

TEST REPORT

Report no.:
300-KLAB-21-004 rev.1
(This report replaces 300-KLAB-21-004)



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Customer: Company: Panasonic Marketing Europe GmbH
Address: Hagenauer Str. 43
City: D-65203 Wiesbaden
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Component: Brand: Panasonic
Type: Air to water heat pump (mono bloc)
Model: Unit: WH-MXC09J3E5
Series no.: Unit: 5623200003
Prod. year: Unit: 2020.11

Dates: Component tested: April-May 2021

Procedure: See objective (page 2) for list of standards.

Remarks: The report has been revised due to a typo in the model name.
The unit was delivered by the customer. The installation and test settings were done according to the manufacturer's instructions. All tests are done with enabled defrost mode.
The unit was delivered as model no. WH-MXC12J6E5, cf. the rating plates of the units. By changing the software, the unit was changed to model no. WH-MXC09J3E5.

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Test Rep. nr.



Objective

The objective of this report is to document the following:

The Seasonal Coefficient of Performance (SCOP) at low and medium temperature application for average climate according to EN 14825:2016. In order to calculate the SCOP, tests were carried out at the part load conditions stated in the tables on page 5 and 6.

Rating conditions low temperature (heating mode) according to EN 14511:2018 at A7/W35, A2/W35 and A-7/W35.

Rating conditions medium temperature (heating mode) according to EN 14511:2018 at A7/W55, A2/W55 and A-7/W55.

SEER test points at fan cooling application for space cooling according to EN 14825:2016 at test condition A (A35/W7) and test condition C (A25/W10)

SEER test points at floor cooling application for space cooling according to EN 14825:2016 at test condition A (A35/W18) and test condition C (A25/W18)

Operating requirements according to EN 14511-4:2013:

- 4.2.1 Starting and operating tests

Operating requirements according to EN 14511-4:2018:

- 4.2.1 Starting and operating tests
- 4.5 Shutting of the heat transfer medium flows
- 4.6 Complete power supply failure

Power consumption of liquid pump for COP and SCOP test points.

Sound power measurements according to EN 12102-1:2017 for standard rating condition (A7/W55), quiet mode level 3 (A7/W55) and energy label (A7/W55).

This report includes all requirements for the European KEYMARK Scheme for Heat Pumps.





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Test conditions

SCOP test conditions for low temperature – EN 14825

Part load conditions for reference SCOP and reference SCOP_{on} calculation of air to water units for low temperature application for the reference heating season;

"A" = average, "W" = warmer, and "C" = colder.

Condition ^a	Part Load Ratio in %				Outdoor heat exchanger		Indoor heat exchanger			
					Inlet dry (wet) bulb temperature °C		Fixed outlet °C	Variable outlet ^d °C		
	Formula	A	W	C	Outdoor air	Exhaust air	All climates	A	W	C
A	$(-7 - 16) / (T_{\text{designh}} - 16)$	88	n/a	61	-7(-8)	20(12)	^a / 35	^a / 34	n/a	^a / 30
B	$(+2 - 16) / (T_{\text{designh}} - 16)$	54	100	37	2(1)	20(12)	^a / 35	^a / 30	^a / 35	^a / 27
C	$(+7 - 16) / (T_{\text{designh}} - 16)$	35	64	24	7(6)	20(12)	^a / 35	^a / 27	^a / 31	^a / 25
D	$(+12 - 16) / (T_{\text{designh}} - 16)$	15	29	11	12(11)	20(12)	^a / 35	^a / 24	^a / 26	^a / 24
E	$(TOL - 16) / (T_{\text{designh}} - 16)$				TOL	20(12)	^a / 35	^a / b	^a / b	^a / b
F	$(T_{\text{bivalent}} - 16) / (T_{\text{designh}} - 16)$				T _{bivalent}	20(12)	^a / 35	^a / c	^a / c	^a / c
G	$(-15 - 16) / (T_{\text{designh}} - 16)$	n/a	n/a	82	-15	20(12)	^a / 35	n/a	n/a	^a / 32

^a With the water flow rate as determined at the standard rating conditions given in EN 14511-2 at 30/35 conditions for units with a fixed water flow rate, and with a fixed delta T of 5 K for units with a variable flow rate. If the resulting flow rate is below the minimum flow rate then this minimum flow rate is used with the outlet temperature.

^b Variable outlet shall be calculated by interpolation from T_{designh} and the temperature which is closest to the TOL.

^c Variable outlet shall be calculated by interpolation between the upper and lower temperatures which are closest to the bivalent temperature.

^d If the variable outlet temperature is below the minimum of the operation range of the unit, this minimum should be considered.

Additional information

Climate	T _{designh} [°C]	T _{bivalent} [°C]	TOL [°C]	Outlet temperature	Flow rate
Average	-10	-10	-10	Variable	Variable



SCOP test conditions for medium temperature – EN 14825

Part load conditions for reference SCOP and reference SCOPon calculation of air to water units for medium temperature application for the reference heating season;

"A" = average, "W" = warmer, and "C" = colder.

Condition	Part Load Ratio in %				Outdoor heat exchanger		Indoor heat exchanger			
					Inlet dry (wet) bulb temperature °C		Fixed outlet °C	Variable outlet ^d °C		
	Formula	A	W	C	Outdoor air	Exhaust air	All climates	A	W	C
A	$(-7 - 16) / (T_{\text{designh}} - 16)$	88	n/a	61	-7(-8)	20(12)	^a / 55	^a / 52	n/a	^a / 44
B	$(+2 - 16) / (T_{\text{designh}} - 16)$	54	100	37	2(1)	20(12)	^a / 55	^a / 42	^a / 55	^a / 37
C	$(+7 - 16) / (T_{\text{designh}} - 16)$	35	64	24	7(6)	20(12)	^a / 55	^a / 36	^a / 46	^a / 32
D	$(+12 - 16) / (T_{\text{designh}} - 16)$	15	29	11	12(11)	20(12)	^a / 55	^a / 30	^a / 34	^a / 28
E	$(\text{TOL} - 16) / (T_{\text{designh}} - 16)$				TOL	20(12)	^a / 55	^a / ^b	^a / ^b	^a / ^b
F	$(T_{\text{bivalent}} - 16) / (T_{\text{designh}} - 16)$				T_{bivalent}	20(12)	^a / 55	^a / ^c	^a / ^c	^a / ^c
G	$(-15 - 16) / (T_{\text{designh}} - 16)$	n/a	n/a	82	-15	20(12)	^a / 55	n/a	n/a	^a / 49

^a With the water flow rate as determined at the standard rating conditions given in EN 14511-2 at 47/55 conditions for units with a fixed water flow rate, and with a fixed delta T of 8 K for units with a variable flow rate. If the resulting flow rate is below the minimum flow rate then this minimum flow rate is used with the outlet temperature.

^b Variable outlet shall be calculated by interpolation T_{designh} and the temperature which is closest to the TOL.

^c Variable outlet shall be calculated by interpolation between the upper and lower temperatures which are closest to the bivalent temperature.

^d If the variable outlet temperature is below the minimum of the operation range of the unit, this minimum should be considered.

Additional information

Climate	T_{designh} [°C]	T_{bivalent} [°C]	TOL [°C]	Outlet temperature	Flow rate
Average	-10	-10	-10	Variable	Variable



Test conditions for rating condition low temperature – EN 14511

N#	Heat source		Heat sink		
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)	
1	7	6	30	35	
2	2	1	30	35	
3	-7	-8	30	35	

Test conditions for rating condition medium temperature – EN 14511

N#	Heat source		Heat sink		
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)	
1	7	6	47	55	
2	2	1	47	55	
3	-7	-8	47	55	



Test conditions for SEER test points at fan cooling application for space cooling - EN 14825

N#	Heat source		Heat sink		Test point
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)	
1	35	-	12	7	A
2	25	-	15	10	C

Test conditions for SEER test points at floor cooling application for space cooling - EN 14825

N#	Heat source		Heat sink		Test point
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)	
1	35	-	23	18	A
2	25	-	23	18	C

Test conditions for operating requirements – EN 14511-4: 2013

N#	Heat source		Heat sink	Water flow rate at indoor heat exchanger	Test
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Outlet temperature (°C)		
1	35	-	55	Maximum	Starting
2	35	-	25	Minimum	Operating



Test conditions for operating requirements – EN 14511-4: 2018

N#	Heat source		Heat sink	Water flow rate at indoor heat exchanger	Test
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)		
1	-20	-	20	Minimum	Starting
2	-20	-	47	Minimum	Operating

Test conditions for shutting of the heat transfer medium – EN 14511-4

N#	Heat source		Heat sink		Heat exchanger
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)	
1	7	6	30	35	Indoor
2	7	6	30	35	Outdoor

Test conditions for complete power supply failure – EN 14511-4

N#	Heat source		Heat sink		
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)	
1	7	6	30	35	



Test conditions for sound power measurements – EN 12102-1

N [#]	Test condition		Heat pump setting			
	Outdoor heat exchanger (dry bulb/ wet bulb) (°C)	Indoor heat exchanger (inlet/ outlet) (°C)	Compressor speed (Hz)	Fan speed Outdoor 1/2 (rpm)	Heating capacity (kW)	Power input (kW)
1 ^R	7/6	47/55	38	490/530	9.0	2.9
2 ^Q	7/6	47/55	24	240/280	4.9	1.7
3 ^E	7/6	47/55	22	360/400	4.75	1.68

R) Rating capacity, Q) Quiet mode 3, E) ErP labelling,





Test results

Test results of SCOP test at low temperature - heating season average – EN 14825

Model (Outdoor)	WH-MXC09J3E5
Air-to-water heat pump mono bloc	Y
Low-temperature heat pump	N
Equipped with supplementary heater	Y
Heat pump combination heater	Y

Rated heat output¹⁾	P_{rated}	9 [kW]
Seasonal space heating energy efficiency	η_s	207.5 [%]
	SCOP	5.26 [-]

Measured capacity for heating for part load at outdoor temperature T_j	Average Climate - Low temperature application	$T_j = -15\text{ °C}$	P_{dh}	- [kW]
		$T_j = -7\text{ °C}$	P_{dh}	8.03 [kW]
		$T_j = 2\text{ °C}$	P_{dh}	4.90 [kW]
		$T_j = 7\text{ °C}$	P_{dh}	5.40 [kW]
		$T_j = 12\text{ °C}$	P_{dh}	6.32 [kW]
		$T_j = \text{bivalent temperature}$	P_{dh}	9.04 [kW]
		$T_j = \text{operation limit}$	P_{dh}	9.04 [kW]

Measured coefficient of performance at outdoor temperature T_j	Average Climate - Low temperature application	$T_j = -15\text{ °C}$	COP _d	- [-]
		$T_j = -7\text{ °C}$	COP _d	3.23 [-]
		$T_j = 2\text{ °C}$	COP _d	5.25 [-]
		$T_j = 7\text{ °C}$	COP _d	6.75 [-]
		$T_j = 12\text{ °C}$	COP _d	8.85 [-]
		$T_j = \text{bivalent temperature}$	COP _d	3.06 [-]
		$T_j = \text{operation limit}$	COP _d	3.06 [-]

Bivalent temperature	$T_{bivalent}$	-10 [°C]
Operation limit temperatures	TOL	-10 [°C]
	WTOL	- [°C]
Degradation coefficient	C_{dh}	0.99 [-]

Power consumption in modes other than active mode	Off mode	P_{OFF}	0.008 [kW]
	Thermostat-off mode	P_{TO}	0.008 [kW]
	Standby mode	P_{SB}	0.008 [kW]
	Crankcase heater mode	P_{CK}	0.008 [kW]
Supplementary heater¹⁾	Rated heat output	P_{SUP}	0.00 [kW]
	Type of energy input		Electrical

Other items	Capacity control		Variable
	Water flow control		Variable
	Water flow rate		-
	Annual energy consumption	Q_{HE}	3534 [kWh]

¹⁾For heat pump space heaters and heat pump combination heaters, the rated heat output, P_{rated} , is equal to the design load for heating, $P_{designh}$, and the rated heat output of a supplementary heater, P_{sup} , is equal to the supplementary capacity for heating, $sup(T_j)$.



Test results of SCOP test at medium temperature - heating season average – EN 14825

Model (Outdoor)	WH-MXC09J3E5
Air-to-water heat pump mono bloc	Y
Low-temperature heat pump	N
Equipped with supplementary heater	Y
Heat pump combination heater	Y

Rated heat output ¹⁾	P _{rated}	9 [kW]
Seasonal space heating energy efficiency	η_s	146.5 [%]
	SCOP	3.74 [-]

Measured capacity for heating for part load at outdoor temperature T _j	Average Climate	T _j = -15 °C	P _{dh}	- [kW]
	-	T _j = -7 °C	P _{dh}	7.54 [kW]
	Medium temperature application	T _j = 2 °C	P _{dh}	4.89 [kW]
		T _j = 7 °C	P _{dh}	5.01 [kW]
		T _j = 12 °C	P _{dh}	6.08 [kW]
		T _j = bivalent temperature	P _{dh}	8.84 [kW]
		T _j = operation limit	P _{dh}	8.84 [kW]

Measured coefficient of performance at outdoor temperature T _j	Average Climate	T _j = -15 °C	COP _d	- [-]
	-	T _j = -7 °C	COP _d	2.36 [-]
	Medium temperature application	T _j = 2 °C	COP _d	3.67 [-]
		T _j = 7 °C	COP _d	4.75 [-]
		T _j = 12 °C	COP _d	6.49 [-]
		T _j = bivalent temperature	COP _d	2.12 [-]
		T _j = operation limit	COP _d	2.12 [-]

Bivalent temperature	T _{bivalent}	-10 [°C]
Operation limit temperatures	TOL	-10 [°C]
	WTOL	- [°C]
Degradation coefficient	C _{dh}	0.99 [-]

Power consumption in modes other than active mode	Off mode	P _{OFF}	0.008 [kW]
	Thermostat-off mode	P _{TO}	0.008 [kW]
	Standby mode	P _{SB}	0.008 [kW]
	Crankcase heater mode	P _{CK}	0.008 [kW]
Supplementary heater ¹⁾	Rated heat output	P _{SUP}	0.00 [kW]
	Type of energy input		Electrical

Other items	Capacity control		Variable
	Water flow control		Variable
	Water flow rate		-
	Annual energy consumption	Q _{HE}	4974 [kWh]

¹⁾For heat pump space heaters and heat pump combination heaters, the rated heat output, P_{rated}, is equal to the design load for heating, P_{designh}, and the rated heat output of a supplementary heater, P_{sup}, is equal to the supplementary capacity for heating, sup(T_j).



Test results of standard rating test at low temperature – EN 14511

N#	Test conditions	Heating capacity [kW]	COP
1	A7/W35	9.06	5.15
2	A2/W35	9.35	3.92
3	A-7/W35	9.56	3.08

Test results of standard rating test at medium temperature – EN 14511

N#	Test conditions	Heating capacity [kW]	COP
1	A7/W55	9.04	3.17
2	A2/W55	9.17	2.56
3	A-7/W55	9.27	2.17

Test results of SEER test points at fan cooling application for space cooling - EN 14825

N#	Test conditions	Cooling capacity [kW]	EER
	A35/W7	8.36	3.03
2	A25/W10	4.32	5.28



Test results of SEER test points at floor cooling application for space cooling - EN 14825

N#	Test conditions	Cooling capacity [kW]	EER
1	A35/W18	10.85	3.84
2	A25/W18	5.40	8.1

Test results of operating requirements – EN 14511-4:2013

N#	Test conditions	Water flow rate at indoor heat exchanger (l/h)	Test validation
1	A35/W55	1615	Passed
2	A35/W25	811	Passed

Test results of operating requirements – EN 14511-4:2018

N#	Test conditions	Water flow rate at indoor heat exchanger (l/h)	Test validation
1	A-20/W20	570	Passed
2	A-20/W47	806	Passed

Test results of shutting of the heat transfer medium – EN 14511-4

N#	Test conditions	Test validation
1	A7/W35	Passed
2	A7/W35	Passed



Test results of complete power supply failure – EN 14511-4

N#	Test conditions	Test validation
1	A7/W35	Passed

Power consumption of liquid pump for COP test points

N#	COP test points	Measured power consumption (W)
1	A7/W35	44
2	A2/W35	44
3	A-7/W35	44
4	A7/W55	49
5	A2/W55	49
6	A-7/W55	49



Power consumption of liquid pump for SCOP test points – low temperature application

N#	SCOP test points	Measured power consumption (W)
1	A12/W24	47
2	A7/W27	46
3	A2/W30	44
4	A-7/W34	44
5	A10/W35	44

Power consumption of liquid pump for SCOP test points – medium temperature application

N#	SCOP test points	Measured power consumption (W)
1	A12/W30	44
2	A7/W36	44
3	A2/W42	44
4	A-7/W52	44
5	A10/W55	44

The power consumptions of the liquid pump have been measured separately



Test results of sound power measurements – EN 12102

N [#]	Sound power level LW(A) [dB re 1pW]	Uncertainty (dB) (weighted value)
1 ^R	61	0.5
2 ^Q	56	0.5
3 ^E	55.5	0.5

R) Rating capacity, Q) Quiet mode 3, E), ErP labelling

The uncertainty value is a weighted value using the level and frequency dependant influence for each 1/1-octave level on the final A-weighted sound power level.

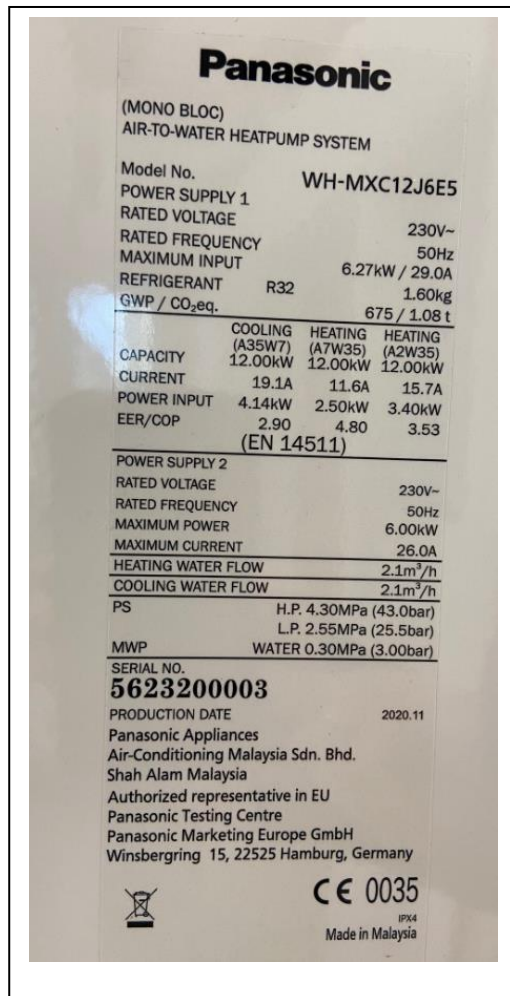
The A-weighted total sound power level is determined for the measured frequency range from 100 Hz to 10 kHz.





Photo

Rating plate



Unit





SCOP - detailed calculation

Detailed SCOP calculation of low temperature and average climate conditions – EN 14825

Calculation of reference SCOP

$$SCOP = \frac{P_{designh} \times H_{he}}{\frac{P_{designh} \times H_{he}}{SCOP_{on}} + H_{TO} \times P_{TO} + H_{SB} \times P_{SB} + H_{CK} \times P_{CK} + H_{OFF} \times P_{OFF}}$$

Where

P_{design} =

Heating load of the building at design temperature, kW

H_{he} =

Number of equivalent heating hours, 2066 h

H_{TO} , H_{SB} , H_{CK} , H_{OFF} =

Number of hours for which the unit is considered to work in thermostat off mode, standby mode, crankcase heater mode and off mode, h, respectively

P_{TO} , P_{SB} , P_{CK} , P_{OFF} =

Electricity consumption during thermostat off mode, standby mode, crankcase heater mode and off mode, kW, respectively

Data for SCOP

	Outdoor temperature [°C]	Part load ratio [%]	Part load [kW]	Declared capacity [kW]	Declared COP [-]	cdh [-]	CR [-]	COPbin [-]
A	-7	88	7.96	8.03	3.23	1.00	1.00	3.23
B	2	54	4.85	4.90	5.25	0.99	1.00	5.25
C	7	35	3.12	5.40	6.75	0.99	0.58	6.70
D	12	15	1.38	6.32	8.85	0.99	0.22	8.51
E	-10	100	9.00	9.04	3.06	1.00	1.00	3.06
F - BIV	-10	100	9.00	9.04	3.06	1.00	1.00	3.06

Energy consumption for thermostat off, standby, off mode, crankcase heater mode

	Hours [h]	Power input [kW]	Applied to SCOP calculation [kW]	Energy consumption [kWh]
Off mode	3672	0.008	0.008	29.376
Thermostat off	178	0.008	0.008	1.424
Standby	0	0.008	0.008	0
Crankcase heater	3850	0.008	0	0



Calculation Bin for SCOPon

	Bin	Outdoor temperature [°C]	Hours [h]	Heat load [kW]	Heat load covered by heat pump [kW]	Electrical back up heater [kW]	Annual backup heater energy input [kWh]	COPbin	Annual heating demand [kWh]	Annual energy input [kWh]	Net annual heating capacity [kWh]	Net annual power input [kWh]
E / F - BIV	21	-10	1	9.00	9.00	0.00	0.00	3.06	9.00	2.94	9.00	2.94
	22	-9	25	8.65	8.65	0.00	0.00	3.12	216.35	69.42	216.35	69.42
	23	-8	23	8.31	8.31	0.00	0.00	3.17	191.08	60.21	191.08	60.21
A	24	-7	24	7.96	7.96	0.00	0.00	3.23	191.08	59.16	191.08	59.16
	25	-6	27	7.62	7.62	0.00	0.00	3.45	205.62	59.52	205.62	59.52
	26	-5	68	7.27	7.27	0.00	0.00	3.68	494.31	134.36	494.31	134.36
	27	-4	91	6.92	6.92	0.00	0.00	3.90	630.00	161.40	630.00	161.40
	28	-3	89	6.58	6.58	0.00	0.00	4.13	585.35	141.81	585.35	141.81
	29	-2	165	6.23	6.23	0.00	0.00	4.35	1028.08	236.22	1028.08	236.22
	30	-1	173	5.88	5.88	0.00	0.00	4.58	1018.04	222.44	1018.04	222.44
	31	0	240	5.54	5.54	0.00	0.00	4.80	1329.23	276.86	1329.23	276.86
	32	1	280	5.19	5.19	0.00	0.00	5.03	1453.85	289.29	1453.85	289.29
B	33	2	320	4.85	4.85	0.00	0.00	5.25	1550.77	295.38	1550.77	295.38
	34	3	357	4.50	4.50	0.00	0.00	5.54	1606.50	289.97	1606.50	289.97
	35	4	356	4.15	4.15	0.00	0.00	5.83	1478.77	253.63	1478.77	253.63
	36	5	303	3.81	3.81	0.00	0.00	6.12	1153.73	188.50	1153.73	188.50
	37	6	330	3.46	3.46	0.00	0.00	6.41	1142.31	178.19	1142.31	178.19
C	38	7	326	3.12	3.12	0.00	0.00	6.70	1015.62	151.56	1015.62	151.56
	39	8	348	2.77	2.77	0.00	0.00	7.06	963.69	136.45	963.69	136.45
	40	9	335	2.42	2.42	0.00	0.00	7.42	811.73	109.33	811.73	109.33
	41	10	315	2.08	2.08	0.00	0.00	7.79	654.23	84.02	654.23	84.02
	42	11	215	1.73	1.73	0.00	0.00	8.15	372.12	45.67	372.12	45.67
D	43	12	169	1.38	1.38	0.00	0.00	8.51	234.00	27.50	234.00	27.50
	44	13	151	1.04	1.04	0.00	0.00	8.87	156.81	17.67	156.81	17.67
	45	14	105	0.69	0.69	0.00	0.00	9.23	72.69	7.87	72.69	7.87
	46	15	74	0.35	0.35	0.00	0.00	9.60	25.62	2.67	25.62	2.67

SUM	18590.54	3502.05	18590.54	3502.05
SCOPon		5.31	SCOPnet	5.31



Detailed SCOP calculation of medium temperature and average climate conditions – EN 14825

Calculation of reference SCOP

$$SCOP = \frac{P_{designh} \times H_{he}}{\frac{P_{designh} \times H_{he}}{SCOP_{en}} + H_{TO} \times P_{TO} + H_{SB} \times P_{SB} + H_{CK} \times P_{CK} + H_{OFF} \times P_{OFF}}$$

Where

P_{design} = Heating load of the building at design temperature, kW
 H_{he} = Number of equivalent heating hours, 2066 h
 $H_{TO}, H_{SB}, H_{CK}, H_{OFF}$ = Number of hours for which the unit is considered to work in thermostat off mode, standby mode, crankcase heater mode and off mode, h, respectively

$P_{TO}, P_{SB}, P_{CK}, P_{OFF}$ = Electricity consumption during thermostat off mode, standby mode, crankcase heater mode and off mode, kW, respectively

Data for SCOP

	Outdoor temperature [°C]	Part load ratio [%]	Part load [kW]	Declared capacity [kW]	Declared COP [-]	cdh [-]	CR [-]	COPbin [-]
A	-7	88	7.96	7.54	2.36	1.00	1.00	2.36
B	2	54	4.85	4.89	3.67	0.99	1.00	3.67
C	7	35	3.12	5.01	4.75	0.99	0.62	4.73
D	12	15	1.38	6.08	6.49	0.99	0.23	6.31
E	-10	100	9.00	8.84	2.12	1.00	1.00	2.12
F - BIV	-10	100	9.00	8.84	2.12	1.00	1.00	2.12

Energy consumption for thermostat off, standby, off mode, crankcase heater mode

	Hours [h]	Power input [kW]	Applied to SCOP calculation [kW]	Energy consumption [kWh]
Off mode	3672	0.008	0.008	29.376
Thermostat off	178	0.008	0.008	1.424
Standby	0	0.008	0.008	0
Crankcase heater	3850	0.008	0	0



Calculation Bin for SCOPon

	Bin	Outdoor temperature [°C]	Hours [h]	Heat load [kW]	Heat load covered by heat pump [kW]	Electrical back up heater [kW]	Annual backup heater energy input [kWh]	COPbin	Annual heating demand [kWh]	Annual energy input [kWh]	Net annual heating capacity [kWh]	Net annual power input [kWh]
E / F - BIV	21	-10	1	9.00	8.84	0.00	0.00	2.12	9.00	4.25	9.00	4.25
	22	-9	25	8.65	8.41	0.00	0.00	2.20	216.35	98.34	216.35	98.34
	23	-8	23	8.31	7.97	0.00	0.00	2.28	191.08	83.81	191.08	83.81
A	24	-7	24	7.96	7.54	0.00	0.00	2.36	191.08	80.96	191.08	80.96
	25	-6	27	7.62	7.24	0.00	0.00	2.51	205.62	82.06	205.62	82.06
	26	-5	68	7.27	6.94	0.00	0.00	2.65	494.31	186.45	494.31	186.45
	27	-4	91	6.92	6.64	0.00	0.00	2.80	630.00	225.27	630.00	225.27
	28	-3	89	6.58	6.34	0.00	0.00	2.94	585.35	198.95	585.35	198.95
	29	-2	165	6.23	6.04	0.00	0.00	3.09	1028.08	332.95	1028.08	332.95
	30	-1	173	5.88	5.74	0.00	0.00	3.23	1018.04	314.86	1018.04	314.86
	31	0	240	5.54	5.44	0.00	0.00	3.38	1329.23	393.39	1329.23	393.39
	32	1	280	5.19	5.15	0.00	0.00	3.52	1453.85	412.50	1453.85	412.50
B	33	2	320	4.85	4.85	0.00	0.00	3.67	1550.77	422.55	1550.77	422.55
	34	3	357	4.50	4.50	0.00	0.00	3.88	1606.50	413.87	1606.50	413.87
	35	4	356	4.15	4.15	0.00	0.00	4.09	1478.77	361.27	1478.77	361.27
	36	5	303	3.81	3.81	0.00	0.00	4.30	1153.73	268.00	1153.73	268.00
	37	6	330	3.46	3.46	0.00	0.00	4.52	1142.31	252.92	1142.31	252.92
C	38	7	326	3.12	3.12	0.00	0.00	4.73	1015.62	214.80	1015.62	214.80
	39	8	348	2.77	2.77	0.00	0.00	5.04	963.69	191.06	963.69	191.06
	40	9	335	2.42	2.42	0.00	0.00	5.36	811.73	151.45	811.73	151.45
	41	10	315	2.08	2.08	0.00	0.00	5.68	654.23	115.27	654.23	115.27
	42	11	215	1.73	1.73	0.00	0.00	5.99	372.12	62.11	372.12	62.11
D	43	12	169	1.38	1.38	0.00	0.00	6.31	234.00	37.10	234.00	37.10
	44	13	151	1.04	1.04	0.00	0.00	6.62	156.81	23.68	156.81	23.68
	45	14	105	0.69	0.69	0.00	0.00	6.94	72.69	10.48	72.69	10.48
	46	15	74	0.35	0.35	0.00	0.00	7.25	25.62	3.53	25.62	3.53
SUM									18590.54	4941.86	18590.54	4941.86
SCOPon										3.76	SCOPnet	3.76



Detailed test results

Detailed SCOP test results - low temperature application – EN 14825

Detailed result for 'EN14825:2016' Average Low (A) A -7 /W34		
Tested according to:	EN14511:2018 and EN14825:2016	
Climate zone:		Average
Temperature application:		Low
Condition name:		A
Condition temperature:	°C	-7
Part load:	%	88%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	9.00
Heating demand:	kW	7.96
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Transient
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	8.03
COP	-	3.23
Power consumption	kW	2.49
Measured		
Heating capacity	kW	8.06
COP	-	3.19
Power consumption	kW	2.53
During heating		
Air temperature dry bulb	°C	-7.0
Air temperature wet bulb	°C	-8.1
Air temperature dry bulb outlet	°C	-10.4
Inlet temperature	°C	29.0
Outlet temperature	°C	34.1
Outlet temperature (Time averaged)	°C	34.1
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	22852
Calculated Hydraulic power	W	10
Calculated global efficiency	η	0.23
Calculated Capacity correction	W	33
Calculated Power correction	W	42
Water Flow	m ³ /s	0.000421



Detailed result for 'EN14825:2016' Average Low (B) A 2 /W30		
Tested according to:	EN14511:2018 and EN14825:2016	
Climate zone:	Average	
Temperature application:	Low	
Condition name:	B	
Condition temperature:	°C	2
Part load:	%	54%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	9.00
Heating demand:	kW	4.85
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:	Steady State	
Integrated circulation pump:	Yes	
Included corrections (Final result)		
Heating capacity	kW	4.90
COP	-	5.25
Power consumption	kW	0.93
Measured		
Heating capacity	kW	4.93
COP	-	5.04
Power consumption	kW	0.98
During heating		
Air temperature dry bulb	°C	2.1
Air temperature wet bulb	°C	0.8
Air temperature dry bulb outlet	°C	-0.4
Inlet temperature	°C	25.0
Outlet temperature	°C	30.1
Outlet temperature (Time averaged)	°C	30.1
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	46539
Calculated Hydraulic power	W	11
Calculated global efficiency	η	0.24
Calculated Capacity correction	W	35
Calculated Power correction	W	46
Water Flow	m³/s	0.000234



Detailed result for 'EN14825:2016' Average Low (C) A 7 /W27		
Tested according to:	EN14511:2018 and EN14825:2016	
Climate zone:		Average
Temperature application:		Low
Condition name:		C
Condition temperature:	°C	7
Part load:	%	35%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	9.00
Heating demand:	kW	3.12
CR:	-	0.6
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	5.40
COP	-	6.75
Power consumption	kW	0.80
Measured		
Heating capacity	kW	5.44
COP	-	6.42
Power consumption	kW	0.85
During heating		
Air temperature dry bulb	°C	7.0
Air temperature wet bulb	°C	5.7
Air temperature dry bulb outlet	°C	3.8
Inlet temperature	°C	24.0
Outlet temperature	°C	29.0
Outlet temperature (Time averaged)	°C	26.9
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	45366
Calculated Hydraulic power	W	12
Calculated global efficiency	η	0.25
Calculated Capacity correction	W	36
Calculated Power correction	W	48
Water Flow	m ³ /s	0.000259



Detailed result for 'EN14825:2016' Average Low (D) A 12 /W24		
Tested according to:	EN14511:2018 and EN14825:2016	
Climate zone:		Average
Temperature application:		Low
Condition name:		D
Condition temperature:	°C	12
Part load:	%	15%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	9.00
Heating demand:	kW	1.38
CR:	-	0.2
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	6.32
COP	-	8.85
Power consumption	kW	0.71
Measured		
Heating capacity	kW	6.36
COP	-	8.32
Power consumption	kW	0.76
During heating		
Air temperature dry bulb	°C	12.0
Air temperature wet bulb	°C	10.8
Air temperature dry bulb outlet	°C	8.7
Inlet temperature	°C	22.9
Outlet temperature	°C	27.9
Outlet temperature (Time averaged)	°C	24.0
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	41448
Calculated Hydraulic power	W	13
Calculated global efficiency	η	0.25
Calculated Capacity correction	W	37
Calculated Power correction	W	50
Water Flow	m ³ /s	0.000302



Detailed result for 'EN14825:2016' Average Low (E and F) A -10 /W35		
Tested according to:	EN14511:2018 and EN14825:2016	
Climate zone:		Average
Temperature application:		Low
Condition name:		E and F
Condition temperature:	°C	-10
Part load:	%	100%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	9.00
Heating demand:	kW	9.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	9.04
COP	-	3.06
Power consumption	kW	2.95
Measured		
Heating capacity	kW	9.07
COP	-	3.03
Power consumption	kW	2.99
During heating		
Air temperature dry bulb	°C	-9.9
Air temperature wet bulb	°C	-11.2
Air temperature dry bulb outlet	°C	-13.2
Inlet temperature	°C	30.0
Outlet temperature	°C	34.9
Outlet temperature (Time averaged)	°C	34.9
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	19852
Calculated Hydraulic power	W	9
Calculated global efficiency	η	0.22
Calculated Capacity correction	W	32
Calculated Power correction	W	40
Water Flow	m ³ /s	0.000443



Detailed SCOP test results - medium temperature application - EN 14825

Detailed result for 'EN14825:2016' Average Medium (A) A -7 /W52		
Tested according to:	EN14511:2018 and EN14825:2016	
Climate zone:		Average
Temperature application:		Medium
Condition name:		A
Condition temperature:	°C	-7
Part load:	%	88%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	9.00
Heating demand:	kW	7.96
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	7.54
COP	-	2.36
Power consumption	kW	3.19
Measured		
Heating capacity	kW	7.57
COP	-	2.34
Power consumption	kW	3.24
During heating		
Air temperature dry bulb	°C	-7.0
Air temperature wet bulb	°C	-8.3
Air temperature dry bulb outlet	°C	-9.8
Inlet temperature	°C	44.0
Outlet temperature	°C	51.8
Outlet temperature (Time averaged)	°C	51.8
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	45709
Calculated Hydraulic power	W	11
Calculated global efficiency	η	0.24
Calculated Capacity correction	W	35
Calculated Power correction	W	45
Water Flow	m ³ /s	0.000234



Detailed result for 'EN14825:2016' Average Medium (B) A 2 /W42		
Tested according to:	EN14511:2018 and EN14825:2016	
Climate zone:		Average
Temperature application:		Medium
Condition name:		B
Condition temperature:	°C	2
Part load:	%	54%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	9.00
Heating demand:	kW	4.85
CR:	-	1.0
Minimum flow reached:	-	Yes
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	4.89
COP	-	3.67
Power consumption	kW	1.33
Measured		
Heating capacity	kW	4.92
COP	-	3.59
Power consumption	kW	1.37
During heating		
Air temperature dry bulb	°C	2.1
Air temperature wet bulb	°C	0.8
Air temperature dry bulb outlet	°C	-0.3
Inlet temperature	°C	34.4
Outlet temperature	°C	42.1
Outlet temperature (Time averaged)	°C	42.1
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	52557
Calculated Hydraulic power	W	8
Calculated global efficiency	η	0.21
Calculated Capacity correction	W	30
Calculated Power correction	W	39
Water Flow	m ³ /s	0.000155



Detailed result for 'EN14825:2016' Average Medium (C) A 7 /W36		
Tested according to:	EN14511:2018 and EN14825:2016	
Climate zone:		Average
Temperature application:		Medium
Condition name:		C
Condition temperature:	°C	7
Part load:	%	35%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	9.00
Heating demand:	kW	3.12
CR:	-	0.6
Minimum flow reached:	-	Yes
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	5.01
COP	-	4.75
Power consumption	kW	1.05
Measured		
Heating capacity	kW	5.04
COP	-	4.60
Power consumption	kW	1.09
During heating		
Air temperature dry bulb	°C	7.0
Air temperature wet bulb	°C	5.8
Air temperature dry bulb outlet	°C	4.1
Inlet temperature	°C	31.3
Outlet temperature	°C	38.9
Outlet temperature (Time averaged)	°C	36.0
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	54398
Calculated Hydraulic power	W	9
Calculated global efficiency	η	0.22
Calculated Capacity correction	W	31
Calculated Power correction	W	40
Water Flow	m ³ /s	0.000160



Detailed result for 'EN14825:2016' Average Medium (D) A 12 /W30		
Tested according to:	EN14511:2018 and EN14825:2016	
Climate zone:		Average
Temperature application:		Medium
Condition name:		D
Condition temperature:	°C	12
Part load:	%	15%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	9.00
Heating demand:	kW	1.38
CR:	-	0.2
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	6.08
COP	-	6.49
Power consumption	kW	0.94
Measured		
Heating capacity	kW	6.11
COP	-	6.24
Power consumption	kW	0.98
During heating		
Air temperature dry bulb	°C	12.0
Air temperature wet bulb	°C	10.8
Air temperature dry bulb outlet	°C	8.9
Inlet temperature	°C	28.1
Outlet temperature	°C	36.1
Outlet temperature (Time averaged)	°C	29.9
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	52424
Calculated Hydraulic power	W	10
Calculated global efficiency	η	0.23
Calculated Capacity correction	W	33
Calculated Power correction	W	43
Water Flow	m ³ /s	0.000184



Detailed result for 'EN14825:2016' Average Medium (E and F) A -10 /W55		
Tested according to:	EN14511:2018 and EN14825:2016	
Climate zone:		Average
Temperature application:		Medium
Condition name:		E and F
Condition temperature:	°C	-10
Part load:	%	100%
Chosen Tbivalent	°C	-10
Tdesign	°C	-10
Pdesign	kW	9.00
Heating demand:	kW	9.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	8.84
COP	-	2.12
Power consumption	kW	4.17
Measured		
Heating capacity	kW	8.88
COP	-	2.10
Power consumption	kW	4.22
During heating		
Air temperature dry bulb	°C	-10.0
Air temperature wet bulb	°C	-11.1
Air temperature dry bulb outlet	°C	-12.5
Inlet temperature	°C	47.0
Outlet temperature	°C	55.0
Outlet temperature (Time averaged)	°C	55.0
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	43507
Calculated Hydraulic power	W	12
Calculated global efficiency	η	0.25
Calculated Capacity correction	W	36
Calculated Power correction	W	48
Water Flow	m ³ /s	0.000268



Detailed test results for rating conditions – low temperature

Detailed result for 'EN14511:2018' A7/W35		
Tested according to:		EN14511:2018
Minimum flow reached:		No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	9.06
COP	-	5.15
Power consumption	kW	1.76
Measured		
Heating capacity	kW	9.09
COP	-	5.05
Power consumption	kW	1.80
During heating		
Air temperature dry bulb	°C	7.0
Air temperature wet bulb	°C	5.8
Air temperature dry bulb outlet	°C	3.8
Inlet temperature	°C	30.0
Outlet temperature	°C	35.0
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	22460
Calculated Hydraulic power	W	10
Calculated global efficiency	η	0.23
Calculated Capacity correction	W	33
Calculated Power correction	W	43
Water Flow	m ³ /s	0.000437



Detailed result for 'EN14511:2018' A2/W35		
Tested according to:		EN14511:2018
Minimum flow reached:		No
Measurement type:		Transient
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	9.35
COP	-	3.92
Power consumption	kW	2.39
Measured		
Heating capacity	kW	9.38
COP	-	3.87
Power consumption	kW	2.42
During heating		
Air temperature dry bulb	°C	2.0
Air temperature wet bulb	°C	0.7
Air temperature dry bulb outlet	°C	-2.1
Inlet temperature	°C	30.0
Outlet temperature	°C	35.1
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	13732
Calculated Hydraulic power	W	7
Calculated global efficiency	η	0.20
Calculated Capacity correction	W	28
Calculated Power correction	W	35
Water Flow	m ³ /s	0.000498



Detailed result for 'EN14511:2018' A-7/W35		
Tested according to:		EN14511:2018
Minimum flow reached:		No
Measurement type:		Transient
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	9.56
COP	-	3.08
Power consumption	kW	3.11
Measured		
Heating capacity	kW	9.59
COP	-	3.06
Power consumption	kW	3.14
During heating		
Air temperature dry bulb	°C	-7.1
Air temperature wet bulb	°C	-8.2
Air temperature dry bulb outlet	°C	-10.9
Inlet temperature	°C	30.0
Outlet temperature	°C	35.2
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	13025
Calculated Hydraulic power	W	6
Calculated global efficiency	η	0.19
Calculated Capacity correction	W	27
Calculated Power correction	W	33
Water Flow	m ³ /s	0.000480



Detailed test results for rating conditions – medium temperature

Detailed result for 'EN14511:2018' A7/W55		
Tested according to:		EN14511:2018
Minimum flow reached:		No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	9.04
COP	-	3.17
Power consumption	kW	2.85
Measured		
Heating capacity	kW	9.08
COP	-	3.13
Power consumption	kW	2.90
During heating		
Air temperature dry bulb	°C	7.0
Air temperature wet bulb	°C	6.0
Air temperature dry bulb outlet	°C	4.4
Inlet temperature	°C	47.0
Outlet temperature	°C	54.9
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	47770
Calculated Hydraulic power	W	13
Calculated global efficiency	η	0.26
Calculated Capacity correction	W	38
Calculated Power correction	W	51
Water Flow	m ³ /s	0.000278



Detailed result for 'EN14511:2018' A2/W55		
Tested according to:		EN14511:2018
Minimum flow reached:		No
Measurement type:		Transient
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	9.17
COP	-	2.56
Power consumption	kW	3.59
Measured		
Heating capacity	kW	9.21
COP	-	2.53
Power consumption	kW	3.64
During heating		
Air temperature dry bulb	°C	2.0
Air temperature wet bulb	°C	0.8
Air temperature dry bulb outlet	°C	-1.4
Inlet temperature	°C	47.0
Outlet temperature	°C	55.1
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	42586
Calculated Hydraulic power	W	13
Calculated global efficiency	η	0.26
Calculated Capacity correction	W	38
Calculated Power correction	W	51
Water Flow	m ³ /s	0.000306



Detailed result for 'EN14511:2018' A-7/W55		
Tested according to:		EN14511:2018
Minimum flow reached:		No
Measurement type:		Transient
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	9.27
COP	-	2.17
Power consumption	kW	4.27
Measured		
Heating capacity	kW	9.31
COP	-	2.16
Power consumption	kW	4.32
During heating		
Air temperature dry bulb	°C	-7.0
Air temperature wet bulb	°C	-8.2
Air temperature dry bulb outlet	°C	-10.2
Inlet temperature	°C	47.0
Outlet temperature	°C	55.1
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	42827
Calculated Hydraulic power	W	12
Calculated global efficiency	η	0.25
Calculated Capacity correction	W	36
Calculated Power correction	W	48
Water Flow	m ³ /s	0.000278



Detailed SEER test results for cooling mode, fan coil - EN 14825

Detailed result for 'EN14825:2016 Cooling fan (A) A 35 /W7		
Tested according to:	EN14511:2018 and	EN14825:2016
Climate zone:		N/A
Temperature application:		Cooling fan
Condition name:		A
Condition temperature:	°C	35
Part load:	%	100%
Chosen Tbivalent	°C	N/A
Tdesign	°C	35
Pdesign	kW	9.00
Cooling demand:	kW	9.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Cooling capacity	kW	8.36
EER	-	3.03
Power consumption	kW	2.76
Measured		
Cooling capacity	kW	8.33
EER	-	2.97
Power consumption	kW	2.80
During heating		
Air temperature dry bulb	°C	35.1
Air temperature wet bulb	°C	-
Air temperature dry bulb outlet	°C	39.9
Inlet temperature	°C	12.0
Outlet temperature	°C	7.0
Outlet temperature (Time averaged)	°C	7.0
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	24640
Calculated Hydraulic power	W	10
Calculated global efficiency	η	0.23
Calculated Capacity correction	W	33
Calculated Power correction	W	43
Water Flow	m ³ /s	0.000394



Detailed result for 'EN14825:2016 Cooling fan (C) A 25 /W10		
Tested according to:	EN14511:2018 and EN14825:2016	
Climate zone:		N/A
Temperature application:		Cooling fan
Condition name:		C
Condition temperature:	°C	25
Part load:	%	47%
Chosen Tbivalent	°C	N/A
Tdesign	°C	35
Pdesign	kW	9.00
Cooling demand:	kW	4.23
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Cooling capacity	kW	4.32
EER	-	5.28
Power consumption	kW	0.82
Measured		
Cooling capacity	kW	4.29
EER	-	4.97
Power consumption	kW	0.86
During heating		
Air temperature dry bulb	°C	25.0
Air temperature wet bulb	°C	-
Air temperature dry bulb outlet	°C	29.3
Inlet temperature	°C	15.0
Outlet temperature	°C	10.1
Outlet temperature (Time averaged)	°C	10.1
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	48890
Calculated Hydraulic power	W	10
Calculated global efficiency	η	0.23
Calculated Capacity correction	W	34
Calculated Power correction	W	44
Water Flow	m ³ /s	0.000207



Detailed SEER test results for cooling mode, floor - EN 14825




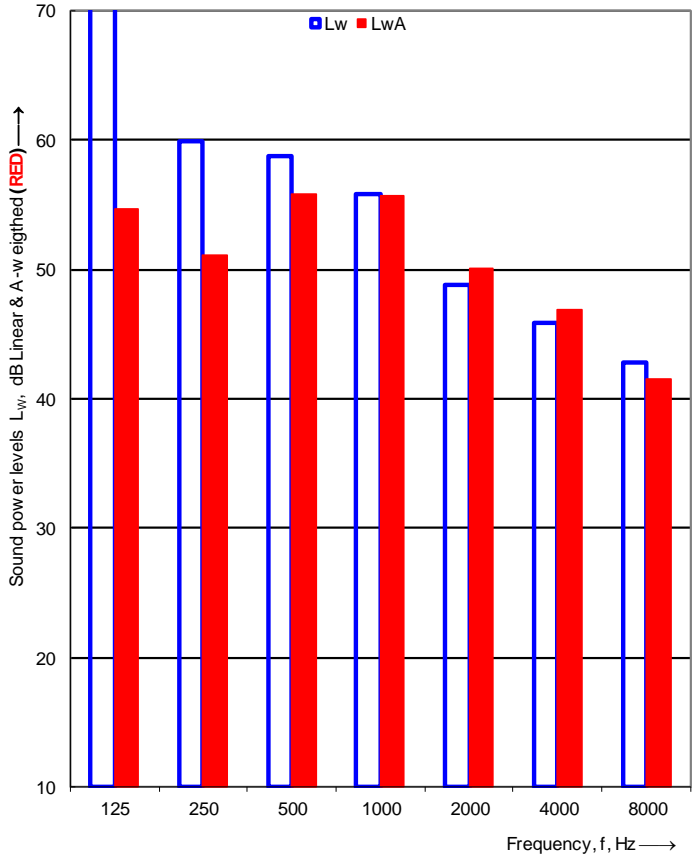
Detailed result for 'EN14825:2016 Cooling floor (A) A35/W18		
Tested according to:	EN14511:2018 and	EN14825:2016
Climate zone:		N/A
Temperature application:		Cooling floor
Condition name:		A
Condition temperature:	°C	35
Part load:	%	100%
Chosen Tbivalent	°C	N/A
Tdesign	°C	35
Pdesign	kW	11.00
Cooling demand:	kW	11.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Cooling capacity	kW	10.85
EER	-	3.84
Power consumption	kW	2.83
Measured		
Cooling capacity	kW	10.84
EER	-	3.82
Power consumption	kW	2.84
During heating		
Air temperature dry bulb	°C	35.1
Air temperature wet bulb	°C	-
Air temperature dry bulb outlet	°C	41.1
Inlet temperature	°C	23.0
Outlet temperature	°C	18.1
Outlet temperature (Time averaged)	°C	18.1
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	2862
Calculated Hydraulic power	W	1
Calculated global efficiency	η	0.13
Calculated Capacity correction	W	10
Calculated Power correction	W	11
Water Flow	m ³ /s	0.000522



Detailed result for 'EN14825:2016 Cooling floor (C) A25/W18		
Tested according to:	EN14511:2018 and	EN14825:2016
Climate zone:		N/A
Temperature application:		Cooling floor
Condition name:		C
Condition temperature:	°C	25
Part load:	%	47%
Chosen Tbivalent	°C	N/A
Tdesign	°C	35
Pdesign	kW	11.00
Cooling demand:	kW	5.17
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Cooling capacity	kW	5.40
EER	-	8.10
Power consumption	kW	0.67
Measured		
Cooling capacity	kW	5.36
EER	-	7.51
Power consumption	kW	0.71
During heating		
Air temperature dry bulb	°C	25.0
Air temperature wet bulb	°C	-
Air temperature dry bulb outlet	°C	30.3
Inlet temperature	°C	23.0
Outlet temperature	°C	17.9
Outlet temperature (Time averaged)	°C	17.9
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	46268
Calculated Hydraulic power	W	12
Calculated global efficiency	η	0.25
Calculated Capacity correction	W	36
Calculated Power correction	W	48
Water Flow	m ³ /s	0.000254




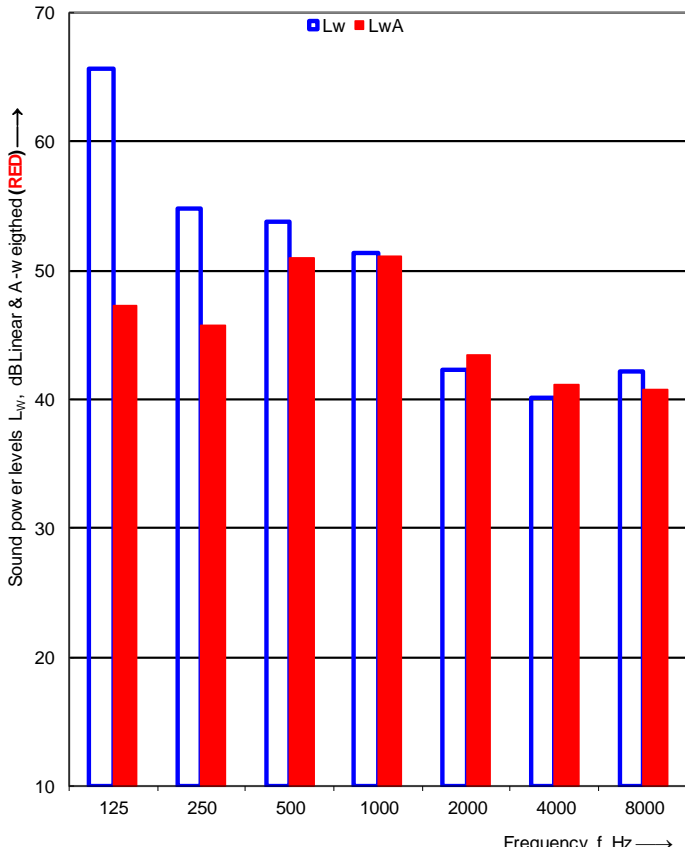


Detailed test results of sound power measurement – Test N#1

 		Sound power levels according to ISO 3743-1:2010		 TEKNOLOGISK INSTITUT																																																																			
Engineering method for small, movable sources in reverberant fields - Comparison method for hard-walled test rooms																																																																							
Client:	Panasonic Europe GmbH			Date of test: 01-06-2021																																																																			
Object:	Type: Mono air to water unit Model: WH-MXC09J3E5																																																																						
Mounting conditions:	The unit is standing free on two pieces of heavy concrete tiles (90x90x9cm) laying on the floor. The unit is mounted on supporting metal frame using 6 vibration isolators.																																																																						
Operating conditions: A7/55, Compressor speed: 38[Hz], Heating capacity: 9.0[kW], Power_input: 2.9[kW], Fan speed _1: 490 [rpm], Fan speed_2: 530 [rpm], Water flow rate: 1000[l/h] and dp_water: 460 [mbar]																																																																							
Static pressure:	1021 kPa			<u>Reference box:</u>																																																																			
Air temperature:	7.0 °C			L1:	1.3 m																																																																		
Relative air humidity:	85.0 %			L2:	0.3 m																																																																		
Test room volume:	102.8 m³	Room:	Room 2	L3:	1.3 m																																																																		
Area, S, of test room:	138.9 m²			Volume:	0.5 m³																																																																		
<table border="1"> <thead> <tr> <th>Frequency f [Hz]</th> <th>L_w 1/3 octave [dB]</th> <th>1/1 oct [dB]</th> </tr> </thead> <tbody> <tr><td>100</td><td>73.4</td><td></td></tr> <tr><td>125</td><td>56.5</td><td>73.5</td></tr> <tr><td>160</td><td>53.7</td><td></td></tr> <tr><td>200</td><td>56.2</td><td></td></tr> <tr><td>250</td><td>55.0</td><td>59.9</td></tr> <tr><td>315</td><td>53.7</td><td></td></tr> <tr><td>400</td><td>52.5</td><td></td></tr> <tr><td>500</td><td>54.7</td><td>58.8</td></tr> <tr><td>630</td><td>54.5</td><td></td></tr> <tr><td>800</td><td>51.3</td><td></td></tr> <tr><td>1000</td><td>52.1</td><td>55.8</td></tr> <tr><td>1250</td><td>49.0</td><td></td></tr> <tr><td>1600</td><td>44.6</td><td></td></tr> <tr><td>2000</td><td>42.6</td><td>48.8</td></tr> <tr><td>2500</td><td>44.7</td><td></td></tr> <tr><td>3150</td><td>43.2</td><td></td></tr> <tr><td>4000</td><td>40.9</td><td>45.9</td></tr> <tr><td>5000</td><td>37.4</td><td></td></tr> <tr><td>6300</td><td>33.5</td><td></td></tr> <tr><td>8000</td><td>40.5</td><td>42.8</td></tr> <tr><td>10000</td><td>37.6</td><td></td></tr> </tbody> </table>		Frequency f [Hz]	L _w 1/3 octave [dB]	1/1 oct [dB]	100	73.4		125	56.5	73.5	160	53.7		200	56.2		250	55.0	59.9	315	53.7		400	52.5		500	54.7	58.8	630	54.5		800	51.3		1000	52.1	55.8	1250	49.0		1600	44.6		2000	42.6	48.8	2500	44.7		3150	43.2		4000	40.9	45.9	5000	37.4		6300	33.5		8000	40.5	42.8	10000	37.6					
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Sound power level L_w(A): 61 dB [re 1pW]																																																																							
Name of test institute: DTI																																																																							
No. of test report: 300-KLAB-21-004																																																																							
Date: 01-06-2021																																																																							




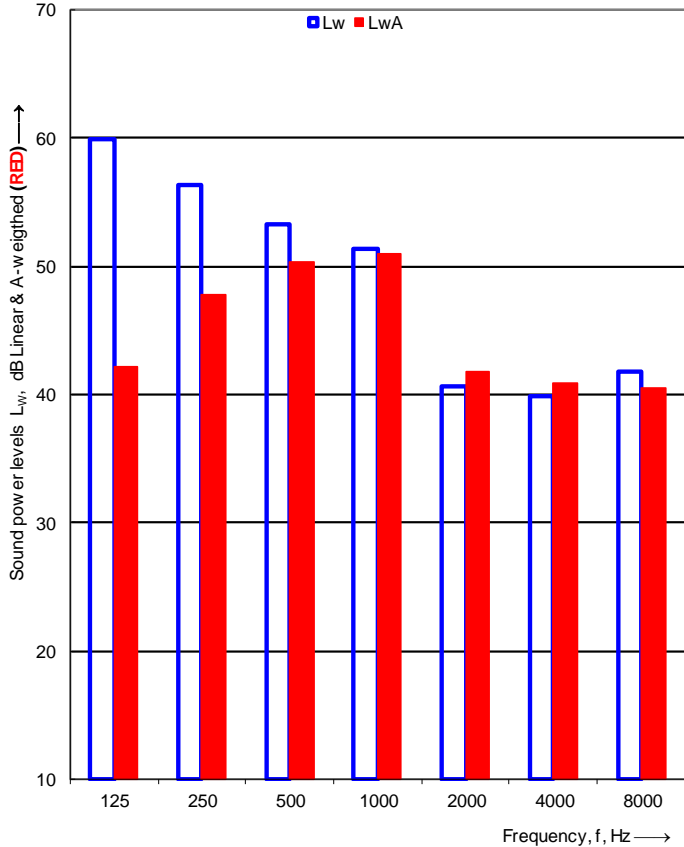


Detailed test results of sound power measurement – Test N#2

 		Sound power levels according to ISO 3743-1:2010		 TEKNOLOGISK INSTITUT																																																																			
Engineering method for small, movable sources in reverberant fields - Comparison method for hard-walled test rooms																																																																							
Client:	Panasonic Europe GmbH		Date of test: 02-06-2021																																																																				
Object:	Type: Mono air to water unit Model: WH-MXC09J3E5																																																																						
Mounting conditions:	The unit is standing free on two pieces of heavy concrete tiles (90x90x9cm) laying on the floor. The unit is mounted on supporting metal frame using 6 vibration isolators.																																																																						
Operating conditions: A7/55, Quiet mode 3, Compressor speed: 24[Hz], Heating capacity: 4.9[kW], Power input: 2.9[kW], Fan speed_1: 240 [rpm], Fan speed_2: 280 [rpm], Water flow rate: 550[l/h] and																																																																							
Static pressure:	1021 kPa			<u>Reference box:</u>																																																																			
Air temperature:	7.0 °C			L1:	1.3 m																																																																		
Relative air humidity:	85.0 %			L2:	0.3 m																																																																		
Test room volume:	102.8 m³	Room:	Room 2	L3:	1.3 m																																																																		
Area, S, of test room:	138.9 m²			Volume:	0.5 m³																																																																		
<table border="1"> <thead> <tr> <th>Frequency f [Hz]</th> <th>L_w 1/3 octave [dB]</th> <th>1/1 oct [dB]</th> </tr> </thead> <tbody> <tr><td>100</td><td>65.2</td><td></td></tr> <tr><td>125</td><td>52.5</td><td>65.7</td></tr> <tr><td>160</td><td>52.8</td><td></td></tr> <tr><td>200</td><td>52.1</td><td></td></tr> <tr><td>250</td><td>49.5</td><td>54.8</td></tr> <tr><td>315</td><td>47.3</td><td></td></tr> <tr><td>400</td><td>47.4</td><td></td></tr> <tr><td>500</td><td>48.7</td><td>53.8</td></tr> <tr><td>630</td><td>50.5</td><td></td></tr> <tr><td>800</td><td>47.6</td><td></td></tr> <tr><td>1000</td><td>47.6</td><td>51.3</td></tr> <tr><td>1250</td><td>43.0</td><td></td></tr> <tr><td>1600</td><td>36.1</td><td></td></tr> <tr><td>2000</td><td>32.7</td><td>42.2</td></tr> <tr><td>2500</td><td>40.3</td><td></td></tr> <tr><td>3150</td><td>37.2</td><td></td></tr> <tr><td>4000</td><td>35.5</td><td>40.1</td></tr> <tr><td>5000</td><td>31.6</td><td></td></tr> <tr><td>6300</td><td>32.3</td><td></td></tr> <tr><td>8000</td><td>39.9</td><td>42.1</td></tr> <tr><td>10000</td><td>36.9</td><td></td></tr> </tbody> </table>		Frequency f [Hz]	L _w 1/3 octave [dB]	1/1 oct [dB]	100	65.2		125	52.5	65.7	160	52.8		200	52.1		250	49.5	54.8	315	47.3		400	47.4		500	48.7	53.8	630	50.5		800	47.6		1000	47.6	51.3	1250	43.0		1600	36.1		2000	32.7	42.2	2500	40.3		3150	37.2		4000	35.5	40.1	5000	31.6		6300	32.3		8000	39.9	42.1	10000	36.9					
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<div style="border: 1px solid black; padding: 5px;"> Sound power level L_w(A): 56 dB [re 1pW] </div>																																																																							
Name of test institute:		DTI																																																																					
No. of test report:		300-KLAB-21-004																																																																					
Date: 02-06-2021																																																																							



Detailed test results of sound power measurement – Test N#3

 		Sound power levels according to ISO 3743-1:2010		 TEKNOLOGISK INSTITUT																																																																			
Engineering method for small, movable sources in reverberant fields - Comparison method for hard-walled test rooms																																																																							
Client:	Panasonic Europe GmbH		Date of test: 02-06-2021																																																																				
Object:	Type: Mono air to water unit Model: WH-MXC09J3E5																																																																						
Mounting conditions:	The unit is standing free on two pieces of heavy concrete tiles (90x90x9cm) laying on the floor. The unit is mounted on supporting metal frame using 6 vibration isolators.																																																																						
Operating conditions: A7/W55, Compressor speed: 22[Hz], Heating capacity: 4..75[kW], Power input: 1.68[kW], Fan speed_1: 360 [rpm], Fan speed_2: 400 [rpm], Water flow rate: 530 [l/h] and dp_water: 555 [mbar]																																																																							
Static pressure:	1021 kPa	Reference box:																																																																					
Air temperature:	7.0 °C	L1: 1.3 m																																																																					
Relative air humidity:	85.0 %	L2: 0.3 m																																																																					
Test room volume:	102.8 m³	Room:	Room 2	L3: 1.3 m																																																																			
Area, S, of test room:	138.9 m²	Volume: 0.5 m³																																																																					
<table border="1"> <thead> <tr> <th>Frequency f [Hz]</th> <th>L_w 1/3 octave [dB]</th> <th>1/1 oct [dB]</th> </tr> </thead> <tbody> <tr><td>100</td><td>58.9</td><td></td></tr> <tr><td>125</td><td>49.9</td><td>59.9</td></tr> <tr><td>160</td><td>50.0</td><td></td></tr> <tr><td>200</td><td>48.6</td><td></td></tr> <tr><td>250</td><td>54.7</td><td>56.3</td></tr> <tr><td>315</td><td>47.9</td><td></td></tr> <tr><td>400</td><td>48.2</td><td></td></tr> <tr><td>500</td><td>47.9</td><td>53.3</td></tr> <tr><td>630</td><td>49.3</td><td></td></tr> <tr><td>800</td><td>49.0</td><td></td></tr> <tr><td>1000</td><td>46.4</td><td>51.4</td></tr> <tr><td>1250</td><td>41.4</td><td></td></tr> <tr><td>1600</td><td>37.1</td><td></td></tr> <tr><td>2000</td><td>34.4</td><td>40.7</td></tr> <tr><td>2500</td><td>35.8</td><td></td></tr> <tr><td>3150</td><td>36.1</td><td></td></tr> <tr><td>4000</td><td>35.8</td><td>39.9</td></tr> <tr><td>5000</td><td>32.8</td><td></td></tr> <tr><td>6300</td><td>32.3</td><td></td></tr> <tr><td>8000</td><td>39.6</td><td>41.8</td></tr> <tr><td>10000</td><td>36.4</td><td></td></tr> </tbody> </table>		Frequency f [Hz]	L _w 1/3 octave [dB]	1/1 oct [dB]	100	58.9		125	49.9	59.9	160	50.0		200	48.6		250	54.7	56.3	315	47.9		400	48.2		500	47.9	53.3	630	49.3		800	49.0		1000	46.4	51.4	1250	41.4		1600	37.1		2000	34.4	40.7	2500	35.8		3150	36.1		4000	35.8	39.9	5000	32.8		6300	32.3		8000	39.6	41.8	10000	36.4					
Frequency f [Hz]	L _w 1/3 octave [dB]	1/1 oct [dB]																																																																					
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Sound power level L_w(A): 55.5 dB [re 1pW]																																																																							
Name of test institute:	DTI																																																																						
No. of test report:	300-KLAB-21-004																																																																						
Date:	02-06-2021																																																																						



Appendix 1: Test Procedure

The measurements of the emitted sound power level from the heat pump are carried out according to the following:

- DS/EN 14511
- EN 12102 - 1
- ISO/EN 3743/1

The basic acoustic measurement standard ISO/EN 3743-1 is a comparison method using a calibrated reference sound source. Two series of sound pressure measurements are made under exactly the same acoustic conditions, e.g. the same microphone positions, temperature and air humidity. The calibrated sound power levels are known for the reference sound source at each frequency band, and they are used in the estimation of the acoustical correction factor for the calculation of the sound power emitted from the tested heat pump. The background noise levels are measured and used for relevant corrections.

The final total A-weighted sound power level is based on measurements and calculations in 1/3-octave levels, which then are summed into 1/1-octave levels. The uncertainty is estimated on the weighted standard deviations in 1/1-octave levels.

The actual microphone positions and correction values are saved in data files linked to the complete project documentation according to the DANAK-accreditation.

The complete measurement system is documented and regularly calibrated according to DANAK.

The detailed description of the measurement method is given in Danish in the quality database system "QA Web" at Danish Technological Institute, which is accessible by DANAK.

