

TEST REPORT

Report no.:
300-KLAB-19-020



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Page 1 of 27
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Enclosures: 0

Customer: Company: Panasonic DE GmbH
Address: Hagenauer Strasse 43
City: 65203 Wiesbaden
Tel.: +49 1724 141441

Component: Brand: Panasonic
Type: Air to water heat pump
Model: Outdoor: WH-UD05JE5 Indoor: WH-ADC0309J3E5
Series no.: Outdoor: 5621201008 Indoor: 5704001319
Production year: Outdoor:2019.04 Indoor: 2019.05

Dates: Component tested: October 2019

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.
The unit was delivered as model no. WH-UD03JE5, cf. the rating plates of the units. By changing the software, the unit was changed to model no. WH-UD05JE5.

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Division/Centre: Danish Technological Institute
Energy and Climate
Heat Pump Laboratory, Aarhus

Date: 2019.11.01

Signature: Kamalathasan Arumugam
B.Sc. Engineer



 **DANAK**
Test Reg. nr. 300



Objective

The objective of this report is to document the following:

- The Seasonal Coefficient of Performance (SCOP) according to EN 14825:2016. In order to calculate the SCOP, tests were carried out at the part load conditions stated in the table below.
- Part load test according to EN14511:2018 at A7/W35 and A2/W35
- Full load test according to EN14511:2018 at A-7/W35





Test conditions for low temperature application at reference heating season average

Part load conditions for reference SCOP and reference SCOPon 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





Test conditions for medium temperature application at reference heating season average

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	$\frac{(-7 - 16)}{(T_{\text{designh}} - 16)}$	88	n/a	61	-7(-8)	20(12)	^a / 55	^a / 52	n/a	^a / 44
B	$\frac{(+2 - 16)}{(T_{\text{designh}} - 16)}$	54	100	37	2(1)	20(12)	^a / 55	^a / 42	^a / 55	^a / 37
C	$\frac{(+7 - 16)}{(T_{\text{designh}} - 16)}$	35	64	24	7(6)	20(12)	^a / 55	^a / 36	^a / 46	^a / 32
D	$\frac{(+12 - 16)}{(T_{\text{designh}} - 16)}$	15	29	11	12(11)	20(12)	^a / 55	^a / 30	^a / 34	^a / 28
E	$(TOL - 16) / (T_{\text{designh}} - 16)$				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	$\frac{(-15 - 16)}{(T_{\text{designh}} - 16)}$	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 EN14511:2018, part load and full load tests

No.	Inlet dry bulb air temperature (°C)	Inlet wet bulb air temperature (°C)	Outlet water temperature (°C)	Inlet water temperature (°C)
1 ^a	2	1	35	30
2 ^b	7	6	35	30
3 ^c	-7	-8	35	30

- a) Part load test at test mode 29 (60% of the heating capacity of A-7W35)
b) Part load test at test mode 21 (40% of the heating capacity of A-7W35)
c) Full load test at test mode 1





Main test results for low temperature application at reference heating season average

Model (Indoor + Outdoor)	WH-ADC0309J3E5 + WH-UD05JE5
Air-to-water heat pump monobloc	N
Low-temperature heat pump	N
Equipped with supplementary heater	Y
Heat pump combination heater	Y

Rated heat output¹⁾	P_{rated}	5 [kW]
Seasonal space heating energy efficiency	η_s	206.2 [%]
	SCOP	5.23 [-]

Measured capacity for heating for part load at outdoor temperature T_j	Average Climate	$T_j = -15\text{ °C}$	P_{dh}	- [kW]
	-	$T_j = -7\text{ °C}$	P_{dh}	4.13 [kW]
	Low temperature application	$T_j = 2\text{ °C}$	P_{dh}	2.67 [kW]
		$T_j = 7\text{ °C}$	P_{dh}	1.81 [kW]
		$T_j = 12\text{ °C}$	P_{dh}	1.65 [kW]
		$T_j = \text{bivalent temperature}$	P_{dh}	4.99 [kW]
		$T_j = \text{operation limit}$	P_{dh}	4.99 [kW]

Measured coefficient of performance at outdoor temperature T_j	Average Climate	$T_j = -15\text{ °C}$	COPd	- [-]
	-	$T_j = -7\text{ °C}$	COPd	2.63 [-]
	Low temperature application	$T_j = 2\text{ °C}$	COPd	5.35 [-]
		$T_j = 7\text{ °C}$	COPd	7.23 [-]
		$T_j = 12\text{ °C}$	COPd	10.12 [-]
		$T_j = \text{bivalent temperature}$	COPd	2.57 [-]
		$T_j = \text{operation limit}$	COPd	2.57 [-]

Bivalent temperature	$T_{bivalent}$	-10 [°C]
Operation limit temperatures	TOL	-10 [°C]
Degradation coefficient	WTOL	- [°C]
	C_{dh}	0.96 [-]

Power consumption in modes other than active mode	Off mode	P_{OFF}	0.005 [kW]
	Thermostat-off mode	P_{TO}	0.007 [kW]
	Standby mode	P_{SB}	0.005 [kW]
	Crankcase heater mode	P_{CK}	0.005 [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}	1975 [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, $sup(T_j)$.



Main test results for medium temperature application at reference heating season average

Model (Indoor + Outdoor)	WH-ADC0309J3E5 + WH-UD05JE5
Air-to-water heat pump monobloc	N
Low-temperature heat pump	N
Equipped with supplementary heater	Y
Heat pump combination heater	Y

Rated heat output ¹⁾	P _{rated}	4 [kW]
Seasonal space heating energy efficiency	η_s	142.1 [%]
	SCOP	3.63 [-]

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}	3.63 [kW]
	Medium temperature application	T _j = 2 °C	P _{dh}	2.18 [kW]
		T _j = 7 °C	P _{dh}	1.47 [kW]
		T _j = 12 °C	P _{dh}	1.54 [kW]
		T _j = bivalent temperature	P _{dh}	3.81 [kW]
		T _j = operation limit	P _{dh}	3.81 [kW]

Measured coefficient of performance at outdoor temperature T _j	Average Climate	T _j = -15 °C	COP _d	- [-]
	-	T _j = -7 °C	COP _d	2.05 [-]
	Medium temperature application	T _j = 2 °C	COP _d	3.61 [-]
		T _j = 7 °C	COP _d	4.86 [-]
		T _j = 12 °C	COP _d	7.30 [-]
		T _j = bivalent temperature	COP _d	1.54 [-]
		T _j = operation limit	COP _d	1.54 [-]

Bivalent temperature	T _{bivalent}	-10 [°C]
Operation limit temperatures	TOL	-10 [°C]
	WTOL	- [°C]
Degradation coefficient	C _{dh}	0.97 [-]

Power consumption in modes other than active mode	Off mode	P _{OFF}	0.005 [kW]
	Thermostat-off mode	P _{TO}	0.007 [kW]
	Standby mode	P _{SB}	0.005 [kW]
	Crankcase heater mode	P _{CK}	0.005 [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}	2278 [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 for EN14511:2018, part load and full load tests

No.	Test condition	Heating capacity – [kW]	COP
1 ^a	A2/W35	3.03	4.32
2 ^b	A7/W35	1.97	5.19
3 ^c	A-7/W35	4.13	2.66

- a) Part load test at test mode 29 (60% of the heating capacity of A-7W35)
b) Part load test at test mode 21 (40% of the heating capacity of A-7W35)
c) Full load test at test mode 1





Outdoor unit



Outdoor unit rating plate





Indoor unit



Indoor unit rating plate

Panasonic

AIR-TO-WATER HYDROMODULE + TANK

Model No. WH-ADC0309J3E5

OUTDOOR UNIT WH-UD03JE5
WH-UD05JE5
WH-UD07JE5
WH-UD09JE5

POWER SUPPLY 1 (HEAT PUMP)
RATED VOLTAGE 230V~
RATED FREQUENCY 50Hz

POWER SUPPLY 2 (BACKUP HEATER)
RATED VOLTAGE 230V~
RATED FREQUENCY 50Hz
MAXIMUM POWER 3.00kW
MAXIMUM CURRENT 13.00A

MAX. WORKING PRESSURE MPa (Bar)
- SPACE HEAT/COOL 0.3 (3.0)
- TANK CIRCUIT 0.8 (8.0)

TANK UNIT CAPACITY (NETT) 185L

Panasonic AVC Networks Czech, s.r.o.
U Panasoniku 1, 320 84 Plzeň, Czech Republic
Assembled in the Czech Republic
Authorized representative in EU
Panasonic Testing Centre
Panasonic Marketing Europe GmbH
Winsberggring 15, 22525 Hamburg, Germany

SERIAL NO. **5704001319**

CE

IP21

ACXF09-04700

R32

PRODUCTION DATE 2019.05





Detailed SCOP calculation for low temperature and average climate conditions

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	4.42	4.13	2.63	1.00	1.00	2.63
B	2	54	2.69	2.67	5.35	0.99	1.00	5.35
C	7	35	1.73	1.81	7.23	0.97	1.00	7.23
D	12	15	0.77	1.65	10.12	0.96	0.47	9.65
E	-10	100	5.00	4.99	2.57	1.00	1.00	2.57
F - BIV	-10	100	5.00	4.99	2.57	1.00	1.00	2.57

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	0.005	0.005	18.36
Thermostat off	178	0.007	0.007	1.246
Standby	0	0.005	0.005	0
Crankcase heater	3850	0.005	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	5.00	4.99	0.00	0.00	2.57	5.00	1.95	5.00	1.95
	22	-9	25	4.81	4.70	0.00	0.00	2.59	120.19	46.41	120.19	46.41
	23	-8	23	4.62	4.42	0.00	0.00	2.61	106.15	40.67	106.15	40.67
A	24	-7	24	4.42	4.13	0.00	0.00	2.63	106.15	40.36	106.15	40.36
	25	-6	27	4.23	3.97	0.00	0.00	2.93	114.23	38.96	114.23	38.96
	26	-5	68	4.04	3.81	0.00	0.00	3.23	274.62	84.90	274.62	84.90
	27	-4	91	3.85	3.64	0.00	0.00	3.54	350.00	98.96	350.00	98.96
	28	-3	89	3.65	3.48	0.00	0.00	3.84	325.19	84.71	325.19	84.71
	29	-2	165	3.46	3.32	0.00	0.00	4.14	571.15	137.92	571.15	137.92
	30	-1	173	3.27	3.16	0.00	0.00	4.44	565.58	127.29	565.58	127.29
	31	0	240	3.08	2.99	0.00	0.00	4.75	738.46	155.61	738.46	155.61
	32	1	280	2.88	2.83	0.00	0.00	5.05	807.69	160.01	807.69	160.01
B	33	2	320	2.69	2.67	0.00	0.00	5.35	861.54	161.04	861.54	161.04
	34	3	357	2.50	2.48	0.00	0.00	5.73	892.50	155.87	892.50	155.87
	35	4	356	2.31	2.29	0.00	0.00	6.10	821.54	134.63	821.54	134.63
	36	5	303	2.12	2.11	0.00	0.00	6.48	640.96	98.94	640.96	98.94
	37	6	330	1.92	1.92	0.00	0.00	6.85	634.62	92.59	634.62	92.59
C	38	7	326	1.73	1.73	0.00	0.00	7.23	564.23	78.04	564.23	78.04
	39	8	348	1.54	1.54	0.00	0.00	7.71	535.38	69.41	535.38	69.41
	40	9	335	1.35	1.35	0.00	0.00	8.20	450.96	55.02	450.96	55.02
	41	10	315	1.15	1.15	0.00	0.00	8.68	363.46	41.88	363.46	41.88
	42	11	215	0.96	0.96	0.00	0.00	9.16	206.73	22.56	206.73	22.56
D	43	12	169	0.77	0.77	0.00	0.00	9.65	130.00	13.48	130.00	13.48
	44	13	151	0.58	0.58	0.00	0.00	10.13	87.12	8.60	87.12	8.60
	45	14	105	0.38	0.38	0.00	0.00	10.61	40.38	3.81	40.38	3.81
	46	15	74	0.19	0.19	0.00	0.00	11.10	14.23	1.28	14.23	1.28

SUM	10328.08	1954.90	10328.08	1954.90
SCOPon		5.28	SCOPnet	5.28



Detailed SCOP calculation for medium temperature and average climate conditions

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	3.54	3.63	2.05	1.00	1.00	2.05
B	2	54	2.15	2.18	3.61	0.99	1.00	3.61
C	7	35	1.38	1.47	4.86	0.98	1.00	4.86
D	12	15	0.62	1.54	7.30	0.97	0.40	6.95
E	-10	100	4.00	3.81	1.54	1.00	1.00	1.54
F - BIV	-10	100	4.00	3.81	1.54	1.00	1.00	1.54

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	0.005	0.005	18.36
Thermostat off	178	0.007	0.007	1.246
Standby	0	0.005	0.005	0
Crankcase heater	3850	0.005	0	0



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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	4.00	3.81	0.00	0.00	1.54	4.00	2.60	4.00	2.60
	22	-9	25	3.85	3.72	0.00	0.00	1.71	96.15	56.23	96.15	56.23
	23	-8	23	3.69	3.63	0.00	0.00	1.88	84.92	45.17	84.92	45.17
A	24	-7	24	3.54	3.54	0.00	0.00	2.05	84.92	41.43	84.92	41.43
	25	-6	27	3.38	3.38	0.00	0.00	2.22	91.38	41.10	91.38	41.10
	26	-5	68	3.23	3.23	0.00	0.00	2.40	219.69	91.67	219.69	91.67
	27	-4	91	3.08	3.08	0.00	0.00	2.57	280.00	108.95	280.00	108.95
	28	-3	89	2.92	2.92	0.00	0.00	2.74	260.15	94.83	260.15	94.83
	29	-2	165	2.77	2.77	0.00	0.00	2.92	456.92	156.66	456.92	156.66
	30	-1	173	2.62	2.62	0.00	0.00	3.09	452.46	146.43	452.46	146.43
	31	0	240	2.46	2.46	0.00	0.00	3.26	590.77	181.03	590.77	181.03
	32	1	280	2.31	2.31	0.00	0.00	3.44	646.15	188.02	646.15	188.02
B	33	2	320	2.15	2.15	0.00	0.00	3.61	689.23	190.92	689.23	190.92
	34	3	357	2.00	2.00	0.00	0.00	3.86	714.00	184.97	714.00	184.97
	35	4	356	1.85	1.85	0.00	0.00	4.11	657.23	159.91	657.23	159.91
	36	5	303	1.69	1.69	0.00	0.00	4.36	512.77	117.61	512.77	117.61
	37	6	330	1.54	1.54	0.00	0.00	4.61	507.69	110.13	507.69	110.13
C	38	7	326	1.38	1.38	0.00	0.00	4.86	451.38	92.88	451.38	92.88
	39	8	348	1.23	1.23	0.00	0.00	5.28	428.31	81.14	428.31	81.14
	40	9	335	1.08	1.08	0.00	0.00	5.70	360.77	63.32	360.77	63.32
	41	10	315	0.92	0.92	0.00	0.00	6.12	290.77	47.54	290.77	47.54
	42	11	215	0.77	0.77	0.00	0.00	6.53	165.38	25.31	165.38	25.31
D	43	12	169	0.62	0.62	0.00	0.00	6.95	104.00	14.96	104.00	14.96
	44	13	151	0.46	0.46	0.00	0.00	7.37	69.69	9.45	69.69	9.45
	45	14	105	0.31	0.31	0.00	0.00	7.79	32.31	4.15	32.31	4.15
	46	15	74	0.15	0.15	0.00	0.00	8.21	11.38	1.39	11.38	1.39

SUM	8262.46	2257.79	8262.46	2257.79
SCOPon		3.66	SCOPnet	3.66



Detailed test results - low temperature application

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	5.00
Heating demand:	kW	4.42
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Transient
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	4.13
COP	-	2.63
Power consumption	kW	1.57
Measured		
Heating capacity	kW	4.16
COP	-	2.59
Power consumption	kW	1.61
During heating		
Air temperature dry bulb	°C	-7.0
Air temperature wet bulb	°C	-8.1
Inlet temperature	°C	29.1
Outlet temperature	°C	34.1
Outlet temperature (Time averaged)	°C	34.1
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	30602
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	0.000240





Detailed result for 'EN14825:2016' Average Low (B) A2/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	5.00
Heating demand:	kW	2.69
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	2.67
COP	-	5.35
Power consumption	kW	0.50
Measured		
Heating capacity	kW	2.69
COP	-	5.11
Power consumption	kW	0.53
During heating		
Air temperature dry bulb	°C	2.1
Air temperature wet bulb	°C	1.0
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	37769
Calculated Hydraulic power	W	5
Calculated global efficiency	η	0.17
Calculated Capacity correction	W	23
Calculated Power correction	W	28
Water Flow	m ³ /s	0.000127



Detailed result for 'EN14825:2016' Average Low (C) A7/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	5.00
Heating demand:	kW	1.73
CR:	-	1.0
Minimum flow reached:	-	Yes
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	1.81
COP	-	7.23
Power consumption	kW	0.25
Measured		
Heating capacity	kW	1.83
COP	-	6.60
Power consumption	kW	0.28
During heating		
Air temperature dry bulb	°C	7.0
Air temperature wet bulb	°C	6.0
Inlet temperature	°C	23.6
Outlet temperature	°C	27.1
Outlet temperature (Time averaged)	°C	27.1
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	37732
Calculated Hydraulic power	W	5
Calculated global efficiency	η	0.17
Calculated Capacity correction	W	23
Calculated Power correction	W	27
Water Flow	m ³ /s	0.000125



Detailed result for 'EN14825:2016' Average Low (D) A12/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	5.00
Heating demand:	kW	0.77
CR:	-	0.5
Minimum flow reached:	-	Yes
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	1.65
COP	-	10.12
Power consumption	kW	0.16
Measured		
Heating capacity	kW	1.67
COP	-	8.77
Power consumption	kW	0.19
During heating		
Air temperature dry bulb	°C	12.0
Air temperature wet bulb	°C	11.0
Inlet temperature	°C	22.5
Outlet temperature	°C	25.7
Outlet temperature (Time averaged)	°C	24.0
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	38352
Calculated Hydraulic power	W	5
Calculated global efficiency	η	0.17
Calculated Capacity correction	W	23
Calculated Power correction	W	28
Water Flow	m ³ /s	0.000124



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	5.00
Heating demand:	kW	5.00
CR:	-	1.0
Minimum flow reached:	-	No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	4.99
COP	-	2.57
Power consumption	kW	1.94
Measured		
Heating capacity	kW	5.02
COP	-	2.54
Power consumption	kW	1.98
During heating		
Air temperature dry bulb	°C	-10.0
Air temperature wet bulb	°C	-11.2
Inlet temperature	°C	30.0
Outlet temperature	°C	35.0
Outlet temperature (Time averaged)	°C	35.0
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	30557
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	0.000241



Detailed test results - medium temperature application

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	4.00
Heating demand:	kW	3.54
CR:	-	1.0
Minimum flow reached:	-	Yes
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	3.63
COP	-	2.05
Power consumption	kW	1.77
Measured		
Heating capacity	kW	3.65
COP	-	2.03
Power consumption	kW	1.80
During heating		
Air temperature dry bulb	°C	-7.0
Air temperature wet bulb	°C	-8.0
Inlet temperature	°C	45.0
Outlet temperature	°C	52.1
Outlet temperature (Time averaged)	°C	52.1
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	39197
Calculated Hydraulic power	W	5
Calculated global efficiency	η	0.17
Calculated Capacity correction	W	23
Calculated Power correction	W	28
Water Flow	m ³ /s	0.000125





Detailed result for 'EN14825:2016' Average Medium (B) A2/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	4.00
Heating demand:	kW	2.15
CR:	-	1.0
Minimum flow reached:	-	Yes
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	2.18
COP	-	3.61
Power consumption	kW	0.61
Measured		
Heating capacity	kW	2.21
COP	-	3.48
Power consumption	kW	0.63
During heating		
Air temperature dry bulb	°C	2.0
Air temperature wet bulb	°C	1.0
Inlet temperature	°C	38.0
Outlet temperature	°C	42.2
Outlet temperature (Time averaged)	°C	42.2
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	40110
Calculated Hydraulic power	W	5
Calculated global efficiency	η	0.18
Calculated Capacity correction	W	23
Calculated Power correction	W	29
Water Flow	m ³ /s	0.000125



Detailed result for 'EN14825:2016' Average Medium (C) A7/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	4.00
Heating demand:	kW	1.38
CR:	-	1.0
Minimum flow reached:	-	Yes
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	1.47
COP	-	4.86
Power consumption	kW	0.30
Measured		
Heating capacity	kW	1.49
COP	-	4.51
Power consumption	kW	0.33
During heating		
Air temperature dry bulb	°C	7.0
Air temperature wet bulb	°C	6.0
Inlet temperature	°C	33.1
Outlet temperature	°C	36.0
Outlet temperature (Time averaged)	°C	36.0
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	39945
Calculated Hydraulic power	W	5
Calculated global efficiency	η	0.18
Calculated Capacity correction	W	23
Calculated Power correction	W	28
Water Flow	m ³ /s	0.000125



Detailed result for 'EN14825:2016' Average Medium (D) A12/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	4.00
Heating demand:	kW	0.62
CR:	-	0.4
Minimum flow reached:	-	Yes
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	1.54
COP	-	7.30
Power consumption	kW	0.21
Measured		
Heating capacity	kW	1.56
COP	-	6.54
Power consumption	kW	0.24
During heating		
Air temperature dry bulb	°C	12.0
Air temperature wet bulb	°C	11.0
Inlet temperature	°C	28.8
Outlet temperature	°C	31.8
Outlet temperature (Time averaged)	°C	30.0
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	39176
Calculated Hydraulic power	W	5
Calculated global efficiency	η	0.17
Calculated Capacity correction	W	23
Calculated Power correction	W	28
Water Flow	m ³ /s	0.000124



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	4.00
Heating demand:	kW	4.00
CR:	-	1.0
Minimum flow reached:	-	Yes
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	3.81
COP	-	1.54
Power consumption	kW	2.47
Measured		
Heating capacity	kW	3.83
COP	-	1.53
Power consumption	kW	2.50
During heating		
Air temperature dry bulb	°C	-10.0
Air temperature wet bulb	°C	-11.1
Inlet temperature	°C	47.8
Outlet temperature	°C	55.2
Outlet temperature (Time averaged)	°C	55.2
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	39800
Calculated Hydraulic power	W	5
Calculated global efficiency	η	0.18
Calculated Capacity correction	W	23
Calculated Power correction	W	28
Water Flow	m ³ /s	0.000125



Detailed test results – for EN14511 full load test

Detailed result for 'EN14511:2018' A-7/W35 Full load		
Tested according to:		EN14511:2018
Minimum flow reached:		No
Measurement type:		Transient
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	4.13
COP	-	2.66
Power consumption	kW	1.55
Measured		
Heating capacity	kW	4.15
COP	-	2.62
Power consumption	kW	1.58
During heating		
Air temperature dry bulb	°C	-7.2
Air temperature wet bulb	°C	-8.2
Inlet temperature	°C	30.0
Outlet temperature	°C	35.0
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	30386
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	0.000228





Detailed test results – for EN14511 part load test

Detailed result for 'EN14511:2018' A2/W35 Part load		
Tested according to:		EN14511:2018
Minimum flow reached:		No
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	3.03
COP	-	4.32
Power consumption	kW	0.70
Measured		
Heating capacity	kW	3.06
COP	-	4.18
Power consumption	kW	0.73
During heating		
Air temperature dry bulb	°C	2.0
Air temperature wet bulb	°C	0.8
Inlet temperature	°C	30.0
Outlet temperature	°C	35.1
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	37600
Calculated Hydraulic power	W	5
Calculated global efficiency	η	0.18
Calculated Capacity correction	W	25
Calculated Power correction	W	30
Water Flow	m ³ /s	0.000144





Detailed result for 'EN14511:2018' A7/W35 Part load		
Tested according to:		EN14511:2018
Minimum flow reached:		Yes
Measurement type:		Steady State
Integrated circulation pump:		Yes
Included corrections (Final result)		
Heating capacity	kW	1.97
COP	-	5.19
Power consumption	kW	0.38
Measured		
Heating capacity	kW	1.99
COP	-	4.90
Power consumption	kW	0.41
During heating		
Air temperature dry bulb	°C	7.0
Air temperature wet bulb	°C	5.9
Inlet temperature	°C	31.3
Outlet temperature	°C	35.0
Circulation pump		
Measured: Static differential pressure, liquid pump	Pa	36883
Calculated Hydraulic power	W	5
Calculated global efficiency	η	0.17
Calculated Capacity correction	W	23
Calculated Power correction	W	27
Water Flow	m ³ /s	0.000128