 4.4.1 | Test conditions during heating operation – steady state | | — |
| | The following accuracy of parameter settings and measurements must be achieved during the tests | (See appended table) | P |

| Testing of Water/Water and Brine/Water Heat Pumps | | | |
|---|---|---------------------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| 5 | PERFORMANCE TESTING | | — |
| 5.1 | General | | — |
| | If liquid heat transfer media other than water are used, the specific thermal capacity and density of the heat transfer medium must be determined and taken into account during the calculations. | | P |
| | When testing brine/water heat pumps, use a brine of 30 % by volume of ethylene glycol, with a freezing point of -15 °C. | EG 28,4% by vol at 21,1°C | P |
| | Ensure, throughout the test, that no water drips or drains from any part of the equipment except from the drainage openings intended for the purpose. | | P |
| 5.2 | Performance measurement procedure | | — |
| 5.2.1 | Measurement of steady state or transient test conditions | | — |
| | Measure the outputs under steady-state conditions, which must be established prior to beginning the measurements. Steady-state conditions are regarded as met and maintained if all the measurement variables have been held constant for at least 60 minutes without having to change the set values. The following measurement period lasts for a minimum of 35 minutes. | | P |
| | Periodic fluctuations in the measured variables are permitted, according to the technical regulations, if the mean values of the permissible deviations as shown in Table 4 are not exceeded. | | P |
| | Record the measured values at least every 30 seconds throughout the entire test period. | Registered interval: 1s | P |
| 5.3 | Performance test with variable-output heat pumps | | — |
| 5.3.1 | General | | — |
| | Standard heat pumps, which are run in on/off mode, always deliver full output during operation. Variable-output heat pumps, which can be run depending on need, can deliver reduced output during operation. | | P |
| | Make partial-load measurements with liquid flow rates as set at full load measurements during continuous operation. | | P |
| | The usage limit test, safety test and sound measurement are always performed with maximum heat output. | | P |
| 5.3.2 | Heat pumps with variable capacity | | — |
| | All test points listed in Table 3 at 100 % heat output must be measured. For test point W10/W35 or B0/W35 an additional test is performed at the output level nearest to 50 % of the measured heat output. 50 % is based on the capacity measured at W10 or B0 and return temperature W30. The liquid flow rate is set at W10/W35 or B0/W35 full load and is maintained constant. | | N/A |


| Testing of Water/Water and Brine/Water Heat Pumps | | | |
|--|---|-----------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| | Other test points from Table 3 can be measured with the same output setting, if requested by the applicant. It must be possible to adjust the output levels during testing. The setting must remain constant during the test. | | N/A |
| | It must be possible manually to adjust the output levels during testing. The setting must not vary itself during the test. | | N/A |
| 5.4 | Analysis | | — |
| | Calculations are in accordance with standard EN 14511 for information, equations used are listed in Annex B. | | N/A |

| | | | |
|----------|---|--|---|
| 6 | SAFETY TEST | | — |
| | The safety test checks if the safety devices respond correctly to operational malfunctions and protect the heat pump from damage. Perform this test in addition to the tests specified in EN 14511-4. | | — |
| 6.1 | General | | — |
| | a) Perform this test at W10/W35 and B0/W35 under the conditions given in Chapter 4.2, Table 3a or 3b. When starting the test, the limit values as shown in Table 4 must be met. | | P |
| | b) To check the safety devices of the heat pump, simulate a series of operating states and malfunctions (see 6.2.a and 6.3.b, below). Before and after each simulated state or malfunction, the test object must reach the steady-state condition of normal operation for the indicated test condition. | | P |
| | c) For the safety tests, disable devices on the heat pump that do not serve as overload protection or safety devices. 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.) | | P |
| 6.2 | Malfunctions to be simulated | | — |
| | Maintain the simulated malfunctions for transfer medium flows for at least two hours. The test object must not suffer any damage throughout the entire sequence of tests and must be fully functional after testing. | | P |
| | The heat pump must not switch on and off more than four times during the last 60 minutes of the test. If a safety device locks the heat pump out of operation (locking malfunction), the heat pump is considered to have passed the test and the test is ended. | | P |
| | a) Blocking the heat transfer medium flow/s (stop the circulation pump/s for the heat pump). | Effect: the pressure falls, the low pressure switch shut down the system after 2 minutes and 42s. Effect: the pressure grows up, the high pressure switch shut down the system after 50s. | P |

| Testing of Water/Water and Brine/Water Heat Pumps | | | |
|--|---|---|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| | c) Complete power failure for at least five seconds. The heat pump must return to a stable operating state no later than 20 minutes after restarting the compressor. | After switch on the power, heat pump returns back to normal operation after 3 minutes and 14 seconds. | P |
| | The test is performed at the flow rate obtained during the test at W10/W35 or B0/W35. | | P |
| 6.3 | Testing the usage limit | | — |
| 6.4 | Purpose | | |
| | The test at the boundaries is intended to show whether the heat pump is fully functional and operable in the warranted usage range stated by the manufacturer. For the test of usage limit (operating range) see Chapter 6.4 in standard EN14511-4. | B-10/W55 B-10/W25 B0/W62 B10/W25 B20/W35 B20/W62 | P |
| 6.4.1 | Test conditions | | — |
| | The definition of the operating boundaries is explained in Section 2.2.2 and Figure 1 below. Use the values given by the manufacturer as target values for the source temperatures. Test have to be performed with same flow rates as used for the test point W10/W35 and B0/W35, and set the ambient conditions as shown in Table 2. | | P |
| | During the test conditions in Chapter 4 (Table 4) must not be exceeded. | | P |
| 6.4.2 | Test sequence | | — |
| | The heat pump must remain in operation during the entire test period without being shut off by a safety device. There must be no damage to the heat pump throughout the entire test. The test object must remain in operation under the specified operating conditions for at least 60 minutes without external interference. | Normal operation of heat pump over 60 minutes. | P |

| | | | |
|----------|--|--|-----|
| 7 | SOUND MEASUREMENT | | — |
| | Test is performed according to EN 12102 and EN 14511-2 at test point B0/W35 or W10/W35 and with the same settings as for the other test points according to table 3a or 3b. For set up see standard EN 12102. For a combined test (water/water and brine/water heat test), measure the sound output only for the brine/water test. | | P |
| | Measure the sound level by one of the following methods: | | — |
| | - Live room method in accordance with EN ISO 3741 and EN ISO 3743 | | N/A |
| | - Free field method in accordance with EN ISO 3744 and EN ISO 3745 | | N/A |
| | - Intensity method in accordance with EN ISO 9614-2 | | P |
| | - EN ISO 3746 | | N/A |

| Testing of Water/Water and Brine/Water Heat Pumps | | | |
|--|--|-----------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| | - EN ISO 3747, provided that the test environment meet the requirements for engineering method (grade 2) | | N/A |

| | | | |
|----------|---|---|---|
| 8 | TEST OF ELECTRICAL CHARACTERISTIC VALUES | | — |
| | The electrical characteristic values for the start and operation of each phase are recorded using a voltage analyzer. Only the measured state is given in the test report. This test is performed at the standard test point W10/W35 or B0/W35, as shown in Table 3. For a combined test (water/water and brine/water heat test), measure the electrical characteristic values only for the brine/water test. | | P |
| 9 | DOCUMENTATION PROVIDED BY THE MANUFACTURER | | — |
| 9.1 | Marking | | — |
| | Each heat pump unit must have a name plate securely and permanently attached. It must be applied such that it is easily readable and accessible and include the following information. | Sample of name plate see page 8 | P |
| | For additional information see also EN 60335-1, -2-40: | | — |
| | - Manufacturer or supplier |  | P |
| | - Model designation and serial number | | P |
| | - COP and heat output in kW with at least three significant figures for W10/W35 or B0/W35 | | P |
| | - Type and filling weight of the refrigerant | | P |
| A | ANNEX A – ADDITIONAL REQUIREMENTS ACCORDING TO EHPA | | — |
| | The test conditions and testing method for the EHPA Quality Label are based on the European standard EN 14511, Parts 1 to 4, version 2007. It applies for space heating, additionally requirements can be found in the text and are also summarized in this Annex. Anything not defined in this test regulation should be handled in line with EN 14511. | | P |
| | Chapter 4 | | — |
| | Testing points are given in Chapter 4.2; Table 3a and 3b. | | P |
| | The ambient conditions and the electrical data for performance testing and functional inspection are listed in the Table below. The testing conditions for the voltage are fixed according to common procedure in all EHPA test labs. | | P |
| | For the heat pump start-up the following information shall be included, see 4.3: | | — |
| | - the quantity of refrigerant, | | P |

| Testing of Water/Water and Brine/Water Heat Pumps | | | |
|--|--|----------------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| | For refrigerant charge the value on the marking plate can be used (for compact, factory filled units with a monitoring system in place). In all other cases, the heat pump unit has to be delivered filled with nitrogen and shall be charged with refrigerant supplied by the test laboratory (see chapter 4.3). | | P |
| | Chapter 5 | | — |
| | Flow rates must be indicated at for W10/W35 or B0/W35 for all test-points. | | P |
| | Chapter 6 | | — |
| | All medium flow malfunctions are simulated for at least two hours, which is a longer time than prescribed in EN14511. | | P |
| | Regarding automatic restart after power-off simulation (see chapter 6.2), the test has not to be performed if the machine is not capable of restarting automatically after power supply failure. | | P |
| | Chapter 10 | | — |
| | In the test report references to the EHPA regulation and version are required. | | P |
| B | ANNEX B – EQUATIONS | | — |
| | Calculation of heat output/ heating capacity | | — |
| | Calculate the heat output of the test object as follows: | | — |
| | $\dot{Q}_{\text{HPaverage}} = \frac{Q_{\text{HP}}}{t_{\text{duration}}} \quad [\text{W}]$ <p>where:</p> $Q_{\text{HP}} = \sum_{i=1}^{n-1} \frac{\dot{Q}_{\text{HP.average.i}} + \dot{Q}_{\text{HP.average.i+1}}}{2} \quad [\text{J}]$ <p>where:</p> $Q_{\text{HP}} = q_w \cdot \rho_w(T_{\text{return}}) \cdot c_{p_w} \cdot (T_{\text{outlet}} - T_{\text{return}}) \quad [\text{W}]$ | | P |
| | Definitions | (See appended table) | P |
| | Calculation of power consumption | | — |
| | Calculate the effective power consumption of the heat pump from the power consumption of the compressor and all electrical equipment of the heat pump that functions during the heating mode. | | P |
| | Include the power consumption figures for the delivery apparatus of the heat pump only to such an extent as is required to overcome the internal static pressure differentials. | | P |
| | The power consumption of the heat pump is calculated as follows: | | — |

| Testing of Water/Water and Brine/Water Heat Pumps | | | |
|---|--|----------------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| | $P_{HP,average} = \frac{E_{el}}{t_{duration}} \quad [W]$ <p>where:</p> $E_{el} = \sum_{i=1}^{n-1} \frac{P_{HP,i} + P_{HP,i+1}}{2} \cdot \Delta t \quad [J]$ <p>were:</p> $P_{HP} = P_{em} + P_{ep,w} + P_{ep,c} + P_E \quad [W]$ <p>where:</p> $\pm P_{ep,w} = \frac{q_w \cdot \Delta p}{\eta_p} \quad [W]$ <p>where:</p> $\pm P_{ep,c} = \frac{q_c \cdot \Delta p}{\eta_p} \quad [W]$ | | P |
| | Definitions | (See appended table) | P |
| | Determining the Coefficient Of Performance (COP) | | — |
| | The COP (coefficient of performance) corresponds to the ratio of the heat output to the electrical power consumption as measured or calculated in the output test. | | P |
| | Calculate the average COP as follows: | | — |
| | $COP_{HP} = \frac{Q_{HP}}{E_{el}} \quad [-]$ | | P |
| | Definitions | (See appended table) | P |

| 2.2.3 | TABLE: Uncertainties of measurement for indicated values | | | |
|--|--|--|---------|--|
| Measurements variables | Unit | Uncertainty of measurement (+/-) of the cited values | Verdict | |
| Water/brine | | | | |
| - Temperature inlet/outlet | °C | 0,1 K | P | |
| - Volume flow | m ³ /s | 1 % | P | |
| - Static pressure difference | Pa | 5 % | P | |
| - Heat transfer medium concentration | % | 2 % | P | |
| Electrical power | W | 1 % | P | |
| Voltage | V | 0,5 % | P | |
| Current | A | 0,5 % | P | |
| Electrical energy | kWh | 1 % | P | |
| The heat output determined by the water side must be determined such that there is a maximum 5 % measurement uncertainty, regardless of the individual measurement inaccuracies. | | | | |
| supplementary information: | | | | |

| 4.1 | | TABLE: Ambient conditions and electrical connection data | | | |
|--|-----------------------|--|---------|--|--|
| Model: | Measurement variable: | Limit values: | Verdict | | |
| Water-water resp. brine-water heat pumps | Ambient temperature | 15 to 30 °C | P | | |
| | Electrical voltage | ± 4 % rated voltage ¹⁾ | P | | |
| ¹⁾ Manufacturer's information supplementary information: All tests at 21,3 °C room temperature | | | | | |

| 4.2 | | TABLE: Rated points for power testing of water/water heat pumps | | | | | | | | |
|---|-------------------|---|-----------|------------|------------|-----------|--------------|-----------|-------------------|----------|
| Test condit. | Standard | Type ¹⁾ | HSS | | HUS | | measured COP | | min. required COP | Verdict |
| | | | T.in (°C) | T.out (°C) | T.out (°C) | T.in (°C) | VWS 101/3 | VWS 171/3 | | |
| W10/W35²⁾ | EN 14511-2 | QL | 10 | 7 | 35 | 30 | 5,77 | 5,56 | 4,50 | P |
| W10/W35-25 | DACH-EHPA | N | 10 | 7 | 35 | 25 | 6,00 | 5,96 | 4,50 | Optional |
| W10/W45 | EN 14511-2 | N | 10 | a | 45 | a | 4,68 | 4,59 | -- | P |
| W15/W45 | EN 14511-2 | B | 15 | a | 45 | a | 5,12 | 4,97 | -- | P |
| W10/W55 | EN 14511-2 | B | 10 | a | 55 | a | 3,78 | 3,63 | -- | P |
| W15/W55 | DACH-EHPA | B | 15 | a | 55 | a | 4,13 | 3,90 | -- | P |
| ¹⁾ Type name: N -> standard rated point, B -> operating rated point, QL -> Quality Label ²⁾ For the EHPA-DACH Quality Label relevant test condition a The test is conducted with the volume flows indicated for W10/W35 supplementary information: | | | | | | | | | | |

| 4.2 | | TABLE: Rated points for power testing of brine/water heat pumps | | | | | | | | |
|--|-------------------|---|-----------|------------|------------|-----------|--------------|-------------|-------------------|---------|
| Test condit. | Standard | Type ¹⁾ | HSS | | HUS | | measured COP | | min. required COP | Verdict |
| | | | T.in (°C) | T.out (°C) | T.out (°C) | T.in (°C) | VWS 101/3 | VWS 171/3 | | |
| B0/W35²⁾ | EN 14511-2 | QL | 0 | -3 | 35 | 30 | 4,99 | 4,85 | 4,00 | P |
| B0/W35-25 | DACH-EHPA | N | 0 | -3 | 35 | 25 | 5,13 | 5,19 | 4,00 | P |
| B5/W35 | EN 14511-2 | B | 5 | a | 35 | a | 5,39 | 5,27 | -- | P |
| B0/W45 | EN 14511-2 | N | 0 | a | 45 | a | 3,79 | 3,86 | -- | P |
| B5/W45 | EN 14511-2 | B | 5 | a | 45 | a | 4,25 | 4,24 | -- | P |
| B-5/W45 | EN 14511-2 | B | -5 | a | 45 | a | 3,41 | 3,51 | -- | P |
| B0/W55 | EN 14511-2 | B | 0 | a | 55 | a | 3,02 | 3,16 | -- | P |
| B5/W55 | DACH-EHPA | B | 5 | a | 55 | a | 3,38 | 3,44 | -- | P |
| ¹⁾ Type name: N -> standard rated point, B -> operating rated point, QL -> Quality Label ²⁾ For the EHPA-DACH Quality Label relevant test condition a The test is conducted with the volume flows indicated for B0/W35 supplementary information: | | | | | | | | | | |

| 5.4 | TABLE: Permissible deviations (+/-) from the desired values | | | |
|----------------------------|--|---|---------|--|
| Measurement variable: | Max. permissible deviation (+/-) of arithmetic mean from set value | Permissible dev. (+/-) of individual measured values from set value | Verdict | |
| Water/brine: | | | | |
| Inlet temperature | 0,2 K | 0,5 K | P | |
| Outlet temperature | 0,3 K | 0,6 K | P | |
| Volume flow | 2 % | 5 % | P | |
| | | | | |
| Electrical voltage | 4 % | 4 % | P | |
| supplementary information: | | | | |

| B | Definitions |
|--------------------------|---|
| $\dot{Q}_{HP,average}$ | Average heat output in [W] |
| Q_{HP} | Heat energy given off during the test in [J] |
| $\dot{Q}_{HP,j}$ | Heat output for the i th measurement in [W] |
| \dot{Q}_{HP} | Present heat output in [W] |
| $t_{duration}$ | Test duration in [s] |
| n | Number of measuring intervals |
| Δt | Duration of a measuring interval in [s] |
| q_w | Volume flow from the heat transfer medium on the warm side in [m ³ /s] |
| $\rho_w(T_{return})$ | Density of the heat transfer medium at return temperature in [kg/m ³] |
| c_{pW} | Specific heat capacity of the heat transfer medium J/(kg K) |
| T_{outlet}, T_{return} | Temperature of the heat transfer medium in (outlet and return, respectively) in [K] |
| | |
| | |
| $P_{HP,average}$ | Average electrical power consumption in [W] |
| P_{HP} | Electrical power consumption of the entire heat pump in [W] |
| $P_{HP,i}$ | Electrical power consumption for the i^{th} measurement in [W] |
| P_{em} | Electrical power consumption of the compressor in [W] |
| P_{ep} | Proportional electrical power consumption of the circulating pump in warm or cold side, in [W] [W] |
| P_E | Electrical power consumption of all additional mechanisms in [W] |
| E_{el} | Electrical energy consumed during the test in [J] |
| $t_{duration}$ | Test duration in [s] |
| n | Number of measuring intervals in [s] |
| Δt | Duration of a measuring interval in [s] |
| q_w | Volume flow from the heat transfer medium on the cold or warm side in [m ³ /s] |
| q_c | Static pressure drop (cold or warm side) in the heat exchanger via the heat pump in [Pa] |
| η_p | Efficiency of the circulating pump = 0.3 (cold or warm side) as given in EN 14511 |
| | |
| COP_{HP} | Coefficient of performance for the heat pump |
| Q_{HP} | Heat energy given off during the test in [J] |
| E_{el} | Electrical energy consumed during the test in [J] |

| Testing of Air/Water Heat Pumps | | | |
|--|---|------------------------|----------------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| 1 | INTRODUCTION | | — |
| | The test conditions and testing method for the EHPA Quality Label are based on the European standard EN 14511, Parts 1 to 4, version 2007. It applies for space heating, additionally requirements according EHPA Quality Label can be found in the text (they are also summarized in Annex A). Anything not defined in this test regulation should be handled in line with EN 14511. | | N/A |
| | A heat pump can be awarded 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". | | N/A |
| | This regulation has been adopted by the EHPA Quality Label Committee. Any changes to them must be approved by the Committee. | | N/A |
| 2 | SCOPE OF TESTING REGULATION | | — |
| | The scope of this testing regulation is to specify the testing conditions and the test method for testing electrically driven air/water heat pumps. In order to qualify for the EHPA Quality Label, the heat pump submitted for testing must be from series production. | | N/A |
| 2.1 | Scope of testing | | — |
| | The scope of the test comprises: | | — |
| | a) A performance test for different standardized points as specified in EN 14511 Parts 2 & 3 and other points as defined in Chapter 5, | | N/A |
| | b) The testing of the operating range as defined by the manufacturer (see chapter 3.5 and 6.3), | | N/A |
| | c) A safety test (see chapter 6), | | N/A |
| | d) Sound measurement in accordance with EN 12102 (see chapter 7), | | N/A |
| | e) Testing the electrical characteristic values (see chapter 8). | | N/A |
| 2.2 | Testing methods | | — |
| 2.2.1 | Performance testing | | — |

| Testing of Air/Water Heat Pumps | | | |
|--|--|----------------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| | Perform the test under constant ambient conditions, i.e., during the test, the set conditions (e.g. software and control devices) on both source and user sides must remain constant. This test determines the heat output and the electrical power consumed, from which the performance figure for the heat pump is calculated. | | N/A |
| 2.2.2 | Testing the operating range | | — |
| | The operating range (max. 6 key points, see chapter 3.5 and figure 1 in Chapter 6) is declared by the manufacturer and describes the operating range for the heat pump which is covered by the full manufacturer's warranty. Testing is performed to evaluate whether the heat pump can operate at the limits of the operating range for an extended period of time. | | N/A |
| 2.2.3 | Uncertainties of measurement for indicated values | | — |
| | Uncertainty of measurement (\pm) of the cited values in accordance with EN 14511-3 Section 4.3 | (See appended table) | N/A |
| 2.2.4 | Safety test | | — |
| | The safety of equipment is tested by simulating operational malfunctions during normal heat pump operation. | | N/A |

| | | | |
|----------|---|--|-----|
| 3 | TERMS AND DEFINITIONS | | — |
| | The following terms supplement the terms and definitions defined in EN 14511-1. | | N/A |
| 3.1 | Heat source system | | — |
| | A heat source system is extracting the heat from the heat source (e.g. air, water, soil). | | N/A |
| 3.2 | Heat sink system | | — |
| | A heat sink system is distributing the heat from the warm side (heat sink, condenser) of the heat pump to the heat distribution system (space heating, domestic hot water, swimming pools, etc.). | | N/A |
| 3.3 | Heating capacity, PH | | — |
| | Heat delivered by the heat pump to the heat transfer medium. | | N/A |
| 3.4 | Effective power input, PE | | — |
| | The average electrical power input of the unit within the defined interval of time obtained for operating the heat source system including all control, regulation and safety equipment | | N/A |
| 3.5 | Operating range | | — |
| | The working range for the heat pump as specified by the manufacturer, limited by a maximum of six points (see figure 1, in Chapter 6), and covered by full manufacturer warranty. | | N/A |

| Testing of Air/Water Heat Pumps | | | |
|--|---|-----------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| 3.6 | Safety range | | — |
| | The safety range are the conditions outside the operating range at which the safety devices prevent the heat pump from being damaged. | | N/A |
| 3.7 | Acoustic power level | | — |
| | The acoustic power level is expressed in decibels, dB(A), as defined in EN 12012. | | N/A |
| 3.8 | Defrosting | | — |
| 3.8.1 | Defrosting system | | — |
| | Part of the heat pump system to remove ice or frost from the evaporator. | | N/A |
| 3.8.2 | Defrost mode | | — |
| | Operating condition of the heat pump in heating mode when the outdoor heat exchanger is defrosting. | | N/A |
| 3.8.3 | Defrost period | | — |
| | Time during which the unit is in defrost mode. | | N/A |
| 3.8.4 | Operating cycle with defrost time | | — |
| | Cycle consisting of an heating period and a defrost period, from one defrost termination to the next defrost termination. | | N/A |
| 3.8.5 | Relative defrost time | | — |
| | The relative defrost time is the ratio of the defrost time over the time for an operating cycle with defrost time. | | N/A |

| | | | |
|----------|---|----------------------|-----|
| 4 | TEST CONDITIONS | | — |
| 4.1 | Ambient conditions and electrical data | | — |
| | The ambient conditions and the electrical data for the performance and functional inspection are listed in Table 2. | (See appended table) | N/A |
| 4.2 | Test conditions for performance testing | | — |
| | Test conditions for performance testing Table 3 | (See appended table) | N/A |
| 4.3 | Air-side volume flow | | — |
| | In ducted units the volume flow and the pressure difference shall be related to standard air with a dry evaporator. Standard air is dry air at 20 °C and at standard barometric pressure of 101,325 kPa, having a mass density of 1,204 kg/ m3. | | N/A |
| | Below are pressure requirement for comfort air conditioners, minimal External Static Pressures (ESP) defined. For the inlet-side and outlet-side are: | | — |
| | Rated power up to 8 kW: 25 Pa | | N/A |
| | Rated power from 8 to 12 kW: 37 Pa | | N/A |
| | Rated power from 12 to 20 kW: 50 Pa | | N/A |

| Testing of Air/Water Heat Pumps | | | |
|--|---|----------------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| | Rated power from 20 to 30 kW:.....62 Pa | | N/A |
| | Rated power from 30 to 45 kW:.....75 Pa | | N/A |
| | The measured ESP must be greater than the min. values in above table. Otherwise the air flow rate is lowered in order to achieve an ESP equal to 80 %. | | N/A |
| | If the evaporator fan can be run at more than one speed, the speed selected must meet above pressure conditions and result in value as close as possible to the manufacturer's rated volume flow. | | N/A |
| 4.4 | Setting up and connecting the test object | | — |
| | The heat pump must be set up and connected for the test as recommended by the manufacturer in the installation and operating manual. | | N/A |
| | The length of each refrigerant pipe (for a split system) must be between 5 and 7,5 m and the height difference should not exceed 1 m, the pipes should be thermal insulated according the manufacturer's instructions. At least half of the connecting lines shall be exposed to the outside conditions. | | N/A |
| | Heat pump start-up shall be performed by a manufacturer's representative otherwise the test laboratory shall charge the unit according to the specification of the manufacturer, which shall include: | | — |
| | - the quantity of refrigerant, | | N/A |
| | - the suction pressure and the superheating temperature | | N/A |
| | - and the expansion device or other component setting for achieving a correct operation of the heat pump. | | N/A |
| | Compact units automatically filled with refrigerant at the manufacturer's site can be delivered as produced. The manufacturer has to confirm that a control system documenting the filling is used. If such a system does not exist the heat pump must be delivered filled with nitrogen and shall be charged with refrigerant defined by the manufacturer at the test laboratory. The refrigerant type and charge must be in line with the technical data (marking plate) presented by the manufacturer. | | N/A |
| 4.5 | Requirements for the test facility | | — |
| | Different requirements apply during heating operation and the defrosting phases with regard to meeting the specified desired values. | | N/A |
| 4.5.1 | Test conditions during heating operation – steady state | | — |
| | Permissible deviations according Table 4a | (See appended table) | N/A |
| 4.5.2 | Defrost cycle test conditions – transient | | — |

| Testing of Air/Water Heat Pumps | | | |
|--|---|----------------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| | The test conditions apply during a defrost cycle and during the first 10 min after the termination of a defrost cycle when the heat pump is operating in the heating mode, see table 5 (EN 14511-3) for more applied conditions when using the transient ("T") test procedure, see also Chapter 5.4. | | N/A |
| | Permissible deviations (\pm) from the desired values during the defrost cycle and recovery period Table 4b | (See appended table) | N/A |
| 5 | PERFORMANCE TESTING | | — |
| 5.1 | General | | — |
| | Ensure throughout the test that there is no water drips or drains from any part of the equipment except from the drainage openings intended for the purpose. | | N/A |
| 5.2 | Performance measurement procedure | | — |
| | Start the measurement with a preconditioning period, during which the actual values over at least ten minutes must lie within the tolerance limits defined in Table 4a (Region A in Graphs 1-3). | | N/A |
| | Follow this by a defrost cycle with a 10-minute recovery phase with the defrosting being triggered automatically or manually by the test item control gear. During this period, deviations from the desired values as shown in Table 4b are permissible (Region B in Graphs 1-3). | | N/A |
| | 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). Follow this by the data collection period, which last 35 minutes or three hours, depending on the test conditions. | | N/A |
| | If defrosting occurs during the equilibrium phase and/or the measurement period, the tolerance limits for the desired values during the defrost phases and the subsequent 10-minute recovery period according to Table 4b apply, defrost cycle test conditions – transient. | | N/A |
| | Record the measured values every 10 seconds throughout the entire measurement period. | | N/A |
| 5.2.1 | Measurement of steady state or transient test conditions | | — |
| | Basically performance measurements must be regarded as, and treated as, transient test conditions if it is possible for the heat pump to defrost during the test. If the temperature difference (leaving and entering temperatures of the heat transfer medium) decreases by more than 2,5 % during the first 35 minutes of the data collection period the data collection has to be extended up to a minimum of 3 hours. | | N/A |

| Testing of Air/Water Heat Pumps | | | |
|--|---|------------------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| | Experience indicates that this applies to all of the tests shown in table 3 to be performed with an air temperature less than or equal to +2 °C. All these test conditions must be carried out under transient conditions as described in 5.4. | | N/A |
| | Measure the standard A7/W35 rating point under transient test conditions. If during this measurement no defrosting of the evaporator occurs, the measurements of A7/W55 could be performed under steady state conditions in accordance with chapter 5.3. If not, the measurements must be carried out in accordance with chapter 5.4. | | N/A |
| | Measurement under test conditions A20/W55 can always be carried out under steady state conditions (chapter 5.3). | | N/A |
| 5.3 | Steady state conditions without defrosting the evaporator | | — |
| | Measurement conditions can be regarded as steady state if: | | — |
| | - no defrosting processes occur during the equilibrium or data collection period (see graph 1) and/or | | N/A |
| | - the temperature difference is less than 2,5 % as explained in Chapter 5.2.1. | | N/A |
| | Testing and evaluation under steady state operating conditions without defrosting (see graph 1) | (See appended graph 1) | N/A |
| | Use the data from the entire data collection period to determine the capacity calculation (Regions E and D in graph 1). | (See appended graph 1) | N/A |
| 5.4 | Transient test conditions with defrosting of the evaporator | | — |
| | Transient test conditions are present if one or more defrosting cycles occur during the equilibrium or data collection period. The defrosting processes of the evaporator are triggered only by the defrost control of the test object. | | N/A |
| | To determine the outputs, record all significant measured values every ten seconds and calculate an integral average. | | N/A |
| 5.4.1 | Performance determination with one defrost in the data collection period | | — |
| | If a defrosting process occurs during the data collection period, the measured values recorded during the entire data collection period are applied to determine the capacity calculation (see graph 2 Section E). | (See appended graph 2) | N/A |
| | The length of the operating cycle with one defrost period is shown in graph 2, Region F "Operating cycle with defrost". It is the time between the defrost cycle before the equilibrium period and the defrost cycle during the data collection period. | (See appended graph 2) | N/A |

| Testing of Air/Water Heat Pumps | | | |
|--|--|------------------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| | Determine the performance data in accordance with the performance specification for multiple-defrostings in the measuring period as outlined in chapter 5.4.2. | | N/A |
| 5.4.2 | Performance determination for multiple defrosting in the data collection period | | — |
| | If two or more defrost periods occurs during the data collection period, 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 data collection period can be used for the capacity calculation (see Graph 3, Region E). | (See appended graph 3) | N/A |
| | The length of an operating cycle is consisting of complete cycles and includes at least a period from termination to termination of defrost or from start to start of defrost (graph 3, Region F "operating cycle with defrost"). | (See appended graph 3) | N/A |
| 5.5 | Output measurement with variable-output heat pumps | | — |
| 5.5.1 | General | | — |
| | Standard heat pumps, which are run in on/off mode, always deliver full output during operation. Variable-output heat pumps, which can be run depending on need, can deliver reduced output during operation. | | N/A |
| | Make partial-load measurements with liquid flow rates as set at full load measurements during continuous operation. | | N/A |
| | The usage limit test, safety test and sound measurement are always performed with maximum heat output. | | N/A |
| 5.5.2 | Heat pumps with variable capacity | | — |
| | All test points listed in Table 3 at 100 % heat output must be measured. For test point A7/W35 an additional test is performed at the output level nearest to 50 % of the measured heat output. 50 % is based on the capacity measured at A7 and return temperature W30. The liquid flow rate is set at A7/W35 full load and is maintained constant. | | N/A |
| | Other test points from Table 3 can be measured with the same output setting, if requested by the applicant. It must be possible to adjust the output levels during testing. The setting must remain constant during the test. | | N/A |
| | It must be possible manually to adjust the output levels during testing. The setting must not vary itself during the test. | | N/A |
| 5.6 | Analysis | | — |
| | Calculations are in accordance with standard EN 14511 for information, equations used are listed in Annex B. | | N/A |

| Testing of Air/Water Heat Pumps | | | |
|--|---|-----------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| 6 | SAFETY TEST | | — |
| 6.1 | General | | — |
| | a) Perform this test at A7/W35 under the conditions given in Chapter 4.2, Table 3. When starting the test, the limit values as shown in Table 4a must be met. | | N/A |
| | b) To check the safety devices of the heat pump, simulate a series of operating states and malfunctions (see 6.2.a and 6.3.b, below). Before and after each simulated state or malfunction, the test object must reach the steady-state condition of normal operation for the indicated test condition. | | N/A |
| | c) For the safety tests, disable devices on the heat pump that do not serve as overload protection or safety devices. 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.) | | N/A |
| 6.2 | Malfunctions to be simulated | | — |
| | Maintain the simulated malfunctions for transfer medium flows for at least two hours (This requirement is set by EHPA. In order to maintain the readability of the text, it is made here and in the Annex A.). The test object must not suffer any damage throughout the entire sequence of tests and must be fully functional after testing. | | N/A |
| | The heat pump must not switch on and off more than four times during the last 60 minutes of the test. If a safety device locks the heat pump out of operation (locking malfunction), the heat pump is considered to have passed the test and the test is ended. | | N/A |
| | a) Blocking the heat transfer medium flow of the heat source system (switch the fan off on the source side). | | N/A |
| | b) Blocking the heat transfer medium flow of the heat usage system (switch the circulating pump off on the user side). | | N/A |
| | c) Complete power failure for at least five seconds. The heat pump must return to a stable operating state no later than 20 minutes after restarting the compressor. | | N/A |
| | d) The test point A2 is included for at freeze up test, explained in standard EN 14511-4 Chapter 4.2.3. For units with defrosting system the heat transfer medium flow at the indoor heat exchanger, at the beginning of the defrosting phase is shut off, explained in standard EN 14511-4 Chapter 4.4. | | N/A |

| Testing of Air/Water Heat Pumps | | | |
|--|---|-----------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| | The test is performed at the flow rate obtained during the test at the corresponding standard rating conditions. | | N/A |
| 6.3 | Testing the usage limit | | — |
| | The test at the boundaries is intended to show whether the heat pump is fully functional and operable in the warranted usage range stated by the manufacturer. For the test of usage limit (operating range) see Chapter 6.4 in standard EN14511-4. | | N/A |
| 6.3.1 | Test conditions | | N/A |
| | The definition of the operating boundaries is explained in Section 2.2.2 and Figure 1 below. Use the values given by the manufacturer as target values for the source temperatures. The calculations of humidity must be done as given in Annex A equation. Test have to be performed with same flow rates as used for the test point A7/W35. | | N/A |
| | During the test conditions in Chapter 4. (Table 4a to Table 4b) must not be exceeded. | | N/A |
| 6.3.2 | Test sequence | | — |
| | The heat pump must remain in operation during the entire test period without being shut off by a safety device. There must be no damage to the heat pump throughout the entire test. The test object must remain in operation under the specified operating conditions for at least 60 minutes without external interference. | | N/A |
| | 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 have been within the tolerance limits defined in Table 4a for at least 10 minutes after defrosting. | | N/A |

| | | | |
|----------|--|--|-----|
| 7 | SOUND MEASUREMENT | | — |
| | Test is performed according to EN 12102 and EN 14511-2 in standard rating condition A7/W35 according to table 3. For set up see standard EN 12102. | | N/A |
| | Measure the sound level by one of the following methods: | | — |
| | - Live room method in accordance with EN ISO 3741 and EN ISO 3743 | | N/A |
| | - Free field method in accordance with EN ISO 3744 and EN ISO 3745 | | N/A |
| | - Intensity method in accordance with EN ISO 9614-2 | | N/A |

| Testing of Air/Water Heat Pumps | | | |
|--|--|-----------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| | - EN ISO 3746 | | N/A |
| | - EN ISO 3747, provided that the test environment meet the requirements for engineering method (grade 2) | | N/A |
| 8 | TEST OF ELECTRICAL CHARACTERISTIC VALUES | | — |
| | The electrical characteristic values for the start and operation of each phase are recorded using a voltage analyzer. 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. | | N/A |
| 9 | DOCUMENTATION PROVIDED BY THE MANUFACTURER | | — |
| 9.1 | Marking | | — |
| | Each heat pump unit must have a name plate securely and permanently attached. It must be applied such that it is easily readable and accessible and include the following information. | | N/A |
| | For additional information see also EN 60335-1, -2-40: | | — |
| | - Manufacturer or supplier | | N/A |
| | - Model designation and serial number | | N/A |
| | - COP and heat output in kW with at least three significant figures for A2/W35 and A7/W35 | | N/A |
| | - Type and filling weight of the refrigerant | | N/A |
| A | ANNEX A – ADDITIONAL REQUIREMENTS ACCORDING TO EHPA | | — |
| | The test conditions and testing method for the EHPA Quality Label are based on the European standard EN 14511, Parts 1 to 4, version 2007. It applies for space heating, additionally requirements can be found in the text and are also summarized in this Annex. Anything not defined in this test regulation should be handled in line with EN 14511. | | N/A |
| | Chapter 4 | | — |
| | Testing points are given in Chapter 4.2; Table 3. | | N/A |
| | The ambient conditions and the electrical data for performance testing and functional inspection are listed in the Table 3 (see 4.2) | | N/A |
| | For the heat pump start-up the following information shall be included, see 4.3: | | — |
| | - the quantity of refrigerant, | | N/A |
| | For refrigerant charge the value on the marking plate can be used (for compact, factory filled units with a monitoring system in place). In all other cases, the heat pump unit has to be delivered filled with nitrogen and shall be charged with refrigerant supplied by the test laboratory (see chapter 4.4). | | N/A |
| | Chapter 5 | | — |

| Testing of Air/Water Heat Pumps | | | | |
|--|--|---|---|---------|
| Clause | Requirement - Test | | Result - Remark | Verdict |
| | Period of defrost 35 minutes vs. 3 hours. Resent test results show that a testing duration of 3 hours gives more accurate results (see chapter 5). | | | N/A |
| | Flow rates must be indicated at A7/W35 flow for all test-points. | | | N/A |
| | Chapter 6 | | | — |
| | All medium flow malfunctions are simulated for at least two hours, which is a longer time than prescribed in EN14511. | | | N/A |
| | Regarding automatic restart after power-off simulation (see chapter 6.2), the test has not to be performed if the machine is not capable of restarting automatically after power supply failure. | | | N/A |
| | Calculation of humidity | | | — |
| | For chapter 6.3, the humidity relative to the source temperatures of the maximum 6 boundary condition lines must be determined as follows (rounded to 1 %): | | | — |
| | $T_{Q.Boundary}$ (°C) | Relative humidity [%] | | N/A |
| | | $\leq -7^{\circ}\text{C}$ | Not defined | N/A |
| | $> -7^{\circ}\text{C}$ | $\leq 7^{\circ}\text{C}$ | $\varphi_L = T_{Q.Boundary} + 82$ | N/A |
| | $> 7^{\circ}\text{C}$ | $\leq 20^{\circ}\text{C}$ | $\varphi_L = -3,0 * T_{Q.Boundary} + 110$ | N/A |
| | $> 20^{\circ}\text{C}$ | | 50 | N/A |
| | Definitions: | | | — |
| | φ_L | Relative humidity in [%] | | N/A |
| | $T_{Q.Boundary}$ | Source temperature (air temperature) of the respective boundary line in °C. | | N/A |
| | Chapter 10 | | | — |
| | In the test report references to the EHPA regulation and version are required. | | | N/A |
| B | ANNEX B – EQUATIONS | | | — |
| | Calculation of heat output/ heating capacity | | | — |
| | Calculate the heat output of the test object as follows: | | | — |
| | $\dot{Q}_{HPaverage} = \frac{Q_{HP}}{t_{duration}} \quad [\text{W}]$ <p>where:</p> $Q_{HP} = \sum_{i=1}^{n-1} \frac{\dot{Q}_{HP.average.i} + \dot{Q}_{HP.average.i+1}}{2} \quad [\text{J}]$ <p>where:</p> $Q_{HP} = q_w \cdot \rho_w(T_{return}) \cdot c_{p_w} \cdot (T_{outlet} - T_{return}) \quad [\text{W}]$ | | | N/A |

| Testing of Air/Water Heat Pumps | | | |
|--|---|----------------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| | Definitions | (See appended table) | N/A |
| | Calculation of power consumption | | — |
| | Calculate the effective power consumption of the heat pump from the power consumption of the fan, the compressor and all electrical equipment of the heat pump that functions during the heating mode. | | N/A |
| | Include the power consumption figures for the delivery apparatus of the heat pump only to such an extent as is required to overcome the internal static pressure differentials. | | N/A |
| | The power consumption of the heat pump is calculated as follows: | | |
| | $P_{HP,average} = \frac{E_{el}}{t_{duration}} \quad [W]$ <p>where:</p> $E_{el} = \sum_{i=1}^{n-1} \frac{P_{HP,i} + P_{HP,i+1}}{2} \cdot \Delta t \quad [J]$ <p>where:</p> $P_{HP} = P_{em} + P_{ep} + P_E - P_{efan} \quad [W]$ <p>where:</p> $\pm P_{ep} = \frac{q_w \cdot \Delta p}{\eta_p} \quad [W]$ <p>where:</p> $\pm P_{efan} = \frac{q_c \cdot \Delta p_{fan}}{\eta_{fan}} \quad [W]$ | | N/A |
| | Definitions | (See appended table) | N/A |
| | Determining the Coefficient Of Performance (COP) | | — |
| | The COP (coefficient of performance) corresponds to the ratio of the heat output to the electrical power consumption as measured or calculated in the output test. | | N/A |
| | Calculate the average COP as follows: | | — |
| | $COP_{HP} = \frac{Q_{HP}}{E_{el}} \quad [-]$ | | N/A |
| | Definitions | (See appended table) | N/A |
| | Calculation of relative defrost time | | — |
| | Calculate the relative defrost time as follows: | | N/A |
| | $\tau_{rel} = \frac{\tau_D}{(\tau_H + \tau_D)} \cdot 100 \quad [%]$ | | N/A |
| | Definitions | (See appended table) | N/A |

| 2.2.3 | TABLE: Uncertainties of measurement for indicated values | | | |
|---|--|--|---------|--|
| Measurements variables | Unit | Uncertainty of measurement (\pm) of the cited values | Verdict | |
| Air | | | | |
| - Dry bulb temperature | °C | 0,2 K | N/A | |
| - Wet-bulb temperature ¹⁾ | °C | 0,3 K | N/A | |
| - Relative humidity ¹⁾ | % RH | 2,5 % RH | N/A | |
| - Volume flow | m ³ /s | 5 % | N/A | |
| - Static pressure difference | Pa | 5 Pa ($\Delta p \leq 100$ Pa) 5 % ($\Delta p > 100$ Pa) | N/A | |
| Water/brine | | | | |
| - Temperature inlet/outlet | °C | 0,1 K | N/A | |
| - Volume flow | m ³ /s | 1 % | N/A | |
| - Static pressure difference | Pa | 5 Pa ($\Delta p \leq 100$ Pa) 5 % ($\Delta p > 100$ Pa) | N/A | |
| - Heat transfer medium | % | 2 % | N/A | |
| Electrical power | W | 1 % | N/A | |
| Voltage | V | 0,5 % | N/A | |
| Current | A | 0,5 % | N/A | |
| Electrical energy | kWh | 1 % | N/A | |
| 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. | | | | |
| ¹⁾ According to EN 14511, the wet bulb temperature is given to determine air humidity. The measurements can also be made on the basis of measurement of relative humidity. The measurement uncertainty specified by EN 14511 must not be exceeded. | | | | |
| supplementary information: | | | | |

| 4.1 | TABLE: Ambient conditions and electrical data | | | |
|---|---|---------------------------------------|---------|--|
| Model: | Measurement variable: | Limit values: | Verdict | |
| Air/water heat pump with duct connection on the air inlet and outlet side | Ambient temperature | 15 to 30 °C | N/A | |
| | Electrical voltage (230V/400V; 50 Hz) | ± 4 % rated voltage ¹⁾ | N/A | |
| Air/water heat pump without duct connection on the air inlet side | Ambient temperature | For test conditions see Tab. 3 below. | N/A | |
| | Electrical voltage (230V/400V; 50 Hz) | ± 4 % rated voltage ¹⁾ | N/A | |
| ¹⁾ Manufacturer's information | | | | |
| supplementary information: -- | | | | |

| 4.2 | | | | | | | | | | |
|---|-------------------|--------------------|-----------|-----------|--------------|-----------|----------|--------------|-------------------|-----------|
| TABLE: Test conditions for performance testing | | | | | | | | | | |
| Test condit. | Standard | Type ¹⁾ | HSS on | | | HUS | | measured COP | min. required COP | Verdict |
| | | | T.db (°C) | T.wb (°C) | ϕ^2 (%) | Tout (°C) | Tin (°C) | | | |
| A7/W35 | EN 14511-2 | N | 7 | 6 | 89 | 35 | 30 | -- | -- | -- |
| A2/W35³ | EN 14511-2 | QL | 2 | 1 | 84 | 35 | a | -- | -- | -- |
| A2/W35-25 | DACH-EHPA | N | 2 | 1 | 84 | 35 | 25 | -- | -- | -- |
| 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 | -- | -- | -- |
| A2/W45 | EN 14511-2 | B | 2 | 1 | 84 | 45 | a | -- | -- | -- |
| A-7/W45 | EN 14511-2 | B | -7 | -8 | 75 | 45 | a | -- | -- | -- |
| A-15/W45 | EN 14511-2 | B | -15 | b | b | 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

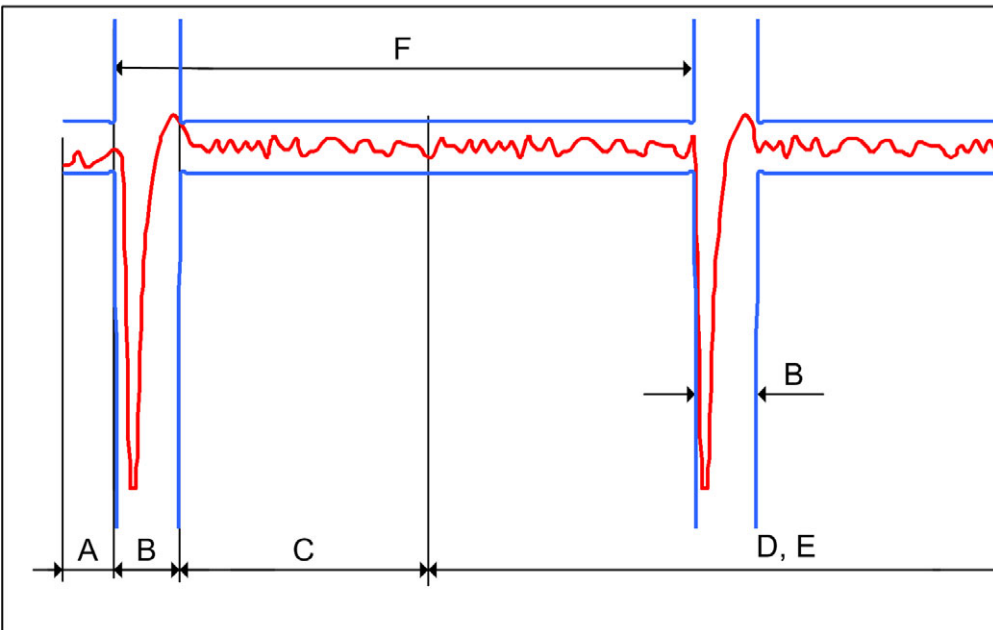
b No specification for air humidity

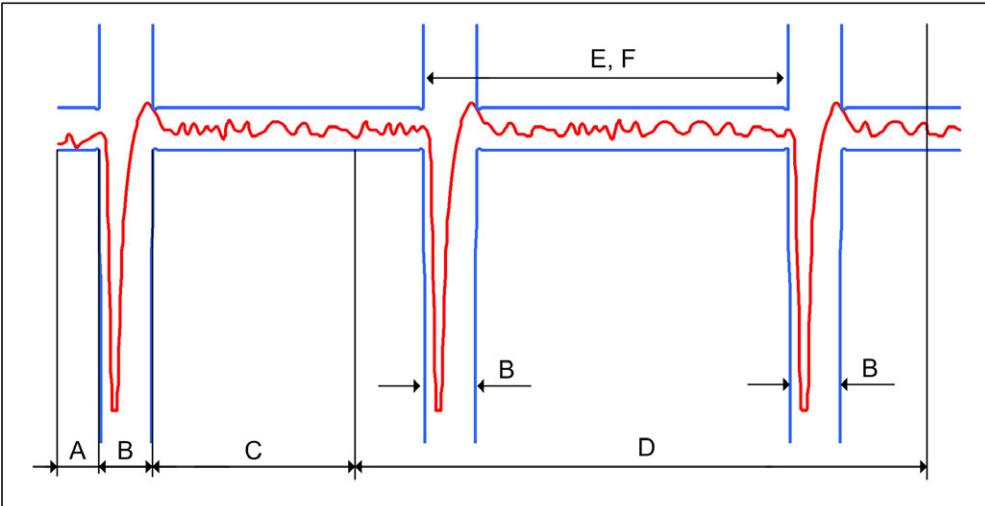
supplementary information: --

| 4.5.1 | TABLE: Permissible deviations (\pm) from set values during heating operation | | | |
|--|--|--|---------|--|
| Measurement variable: | Permissible dev. (\pm) of the arith-metic mean values from set value | Permissible dev. (\pm) of individual measured values from set values | Verdict | |
| Air: | | | | |
| - Dry temperature | 0,3 K | 1 K | N/A | |
| - wet-bulb temperature | 0,3 K | 1 K | N/A | |
| - Relative humidity ¹ | 3 % RH | 7 %RH | N/A | |
| | | | | |
| Water/brine: | | | | |
| - Inlet temperature | 0,2 K | 0,5 K | N/A | |
| - Outlet temperature | 0,3 K | 0,6 K | N/A | |
| - Volume flow | 2 % | 5 % | N/A | |
| | | | | |
| Electrical voltage | 4 % | 4 % | N/A | |
| supplementary information: | | | | |
| ¹ According to EN 14511, the wet bulb temperature is given to determine air humidity. The measurements can also be made on the basis of measurement of relative humidity. The measurement uncertainty specified by EN 14511 must not be exceeded. | | | | |

| 4.5.2 | TABLE: Permissible deviations (\pm) from the desired values during the defrost cycle and recovery period | | | |
|--|--|--|---------|--|
| Measurement variable: | Max. permissible deviation (+/-) of arithmetic mean from target value | Max. permissible dev. individual measured values from target value | Verdict | |
| Air: | | | | |
| Temperature, air entering | | | N/A | |
| Indoor-side | | | N/A | |
| Dry-bulb | 1,5 K | 2,5 K | N/A | |
| Wet-bulb | | - | N/A | |
| Relative humidity ¹ | | - | N/A | |
| Temperature, air entering | | | N/A | |
| Outdoor-side | | | N/A | |
| Dry-bulb | 1,5 K | 5 K | N/A | |
| Wet-bulb | 1 K | - | N/A | |
| Relative humidity ¹ | 9 % H | - | N/A | |
| | | | | |
| Water/brine: | | | | |
| Inlet temperature | - | - | N/A | |
| Outlet temperature | - | ± 2 K | N/A | |
| Volume flow | 2 % | 5 % | N/A | |
| | | | | |
| Electrical voltage | 4 % | 4 % | N/A | |
| supplementary information: | | | | |
| ¹ The measurements can also be made on the basis of measurement of relative humidity. The measurement uncertainty specified by EN 14511 must not be exceeded. | | | | |

| | | |
|-----|--|--|
| 5.3 | Graph 1: Testing and evaluation under steady state operating conditions without defrosting | |
| | <p>The graph shows a red line representing a signal over time. The x-axis is divided into five periods: A, B, C, D, and E. Period A is a preconditioning period. Period B is a defrost period with a recovery time. Period C is an equilibrium period. Period D is a data collection period. Period E is a period for capacity calculation. The red line shows a sharp drop during period B, followed by a recovery and then a steady state oscillating signal during periods C, D, and E.</p> | |
| | <p>A Preconditioning period: 10 minutes</p> <p>B Defrost with recovery time: defrost time + 10 minutes</p> <p>C Equilibrium period: 60 minutes</p> <p>D Data collection period: 35 minutes</p> <p>E Period for capacity calculation</p> | |

| | | |
|-------|---|--|
| 5.4.1 | Graph 2: Transient operating conditions with one defrosting process in the measuring period | |
| |  | |
| | <p>A Preconditioning period: 10 minutes</p> <p>B Defrost with recovery time: defrost time + 10 minutes</p> <p>C Equilibrium period: 60 minutes</p> <p>D Data collection period: 3 hours</p> <p>E Period for capacity calculation</p> <p>F Operating cycle with defrost period</p> | |

| | | |
|-------|--|--|
| 5.4.2 | Graph 3: Transient operating conditions with multiple defrosting cycles in the data collection period | |
| |  | |
| | <p>A Preconditioning period: 10 minutes</p> <p>B Defrost with recovery time: defrost time + 10 minutes</p> <p>C Equilibrium period: 60 minutes</p> <p>D Data collection period: 3 hours</p> <p>E Period for capacity calculation</p> <p>F Work cycle with defrost time</p> | |

| B | Definitions |
|--|---|
| $\dot{Q}_{\text{HP,average}}$ | Average heat output in [W] |
| Q_{HP} | Heat energy given off during the test in [J] |
| $\dot{Q}_{\text{HP},j}$ | Heat output for the i th measurement in [W] |
| \dot{Q}_{HP} | Present heat output in [W] |
| t_{duration} | Test duration in [s] |
| n | Number of measuring intervals |
| Δt | Duration of a measuring interval in [s] |
| q_w | Volume flow from the heat transfer medium on the warm side in [m ³ /s] |
| $\rho_w(T_{\text{return}})$ | Density of the heat transfer medium at return temperature in [kg/m ³] |
| c_{pW} | Specific heat capacity of the heat transfer medium J/(kg K) |
| $T_{\text{outlet}}, T_{\text{return}}$ | Temperature of the heat transfer medium (outflow and return, respectively) in [K] |

| | |
|-------------------------|---|
| $P_{\text{HP,average}}$ | Average electrical power consumption in [W] |
| P_{HP} | Electrical power consumption of the entire heat pump in [W] |
| $P_{\text{HP},i}$ | Electrical power consumption for the i^{th} measurement in [W] |
| P_{em} | Electrical power consumption of the compressor in [W] |
| P_{ep} | Proportional electrical power consumption of the circulating pump [W] |
| P_{efan} | Proportional electrical power consumption of the blower for the external pressure drop in [W] (only if $\Delta p_k > 25$ Pa), excluded or included depending |
| P_E | Electrical power consumption of all additional mechanisms in [W] |
| E_{el} | Electrical energy consumed during the test in [J] |
| t_{duration} | Test duration in [s] |
| n | Number of measuring intervals in [s] |
| Δt | Duration of a measuring interval in [s] |
| q_w | Volume flow from the heat transfer medium on the warm side in [m ³ /s] |
| q_c | Volume flow from the heat transfer medium on the cool side in [m ³ /s] |
| Δp | Static pressure drop in the heat exchanger via the heat pump in [Pa] |
| Δp_{fan} | Maximum external static pressure drop for heat pumps with duct/channel interface in [Pa] |
| η_p | Efficiency of the circulating pump = 0,3 (as given in EN 14511) |
| η_v | Efficiency of the fan = 0,3 (as given in EN 14511) |

| | |
|------------|---|
| | |
| COP_{HP} | Coefficient of performance for the heat pump |
| Q_{HP} | Heat energy given off during the test in [J] |
| E_{el} | Electrical energy consumed during the test in [J] |


| | |
|----------------------|---|
| Clause 6.6.4: | |
| τ_{rel} | Relative defrost time in [%] |
| τ_D | Interval D, defrosting + 10 minutes of reheating in [h] |
| τ_H | Interval H, heating period in [h] |

| EN 14511-1, EN 14511-2, EN 14511-3, EN 14511-4 | | | |
|--|---|--|----------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| 4 | REQUIREMENTS | | — |
| 4.1 | General | | — |
| | Except where otherwise stated, | | P |
| | tests conducted as described in EN 14511-2 and EN 14511-3 | additionally EHPA Regulations | P |
| 4.2 | Temperature operating range | | — |
| 4.2.1 EN 14511-4 | Starting test | | — |
| | Unit capable of operating within limit of use indicated by manufacturer | Same requirements for usage limits in EHPA Regulations | P |
| | Every condition stated in Table 1, and for both cooling and heating mode where applicable, unit start up and operate for at least 20 min, without being stopped by safety devices | Heating mode only | P |
| | Temperatures set (°C) at beginning of test and maintained constant during test.....: | | P |
| | Test voltage (V) specified in Table 1. Set at beginning of test and maintained constant during test | | P |
| | Environmental conditions during test specified in Tables 1 and 2 of EN 14511-2.....: | | P |
| | Flow rates same as used for rating capacity test, as specified in EN 14511-2.....: | | P |
| | Deviation between individual values and set values between: | | — |
| | - zero and minus twice permissible deviation according Table 2 of EN 14511-3, for upper limit of use; | No air water heat pumps | N/A |
| | - zero and plus twice permissible deviation according Table 2 of EN 14511-3, for lower limit of use | | N/A |
| | Uncertainty of measurement as specified in Table 1 of EN 14511-3 | (See appended table) | P |
| 4.2.2 EN 14511-4 | Test at maximum operating conditions (cooling mode) | | — |
| | When operated at conditions stated in Table 2 during 1 h, then switch off for 3 min, and then switched on again for 1 h, unit meet the following requirements: | | — |
| | - unit shall suffer no damage; | No cooling mode | N/A |
| | - unit motor operate continuously for first hour without tripping of motor overload protective devices; | | N/A |
| | - after shut-down period of 3 min, unit restart automatically no more than 5 min after restarting of compressor; | | N/A |

| EN 14511-1, EN 14511-2, EN 14511-3, EN 14511-4 | | | |
|--|---|--|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| | - unit motor operate again continuously for rest of second hour without tripping of motor overload protective devices | | N/A |
| | NOTE: When possible, switching off unit should be done through control panel of unit | | — |
| | Test can combined with corresponding starting test, | | N/A |
| | except for control cabinet air conditioners where inlet temperature at indoor heat exchanger lowered to 35 °C after starting time | | N/A |
| 4.2.3 EN 14511-4 | Freeze-up test | Not applicable for those kind of heat pumps | N/A |
| 4.2.3.1 | Air-cooled unit | Not applicable for those kind of heat pumps | N/A |
| | After unit operated for 6 h at conditions stated in Table 3, and after last freeze up cycle completed, following requirements be fulfilled: | | --- |
| | - no ice accumulated on evaporator; | | N/A |
| | - no ice drip from unit; | | N/A |
| | - no water drip or blown off unit into room. | | N/A |
| 4.2.3.2 | Water-cooled units | Not applicable for those kind of heat pumps | |
| | After unit operated for 6 h at conditions stated in Table 3 following requirements be fulfilled: | | — |
| | - air flow through unit not have dropped by more than 5 %;.....: | | N/A |
| | NOTE: It should be assured that air flow through unit not adjusted during test by some automatic control device | | N/A |
| | - water temperature difference (K) through unit not have dropped by more than 30 %; | | N/A |
| | - saturated temperature corresponding to pressure measured at suction of compressor not have decreased by more than 2 K | | N/A |
| | For all units, electrical power voltage and frequency given by manufacturer | | N/A |
| 4.3 EN 14511-4 | Outside the operating range | | — |
| | Operating outside temperature range can cause damage to unit, it be provided with safety devices which ensure that unit suffers no damage when operating limits of use indicated by manufacturer exceeded and remains capable of operating when coming back within these limits | See safety tests clause 8 in EHPA Regulations (same requirements as EN14511) | P |
| | Safety device that does not automatically reset may trip provided that warning device is fitted. | | N/A |
| | Manufacturer indicate any safety devices provided and their operating conditions according to clause 7.2.3 | | P |

| EN 14511-1, EN 14511-2, EN 14511-3, EN 14511-4 | | | |
|--|---|---|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| 4.4 EN 14511-4 | Shutting off heat transfer medium flows | | — |
| | To check correct operating of safety devices on unit, following faults be simulated consecutively: | | — |
| | Unit have attained steady state in standard rating conditions according Tables 3 to 15 of EN 14511-2 before every fault simulated | Same requirements as clause 8 in EHPA Regulations. Test point for failure simulation: B0/W35 | P |
| | Each fault simulated maintained for at least 1 h | | P |
| | NOTE: In case unit provided without flow switch but required by manufacturer instructions, unit tested with an additional flow switch | | — |
| | a) Shutting off heat transfer medium flow at outdoor heat exchanger | See tests clause 8 EHPA Regulations | P |
| | b) Shutting off heat transfer medium flow at indoor heat exchanger | See tests clause 8 EHPA Regulations | P |
| | c) Shutting off heat transfer medium flow at heat recovery heat exchanger where applicable | | N/A |
| | Unit checked for any damage sustained during test and if any safety devices operated during test. | | P |
| | Unit shall suffer no damage and remain capable of operating after restoration of flow rates | | P |
| | Safety device that does not automatically reset may trip provided that a warning device is fitted | | N/A |
| | Units with defrosting system, an additional test conducted at test conditions specified in Table 4 by shutting off heat transfer medium flow at indoor heat exchanger, at beginning of defrosting phase | | N/A |
| 4.5 EN 14511-4 | Complete power supply failure | | — |
| | Complete power supply failure lasting approximately 5 s simulated. Unit attained steady state conditions before fault simulation, at standard rating condition according to Tables 3 to 15 of EN 14511-2: | See tests clause 8 EHPA Regulations | P |
| | After restoration of power unit restart automatically no more than 20 min after compressor allowed to restart by control devices of unit | | P |
| | Unit checked for any damage sustained during test and if any safety devices operated during test | | P |
| | Test not apply when manufacturer states that machine not automatically restart after power supply failure | | P |
| 4.6 EN 14511-4 | Condensate draining and enclosure sweat test | | — |
| | Heating mode, draining of condensate, including that formed on enclosure, made correctly when operating at standard rating conditions given in Tables 3 to 15 of EN 14511-2 | All relevant pipings and components are insulated. => no condensed moisture | N/A |

| EN 14511-1, EN 14511-2, EN 14511-3, EN 14511-4 | | | |
|--|---|-----------------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| | Cooling mode, draining of condensate, including that formed on enclosure, made correctly when operating at conditions given in Table 5 | | N/A |
| | During test of 4 h no condensed water drip, run or blow off unit except through drain | | N/A |
| | Indoor units, drain holes provided with suitable pipe connection, minimum diameter 12 mm | | N/A |
| 4.7 EN 14511-4 | Defrosting | | — |
| | Functioning of any defrosting system specified under any one of application rating conditions (see Tables 3 to 15 in EN 14511-2), where frosting occurs | No air to water units | N/A |
| | Successive frosting/defrosting cycles repeated without running in progressively deteriorating average performances | | N/A |
| | No growth of ice in and around drip tray | | N/A |
| 4.8 EN 14511-4 | Further requirements | | — |
| | Components in air handling systems, such as fans, filters, heat exchangers, etc., easily accessible and resistant for cleaning purposes recommended by manufacturer | | N/A |

| | | | |
|-----------------|---|---|---|
| 5 EN 14511-4 | MARKING | | — |
| | Each unit have durable, permanently fixed rating plate that easily readable or accessible when unit is in position for use, bearing at least following information in addition to information required by safety standards. In case of units consisting of several parts which can be made by different matching, only items a) and b) are to be indicated, where item b) applies to each part | Rating plate on main part of heat pump. All relevant informations according EN60335-1 / -2-40 and EN 14511 are given. | P |
| | Items c) and d) depend on the considered matching and shall be indicated in the manufacturer's data sheet | | P |
| | a) manufacturer or supplier; |  | P |
| | b) manufacturer's model designation and serial number; | Type and serial no. | P |
| | c) COP and/or EER to three significant figures and standard rating condition at which measured according Tables 3 to 15 of EN 14511-2; | COP with three significant figures according EHPA Regulation | P |
| | d) heating/cooling capacity in kilowatts, with two digits after the decimal comma but not more than 3 significant figures at the test condition given in item c) of Clause 5 | Heating capacity with two significant figures according EHPA Regulations | P |

| EN 14511-1, EN 14511-2, EN 14511-3, EN 14511-4 | | | |
|--|--|-----------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| | e) for control cabinet air conditioners, sensible cooling capacity in kilowatts, with one digit after the decimal comma not more than 3 significant figures at test condition given in item c) of Clause 5 | | N/A |
| | Further information provided; with regard to rating only other rating conditions given in Tables 3 to 15 of EN 14511-2 used | | P |

| | | | |
|------------------------|--|---|-----|
| 6 EN 14511-4 | TECHNICAL DATA SHEET | | — |
| 6.1 | General description | Detailed information listed in Installation-manual (IM) 0020087970_01, date 092010 User-manual (UM) 0020087971_01, date 092010 | — |
| | Manufacturer provide following information: | | — |
| | - trade mark, model designation; | (IM) page 3, clause 1.4 (IM) page 9, clause 3.1 | P |
| | - power supply (voltage, frequency); | (IM) page 107, table 14.1 | P |
| | - denomination of the unit (e.g.: air-to-water); | (IM) page 4, clause 1.4 | P |
| | - intended use of the unit (e.g.: control cabinet air conditioner); | (IM) page 4, clause 1.4 | P |
| | - number of separate component units; | (IM) page 18, clause 4.5 | P |
| | - type and mass of refrigerant charge; | (IM) page 108, table 14.1 | P |
| | - overall dimensions and weight of each separate component unit | (IM) page 16, clause 4.1 (IM) page 107, table 14.1 | P |
| 6.2 | Performance characteristics | | — |
| 6.2.1 | Rating characteristics | | — |
| | Manufacturer provide in table or as graph rating characteristics according EN 14511-2 and EN 14511-3 | Detailed information in i(UM) page 41, table 9.1 and page 42 table 9.2 | P |
| | Rating characteristics include: | | — |
| | - cooling capacity, effective power input, EER and SHR (where applicable); | | N/A |
| | - heating capacity, effective power input and COP (where applicable); | (IM) page 99, clause 14.1 | P |
| | - heat recovery capacity and type of liquid (where applicable) | | N/A |
| | Manufacturer shall state that the characteristics apply to a new unit with clean heat exchangers. | (IM) page 112, table 14.2 (UM) page 41, table 9.1 | P |
| 6.2.2 | Additional characteristics | | — |
| | In addition, manufacturer provide following characteristics for rated point(s): | | — |
| | - non ducted air-to-air units: flow rates or rotational speeds of fans; | | N/A |

| EN 14511-1, EN 14511-2, EN 14511-3, EN 14511-4 | | | |
|--|---|---------------------------|---------|
| Clause | Requirement - Test | Result - Remark | Verdict |
| | - non ducted air-to-water units: air flow rate or rotational speed of fan; water flow rate and pressure difference; | | N/A |
| | - unit intended to discharge into double floor: nominal flow rate and external static pressure difference; | | N/A |
| | - other types of units: nominal flow rates and external static pressure differences for air and water. | (IM) page 111, table 14.2 | P |

| | | | |
|-------|---|---|-----|
| 6.2.3 | Sound characteristics | | — |
| | Manufacturer provide sound power level and corresponding test method according EN 12102 | (IM) page 112, clause 14.2 | P |
| 6.3 | Electrical characteristics | | — |
| | Manufacturer specify electrical characteristics in accordance with EN 60335-2-40 or EN 60204-1 as applicable and: | According EN60335-1 and EN60335-2-40 | P |
| | - maximum starting current of unit, as defined in EN 61000-3-11; | (IM) page 110, clause 14.2 | P |
| | - total power input and current at rated point, excluding starting period; | According EN60335-1 and EN60335-2-40. (IM) page 110, clause 14.2 | P |
| | - reactive power or power factor at rated point, for units with total power input greater than 10 kW; | | N/A |
| | - power input of fan and pump if included in the units. | | N/A |
| 6.4 | Operating range | | — |
| | Manufacturer specify: | | — |
| | - limits of use (temperatures and flows); | (IM) temperatures limits, page 109 table 14.1 | P |
| | - whether devices fitted which do not allow unit to operate when these limits exceeded. | (IM) temperatures limits, page 109 table 14.1 | P |

| | | | |
|------------------------|---|---|---|
| 7 EN 14511-4 | INSTRUCTIONS | | — |
| 7.1 | General | | — |
| | If not already required by other standards, manufacturer provide information as described | All relevant informations according EN60335-1 / -2-40 and EN 14511 are given. | P |
| 7.2 | Physical description | | — |
| 7.2.1 | Refrigerant, air and/or liquid circuits | | — |
| | Manufacturer: | | — |
| | - specify the refrigerant, air and liquid circuits preferably providing circuit diagrams, showing every functional unit, control and safety device and specifying their type; | (IM) page 120/121, graph 1/2 | P |
| | - unit uses water in heat exchangers specify water capacity contained in unit, and specify either constructional materials of heat exchangers or water quality; | (IM) page 108, table 14.1 | P |
| | - if used specify type of brine and concentration into any other liquid ; | (IM) page 108, table 14.1 | P |
| | - specify type of oil to be used in the compressor. | (IM) page 108, table 14.1 | P |
| 7.2.2 | Additional heating devices, when integral to unit | | — |
| | Manufacturer specify type and location of additional heating devices and their control and safety devices | (IM) page 120/121, graph 1/2 | P |
| 7.2.3 | Control and safety | | — |
| | Manufacturer: | | — |

| | | | |
|-----|--|--|-----|
| | - state functions achieved by control and safety devices provided with unit and specify when applicable their provision for adjustment and method by safety devices reset; | (IM) page 65-94, clause 9 (UM) page 12-31, clause 4 | P |
| | - provide specifications for any control or safety devices necessary to ensure correct operation of unit but which not provided with unit; | (IM) page 23, clause 5.1 | P |
| | - specify any limitation to use of rest of installation. | (IM) page 5, clause 2.2 | P |
| 7.3 | Instructions for installation | | — |
| | The manufacturer shall specify in particular: | | — |
| | - required location conditions (whether units to be installed outside or in a weather proof enclosure, or in heated space); | (IM) page 14, clause 4.1/4.2 | P |
| | - requirements of physical layout, access and clearance; | (IM) page 17, clause 4.2 | P |
| | - requirements for electrical, liquid, air and refrigerant connections, to be made on site; | (IM) page 23-42, clause 5+6 (IM) page 43-61, clause 7 | P |
| | - location of warning and tripping devices; | Not required for heat pumps listed under low voltage directive | N/A |
| | - the installation precautions to be taken to ensure, in particular: | | — |
| | - correct circulation of the heat transfer media; | (IM) page 23-42, clause 5+6 | P |
| | - water draining; | | N/A |
| | - cleanliness of heat exchange surfaces; | | N/A |
| | - to minimise noise, vibration or other adverse effects. | (IM) page 14, clause 4.1 | P |
| | Special indications for units using soil, sea water, ground water or surface water: specify any materials in contact with water or with brine | (IM) page 111, table 14.2 | P |
| 7.4 | Instruction for maintenance | | — |
| | Manufacturer state: | | — |
| | - content and frequency of routine maintenance operations to be performed by user; | (UM) page 36-37, clause 6 | P |
| | - content and frequency of maintenance and inspection operations performed by specialist. | (IM) page 95, clause 10 | P |

| 4.3 EN14511-3 | TABLE 1: Uncertainties of measurement for indicated values | | | |
|---|--|---|---------|--|
| Measured quantity | Unit | Uncertainty of measurement | Verdict | |
| Liquid | | | | |
| - temperature inlet/outlet | °C | ± 0,1 K | P | |
| - volume flow | m³/s | ± 1 % | P | |
| - static pressure difference | Pa | ± 5 Pa ($\Delta p \leq 100$ Pa) ± 5 Pa ($\Delta p > 100$ Pa) | P | |
| Air | | | | |
| - dry bulb temperature | °C | ± 0,2 K | N/A | |
| - wet bulb temperature | °C | ± 0,3 K | N/A | |
| - volume flow | m³/s | ± 5 % | N/A | |
| - static pressure difference | Pa | ± 5 Pa ($\Delta p \leq 100$ Pa) ± 5 Pa ($\Delta p > 100$ Pa) | N/A | |
| Refrigerant | | | | |
| - pressure at compressor outlet | kPa | ± 1 % | N/A | |
| - temperature | °C | ± 0,5 K | N/A | |
| Concentration | | | | |
| - Heat transfer medium | % | ± 2 % | P | |
| Electrical quantities | | | | |
| - electric power | W | ± 1 % | P | |
| - voltage | V | ± 0,5 % | P | |
| - current | A | ± 0,5 % | P | |
| - electrical energy | kWh | ± 1 % | P | |
| | | | | |
| Compressor rotational speed | min ⁻¹ | ± 0,5 % | N/A | |
| The heating or cooling capacities measured on the liquid side shall be determined within a maximum uncertainty of 5 % independent of the individual uncertainties of measurement including the uncertainties on the properties of fluids. | | | | |
| supplementary information: identical requirements as in EHPA Regulation | | | | |

| 4.2.1 EN14511-4 | TABLE 1: Operational requirements conditions | | | | | |
|---|--|--------------------|--|--------------------|-------------|--|
| Type | Temperature outdoor heat exchanger (°C) | | Temperature indoor heat exchanger (°C) | | Voltage (V) | |
| | Lower limit of use | Upper limit of use | Lower limit of use | Upper limit of use | | |
| All types | -10 | 25 | 25 | 62 | 3N AC 400V | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| supplementary information: see also clause 7 tests of usage limits according EHPA Regulations | | | | | | |

| 4.2.2 EN14511-4 | TABLE 2: Maximum operating conditions cooling | | | | | |
|---------------------------------|---|--|----|-------------|--|--|
| Type | Temperature outdoor heat exchanger (°C) | Temperature indoor heat exchanger (°C) | | Voltage (V) | | |
| | Upper limit of use | Upper limit of use | | | | |
| Control cabinet air conditioner | -- | -- | 35 | -- | | |
| All other types | -- | -- | -- | -- | | |
| | | | | | | |
| | | | | | | |
| supplementary information: | | | | | | |

| 4.2.3.2 EN14511-4 | TABLE 3: Freeze up test conditions | | | | | |
|---|---|--|----------|-----------------------------|--|--|
| Unit type | Temperature outdoor heat exchanger (°C) | Temperature indoor heat exchanger (°C) | | | Air flow rate (m/s) | |
| | Lowest limit of use | Air | | Water | Minimum setting as allowed by manufacturer | |
| | | Dry bulb | Wet bulb | Lowest entering temperature | | |
| All types | -- | 21 | 15 | -- | -- | |
| | -- | -- | -- | -- | -- | |
| | -- | -- | -- | -- | -- | |
| supplementary information: special freeze up test not included in EHPA Regulation | | | | | | |

| Unit type | Outdoor heat exchanger | | Indoor heat exchanger | | | |
|---|---------------------------------|---------------------------------|---------------------------------|---------------------------------|------------------------------|-------------------------------|
| | Inlet dry bulb temperature (°C) | Inlet wet bulb temperature (°C) | Inlet dry bulb temperature (°C) | Inlet wet bulb temperature (°C) | Inlet water temperature (°C) | Outlet water temperature (°C) |
| Air-to-air units | 2 | 1 | 20 | 15 max. | | |
| Air-to-water units | 2 | 1 | | | a) | 45 |
| Air-to-water units (floor heating or similar application) | 2 | 1 | | | a) | 35 |
| | | | | | | |
| | | | | | | |

a) Test performed at flow rate obtained during test at corresponding standard rating conditions

supplementary information: see EHPA Regulation clause 8

| | Indoor heat exchanger temperatures (°C) | | | | Outdoor heat exchanger temperatures (°C) | | | |
|-------------------------------|---|----------------|-------------|--------------|--|------------------|-------------|--------------|
| | Inlet dry bulb | Inlet wet bulb | Inlet water | Outlet water | Inlet dry bulb | Inlet wet bulb | Inlet water | Outlet water |
| Air-to-air units | 27 | 24 | -- | -- | 27 | 24 | -- | -- |
| Water-to-air units | -- | -- | 27 | a) | 27 | 24 | -- | -- |
| Close control, air cooled | 27 | b) | -- | -- | 27 | b) | | |
| Close control, water cooled | -- | -- | 27 | a) | 27 | b) | -- | -- |
| Control cabinet, air cooled | 27 | 24 | -- | -- | 27 | 24 ^{c)} | -- | -- |
| Control cabinet, water cooled | -- | -- | 27 | a) | 27 | 24 ^{c)} | -- | -- |
| | | | | | | | | |
| | | | | | | | | |

a) Same water flow rate as for rating capacity test at standard rating conditions

b) With highest relative humidity stated by manufacturer

c) If not possible, make test at lowest dry bulb temperature (greater than 27 °C) with 80 % relative humidity

supplementary information: heat pumps without cooling function

Test results Brine-Water-Heat pump * heating * in conjunction with EN14511-2 Table 7 and EHPA-DACH Testing Regulation for Brine/Water-Water Heat pump Version 1.2 Release 20.08.2008

| Model -> | | VWS 171/3 <input checked="" type="checkbox"/> | VWS 141/3 <input type="checkbox"/> | VWS 101/3 <input checked="" type="checkbox"/> | VWS 81/3 <input type="checkbox"/> | VWS 61/3 <input type="checkbox"/> | | | | |
|---------------------------------|-------------------|--|---------------------------------------|--|--------------------------------------|--------------------------------------|--|--|--|--|
| Volume flow Q / N | m ³ /h | 4,448/3,070 | 3,532/2,438 | 2,495/1,909 | 1,842 / 1,37 | 1,524/1,056 | | | | |
| Refrig. mass | Typ /kg | R407 C / 3,05Kg | R407C / 2,9 | R407C / 2,05 | R407 / 2,2 | R407 / 1,9 | | | | |
| Sound power | dB(A) | 53 | 52 | 50 | 48 | 46 | | | | |
| B5/W35 | Heat output/kW | 19,961 | 16,332 | 12,000 | 8,999 | 6,929 | | | | |
| | El. input/ kW | 3,795 | 3,081 | 2,228 | 1,741 | 1,344 | | | | |
| | COP | 5,26 | 5,30 | 5,39 | 5,17 | 5,15 | | | | |
| B0/W35 | Heat output/kW | 17,439 | 14,034 | 10,889 | 7,841 | 6,077 | | | | |
| | El. input/ kW | 3,592 | 3,013 | 2,182 | 1,683 | 1,309 | | | | |
| | COP | 4,85 | 4,66 | 4,99 | 4,66 | 4,64 | | | | |
| | Minimum COP | 4,0 | | | | | | | | |
| B0/W35-25 (optional) | Heat output/kW | 17,991 | 14,418 | 10,751 | 8,034 | 6,246 | | | | |
| | El. input/ kW | 3,469 | 2,864 | 2,098 | 1,599 | 1,264 | | | | |
| | COP | 5,19 | 5,03 | 5,13 | 5,03 | 4,94 | | | | |
| B5/W45 | Heat output/kW | 19,254 | 15,844 | 11,594 | 8,805 | 6,738 | | | | |
| | El. input/ kW | 4,539 | 3,806 | 2,730 | 2,092 | 1,630 | | | | |
| | COP | 4,24 | 4,16 | 4,25 | 4,21 | 4,13 | | | | |
| B0/W45 | Heat output/kW | 16,659 | 13,559 | 10,224 | 7,804 | 5,889 | | | | |
| | El. input/ kW | 4,313 | 3,638 | 2,701 | 2,067 | 1,576 | | | | |
| | COP | 3,86 | 3,73 | 3,79 | 3,78 | 3,74 | | | | |
| B-5/W45 | Heat output/kW | 14,624 | 11,567 | 8,791 | 6,930 | 5,083 | | | | |
| | El. input/ kW | 4,164 | 3,483 | 2,576 | 2,006 | 1,520 | | | | |
| | COP | 3,51 | 3,32 | 3,41 | 3,45 | 3,34 | | | | |
| B5/W55 | Heat output/kW | 18,327 | 15,170 | 11,242 | 8,830 | 6,473 | | | | |
| | El. input/ kW | 5,320 | 4,540 | 3,327 | 2,599 | 1,992 | | | | |
| | COP | 3,44 | 3,34 | 3,38 | 3,40 | 3,25 | | | | |
| B0/W55 | Heat output/kW | 16,329 | 13,071 | 9,653 | 7,755 | 5,656 | | | | |
| | El. input/ kW | 5,160 | 4,324 | 3,199 | 2,525 | 1,911 | | | | |
| | COP | 3,16 | 3,02 | 3,02 | 3,07 | 2,96 | | | | |
| Compressor | Manufacturer | Copeland | Copeland | Copeland | Copeland | Copeland | | | | |
| | Type | Scroll | Scroll | Scroll | Scroll | Scroll | | | | |
| | quantity | 1 | 1 | 1 | 1 | 1 | | | | |

Footnote

- This test sample was selected and tested by the test center
 The tech. datas of this type were transmitted by the manufacturer and **not tested by the test center**

Test results Brine-Water-Heat pump * heating * in conjunction with EN14511-2 Table 7 and
EHPA-DACH Testing Regulation for Brine/Water-Heat pump Version 1.2 Release 20.08.2008

| Model | | VWW 171/3 | VWW 141/3 | VWW 101/3 | VWW 81/3 | VWW 61/3 |
|----------------------------------|-------------------|-------------------------------------|--------------------------|-------------------------------------|--------------------------|--------------------------|
| | Footnote | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Volume flow Q/N | m ³ /h | 5,771/4,003 | 4,850/3,317 | 3,193/2,403 | 2,625 / 1,890 | 2,182/1,448 |
| Refrig. mass | Refrig / kg | R407C / 3,05 | R407C / 2,9 | R407C / 2,05 | R407C / 2,2 | R407C / 1,9 |
| Installation | | | | | | |
| Sound power | dB(A) | 53 | 52 | 50 | 48 | 46 |
| W 10/W35 | Heat output/kW | 23,997 | 19,825 | 13,962 | 10,858 | 8,382 |
| | El. input/ kW | 4,313 | 3,513 | 2,419 | 1,955 | 1,461 |
| | COP | 5,56 | 5,64 | 5,77 | 5,55 | 5,74 |
| | Minimum COP | 4.5 | | | | |
| W 10/W35-25 (optional) | Heat output/kW | 23,627 | 14,023 | 14,023 | 11,246 | 8,649 |
| | El. input/ kW | 3,964 | 2,419 | 2,335 | 1,866 | 1,432 |
| | COP | 5,96 | 5,80 | 6,00 | 6,03 | 6,04 |
| W 15/W45 | Heat output/kW | 25,288 | 21,681 | 15,321 | 12,023 | 9,144 |
| | El. input/ kW | 5,091 | 4,297 | 2,993 | 2,410 | 1,846 |
| | COP | 4,97 | 5,05 | 5,12 | 4,99 | 4,95 |
| W 10/W45 | Heat output/kW | 22,559 | 18,988 | 13,647 | 10,400 | 7,978 |
| | El. input/ kW | 4,914 | 4,197 | 2,918 | 2,305 | 1,811 |
| | COP | 4,59 | 4,52 | 4,68 | 4,51 | 4,40 |
| W 15/W55 | Heat output/kW | 23,917 | 20,330 | 14,970 | 11,321 | 8,620 |
| | El. input/ kW | 6,133 | 5,161 | 3,623 | 2,886 | 2,292 |
| | COP | 3,90 | 3,94 | 4,13 | 3,92 | 3,76 |
| W 10/W55 | Heat output/kW | 21,544 | 17,817 | 13,290 | 9,750 | 7,636 |
| | El. input/ kW | 5,589 | 4,999 | 3,516 | 2,823 | 2,263 |
| | COP | 3,63 | 3,56 | 3,78 | 3,45 | 3,37 |

Footnote

- This test sample was selected and tested by the test center
 The tech. datas of this type were transmitted by the manufacturer and **not tested by the test center**

-- END OF TEST REPORT --