

TEST REPORT

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300-KLAB-23-034



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Customer: Company: Panasonic Marketing Europe GmbH
Address: Hagenauer Str. 43
City: 65203 Wiesbaden
Tel.: +49 611 2350

Component: Brand: Panasonic
Type: Air to water heat pump (split)
Model: Outdoor unit: WH-UDZ09KE5
Indoor unit: WH-ADC0309K3E5
Series no.: Outdoor unit: 5624304657
Indoor unit: 5706600032
Prod. year: 2023.04

Dates: Component tested: November 2023 – February 2024

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

Remarks: The unit was delivered by the customer. The installation and test settings were done according to the manufacturer's instructions.

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Test Reg. nr. 300



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 14825:2018.

In order to calculate the SCOP, tests were carried out at the part load conditions stated in the tables on page 5 and 6.

COP test conditions (heating mode) at low and medium temperature application, chosen by the manufacturer according to EN 14511:2018.

The Seasonal Energy Efficiency Ratio (SEER) for fan coil application for space cooling according to EN 14825:2018.

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.

Domestic hot water tests according to EN 16147:2017, chosen by the manufacturer.





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Test conditions

SCOP test conditions for low temperature – EN14825

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	-7	-10	Variable	Variable



SCOP test conditions for medium temperature – EN14825

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				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	$(T_{\text{OL}} - 16) / (T_{\text{designh}} - 16)$				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	-7	-10	Variable	Variable



COP test conditions - low temperature – EN14511

N#	Heat source		Heat sink		Heat pump settings
	Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)	Inlet temperature (°C)	Outlet temperature (°C)	
1 ^S	7	6	30	35	
2 ^A	2	1	30	35	
3 ^A	-7	-8	30	35	
4 ^A	2	1	30	35	Quiet mode 3

S: Standard rating condition

A: Application rating condition

COP test conditions - medium temperature – EN14511

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

S: Standard rating condition

A: Application rating condition



SEER test conditions for fan cooling application for space cooling - EN14825

	Part load ratio	Part load ratio %	Outdoor heat exchanger		Indoor heat exchanger		
			Outdoor air dry bulb temperature °C	Exhaust air dry bulb temperature °C	Fan coil application Inlet/outlet water(brine) temperatures		Cooling floor application Inlet/outlet water(brine) temperatures °C
					Fixed outlet °C	Variable outlet ^b °C	
A	$(35-16)/(T_{\text{designc}} - 16)$	100,00	35	27	12 / 7	12 / 7	23 / 18
B	$(30-16)/(T_{\text{designc}} - 16)$	73,68	30	27	^a / 7	^a / 8,5	^a / 18
C	$(25-16)/(T_{\text{designc}} - 16)$	47,37	25	27	^a / 7	^a / 10	^a / 18
D	$(20-16)/(T_{\text{designc}} - 16)$	21,05	20	27	^a / 7	^a / 11,5	^a / 18
^a With the flow rate as determined during "A" test for units with a fixed flow rate or with a fixed water temperature difference of 5 K for units with a variable flow rate. If for any of the test conditions the resulting flow rate is below the minimum flow rate then this minimum flow rate is used as a fixed flow rate with the outlet temperature for this test condition. ^b If the variable outlet temperature is above the maximum of the operating range of the unit, this maximum is used.							

Test conditions for operating requirements – EN14511-4

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	-25	-	15	480 L/h	Starting
2	-25	-	47	480 L/h	Operating



Test conditions for shutting off the heat transfer medium flow – EN14511-4

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	47	55	Indoor
2	7	6	47	55	Outdoor

Test conditions for complete power supply failure – EN14511-4

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

Test conditions for domestic hot water test - EN16147

N#	Test climate	Heat source		Domestic hot water tapping profile	Setpoint tank / reheat temperature (°C)
		Inlet dry bulb temperature (°C)	Inlet wet bulb temperature (°C)		
1	Average	7	6	L	53/44
2	Average	7	6	L	55/46



Test results

Test results of SCOP test at low temperature - heating season average – EN14825

Model (Outdoor)	WH-UDZ09KE5	
Air-to-water heat pump mono bloc	N	
Low-temperature heat pump	N	
Equipped with supplementary heater	Y	
Heat pump combination heater	Y	
Rated heat output¹⁾	P_{rated}	8 [kW]
Seasonal space heating energy efficiency	η_s	187.1 [%]
	SCOP	4.75 [-]

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}	6.84 [kW]
		$T_j = 2\text{ °C}$	P_{dh}	5.07 [kW]
		$T_j = 7\text{ °C}$	P_{dh}	2.85 [kW]
		$T_j = 12\text{ °C}$	P_{dh}	3.23 [kW]
		$T_j = \text{bivalent temperature}$	P_{dh}	6.84 [kW]
		$T_j = \text{operation limit}$	P_{dh}	6.72 [kW]

Measured coefficient of performance at outdoor temperature T_j	Average Climate - Low temperature application	$T_j = -15\text{ °C}$	COPd	- [-]
		$T_j = -7\text{ °C}$	COPd	2.83 [-]
		$T_j = 2\text{ °C}$	COPd	4.45 [-]
		$T_j = 7\text{ °C}$	COPd	7.04 [-]
		$T_j = 12\text{ °C}$	COPd	8.67 [-]
		$T_j = \text{bivalent temperature}$	COPd	2.83 [-]
		$T_j = \text{operation limit}$	COPd	2.52 [-]

Bivalent temperature	$T_{bivalent}$	-7 [°C]
Operation limit temperatures	TOL	-10 [°C]
Degradation coefficient	C_{dh}	0.98 [-]

Power consumption in modes other than active mode	Off mode	P_{OFF}	0.007 [kW]
	Thermostat-off mode	P_{TO}	0.008 [kW]
	Standby mode	P_{SB}	0.007 [kW]
	Crankcase heater mode	P_{CK}	0.007 [kW]
Supplementary heater¹⁾	Rated heat output	P_{SUP}	1.28 [kW]
	Type of energy input		Electrical

Other items	Capacity control	Variable	
	Water flow control	Variable	
	Water flow rate	-	
	Annual energy consumption	Q_{HE}	3478 [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, $P_{design,h}$, 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 – EN14825

Model (Outdoor)	WH-UDZ09KE5
Air-to-water heat pump mono bloc	N
Low-temperature heat pump	N
Equipped with supplementary heater	Y
Heat pump combination heater	Y

Rated heat output¹⁾	P_{rated}	8 [kW]
Seasonal space heating energy efficiency	η_{ls}	143.1 [%]
	SCOP	3.65 [-]

Measured capacity for heating for part load at outdoor temperature T_j	Average Climate - Medium temperature application	$T_j = -15\text{ °C}$	P_{dh}	- [kW]
		$T_j = -7\text{ °C}$	P_{dh}	6.92 [kW]
		$T_j = 2\text{ °C}$	P_{dh}	4.70 [kW]
		$T_j = 7\text{ °C}$	P_{dh}	2.67 [kW]
		$T_j = 12\text{ °C}$	P_{dh}	3.12 [kW]
		$T_j = \text{bivalent temperature}$	P_{dh}	6.92 [kW]
		$T_j = \text{operation limit}$	P_{dh}	6.13 [kW]

Measured coefficient of performance at outdoor temperature T_j	Average Climate - Medium temperature application	$T_j = -15\text{ °C}$	COPd	- [-]
		$T_j = -7\text{ °C}$	COPd	2.19 [-]
		$T_j = 2\text{ °C}$	COPd	3.49 [-]
		$T_j = 7\text{ °C}$	COPd	5.09 [-]
		$T_j = 12\text{ °C}$	COPd	6.71 [-]
		$T_j = \text{bivalent temperature}$	COPd	2.19 [-]
		$T_j = \text{operation limit}$	COPd	1.80 [-]

Bivalent temperature	$T_{bivalent}$	-7 [°C]
Operation limit temperatures	TOL	-10 [°C]
	WTOL	- [°C]
Degradation coefficient	C_{dh}	0.98 [-]

Power consumption in modes other than active mode	Off mode	P_{OFF}	0.007 [kW]
	Thermostat-off mode	P_{TO}	0.008 [kW]
	Standby mode	P_{SB}	0.007 [kW]
	Crankcase heater mode	P_{CK}	0.007 [kW]
Supplementary heater¹⁾	Rated heat output	P_{SUP}	1.87 [kW]
	Type of energy input		Electrical

Other items	Capacity control		Variable
	Water flow control		Variable
	Water flow rate		-
	Annual energy consumption	Q_{HE}	4526 [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, $P_{design,h}$, and the rated heat output of a supplementary heater, P_{sup} , is equal to the supplementary capacity for heating, $sup(T_j)$.



COP test results - low temperature – EN 14511

N#	Test conditions	Heating capacity [kW]	COP
1	A7/W35	8.929	4.680
2	A2/W35	7.284	3.535
3	A-7/W35	6.136	2.955
4	A2/W35	5.356	3.947

COP test results - medium temperature – EN14511

N#	Test conditions	Heating capacity [kW]	COP
1	A7/W55	8.590	2.910
2	A2/W55	6.558	2.333
3	A-7/W55	5.893	2.007



Test results of SEER for fan cooling application for space cooling - EN14825

Rated cooling output	$P_{rated,c}$	7 [kW]
	$\eta_{S,c}$	219.1 [%]
	SEER	5.55 [-]

	Air dry bulb temperature	$T_j=35\text{ }^{\circ}\text{C}$	P_{dc}	6.54 [kW]
		$T_j=30\text{ }^{\circ}\text{C}$	P_{dc}	4.83 [kW]
		$T_j=25\text{ }^{\circ}\text{C}$	P_{dc}	3.64 [kW]
		$T_j=20^{\circ}\text{C}$	P_{dc}	2.99 [kW]
		-		
		$T_j=35\text{ }^{\circ}\text{C}$	EERd	3.18 [-]
		$T_j=30\text{ }^{\circ}\text{C}$	EERd	4.12 [-]
		$T_j=25\text{ }^{\circ}\text{C}$	EERd	6.77 [-]
		$T_j=20^{\circ}\text{C}$	EERd	8.49 [-]

Degradation coefficient	C_{dc}	0.98 [-]
--------------------------------	----------	-----------------

Power consumption in modes other than active mode	Off mode	P_{OFF}	0.007 [kW]
	Thermostat-off mode	P_{TO}	0.008 [kW]
	Standby mode	P_{SB}	0.007 [kW]
	Crankcase heater mode	P_{CK}	0.007 [kW]
Supplementary heater	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}	441 [kWh]

Test results for starting and operating test - EN14511-4

N#	Test conditions air/water inlet [$^{\circ}\text{C}$]	Test validation
Starting	A-25/W15	Passed
Operating	A-25/W47	Passed



Test results for shutting off the heat transfer medium – EN14511-4

N#	Heat exchanger	Test validation
1	Indoor	Passed
2	Outdoor	Passed

Test results for complete power supply failure – EN14511-4

N#	Test validation
1	Passed

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

N#	Test condition	Measured power consumption (W)	Test mode no.
A	A-7/W34	40	6
B	A2/W30	39	5
C	A7/W27	28	4
D	A12/W24	30	3
E&F	A-10/W35	40	7

The power consumptions of the liquid pump have been measured separately.



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

N#	Test condition	Measured power consumption (W)	Test mode no.
A&F	A-7/W52	32	11
B	A2/W42	30	10
C	A7/W36	28	9
D	A12/W30	28	8
E	A-10/W55	31	12

The power consumptions of the liquid pump have been measured separately.

Power consumption of liquid pump for EN14511 - low temperature application

N#	Test condition	Measured power consumption (W)	Test mode no.
1	A7/W35	40	1
2	A2/W35	40	1
3	A-7/W35	40	1

The power consumptions of the liquid pump have been measured separately.



Power consumption of liquid pump for EN14511 - medium temperature application

N#	Test condition	Measured power consumption (W)	Test mode no.
1	A7/W55	39	1
2	A2/W55	34	1
3	A-7/W55	31	1

The power consumptions of the liquid pump have been measured separately.

Pre-run and post-run time for liquid pump

N#	Time (sec)
Pre-run	180
Post-run	60



Test results of domestic hot water test, average climate, load profile L - EN16147

Presentation of main results

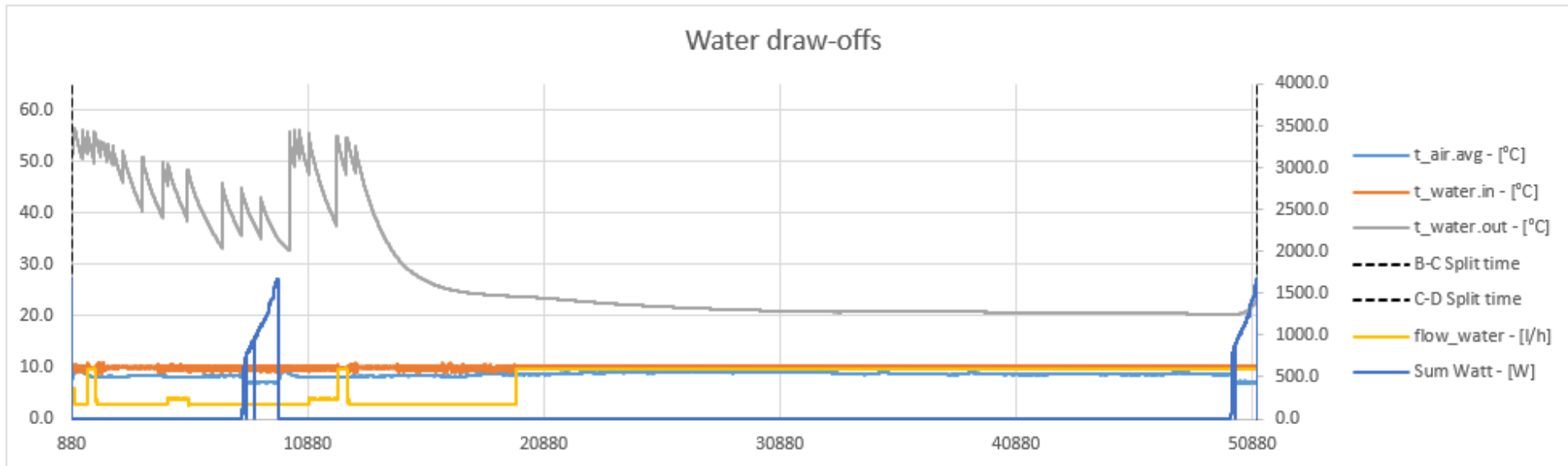
No		Symbol	Result	Unit
1)	Load profile	-	L	-
2)	Settings of the control	-	53	-
3)	Heating up time	t_h	4498	[s]
4)	Heating up electrical energy consumption	W_{eh-HP}	3.17	[kWh]
5)	Stand-by power input	P_{es}	0.03	[kW]
6)	Total useful energy content during the load profile	Q_{LP}	11.68	[kWh]
7)	Total electrical energy consumption during load profile	W_{EL-LP}	3.10	[kWh]
8)	Daily electrical energy consumption	Q_{elec}	3.09	[kWh]
9)	Coefficient of Performance	COP_{DHW}	3.77	[-]
10)	Water heating energy consumption	η_{wh}	160.0%	[%]
11)	Annual electrical energy consumption	AEC	640	[kWh/a]
12)	Reference hot water temperature	θ'_{WH}	53.9	[°C]
13)	Maximum volume of mixed water at 40°C	V_{40}	257	[L]
19)	Rated heat output	P_{rated}	-	[kW]
20)	Seasonal coefficient of performance	$SCOP_{DHW}$	-	[-]



Time	Duration	QHP-tap	QEL-tap	Tcold water, inlet [°C]			Thot water, outlet [°C]			Water Flow [L/min]			Tair dry [°C]	Tair wet [°C]	Comp
	[s]	[kWh]	[kWh]	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Avg	Avg	mode
07:00:04	37	0.108	0.00	9.1	10.0	9.4	25.8	55.7	48.0	3.0	3.0	3.0	7.2	6.7	S
07:05:03	254	1.406	0.00	9.4	10.4	9.9	51.6	56.5	56.3	6.0	6.0	6.0	8.7	8.1	S
07:30:00	33	0.107	0.00	9.2	10.1	9.5	50.5	56.0	54.2	3.0	3.0	3.0	9.1	8.6	S
07:45:03	33	0.107	0.00	9.5	10.5	10.1	51.5	55.8	54.4	2.9	3.0	3.0	8.5	7.9	S
08:05:01	408	3.611	0.00	9.9	10.1	10.0	49.7	55.7	55.1	10.0	10.1	10.0	8.2	7.5	S
08:25:02	33	0.105	0.00	8.9	10.1	9.3	50.9	53.9	52.9	3.0	3.0	3.0	8.2	7.5	S
08:30:01	33	0.105	0.00	9.3	10.7	10.1	52.4	53.8	53.3	2.9	3.0	3.0	8.2	7.5	S
08:45:02	33	0.101	0.00	10.3	10.4	10.4	49.9	53.3	52.1	3.0	3.0	3.0	8.2	7.5	S
09:00:03	34	0.103	0.00	10.1	10.2	10.1	49.3	52.8	51.7	3.0	3.0	3.0	8.2	7.6	S
09:30:01	38	0.108	0.00	10.1	10.2	10.2	45.9	52.1	50.3	3.0	3.0	3.0	8.2	7.5	S
10:30:04	38	0.103	0.00	10.1	10.2	10.1	40.2	50.7	47.9	3.0	3.0	3.0	8.3	7.7	S
11:30:04	38	0.104	0.00	9.3	10.1	9.6	38.9	49.6	46.8	2.9	3.0	3.0	8.3	7.6	S
11:45:02	38	0.105	0.00	9.3	10.1	9.6	45.3	49.5	48.3	3.0	3.0	3.0	8.2	7.5	S
12:45:04	86	0.275	0.04	9.5	10.4	9.9	38.4	48.3	47.1	4.0	4.0	4.0	8.1	7.4	S
14:30:00	43	0.103	0.00	9.1	10.1	9.5	33.2	45.9	42.8	3.0	3.0	3.0	8.3	7.6	S
15:30:04	44	0.101	0.00	9.6	10.2	9.9	35.4	44.7	42.5	3.0	3.0	3.0	8.3	7.6	S
16:30:01	48	0.106	0.00	9.4	10.0	9.7	35.0	42.9	41.2	3.0	3.0	3.0	7.1	5.9	H
18:00:03	36	0.108	0.00	9.3	10.1	9.7	32.6	55.7	49.4	3.0	3.0	3.0	8.8	8.1	S
18:15:00	31	0.103	0.00	9.7	10.1	9.9	48.8	55.9	53.7	3.0	3.0	3.0	8.4	7.7	S
18:30:03	31	0.105	0.00	9.3	9.8	9.5	50.6	55.9	54.2	3.0	3.0	3.0	8.2	7.5	S
19:00:02	31	0.103	0.00	9.2	10.0	9.6	47.4	55.6	52.9	3.0	3.0	3.0	8.2	7.4	S
20:30:03	204	0.727	0.01	9.4	10.4	9.9	37.5	54.8	53.9	4.0	4.0	4.0	8.0	7.3	S
21:00:02	417	3.617	0.00	10.0	10.3	10.1	47.5	54.6	54.2	10.0	10.1	10.0	8.2	7.5	S
21:30:01	36	0.110	0.00	9.3	10.7	10.2	47.6	52.9	51.4	3.0	3.0	3.0	8.2	7.6	S



Water draw-offs



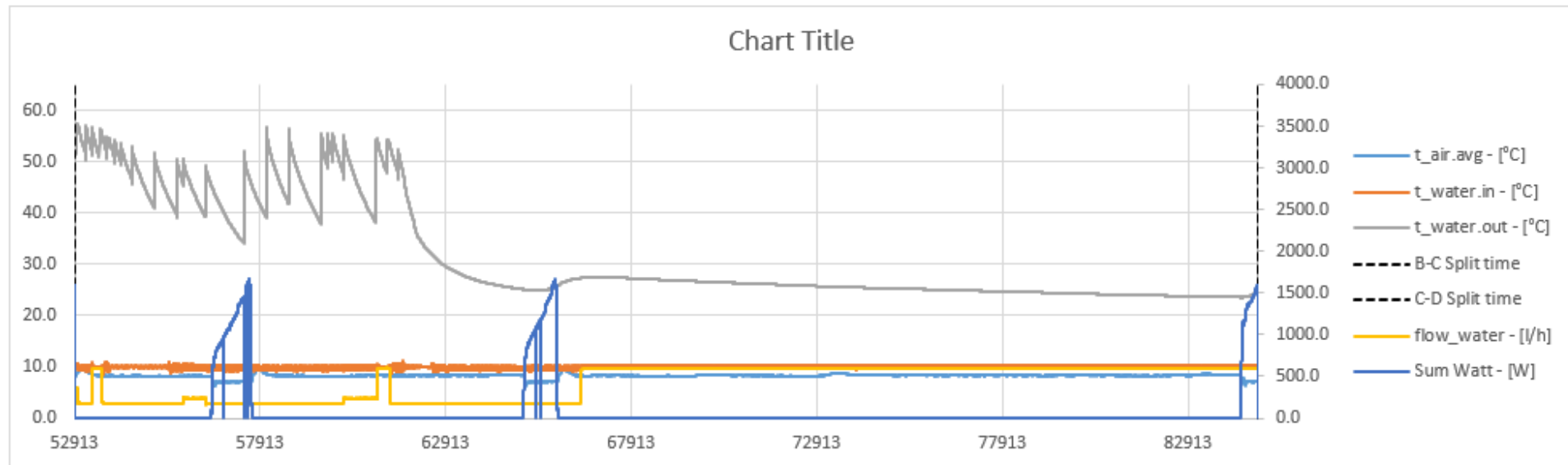


Presentation of main results

No		Symbol	Result	Unit
1)	Load profile	-	L	-
2)	Settings of the control	-	55	-
3)	Heating up time	t_h	4967	[s]
4)	Heating up electrical energy consumption	W_{eh-HP}	3.38	[kWh]
5)	Stand-by power input	P_{es}	0.04	[kW]
6)	Total useful energy content during the load profile	Q_{LP}	11.71	[kWh]
7)	Total electrical energy consumption during load profile	W_{EL-LP}	4.20	[kWh]
8)	Daily electrical energy consumption	Q_{elec}	4.18	[kWh]
9)	Coefficient of Performance	COP_{DHW}	2.79	[-]
10)	Water heating energy consumption	η_{wh}	117.1%	[%]
11)	Annual electrical energy consumption	AEC	874	[kWh/a]
12)	Reference hot water temperature	θ'_{WH}	54.7	[°C]
13)	Maximum volume of mixed water at 40°C	V_{40}	265	[L]
19)	Rated heat output	P_{rated}	-	[kW]
20)	Seasonal coefficient of performance	$SCOP_{DHW}$	-	[-]



Time	Duration	QHP-tap	QEL-tap	Tcold water, inlet [°C]			Thot water, outlet [°C]			Water Flow [L/min]			Tair dry [°C]	Tair wet [°C]	Start tab	End tab	Comp
				Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Avg	Avg	Log nr.	Log nr.	mode
07:00:06	34	0.106	0.00	9.0	9.9	9.5	25.4	56.5	44.6	3.0	3.0	3.0	7.6	7.0	52914	52920	H
07:05:05	250	1.417	0.00	9.6	10.5	10.2	51.6	57.3	57.1	6.0	6.0	6.0	8.8	8.1	52964	53008	S
07:30:06	29	0.108	0.00	9.3	10.1	9.8	50.1	56.8	54.7	3.0	3.0	3.0	9.2	8.6	53222	53228	S
07:45:00	30	0.109	0.00	9.1	10.2	9.8	51.2	56.6	54.9	3.0	3.0	3.0	8.7	8.0	53375	53381	S
08:05:05	396	3.605	0.00	10.0	10.2	10.1	50.9	56.5	55.9	10.0	10.1	10.0	8.3	7.6	53580	53649	S
08:25:05	29	0.105	0.00	9.2	10.7	9.9	50.4	54.8	53.5	3.0	3.0	3.0	8.2	7.6	53785	53791	S
08:30:02	29	0.105	0.00	9.6	10.2	9.9	52.8	54.7	54.1	3.0	3.0	3.0	8.3	7.6	53836	53842	S
08:45:01	29	0.102	0.00	9.8	9.9	9.8	49.6	54.2	52.8	3.0	3.0	3.0	8.2	7.6	53990	53996	S
09:00:01	29	0.101	0.00	10.0	10.1	10.1	49.1	53.7	52.3	3.0	3.0	3.0	8.3	7.6	54144	54150	S
09:30:01	35	0.112	0.00	10.2	10.2	10.2	45.4	53.0	50.9	3.0	3.0	3.0	8.3	7.6	54449	54456	S
10:30:04	34	0.106	0.00	10.1	10.3	10.2	40.9	51.6	48.3	3.0	3.0	3.0	8.2	7.5	55063	55069	S
11:30:01	34	0.102	0.00	9.3	10.4	9.9	38.9	50.6	46.5	3.0	3.0	3.0	8.2	7.6	55672	55678	S
11:45:02	35	0.108	0.00	9.2	10.3	9.7	45.2	50.4	49.0	3.0	3.0	3.0	8.2	7.6	55824	55831	S
12:45:03	83	0.281	0.03	9.6	10.4	9.9	39.4	49.3	47.9	4.0	4.0	4.0	8.2	7.5	56428	56443	S
14:30:01	30	0.094	0.01	9.2	10.2	9.8	34.0	51.7	46.0	3.0	3.0	3.0	7.0	5.6	57484	57490	H
15:30:03	30	0.107	0.00	9.4	9.9	9.6	39.1	56.5	51.0	3.0	3.0	3.0	8.6	8.0	58086	58092	S
16:30:05	29	0.103	0.00	9.5	10.0	9.8	41.8	56.1	50.7	3.0	3.0	3.0	8.3	7.6	58683	58688	S
18:00:05	30	0.104	0.00	9.6	10.2	10.0	37.8	55.4	49.7	3.0	3.0	3.0	8.2	7.6	59568	59574	S
18:15:02	30	0.109	0.00	9.3	10.1	9.8	48.7	55.6	53.4	3.0	3.0	3.0	8.2	7.6	59716	59722	S
18:30:03	30	0.110	0.00	9.4	10.2	9.7	49.8	55.5	53.8	3.0	3.0	3.0	8.2	7.5	59863	59869	S
19:00:03	31	0.107	0.00	9.4	10.1	9.8	46.3	55.1	52.4	3.0	3.0	3.0	8.2	7.5	60156	60162	S
20:30:03	200	0.719	0.02	9.5	10.4	9.9	38.0	54.4	53.4	4.0	4.0	4.0	8.3	7.7	61040	61073	S
21:00:02	418	3.628	0.00	10.0	10.2	10.1	47.6	54.2	53.8	10.0	10.1	10.0	8.3	7.7	61333	61402	S
21:30:02	33	0.111	0.00	9.7	10.7	10.3	46.3	52.4	50.7	3.0	3.0	3.0	8.3	7.7	61625	61631	S





Photo

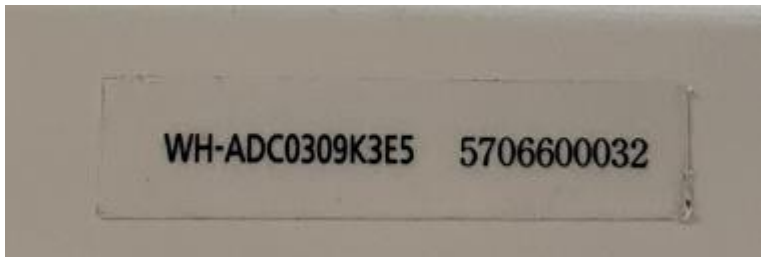
Rating plate (outdoor unit)

Outdoor unit





Rating plate (indoor unit)



Indoor unit





SCOP & SEER - 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	7.08	6.84	2.83	1.00	1.00	2.83
B	2	54	4.31	5.07	4.45	0.99	0.85	4.44
C	7	35	2.77	2.85	7.04	0.98	1.00	7.04
D	12	15	1.23	3.23	8.67	0.98	0.38	8.39
E	-10	100	8.00	6.72	2.52	1.00	1.00	2.52
F - BIV	-7	88	7.08	6.84	2.83	1.00	1.00	2.83

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	0	0.00692	0.00692	0
Thermostat off	178	0.00763	0.00763	1.35814
Standby	0	0.00692	0.00692	0
Crankcase heater	178	0.00697	5E-05	0.0089



Calculation Bin for SCOP_{on}

	Bin	Outdoor temperature [°C]	Hours [h]	Heat load [kW]	Heat load covered by heat pump [kW]	Electrical back up heater [kW]	backup heater energy input [kWh]	COP _{bin} [-]	Annual heating demand [kWh]	Annual energy input [kWh]	Net annual heating capacity [kWh]	Net annual power input [kWh]
E	21	-10	1	8.00	6.72	1.28	1.28	2.52	8.00	3.94	6.72	2.66
	22	-9	25	7.69	6.76	0.93	23.22	2.62	192.31	87.66	169.08	64.44
	23	-8	23	7.38	6.80	0.58	13.36	2.73	169.85	70.79	156.48	57.43
A / F - BIV	24	-7	24	7.08	6.84	0.00	0.00	2.83	169.85	60.10	169.85	60.10
	25	-6	27	6.77	6.56	0.00	0.00	3.01	182.77	60.81	182.77	60.81
	26	-5	68	6.46	6.28	0.00	0.00	3.18	439.38	137.96	439.38	137.96
	27	-4	91	6.15	6.00	0.00	0.00	3.36	560.00	166.46	560.00	166.46
	28	-3	89	5.85	5.72	0.00	0.00	3.54	520.31	146.83	520.31	146.83
	29	-2	165	5.54	5.43	0.00	0.00	3.72	913.85	245.46	913.85	245.46
	30	-1	173	5.23	5.15	0.00	0.00	3.90	904.92	231.89	904.92	231.89
	31	0	240	4.92	4.87	0.00	0.00	4.08	1181.54	289.46	1181.54	289.46
	32	1	280	4.62	4.59	0.00	0.00	4.26	1292.31	303.27	1292.31	303.27
B	33	2	320	4.31	4.31	0.00	0.00	4.44	1378.46	310.42	1378.46	310.42
	34	3	357	4.00	4.00	0.00	0.00	4.96	1428.00	287.91	1428.00	287.91
	35	4	356	3.69	3.69	0.00	0.00	5.48	1314.46	239.91	1314.46	239.91
	36	5	303	3.38	3.38	0.00	0.00	6.00	1025.54	170.98	1025.54	170.98
	37	6	330	3.08	3.08	0.00	0.00	6.52	1015.38	155.80	1015.38	155.80
C	38	7	326	2.77	2.77	0.00	0.00	7.04	902.77	128.30	902.77	128.30
	39	8	348	2.46	2.46	0.00	0.00	7.31	856.62	117.22	856.62	117.22
	40	9	335	2.15	2.15	0.00	0.00	7.58	721.54	95.21	721.54	95.21
	41	10	315	1.85	1.85	0.00	0.00	7.85	581.54	74.08	581.54	74.08
	42	11	215	1.54	1.54	0.00	0.00	8.12	330.77	40.73	330.77	40.73
D	43	12	169	1.23	1.23	0.00	0.00	8.39	208.00	24.79	208.00	24.79
	44	13	151	0.92	0.92	0.00	0.00	8.66	139.38	16.09	139.38	16.09
	45	14	105	0.62	0.62	0.00	0.00	8.93	64.62	7.23	64.62	7.23
	46	15	74	0.31	0.31	0.00	0.00	9.21	22.77	2.47	22.77	2.47

SUM	16524.92	3475.77	16487.06	3437.91
SCOP_{on}		4.75	SCOP_{net}	4.80



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

Calculation of reference SCOP

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

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	7.08	6.92	2.19	1.00	1.00	2.19
B	2	54	4.31	4.70	3.49	0.99	1.00	3.49
C	7	35	2.77	2.67	5.09	0.99	1.00	5.09
D	12	15	1.23	3.12	6.71	0.98	0.39	6.55
E	-10	100	8.00	6.13	1.80	1.00	1.00	1.80
F - BIV	-7	88	7.08	6.92	2.19	1.00	1.00	2.19

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	0	0.00692	0.00692	0
Thermostat off	178	0.00763	0.00763	1.35814
Standby	0	0.00692	0.00692	0
Crankcase heater	178	0.00697	5E-05	0.0089



Calculation Bin for SCOP_{on}

	Bin	Outdoor temperature [°C]	Hours [h]	Heat load [kW]	Heat load covered by heat pump [kW]	Electrical back up heater [kW]	backup heater energy input [kWh]	COP _{bin} [-]	Annual heating demand [kWh]	Annual energy input [kWh]	Net annual heating capacity [kWh]	Net annual power input [kWh]
	[-]											
E	21	-10	1	8.00	6.13	1.87	1.87	1.80	8.00	5.27	6.13	3.40
	22	-9	25	7.69	6.39	1.30	32.54	1.93	192.31	115.22	159.77	82.68
	23	-8	23	7.38	6.66	0.73	16.78	2.06	169.85	91.05	153.07	74.28
A / F - BIV	24	-7	24	7.08	6.92	0.00	0.00	2.19	169.85	77.58	169.85	77.58
	25	-6	27	6.77	6.63	0.00	0.00	2.33	182.77	78.33	182.77	78.33
	26	-5	68	6.46	6.34	0.00	0.00	2.48	439.38	177.36	439.38	177.36
	27	-4	91	6.15	6.05	0.00	0.00	2.62	560.00	213.63	560.00	213.63
	28	-3	89	5.85	5.76	0.00	0.00	2.77	520.31	188.15	520.31	188.15
	29	-2	165	5.54	5.47	0.00	0.00	2.91	913.85	314.10	913.85	314.10
	30	-1	173	5.23	5.18	0.00	0.00	3.05	904.92	296.36	904.92	296.36
	31	0	240	4.92	4.89	0.00	0.00	3.20	1181.54	369.52	1181.54	369.52
	32	1	280	4.62	4.60	0.00	0.00	3.34	1292.31	386.75	1292.31	386.75
B	33	2	320	4.31	4.31	0.00	0.00	3.49	1378.46	395.48	1378.46	395.48
	34	3	357	4.00	3.98	0.00	0.00	3.81	1428.00	375.11	1428.00	375.11
	35	4	356	3.69	3.65	0.00	0.00	4.13	1314.46	318.41	1314.46	318.41
	36	5	303	3.38	3.33	0.00	0.00	4.45	1025.54	230.48	1025.54	230.48
	37	6	330	3.08	3.00	0.00	0.00	4.77	1015.38	212.83	1015.38	212.83
C	38	7	326	2.77	2.67	0.00	0.00	5.09	902.77	177.28	902.77	177.28
	39	8	348	2.46	2.38	0.00	0.00	5.38	856.62	159.12	856.62	159.12
	40	9	335	2.15	2.10	0.00	0.00	5.67	721.54	127.15	721.54	127.15
	41	10	315	1.85	1.81	0.00	0.00	5.97	581.54	97.47	581.54	97.47
	42	11	215	1.54	1.52	0.00	0.00	6.26	330.77	52.86	330.77	52.86
D	43	12	169	1.23	1.23	0.00	0.00	6.55	208.00	31.76	208.00	31.76
	44	13	151	0.92	0.94	0.00	0.00	6.84	139.38	20.38	139.38	20.38
	45	14	105	0.62	0.65	0.00	0.00	7.13	64.62	9.06	64.62	9.06
	46	15	74	0.31	0.37	0.00	0.00	7.42	22.77	3.07	22.77	3.07
SUM									16524.92	4523.78	16473.73	4472.59
SCOP_{on}										3.65	SCOP_{net}	3.68



Detailed SEER calculation for fan coil application – EN14825

Calculation of reference SEER

Where

P_{design} = Cooling load of the building at design temperature, kW
 H_{he} = Number of equivalent heating hours, 350 h
 $H_{\text{TO}}, H_{\text{SB}}, H_{\text{CK}}, H_{\text{OFF}}$ = 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

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

Data for SEER

	Outdoor temperature [°C]	Part load ratio [%]	Part load [kW]	Declared capacity [kW]	Declared EER [-]	cdc [-]	CR [-]	EERbin [-]
A	35	100	6.00	5.72	3.33	1.00	1.00	3.33
B	30	74	4.42	4.30	4.45	0.99	1.00	4.45
C	25	47	2.84	3.18	6.95	0.98	0.89	6.94
D	20	21	1.26	2.65	6.92	0.98	0.48	6.78

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	0	0.00665	0.00665	0
Thermostat off	221	0.00723	0.00723	1.59783
Standby	2142	0.00665	0.00665	14.2443
Crankcase heater	2672	0.00665	0	0

Where

P_{design} = Cooling load of the building at design temperature, kW
 H_{he} = Number of equivalent heating hours, 350 h
 $H_{\text{TO}}, H_{\text{SB}}, H_{\text{CK}}, H_{\text{OFF}}$ = 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

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



Calculation Bin for SEER_{on}

	Bin	Outdoor temperature [°C]	Hours [h]	Cooling load [kW]	EER _{bin} [-]	Annual cooling demand [kWh]	Annual energy input [kWh]
	1	17	205	0.37	8.31	75.53	9.09
	2	18	227	0.74	8.31	167.26	20.13
	3	19	225	1.11	8.31	248.68	29.93
D	4	20	225	1.47	8.31	331.58	39.91
	5	21	216	1.84	8.00	397.89	49.73
	6	22	215	2.21	7.69	475.26	61.77
	7	23	218	2.58	7.39	562.21	76.11
	8	24	197	2.95	7.08	580.63	82.01
C	9	25	178	3.32	6.77	590.21	87.13
	10	26	158	3.68	6.24	582.11	93.24
	11	27	137	4.05	5.71	555.21	97.19
	12	28	109	4.42	5.18	481.89	92.99
	13	29	88	4.79	4.65	421.47	90.60
B	14	30	63	5.16	4.12	324.95	78.84
	15	31	39	5.53	3.93	215.53	54.80
	16	32	31	5.89	3.74	182.74	48.80
	17	33	24	6.26	3.56	150.32	42.27
	18	34	17	6.63	3.37	112.74	33.47
A	19	35	13	7.00	3.18	91.00	28.62
	20	36	9	7.37	3.18	66.32	20.86
	21	37	4	7.74	3.18	30.95	9.73
	22	38	3	8.11	3.18	24.32	7.65
	23	39	1	8.47	3.18	8.47	2.66
	24	40	0	8.84	3.18	0.00	0.00

SUM	6677.26	1157.54
SEER_{on}		5.77



Detailed test results

Detailed SCOP test results - low temperature application - average climate – EN14825

Detailed result for 'EN14825:2018' Average Low (A) A -7 /W34		
Tested according to:	EN14511:2018 and EN14825:2018	
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	8.00
Heating demand:	kW	7.08
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Transient
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	6.844
COP	-	2.826
Power consumption	kW	2.422
Measured		
Heating capacity	kW	6.881
COP	-	2.784
Power consumption	kW	2.471
During heating		
Air temperature dry bulb	°C	-7.02
Air temperature wet bulb	°C	-8.12
Air temperature dry bulb outlet	°C	-11.04
Inlet temperature	°C	29.06
Outlet temperature	°C	34.20
Outlet temperature (Time averaged)	°C	34.20
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	34390
Calculated Hydraulic power	W	12
Calculated global efficiency	η	0.25
Calculated Capacity correction	W	37
Calculated Power correction	W	49
Water Flow	m ³ /s	0.000361



Detailed result for 'EN14825:2018' Average Low (B) A 2 /W30

Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:	Average	
Temperature application:	Low	
Condition name:	B	
Condition temperature:	°C	2
Part load:	%	54%
Chosen Tbivalent	°C	-7
Tdesign	°C	-10
Pdesign	kW	8.00
Heating demand:	kW	4.31
CR:	-	0.9
Minimum flow reached:	-	No
Measurement type:	Transient	
Integrated circulation pump:	Yes	
Included corrections (Final result)		
Heating capacity	kW	5.066
COP	-	4.446
Power consumption	kW	1.139
Measured		
Heating capacity	kW	5.102
COP	-	4.295
Power consumption	kW	1.188
During heating		
Air temperature dry bulb	°C	2.15
Air temperature wet bulb	°C	0.91
Air temperature dry bulb outlet	°C	-1.77
Inlet temperature	°C	25.61
Outlet temperature	°C	30.53
Outlet temperature (Time averaged)	°C	29.79
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	42100
Calculated Hydraulic power	W	12
Calculated global efficiency	η	0.25
Calculated Capacity correction	W	36
Calculated Power correction	W	49
Water Flow	m ³ /s	0.000286



Detailed result for 'EN14825:2018' Average Low (C) A 7 /W27

Tested according to:	EN14511:2018 and EN14825:2018	
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	8.00
Heating demand:	kW	2.77
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:	Steady State	
Integrated circulation pump:	Yes	
Included corrections (Final result)		
Heating capacity	kW	2.851
COP	-	7.037
Power consumption	kW	0.405
Measured		
Heating capacity	kW	2.877
COP	-	6.580
Power consumption	kW	0.437
During heating		
Air temperature dry bulb	°C	7.00
Air temperature wet bulb	°C	6.06
Air temperature dry bulb outlet	°C	4.42
Inlet temperature	°C	22.00
Outlet temperature	°C	27.08
Outlet temperature (Time averaged)	°C	27.08
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	44284
Calculated Hydraulic power	W	6
Calculated global efficiency	η	0.19
Calculated Capacity correction	W	26
Calculated Power correction	W	32
Water Flow	m³/s	0.000136



Detailed result for 'EN14825:2018' Average Low (D) A 12 /W24

Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:	Average	
Temperature application:	Low	
Condition name:	D	
Condition temperature:	°C	12
Part load:	%	15%
Chosen Tbivalent	°C	-7
Tdesign	°C	-10
Pdesign	kW	8.00
Heating demand:	kW	1.23
CR:	-	0.4
Minimum flow reached:	-	No
Measurement type:	Steady State	
Integrated circulation pump:	Yes	
Included corrections (Final result)		
Heating capacity	kW	3.232
COP	-	8.671
Power consumption	kW	0.373
Measured		
Heating capacity	kW	3.260
COP	-	7.996
Power consumption	kW	0.408
During heating		
Air temperature dry bulb	°C	12.02
Air temperature wet bulb	°C	10.95
Air temperature dry bulb outlet	°C	8.87
Inlet temperature	°C	22.13
Outlet temperature	°C	27.07
Outlet temperature (Time averaged)	°C	24.01
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	43870
Calculated Hydraulic power	W	7
Calculated global efficiency	η	0.20
Calculated Capacity correction	W	28
Calculated Power correction	W	35
Water Flow	m³/s	0.000158



Detailed result for 'EN14825:2018' Average Low (E) A -10 /W35

Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:	Average	
Temperature application:	Low	
Condition name:	E	
Condition temperature:	°C	-10
Part load:	%	100%
Chosen Tbivalent	°C	-7
Tdesign	°C	-10
Pdesign	kW	8.00
Heating demand:	kW	8.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:	Transient	
Integrated circulation pump:	Yes	
Included corrections (Final result)		
Heating capacity	kW	6.723
COP	-	2.523
Power consumption	kW	2.664
Measured		
Heating capacity	kW	6.759
COP	-	2.492
Power consumption	kW	2.713
During heating		
Air temperature dry bulb	°C	-10.04
Air temperature wet bulb	°C	-11.04
Air temperature dry bulb outlet	°C	-13.76
Inlet temperature	°C	30.14
Outlet temperature	°C	35.21
Outlet temperature (Time averaged)	°C	35.21
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	33209
Calculated Hydraulic power	W	12
Calculated global efficiency	η	0.25
Calculated Capacity correction	W	36
Calculated Power correction	W	48
Water Flow	m³/s	0.000361



Detailed SCOP test results - medium temperature application - average climate – EN14825

Detailed result for 'EN14825:2018' Average Medium (A) A -7 /W52		
Tested according to:	EN14511:2018 and EN14825:2018	
Climate zone:	Average	
Temperature application:	Medium	
Condition name:	A	
Condition temperature:	°C	-7
Part load:	%	88%
Chosen Tbivalent	°C	-7
Tdesign	°C	-10
Pdesign	kW	8.00
Heating demand:	kW	7.08
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:	Steady State	
Integrated liquid pump:	Yes	
Integrated liquid pump able to generate a positive ext. static pressure difference:	Yes	
Included corrections (Final result)		
Heating capacity	kW	6.920
COP	-	2.189
Power consumption	kW	3.161
Measured		
Heating capacity	kW	6.952
COP	-	2.169
Power consumption	kW	3.205
During heating		
Air_inlet temperature dry bulb	°C	-6.88
Air temperature wet bulb	°C	-8.15
Air_outlet temperature dry bulb	°C	-10.36
Water_inlet temperature	°C	44.01
water_outlet temperature	°C	52.19
Water_outlet temperature (Time averaged)	°C	52.19
Circulation pump		
Measured external static pressure difference, liquid pump	Pa	44737
Calculated Hydraulic power	W	9
Calculated global efficiency	η	0.22
Calculated Capacity correction	W	32
Calculated Power correction	W	41
Water Flow	m³/s	0.000206



Detailed result for 'EN14825:2018' Average Medium (B) A 2 /W42

Tested according to:		EN14511:2018 and EN14825:2018	
Climate zone:		Average	
Temperature application:		Medium	
Condition name:		B	
Condition temperature:	°C	2	
Part load:	%	54%	
Chosen Tbivalent	°C	-7	
Tdesign	°C	-10	
Pdesign	kW	8.00	
Heating demand:	kW	4.31	
CR:	-	1.0	
Minimum flow reached:	-	No	
Measurement type:		Transient	
Integrated liquid pump:		Yes	
Integrated liquid pump able to generate a positive ext. static pressure difference:		Yes	
Included corrections (Final result)			
Heating capacity	kW	4.695	
COP	-	3.486	
Power consumption	kW	1.347	
Measured			
Heating capacity	kW	4.723	
COP	-	3.417	
Power consumption	kW	1.382	
During heating			
Air_inlet temperature dry bulb	°C	2.13	
Air temperature wet bulb	°C	0.92	
Air_outlet temperature dry bulb	°C	-1.46	
Water_inlet temperature	°C	34.02	
water_outlet temperature	°C	41.92	
Water_outlet temperature (Time averaged)	°C	41.92	
Circulation pump			
Measured external static pressure difference, liquid pump	Pa	44497	
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	0.000156	



Detailed result for 'EN14825:2018' Average Medium (C) A 7 /W36

Tested according to:		EN14511:2018 and EN14825:2018	
Climate zone:		Average	
Temperature application:		Medium	
Condition name:		C	
Condition temperature:	°C	7	
Part load:	%	35%	
Chosen Tbivalent	°C	-7	
Tdesign	°C	-10	
Pdesign	kW	8.00	
Heating demand:	kW	2.77	
CR:	-	1.0	
Minimum flow reached:	-	Yes	
Measurement type:		Steady State	
Integrated liquid pump:		Yes	
Integrated liquid pump able to generate a positive ext. static pressure difference:		Yes	
<hr/>			
Included corrections (Final result)			
Heating capacity	kW	2.672	
COP	-	5.092	
Power consumption	kW	0.525	
Measured			
Heating capacity	kW	2.698	
COP	-	4.823	
Power consumption	kW	0.559	
During heating			
Air_inlet temperature dry bulb	°C	7.00	
Air temperature wet bulb	°C	6.07	
Air_outlet temperature dry bulb	°C	4.59	
Water_inlet temperature	°C	31.08	
water_outlet temperature	°C	35.95	
Water_outlet temperature (Time averaged)	°C	35.95	
Circulation pump			
Measured external static pressure difference, liquid pump	Pa	44710	
Calculated Hydraulic power	W	6	
Calculated global efficiency	η	0.19	
Calculated Capacity correction	W	26	
Calculated Power correction	W	32	
Water Flow	m ³ /s	0.000133	



Detailed result for 'EN14825:2018' Average Medium (D) A 12 /W30

Tested according to:		EN14511:2018 and EN14825:2018	
Climate zone:		Average	
Temperature application:		Medium	
Condition name:		D	
Condition temperature:	°C		12
Part load:	%		15%
Chosen Tbivalent	°C		-7
Tdesign	°C		-10
Pdesign	kW		8.00
Heating demand:	kW		1.23
CR:	-		0.4
Minimum flow reached:	-		Yes
Measurement type:		Steady State	
Integrated liquid pump:		Yes	
Integrated liquid pump able to generate a positive ext. static pressure difference:		Yes	
Included corrections (Final result)			
Heating capacity	kW		3.120
COP	-		6.714
Power consumption	kW		0.465
Measured			
Heating capacity	kW		3.146
COP	-		6.260
Power consumption	kW		0.503
During heating			
Air_inlet temperature dry bulb	°C		12.01
Air temperature wet bulb	°C		10.98
Air_outlet temperature dry bulb	°C		9.03
Water_inlet temperature	°C		27.81
water_outlet temperature	°C		33.48
Water_outlet temperature (Time averaged)	°C		30.05
Circulation pump			
Measured external static pressure difference, liquid pump	Pa		44769
Calculated Hydraulic power	W		6
Calculated global efficiency	η		0.19
Calculated Capacity correction	W		26
Calculated Power correction	W		32
Water Flow	m³/s		0.000133



Detailed result for 'EN14825:2018' Average Medium (E) A -10 /W55

Tested according to:		EN14511:2018 and EN14825:2018	
Climate zone:		Average	
Temperature application:		Medium	
Condition name:		E	
Condition temperature:	°C		-10
Part load:	%		100%
Chosen Tbivalent	°C		-7
Tdesign	°C		-10
Pdesign	kW		8.00
Heating demand:	kW		8.00
CR:	-		1.0
Minimum flow reached:	-		No
Measurement type:		Steady State	
Integrated liquid pump:		Yes	
Integrated liquid pump able to generate a positive ext. static pressure difference:		Yes	
Included corrections (Final result)			
Heating capacity	kW		6.126
COP	-		1.804
Power consumption	kW		3.395
Measured			
Heating capacity	kW		6.156
COP	-		1.792
Power consumption	kW		3.435
During heating			
Air_inlet temperature dry bulb	°C		-9.74
Air temperature wet bulb	°C		-10.92
Air_outlet temperature dry bulb	°C		-12.72
Water_inlet temperature	°C		46.99
water_outlet temperature	°C		55.27
Water_outlet temperature (Time averaged)	°C		55.27
Circulation pump			
Measured external static pressure difference, liquid pump	Pa		45433
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		0.000181



Detailed COP test results - low temperature – EN14511

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	8.929
COP	-	4.680
Power consumption	kW	1.908
Measured		
Heating capacity	kW	8.963
COP	-	4.590
Power consumption	kW	1.953
During heating		
Air temperature dry bulb	°C	7.00
Air temperature wet bulb	°C	6.02
Air temperature dry bulb outlet	°C	3.15
Inlet temperature	°C	30.01
Outlet temperature	°C	35.06
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	24802
Calculated Hydraulic power	W	11
Calculated global efficiency	η	0.24
Calculated Capacity correction	W	34
Calculated Power correction	W	45
Water Flow	m ³ /s	0.000428



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	7.284	
COP	-	3.535	
Power consumption	kW	2.061	
Measured			
Heating capacity	kW	7.319	
COP	-	3.475	
Power consumption	kW	2.106	
During heating			
Air temperature dry bulb	°C	2.10	
Air temperature wet bulb	°C	0.81	
Air temperature dry bulb outlet	°C	-2.71	
Inlet temperature	°C	30.07	
Outlet temperature	°C	35.14	
Circulation pump			
Measured: Static differential pressure, liquid pump	Pa	27178	
Calculated Hydraulic power	W	11	
Calculated global efficiency	η	0.24	
Calculated Capacity correction	W	35	
Calculated Power correction	W	46	
Water Flow	m ³ /s	0.000403	



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	6.136	
COP	-	2.955	
Power consumption	kW	2.077	
Measured			
Heating capacity	kW	6.173	
COP	-	2.902	
Power consumption	kW	2.127	
During heating			
Air temperature dry bulb	°C	-6.89	
Air temperature wet bulb	°C	-8.10	
Air temperature dry bulb outlet	°C	-10.81	
Inlet temperature	°C	30.05	
Outlet temperature	°C	35.19	
Circulation pump			
Measured: Static differential pressure, liquid pump	Pa	40103	
Calculated Hydraulic power	W	13	
Calculated global efficiency	η	0.25	
Calculated Capacity correction	W	38	
Calculated Power correction	W	50	
Water Flow	m ³ /s	0.000319	



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		5.356
COP	-		3.947
Power consumption	kW		1.357
Measured			
Heating capacity	kW		5.391
COP	-		3.842
Power consumption	kW		1.403
During heating			
Air temperature dry bulb	°C		2.03
Air temperature wet bulb	°C		0.89
Air temperature dry bulb outlet	°C		-2.09
Inlet temperature	°C		30.05
Outlet temperature	°C		35.23
Circulation pump			
Measured: Static differential pressure, liquid pump	Pa		38976
Calculated Hydraulic power	W		11
Calculated global efficiency	η		0.24
Calculated Capacity correction	W		35
Calculated Power correction	W		46
Water Flow	m ³ /s		0.000285

Note) Quiet mode 3



Detailed COP test results - medium temperature – EN14511

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	8.590
COP	-	2.910
Power consumption	kW	2.952
Measured		
Heating capacity	kW	8.625
COP	-	2.877
Power consumption	kW	2.998
During heating		
Air temperature dry bulb	°C	7.00
Air temperature wet bulb	°C	6.00
Air temperature dry bulb outlet	°C	3.18
Inlet temperature	°C	47.00
Outlet temperature	°C	55.19
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	42649
Calculated Hydraulic power	W	11
Calculated global efficiency	η	0.24
Calculated Capacity correction	W	35
Calculated Power correction	W	46
Water Flow	m ³ /s	0.000256



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		6.558
COP	-		2.333
Power consumption	kW		2.811
Measured			
Heating capacity	kW		6.592
COP	-		2.309
Power consumption	kW		2.854
During heating			
Air temperature dry bulb	°C		2.13
Air temperature wet bulb	°C		0.96
Air temperature dry bulb outlet	°C		-1.31
Inlet temperature	°C		47.06
Outlet temperature	°C		54.94
Circulation pump			
Measured: Static differential pressure, liquid pump	Pa		44145
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		0.000228



Detailed result for 'EN14511:2018' A-7/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	5.893
COP	-	2.007
Power consumption	kW	2.936
Measured		
Heating capacity	kW	5.923
COP	-	1.992
Power consumption	kW	2.974
During heating		
Air temperature dry bulb	°C	-6.91
Air temperature wet bulb	°C	-8.06
Air temperature dry bulb outlet	°C	-10.00
Inlet temperature	°C	47.00
Outlet temperature	°C	55.21
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	45437
Calculated Hydraulic power	W	8
Calculated global efficiency	η	0.21
Calculated Capacity correction	W	30
Calculated Power correction	W	38
Water Flow	m ³ /s	0.000175



Detailed SEER test results for test points at fan cooling application for space cooling - EN14825

Detailed result for 'EN14825:2018 Cooling fan (A) A35/W7		
Tested according to:	EN14511:2018 and	EN14825:2018
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	7.00
Cooling demand:	kW	7.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Integrated liquid pump able to generate a positive ext. static pressure difference:		Yes
Included corrections (Final result)		
Cooling capacity	kW	6.544
EER	-	3.180
Power consumption	kW	2.058
Measured		
Cooling capacity	kW	6.509
EER	-	3.095
Power consumption	kW	2.103
During cooling		
Air_inter temperature dry bulb	°C	34.99
Air_outlet temperature dry bulb	°C	42.73
Water_Inlet temperature	°C	11.96
Water_outlet temperature	°C	7.03
Water_outlet temperature (Time averaged)	°C	7.03
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	33792
Calculated Hydraulic power	W	11
Calculated global efficiency	η	0.24
Calculated Capacity correction	W	34
Calculated Power correction	W	45
Water Flow	m ³ /s	0.000315



Detailed result for 'EN14825:2018 Cooling fan (B) A30/W8.5

Tested according to:	EN14511:2018 and	EN14825:2018
Climate zone:		N/A
Temperature application:		Cooling fan
Condition name:		B
Condition temperature:	°C	30
Part load:	%	73.68%
Chosen Tbivalent	°C	N/A
Tdesign	°C	35
Pdesign	kW	7.00
Cooling demand:	kW	5.16
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Integrated liquid pump able to generate a positive ext. static pressure difference:		Yes
Included corrections (Final result)		
Cooling capacity	kW	4.825
EER	-	4.121
Power consumption	kW	1.171
Measured		
Cooling capacity	kW	4.793
EER	-	3.955
Power consumption	kW	1.212
During cooling		
Air_inter temperature dry bulb	°C	29.99
Air_outlet temperature dry bulb	°C	35.49
Water_Inlet temperature	°C	13.52
Water_outlet temperature	°C	8.56
Water_outlet temperature (Time averaged)	°C	8.56
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	39608
Calculated Hydraulic power	W	9
Calculated global efficiency	η	0.22
Calculated Capacity correction	W	32
Calculated Power correction	W	41
Water Flow	m ³ /s	0.000231



Detailed result for 'EN14825:2018 Cooling fan (C) A25/W10

Tested according to:	EN14511:2018 and	EN14825:2018
Climate zone:		N/A
Temperature application:		Cooling fan
Condition name:		C
Condition temperature:	°C	25
Part load:	%	47.37%
Chosen Tbivalent	°C	N/A
Tdesign	°C	35
Pdesign	kW	7.00
Cooling demand:	kW	3.32
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Integrated liquid pump able to generate a positive ext. static pressure difference:		Yes
Included corrections (Final result)		
Cooling capacity	kW	3.644
EER	-	6.774
Power consumption	kW	0.538
Measured		
Cooling capacity	kW	3.615
EER	-	6.301
Power consumption	kW	0.574
During cooling		
Air_inter temperature dry bulb	°C	25.02
Air_outlet temperature dry bulb	°C	29.52
Water_Inlet temperature	°C	15.03
Water_outlet temperature	°C	9.97
Water_outlet temperature (Time averaged)	°C	9.97
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	42179
Calculated Hydraulic power	W	7
Calculated global efficiency	η	0.20
Calculated Capacity correction	W	29
Calculated Power correction	W	36
Water Flow	m ³ /s	0.000171



Detailed result for 'EN14825:2018 Cooling fan (D) A20/W11.5

Tested according to:	EN14511:2018 and	EN14825:2018
Climate zone:		N/A
Temperature application:		Cooling fan
Condition name:		D
Condition temperature:	°C	20
Part load:	%	21.05%
Chosen Tbivalent	°C	N/A
Tdesign	°C	35
Pdesign	kW	7.00
Cooling demand:	kW	1.47
CR:	-	0.5
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Integrated liquid pump able to generate a positive ext. static pressure difference:		Yes
Included corrections (Final result)		
Cooling capacity	kW	2.987
EER	-	8.493
Power consumption	kW	0.352
Measured		
Cooling capacity	kW	2.961
EER	-	7.708
Power consumption	kW	0.384
During cooling		
Air_inter temperature dry bulb	°C	20.02
Air_outlet temperature dry bulb	°C	25.89
Water_inlet temperature	°C	13.81
Water_outlet temperature	°C	8.87
Water_outlet temperature (Time averaged)	°C	11.37
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	42832
Calculated Hydraulic power	W	6
Calculated global efficiency	η	0.19
Calculated Capacity correction	W	26
Calculated Power correction	W	32
Water Flow	m ³ /s	0.000143